Foreword

India is blessed with diversified of livestock population. India inhabits 15 percent of world livestock population on 2.4 percent of geographical area, which shows extent of livestock pressure on the available subcontinental resources in comparison to other countries. Recent trend in animal husbandry indicates a rapid and considerable increase in the consumption of livestock origin products. However, deficiency in quality feed and fodder is major hurdle in achieving desired level of livestock production. The production and quality of feed and fodder will be pivotal in sustaining the incremental growth of animal husbandry sector. Due to competing land use, area under cultivated fodder is nearly static for last three decades because of low priority in comparison to other sectors of agriculture. Hence, only option available is to catalyze horizontal increase to underutilized areas and vertical increase in the forage productivity to meet out the fast increasing demand of the fodder for economic livestock production. In present scenario the productivity of cultivated fodder crops is low as minimal production resources are allocated to these species. This needs to be tackled by educating the farmers about the production packages of fodder crops like selection of appropriate forage species, varieties and management techniques to sustain forage yields and soil fertility. The country has varied agro climatic conditions as well as farming situation. In these circumstances, the objective of improving the forage varieties and forage productivity is complicated. Each crop has to be dealt with concise manner to accommodate the information on sowing technique, varieties, nutrient management, water management, crop protection, quality attributes and harvesting.

AICRP on Forage Crops & Utilization is consistently pursuing the mandate for development of varieties, technique for increasing productivity of cultivated forage crops and grasses of annual and perennial nature and eco-friendly plant protection technologies and bringing different stakeholders under single umbrella.

I would like to sincerely acknowledge Project coordinator and other scientists of project coordinating unit of AICRP (FC&U) who have contributed in the preparation of the Annual Report *Rabi* 2021-22 and helped in achieving the set targets.

(Amaresh Chandra)
Director
ICAR-IGFRI, Jhansi

PREFACE

The Annual Report (2021-22), Part II–*Rabi* 2021-22 embodies the results of various research trials conducted in the areas of forage crop improvement, crop production and crop protection with the view to develop and test the technologies for better quality/quantity of forage production in different agro climatic situations. This report is the outcome of sincere efforts made by all contributing scientists and staff at the Coordinating Unit and AICRP-FCU Centres. The trials and activities were successfully conducted as per the technical programme fixed for *Rabi* 2021-22. The forage crops tested during the period under report, included forage cereals and legumes adaptable to a wide range of agro-ecological regions of the country. The report is divided into several chapters, which include Crop Improvement, Crop Production, Crop Protection, Breeder Seed Production etc. The results of multi-locational evaluation of newly developed genetic material for single and perennial forage species are compiled in Crop Improvement chapter. The trials presented in Crop Production chapter focused on optimization of fertilizer levels for forage crop in different cropping system, forage production potential, location specific research on weed management and agronomical trial for AVT entries of Oats, Berseem and Lucerne. The chapter on Crop Protection deals with different aspects of crop protection in important rabi forage crops *viz*., Berseem, Oats, Lucerne etc. as well as generation of technologies for pest management in the selected crops. The information on breeder seed production against the DAC indent is also provided in Breeder Seed Production chapter. Weather data from coordinating and voluntary centers has also been compiled to correlate the growth and yield of forage crops with weather parameters at different sites during crop period. Other chapters include details of inhouse breeding activities etc.

The contribution and sincere efforts made by each and every member of the team and their associates at the centres deserve appreciation in achieving the objectives of this project. Their valuable contribution for over all outputs of AICRP on Forage Crops and Utilization is gratefully acknowledged.

My colleagues at Project Coordinating unit, Dr. R. K. Agrawal, Principal Scientist (Agronomy), Dr. Nitish R. Bhardwaj, Scientist (Plant Pathology) and technical officers, Shri R. S. Patel and Shri H. K. Agarwal provided support in distribution of seed/planting material for the trials and analysis and tabulation of data of trials conducted at all the locations. Their contributions are thankfully acknowledged.

The administrative support and cooperation received from Dr. Amaresh Chandra, Director, IGFRI during the period is thankfully acknowledged. I also record my sincere thanks to colleagues at IGFRI for their kind support.

Meeting all the targeted activities would not have been possible without the active leadership, support, guidance and encouragement received from Dr. Himanshu Pathak, Secretary DARE & DG, ICAR; Dr. T. R. Sharma, DDG (CS); Dr. R. K. Singh, ADG (CC & FFC) and Dr. D.K. Yadava, ADG (seed) are gratefully acknowledged. Each and every one in the team at AICRP on Forage Crops & Utilization gratefully acknowledges their guidance and support.

A. K. Roy
Project Coordinator

CONTENTS

EXECUTIVE SUMMARY

The report provides compilation of the results of the coordinated multi-location trials conducted on crop improvement, crop production, crop protection as well as the breeder seed production, technology demonstrations, developmental and research activities under various government schemes like NEH, DAPSC, DAPSTC etc. of the different forage crops during Rabi 2021-22 as well as summer 2022 at different centres in the country. Weather data at different centres are also reported to correlate the growth and yield of forage crops as well as disease prevalence with weather parameters during crop period. Results of other activities carried out by the staff of AICRP units, in-house breeding, research guidance, teaching, extension activities etc. are also included.

A. FORAGE CROP IMPROVEMENT

In Rabi 2021-22 and summer 2022, multi-location trials were conducted across the country to identify the suitable entries for different zones and at national level. Various parameters were considered which includes green and dry forage yield (GFY, DMY), crude protein yield (CPY), crude protein (CP), ADF, NDF, IVDMD, per day productivity, plant height, leafiness etc.

A total of 24 multi locational trials comprising of test entries along with their respective checks were conducted at 34 locations in the country. It included 20 trials under annual and 4 under perennial crops. The annual crops included Berseem, Oats, Lucerne, Lathyrus, Bajra (multicut, summer), whereas under the perennial system Lucerne, Sainfoin, Orchard grass, Tall fescue were evaluated. A total of 127 entries including 99 annual and 28 perennial along with national and zonal checks were evaluated.

The results led to identification of promising entries which have recorded their superiority with respect to best zonal/national check. The summarized results of different cultivated annual and perennial forage evaluation trials are as below:

BERSEEM

IVTB: In Initial Varietal Trial in Berseem, Five entries along with one national check and one zonal check in respective zones were evaluated at 17 centres comprising of 2 locations in HZ, 5 each in NWZ, NEZ and central zone.

For hill zone, entries BM-13 (20.4%), PC-115 (19.5%), HFB-18-3 (19.5%) were better than the best check (19.3%) for crude protein %. For NWZ, entry PC 115 showed marginal superiority over the best check. For crude protein yield, entries BM -13 (19.9%), PC-115 (18.8%) were better than the best check (17.7%). For crude protein %, entries HFB-18-3 (19.9), JB-08-19 (19.3), BM-13 (19.2) performed better than the national check Wardan (19.1). In central zone, entries PC -115, BM-13, HFB -18-3, HFB-18-9, JB-08-19 performed better than the best check for GFY, DMY and CPY. For crude protein %, entries HFB-18-9 (19.9%), PC-115 (19.2%), performed better than the best zonal check BL-44 (18.5%). In NEZ, national check Wardan performed best for GFY, DMY as well as CP% and CPY. For other quality parameters, entry BM-13 top ranked for ADF%, national check

Wardan for NDF%. For IVDMD, entry BM -13 (57.4%) top ranked followed by PC-115 (56.4%), and JB-08-19 (56.2%) and national check Wardan (55.8%).

AVTB-1: In First Advanced Varietal Trial in Berseem, four entries along with one national check and one zonal check were evaluated at 17 centres, 3 in Hill, 5 each in NW and central zones, 4 locations in NE zone. In Hill zone, for crude protein yield and crude protein %, entry PC-114 ranked first. In NWZ, entry PC-114 for GFY and entries JB-08-17 and PC-114 for DMY were more than 5% superior over the best check. Entry PC-114 with a value of 22.2 ranked first for CPY followed by entry JB-08-17 (21.0) and national check Wardan (19.8 q/ha).

For NEZ, entry JB-08-17 showed superiority by a margin of 6.1% for GFY and 5.3% for DMY over the best check. For central zone, entries performing better than the best check for GFY, DMY, CPY and CP% included JB-08-17, PC-114, JHB-20-1 and JHB-20-2. At all India level, PC-114 was best performer showing superiority of 5.2% over the national check Wardan. For DMY also, entries JB-08-17, PC-114 performed better than the national check by margins of 7.8%, 7.1% respectively. Entries PC-114 (15.2%), JB-08-17 (14.3%) performed better than the national check Wardan (13.3) for CP%. Entry PC-114 was best performer for NDF%, ADF% and IVDMD%.

AVTB-2: In Second Advanced Varietal Trial In Berseem, two entries along with one national check and one zonal were evaluated at 17 centres, 3 locations in Hill, 5 each in NW and central zones, 4 in NE zone. In Hill, NW and NE zone, national or zonal checks showed superiority or marginal inferiority as compared to entries for desirable traits. In central zone, entry JB-07-15 followed by entry BM-14 showed superiority over the best check for GFY and DMY, CPY, CP%. At all India level, entries BM-14 and JB-07-15 showed marginal superiority over the best check. National check Wardan ranked first for NDF%, ADF% as well as IVDMD%. Same entries were evaluated in **AVTB-2 (SEED)** conducted at 11 centres, 1 in Hill, 3 each in NW and NE and 4 locations in central zone. In Hill zone, entry JB-07-15 performed better than the national check by a margin of 15.2%. In NWZ, entry BM-14 was best performer followed by JB-07-15 showing higher seed yield by margins of 39.4% and 15.3% respectively over the best zonal check. In NEZ, entries JB-07-15 and BM-14 performed better than the best zonal check by margins of 4.2% and 1.6% respectively. At all India level, entries JB-07-15 and BM-14 showed higher seed production by margins of 11.8% and 3.0% over the national check Wardan.

OAT (SINGLE CUT)

IVTO (SC): In Initial Varietal Trial Oat (single cut), thirteen entries along with one national check and one zonal check for respective zones were evaluated at 27 locations, 3 in hill zone, 6 each in NWZ, NEZ, 4 in south zone and 8 locations in central zone.

In hill zone, the entries surpassing the best check by margin of more than 5% were UPO-21-1 (11.8%), BAUO-105 (11.8%), and HFO-1113 (10.8%) for GFY. Similarly entries BAUO-105 (9.3%), JO-08-41 (7.5%), OL-1988 (6.6%), and UPO-21-1 (6.1%) showed more than 5% superiority over the best check for DMY. For crude protein yield, BAUO-102 top ranked followed by BAUO-105 with values of 7.4 and 7.2 as compared to the best check OS-6 with value of 6.8 q/ha. For crude protein content, entries showing more than 5% superiority over the best check were NDO-1925, SKO-245 and BAUO-102.

In NWZ, CZ and NEZ, none of the entries could perform better than the best check by a margin of 5% for GFY or DMY. In NEZ, for crude protein yield, entries OL-1988, BAUO-105, JHO-21-1, and UPO-21-1 showed more than 5% superiority over the best check.

For crude protein content, entries showing more than 5% superiority over the best check were OL-1988 and OL-1967. In south zone, the entries performing better than the best check by a margin of more than 5% were JHO-21-1 (12.4%), JO-08-41 (10.3%), and OL-1931-1 (7.9%) for GFY. Similarly entries OL-1931-1 (15.9%) and JO-08-41(12.5%) were best performers for DMY. For crude protein yield, entry JO-08-41 and for crude protein %, NDO-1925 were best performers.

At all India level, entries JHO-21-1 (7.7%), OL-1931-1 (7.6%), HFO-1113 (7.4%), and OL-1967 (6.2%) performed better than the best check by a margin of more than 5% for GFY. All other entries were either inferior or marginally superior to the best check in their respective zones or at national level. For other quality parameters, entry OL-1931-1 top ranked for NDF%, national check OS-6 for ADF, entry OL-1988 for IVDMD%.

AVTO (SC)-1: In First Advanced Varietal Trial in Oat (single cut), eight entries promoted from IVT were evaluated against two national checks and one zonal check at 26 locations, 3 locations in HZ, 5 in NWZ, 6 in NEZ, 8 in CZ and 4 in SZ.

In Hill zone, for DMY, only one entry JO-08-37 (7.2%), showed more than 5% superiority over the best check. For crude protein yield, entries JO-08-37 and OL-1980 showed more than 5% superiority over the best check. For crude protein %, entry JHO-20-1 and zonal check were best performer with value of 10.5%. In NWZ for GFY, entry SKO-244, performed better than the best check OS-403 by a margin of 6.1%. For DMY, entries OL-1977 (10.5%), SKO-244 (7.8%), HFO-1003 (2.3%) showed better performance than the best check. In NEZ, SZ and CZ, none of the entries showed substantial improvement over the best check. At all India level, for GFY, DMY and CPY, entries SKO-244, OL-1977, HFO-1009, and HFO-1003 showed more than 5% superiority over the best national check. For crude protein content, entries OL-1980 with 9.3% was superior over the best check having value of 8.9%. For NDF% and IVDMD%, entry JO-08-37 was best. For ADF%, national check was best.

AVTO (SC)-2: In Second Advanced Varietal Trial Oat (Single cut) three entries JO-07-28, HFO-904 and HFO-906 along with two national checks and one zonal check were evaluated at 26 locations, 3 in HZ, 5 in NWZ, 6 in NEZ, 8 in CZ and 4 locations in South zone.

In Hill zone, for DMY, entries JO-07-28 and HFO-904 were superior by margins of 11.6% and 4.7% respectively over the best check. For CP%, entry HFO-904 and check OS-6 were joint top ranker. In NWZ for DMY, entry HFO-904 was superior by a margin of 5.8% over the best check. In NEZ, SZ for GFY and DMY as well as CPY, national check OS-6 was best performer. In CZ, for GFY entry HFO-906 showed marginal superiority. For DMY, CPY, CP%, the checks were best. At all India level for GFY, entries HFO-904, HFO-906 showed superiority over the best check by margins of 9.2%, 6.6% respectively. For DMY, entries HFO-904 showed superiority over the best national check Kent by a margin of 10.4%. In **AVTO (SC)-2 (SEED),** same three entries were evaluated at 11 locations, 2 in HZ, 2 in NWZ, 3 in NEZ, 2 in CZ and 2 locations in South zone. Entry HFO-906 was top ranker in CZ showing marginal superiority over the best check. Entry JO-07-28 showed superiority of 8.6% in south zone. At all India level, entry HFO-904 and national check were joint first.

OAT (MULTI CUT)

IVTO-MC: In Initial Varietal Trial in Oat (Multi cut), fourteen entries were evaluated against two national checks at 15 locations, 2 in HZ, 3 in NWZ, 5 locations each in NEZ and central zone. In Hill zone for GFY, all entries performed better than the checks.

The margin of superiority over the best check were FO-21-2 (22.0%), HFO-1121 (17.4%), HFO-1123 (16.9%), UPO-21-2 (15.4%), JHO-21-3 (13.9%), OL-1969 (13.4%), BAUO-103 (13.1%), JHO-21-4 (10.4%), JO-08-335 (10.3%), BAUO-104 (10.1%), FO-21-1 (8.1%), OL-1931-2 (7.1%). For DMY, the margin of superiority over the best check were FO-21-2 (11.9%), HFO-1121 (9.0%), FO-21-1 (8.8%), JHO-21-3 (7.8%), OL-1969 (7.6%), HFO-1123 (5.3%), For CPY, almost all the entries performed better than the national checks. Top ranking entries include HFO-1121 (4.2), FO-21-2 (4.1), BAUO-103 (4.0), and OL-1969 (4.0) as compared to 2.8q/ha of best check UPO-212.

In NWZ for GFY and DMY, entries showing more than 5% superiority over the best check were OL-1969, OL-1931-2, and FO-21-1. In NEZ for GFY and DMY as well as CPY, national check RO-19 ranked first. In CZ for GFY, national check RO-19 ranked first. For DMY entry JO-08-335 showed marginal superiority over the best check. For CPY, entry JO-08-335 was the only entry showing more than 5% superiority over the best check. Entries OL-1975, FO-21-2, OL-1931-2 showed more than 5% improvement over the best check UPO-212 for CP%. At all India level for GFY and DMY as well as CPY, national check RO-19 ranked first. For other quality parameters, the best ranking entries were PLP-29 for NDF%, JHO-21-4 for ADF% and IVDMD%

AVTO (MC)-1: In First Advance Varietal Trial in Oat (Multi cut), six entries were evaluated against two national checks at 7 locations, 3 in HZ and 4 locations in NWZ.

For GFY, entry HFO-915 was better than the best check by a margin of 5.5% in Hill zone. Other entries were either inferior or marginally superior over the best check in HZ and NWZ. For DMY (q/ha), entries PLP-27 (5.0%), HFO-915 (4.2%), OL-1949 (3.7%), JO-08-329 (2.9%) were better than the best check in Hill zone. Other entries were inferior to the best check in HZ and NWZ.

For CPY, entry JHO-20-3 and JO-08-329 with values of 12.1 and 12.0 were better than the best check RO-19 with value of 11.4 q/ha. For CP%, entries JO-08-329, JHO-20-3, OL-1949, PLP-27 with values of 13.3%, 12.9%, 12.0%, 11.9% respectively were better than the best check with value of 11.8%. For other quality parameters, national check RO-19 for ADF%, entry UPO-20-2 for ADF%, JHO-20-3 for IVDMD were best.

AVTO (MC)-2: In Second Advance Varietal Trial in Oat (Multi cut), two entries JO-07-310 and PLP-24 were evaluated against two national checks at 3 locations in hill and 5 locations in central zone. In Hill zone, entry PLP-24 was better than the best check by margin of 7.5% for DMY. In central zone, the national check was best for GFY and DMY as well as fodder production potential. National check RO-19 ranked first for NDF%, ADF% and IVDMD%. In **AVTO (MC)-2 (SEED),** same two entries JO-07-310 and PLP-24 were evaluated at 2 locations in hill and 3 locations in central zone. Entry JO-07-310 was top ranked for hill zone and NWZ showing a superiority of 17.7% and 1.9% over the best check.

OAT (DUAL)

IVTO (DUAL): An Initial Varietal Trial in Oat (Dual) comprising of nine entries along with two national checks was conducted at 13 centres, 4 each in NWZ, NEZ and 5 locations in CZ. In NWZ for GFY and DMY, entry OL-1874-2 showed superiority of 10.8% and 6.3% over the best check.

Entry OL-1874-2 showed marginal superiority over the best check for CPY. For crude protein %, national check was best.

For seed yield, national check JHO 822 was best. In NEZ, for GFY and DMY, entries HFO-1008, JHO-21-6, OL 1967-1, UPO-21-3, OL-1982-2, OL-1874-2, were superior by more than 5% margin over the best check UPO-212. For CPY, entries HFO-1108 (5.6), UPO-21-3 (5.0), OL-1967-1 (4.8), JHO-21-6 (4.8), JO-13-518 (4.8), OL-1874-2 (4.7) showed more than 5% superiority over the best check JHO 822 (4.3 q/ha). Entries JHO-21-5 and OL-1982-2 were marginally superior over the best check for crude protein %. For seed yield, entries HFO-1108 and HFO-1119 showed superiority by margins of 4.0% and 3.4% over the best check. In CZ for GFY, national check JHO-822 was best. For DMY and CPY only marginal superiority was observed in a few entries. For crude protein%, Check UPO-212 and entry JHO-21-5 were joint first. Check JHO-822 ranked first for seed yield. Entries OL-1967-1 and JHO-21-5 ranked joint first for NDF%. Entries JHO-21-5 and UPO-21-3 ranked joint first for ADF%, whereas entry JHO-21-5 ranked first for IVDMD %.

AVTO-1 (Dual): In first advance varietal trial in oat (dual), five (05) entries were evaluated against two national checks at 8 locations comprising 4 each in NWZ, NEZ. In NWZ for DMY, only one entry JO-03-513 showed more than 5% superiority over the best check. For crude protein%, entries HFO-1014 (15.6%), JHO-20-2 (14.2%), HFO-917 (13.9%), OL-1931 (13.1%), and JO-03-513 (12.9%) were superior as compared to the best check UPO-212 with value of 12.4%. For seed yield, entry HFO-1014 showed more than 5% better yield than the best check. In NEZ, entries JO-03-513 and HFO-917 were superior over the best check for GFY, DMY and CPY. For crude protein %, entries JHO-202 (10.1%), HFO-1014 (10.0%), HFO-817 (10.0%), OL-1931 (9.9%), and JO-03-513 (9.7%) were superior over the best check UPO-212 (9.6%). For NDF%, ADF% and IVDMD% entries HFO-1014 and HFO-917 were best performers.

LUCERNE

VT Lucerne Perennial: (2nd year) A Varietal Trial in Lucerne (perennial) was established in 2020 with 5 entries. The data of this year was reported from seven locations including 2 locations in NWZ, 2 in CZ and 3 in south zone. The trial will continue in coded form.

AVT-2 Lucerne Annual: A Second Advanced Varietal Trial in Lucerne (annual) comprising of single entry LLC-6 along with two national checks was conducted at 6 centres, 2 locations in NWZ and 4 locations in SZ. Entry LLC-6 was superior by margin of 21.2% and 24.8% for GFY and DMY respectively over the best check (RL-88) in NW zone. In south zone, the national check RL-88 was best for GFY as well as DMY. For quality parameters, entry LLC-6 (18.5 q/ha) ranked first followed by both the national checks (16.0 q/ha) for crude protein yield. Entry LL-6 was best for IVDMD%. In **AVT-2 (seed),** single entry LLC-6 was evaluated against two national checks at 4 locations, 2 each in NWZ and SZ. National check Anand-2 was best for both the zones for seed yield.

LATHYRUS

IVT Lathryus: In Initial Varietal Trial in fodder Lathyrus, nine (09) entries were tested against the two national checks at seven locations. Entries performing better than the best checks for various traits included JCL-21-3, IPLa-2021-01, JCL-21-1, BL-3, IPLa-2021-03, BL-5, JCL-21-2, BL-3, and BL-1.

AVT-1 Lathyrus: In First Advanced Varietal Trial in fodder Lathyrus, one entry KL-5 was evaluated against 2 national checks at seven locations. The entry KL-5 performed better than the two national checks for GFY, DMY, CPY, CP% and per day productivity.

SUMMER MULTICUT PEARL MILLET

IVT BAJRA (MULTICUT): In Initial Varietal Trial on multicut summer Bajra, ten (10) entries were evaluated against three checks at 4 locations in central zone and 3 locations in south zone.

In central zone, none of entries could surpass the national check for GFY and DMY. In south zone, entries Alamdar-12, BAIF Bajra-9, ADV 2184, IIMR-FB-MC-2022-2, SBH-104, BAIF Bajra -10, HTBH-4904 showed more than 10% superiority over the best check for GFY and DMY. However, for CPY and crude protein content, Check Moti Bajra top ranked.

AVT-1 BAJRA (MULTICUT): In First stage Advanced Varietal Trial on Summer Bajra Multicut, two entries SBH-103 and 16-ADV175020 were evaluated along with 3 checks at four locations in central zone and 3 locations in south zone. None of the entries could beat the best check by substantial margin in either of the two zones for desirable parameters.

PERENNIAL TEMPERATE FORAGE CROPS

VT Orchard Grass with 7 entries and **VT Sainfoin** with 7 entries, **VT Tall Fescue Grass** with 10 entries were established at different centres of hill zone. The year being the establishment year, the data will be reported from next year onwards. These are perennial trials and will continue in coded form.

B. FORAGE CROP PRODUCTION

The forage crop production programme was executed at 61 locations in five zones. In total 17 experiments were conducted, out of which 11 were in network (9 coordinated and 4 AVT based) and 6were in location specific mode.

Experiment on Effect of cutting and splitting of nitrogen doses on growth, yield and quality of fodder oat cultivars was conducted at Raipur, Ranchi, Ayodhya, and Pantnagar. Maximum green fodder yield at Ranchi, Raipur and Ayodhya was obtained with oat cultivar RO-19 and at Pantnagar with UPO-06-1. Nitrogen application and cutting management as three cut + 50% basal+25% at 1st cut+25% at 2nd cut At Raipur; three cut + 40% N as basal+30% at 1st cut+30% at 2nd cut at Ayodhya and at Pantnagar with two cut + 50% N as basal+50% at 1st cut at Pantnagar proved better. Experiment on Effect of different potassic fertilizer sources on green fodder production and quality of fodder maize was conducted at Anand and Hyderabad centres. At Anand 75% RDK through Potassium schoenite + 1 % schoenite foliar spray (at 30 and 45 DAS) recorded maximum GFY and DFY. Whereas, at Hyderabad, 100 % RDK through Potassium schoenite was better. Trial Studies on organic source of nutrients on forage yield and quality of Fodder cowpea-maize system under irrigated situation was conducted at Mandya, Coimbatore, Vellayani and Hyderabad. On locational mean basis, Application of 100% RDN through inorganic fertilizer recorded higher green fodder and dry matter yields of cowpea, maize as well as higher system productivity, net returns and B:C ratio. Experiment on Studies on organic source of nutrient on green forage yield and quality of Rice bean-oat under irrigated situation was conducted at Kalyani, Imphal, Pusa and Ranchi. The highest GFY and DMY recorded with 50% RDN through FYM + 50% RDN through vermicompost at all centres except Ranchi where 75% RDN through FYM + 25% RDN through vermicompost proved better.

Experiment on Efficacy of plant growth regulators on forage yield and quality of maize-oat cropping system was conducted at Urulikanchan, Srinagar, Pusa, Raipur, Hisar and Ranchi. Application mepiquat chloride at 300 ppm produced the highest green forage yield over locations but the highest dry matter and crude protein yields were recorded with the application of GA_3 at 400 ppm. Precision nitrogen management for enhancing fodder yield and nitrogen use efficiency in forages was conducted at Mandya and Dharwad.

On the location mean basis application of 150 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 50) recorded significantly higher GFY, gross returns, Net returns and B:C ratio. Organic nutrient management for soil health and sustainability of round the year fodder production system was conducted at Palampur. Application of FYM @ 10 t/ha resulted in significantly higher green and dry fodder yield q/ha, of system. Studies on performance of organic nutrient management practices on soil health and sustainability of sorghum-Oat cropping system was conducted at Ayodhya. Significantly higher GFY, DMY, CPY, Net return and B:C ratio were recorded with FYM 5 t/ha basal + natural farming with mulch or FYM 10 t/ha. Optimizing production technology for sustainable organic fodder production and soil health was conducted at Pantnagar.

Higher green fodder yield was recorded under Vermicompost application and rishi krishi system. BN Hybrid +Cowpea/Berseem/ Rice cropping system produced highest green and dry fodder yield gross return, net return as well as B:C ratio. Enrichment of BN hybrids and Maize silage quality by amalgamation with legume tree and fodder crops was initiated at Hyderabad. Silage prepared from fodder maize showed lower pH levels than APBN 1 silage. Highest crude protein content was observed with the APBN-1+Hedge Lucerne. Evaluation of

Hedge Lucerne for optimum seed rate and spacing for Seed Production was initiated at Hyderabad. Planting at 100 cm spacing along with 9Kg ha^{-1} seed rate was superior. Intensive Fodder based cropping system for year round fodder supply was carried out at Hyderabad. In the first year, the annual based cropping system Sorghum (MC) + Cowpea (4: 2) – Maize+ Cowpea (4: 2) – Bajra (MC) + Cow pea (4: 2) was more productive and remunerative.

AVT-2 Trials

Effect of P levels on forage yield of promising entries of Berseem (AVTB-2-MC) was conducted at 10 locations. In Hill, North West, Central zone as well as on national level, entry JB-07-15 proved significantly superior. Effect of N levels on forage yield of promising entries of single cut oat (AVT-2 SC) was conducted at 10 locations in all five zones. In North East and Central and South zone, entry JO-07-28 yielded maximum green fodder, dry matter yields. On overall mean basis, linear response to nitrogen application was noted up to 120 kg N/ha. Effect of N levels on forage yield of promising entries of Multi cut oat (AVT-2 MC) was conducted at five locations in two zones. In Hill zone, both the entries (PLP-24 and JO-07-310) proved higher yielder than checks. On overall mean basis, linear response to nitrogen application was noted up to 140 kg N/ha. Effect of P levels on forage yield of promising entries of Annual Lucerne was conducted at five locations in North West and South zones. In both the zones, LLC-6 proved superior and responsive up to 100 kg P_2O_5/ha

C. FORAGE CROP PROTECTION

During rabi 2021-22, total nine trial were conducted across five locations. Forage crops evaluated were Berseem, Oat and Lucerne. Forage crops protection trials conducted focuses on (a) Monitoring of diseases and insect pests in forage crops ecosystem; (b) Evaluation of breeding materials for their resistance to diseases and insect-pests under natural conditions (c) Development of location and region specific crop protection technologies and (d) Assessment of yield losses in different forage crops.

Monitoring of diseases and insect pests in Rabi forage crops

The study was carried out with the objectives to record the occurrence and abundance of major diseases and insect-pests in berseem, lucerne and oat.

At Ludhiana, Stem rot on berseem was first observed in end of December. Disease progressed at faster rate till first week of April with maximum disease incidence of 61.7%. Leaf blight of oat appeared in the 1st week of January. Disease development was fast upto first week of April with highest disease severity of 49.3%. Downy mildew of Lucerne was observed in the first week of January. Disease progressed at faster rate till first week of April.

Highest disease severity was 44.7%. **At Rahuri,** pea aphid was noticed on lucerne during December (2.20 aphids/tiller) and increased steadily at its peak level upto March (76 aphids/tiller). Cowpea aphid was observed on Lucerne during

2nd week of January (4.60 aphids/tiller) and reached at its peak during March with 143 aphids/tiller. Oat aphid was recorded recorded from December to March in the range of 0.80 to 320 aphids/tiller. **At Palampur,** Oat crop was severely affected by powdery mildew (45% severity), followed by leaf blight (18%) and sucking pests (18%). In berseem, low incidence of root rot (5%), moderate intensity of leaf spot (12%) was observed. **At Bhubaneswar,** In oat, maximum leaf blight recorded was 50.6% and maximum root rot incidence was 24.4%. The Berseem leaf spot and blight severity recorded 38.4% towards 1st week of February, whereas root rot incidence was 30.0%. **At Jhansi,** In Berseem, incidence of stem rot started was 27.8%. In Oat, leaf blight was the major disease and it appeared during 3rd week of January and maximum severity of 71.5% was observed during 2nd week of March. **At Coimbatore,** in Lucerne, the major pests observed were leaf folder, leaf miner, aphids and stink bug. Apart from that natural enemies viz., coccinellids and rove beetles were also observed. The leaf folder incidence was noticed from first week of October to third week of June.

Evaluation of Rabi forage crops breeding materials for prevalent diseases and insect pests under natural conditions

In IVT Berseem, At Ludhiana, all the entries showed moderately resistant disease reaction to stem rot. At Rahuri, all the entries were found moderately susceptible to aphids except BB-2, HFB-18-9, BM-13 and PC-115. At Palampur, all the entries including checks were resistant to root rot. At Bhubaneswar, all the entries showed resistant to moderately resistant disease reaction except JB-08-19. **In Combined AVT-1 & 2 in Berseem,** at Ludhiana, all the entries showed moderately resistant disease reaction to stem rot. At Rahuri, all the entries were found moderately susceptible to aphids except BB-2. At Palampur, all the entries including checks were resistant to root rot. At Bhubaneswar, JHB-20-2 and Wardan were moderately susceptible and rests were resistant to moderately resistant against leaf spot and blight.

Oat – IVTO SC: At Ludhiana, all entries showed low resistant disease reaction to leaf blight. At Rahuri, all the entries were found susceptible to aphids. At Palampur, JHO-21-2, SKO-225, OL-1967 and JHO-21-1 were moderately resistant while others were susceptible to powdery mildew. At Bhubaneswar, all the entries showed resistant to moderately resistant disease reaction to leaf spot and blight, Sclerotium root rot and infestation by leaf defoliator except JHO-21-2. At Jhansi, JHO-21-2 was resistant and UPO-21-1 was low susceptible; rest all entries were in low resistant or mesothetic category against leaf blight.

Oat-IVTO MC: At Ludhiana, all entries showed low resistant disease reaction. At Rahuri, all the entries were found susceptible to aphids. At Palampur, JHO-21-4, PLP-29, OL-1969 and OL-1931-2 were moderately resistant to powdery mildew. At Bhubaneswar, all the entries showed resistant to moderately resistant disease reaction to leaf spot and blight, Sclerotium root rot and infestation by leaf defoliator except UPO-212 and JHO-21-4,. At Jhansi, OL-1931-2 was moderately resistant and rest all entries were in low resistant or mesothetic category against leaf blight.

Oat– IVTO Dual: At Ludhiana, all entries were found low resistant to leaf blight. At Rahuri, all the entries were found susceptible to aphids. At Bhubaneswar, all the entries showed resistant to moderately resistant disease reaction to leaf spot and blight, Sclerotium root rot, defoliator except JHO-822 and JHO-21-5. At Jhansi, all entries were in low resistant or mesothetic category against leaf blight.

Combined AVTOSC-1 and AVTOSC-2: At Ludhiana, all entries were found low resistant to leaf blight. At Rahuri, all the entries were found susceptible to aphids. At Palampur, JO-07-28 and JO-08-37 were moderately resistant to powdery mildew and rests were found susceptible. At Bhubaneswar, all the entries showed resistant to moderately resistant to leaf blight, Sclerotium root rot and defoliator. At Jhansi, RO-11-1 and HFO-1009 were moderately resistant to leaf blight.

Oat-AVTO-1 (Multicut): At Ludhiana, all entries showed low resistant disease reaction to leaf blight. At Palampur, all the entries were found susceptible to powdery mildew.

Oat-AVTO-2 (Multicut): At Palampur, JO-07-310 showed moderately resistant disease reaction to powdery mildew. At Rahuri, all the entries were susceptible to aphids. At Jhansi, all entries were in low resistant category against leaf blight except PLP-24.

AVTO-1-Dual: At Ludhiana, all entries showed low resistant disease reaction to leaf blight. At Bhubaneswar, all the entries showed resistant to moderately resistant disease reaction to leaf blight, *Sclerotium* root rot and infestation by leaf defoliator.

In IVT Lucerne: At Ludhiana, all the entries were moderately susceptible to downy mildew. At coimbatore, all the entries were resistant to leaf miner.

AVT-2 Lucerne: At Ludhiana, all the entries were moderately susceptible to downy mildew. At coimbatore, all the entries were resistant to leaf miner.

Validation of best treatments of the trial "Eco-friendly pest management techniques in berseem ecosystem"

At Ludhiana, T1 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSKE @ 5%+ Chickpea as trap crop on border row + Bird perches) exhibited least disease incidence of stem rot (21.10 %), lower *Helicoverpa* larvae (2.43), higher green fodder (591.71 q/ha), higher seed yield (3.93 q/ha) with high B:C ratio of 2.7 compared to T1 and control.

Validation of best treatment of trial entitled "Integrated disease management in berseem"

At Ludhiana, T1 (Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%) showed least stem rot incidence (18.21%) with 63.57 percent disease control and 17.46 percent increase in green fodder yield as compared to control (50.0%). The B:C ratio was high (2.57) in T1 as compared to untreated control (2.43). At Palampur, T2 (Seed treatment with carbendazim @ 0.2 % + foliar spray of Chitosan @ 0.05 %) showed least root rot incidence (1.00%) and least leaf blight severity (1.93%) with 87.83 and 85.16 percent disease control and 4.65 percent increase in green fodder yield as compared to control. The B:C ratio was 4.6 in T2 as compared to 3.3 in T1. At Bhubaneswar, T2 (Seed treatment with carbendazim @ 0.2% + foliar application of Carbendazim @ 0.1%) was found the best in reducing the foliar disease by 80.7%, root rot by 59.4% increasing the yield by 28.8% over control. The BC ratio recorded was 1.66 in T2 (Table PPT 34c). At Jhansi, T2 (Seed treatment with carbendazim @ 0.2 % + foliar spray of carbendazim @ 0.1 %) showed least stem rot incidence (15.7% respectively) with high green fodder yield (282.20 q/ha). The B:C ratio was highest (1.27) .in T2.

Non chemical management of stem rot of berseem caused by *Sclerotinia trifoliorum*

At Ludhiana, The plant extracts and organic inputs showing strong antifungal activities against the test pathogens in vitro were screened in pot experiments. Lowest disease incidence was provided by panchgavya (18.33%) followed by Organic formulation 2 (19.33%), Aegle marmelos (22.67%) and Cymbopogan citrates (23.67%) at 10% concentration.

Assessment of yield losses due to insect-pests and diseases in Lucerne

At Rahuri, Cumulative average yield loss due to aphids, rust, *Spodoptera litura, Helicoverpa armigera* recorded were 6.84%, 12.21%, 6.15%, 14.08%. Cumulative average yield losses in control due to insect-pest and diseases were 37.27%. At Ludhiana, Cumulative average yield loss due to downy mildew, weevil recorded was 10.4% and 6.6%. Cumulative average yield losses in control due to insect-pest and diseases were 16.7%. At Jhansi, there was no significant yield difference in all the treatments as pest population (aphids and weevil) was very low this year to cause any significant yield loss.

Development of *Trichoderma* mediated biocontrol strategy for managing leaf blight (*Drechslera avenae*) disease in Oat

During 2021-2022, leaf blight infected leaf samples of oat were collected from Ludhiana, Palampur, Bhubaneswar, Rahuri and Jhansi. From infected leaf tissues, a total of 18 isolates of *Drechslera avenae* (3 from Ludhiana, 2 isolates from Jhansi, 7 from Palampur, 4 from Rahuri and 2 from Bhubaneswar) were isolated, purified and maintained for further studies. Soil samples from oat rhizosphere were collected. From these soil samples, the serial dilution method was used for isolation of *Trichoderma* sp. Till now, soil samples obtained from Palampur and Ludhiana have been proceesed and *Trichoderma* sp. from these locations have been isolated, purified and maintained for further studies.

Bio intensive management of defoliator insect pests in Lucerne

At Rahuri, 14 days after spraying, *HaNPV* and S*lNPV* 500 LE/ha was highly promising against defoliator larvae (1.28 larva/ m2) and it was at par with *N. rileyi* 1.15 WP (1.58 larvae) and *M. anisopliae* 1.15 WP (1.70 larvae). At Coimbatore, no larvae were recorded and no adult moths were trapped subsequently, hence treatments were not imposed.

Germplasm evaluation programme against diseases and insect-pests in Rabi forages

In Oat, a total of 122 germplasm lines were tested against different diseases and insect-pest at various locations. OGP-2 was found moderately resistant against powdery mildew at Palampur, resistant (against leaf blight) at Jhansi, Bhubaneswar and mesothetic against leaf blight at Ludhiana and thus can serve as effective source of resistance against both powdery mildew and leaf blight disease in oat. In Berseem, a total of 72 germplasm lines were tested against different diseases and insect-pest at various locations.

Germplasm lines viz, BM-14, PC-114, BL-22, BL-1, BL-10, HFB-20-3, HFB-20-4, JB-06-1, JB-06-2, JB-06-6, JB-15-3, JB-15-4, JBSC-1 were found moderately resistant against stem rot; resistant to moderately resistant against leaf blight as well as root rot and thus can serve as effective source of resistance against stem rot, root rot and leaf blight disease in berseem. In Lucerne, a total of 27 germplasm lines were tested against different diseases and insect-pest at various locations. Against Downy mildew, all the lines were moderately susceptible. Against weevil, all the lines were in resistant or moderately resistant. Against aphids, all lines were susceptible at Rahuri. Against rust, 4 lines were categorized as resistant; 23 lines were moderately resistant.

D. Breeder Seed Production

The indent for Breeder Seed Production was received from DAC, GOI for 38 varieties in four forage crops *viz*., Oat (22), Berseem (10), Lucerne (4) and Hedge Lucerne (2). The total quantity allocated was 525.97 q and production was 536.46 q which is 10.49 q surplus (an increase of 1.99%). **In Oat,** the production was 485.08q against the allocation of 438.88 q making a surplus of 46.20 q. Out of 22 varieties, there was deficit in production in seven varieties and in other cases there was surplus or equal production. The indent was allocated to 10 centres in 09 states / UT. **In Berseem,** the total production was 48.05 q against the indent of 80.99 q making a deficit of 32.94 q. Out of 10 varieties indented and allocated to 4 centres, there was deficit production in 5 varieties and in other cases production was surplus or equal. **In Lucerne,** the total production was 2.33 q which was 0.77 q lower than the indent of 3.10 q allotted to three centres. Out of 4 varieties, in one case there was deficit production. **In Hedge Lucerne,** there was indent of 3.00 q seed of two varieties and it was allocated to 2 centres. In variety THSL-1 the target was achieved whereas in TND 1308 there was deficit production.

ALL INDIA COORDINATED RESEARCH PROJECT ON FORAGE CROPS & UTILIZATION
ZONE, COORDINATED CENTERS AND TESTING LOCATIONS

Zone	Coordinated Centers				Testing Locations		
	S.N.	Location	Establishment Year	State / Union Territory	S.N.	Location	State/Union Territory
I. Hill State/UT States = 3 Locations = 5	1. 2.	CSKHPKV, Palampur SKUAS&T-K, Srinagar	1970 2010	Himachal Pradesh Jammu & Kashmir	1. 2. 3.	ICAR-VPKAS*, Almora SKUAST-J, Rajouri CSKHPKV RRS, Bajoura (Kullu)	Uttarakhand J & K H P
II. North West States = 5 Locations = 10	3. 4. 5. 6.	PAU, Ludhiana CCS HAU, Hisar GBPUAT, Pantnagar SKRAU, Bikaner	1989 1970 1995 1995	Punjab Haryana Uttarakhand Rajasthan	4. 5. 6. 7. 8. 9.	SVBPUA&T, Meerut PAU,RRS, Ballowal Sankhari IGFRI-RRS*, Avikanagar ICAR-CAZRI*, Jodhpur SKRAU, ARS, Jalore SKANU, Jobner	Uttar Pradesh Punjab Rajasthan Rajasthan Rajasthan Rajasthan
III. East/ North States = 8 Locations = 9	7. 8. 9. 10. 11. 12. 13.	ANDUAT, Ayodhya BAU, Ranchi BCKV, Kalyani OUAT, Bhubaneswar AAU, Jorhat CAU, Imphal RPCAU, Pusa	1982 1970 1972 1987 1970 2010 2017	Uttar Pradesh Jharkhand West Bengal Orissa Assam Manipur Bihar	10. 11.	Medziphema, Nagaland University BAU, Sabour	Nagaland Bihar

Zone	Coordinated Centers				Testing Locations		
	S.N.	Location	Establishment Year	State / UT	S.N.	Location	State/Union Territory
IV. Central States = 4 Locations = 12	14.	AAU, Anand	1970	Gujarat	12.	CSAU&T, Kanpur	Uttar Pradesh
	15.	JNKVV, Jabalpur	1970	Madhya Pradesh	13.	ICAR-IGFRI*, Jhansi	Uttar Pradesh
					14	BHU, Varanasi	Uttar Pradesh
	16.	MPKV, Rahuri	1971	Maharashtra	15.	BUAT, Banda	Uttar Pradesh
					16.	JAU, Dhari	Gujarat
	17.	BAIF, Urulikanchan	1982	Maharashtra	17.	NDDB, Anand	Gujarat
	18.	IGKV, Raipur	2010	Chhattisgarh	18.	RARS, BSKKV, Karjat	Maharashtra
V. South States/UT = 6 Locations = 10	19.	UAS (B), Mandya	1986	Karnataka	19.	ICAR-IGFRI-RRS*, Dharwad	Karnataka
	20.	TNAU, Coimbatore	1976	Tamil Nadu	20.	PJLNCA & RI, Karaikal	Pudducherry
	21.	KAU, Vellayani	1971	Kerala	21.	ANGRAU, Tirupati/Guntur	Andhra Pradesh
	22.	PJTSAU, Hyderabad	1970	Telangana	22.	UAS, Raichur	Karnataka
					23.	KLDB, Mattupetty	Kerala
					24.	RARS Ambalavayal, Wayanad	Kerala

Summary: Zone = 5, States/UT = 26, Coordinating Centers = 22, Testing Locations = 24

*ICAR Institute

Entries Code for Rabi 2021-22

1. IVTB:

S. N.	Contributor	Entry name	Code name
1.	(CCS HAU, Hisar)	HFB 18-3	IVTB - 1
2.	ZC (HZ)	BL-22	IVTB - 2
3.	ZC (CZ)	Bundel Berseem-2	IVTB - 2
4.	ZC (NWZ and NEZ)	BL-44	IVTB - 2
5.	(CCS HAU, Hisar)	HFB-18-9	IVTB - 3
6.	(JNKVV, Jabalpur)	JB- 08-19	IVTB - 4
7.	(PAU, Ludhiana)	BM-13	IVTB - 5
8.	(PAU, Ludhiana)	PC-115	IVTB - 6
9.	(NC)	Wardan	IVTB - 7

2. AVTB-1:

S. N.	Contributor	Entry name	Code name
1.	JNKVV, Jabalpur	JB-08-17	AVTB-1,2 Comb-2
2.	IGFRI, Jhansi	JHB-20-1	AVTB-1,2 Comb-3
3.	IGFRI, Jhansi	JHB-20-2	AVTB-1,2 Comb-4
4.	(NC)	Wardan	AVTB-1,2 Comb-5
5.	PAU, Ludhiana	PC 114	AVTB-1,2 Comb-6
6.	ZC (HZ)	BL-22	AVTB-1,2 Comb-8
7.	ZC (NWZ,CZ)	BB-2	AVTB-1,2 Comb-8
8.	ZC (NEZ)	BB-3	AVTB-1,2 Comb-8

3. AVTB-2:

S. N.	Contributor	Entry name	Code name
5.	PAU, Ludhiana	BM-14	AVTB-1,2 Comb-1
6.	(NC)	Wardan	AVTB-1,2 Comb-5
7.	JNKVV, Jabalpur	JB-07-15	AVTB-1,2 Comb-7
8.	ZC (HZ)	BL- 22	AVTB-1,2 Comb-8
9.	ZC (NWZ and CZ)	BB-2	AVTB-1,2 Comb-8
10.	ZC (NEZ)	BB-3	AVTB-1,2 Comb-8

4. AVTB-2 (Seed):

S. N.	Contributor	Entry name	Code name
1.	(NC)	Wardan	AVTB-2 Seed- 1
2.	JNKVV, Jabalpur	JB-07-15	AVTB-2 Seed- 2
3.	ZC (HZ)	BL- 22	AVTB-2 Seed- 3
4.	ZC (NWZ and CZ)	BB-2	AVTB-2 Seed- 3
5.	ZC (NEZ)	BB-3	AVTB-2 Seed- 3
6.	PAU, Ludhiana	BM-14	AVTB-2 Seed- 4

5. IVTO (SC):

S. N.	Contributor	Entry name	Code name
1.	GBPUAT, Pantnagar	UPO-21-1	IVTO –SC- 1
2.	BAU, Ranchi	BAUO-105	IVTO –SC- 2
3.	CCS HAU, Hisar	HFO-1113	IVTO –SC- 3
4.	IGFRI, Jhansi	JHO-21-2	IVTO –SC- 4
5.	ZC (HZ)	SKO-225	IVTO –SC- 5
6.	ZC (NEZ,NWZ, CZ, SZ)	OL- 1896	IVTO –SC- 5
7.	BAU, Ranchi)	BAUO-102	IVTO –SC- 6
8.	PAU, Ludhiana	OL-1988	IVTO –SC- 7
9.	PAU, Ludhiana	OL-1967	IVTO –SC- 8
10.	ANDUAT, Ayodhya	NDO-1925	IVTO –SC- 9
11.	CCS HAU, Hisar	HFO-1101	IVTO –SC- 10
11.	IGFRI, Jhansi	JHO-21-1	IVTO –SC- 11
12.	JNKVV, Jabalpur	JO-08-41	IVTO –SC- 12
13.	PAU, Ludhiana	OL-1931-1	IVTO –SC- 13
14.	(SKUAST, Srinagar)	SKO-245	IVTO –SC- 14
15.	(NC)	OS-6	IVTO –SC- 15

6. AVTO-1 (SC):

S. N.	Contributor	Entry name	Code name
1.	ZC (NWZ, NEZ, SZ)	OS-403	AVTO-SC-Comb-1
2.	ZC (CZ)	RO-11-1	AVTO-SC-Comb-1
3.	PAU, Ludhiana	OL-1980	AVTO-SC-Comb-3
4.	JNKVV, Jabalpur	JO-08-37	AVTO-SC-Comb-4
5.	(NC)	OS-6	AVTO-SC-Comb-5
6.	SKUAST, Srinagar	SKO-244	AVTO-SC-Comb-6
7.	CCS HAU, Hisar	HFO-1009	AVTO-SC-Comb-8
8.	PAU, Ludhiana	OL-1977	AVTO-SC-Comb-9
9.	CCS HAU, Hisar	HFO-1013	AVTO-SC-Comb-11
10.	CCS HAU, Hisar	HFO-1003	AVTO-SC-Comb-12
11.	(NC)	Kent	AVTO-SC-Comb-13
12.	IGFRI, Jhansi	JHO-20-1	AVTO-SC-Comb-14
13.	ZC (HZ)	SKO-225	AVTO-SC-Comb-15

7. AVTO-2 (SC):

S. N.	Contributor	Entry name	Code name
1.	ZC (NWZ, NEZ, SZ)	OS-403	AVTO-SC-Comb-1
2.	ZC (CZ)	RO-11-1	AVTO-SC-Comb-1
3.	JNKVV, Jabalpur	JO-07-28	AVTO-SC-Comb-2
4.	(NC)	OS-6	AVTO-SC-Comb-5
5.	CCS HAU, Hisar	HFO-904	AVTO-SC-Comb-7
6.	CCS HAU, Hisar	HFO-906	AVTO-SC-Comb-10
7.	(NC)	Kent	AVTO-SC-Comb-13
8.	ZC (HZ)	SKO-96	AVTO-SC-Comb-16

8. AVTO-2 (SC (Seed):

S. N.	Contributor	Entry name	Code name
1.	CCS HAU, Hisar	HFO-904	AVTO-2-SCS-1- 1
2.	CCS HAU, Hisar	HFO-906	AVTO-2-SCS-1- 2
3.	ZC (NWZ, NEZ, SZ)	OS-403	AVTO-2-SCS-1- 3
4.	ZC (HZ)	SKO-96	AVTO-2-SCS-1- 3
5.	ZC (CZ)	RO-11-1	AVTO-2-SCS-1- 3
7.	(NC)	OS-6	AVTO-2-SCS-1- 4
8.	JNKVV, Jabalpur	JO-07-28	AVTO-2-SCS-1- 5
9.	(NC)	Kent	AVTO-2-SCS-1- 6

9. IVTO (MC):

S. N.	Contributor	Entry name	Code name
1.	BAU, Ranchi	BAUO-103	IVTO MC - 1
2.	Foragen Seeds	FO-21-2	IVTO MC - 2
3.	CCS HAU, Hisar	HFO-1121	IVTO MC - 3
4.	(NC)	UPO-212	IVTO MC - 4
5.	IGFRI, Jhansi	JHO-21-4	IVTO MC - 5
6.	GBPUAT, Pantnagar	UPO-21-2	IVTO MC - 6
7.	BAU, Ranchi	BAUO-104	IVTO MC - 7
8.	JNKVV, Jabalpur	JO-08-335	IVTO MC - 8
9.	PAU, Ludhiana	OL-1975	IVTO MC - 9
10.	CCS HAU, Hisar	HFO-1123	IVTO MC - 10
11.	IGFRI, Jhansi	JHO 21-3	IVTO MC - 11
12.	CSK HPKV, Palampur	PLP-29	IVTO MC - 12
13.	PAU, Ludhiana	OL-1969	IVTO MC - 13
14	PAU, Ludhiana	OL-1931-2	IVTO MC - 14
15	(NC)	RO-19	IVTO MC - 15
16	Foragen Seeds	FO-21-1	IVTO MC - 16

10. AVTO-1 (MC):

S. N.	Contributor	Entry name	Code name
1.	CCS HAU, Hisar	HFO-915	AVTO-1-MC- 1
2.	IGFRI, Jhansi	JHO-20-3	AVTO-1-MC- 2
3.	(NC)	RO-19	AVTO-1-MC- 3
4.	(NC)	UPO-212	AVTO-1-MC- 4
5.	CSK HPKV, Palampur	PLP-27	AVTO-1-MC- 5
6.	JNKVV, Jabalpur	JO-08-329	AVTO-1-MC- 6
7.	PAU, Ludhiana	OL- 1949	AVTO-1-MC- 7
8.	GBPUAT, Pantnagar	UPO-20-2	AVTO-1-MC- 8

11. AVTO-2 (Multi cut):

S. N.	Contributor	Entry name	Code name
1.	JNKVV, Jabalpur	JO-07-310	AVTO-2-MC- 1
2.	(NC)	RO-19	AVTO-2-MC- 2
3.	(NC)	UPO-212	AVTO-2-MC- 3
4.	CSK HPKV, Palampur	PLP-24	

12. AVTO-2 (MC) (Seed):

S. N.	Contributor	Entry name	Code name
1.	JNKVV, Jabalpur	JO-07-310	AVTO-2-MC- Seed-1
2.	(NC)	RO-19	AVTO-2-MC- Seed-2
3.	(NC)	UPO-212	AVTO-2-MC- Seed-3
4.	CSK HPKV, Palampur	PLP-24	AVTO-2-MC- Seed-4

13. IVTO Dual:

S. N.	Contributor	Entry name	Code name
1.	CCS HAU, Hisar	HFO-1108	IVTO –D- 1
2.	(NC)	JHO-822	IVTO –D- 2
3.	PAU, Ludhiana	OL-1967-1	IVTO –D- 3
4.	GBPUAT, Pantnagar	UPO-21-3	IVTO –D- 4
5.	PAU, Ludhiana	OL-1982-2	IVTO –D- 5
6.	IGFRI, Jhansi	JHO-21-5	IVTO –D- 6
7.	CCS HAU, Hisar	HFO-1119	IVTO –D- 7
8.	(NC)	UPO-212	IVTO –D- 8
9.	PAU, Ludhiana	OL-1984-2	IVTO –D- 9
10.	IGFRI, Jhansi	JHO-21-6	IVTO –D- 10
11.	JNKVV, Jabalpur	JO-13-518	IVTO –D- 11

14. AVTO-1 (Dual):

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	OL-1931	AVTO –1-D- 1
2.	JNKVV, Jabalpur	JO-03-513	AVTO –1-D- 2
3.	(NC)	UPO-212	AVTO –1-D- 3
4.	IGFRI, Jhansi	JHO-20-2	AVTO –1-D- 4
5.	(NC)	JHO-822	AVTO –1-D- 5
6.	CCS HAU, Hisar	HFO-1014	AVTO –1-D- 6
7.	CCS HAU, Hisar	HFO-917	AVTO –1-D- 7

16. AVT Lucerne-2 (Annual):

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	LLC-6	AVT-Lu-1
2.	(NC)	RL-88	AVT-Lu-2
3.	(NC)	Anand-2	AVT-Lu-3

17. AVT Lucerne-2 Annual (seed):

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	LLC-6	AVT-Lu-Seed-1
2.	(NC)	RL-88	AVT-Lu-Seed-2
3.	(NC)	Anand-2	AVT-Lu-Seed-3

18. IVT Lathyrus:

S. N.	Contributor	Entry name	Code name
1.	BAU, Ranchi	BL-5	IVT Comb Lath-1
2.	AAU, Jorhat	JCL-21-1	IVT Comb Lath-3
3.	AAU, Jorhat	JCL-21-3	IVT Comb Lath-4
4.	IIPR, Kanpur RRS Bhopal	IPLa 2021-01	IVT Comb Lath-5
5.	IIPR, Kanpur RRS Bhopal	IPLa 2021-03	IVT Comb Lath-6
6.	IIPR, Kanpur RRS Bhopal	IPLa 2021-02	IVT Comb Lath-7
7.	AAU, Jorhat	JCL-21-2	IVT Comb Lath-8
8.	(NC)	Mahateora	IVT Comb Lath-9
9.	BAU, Ranchi	BL-1	IVT Comb Lath-10
10.	(NC)	Prateek	IVT Comb Lath-11

19. AVT-1 Lathyrus:

S. N.	Contributor	Entry name	Code name
1.	BCKV, Kalyani	KL-5	IVT Comb Lath-2
2.	(NC)	Mahateora	IVT Comb Lath-9
3.	(NC)	Prateek	IVT Comb Lath-11

20. IVT Summer Bajra:

S. N.	Contributor	Entry name	Code name
1.	IIMR	IIMR-FB-MC-2022-2	IVTMSB - 1
2.	BAIF, Urulikanchan	BAIF Bajra-10	IVTMSB - 2
3.	(NC)	Giant bajra	IVTMSB - 3
4.	BAIF, Urulikanchan	BAIF Bajra 9	IVTMSB - 4
5.	Hytech Seed	HTBH 4904	IVTMSB - 5
6.	Rasi Seeds	SBH-104	IVTMSB - 6
7.	Alamdar Seeds	Alamdar-12	IVTMSB - 7
8.	(NC)	BAIF Bajra 1	IVTMSB - 8
9.	AAU, Anand	AFB-54	IVTMSB - 9
10.	Advanta Seeds	ADV 2184	IVTMSB - 10
11.	(NC)	Moti bajra	IVTMSB - 11
12.	AAU, Anand	AFB-45	IVTMSB - 12
13.	IIMR	IIMR-FB-MC-2022-1	IVTMSB - 13

21. AVT -1 Summer Bajra:

S. N.	Contributor	Entry name	Code name
1	RASI seed	SBH-103	AVT1MSB-1
2	(NC)	Giant bajra	AVT1MSB-2
3.	(NC)	BAIF Bajra 1	AVT1MSB-3
4.	Advanta seeds	16-ADV17020	AVT1MSB-4
(NC)	Moti bajra	AVT1MSB-5	AVT1MSB-4

Entries code for Agronomy Trials Rabi 2021-22

R-21-AST-3 (AVTB-2) (MC):

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	BM-14	AVTB-2-MC-Ag-1
2.	JNKVV, Jabalpur	JB-07-15	AVTB-2-MC-Ag-2
3.	ZC (HZ)	BL-22	AVTB-2-MC-Ag-3
4.	ZC (NWZ and CZ)	BB-2	AVTB-2-MC-Ag-3
5.	ZC (NEZ)	BB-3	AVTB-2-MC-Ag-3
6.	(NC)	Wardan	AVTB-2-MC-Ag-4

R-21-AST-4 (AVTO-2) (SC):

S. N.	Contributor	Entry name	Code name
1.	(NC)	Kent	AVTO-2-SC-Ag-1
2.	JNKVV, Jabalpur	JO-07-28	AVTO-2-SC-Ag-2
3.	ZC (HZ)	SKO-96	AVTO-2-SC-Ag-3
4.	ZC (CZ)	RO-11-1	AVTO-2-SC-Ag-3
5.	ZC (NWZ, NEZ and SZ)	OS-403	AVTO-2-SC-Ag-3
7.	(NC)	OS-6	AVTO-2-SC-Ag-4
8.	CCS HAU, Hisar	HFO-904	AVTO-2-SC-Ag-5
9.	CCS HAU, Hisar	HFO-906	AVTO-2-SC-Ag-6

R-21-AST-5 AVTO-2 (MC):

S. N.	Contributor	Entry name	Code name
1.	CSKHPKV, Palampur	PLP-24	AVTO-2-MC-Ag-1
2.	(NC)	UPO-212	AVTO-2-MC-Ag-2
3.	(NC)	RO-19	AVTO-2-MC-Ag-3
4.	JNKVV, Jabalpur	JO-07-310	AVTO-2-MC-Ag-4

R-21-AST-6 AVT-2 Lucerne (Annual):

S. N.	Contributor	Entry name	Code name
1.	(NC)	RL-88	AVT-2-Lu-MC-Ag-1
2.	PAU, Ludhiana	LLC-6	AVT-2-Lu-MC-Ag-2
3.	(NC)	Anand-2	AVT-2-Lu-MC-Ag-3

CHAPTER-1

FORAGE CROP IMPROVEMENT

1. IVTB: INITIAL VARIETAL TRIAL IN BERSEEM

(Reference tables 1.1 to 1.9)

An Initial Varietal Trial in Berseem comprising of five entries along with one national check (Wardan) and one check in respective zones [BL-22 (HZ), Bundel Berseem-2 (CZ), BL-44 (NWZ and NEZ)] was conducted at 17 centres located in four different zones (HZ, NWZ, NEZ, CZ) of the country. There were 2 locations in HZ, 5 each in NWZ, NEZ and Central zone.

For Hill zone, national check Wardan ranked first for GFY and DMY. For crude protein%, entry BM-13 (20.4%), PC-115 (19.5%), HFB-18-3 (19.5%) were better than the best check (19.3%). For CPY, entry BM-13 showed marginally better performance than the best check.

For NWZ, entry PC 115 showed marginal superiority over the best zonal check by margin of 1.1% for GFY and 0.8% for DMY. For crude protein yield (q/ha), entry BM -13 (19.9%), PC-115 (18.8%) were better than the best zonal check (17.7%). For crude protein %, entries HFB-18-3 (19.9), JB-08-19 (19.3), BM-13 (19.2) performed better than the national check Wardan (19.1).

In NEZ, national check Wardan performed best for GFY, DMY as well as CP% and CPY.

In central zone, entries PC -115 (11.2%), BM-13 (10.2%), HFB -18-3 (8.2%), HFB-18-9 (5.3%), JB-08-19 (4.4%) performed better than the best check for GFY. Similarly entries BM-13 (11.4%), PC -115 (7.2%), HFB -18-3 (7.0%), JB-08-19 (5.8%), HFB-18-9 (1.3%), performed better than the best check for DMY. Entries BM-13 (14.5), PC -115 (14.1), HFB-18-9 (13.9) performed better than the best national check Wardan (12.6) for crude protein yield (q/ha). For crude protein %, entries HFB-18-9 (19.9%), PC-115 (19.2%), performed better than the best zonal check BL-44 (18.5%).

At the all India level, entry BM-13 showed only a marginal superiority over the national check by a margin of 0.3% for GFY and 2.5% for DMY. For CPY (q/ha) entry BM-13 (13.6) performed better than the best national check Wardan (13.1). For Crude protein %, national check Wardan was the best (18.1%).

All other entries were either inferior or equal to the best check in their respective zones and at national level.

For plant height (cm), the best performing entry was JB-08-19 followed by check. For leafiness, entry BM-13 was best followed closely by PC-115 and HFB-18-3. For per day productivity (q/ha/day), entry BM-13 ranked first for both GFY and DMY with values of 3.75 and 0.61 respectively. It was followed by national check Wardan for both traits.

For other quality parameters, entry BM-13 top ranked for ADF%, national check Wardan for NDF%. For IVDMD, entry BM -13 (57.4%) top ranked followed by PC-115 (56.4%), and JB-08-19 (56.2%) and national check Wardan (55.8%).

Table 1.1: IVT Berseem: Initial Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	Hill Zone				North West Zone							
	Palam-pur	Rajo-uri	Aver-age	Ra-nk	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Aver-age	Ra-nk	Superi-ority (%)
HFB-18-3	235.7	536.1	385.9	2	462.4	647.9	1037.7	548.3	549.9	649.2	7	
HFB-18-9	255.6	373.1	314.3	6	458.5	620.3	983.6	734.9	788.6	717.2	4	
JB-08-19	259.5	452.4	356.0	3	478.6	651.1	837.7	709.1	707.7	676.8	6	
BM-13	291.3	393.1	342.2	4	458.0	644.0	1187.3	718.3	589.6	719.4	3	
PC-115	256.4	349.9	303.1	7	515.8	658.7	1224.7	603.9	746.5	749.9	1	1.1
Wardan (NC)	319.1	500.7	409.9	1	542.0	685.9	880.7	849.2	569.5	705.5	5	
BL-22 ZC (HZ)	223.8	408.5	316.2	5								
BL-44 ZC (NWZ-NEZ)					473.9	686.6	1171.7	632.7	742.1	741.4	2	
Mean	**263.0**	**430.5**	**346.8**		**484.2**	**656.3**	**1046.2**	**685.2**	**670.6**	**708.5**		
CD at 5%	**25.7**				**NS**	**NA**	**23.2**	**54.5**	**100.6**			
CV%	**5.4**				**6.9**	**5.2**	**10.3**	**8.2**	**8.4**			

Table 1.1: IVT Berseem: Initial Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	North East Zone						
	Kal-yani	Ran-chi	Pu-sa	Sab-our	** Bhuban-eswar	Aver-age	Ra-nk
HFB-18-3	260.3	396.3	545.7	461.0	149.3	415.8	2
HFB-18-9	208.7	319.4	488.8	427.0	126.4	361.0	5
JB-08-19	274.7	298.4	535.0	456.0	113.2	391.0	3
BM-13	255.8	340.4	533.2	394.0	143.1	380.8	4
PC-115	240.3	359.3	341.7	431.0	133.3	343.1	7
Wardan (NC)	309.9	406.1	555.2	412.0	138.2	420.8	1
BL-44 ZC (NWZ-NEZ)	239.5	374.6	455.8	361.0	117.4	357.7	6
Mean	**255.6**	**356.4**	**493.6**	**420.3**	**131.6**	**381.5**	
CD at 5%	**25.5**	**59.9**	**47.5**		**15.3**		
CV%	**9.6**	**10.5**	**5.4**		**6.5**		

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 1.1: IVT Berseem: Initial Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Jabal-pur	Urulikan-chan	Rai-pur	** Rah-uri	Aver-age	Ra-nk	Superi-ority (%)	Aver-age	Ra-nk	Superi-ority (%)
HFB-18-3	854.0	862.9	367.4	573.7	187.1	664.5	3	8.2	555.9	4	
HFB-18-9	795.9	902.8	314.0	574.1	318.4	646.7	4	5.3	549.7	5	
JB-08-19	879.1	817.1	285.7	583.0	265.3	641.2	5	4.4	548.3	6	
BM-13	833.2	828.9	466.2	577.6	355.0	676.5	2	10.2	567.4	1	0.3
PC-115	853.2	828.9	472.1	575.6	273.2	682.4	1	11.2	563.9	3	
Wardan (NC)	766.6	721.4	358.3	609.3	283.9	613.9	6		565.7	2	
Bundel Berseem-2 ZC (CZ)	765.5	802.9	354.0	522.2	237.7	611.2	7				
Mean	**821.1**	**823.6**	**374.0**	**573.6**	**274.4**	**648.1**			**558.5**		
CD at 5%	**79.4**	**5.0**	**91.3**	**37.5**	**58.2**						
CV%	**5.4**	**3.5**	**13.6**	**3.7**	**11.9**						

Note: ** Data is not included in zonal and all India average due to low yield of data

Table1.2: IVT Berseem: Initial Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	Hill Zone		North West Zone						
	Palam-pur	Ra-nk	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Superi-ority (%)
HFB-18-3	47.3	5	74.9	82.8	105.5	85.5	87.2	7	
HFB-18-9	47.3	5	73.4	88.7	99.9	132.3	98.6	5	
JB-08-19	50.3	3	85.2	90.0	103.3	107.8	96.6	6	
BM-13	57.2	2	76.9	92.1	130.6	126.4	106.5	3	
PC-115	50.0	4	80.5	89.4	157.2	107.5	108.7	1	0.8
Wardan (NC)	60.2	1	86.2	97.2	101.3	132.5	104.3	4	
BL-22 ZC (HZ)	45.2	6							
BL-44 ZC (NWZ-NEZ)			81.5	95.5	150.3	103.8	107.8	2	
Mean	**51.1**		**79.8**	**90.8**	**121.2**	**113.7**	**101.4**		
CD at 5%	**6.4**		**NS**	**NA**	**17.3**	**12.4**			
CV%	**6.9**		**7.0**	**5.7**	**8.8**	**11.6**			

Table1.2: IVT Berseem: Initial Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	North East Zone					
	Kalyani	Ranchi	Pusa	**Bhubaneswar	Average	Rank
HFB-18-3	36.0	45.6	135.0	33.9	72.2	2
HFB-18-9	30.0	34.6	120.7	30.0	61.8	5
JB-08-19	38.7	32.8	131.8	26.8	67.8	3
BM-13	36.4	35.7	131.4	33.1	67.8	3
PC-115	34.3	37.7	83.5	28.8	51.8	6
Wardan (NC)	47.0	40.6	136.8	32.4	74.8	1
BL-44 ZC (NWZ-NEZ)	30.9	45.0	112.4	26.6	62.8	4
Mean	**36.2**	**38.9**	**121.7**	**30.2**	**65.6**	
CD at 5%	**5.4**		**12.1**	**3.6**		
CV%	**10.6**		**5.5**	**6.7**		

Table 1.2: IVT Berseem: Initial Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Jabal-pur	Urulikan-chan	Rai-pur	**Rah-uri	Aver-age	Ra-nk	Superi-ority (%)	Aver-age	Ra-nk	Superi-ority (%)
HFB-18-3	142.7	120.8	60.4	69.6	32.5	98.4	3	7.0	83.8	5	
HFB-18-9	131.1	127.1	46.8	67.9	53.3	93.2	5	1.3	83.3	6	
JB-08-19	156.1	114.2	46.9	72.1	48.2	97.3	4	5.8	85.8	4	
BM-13	144.7	115.5	78.6	71.1	63.1	102.4	1	11.4	91.4	1	2.5
PC-115	139.3	116.3	69.8	69.0	49.3	98.6	2	7.2	86.2	3	
Wardan (NC)	132.8	100.3	55.5	79.3	48.7	92.0	6		89.1	2	
Bundel Berseem-2 ZC (CZ)	133.7	112.5	58.2	58.8	39.9	90.8	7				
Mean	**140.1**	**115.2**	**59.4**	**69.7**	**47.8**	**96.1**			**86.6**		
CD at 5%	**NA**	**0.70**	**14.5**	**8.3**	**10.1**						
CV%	**8.7**	**3.52**	**13.5**	**6.7**	**11.9**						

Table1.3: IVT Berseem: Initial Varietal Trial in Berseem: Green Forage Yield (q/ha/day)

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Kal-yani	Ran-chi	Pu-sa	Bhuban-eswar	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
HFB-18-3	3.50	3.79	6.00	3.63	2.05	2.55	4.86	2.41	1.93	3.06	3.77	3.41	4
HFB-18-9	3.47	3.62	5.69	4.87	1.64	2.07	4.16	2.26	3.28	2.62	3.78	3.41	4
JB-08-19	3.63	3.80	4.84	4.70	2.16	2.01	4.52	1.89	2.73	2.38	3.84	3.32	5
BM-13	3.47	3.72	6.86	4.76	2.01	2.15	4.65	2.27	3.66	3.89	3.8	3.75	1
PC-115	3.91	3.76	7.08	4.00	1.89	2.32	2.89	2.20	2.82	3.94	3.79	3.51	3
Wardan (NC)	4.11	3.93	5.09	5.62	2.44	2.54	4.95	2.18	2.93	2.99	4.01	3.71	2
BL-44 ZC (NWZ-NEZ)	3.59	4.01	6.77	4.19	1.89	2.45	3.99	2.04					
Bundel Berseem-2 ZC (CZ)									2.45	2.95	3.44		
Mean	**3.67**	**3.80**	**6.05**	**4.54**	**2.01**	**2.30**	**4.29**	**2.18**	**2.83**	**3.12**	**3.78**	**3.52**	

Table1.4: IVT Berseem: Initial Varietal Trial in Berseem: Dry Matter Yield (q/ha/day)

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Kal-yani	Ran-chi	Pu-sa	Bhuban-eswar	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
HFB-18-3	0.57	0.48	0.61	0.57	0.28	0.29	1.20	0.55	0.34	0.50	0.46	0.53	4
HFB-18-9	0.56	0.52	0.58	0.88	0.24	0.22	1.03	0.54	0.55	0.39	0.45	0.54	3
JB-08-19	0.65	0.53	0.6	0.71	0.30	0.22	1.11	0.45	0.50	0.39	0.47	0.54	3
BM-13	0.58	0.54	0.75	0.84	0.29	0.23	1.15	0.53	0.65	0.66	0.47	0.61	1
PC-115	0.61	0.51	0.91	0.71	0.27	0.24	0.71	0.47	0.51	0.58	0.45	0.54	3
Wardan (NC)	0.65	0.56	0.59	0.88	0.37	0.25	1.22	0.51	0.50	0.46	0.52	0.59	2
BL-44 ZC (NWZ-NEZ)	0.62	0.56	0.87	0.69	0.24	0.29	0.98	0.46					
Bundel Berseem-2 ZC (CZ)									0.41	0.49	0.39		
Mean	**0.61**	**0.53**	**0.70**	**0.75**	**0.28**	**0.25**	**1.06**	**0.50**	**0.49**	**0.50**	**0.46**	**0.56**	

Table 1.5: IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein Yield (q/ha)

Entries	Hill Zone		North West Zone					
	Palampur	Rank	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank
HFB-18-3	9.3	5	9.2	16.7	21.3	16.5	15.9	6
HFB-18-9	8.8	6	9.6	16.4	18.8	25.5	17.6	4
JB-08-19	9.5	4	7.9	17.8	20.4	19.8	16.5	5
BM-13	11.7	1	12.0	16.6	26.6	24.3	19.9	1
PC-115	9.8	3	8.9	15.8	30.8	19.8	18.8	2
Wardan (NC)	11.6	2	7.4	18.3	20.4	24.3	17.6	4
BL-22 ZC(HZ)	8.7	7						
BL-44 ZC(NWZ-NEZ)			6.3	19.7	26.8	18.2	17.7	3
Mean	**9.9**		**8.8**	**17.3**	**23.6**	**21.2**	**17.7**	

Table 1.5: IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein Yield (q/ha)

Entries	North East Zone					Central Zone						All India	
	Kal-yani	Ran-chi	Bhuban-eswar	Aver-age	Ra-nk	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Aver-age	Ra-nk
HFB-18-3	5.2	6.4	4.9	5.5	2	5.3	17.9	12.7	12.1	12.0	5	11.4	6
HFB-18-9	4.3	4.6	4.1	4.4	7	11.4	19.5	10.0	14.6	13.9	3	12.3	4
JB-08-19	5.4	5.5	3.7	4.9	5	10.3	16.6	9.4	11.8	12.0	5	11.5	5
BM-13	4.3	5.2	4.7	4.7	6	13.8	16.7	15.9	11.8	14.5	1	13.6	1
PC-115	4.2	7.2	4.0	5.2	4	10.2	17.2	14.6	14.3	14.1	2	13.1	2
Wardan(NC)	6.9	8.5	4.5	6.6	1	9.1	14.5	10.9	16.0	12.6	4	12.7	3
BL-44 ZC(NWZ-NEZ)	3.9	8.5	3.8	5.4	3								
Bundel Berseem-2 ZC (CZ)						6.9	16.6	12.3	12.3	12.0	5		
Mean	**4.9**	**6.6**	**4.2**	**5.2**		**9.6**	**17.0**	**12.2**	**13.3**	**13.0**		**12.4**	

Table 1.6: IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein (%)

Entries	Hill Zone		North West Zone					
	Palampur	Rank	Hisar	Ludhiana	Pantnagar	**Bikaner	Average	Rank
HFB-18-3	19.5	2	20.1	20.2	19.3	12.3	19.9	1
HFB-18-9	18.7	6	18.5	18.8	19.3	13.1	18.8	5
JB-08-19	19.0	5	19.7	19.7	18.4	9.3	19.3	2
BM-13	20.4	1	18.0	20.4	19.3	15.6	19.2	3
PC-115	19.5	2	17.7	19.6	18.4	11.0	18.6	6
Wardan (NC)	19.2	4	18.8	20.2	18.4	8.6	19.1	4
BL-22 ZC (HZ)	19.3	3						
BL-44 ZC (NWZ-NEZ)			20.6	17.8	17.5	7.7	18.6	6
Mean	**19.4**		**19.1**	**19.5**	**18.6**	**11.1**	**19.1**	

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 1.6: IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein (%)

Entries	North East Zone					Central Zone						All India	
	Kal-yani	Ran-chi	Bhuban-eswar	Aver-age	Ra-nk	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Aver-age	Ra-nk
HFB-18-3	14.5	14.1	14.4	14.3	5	16.2	14.8	21.0	17.4	17.4	6	17.4	5
HFB-18-9	14.5	13.4	13.8	13.9	6	21.4	15.4	21.3	21.4	19.9	1	17.8	3
JB-08-19	14.0	16.9	13.8	14.9	4	21.3	14.5	20.1	16.4	18.1	5	17.6	4
BM-13	11.9	14.6	14.1	13.5	7	21.8	14.4	20.2	16.6	18.3	4	17.4	5
PC-115	12.3	19.2	13.9	15.1	3	20.6	14.8	20.9	20.7	19.2	2	18.0	2
Wardan (NC)	14.6	20.8	13.9	16.4	1	18.8	14.5	19.7	20.2	18.3	4	18.1	1
BL-44 ZC (NWZ-NEZ)	12.7	19.0	14.4	15.4	2								
Bundel Berseem-2 ZC (CZ)						17.3	14.7	21.1	20.9	18.5	3		
Mean	**13.5**	**16.8**	**14.0**	**14.8**		**19.6**	**14.7**	**20.6**	**19.1**	**18.5**		**17.7**	

Table 1.7: IVT Berseem: Initial Varietal Trial in Berseem: Plant Height (CM)

Entries	Palam-pur	Bika-ner	Ludh-iana	Pant-nagar	Udai-pur	Kal-yani	Ran-chi	Pu-sa	Bhuban-eswar	Sab-our	Jha-nsi	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
HFB-18-3	50.3	67.0	53.6	48.4	52.0	72.7	51.6	58.7	74.6	81.0	72.3	37.8	56.0	65.8	60.1	6
HFB-18-9	49.6	71.4	50.6	55.1	60.2	74.6	66.5	81.3	68.3	68.0	71.3	41.1	49.6	64.6	62.3	5
JB-08-19	38.7	78.4	57.9	60.2	56.7	83.1	68.5	75.0	63.2	82.0	73.0	44.4	54.0	67.3	64.5	1
BM-13	51.2	73.8	54.6	50.6	51.0	77.6	62.2	79.0	73.9	84.0	76.7	37.7	56.9	58.1	63.4	3
PC-115	42.5	76.4	54.9	54.3	56.2	75.3	58.8	81.7	70.7	80.0	66.7	44.0	53.7	65.3	62.9	4
Wardan (NC)	44.5	83.2	55.7	57.4	53.0	79.3	53.4	72.3	72.5	71.0	84.7	42.5	61.1	64.9	64.0	2
BL-22 ZC (HZ)	43.5															
BL-44 ZC (NWZ-NEZ)		69.0	53.4	52.6	56.6	76.7	58.1	76.7	65.3	76.0						
Bundel Berseem-2 ZC (CZ)											70.0	38.8	54.8	64.7		
Mean	**45.8**	**74.2**	**54.4**	**54.1**	**55.1**	**77.0**	**59.9**	**75.0**	**69.8**	**77.4**	**73.5**	**40.9**	**55.1**	**64.4**	**62.8**	

Table 1.8: IVT Berseem: Initial Varietal Trial in Berseem: Leaf Stem Ratio

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Kal-yani	Ran-chi	Pu-sa	Bhuban-eswar	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
HFB-18-3	0.39	0.88	1.80	0.91	0.90	1.04	0.82	0.58	1.05	0.46	0.82	0.33	0.83	3
HFB-18-9	0.56	0.86	1.73	0.83	0.75	1.00	0.76	0.59	0.84	0.47	0.82	0.36	0.80	5
JB-08-19	0.53	0.81	1.65	0.96	0.81	0.97	0.78	0.68	0.93	0.49	0.82	0.37	0.82	4
BM-13	0.42	0.85	1.69	0.94	0.91	1.02	0.80	0.62	1.08	0.47	1.13	0.41	0.86	1
PC-115	0.40	0.91	1.75	0.96	0.84	1.20	0.80	0.59	0.97	0.45	0.82	0.35	0.84	2
Wardan (NC)	0.40	0.75	1.71	0.91	0.88	0.98	0.76	0.71	1.11	0.42	0.81	0.34	0.82	4
BL-22 ZC (HZ)	0.51													
BL-44 ZC (NWZ-NEZ)		0.91	1.80	0.93	0.83	1.32	0.89	0.55	0.89					
Bundel Berseem-2 ZC (CZ)										0.43	0.73	0.39		
Mean	**0.46**	**0.85**	**1.73**	**0.92**	**0.85**	**1.08**	**0.80**	**0.62**	**0.98**	**0.46**	**0.85**	**0.36**	**0.83**	

Table1.9: IVT Berseem: Initial Varietal Trial in Berseem: ADF (%), NDF & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
HFB-18-3	32.5	4	55.7	2	55.6	5
HFB-18-9	32.5	4	59.4	7	54.7	6
JB-08-19	32.4	3	57.4	5	56.2	3
BM-13	30.2	1	56.4	4	57.4	1
PC-115	33.5	5	56.0	3	56.4	2
Wardan (NC)	32.1	2	55.4	1	55.8	4
BL-44 ZC (NWZ-NEZ)	36.5	6	59.0	6	54.0	7
Mean	**32.8**		**57.0**		**55.7**	

2. AVTB-1: FIRST ADVANCED VARIETAL TRIAL IN BERSEEM

(Reference tables 2.1 to 2.9)

A First stage Advanced Varietal Trial in Berseem comprising of four entries along with one national check (Wardan) and one zonal check [BL-22 (HZ), BB-2 (NWZ, CZ, BB 3 in NEZ)] was conducted at 17 centres located in four zones (Hill, North West, North east and Central zone). There were 3 locations in Hill, 5 locations each in NW and central zones, 4 in NE zone.

In Hill zone, entry PC-114 shoed marginal superiority of 1% over the best national check. For DMY, the check was best performer. For crude protein yield and crude protein %, entry PC-114 ranked first followed by national check Wardan.

For NWZ, entries PC-114 (5.0%), JHB-20-1 (3.3%), JB-08-17 (0.3%) were superior for GFY over the best check. For DMY, the entries JB-08-17 (6.9%) and PC-114 (5.7%) were superior over the best check. Entry PC-114 with a value of 22.2 ranked first for CPY (q/ha) followed by entry JB-08-17 (21.0) and national check Wardan (19.8 q/ha). For crude protein %, entry PC-114 and zonal check BL-22 were top ranked with a value of 19.4.

For NEZ, entries JB-08-17 was best performer showing superiority by margin of 6.1% for GFY and 5.3% for DMY over the best check. Similary entry JHB-20-1 was second ranked showing superiority over the best check by margins of 5.6% for GFY and 2.0% for DMY. Zonal check Bundel Berseem -3 top ranked for crude protein yield (q/ha). For crude protein %, entry JHB-20-1, JHB-20-1 and zonal check Bundel Berseem-3 performed equal with value of 14.9%.

For central zone, entries JB-08-17 (10.2%), PC-114 (9.2%), JHB-20-1 (6.0%), JHB-20-2 (4.2%) performeed better the best check. For DMY also, PC-114 (11.3%), JB-08-17 (11.0%), JHB-20-1(9.1%), JHB-20-2 (3.8%) performed better than the best check. Entries JB-08-17 (16.6), PC-114 (16.2), JHB-20-1 (16.1), JHB-20-2 (14.0) performed better than the national check (13.3) for crude protein yield (q/ha). Similary entries JHB-20-1 (19.7%), JB-08-17 (19.1%), PC-114 (18.1%), and JHB-20-2 (17.8%) performed better than the national check Wardan (17.5%) for crude protein %.

At all India level, PC-114 was best performer showing superiority of 5.16% over the national check Wardan. Similarly other entries also performed better than the national check. The margin of superiority was 3.78%, 3.08% and 0.08% for entries JB-08-17, JHB-20-1, JHB-20-2 respectively. For DMY also, entries JB-08-17, PC-114, JHB-20-1 performed better than the national check by margins of 7.8%, 7.1% and 2.1% respectively. Entries PC-114 (15.2%), JB-08-17 (14.3%) performed better than the national check Wardan (13.3) for crude protein yield (q/ha). For crude protein %, PC-114was the best performer.

For per day productivity (q/ha/day), entry JB-08-17 top ranked with a value of 3.76 and 0.65 respectively for GFY and DMY. It was followed by entry PC-114 with values of 3.74 and 0.63 for GFY and DMY respectively. For plant height, entry JB-08-17 ranked first followed by national check Wardan. For leafiness, entry JHB -20-2 ranked first followed by PC-114. For other quality parameters, entry PC-114 was best performer followed by entry JB-08-17 and national check Wardan for NDF%. Entry PC-114 was top ranker for ADF% followed by national check Wardan. For IVDMD%, entry PC -114 was topranker with a value of 62.2% followed by national check Wardan 61.7%.

Table 2.1: AVTB-1: AVT-1 Forage Berseem: Green Forage Yield (q/ha)

Entries	Hill Zone						North West Zone							
	Palam-pur	Rajo-uri	Alm-ora	Aver-age	Ra-nk	Superi-ority%	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Udai-pur	Aver-age	Ra-nk	Superi-ority%
JB-08-17	170.2	340.0	123.3	211.2	5		702.9	414.2	882.2	969.8	425.2	678.9	3	0.3
JHB-20-1	205.3	252.7	140.6	199.5	6		628.5	350.0	911.6	1030.1	575.9	699.2	2	3.3
JHB-20-2	232.7	374.2	134.1	247.0	4		591.4	454.3	869.7	944.5	504.5	672.9	5	
PC-114	310.6	314.2	157.2	260.7	1	1.0	548.6	424.6	882.2	1222.3	474.3	710.4	1	5.0
Wardan (NC)	273.4	359.9	141.0	258.1	2		777.7	402.2	864.1	895.9	443.9	676.8	4	
BL-22 ZC (HZ)	275.5	321.9	170.4	255.9	3									
BB-2 ZC (NWZ-CZ)							736.3	421.4	917.4	774.4	436.5	657.2	6	
Mean	**244.6**	**327.2**	**144.5**	**238.7**			**664.2**	**411.1**	**887.8**	**972.8**	**476.7**	**682.5**		
CD at 5%	**49.0**		**30.9**				**58.6**	**49.3**	**N/A**	**22.1**	**42.0**			
CV%	**11.4**		**10.0**				**8.8**	**6.6**	**5.0**	**7.7**	**5.0**			

Table 2.1: AVTB-1: AVT-1 Forage Berseem: Green Forage Yield (q/ha)

Entries	North East Zone						
	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk	Superi-ority%
JB-08-17	207.7	332.5	119.3	565.8	306.3	1	6.1
JHB-20-1	242.4	311.5	126.6	538.3	304.7	2	5.6
JHB-20-2	233.5	297.4	112.5	375.9	254.8	6	
PC-114	216.9	260.4	142.2	437.0	264.1	5	
Wardan (NC)	246.1	271.2	118.3	440.2	268.9	4	
BB-3 ZC (NEZ)	222.4	312.9	149.0	470.3	288.7	3	
Mean	**228.2**	**297.7**	**128.0**	**471.3**	**281.3**		
CD at 5%	**12.9**	**47.3**	**12.8**	**74.6**			
CV%	**8.5**	**7.3**	**5.5**	**9.4**			

Table 2.1: AVTB-1: AVT-1 Forage Berseem: Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Superi ority%	Aver-age	Ra-nk	Super-iority (%)
JB-08-17	663.6	504.6	950.5	350.9	587.5	611.4	1	10.2	488.8	2	3.8
JHB-20-1	678.6	463.3	931.5	324.2	543.1	588.1	3	6.0	485.5	3	3.1
JHB-20-2	681.4	467.4	859.7	286.4	593.9	577.8	4	4.2	471.4	4	0.1
PC-114	651.7	481.0	871.0	564.0	461.4	605.8	2	9.2	495.3	1	5.1
Wardan (NC)	701.1	533.2	857.5	252.1	429.4	554.7	5		471.0	5	
BB-2 ZC (NWZ-CZ)	639.0	500.7	918.3	288.0	422.2	553.6	6				
Mean	**669.2**	**491.7**	**898.1**	**344.2**	**506.3**	**581.9**			**482.4**		
CD at 5%	**NA**	**77.1**	**4.9**	**69.1**	**129.8**						
CV%	**6.9**	**8.8**	**3.3**	**10.8**	**14.4**						

Table 2.2: AVTB-1: AVT-1 Forage Berseem: Dry Matter Yield (q/ha)

Entries	Hill Zone				North West Zone						
	Palam-pur	Alm-ora	Aver-age	Ra-nk	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-ority%
JB-08-17	34.0	30.0	32.0	6	157.5	67.9	109.0	127.7	115.5	1	6.9
JHB-20-1	37.0	32.9	35.0	5	106.9	53.2	118.4	127.0	101.4	5	
JHB-20-2	42.5	31.8	37.1	4	104.1	79.0	112.1	124.4	104.9	4	
PC-114	56.7	34.0	45.3	2	113.0	73.9	119.4	150.7	114.2	2	5.7
Wardan (NC)	53.8	33.1	43.5	3	144.7	64.8	115.5	107.4	108.1	3	
BL-22 ZC (HZ)	51.0	41.1	46.1	1							
BB-2 ZC (NWZ-CZ)					119.3	66.6	129.2	89.0	101.0	6	
Mean	**45.8**	**33.8**	**39.8**		**124.2**	**67.6**	**117.3**	**121.0**	**107.5**		
CD at 5%	**9.4**	**3.4**			**12.3**	**8.2**	**12.9**	**12.4**			
CV%	**11.6**	**9.0**			**11.5**	**6.7**	**6.3**	**8.9**			

Table 2.2: AVTB-1: AVT-1 Forage Berseem: Dry Matter Yield (q/ha)

Entries	North East Zone						
	Kalyani	Ranchi	Bhubaneswar	Pusa	Average	Rank	Superiority%
JB-08-17	28.4	58.5	27.2	138.7	63.2	1	5.3
JHB-20-1	34.4	49.8	28.8	131.9	61.2	2	2.0
JHB-20-2	32.4	55.3	25.7	90.7	51.0	6	
PC-114	33.6	48.4	33.0	106.6	55.4	4	
Wardan (NC)	34.5	45.6	28.6	107.7	54.1	5	
BB-3 ZC (NEZ)	33.1	58.2	33.4	115.4	60.0	3	
Mean	**32.7**	**52.6**	**29.4**	**115.2**	**57.5**		
CD at 5%	**2.4**		**3.2**	**18.6**			
CV%	**6.2**		**5.9**	**9.6**			

Table 2.2: AVTB-1: AVT-1 Forage Berseem: Dry Matter Yield (q/ha)

Entries	Central Zone								All India		
	Jhansi	Rahuri	Jabalpur	Urulikanchan	Raipur	Average	Rank	Superiority%	Average	Rank	Superiority%
JB-08-17	122.8	87.8	137.4	56.8	79.0	96.8	2	11.0	84.2	1	7.8
JHB-20-1	132.5	89.8	134.2	48.9	70.0	95.1	3	9.1	79.7	3	2.1
JHB-20-2	121.8	87.0	122.9	42.4	78.2	90.5	4	3.8	76.7	5	
PC-114	114.8	90.9	125.0	92.4	61.8	97.0	1	11.3	83.6	2	7.1
Wardan(NC)	122.2	98.3	122.3	37.6	55.5	87.2	5		78.1	4	
BB-2 ZC (NWZ-CZ)	103.7	87.0	134.3	43.9	55.3	84.8	6				
Mean	**119.6**	**90.1**	**129.3**	**53.7**	**66.6**	**91.9**			**160.9**		
CD at 5%	**NA**	**14.1**	**0.7**	**11.0**	**17.2**						
CV%	**9.4**	**8.8**	**3.3**	**10.9**	**14.3**						

Table 2.3: AVTB-1: AVT-1 Forage Berseem: Green Forage Yield (q/ha/day)

Entries	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
JB-08-17	4.62	3.21	5.21	5.61	1.60	2.13	2.06	4.96	5.20	2.92	3.81	3.76	1
JHB-20-1	4.13	2.71	5.29	5.95	1.86	1.96	2.01	4.71	4.78	2.70	3.53	3.60	3
JHB-20-2	3.89	3.52	5.05	5.46	1.80	1.92	1.80	3.24	4.82	2.38	3.86	3.43	5
PC-114	3.61	3.29	5.19	7.07	1.67	1.74	2.18	3.69	4.96	4.70	3.00	3.74	2
Wardan (NC)	5.12	3.12	5.05	5.18	1.89	1.79	2.03	3.85	5.50	2.10	2.79	3.49	4
BB-2 ZC (NWZ-CZ)	4.84	3.27	5.36	4.48					5.16	2.40	2.74		
BB-3 ZC (NEZ)					1.71	1.94	2.27	3.97					
Mean	**4.37**	**3.19**	**5.19**	**5.63**	**1.76**	**1.91**	**2.06**	**4.07**	**5.07**	**2.87**	**3.29**	**3.60**	

Table 2.4: AVTB-1: AVT-1 Forage Berseem: Dry Matter Yield (q/ha/day)

Entries	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
JB-08-17	1.04	0.53	0.64	0.74	0.22	0.38	0.47	1.22	0.91	0.47	0.51	0.65	1
JHB-20-1	0.70	0.41	0.69	0.73	0.26	0.31	0.46	1.15	0.93	0.41	0.45	0.59	3
JHB-20-2	0.68	0.61	0.65	0.72	0.25	0.36	0.41	0.78	0.90	0.35	0.51	0.56	5
PC-114	0.74	0.57	0.70	0.87	0.26	0.32	0.51	0.90	0.94	0.77	0.40	0.63	2
Wardan (NC)	0.95	0.50	0.67	0.62	0.27	0.30	0.49	0.94	1.01	0.31	0.36	0.58	4
BB-2 ZC (NWZ-CZ)	0.78	0.52	0.75	0.51					0.90	0.37	0.36		
BB-3 ZC (NEZ)					0.25	0.36	0.51	0.98					
Mean	**0.82**	**0.52**	**0.68**	**0.70**	**0.25**	**0.34**	**0.47**	**1.00**	**0.93**	**0.45**	**0.43**	**0.60**	

Table 2.5: AVTB-1: AVT-1 Forage Berseem: Crude Protein Yield (q/ha)

Entries	Hill Zone		North West Zone					
	Palampur	Rank	Pantnagar	Bikaner	Hisar	Ludhiana	Average	Rank
JB-08-17	6.3	6	27.6	13.0	20.5	22.9	21.0	2
JHB-20-1	6.5	5	19.6	4.7	21.9	21.6	16.9	6
JHB-20-2	7.3	4	17.3	13.4	20.6	24.1	18.9	5
PC-114	11.2	1	19.8	14.8	23.7	30.7	22.2	1
Wardan (NC)	10.6	2	26.6	11.7	21.4	19.7	19.8	3
BL-22 ZC (HZ)	9.2	3						
BB-2 ZC (NWZ-CZ)			23.0	12.6	24.5	18.1	19.5	4
Mean	**8.5**		**22.3**	**11.7**	**22.1**	**22.9**	**19.7**	

Table 2.5: AVTB-1: AVT-1 Forage Berseem: Crude Protein Yield (q/ha)

Entries	North East Zone					Central Zone						All India	
	Kal-yani	Ran-chi	Bhuban-eswar	Aver-age	Ra-nk	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Aver-age	Ra-nk
JB-08-17	3.8	7.7	3.8	5.1	5	19.1	19.1	11.1	16.8	16.6	1	14.3	2
JHB-20-1	4.7	8.6	4.0	5.8	2	19.2	19.2	10.2	15.7	16.1	3	13.0	4
JHB-20-2	4.9	8.8	3.5	5.7	3	16.9	16.9	8.9	13.4	14.0	4	13.0	4
PC-114	4.7	8.1	4.5	5.7	3	16.6	16.6	19.6	12.0	16.2	2	15.2	1
Wardan (NC)	4.8	7.9	3.7	5.5	4	18.5	18.5	7.7	8.6	13.3	5	13.3	3
BB-3 ZC (NEZ)	4.4	10.0	4.7	6.4	1								
BB-2 ZC (NWZ-CZ)						15.8	15.8	8.3	11.6	12.9	6		
Mean	**4.5**	**8.5**	**4.0**	**5.7**		**17.7**	**17.7**	**13.0**	**11.0**	**14.8**		**13.8**	

Table 2.6: AVTB-1: AVT-1 Forage Berseem: Crude Protein (%)

Entries	Hill Zone		North West Zone					
	Palampur	Rank	Pantnagar	Bikaner	Hisar	Ludhiana	Average	Rank
JB-08-17	18.4	3	17.5	19.1	18.8	17.9	18.3	2
JHB-20-1	17.5	5	18.4	8.9	18.5	17.0	15.7	4
JHB-20-2	17.2	6	16.6	17.0	18.4	19.4	17.9	3
PC-114	19.8	1	17.5	20.0	19.8	20.4	19.4	1
Wardan (NC)	19.5	2	18.4	18.0	18.5	18.3	18.3	2
BL-22 ZC (HZ)	18.1	4						
BB-2 ZC (NWZ-CZ)			19.3	18.9	19.0	20.3	19.4	1
Mean	**18.4**		**17.9**	**17.0**	**18.8**	**18.9**	**18.2**	

Table 2.6: AVTB-1: AVT-1 Forage Berseem: Crude Protein (%)

Entries	North East Zone					Central Zone						All India	
	Kal-yani	Ran-chi	Bhuban-eswar	Aver-age	Ra-nk	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Aver-age	Ra-nk
JB-08-17	13.4	13.2	13.8	13.5	4	21.8	13.9	19.6	21.3	19.1	2	17.4	2
JHB-20-1	13.6	17.3	13.9	14.9	1	21.4	14.3	20.8	22.4	19.7	1	17.0	5
JHB-20-2	15.0	16.0	13.8	14.9	1	19.4	13.8	21.0	17.1	17.8	4	17.1	4
PC-114	13.8	16.7	13.6	14.7	3	18.3	13.3	21.2	19.7	18.1	3	17.8	1
Wardan (NC)	14.0	17.3	13.0	14.8	2	18.8	15.1	20.5	15.5	17.5	5	17.3	3
BB-3 ZC (NEZ)	13.4	17.1	14.1	14.9	1								
BB-2 ZC (NWZ-CZ)						18.2	11.8	19.0	20.8	17.4	6		
Mean	**13.9**	**16.3**	**13.7**	**14.6**		**19.7**	**13.7**	**20.4**	**19.5**	**18.3**		**17.3**	

Table 2.7: AVTB-1: AVT-1 Forage Berseem: Plant Height (cm)

Entries	Palampur	Pantnagar	Bikaner	Ludhiana	Udaipur	Kalyani	Ranchi	Bhubaneswar	Pusa	Jhansi	Rahuri	Jabalpur	Urulikanchan	Raipur	Average	Rank
JB-08-17	51.9	53.8	52.8	61.4	42.3	84.3	52.3	68.4	77.7	80.7	55.9	55.5	62.2	66.1	61.8	1
JHB-20-1	53.3	51.3	50.4	58.5	42.7	82.7	44.5	70.7	70.7	70.0	53.6	54.1	54.0	59.0	58.2	4
JHB-20-2	53.3	54.5	51.2	56.6	39.7	89.1	42.5	64.4	75.0	72.3	51.5	50.2	58.0	59.9	58.4	3
PC-114	55.6	50.3	48.4	56.0	42.8	80.7	40.4	72.0	75.7	66.3	51.9	50.7	62.4	50.2	57.4	5
Wardan (NC)	54.1	52.6	51.8	58.6	47.6	86.1	53.0	66.2	74.0	77.3	56.4	48.9	65.9	54.3	60.5	2
BL-22 ZC (HZ)	56.1															
BB-2 ZC (NWZ-CZ)		52.3	62.0	55.7	41.4					73.7	54.6	60.2	61.4	50.5		
BB-3 ZC (NEZ)						85.5	52.7	74.3	70.0							
Mean	**54.1**	**52.5**	**52.8**	**57.8**	**42.8**	**84.7**	**47.6**	**69.3**	**73.8**	**73.4**	**54.0**	**53.3**	**60.7**	**56.7**	**59.3**	

Table 2.8: AVTB-1: AVT-1 Forage Berseem: Leaf Stem Ratio

Entries	Palampur	Pantnagar	Bikaner	Hisar	Ludhiana	Kalyani	Ranchi	Bhubaneswar	Pusa	Rahuri	Jabalpur	Urulikanchan	Raipur	Average	Rank
JB-08-17	0.39	0.77	1.01	1.49	0.84	1.07	0.76	0.79	0.59	0.41	0.63	0.83	0.38	0.77	4
JHB-20-1	0.45	1.05	0.81	1.57	0.92	1.18	0.82	0.89	0.68	0.50	0.60	0.71	0.39	0.81	3
JHB-20-2	0.49	0.95	1.09	2.03	0.88	1.11	0.82	0.86	0.61	0.51	0.56	0.71	0.40	0.85	1
PC-114	0.47	0.92	0.92	1.68	0.95	1.20	0.79	0.98	0.65	0.53	0.57	0.80	0.52	0.84	2
Wardan (NC)	0.34	0.89	0.89	1.32	0.83	1.15	0.83	0.83	0.58	0.50	0.56	0.86	0.42	0.77	4
BL-22 ZC (HZ)	0.42														
BB-2 ZC (NWZ-CZ)		0.76	0.91	1.80	0.87					0.50	0.70	0.92	0.40		
BB-3 ZC (NEZ)						0.97	0.82	1.07	0.65						
Mean	**0.43**	**0.89**	**0.94**	**1.65**	**0.88**	**1.11**	**0.81**	**0.90**	**0.63**	**0.49**	**0.60**	**0.81**	**0.42**	**0.81**	

Table 2.9: AVTB-1: AVT-1 Forage Berseem: NDF (%)

Entries	NDF (%)						
	Pant-nagar	Rah-uri	Ludh-iana	Palam-pur	Ran-chi	Aver-age	Ra-nk
JB-08-17	62.4	42.1	56.4	59.4	42.9	52.6	2
JHB-20-1	64.0	45.3	58.1	62.0	36.4	53.2	3
JHB-20-2	62.2	43.6	56.2	62.6	41.2	53.2	3
PC-114	64.6	43.5	55.0	61.8	37.6	52.5	1
Wardan (NC)	63.8	43.8	58.1	60.6	36.5	52.6	2
BL-22 ZC (HZ)				61.4			
BB-2 ZC (NWZ-CZ)	62.6	44.0	55.8				
BB-3 ZC (NEZ)					38.7		
Mean	**63.3**	**43.7**	**56.6**	**61.3**	**38.9**	**52.8**	

Table 2.9: AVTB-1: AVT-1 Forage Berseem: ADF (%) & IVDMD (%)

Entries	ADF (%)							IVDMD (%)				
	Pant-nagar	Rah-uri	Ludh-iana	Palam-pur	Ran-chi	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Ran-chi	Aver-age	Ra-nk
JB-08-17	54.2	31.4	37.5	54.0	32.3	41.9	4	53.4	64.6	62.4	60.1	5
JHB-20-1	53.4	36.2	36.4	54.2	27.6	41.6	3	54.5	60.3	66.2	60.3	4
JHB-20-2	54.6	33.2	34.2	55.8	31.8	41.9	4	56.4	62.6	63.4	60.8	3
PC-114	53.8	31.5	33.9	54.6	28.3	40.4	1	56.8	64.0	65.8	62.2	1
Wardan (NC)	55.8	33.4	34.2	52.4	27.6	40.7	2	55.6	62.5	66.9	61.7	2
BL-22 ZC (HZ)				53.2								
BB-2 ZC (NWZ-CZ)	55.8	33.4	35.2					54.9	62.5			
BB-3 ZC (NEZ)					26.4					67.8		
Mean	**54.6**	**33.2**	**35.2**	**54.0**	**29.0**	**41.3**		**55.3**	**62.8**	**65.4**	**61.0**	

3. AVTB-2: SECOND ADVANCED VARIETAL TRIAL IN BERSEEM

(Reference tables 3.1 to 3.9)

A Second stage Advanced Varietal Trial in Berseem comprising of two entries along with one national check (Wardan) and one zonal check [BL-22 (HZ), BB-2 (NWZ, CZ, BB 3 in NEZ)] was conducted at 17 centres located in four zones (Hill, North West, North east and Central zone). There were 3 locations in Hill, 5 locations in NW and central zones, 4 in NE zone.

In Hill zone, checks were best performers for GFY and DMY as well as CPY and CP%.

In NW zone, entry BM-14 performed better than the best national check Wardan by a margin of 4.7% for GFY. For DMY, national check Wardan and entry BM-14 ranked first. For CPY and CP% also the checks were best performers.

In NEZ, Zonal check Bundel Berseem-3 ranked first for GFY, DMY, CPY and CP%.

In Central zone, both the entries performed better than the checks for GFY and DMY. Entry JB-07-15 top ranked for GFY and DMY with superiority of 7.3% and 10.8% respectively over the best check. It was followed by entry BM-14 showing superiority of 6.6% for GFY and 6.9% for DMY over the best check. Entries JB-07-15 (16.0), BM-14 (15.3) performed better than the national check Wardan (13.3) for crude protein yield (q/ha). For crude protein %, entry BM-14 (18.1%) and entry JB-07-15 (18.0%) were better performer than the best check Wardan (17.5%).

At all India level, the superiority of entries BM-14 and JB-07-15 was 2.44% and 1.44% over the national check Wardan. For DMY also, entries BM-14 and JB-07-15 performed better than the nationalcheck by margin of 1.4% and 4.9% respectively. Entry JB-07-15 (13.9) and entry BM-14(13.6) performed better than the national check Wardan (13.3) for crude protein yield (q/ha).

For per day productivity (q/ha/day), entry BM-14 top ranked followed by JB-07-15 for green fodder whereas entry JB-07-15 top ranked for dry matter followed by BM-14. For plant height, entry JB-07-15 was top ranker followed by national check Wardan. For leafiness, both the entries were superior over the national check. National check Wardan ranked first for NDF%, ADF% as well as IVDMD%.

4. AVTB-2 (SEED): SECOND ADVANCED VARIETAL TRIAL IN BERSEEM FOR SEED

(Reference tables 4.1)

A Second stage Advanced Varietal Trial in Berseem comprising of two entries along with one national check (Wardan) and one zonal check [BL-22 (HZ), BB-2 (NWZ, CZ, BB 3 in NEZ)] was conducted at 11 centres located in four zones (Hill, North West, North east and Central zone). There were 1 location in Hill, 3 locations each in NW and NE and 4 locations in central zone.

In Hill zone, entry JB-07-15 perofrmed better than the national check by a margin of 15.2%. In NWZ, entry BM-14 was best performer followed by JB-07-15 showing higher seed yield by margins of 39.4% and 15.3% respectively over the best zonal check Bundel Berseem-2. In NEZ, entries JB-07-15 and BM-14 performed better than the best zonal check Bundel Berseem -3 by margins of 4.2% and 1.6% respectively.

At all India level, entries JB-07-15 and BM-14 showed higher seed production by margins of 11.8% and 3.0% over the national check Wardan.

Table 3.1: AVTB-2: AVT-2 Forage Berseem: Green Forage Yield (q/ha)

Entries	Hill Zone					North West Zone							
	Palam-pur	Rajo-uri	Alm-ora	Aver-age	Ra-nk	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Udai-pur	Aver-age	Ra-nk	Superi-ority%
BM-14	207.9	279.5	168.0	218.5	4	640.3	472.0	802.7	1135.7	492.0	708.5	1	4.7
JB-07-15	266.2	290.8	161.8	239.6	3	561.1	418.4	833.3	1001.5	485.4	659.9	3	
Wardan (NC)	273.4	359.9	141.0	258.1	1	777.7	402.2	864.1	895.9	443.9	676.8	2	
BL-22 ZC (HZ)	275.5	321.9	170.4	255.9	2								
BB-2 ZC (NWZ-CZ)						736.3	421.4	917.4	774.4	436.5	657.2	4	
Mean	**255.7**	**313.0**	**160.3**	**243.0**		**678.9**	**428.5**	**854.4**	**951.9**	**464.5**	**675.6**		
CD at 5%	**49.0**		**30.9**			**58.6**	**49.3**	**N/A**	**22.1**	**42.0**			
CV%	**11.4**		**10.0**			**8.8**	**6.6**	**5.0**	**7.7**	**5.0**			

Table 3.1: AVTB-2: AVT-2 Forage Berseem: Green Forage Yield (q/ha)

Entries	North East Zone						Central Zone								All India		
	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
BM-14	197.7	351.8	158.9	340.0	262.1	4	646.1	508.8	790.8	417.3	592.2	591.1	2	6.6	482.5	1	2.4
JB-07-15	230.8	324.0	143.8	428.3	281.7	2	609.8	544.3	896.1	424.6	501.7	595.3	1	7.3	477.8	2	1.4
Wardan (NC)	246.1	271.2	118.3	440.2	268.9	3	701.1	533.2	857.5	252.1	429.4	554.7	3		471.0	3	
BB-3 ZC (NEZ)	222.4	312.9	149.0	470.3	288.7	1											
BB-2 ZC (NWZ-CZ)							639.0	500.7	918.3	288.0	422.2	553.6	4				
Mean	**224.3**	**315.0**	**142.5**	**419.7**	**275.4**		**649.0**	**521.7**	**865.7**	**345.5**	**486.4**	**573.7**			**477.1**		
CD at 5%	**12.9**	**47.3**	**12.8**	**74.6**			**NA**	**77.1**	**4.9**	**69.1**	**129.8**						
CV%	**8.5**	**7.3**	**5.5**	**9.4**			**6.9**	**8.8**	**3.3**	**10.8**	**14.4**						

Table 3.2: AVTB-2: AVT-2 Forage Berseem: Dry Matter Yield (q/ha)

Entries	Hill Zone				North West Zone					
	Palampur	Almora	Average	Rank	Pantnagar	Bikaner	Hisar	Ludhiana	Average	Rank
BM-14	42.6	39.7	41.2	4	114.0	80.3	103.6	134.4	108.1	1
JB-07-15	49.0	38.8	43.9	2	116.2	67.8	125.0	121.9	107.7	2
Wardan (NC)	53.8	33.1	43.5	3	144.7	64.8	115.5	107.4	108.1	1
BL-22 ZC (HZ)	51.0	41.1	46.1	1						
BB-2 ZC (NWZ-CZ)					119.3	66.6	129.2	89.0	101.0	3
Mean	**49.1**	**38.2**	**43.7**		**123.5**	**69.9**	**118.3**	**113.2**	**106.2**	
CD at 5%	**9.4**	**3.4**			**12.3**	**8.2**	**12.9**	**12.4**		
CV%	**11.6**	**9.0**			**11.5**	**6.7**	**6.3**	**8.9**		

Table 3.2: AVTB-2: AVT-2 Forage Berseem: Dry Matter Yield (q/ha)

Entries	North East Zone						Central Zone								All India		
	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
BM-14	29.5	61.2	34.5	82.8	52.0	4	120.6	91.1	111.2	62.3	80.7	93.2	2	6.9	79.2	2	1.5
JB-07-15	34.0	53.8	34.1	104.8	56.7	2	117.4	98.6	128.0	69.1	69.7	96.6	1	10.8	81.9	1	4.8
Wardan (NC)	34.5	45.6	28.6	107.7	54.1	3	122.2	98.3	122.3	37.6	55.5	87.2	3		78.1	3	
BB-3 ZC (NEZ)	33.1	58.2	33.4	115.4	60.0	1											
BB-2 ZC (NWZ-CZ)							103.7	87.0	134.3	43.9	55.3	84.8	4				
Mean	**32.7**	**54.7**	**32.7**	**102.7**	**55.7**		**116.0**	**93.8**	**123.9**	**53.2**	**65.3**	**90.4**			**159.5**		
CD at 5%	**2.4**		**3.2**	**18.6**			**NA**	**14.1**	**0.7**	**11.0**	**17.2**						
CV%	**6.2**		**5.9**	**9.6**			**9.4**	**8.8**	**3.3**	**10.9**	**14.3**						

Table 3.3: AVTB-2: AVT-2 Forage Berseem: Green Forage Yield (q/ha/day)

Entries	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
BM-14	4.21	3.66	4.65	6.56	1.52	2.24	2.50	2.89	5.25	3.47	3.85	3.71	1
JB-07-15	3.69	3.24	4.89	5.79	1.78	2.15	2.25	3.63	5.61	3.54	3.26	3.62	2
Wardan (NC)	5.12	3.12	5.05	5.18	1.89	1.79	2.03	3.85	5.50	2.10	2.79	3.49	3
BB-2 ZC (NWZ-CZ)	4.84	3.27	5.36	4.48					5.16	2.40	2.74		
BB-3 ZC (NEZ)					1.71	1.94	2.27	3.97					
Mean	**4.47**	**3.32**	**4.99**	**5.50**	**1.73**	**2.03**	**2.26**	**3.59**	**5.38**	**2.88**	**3.16**	**3.61**	

Table 3.4: AVTB-2: AVT-2 Forage Berseem: Dry Matter Yield (q/ha/day)

Entries	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
BM-14	0.76	0.62	0.60	0.78	0.23	0.39	0.54	0.70	0.94	0.52	0.52	0.60	2
JB-07-15	0.76	0.53	0.73	0.70	0.26	0.36	0.53	0.89	1.02	0.58	0.45	0.62	1
Wardan (NC)	0.95	0.50	0.67	0.62	0.27	0.30	0.49	0.94	1.01	0.31	0.36	0.58	3
BB-2 ZC (NWZ-CZ)	0.78	0.52	0.75	0.51					0.90	0.37	0.36		
BB-3 ZC (NEZ)					0.25	0.36	0.51	0.98					
Mean	**0.81**	**0.54**	**0.69**	**0.65**	**0.25**	**0.35**	**0.52**	**0.88**	**0.97**	**0.45**	**0.42**	**0.60**	

Table 3.5: AVTB-2: AVT-2 Forage Berseem: Crude Protein Yield (q/ha)

Entries	Hill Zone		North West Zone					
	Palampur	Rank	Pantnagar	Bikaner	Hisar	Ludhiana	Average	Rank
BM-14	8.1	4	18.9	14.2	18.5	23.9	18.9	3
JB-07-15	8.7	3	19.3	9.3	26.3	22.9	19.5	2
Wardan (NC)	10.6	1	26.6	11.7	21.4	19.7	19.8	1
BL-22 ZC (HZ)	9.2	2						
BB-2 ZC (NWZ-CZ)			23.0	12.6	24.5	18.1	19.5	2
Mean	**9.1**		**21.9**	**12.0**	**22.7**	**21.2**	**19.4**	

Table 3.5: AVTB-2: AVT-2 Forage Berseem: Crude Protein Yield (q/ha)

Entries	North East Zone					Central Zone						All India	
	Kal-yani	Ran-chi	Bhuban-eswar	Aver-age	Ra-nk	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Aver-age	Ra-nk
BM-14	4.2	9.2	5.0	6.1	2	16.3	16.3	12.7	15.7	15.3	2	13.6	2
JB-07-15	4.7	7.3	4.5	5.5	3	18.5	18.5	13.9	13.0	16.0	1	13.9	1
Wardan (NC)	4.8	7.9	3.7	5.5	3	18.5	18.5	7.7	8.6	13.3	3	13.3	3
BB-3 ZC (NEZ)	4.4	10.0	4.7	6.4	1								
BB-2 ZC (NWZ-CZ)						15.8	15.8	8.3	11.6	12.9	4		
Mean	**4.5**	**8.6**	**4.5**	**5.9**		**17.3**	**17.3**	**12.2**	**10.7**	**14.4**		**13.6**	

Table 3.6: AVTB-2: AVT-2 Forage Berseem: Crude Protein (%)

Entries	Hill Zone		North West Zone					
	Palampur	Rank	Pantnagar	Bikaner	Hisar	Ludhiana	Average	Rank
BM-14	19.0	2	16.6	17.7	17.9	17.8	17.5	3
JB-07-15	17.8	4	16.6	13.7	21.1	18.8	17.5	3
Wardan (NC)	19.5	1	18.4	18.0	18.5	18.3	18.3	2
BL-22 ZC (HZ)	18.1	3						
BB-2 ZC (NWZ-CZ)			19.3	18.9	19.0	20.3	19.4	1
Mean	**18.6**		**17.7**	**17.1**	**19.1**	**18.8**	**18.2**	

Table 3.6: AVTB-2: AVT-2 Forage Berseem: Crude Protein (%)

Entries	North East Zone					Central Zone						All India	
	Kal-yani	Ran-chi	Bhuban-eswar	Aver-age	Ra-nk	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Aver-age	Ra-nk
BM-14	14.4	15.0	14.5	14.7	3	17.9	14.7	20.4	19.5	18.1	1	17.1	2
JB-07-15	13.7	13.6	13.3	13.5	4	18.7	14.4	20.2	18.7	18.0	2	16.7	3
Wardan (NC)	14.0	17.3	13.0	14.8	2	18.8	15.1	20.5	15.5	17.5	3	17.3	1
BB-3 ZC (NEZ)	13.4	17.1	14.1	14.9	1								
BB-2 ZC (NWZ-CZ)						18.2	11.8	19.0	20.8	17.4	4		
Mean	**13.9**	**15.8**	**13.7**	**14.5**		**18.4**	**14.0**	**20.0**	**18.6**	**17.8**		**17.0**	

Table 3.7: AVTB-2: AVT-2 Forage Berseem: Plant Height (cm)

Entries	Palam-pur	Pant-nagar	Bika-ner	Ludh-iana	Udai-pur	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
BM-14	47.4	58.2	61.0	57.1	43.1	80.4	51.3	76.3	65.7	72.0	53.9	47.3	66.2	60.4	60.0	3
JB-07-15	59.3	49.8	49.0	59.1	42.3	87.2	50.3	76.0	71.0	78.0	59.4	52.3	65.4	58.1	61.2	1
Wardan (NC)	54.1	52.6	51.8	58.6	47.6	86.1	53.0	66.2	74.0	77.3	56.4	48.9	65.9	54.3	60.5	2
BL-22 ZC (HZ)	56.1															
BB-2 ZC (NWZ-CZ)		52.3	62.0	55.7	41.4					73.7	54.6	60.2	61.4	50.5		
BB-3 ZC (NEZ)						85.5	52.7	74.3	70.0							
Mean	**54.2**	**53.2**	**56.0**	**57.6**	**43.6**	**84.8**	**51.8**	**73.2**	**70.2**	**75.3**	**56.1**	**52.2**	**64.7**	**55.8**	**60.6**	

Table 3.8 AVTB-2: AVT-2 Forage Berseem: Leaf Stem Ratio

Entries	Palam-pur	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
BM-14	0.52	0.83	1.03	1.36	0.92	1.20	0.85	0.92	0.67	0.47	0.53	0.64	0.43	0.80	1
JB-07-15	0.42	0.86	1.19	1.48	0.92	0.98	0.77	0.95	0.70	0.44	0.60	0.70	0.37	0.80	1
Wardan (NC)	0.34	0.89	0.89	1.32	0.83	1.15	0.83	0.83	0.58	0.50	0.56	0.86	0.42	0.77	2
BL-22 ZC (HZ)	0.42														
BB-2 ZC (NWZ-CZ)		0.76	0.91	1.80	0.87					0.50	0.70	0.92	0.40		
BB-3 ZC (NEZ)						0.97	0.82	1.07	0.65						
Mean	**0.43**	**0.84**	**1.01**	**1.49**	**0.89**	**1.08**	**0.82**	**0.94**	**0.65**	**0.48**	**0.60**	**0.78**	**0.41**	**0.79**	

Table 3.9: AVTB-2: AVT-2 Forage Berseem: NDF (%) & ADF (%)

Entries	NDF (%)							ADF (%)						
	Pant-nagar	Rah-uri	Ludh-iana	Palam-pur	Ran-chi	Aver-age	Ra-nk	Pant-nagar	Rah-uri	Ludh-iana	Palam-pur	Ran-chi	Aver-age	Ra-nk
BM-14	61.8	45.4	58.4	60.4	41.9	53.6	2	52.6	36.1	36.5	53.0	31.5	41.9	2
JB-07-15	64.2	44.5	57.4	60.0	45.8	54.4	3	54.6	35.5	33.5	52.6	34.5	42.1	3
Wardan (NC)	63.8	43.8	58.1	60.6	36.5	52.6	1	55.8	33.4	34.2	52.4	27.6	40.7	1
BL-22 ZC (HZ)				61.4							53.2			
BB-2 ZC (NWZ-CZ)	62.6	44.0	55.8					55.8	33.4	35.2				
BB-3 ZC (NEZ)					38.7							26.4		
Mean	**63.1**	**44.4**	**57.4**	**60.6**	**40.7**	**53.5**		**54.7**	**34.6**	**34.9**	**52.8**	**30.0**	**41.6**	

Table 3.9: AVTB-2: AVT-2 Forage Berseem: IVDMD (%)

Entries	IVDMD (%)				
	Ludhiana	Rahuri	Ranchi	Average	Rank
BM-14	54.6	60.3	64.1	59.7	2
JB-07-15	53.5	60.9	61.3	58.6	3
Wardan (NC)	55.6	62.5	66.9	61.7	1
BB-2 ZC (NWZ-CZ)	54.9	62.5			
BB-3 ZC (NEZ)			67.8		
Mean	**54.7**	**61.6**	**65.0**	**60.0**	

Table 4.1 AVTB-2 (Seed): Second Advanced Varietal Trial in Berseem (Seed): Seed Yield (q/ha)

Entries	Seed Yield (q/ha)								
	Hill Zone			North West Zone					
	Palampur	Rank	Superiority%	Pantnagar	Ludhiana	Hisar	Average	Rank	Superiority%
JB-07-15	1.44	1	15.2	5.48	2.89	2.38	3.58	2	15.3
BM-14	1.11	4		6.32	4.39	2.28	4.33	1	39.4
Wardan (NC)	1.25	2		4.12	2.52	2.35	3.00	4	
BL-22 ZC (HZ)	1.19	3							
BB-2 ZC (NWZ-CZ)				4.72	2.39	2.21	3.11	3	
Mean	**1.25**			**5.16**	**3.05**	**2.31**	**3.50**		
CD at 5%	**0.22**			**0.5**	**2.72**	**N/A**			
CV%	**12.56**			**10.5**	**6.01**	**5.9**			

Table 4.1 AVTB-2 (Seed): Second Advanced Varietal Trial in Berseem (Seed): Seed Yield (q/ha)

Entries	Central Zone						North East Zone						All India		
	Jhansi	Jabalpur	Raipur	Rahuri	Average	Rank	Kalyani	Ranchi	Pusa	Average	Rank	Superiority%	Average	Rank	Superiority%
JB-07-15	2.03	5.03	6.93	1.94	3.98	2	1.80	2.42	5.52	3.25	1	4.2	3.44	1	11.8
BM-14	0.94	5.89	2.59	1.89	2.83	4	2.40	2.14	4.96	3.17	2	1.6	3.17	2	3.0
Wardan (NC)	3.10	4.99	4.64	2.49	3.80	3	1.20	3.38	3.84	2.81	4		3.08	3	
BB-2 ZC (NWZ-CZ)	2.90	6.24	6.53	2.11	4.45	1									
BB-3 ZC (NEZ)							2.10	2.96	4.29	3.12	3				
Mean	**2.24**	**5.54**	**5.17**	**2.11**	**3.76**		**1.88**	**2.73**	**4.65**	**3.08**			**3.23**		
CD at 5%	**0.46**	**NS**	**1.23**	**0.28**			**0.60**	**0.40**	**0.49**						
CV%	**14.85**	**22.9**	**17.19**	**9.56**			**5.60**	**11.82**	**5.24**						

5. IVTO (SC): INITIAL VARIETAL TRIAL IN OAT (SINGLE CUT)

(Reference tables 5.1 to 5.9)

In **Initial Varietal Trial Oat (single cut) IVTO (SC),**thirteen entries along with one national check (OS-6) and one zonal check for respective zones *viz.*, SKO-225 (HZ), OL-1896 for (CZ, NEZ, NWZ, SZ) were evaluated at 27 locations across the five zones. There were 3 locations in hill zone, 6 in NWZ, 6 in NEZ, 4 in south zone and 8 in central zone.

In hill zone, the entries surpassing the best check by margin of more than 5% were UPO- 21-1(11.8%), BAUO-105 (11.8%), and HFO-1113 (10.8%) for GFY. Similarly entries BAUO-105 (9.3%), JO-08-41 (7.5%), OL-1988 (6.6%), and UPO-21-1 (6.1%) showed more than 5% superiority over the best check for DMY. For crude protein yield, BAUO-102 top ranked followed by BAUO-105 with values of 7.4 and 7.2 as compared to the best checkOS-6 with value of 6.8 q/ha. For crude protein content, entries showing more than 5% superiority over the best check were NDO-1925, SKO-245 and BAUO-102.

In NWZ, none of the entries could perform better than the best check by a margin of 5% for GFY or DMY. Zonal check OL-1896 ranked first for crude protein yield. For crude protein content, entry OL-1967 showed marginal superiority over the best check.

In NEZ, none of the entries could perform better than the best check by a margin of 5% for GFY or DMY. For crude protein yield, entries OL-1988, BAUO-105, JHO-21-1, UPO-21-1 with values of 7.5, 7.3, 7.1, 6.8 showed more than 5% superiority over the best check OS-6 with value of 6.4 q/ha. For crude protein content, entries showing more than 5% superiority over the best check were OL-1988 and OL-1967.

In central zone, none of the entries could perform better than the best check by a margin of 5% for GFY or DMY. Zonal check OL-1896 was best performer for crude protein yield. Entry NDO-1925 ranked first for crude protein % followed by SKO-245.

In south zone, the entries performing better than the best check by a margin of more than 5% include JHO-21-1 (12.4%), JO-08-41 (10.3%), and OL-1931-1 (7.9%) for GFY. Similarly entries OL-1931-1 (15.9%) and JO-08-41(12.5%) were best performers for DMY. For crude protein yield, entry JO-08-41 was best performer followed by zonal check with values of 5.5 and 5.2 respectively. For crude protein %, NDO-1925 ranked first.

At all India level, entries JHO-21-1 (7.7%), OL-1931-1 (7.6%), HFO-1113 (7.4%), and OL-1967 (6.2%) performed better than the best check by a margin of more than 5% for GFY. For DMY, entries JHO-21-1 (4.9%), JO-08-41 (4.1%) performed better than the best check. For crude protein yield, entry JHO 21-1 was best followed by national check with values of 8.5 and 8.3 respectively. National check ranked first for crude protein content with value of 9.0%.

All other entries were either inferior or marginally superior to the best check in their respective zones or at national level.

For green fodder per day productivity, OL-1967 with value of 5.27 followed by OL-1931-1 with value of 5.21 were top ranker as compared to national check OS-6 with a value of 4.91 q/ha/day. For dry fodder per day productivity, entries BAUO-105 and JHO 21-1 were top ranked with value of 1.10 as compared to national check OS-6 with a value of 1.07 q/ha/day.

For plant height, entry BAUO-105 ranked first followed by SKO-245 with values of 137 cm and 135.6 cm as compared to best check OS-6 with 133 cm. For leafiness, entry BAUO-102 top ranked followed by JO-08-41. For other quality parameters, entry OL-1931-1 top ranked for NDF%, national check OS-6 for ADF, entry OL-1988 for IVDMD%.

Table 5.1: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	Hill Zone					
	Palampur	Srinagar	Rajouri	Average	Rank	Superiority%
UPO-21-1	280.6	328.0	406.0	338.2	1	11.8
BAUO-105	283.3	319.7	411.0	338.0	2	11.8
HFO-1113	261.1	322.0	422.0	335.0	3	10.8
JHO-21-2	263.9	333.7	226.0	274.5	12	
BAUO-102	260.0	345.3	234.0	279.8	11	
OL-1988	261.1	324.0	204.0	263.0	14	
OL-1967	240.6	355.7	214.0	270.1	13	
NDO-1925	208.3	330.7	192.0	243.7	15	
HFO-1101	228.3	339.3	321.0	296.2	7	
JHO-21-1	237.8	356.7	263.0	285.8	10	
JO-08-41	252.8	352.0	291.0	298.6	6	
OL-1931-1	261.1	294.7	390.0	315.3	4	4.3
SKO-245	240.0	369.7	253.0	287.6	8	
OS-6 (NC)	255.6	321.3	285.0	287.3	9	
SKO-225 ZC (HZ)	261.1	302.0	344.0	302.4	5	
Mean	**253.0**	**333.0**	**297.1**	**294.4**		
CD at 5%	**31.0**	**15.8**	**1.9**			
CV%	**7.3**	**2.8**	**10.6**			

Table 5.1: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	North West Zone								
	Bikaner	Hisar	Ludhiana	Pantnagar	Udaipur	Meerut	Average	Rank	Superiority%
UPO-21-1	368.3	576.2	604.1	610.6	468.5	628.5	542.7	10	
BAUO-105	474.2	626.6	551.4	666.6	489.2	447.7	542.6	11	
HFO-1113	319.0	589.6	615.6	712.8	516.6	662.9	569.4	4	1.8
JHO-21-2	398.6	574.4	522.6	578.3	569.4	497.4	523.4	14	
BAUO-102	388.3	610.7	689.8	528.2	476.8	445.1	523.1	15	
OL-1988	333.0	597.4	618.5	702.4	502.8	679.0	572.2	3	2.3
OL-1967	424.5	585.1	667.0	792.5	466.1	576.8	585.3	1	4.6
NDO-1925	445.8	588.5	588.0	708.3	463.8	496.2	548.4	7	
HFO-1101	423.7	585.9	665.7	518.9	509.1	527.2	538.4	12	
JHO-21-1	476.9	613.6	763.9	522.2	475.9	500.0	558.8	6	
JO-08-41	441.8	630.7	563.3	588.7	461.9	506.2	532.1	13	
OL-1931-1	516.0	597.0	711.9	632.8	486.6	559.8	584.0	2	4.4
SKO-245	472.9	618.5	558.9	509.3	562.0	557.2	546.5	9	
OS-6 (NC)	446.3	620.7	651.9	605.2	543.5	412.9	546.7	8	
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	297.1	593.7	704.8	732.5	485.8	543.6	559.6	5	
Mean	**415.1**	**600.6**	**631.8**	**627.3**	**498.5**	**536.0**	**551.6**		
CD at 5%	**63.7**	**N/A**	**61.9**	**64.3**	**29.7**				
CV%	**9.1**	**8.03**	**11.4**	**11.5**	**3.6**				

Table 5.1: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	North East Zone								
	Jor-hat	**Kal-yani**	**Bhuban-eswar**	**Ran-chi**	**Pu-sa**	**Imp-hal**	**Aver-age**	**Ra-nk**	**Superi-ority%**
UPO-21-1	307.7	325.1	347.9	252.0	533.3	417.7	364.0	6	
BAUO-105	275.9	322.2	411.9	360.9	406.7	470.6	374.7	2	1.2
HFO-1113	351.4	327.0	271.9	222.2	500.0	439.2	352.0	12	
JHO-21-2	343.8	317.0	248.6	206.2	360.0	349.0	304.1	15	
BAUO-102	357.5	314.8	353.3	232.4	420.0	441.2	353.2	11	
OL-1988	199.5	460.7	296.6	277.3	510.0	394.1	356.4	9	
OL-1967	356.9	352.5	362.6	209.3	506.7	337.3	354.2	10	
NDO-1925	276.8	310.3	338.6	260.9	483.3	494.1	360.7	7	
HFO-1101	252.4	358.5	365.2	246.2	480.0	362.8	344.2	14	
JHO-21-1	249.3	382.9	371.2	333.8	503.3	352.9	365.6	5	
JO-08-41	269.7	349.6	429.2	288.0	510.0	398.0	374.1	3	1.1
OL-1931-1	323.0	276.2	317.3	305.3	533.3	396.1	358.5	8	
SKO-245	310.1	398.5	327.9	330.2	530.0	388.2	380.8	1	2.9
OS-6 (NC)	209.3	322.2	381.9	273.3	473.3	423.5	347.3	13	
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	369.4	292.5	393.2	224.4	520.0	421.6	370.2	4	
Mean	**296.9**	**340.7**	**347.8**	**268.2**	**484.7**	**405.8**	**357.3**		
CD at 5%	**5.1**	**26.2**	**24.6**	**36.3**	**85.6**	**17.3**			
CV%	**4.6**	**12.5**	**4.2**	**8.1**	**10.5**	**2.6**			

Table 5.1: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	Central Zone									
	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	** Kar-jat	Aver-age	Ra-nk
UPO-21-1	516.7	522.3	470.6	698.9	599.9	396.3	329.6	102.4	504.9	13
BAUO-105	520.8	483.3	575.1	673.7	595.4	413.0	411.1	148.5	524.6	11
HFO-1113	554.6	431.5	656.2	737.0	706.5	344.4	422.2	69.7	550.4	4
JHO-21-2	469.0	409.9	545.0	743.7	475.4	370.4	418.5	113.9	490.3	15
BAUO-102	503.7	555.4	546.7	846.7	591.0	344.4	407.4	118.0	542.2	6
OL-1988	502.8	555.9	567.3	747.0	688.7	263.0	359.3	119.3	526.3	10
OL-1967	517.6	469.7	622.8	760.7	715.4	383.3	385.2	123.1	550.7	3
NDO-1925	511.6	524.6	512.8	709.3	626.5	407.4	418.5	131.5	530.1	9
HFO-1101	547.7	457.8	596.7	821.1	573.2	333.3	422.2	107.8	536.0	7
JHO-21-1	525.5	539.1	602.3	792.6	653.2	407.4	388.9	98.5	558.4	2
JO-08-41	548.6	526.6	556.7	759.6	702.1	325.9	422.2	142.8	548.8	5
OL-1931-1	550.0	501.0	525.6	816.3	586.5	385.2	385.2	136.1	535.7	8
SKO-245	549.5	428.1	588.4	724.1	524.3	322.2	418.5	136.0	507.9	12
OS-6 (NC)	531.5	399.3	573.4	714.8	635.4	331.5	314.8	92.0	500.1	14
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	519.0	571.9	644.5	762.2	719.8	368.5	359.3	182.2	563.6	1
Mean	**524.6**	**491.8**	**572.3**	**753.8**	**626.2**	**359.8**	**390.9**	**121.5**	**531.3**	
CD at 5%	**31.9**	**61.8**	**99.3**	**NS**	**2.2**	**58.8**		**25.9**		
CV%	**19.1**	**7.3**	**10.3**	**14.0**	**2.8**	**9.8**		**12.0**		

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 5.1: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	South Zone							All India		
	Hydera-bad	Man-dya	Coimb-atore	**Vella-yani	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
UPO-21-1	289.2	244.4	205.6	12.0	246.4	14		429.1	10	1.7
BAUO-105	296.0	283.7	246.3	26.0	275.3	10		440.6	6	4.5
HFO-1113	334.3	214.4	392.6	22.0	313.8	5	1.8	453.1	3	7.4
JHO-21-2	329.1	233.3	311.1	16.0	291.2	9		403.8	14	
BAUO-102	355.7	185.2	342.6	18.0	294.5	8		431.0	9	2.2
OL-1988	400.1	195.2	346.3	18.0	313.9	4	1.9	439.4	7	4.2
OL-1967	343.3	188.9	368.5	26.0	300.2	7		448.1	4	6.2
NDO-1925	297.3	147.8	318.5	20.0	254.5	13		426.4	11	1.1
HFO-1101	189.8	158.9	374.1	23.0	240.9	15		426.4	11	1.1
JHO-21-1	407.4	179.6	451.9	21.0	346.3	1	12.4	454.0	1	7.7
JO-08-41	353.7	284.0	381.5	39.0	339.7	2	10.3	447.8	5	6.2
OL-1931-1	331.5	262.6	403.7	27.0	332.6	3	7.9	453.9	2	7.6
SKO-245	306.5	159.2	348.1	29.0	271.3	12		431.8	8	
OS-6 (NC)	323.4	297.7	196.3	31.0	272.5	11		421.8	12	
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	293.3	255.2	375.9	34.0	308.1	6				
Mean	**323.4**	**219.3**	**337.5**	**24.1**	**293.4**			**436.2**		
CD at 5%	**51.6**	**41.0**	**40.0**	**5.2**						
CV%	**9.5**	**10.9**	**7.1**	**12.9**						

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 5.2: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	Hill Zone				
	Palampur	Srinagar	Average	Rank	Superiority%
UPO-21-1	74.2	72.5	73.3	4	6.1
BAUO-105	79.2	71.8	75.5	1	9.3
HFO-1113	64.4	70.1	67.2	12	
JHO-21-2	66.1	72.1	69.1	9	
BAUO-102	70.7	68.9	69.8	8	1.1
OL-1988	71.9	75.3	73.6	3	6.6
OL-1967	67.6	74.6	71.1	6	3.0
NDO-1925	55.1	76.0	65.6	14	
HFO-1101	58.7	73.2	66.0	13	
JHO-21-1	59.8	76.1	68.0	11	
JO-08-41	67.7	80.8	74.3	2	7.5
OL-1931-1	70.5	69.6	70.1	7	1.5
SKO-245	60.6	82.8	71.7	5	3.8
OS-6 (NC)	68.9	69.3	69.1	9	
SKO-225 ZC (HZ)	66.3	71.2	68.7	10	
Mean	**66.8**	**73.6**	**70.2**		
CD at 5%	**10.5**	**4.9**			
CV%	**9.3**	**3.9**			

Table 5.2: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	North West Zone					
	His-ar	**Ludh-iana**	**Pant-nagar**	**** Bika-ner**	**Aver-age**	**Ra-nk**
UPO-21-1	148.6	125.6	132.2	71.8	135.5	13
BAUO-105	170.3	112.5	137.3	93.9	140.0	9
HFO-1113	161.9	128.7	168.2	70.8	152.9	2
JHO-21-2	152.0	106.6	129.6	74.5	129.4	14
BAUO-102	169.5	146.2	122.5	78.0	146.1	8
OL-1988	149.3	124.9	143.3	65.9	139.2	10
OL-1967	138.4	134.7	182.4	79.8	151.8	5
NDO-1925	160.8	117.6	167.4	86.5	148.6	7
HFO-1101	153.5	137.1	116.2	89.8	135.6	12
JHO-21-1	175.3	154.3	127.8	91.1	152.5	3
JO-08-41	178.6	112.7	147.1	80.4	146.1	8
OL-1931-1	169.3	143.8	143.7	108.4	152.3	4
SKO-245	177.8	114.0	116.3	95.5	136.0	11
OS-6 (NC)	180.7	133.0	139.4	87.0	151.0	6
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	155.1	142.4	165.5	69.5	154.3	1
Mean	**162.7**	**128.9**	**142.6**	**82.9**	**144.8**	
CD at 5%	**N/A**	**41.2**	**19.5**	**12.6**		
CV%	**12.8**	**11.0**	**13.2**	**9.0**		

Table 5.2: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	North East Zone								
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Imp-hal	Aver-age	Ra-nk	Superi-ority%
UPO-21-1	59.7	68.4	79.6	44.4	131.4	95.5	79.8	6	
BAUO-105	50.1	71.1	94.9	67.2	98.5	98.9	80.1	4	0.3
HFO-1113	65.6	73.4	58.2	39.2	121.6	103.9	77.0	11	
JHO-21-2	56.8	68.4	57.8	38.2	87.8	82.9	65.3	15	
BAUO-102	70.1	70.2	82.9	42.1	102.8	96.2	77.4	10	
OL-1988	38.3	100.7	68.6	51.7	125.0	92.0	79.4	7	
OL-1967	60.3	67.0	83.8	38.2	123.5	74.5	74.6	14	
NDO-1925	52.2	67.2	72.6	45.7	117.2	107.6	77.1	9	
HFO-1101	41.8	83.9	85.1	45.9	117.8	85.1	76.6	12	
JHO-21-1	48.2	84.1	83.7	60.9	123.9	80.8	80.3	3	0.5
JO-08-41	52.0	76.5	99.7	52.6	124.8	89.7	82.5	1	3.3
OL-1931-1	61.0	55.0	74.3	52.7	131.3	92.9	77.8	8	
SKO-245	54.4	83.7	75.7	58.6	129.3	88.3	81.7	2	2.2
OS-6 (NC)	38.5	71.9	85.1	48.5	116.3	93.1	75.6	13	
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	68.1	56.5	89.9	40.7	128.1	95.9	79.9	5	
Mean	**54.5**	**73.2**	**79.4**	**48.4**	**118.6**	**91.8**	**77.7**		
CD at 5%	**2.7**	**11.5**	**5.5**		**21.5**	**9.9**			
CV%	**5.6**	**8.4**	**4.2**		**10.8**	**6.4**			

Table 5.2: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	Central Zone										
	Jhansi	**Rahuri**	**Urulikanchan**	**Anand**	**Jabalpur**	**Raipur**	**Dhari**	**** Karjat**	**Average**	**Rank**	**Superiority%**
UPO-21-1	89.9	108.5	98.3	93.8	173.5	84.7	103.7	29.6	107.5	12	
BAUO-105	92.2	82.2	109.9	143.1	172.7	75.7	125.9	44.0	114.5	5	
HFO-1113	90.5	99.3	131.0	102.1	194.6	74.8	118.5	20.5	115.8	3	
JHO-21-2	83.3	72.5	104.1	132.3	140.4	81.5	129.6	33.5	106.2	14	
BAUO-102	83.9	108.4	89.3	111.9	170.4	70.1	122.2	35.3	108.0	11	
OL-1988	84.1	126.2	94.6	100.2	190.8	60.2	111.1	34.7	109.6	9	
OL-1967	84.1	92.6	100.3	129.8	196.1	78.1	111.1	36.4	113.2	7	
NDO-1925	88.8	110.2	94.0	141.6	178.7	74.4	96.3	38.6	112.0	8	
HFO-1101	85.1	106.2	100.3	131.4	161.4	76.1	103.7	31.4	109.2	10	
JHO-21-1	93.3	119.7	128.1	116.5	184.0	90.8	118.5	28.8	121.6	1	2.4
JO-08-41	92.5	101.3	90.3	128.9	193.9	74.9	122.2	42.1	114.9	4	
OL-1931-1	94.6	98.0	107.2	108.8	168.9	65.7	103.7	39.9	106.7	13	
SKO-245	92.7	92.0	106.7	97.2	153.7	71.7	114.8	40.1	104.1	15	
OS-6 (NC)	98.4	75.7	114.7	140.5	181.0	71.9	111.1	29.6	113.3	6	
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	78.3	112.5	124.8	134.4	196.9	80.4	103.7	53.1	118.7	2	
Mean	**88.8**	**100.4**	**106.2**	**120.8**	**177.1**	**75.4**	**113.1**	**35.8**	**111.7**		
CD at 5%	**10.9**	**12.7**	**18.6**	**32.4**	**0.49**	**12.2**		**8.8**			
CV%	**6.5**	**7.3**	**10.4**	**16.1**	**0.24**	**9.7**		**13.7**			

Table 5.2: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	South Zone							All India		
	Hyderabad	Mandya	Coimbatore	**Vellayani	Average	Rank	Superiority%	Average	Rank	Superiority%
UPO-21-1	59.0	50.1	44.2	3.1	51.1	14		92.3	9	
BAUO-105	55.7	71.6	54.9	6.6	60.7	9		96.9	4	0.7
HFO-1113	50.2	48.0	85.7	5.6	61.3	8		97.6	2	
JHO-21-2	66.8	45.3	65.0	3.9	59.0	10		87.6	12	
BAUO-102	65.6	36.1	69.7	4.4	57.1	11		93.8	8	
OL-1988	83.2	40.0	75.0	4.6	66.1	3	1.9	95.5	6	
OL-1967	68.8	38.0	78.7	6.4	61.8	6		96.3	5	
NDO-1925	56.8	28.0	69.6	5.1	51.5	13		94.2	7	
HFO-1101	34.9	31.5	79.6	5.9	48.7	15		90.9	11	
JHO-21-1	68.1	32.1	96.1	5.3	65.4	4	0.9	101.1	1	4.9
JO-08-41	72.7	68.2	78.1	9.7	73.0	2	12.5	100.2	2	4.1
OL-1931-1	69.8	69.4	86.4	6.8	75.2	1	15.9	97.0	3	0.7
SKO-245	65.2	31.5	68.8	7.3	55.2	12		92.2	10	
OS-6 (NC)	68.1	74.4	41.6	4.9	61.4	7		96.3	5	
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	58.9	56.2	79.5	8.5	64.9	5				
Mean	**62.9**	**48.0**	**71.5**	**5.9**	**60.8**			**95.1**		
CD at 5%	**12.7**	**9.1**	**8.1**	**1.7**						
CV%	**12.0**	**10.9**	**6.8**	**16.5**						

Table 5.3: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa
UPO-21-1	3.72	5.31	4.90	6.71	3.54	3.65	4.77	2.82	6.38
BAUO-105	4.79	5.97	4.50	7.25	3.32	3.62	5.97	4.44	4.88
HFO-1113	3.22	5.26	5.00	7.43	4.04	3.67	3.78	2.43	6.07
JHO-21-2	4.03	4.80	4.20	5.78	3.95	3.56	3.50	2.12	4.28
BAUO-102	3.92	5.50	5.60	5.80	4.31	3.54	4.91	2.89	4.88
OL-1988	3.36	5.37	5.00	7.80	2.29	5.18	4.01	3.09	5.99
OL-1967	4.29	5.18	5.40	8.71	4.10	3.96	5.33	2.41	5.97
NDO-1925	4.50	5.36	4.80	7.87	3.33	3.49	5.05	3.27	6.05
HFO-1101	4.28	5.08	5.40	5.52	2.90	4.03	5.22	2.63	5.57
JHO-21-1	4.82	5.37	6.20	5.44	2.77	4.30	5.16	3.69	5.95
JO-08-41	4.46	5.33	4.60	5.83	2.87	3.93	5.80	2.96	6.40
OL-1931-1	5.21	5.56	5.80	6.8	3.71	3.10	4.53	3.46	6.29
SKO-245	4.78	5.46	4.50	5.42	3.30	4.48	4.68	3.64	6.46
OS-6 (NC)	4.51	5.75	5.30	6.72	2.41	3.62	5.79	3.13	5.72
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	3.00	5.24	5.70	7.79	4.25	3.29	5.62	2.54	6.11
Mean	**4.19**	**5.37**	**5.13**	**6.72**	**3.41**	**3.83**	**4.94**	**3.04**	**5.80**

Table 5.3: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	** Kar-jat	** Vella-yani	Aver-age	Ra-nk
UPO-21-1	4.78	6.22	5.54	7.68	4.61	3.84	4.07	3.38	2.48	1.63	0.30	4.69	10
BAUO-105	4.84	5.92	7.19	8.22	5.23	5.20	4.25	3.97	3.08	2.43	0.60	5.15	3
HFO-1113	5.14	4.94	7.46	8.28	3.91	5.27	4.75	2.95	4.51	1.16	0.50	4.90	7
JHO-21-2	4.25	4.90	6.81	8.65	4.69	5.10	4.77	3.44	3.89	1.70	0.30	4.60	12
BAUO-102	4.66	6.86	6.75	9.51	4.20	5.23	5.01	2.56	4.13	1.84	0.40	5.01	5
OL-1988	4.60	6.37	6.3	8.39	2.99	4.29	5.64	2.65	4.07	1.75	0.40	4.86	8
OL-1967	4.73	5.82	7.78	9.28	5.11	4.77	4.90	2.6	4.49	1.81	0.50	5.27	1
NDO-1925	4.72	6.61	6.41	8.55	5.43	5.45	4.27	2.04	3.79	2.02	0.40	5.06	4
HFO-1101	5.01	5.65	6.63	8.29	3.70	4.67	2.49	2.14	4.35	1.74	0.50	4.64	11
JHO-21-1	4.85	5.78	7.09	8.91	4.58	4.55	5.85	2.44	4.97	1.49	0.50	5.15	3
JO-08-41	5.00	5.66	5.92	7.60	3.66	4.50	4.89	3.86	4.29	2.20	0.80	4.86	8
OL-1931-1	5.08	5.94	6.57	9.17	4.59	4.77	4.69	3.76	4.75	2.09	0.60	5.21	2
SKO-245	5.01	5.02	6.76	8.23	3.66	5.37	4.26	2.19	4.05	2.09	0.60	4.85	9
OS-6 (NC)	4.89	5.03	7.17	8.61	4.20	4.08	4.69	4.31	2.45	1.33	0.70	4.91	6
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	4.78	6.76	7.58	8.97	4.66	4.18	4.21	3.62	4.42	2.72	0.70		
Mean	**4.82**	**5.83**	**6.80**	**8.56**	**4.35**	**4.75**	**4.58**	**3.06**	**3.98**	**1.87**	**0.52**	**4.94**	

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 5.4: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa
UPO-21-1	0.73	1.37	1.00	1.45	0.69	0.77	1.09	0.50	1.57
BAUO-105	0.95	1.62	0.90	1.49	0.59	0.80	1.38	0.83	1.18
HFO-1113	0.72	1.45	1.00	1.75	0.77	0.82	0.81	0.43	1.48
JHO-21-2	0.75	1.27	0.90	1.30	0.65	0.77	0.81	0.39	1.05
BAUO-102	0.79	1.53	1.20	1.35	0.84	0.79	1.15	0.52	1.19
OL-1988	0.67	1.34	1.00	1.59	0.44	1.13	0.93	0.58	1.47
OL-1967	0.81	1.23	1.10	2.00	0.69	0.75	1.23	0.44	1.45
NDO-1925	0.87	1.46	1.00	1.86	0.63	0.76	1.08	0.57	1.47
HFO-1101	0.91	1.33	1.10	1.24	0.48	0.94	1.22	0.49	1.37
JHO-21-1	0.92	1.53	1.30	1.37	0.54	0.95	1.16	0.67	1.46
JO-08-41	0.81	1.51	0.90	1.46	0.55	0.86	1.35	0.54	1.57
OL-1931-1	1.10	1.58	1.20	1.55	0.70	0.62	1.06	0.60	1.55
SKO-245	0.97	1.57	0.90	1.24	0.58	0.94	1.08	0.65	1.58
OS-6 (NC)	0.88	1.31	1.10	1.55	0.44	0.81	1.29	0.56	1.40
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	0.70	1.37	1.20	1.76	0.78	0.64	1.28	0.46	1.51
Mean	**0.84**	**1.43**	**1.05**	**1.53**	**0.63**	**0.82**	**1.13**	**0.55**	**1.42**

Table 5.4: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	** Kar-jat	** Vella-yani	Aver-age	Ra-nk
UPO-21-1	0.83	1.29	1.16	1.03	0.98	1.21	0.83	0.69	0.53	0.47	0.07	0.98	8
BAUO-105	0.86	1.01	1.37	1.74	0.96	1.60	0.80	1.00	0.69	0.72	0.15	1.10	1
HFO-1113	0.84	1.14	1.49	1.15	0.85	1.48	0.71	0.66	0.98	0.34	0.12	1.03	6
JHO-21-2	0.76	0.87	1.30	1.54	1.03	1.58	0.97	0.67	0.81	0.50	0.09	0.97	9
BAUO-102	0.78	1.34	1.10	1.26	0.86	1.57	0.92	0.50	0.84	0.55	0.10	1.03	6
OL-1988	0.77	1.44	1.05	1.13	0.68	1.33	1.17	0.55	0.88	0.51	0.10	1.01	7
OL-1967	0.77	1.15	1.25	1.58	1.04	1.38	0.98	0.52	0.96	0.53	0.15	1.07	3
NDO-1925	0.82	1.39	1.17	1.71	0.99	1.25	0.82	0.39	0.83	0.59	0.17	1.06	4
HFO-1101	0.78	1.31	1.11	1.33	0.85	1.15	0.46	0.42	0.93	0.51	0.13	0.97	9
JHO-21-1	0.86	1.28	1.51	1.31	1.02	1.39	0.98	0.44	1.06	0.44	0.12	1.10	1
JO-08-41	0.84	1.09	0.96	1.29	0.84	1.30	1.01	0.92	0.88	0.65	0.20	1.04	5
OL-1931-1	0.87	1.16	1.34	1.22	0.78	1.28	0.99	0.99	1.02	0.61	0.15	1.09	2
SKO-245	0.84	1.08	1.23	1.11	0.81	1.47	0.91	0.43	0.80	0.62	0.16	1.01	7
OS-6 (NC)	0.91	0.95	1.43	1.69	0.91	1.44	0.99	1.08	0.52	0.43	0.17	1.07	3
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	0.72	1.33	1.47	1.58	1.02	1.21	0.85	0.80	0.94	0.79	0.18		
Mean	**0.82**	**1.19**	**1.26**	**1.38**	**0.91**	**1.38**	**0.89**	**0.67**	**0.84**	**0.55**	**0.14**	**1.04**	

Table 5.5: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	HZ		NWZ					
	Palampur	Rank	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank
UPO-21-1	6.9	3	3.7	12.4	8.4	13.9	9.6	10
BAUO-105	7.2	2	6.6	12.9	7.4	14.4	10.3	7
HFO-1113	6.8	4	4.2	11.4	7.7	14.7	9.5	11
JHO-21-2	6.6	6	3.8	11.5	7.8	12.5	8.9	13
BAUO-102	7.4	1	5.5	15.3	12.1	11.8	11.2	3
OL-1988	6.7	5	2.8	12.0	11.2	13.8	10.0	9
OL-1967	6.1	9	6.2	10.4	10.9	19.2	11.7	2
NDO-1925	6.1	9	4.2	11.4	8.3	16.1	10.0	9
HFO-1101	6.0	10	3.8	12.7	8.5	12.2	9.3	12
JHO-21-1	5.4	11	4.7	15.6	9.9	13.4	10.9	5
JO-08-41	6.1	9	4.8	16.4	6.6	14.2	10.5	6
OL-1931-1	6.2	8	6.8	13.5	11.6	12.6	11.1	4
SKO-245	6.5	7	6.7	15.2	7.3	11.2	10.1	8
OS-6 (NC)	6.8	4	7.9	13.7	9.7	13.4	11.2	3
SKO-225 ZC (HZ)	6.6	6						
OL-1896 ZC (NEZ-NWZ, CZ-SZ)			4.1	14.4	11.5	17.4	11.8	1
Mean	**6.5**		**5.0**	**13.2**	**9.3**	**14.0**	**10.4**	

Table 5.5: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	NEZ						
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Imp-hal	Aver-age	Ra-nk
UPO-21-1	6.1	8.5	6.8	4.8	7.6	6.8	4
BAUO-105	5.2	8.2	8.1	6.5	8.3	7.3	2
HFO-1113	6.1	7.8	5.3	4.3	8.0	6.3	7
JHO-21-2	5.9	7.4	4.9	3.4	7.7	5.9	9
BAUO-102	7.4	6.9	6.9	4.5	7.3	6.6	5
OL-1988	4.0	13.7	5.8	3.7	10.4	7.5	1
OL-1967	6.5	8.3	7.1	3.1	7.8	6.6	5
NDO-1925	5.6	7.1	6.6	2.2	8.7	6.0	8
HFO-1101	4.6	9.8	7.1	4.8	6.6	6.6	5
JHO-21-1	4.9	11.4	7.3	5.9	5.9	7.1	3
JO-08-41	5.2	7.5	8.4	3.4	7.6	6.4	6
OL-1931-1	6.7	6.4	6.2	4.1	8.5	6.4	6
SKO-245	5.9	10.3	6.4	3.7	6.7	6.6	5
OS-6 (NC)	4.1	7.7	7.5	4.5	8.2	6.4	6
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	6.7	6.4	7.7	2.0	8.6	6.3	7
Mean	**5.7**	**8.5**	**6.8**	**4.1**	**7.8**	**6.6**	

Table 5.5: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	CZ						
	Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Average	Rank
UPO-21-1	11.3	7.5	10.6	10.8	6.1	9.2	11
BAUO-105	8.8	8.9	18.1	10.7	6.1	10.5	5
HFO-1113	7.4	9.1	12.4	13.1	5.4	9.5	9
JHO-21-2	5.6	7.0	17.1	7.8	6.1	8.7	14
BAUO-102	8.3	6.0	13.8	10.5	6.1	8.9	13
OL-1988	9.8	6.6	12.2	12.6	5.9	9.4	10
OL-1967	7.9	7.2	17.2	13.3	7.7	10.7	4
NDO-1925	11.7	7.0	17.9	11.4	7.4	11.1	2
HFO-1101	11.5	6.5	16.9	9.8	5.7	10.1	7
JHO-21-1	12.1	8.9	15.1	11.9	6.9	11.0	3
JO-08-41	11.1	6.1	14.8	13.0	5.7	10.1	7
OL-1931-1	10.4	8.5	13.0	10.4	5.7	9.6	8
SKO-245	10.2	7.6	13.9	9.0	5.3	9.2	11
OS-6 (NC)	8.3	8.8	18.3	11.6	4.8	10.4	6
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	7.5	12.1	17.3	13.4	6.3	11.3	1
Mean	**9.5**	**7.9**	**15.2**	**11.3**	**6.1**	**10.0**	

Table 5.5: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	SZ					All India	
	Hyderabad	Mandya	Coimbatore	Average	Rank	Average	Rank
UPO-21-1	4.1	3.7	2.7	3.5	9	7.5	9
BAUO-105	4.4	5.7	3.1	4.4	6	8.4	2
HFO-1113	4.4	4.4	6.0	4.9	3	7.7	7
JHO-21-2	5.3	3.6	4.0	4.3	7	7.1	10
BAUO-102	6.0	3.5	4.6	4.7	4	8.0	6
OL-1988	6.2	3.1	4.6	4.6	5	8.1	5
OL-1967	5.1	2.7	4.8	4.2	8	8.4	2
NDO-1925	5.0	2.7	5.2	4.3	7	8.0	6
HFO-1101	2.6	2.2	5.6	3.5	9	7.6	8
JHO-21-1	5.2	2.6	5.1	4.3	7	8.5	1
JO-08-41	6.1	5.7	4.8	5.5	1	8.2	4
OL-1931-1	5.1	4.3	4.6	4.6	5	8.0	6
SKO-245	5.1	2.2	5.4	4.2	8	7.7	7
OS-6 (NC)	6.0	6.2	2.5	4.9	3	8.3	3
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	5.2	5.2	5.2	5.2	2		
Mean	**5.1**	**3.8**	**4.5**	**4.5**	**5.6**	**8.0**	

Table 5.6: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	HZ		NWZ					
	Palampur	Rank	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank
UPO-21-1	9.4	6	5.1	8.3	6.7	10.5	7.7	5
BAUO-105	9.0	8	7.0	7.6	6.6	10.5	7.9	3
HFO-1113	10.5	3	5.9	7.1	6.0	8.8	6.9	9
JHO-21-2	9.9	5	5.1	7.5	7.3	9.6	7.4	6
BAUO-102	10.5	3	7.0	9.0	8.3	9.6	8.5	1
OL-1988	9.3	7	4.2	8.1	9.0	9.6	7.7	5
OL-1967	9.0	8	7.7	7.6	8.1	10.5	8.5	1
NDO-1925	11.1	1	4.8	7.1	7.1	9.6	7.2	8
HFO-1101	10.2	4	4.2	8.3	6.2	10.5	7.3	7
JHO-21-1	9.0	8	5.2	8.9	6.4	10.5	7.8	4
JO-08-41	9.0	8	6.0	9.2	5.9	9.6	7.7	5
OL-1931-1	8.5	9	6.3	8.0	8.1	8.8	7.8	4
SKO-245	10.8	2	7.0	8.5	6.4	9.6	7.9	3
OS-6 (NC)	9.9	5	9.1	7.6	7.3	9.6	8.4	2
SKO-225 ZC (HZ)	9.9	5						
OL-1896 ZC (NEZ-NWZ, CZ-SZ)			5.9	9.3	8.1	10.5	8.4	2
Mean	**19.5**		**12.1**	**16.2**	**14.3**	**19.7**	**15.5**	

Table 5.6: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	NEZ							CZ						
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Imp-hal	Aver-age	Ra-nk	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
UPO-21-1	10.4	12.4	8.6	10.9	8.0	10.0	3	10.4	7.6	11.3	8.1	7.2	8.9	9
BAUO-105	9.6	11.6	8.5	9.7	8.4	9.6	7	10.7	8.1	12.7	8.1	8.1	9.5	3
HFO-1113	10.3	10.6	9.1	10.9	7.7	9.7	6	7.5	6.9	12.1	8.2	7.3	8.4	11
JHO-21-2	10.0	10.9	8.4	8.8	9.2	9.5	8	7.7	6.8	13.3	8.1	7.5	8.7	10
BAUO-102	10.6	9.8	8.3	10.6	7.6	9.4	9	7.7	6.7	12.4	8.1	8.7	8.7	10
OL-1988	10.6	13.6	8.5	7.2	11.3	10.2	1	7.7	7.0	12.2	8.2	9.8	9.0	8
OL-1967	11.0	12.4	8.5	8.1	10.5	10.1	2	8.6	7.2	13.2	8.2	9.8	9.4	4
NDO-1925	10.8	10.6	9.1	4.9	8.1	8.7	11	10.6	7.4	12.7	8.2	10.0	9.8	1
HFO-1101	11.1	11.6	8.4	10.4	7.7	9.8	5	10.8	6.5	12.9	8.1	7.6	9.2	6
JHO-21-1	10.2	13.5	8.7	9.7	7.3	9.9	4	10.1	7.0	13.0	8.2	7.7	9.2	6
JO-08-41	10.2	9.8	8.4	6.5	8.4	8.7	11	11.0	6.8	11.5	8.2	7.6	9.0	8
OL-1931-1	11.1	11.7	8.4	7.9	9.1	9.6	7	10.6	7.9	12.2	8.1	8.6	9.5	3
SKO-245	10.9	12.3	8.5	6.2	7.6	9.1	10	11.1	7.1	14.3	8.1	7.4	9.6	2
OS-6 (NC)	10.6	10.7	8.8	9.3	8.8	9.6	7	11.0	7.7	12.9	8.2	6.7	9.3	5
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	9.9	11.4	8.6	4.9	8.9	8.7	11	6.7	9.7	12.9	8.3	7.9	9.1	7
Mean	**21.0**	**23.0**	**17.1**	**17.0**	**17.1**	**19.1**		**19.1**	**14.6**	**25.2**	**16.3**	**16.3**	**18.3**	

Table 5.6: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	SZ					All India	
	Hyderabad	Mandya	Coimbatore	Average	Rank	Average	Rank
UPO-21-1	7.0	7.4	6.1	6.8	10	8.6	5
BAUO-105	7.9	7.9	5.7	7.2	8	8.8	3
HFO-1113	8.8	9.2	7.0	8.3	3	8.5	6
JHO-21-2	7.9	7.9	6.1	7.3	7	8.4	7
BAUO-102	9.2	9.6	6.6	8.5	2	8.9	2
OL-1988	7.4	7.9	6.1	7.1	9	8.7	4
OL-1967	7.4	7.0	6.1	6.8	10	8.9	2
NDO-1925	8.8	9.5	7.4	8.6	1	8.8	3
HFO-1101	7.4	7.0	7.0	7.1	9	8.7	4
JHO-21-1	7.8	8.3	5.3	7.1	9	8.7	4
JO-08-41	8.4	8.3	6.1	7.6	6	8.4	7
OL-1931-1	7.4	6.1	5.3	6.3	12	8.6	5
SKO-245	7.8	7.0	7.9	7.6	6	8.8	3
OS-6 (NC)	8.8	8.3	6.1	7.7	5	9.0	1
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	8.8	9.2	6.6	8.2	4		
Mean	**16.1**	**16.0**	**12.7**	**14.9**		**17.4**	

Table 5.7: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Palam-pur	Sri-nagar	Bika-ner	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Imp-hal
UPO-21-1	122.7	115.5	148.2	118.0	148.3	114.7	230.0	168.1	152.9	124.3	145.4	139.3	155.9
BAUO-105	117.0	95.1	162.0	138.0	182.5	119.3	210.0	144.1	160.2	147.4	160.2	148.3	166.3
HFO-1113	128.0	101.9	148.8	120.9	159.2	135.3	230.0	136.4	152.3	102.4	140.4	150.0	164.3
JHO-21-2	126.3	89.4	147.4	124.6	145.2	207.7	220.0	131.8	162.0	99.7	92.8	119.3	156.6
BAUO-102	115.3	98.7	137.2	127.8	145.6	128.3	210.0	124.9	155.8	127.2	141.9	140.0	159.8
OL-1988	120.0	101.6	142.6	148.9	148.5	120.0	210.0	154.6	155.8	106.5	151.7	158.3	151.1
OL-1967	125.0	105.7	168.0	124.4	160.3	111.7	220.0	144.3	168.5	131.9	139.4	166.7	172.3
NDO-1925	130.7	100.7	153.2	133.6	157.9	121.7	200.0	115.5	151.9	119.5	129.2	134.0	154.3
HFO-1101	127.0	100.7	174.0	132.4	166.8	110.7	240.0	137.2	159.8	133.8	119.5	150.0	158.7
JHO-21-1	130.3	106.0	171.2	124.4	142.3	127.0	220.0	167.3	152.6	137.7	140.9	166.7	160.4
JO-08-41	125.0	98.5	141.6	120.5	149.6	94.3	225.0	148.7	164.6	149.3	131.5	159.0	171.3
OL-1931-1	134.3	105.7	147.6	123.4	158.8	115.0	225.0	159.0	152.0	109.7	143.1	156.3	155.2
SKO-245	127.7	119.4	150.4	151.1	154.4	198.3	210.0	158.9	164.1	114.3	141.3	139.0	157.8
OS-6 (NC)	132.7	100.6	159.6	131.1	162.8	107.7	190.0	133.9	156.1	140.2	144.1	158.3	157.9
SKO-225 ZC (HZ)	123.0	105.2											
OL-1896 ZC (NEZ-NWZ, CZ-SZ)			145.4	114.4	156.8	109.3	245.0	163.0	167.3	144.2	152.8	169.0	170.9
Mean	**125.7**	**103.0**	**153.1**	**128.9**	**155.9**	**128.1**	**219.0**	**145.8**	**158.4**	**125.9**	**138.3**	**150.3**	**160.9**

Table 5.7: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Vella-yani	Aver-age	Ra-nk
UPO-21-1	153.0	116.0	128.4	115.4	133.1	139.4	145.7	140.7	90.4	77.9	110.5	51.0	131.4	9
BAUO-105	162.8	129.6	135.9	105.8	142.5	104.0	152.0	159.7	98.2	101.4	118.0	66.0	137.0	1
HFO-1113	145.2	119.8	136.9	111.0	127.1	136.4	151.1	149.7	95.2	85.0	135.5	51.0	132.6	7
JHO-21-2	104.2	121.5	138.7	102.8	131.1	117.6	145.9	150.0	85.7	68.2	115.5	57.0	126.4	13
BAUO-102	132.5	107.7	122.9	110.0	128.1	116.3	143.7	149.0	100.0	64.7	123.5	58.0	126.8	12
OL-1988	132.0	104.2	125.8	121.7	124.1	119.1	137.2	141.7	100.6	66.2	125.5	50.0	128.7	11
OL-1967	119.4	123.2	149.9	116.4	134.8	123.7	151.8	159.7	95.9	62.7	133.5	65.0	135.0	3
NDO-1925	132.7	107.4	118.0	100.9	125.1	116.5	135.7	136.7	76.8	62.8	120.5	61.0	123.8	14
HFO-1101	138.2	120.5	142.2	103.7	142.3	128.6	154.3	150.7	63.3	63.7	130.0	55.0	132.1	8
JHO-21-1	153.0	126.7	137.3	103.8	124.9	122.4	147.1	160.3	93.0	62.5	139.0	53.0	134.8	4
JO-08-41	146.6	124.8	128.8	113.7	142.9	141.4	152.7	131.7	97.3	87.1	135.0	60.0	133.6	5
OL-1931-1	162.7	114.7	107.9	119.4	122.5	119.9	144.2	147.7	60.8	88.1	137.5	57.0	130.7	10
SKO-245	154.3	121.9	118.1	116.7	126.8	112.5	148.9	145.0	95.5	63.2	135.5	64.0	135.6	2
OS-6 (NC)	144.3	121.8	135.6	105.8	135.0	133.9	150.9	144.7	97.8	91.7	120.5	69.0	133.0	6
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	142.7	111.6	146.8	106.7	136.1	126.3	148.7	154.3	96.0	82.6	132.0	73.0		
Mean	**141.6**	**118.1**	**131.5**	**110.3**	**131.8**	**123.9**	**147.3**	**148.1**	**89.8**	**75.2**	**127.5**	**59.3**	**131.5**	

Table 5.8: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Palampur	Srinagar	Bikaner	Hisar	Ludhiana	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Imphal
UPO-21-1	0.40	0.34	1.32	0.50	0.65	0.49	1.51	0.97	1.09	0.36	0.39	0.18
BAUO-105	0.36	0.24	0.93	0.51	0.63	0.51	1.49	0.60	1.30	0.32	0.43	0.16
HFO-1113	0.44	0.29	1.08	0.53	0.68	0.63	1.17	1.02	0.93	0.42	0.41	0.17
JHO-21-2	0.40	0.38	0.91	0.49	0.59	0.55	1.36	0.90	0.90	0.36	0.41	0.18
BAUO-102	0.35	0.28	1.05	0.53	0.75	0.54	1.75	0.92	1.12	0.32	0.43	0.10
OL-1988	0.39	0.30	0.96	0.47	0.83	0.62	1.37	0.94	0.92	0.32	0.43	0.21
OL-1967	0.31	0.24	0.83	0.55	0.65	0.68	1.38	0.73	1.14	0.36	0.39	0.19
NDO-1925	0.33	0.23	0.99	0.58	0.75	0.57	1.24	0.78	1.04	0.33	0.44	0.15
HFO-1101	0.32	0.36	1.10	0.56	0.71	0.64	1.35	0.89	1.18	0.37	0.44	0.20
JHO-21-1	0.27	0.35	0.73	0.59	0.81	0.5	1.61	0.93	1.20	0.38	0.38	0.24
JO-08-41	0.38	0.32	1.10	0.57	0.68	0.52	1.80	1.37	1.34	0.42	0.42	0.16
OL-1931-1	0.35	0.26	0.93	0.55	0.73	0.58	1.24	0.52	0.95	0.35	0.42	0.21
SKO-245	0.33	0.29	0.96	0.57	0.83	0.53	1.48	0.88	0.98	0.34	0.43	0.21
OS-6 (NC)	0.37	0.29	0.82	0.53	0.72	0.61	1.58	1.04	1.22	0.37	0.39	0.14
SKO-225 ZC (HZ)	0.37	0.34										
OL-1896 ZC (NEZ-NWZ, CZ-SZ)			1.15	0.49	0.65	0.59	1.54	1.10	1.26	0.37	0.44	0.21
Mean	**0.36**	**0.30**	**0.99**	**0.53**	**0.71**	**0.57**	**1.46**	**0.91**	**1.10**	**0.36**	**0.42**	**0.18**

Table 5.8: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Karjat	Anand	Jabalpur	Raipur	Dhari	Hyderabad	Mandya	Coimbatore	Vellayani	Average	Rank
UPO-21-1	0.46	0.33	0.38	1.59	0.68	0.35	0.58	0.62	0.54	0.34	1.30	0.67	5
BAUO-105	0.47	0.49	0.47	2.33	0.67	0.45	0.56	0.48	0.72	0.32	1.30	0.68	4
HFO-1113	0.42	0.40	0.50	1.23	0.80	0.30	0.51	0.49	0.58	0.41	1.30	0.64	8
JHO-21-2	0.39	0.52	0.54	1.63	0.57	0.45	0.51	0.67	0.60	0.34	1.20	0.65	7
BAUO-102	0.57	0.51	0.44	2.88	0.66	0.48	0.50	0.36	0.52	0.39	1.40	0.73	1
OL-1988	0.64	0.37	0.48	2.2	0.73	0.34	0.46	0.68	0.54	0.38	1.40	0.69	3
OL-1967	0.41	0.49	0.39	0.96	0.82	0.50	0.55	0.59	0.51	0.36	1.20	0.62	9
NDO-1925	0.37	0.62	0.41	1.94	0.69	0.50	0.44	0.77	0.50	0.35	1.50	0.67	5
HFO-1101	0.32	0.43	0.47	2.08	0.62	0.36	0.47	0.35	0.46	0.39	1.30	0.67	5
JHO-21-1	0.42	0.37	0.50	1.69	0.71	0.28	0.48	0.56	0.44	0.43	1.40	0.66	6
JO-08-41	0.63	0.40	0.49	1.18	0.75	0.35	0.52	0.43	0.67	0.40	1.60	0.72	2
OL-1931-1	0.43	0.85	0.41	2.12	0.64	0.61	0.41	0.64	0.69	0.43	1.50	0.69	3
SKO-245	0.45	0.32	0.40	1.61	0.62	0.34	0.46	0.39	0.46	0.39	1.60	0.65	7
OS-6 (NC)	0.35	0.36	0.39	2.13	0.70	0.38	0.48	0.48	0.72	0.33	1.20	0.68	4
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	0.35	0.39	0.37	2.57	0.84	0.48	0.53	0.57	0.58	0.38	1.30		
Mean	**0.45**	**0.46**	**0.44**	**1.88**	**0.70**	**0.41**	**0.50**	**0.54**	**0.57**	**0.38**	**1.37**	**0.67**	

Table 5.9: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)				ADF (%)				IVDMD (%)	
	Ludhiana	Anand	Average	Rank	Ludhiana	Anand	Average	Rank	Ludhiana	Rank
UPO-21-1	70.8	67.9	69.3	10	52.3	39.8	46.0	10	42.0	5
BAUO-105	65.8	69.6	67.7	6	49.4	38.6	44.0	7	41.8	6
HFO-1113	66.7	67.9	67.3	5	50.0	41.8	45.9	9	42.0	5
JHO-21-2	65.3	68.5	66.9	2	48.6	39.3	44.0	7	45.1	3
BAUO-102	66.1	69.4	67.8	7	46.0	38.9	42.4	3	46.6	2
OL-1988	65.4	68.5	67.0	3	45.1	39.7	42.4	3	47.0	1
OL-1967	70.9	69.1	70.0	13	45.8	39.0	42.4	3	40.8	9
NDO-1925	66.9	69.5	68.2	8	47.7	38.9	43.3	5	41.0	8
HFO-1101	68.3	68.9	68.6	9	54.8	37.6	46.2	11	40.6	10
JHO-21-1	70.8	69.1	69.9	12	49.0	38.5	43.7	6	41.4	7
JO-08-41	69.4	70.2	69.8	11	50.0	38.4	44.2	8	41.8	6
OL-1931-1	63.4	67.3	65.3	1	44.7	39.9	42.3	2	40.8	9
SKO-245	67.5	66.6	67.1	4	47.7	38.3	43.0	4	40.8	9
OS-6 (NC)	65.5	69.2	67.3	5	46.8	36.8	41.8	1	40.4	11
OL-1896 ZC (NEZ-NWZ, CZ-SZ)	64.5	69.2			42.9	36.5			44.8	4
Mean	**134.5**	**137.4**	**136.0**		**96.5**	**77.7**	**87.4**		**84.8**	

6. AVTO (SC)-1: FIRST ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT)

(Reference tables 6.1 to 6.9)

In **First Advanced Varietal Trial in Oat (single cut), AVTO (SC)-1,** eight entries promoted from IVT were evaluated against two national checks (OS-6 and Kent) and one zonal check [SKO-225 (HZ), RO-11-1 (CZ) and OS-403 (NWZ, NEZ,SZ)] in respective zones at 26 locations. There were 3 locations in HZ, 5 in NWZ, 6 in NEZ, 8 in CZ and 4 in SZ.

In Hill zone, for GFY entries SKO-244, JHO-20-1, HFO-1009 showed superiority over the best check by margins of 4.7%, 2.1% and 1.0% respectively. For DMY, entries JO-08-37 (7.2%), HFO-1003 (3.6%), OL-1980 (3.3%), HFO-1009 (2.1%), and JHO-20-1 (1.3%) showed better performance than the best check. For crude protein yield (q/ha), entries JO-08-37 and OL-1980 showed more than 5% superiority over the best check. For crude protein %, entry JHO-20-1 and zonal check were best performer with value of 10.5%.

In NWZ for GFY, entries SKO-244, OL-1977 performed better than the best check zonal check OS-403 by a margin of 6.1% and 3.1% respectively. For DMY, entries OL-1977 (10.5%), SKO-244 (7.8%), HFO-1003 (2.3%) showed better performance than the best check. For crude protein yield, entries OL-1977 and SKO-244 with values of 11.9 and 11.5 performed better than the best check 11.4 q/ha. For crude protein, zonal check was best with value of 9.4%.

In NEZ, national check OS-6 was top performer for GFY, whereas for DMY entry HFO-1009 (1.22%) was the only one to show marginal superiority over the best check. For crude protein yield, entries HFO-1009 was marginally superior over the best check. Entry OL-1980 was marginally superior over the best check for crude protein content.

In CZ for GFY, entries SKO-244 and HFO-1009 were superior over the best check by margins of 3.2% and 0.1% respectively. For DMY, zonal check was the highest yielder. For CPY, the check was best. Entry HFO-1013 was marginally superior over the best check for crude protein %.

In SZ for GFY and DMY, zonal check OS-403 ranked first. Entries HFO-1003 and OL-1980 were marginally superior over the best check for crude protein yield. HFO-1013 and HFO-1003 were top ranked with value of 8.5% as compared to best check 8.0% for crude protein %.

At all India level, for GFY entries SKO-244 (10.6%), OL-1977 (7.6%), HFO-1009 (7.2%),HFO-1003 (6.4%), JO-08-37 (5.0%) showed more than 5% superiority over the best national check. For DMY entries, SKO-244 (8.5%), HFO-1009 (8.4%), OL-1977 (7.5%), HFO-1003 (5.3%) showed more than 5% superiority over the best national check. For crude protein yield, entries HFO-1009, OL-1977, OL-1980, JO-08-37, and SKO-244 showed more than 5% superiority over the best check. For crude protein content, entries OL-1980 with 9.3% was superior over the best check having value of 8.9%.

For per day productivity, HFO-1003 was top ranker followed by OL-1977 for green matter and entries OL-1977 was best performer followed by HFO-1003 for dry matter. For plant height and leafinesss the national check was best.

For NDF%, entry JO-08-37 was best followed by HFO-1009. For ADF%, national check was best. For IVDMD%, entry JO-08-37 was best.

Table 6.1: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	Hill Zone						North West Zone							
	Palampur	Srinagar	Rajouri	Average	Rank	Superiority%	Bikaner	Hisar	Ludhiana	Pantnagar	Meerut	Average	Rank	Superiority (%)
OL-1980	269.5	344.7	255.0	289.7	11		411.8	576.2	554.7	542.4	450.7	507.2	8	
JO-08-37	297.0	361.0	260.0	306.0	5		380.9	562.3	595.0	551.3	445.1	506.9	9	
SKO-244	265.8	366.0	337.0	322.9	1	4.7	582.7	547.3	666.8	603.2	554.9	591.0	1	6.1
HFO-1009	262.8	369.0	303.0	311.6	3	1.0	408.1	514.5	592.9	625.4	497.6	527.7	6	
OL-1977	244.4	364.7	302.0	303.7	7		496.1	580.6	636.8	751.8	405.7	574.2	2	3.1
HFO-1013	262.8	361.0	267.0	296.9	9		415.3	592.8	614.3	609.3	487.9	543.9	4	
HFO-1003	276.8	365.0	272.0	304.6	6		425	549.0	615.3	702.7	493.1	557.0	3	
JHO-20-1	267.7	364.0	313.0	314.9	2	2.1	436.7	589.5	638.1	574.1	387.2	525.1	**7**	
OS-6 (NC)	229.8	352.0	325.0	302.3	8		382.3	539.0	500.1	576.8	362.1	472.1	10	
Kent (NC)	275.0	346.7	252.0	291.2	10		430.8	617.0	558.9	656.4	406.9	534.0	5	
SKO-225 ZC (HZ)	244.4	363.7	317.0	308.4	4									
OS-403 ZC (NWZ, NEZ, SZ)							505.3	546.7	554.0	666.6	512.3	557.0	3	
Mean	**263.3**	**359.8**	**291.2**	**304.7**			**443.2**	**565.0**	**593.4**	**623.6**	**454.9**	**536.0**		
CD at 5%	**29.3**	**11.7**	**2.4**				79.3	**N/A**	**57.5**	**59.6**				
CV%	**6.6**	**1.9**	**8.1**				10.7	**7.69**	**11.3**	**9.7**				

Table 6.1: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	North East Zone							
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Imphal	Average	Rank
OL-1980	244.8	404.4	296.0	379.3	513.3	520.2	393.0	9
JO-08-37	454.5	413.8	354.0	327.0	450.0	575.6	429.1	4
SKO-244	288.5	358.8	405.0	351.3	556.7	488.9	408.2	6
HFO-1009	376.3	431.6	376.0	369.0	566.7	504.4	437.3	2
OL-1977	392.8	378.8	461.0	359.3	523.3	393.3	418.1	5
HFO-1013	159.6	457.5	293.0	450.0	433.3	448.9	373.7	11
HFO-1003	324.1	460.8	305.0	383.3	556.7	397.8	404.6	8
JHO-20-1	342.4	344.4	342.5	408.7	550.0	444.4	405.4	7
OS-6 (NC)	438.6	386.6	348.0	406.3	556.7	528.9	444.2	1
Kent (NC)	274.0	395.0	335.0	369.0	473.3	460.0	384.4	10
OS-403 ZC (NWZ, NEZ, SZ)	422.3	372.2	432.0	425.7	466.7	486.7	434.3	3
Mean	**338.0**	**400.4**	**358.9**	**384.5**	**513.3**	**477.2**	**412.0**	
CD at 5%	**2.9**	**23.5**	**31.9**	**45.3**	**49.7**	**17.8**		
CV%	**2.5**	**9.2**	**5.4**	**7.1**	**5.6**	**2.2**		

Table 6.1: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	Central Zone										
	Jhansi	**Rahuri**	**Urulikanchan**	**Anand**	**Jabalpur**	**Raipur**	**Dhari**	****Karjat**	**Average**	**Rank**	**Superiority%**
OL-1980	494.0	454.0	543.7	930.3	433.3	266.7	425.0	172.9	506.7	5	
JO-08-37	488.4	399.1	589.4	937.5	383.3	277.8	472.3	185.8	506.8	4	
SKO-244	519.0	405.5	359.7	1057.8	620.0	348.6	441.7	154.5	536.0	1	3.2
HFO-1009	472.7	484.4	537.6	914.4	566.7	333.3	330.6	234.2	520.0	2	0.1
OL-1977	476.9	475.9	474.4	898.6	493.3	306.3	313.9	220.2	491.3	8	
HFO-1013	441.7	410.8	518.5	808.9	546.7	298.3	416.6	164.3	491.6	7	
HFO-1003	438.0	423.8	557.4	887.5	436.7	372.8	386.1	247.8	500.3	6	
JHO-20-1	425.9	413.4	527.3	873.9	423.3	286.1	352.8	183.6	471.8	10	
OS-6 (NC)	429.2	402.0	476.6	711.1	450.0	294.4	355.6	187.7	445.6	11	
Kent (NC)	435.6	441.6	494.2	877.2	436.7	311.1	419.5	210.8	488.0	9	
RO-11-1 ZC (CZ)	499.1	519.4	388.6	841.7	650.0	291.0	444.5	131.8	519.2	3	
Mean	**465.5**	**439.1**	**497.0**	**885.4**	**494.5**	**307.9**	**396.2**	**190.3**	**497.9**		
CD at 5%	**22.1**	**50.5**	52.2	**150.9**	**5.7**	**41.2**		**39.3**			
CV%	**13.2**	**6.9**	6.1	**10.1**	**6.8**	**8.1**		**12.0**			

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 6.1: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	**Mandya**	**Coimbatore**	**Mattupetty**	**Average**	**Rank**	**Average**	**Rank**	**Superiority%**
OL-1980	301.2	252.4	352.8	373.0	319.8	6	423.6	6	2.4
JO-08-37	353.7	182.9	355.6	390.0	320.5	5	434.3	5	5.0
SKO-244	196.6	175.1	455.6	487.0	328.6	4	457.6	1	10.6
HFO-1009	252.0	195.9	362.5	440.0	312.6	7	443.5	3	7.2
OL-1977	313.1	190.5	429.2	468.0	350.2	2	445.2	2	7.6
HFO-1013	271.5	161.5	370.8	337.0	285.2	9	417.4	7	0.9
HFO-1003	319.5	277.1	345.8	437.0	344.9	3	440.3	4	6.4
JHO-20-1	293.3	193.2	283.3	290.0	265.0	11	414.6	8	
OS-6 (NC)	243.2	212.4	398.6	363.0	304.3	8	410.7	10	
Kent (NC)	243.6	187.9	309.7	337.0	269.6	10	413.8	9	
OS-403 ZC (NWZ, NEZ, SZ)	324.6	301.9	425.0	493.0	386.1	1			
Mean	**282.9**	**211.9**	**371.7**	**401.4**	**317.0**		**430.1**		
CD at 5%	**48.6**	**36.4**	**40.1**	**11.3**					
CV%	**10.3**	**10.0**	**6.4**	**1.7**					

Table 6.2: AVTO-1: Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	Hill Zone					North West Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority%	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Superi-ority (%)
OL-1980	62.6	68.8	65.7	3	3.3	77.8	134.1	116.5	112.9	110.3	9	
JO-08-37	69.6	66.9	68.2	1	7.2	80.0	127.3	123.8	121.8	113.2	8	
SKO-244	60.3	64.5	62.4	10		122.4	130.7	131.4	137.1	130.4	2	7.8
HFO-1009	59.2	70.8	65.0	4	2.1	79.2	123.0	126.9	145.2	118.6	5	
OL-1977	61.1	65.2	63.2	8		111.1	129.7	136.3	157.9	133.7	1	10.5
HFO-1013	60.9	66.1	63.5	7		80.6	136.1	131.5	118.3	116.6	7	
HFO-1003	62.4	69.4	65.9	2	3.6	79.5	125.8	131.7	158.2	123.8	3	2.3
JHO-20-1	59.0	69.9	64.4	5	1.3	91.7	132.3	136.5	109.8	117.6	6	
OS-6 (NC)	57.5	69.7	63.6	6		84.1	124.1	99.0	122.3	107.4	10	
Kent (NC)	58.2	67.5	62.9	9		81.9	135.3	119.6	147.2	121.0	4	
SKO-225 ZC (HZ)	57.9	52.1	55.0	11								
OS-403 ZC (NWZ, NEZ, SZ)						94.5	128.6	114.1	146.7	121.0	4	
Mean	**60.8**	**66.4**	**63.6**			**89.3**	**129.7**	**124.3**	**134.3**	**119.4**		
CD at 5%	**7.1**	**8.5**				**16.1**	**NA**	**36.8**	**15.2**			
CV%	**6.8**	**7.6**				**10.7**	**6.0**	**9.7**	**12.2**			

Table 6.2: AVTO-1: Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	North East Zone								
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Imp-hal	Aver-age	Ra-nk	Super-iority (%)
OL-1980	47.7	93.2	63.5	75.2	126.1	119.7	87.6	9	
JO-08-37	86.3	100.5	80.7	65.9	110.7	140.9	97.5	4	
SKO-244	54.6	72.4	89.4	67.3	137.1	122.6	90.6	6	
HFO-1009	73.7	106.9	85.2	70.7	139.7	120.8	99.5	1	1.6
OL-1977	76.0	86.9	107.4	64.1	129.7	90.4	92.4	5	
HFO-1013	28.9	110.2	64.5	87.0	102.1	115.8	84.8	10	
HFO-1003	55.6	110.9	72.2	72.2	138.0	92.8	90.3	7	
JHO-20-1	57.2	67.7	76.0	80.4	136.1	111.9	88.2	8	
OS-6 (NC)	83.2	72.6	81.6	80.6	137.2	134.6	98.3	2	
Kent (NC)	51.4	82.8	71.1	70.7	116.0	107.8	83.3	11	
OS-403 ZC (NWZ, NEZ, SZ)	82.5	80.3	98.8	85.1	114.4	126.6	98.0	3	
Mean	**63.4**	**89.5**	**80.9**	**74.5**	**126.1**	**116.7**	**91.9**		
CD at 5%	**3.1**	**16.9**	**6.6**		**12.6**	**17.1**			
CV%	**6.3**	**11.5**	**4.9**		**5.8**	**8.7**			

Table 6.2: AVTO-1: Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	Central Zone									
	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	** Kar-jat	Aver-age	Ra-nk
OL-1980	77.9	101.7	96.8	156.5	129.5	54.1	136.1	43.1	107.5	4
JO-08-37	81.4	84.9	95.3	143.3	118.9	59.7	130.5	45.9	102.0	7
SKO-244	84.0	86.3	56.9	152.3	162.5	77.1	144.4	38.4	109.1	3
HFO-1009	72.9	107.5	101.3	152.9	153.4	68.3	116.6	60.9	110.4	2
OL-1977	70.8	95.6	94.9	140.5	139.0	63.4	102.7	53.7	101.0	9
HFO-1013	63.5	81.9	95.3	137	149.3	65.9	138.8	40.8	104.5	5
HFO-1003	65.7	86.7	102.0	148.3	118.5	78.7	111.1	60.0	101.6	8
JHO-20-1	61.6	88.2	92.8	162.1	121.0	63.1	102.7	45.3	98.8	10
OS-6 (NC)	80.8	86.6	79.1	106.5	131.1	60.1	105.5	45.4	92.8	11
Kent (NC)	75.2	79.7	100.8	168.6	123.1	54.5	122.2	54.4	103.4	6
RO-11-1 ZC (CZ)	88.4	123.7	72.1	165.7	164.6	56.3	127.7	34.5	114.1	1
Mean	**74.7**	**93.0**	**89.8**	**148.5**	**137.3**	**63.7**	**121.7**	**47.5**	**104.1**	
CD at 5%	**13.2**	**10.8**	**8.9**	**26.2**	**1.2**	**9.5**		**9.4**		
CV%	**7.9**	**6.8**	**5.8**	**10.3**	**6.5**	**8.9**		**11.5**		

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 6.2: AVTO-1: Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk	Aver-age	Ra-nk	Superi-ority%
OL-1980	64.3	58.6	76.8	93.3	73.3	5	93.2	6	3.2
JO-08-37	72.0	41.1	77.2	97.6	72.0	6	94.6	5	4.8
SKO-244	48.4	37.5	92.8	121.8	75.1	4	98.0	1	8.5
HFO-1009	49.6	40.0	77.4	109.9	69.2	7	97.9	2	8.4
OL-1977	62.8	40.0	92.0	114.3	77.3	2	97.0	3	7.5
HFO-1013	56.0	38.1	76.9	84.2	63.8	9	90.8	7	0.6
HFO-1003	61.7	61.1	75.6	109.2	76.9	3	95.1	4	5.3
JHO-20-1	58.6	39.6	60.5	72.6	57.8	11	89.2	10	
OS-6 (NC)	41.4	51.4	80.7	91.0	66.1	8	89.6	9	
Kent (NC)	45.9	37.6	67.1	92.5	60.8	10	90.3	8	
OS-403 ZC (NWZ, NEZ, SZ)	69.5	75.1	82.1	123.4	87.5	1			
Mean	**57.3**	**47.3**	**78.1**	**100.9**	**70.9**		**93.6**		
CD at 5%	**13.6**	**9.7**	**8.9**	**10.0**					
CV%	**14.0**	**11.8**	**6.8**	**5.9**					

Table 6.3: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa
OL-1980	4.25	5.04	4.40	5.27	2.71	4.13	4.05	4.18	5.90
JO-08-37	3.93	4.70	4.70	5.10	4.78	4.22	4.72	3.20	5.13
SKO-244	6.01	4.73	5.30	5.48	2.83	3.66	5.40	3.32	6.50
HFO-1009	4.21	4.58	4.70	6.19	4.18	4.40	5.01	3.46	6.58
OL-1977	5.11	5.03	5.00	7.23	4.36	3.87	6.88	3.78	6.09
HFO-1013	4.28	5.11	4.80	6.28	1.77	4.67	4.07	5.00	5.02
HFO-1003	4.38	4.72	4.80	7.17	3.60	4.70	4.30	4.12	6.43
JHO-20-1	4.50	5.12	5.00	5.68	3.32	3.51	4.63	4.33	6.48
OS-6 (NC)	3.94	4.63	3.90	5.89	5.16	3.94	5.04	4.58	6.57
Kent (NC)	4.44	5.24	4.40	6.77	3.34	4.03	4.93	4.21	5.48
OS-403 ZC (NWZ, NEZ, SZ), RO-11-1 ZC (CZ)	5.21	4.70	4.40	6.41	4.45	3.80	5.84	4.36	5.49
Mean	**4.57**	**4.87**	**4.67**	**6.13**	**3.68**	**4.08**	**4.99**	**4.05**	**5.97**

Table 6.3: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Ana-nd	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
OL-1980	4.44	5.36	6.97	2.66	10.34	3.14	4.80	4.02	3.50	3.75	8.30	4.86	6
JO-08-37	4.35	4.19	6.41	2.82	9.57	3.02	5.00	4.72	2.46	3.86	8.70	4.78	7
SKO-244	4.66	4.11	3.67	2.27	10.58	3.71	4.40	2.56	2.40	4.85	10.80	4.86	6
HFO-1009	4.27	5.36	5.91	3.55	9.43	3.75	3.70	3.27	2.63	4.22	9.80	4.96	4
OL-1977	4.37	5.73	6.08	3.29	10.10	3.56	3.70	4.17	2.61	4.77	7.00	5.14	2
HFO-1013	4.00	4.69	6.03	2.45	8.79	3.43	5.00	3.64	2.19	4.31	7.50	4.65	9
HFO-1003	3.96	4.93	6.56	3.39	9.75	4.24	4.70	4.15	3.78	4.17	9.70	5.18	1
JHO-20-1	3.84	4.72	6.43	2.74	10.28	3.25	4.40	3.93	2.70	3.50	6.40	4.74	8
OS-6 (NC)	3.97	5.11	6.11	3.03	8.57	3.93	4.60	3.53	3.11	4.86	8.10	4.93	5
Kent (NC)	3.97	5.54	6.34	3.10	10.57	3.99	5.30	3.19	2.52	3.87	8.20	4.97	3
RO-11-1 ZC (CZ)	4.51	5.56	4.09	1.88	9.15	3.13	5.00						
OS-403 ZC (NWZ, NEZ, SZ)								4.33	4.04	4.67	10.90		
Mean	**4.21**	**5.03**	**5.87**	**2.83**	**9.74**	**3.56**	**4.60**	**3.77**	**2.90**	**4.26**	**8.67**	**4.91**	

Table 6.4: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa
OL-1980	0.80	1.17	0.90	1.1	0.53	0.95	0.87	0.83	1.45
JO-08-37	0.83	1.06	1.00	1.13	0.91	1.03	1.08	0.64	1.26
SKO-244	1.26	1.13	1.00	1.25	0.54	0.74	1.19	0.64	1.60
HFO-1009	0.82	1.09	1.00	1.44	0.82	1.09	1.14	0.66	1.62
OL-1977	1.15	1.13	1.10	1.52	0.84	0.89	1.60	0.67	1.51
HFO-1013	0.83	1.17	1.00	1.22	0.32	1.12	0.90	0.97	1.18
HFO-1003	0.82	1.08	1.00	1.61	0.62	1.13	1.02	0.78	1.59
JHO-20-1	0.95	1.15	1.10	1.09	0.56	0.69	1.03	0.85	1.60
OS-6 (NC)	0.87	1.06	0.80	1.25	0.98	0.74	1.18	0.91	1.62
Kent (NC)	0.84	1.15	0.90	1.52	0.63	0.84	1.05	0.81	1.34
OS-403 ZC (NWZ, NEZ, SZ)	0.97	1.11	0.90	1.41	0.87	0.82	1.33	0.87	1.35
Mean	**0.92**	**1.12**	**0.97**	**1.32**	**0.69**	**0.91**	**1.13**	**0.78**	**1.47**

Table 6.4: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Ana-nd	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
OL-1980	0.70	1.20	1.24	0.66	1.74	0.64	1.60	0.86	0.81	0.82	1.40	1.01	8
JO-08-37	0.72	0.89	1.04	0.69	1.46	0.65	1.40	0.96	0.55	0.84	2.20	1.02	7
SKO-244	0.75	0.87	0.58	0.57	1.52	0.82	1.40	0.63	0.51	0.99	2.70	1.03	6
HFO-1009	0.66	1.19	1.11	0.92	1.58	0.77	1.30	0.64	0.54	0.90	2.40	1.08	3
OL-1977	0.65	1.15	1.22	0.80	1.58	0.74	1.20	0.84	0.55	1.02	2.50	1.13	1
HFO-1013	0.58	0.93	1.11	0.61	1.49	0.76	1.70	0.75	0.51	0.89	1.90	1.00	9
HFO-1003	0.59	1.01	1.20	0.83	1.63	0.89	1.30	0.80	0.83	0.91	2.40	1.10	2
JHO-20-1	0.55	1.01	1.13	0.68	1.91	0.72	1.30	0.78	0.55	0.75	1.30	0.98	10
OS-6 (NC)	0.75	1.10	1.01	0.73	1.28	0.80	1.40	0.60	0.75	0.98	2.00	1.04	5
Kent (NC)	0.69	1.00	1.29	0.80	2.03	0.70	1.50	0.60	0.50	0.84	2.10	1.06	4
RO-11-1 ZC (CZ)	0.80	1.33	0.76	0.49	1.80	0.61	1.40						
OS-403 ZC (NWZ, NEZ, SZ)								0.93	1.01	0.90	2.50		
Mean	**0.68**	**1.06**	**1.06**	**0.71**	**1.64**	**0.74**	**1.41**	**0.76**	**0.65**	**0.89**	**2.13**	**1.05**	

Table 6.5: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	HZ		NWZ					
	Palampur	Rank	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank
OL-1980	6.4	2	8.6	13.1	8.6	9.9	10.0	9
JO-08-37	6.7	1	5.8	11.6	12.3	12.8	10.6	6
SKO-244	5.8	6	10.8	10.9	11.2	13.2	11.5	2
HFO-1009	5.9	5	5.9	11.0	11.9	15.2	11.0	4
OL-1977	5.7	7	8.0	10.9	12.0	16.6	11.9	1
HFO-1013	5.7	7	6.1	12.6	8.7	12.4	10.0	9
HFO-1003	5.8	6	5.5	9.5	8.4	18.0	10.3	7
JHO-20-1	6.2	3	7.9	12.3	9.7	10.6	10.1	8
OS-6 (NC)	5.7	7	10.3	9.4	6.1	11.8	9.4	10
Kent (NC)	5.8	6	4.5	11.3	11.5	15.5	10.7	5
SKO-225 ZC (HZ)	6.1	4						
OS-403 ZC (NWZ, NEZ, SZ)			9.8	11.7	8.7	15.4	11.4	3
Mean	**6.0**		**7.5**	**11.3**	**9.9**	**13.8**	**10.6**	

Table 6.5: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	NEZ							CZ						
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Imp-hal	Aver-age	Ra-nk	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
OL-1980	5.3	11.5	6.1	7.3	11.0	8.3	5	8.8	7.6	16.8	7.9	4.6	9.1	3
JO-08-37	9.3	10.5	7.3	3.4	13.1	8.7	3	7.0	7.5	16.0	6.8	5.0	8.5	5
SKO-244	7.7	6.9	8.4	4.4	10.5	7.6	8	6.9	3.9	17.5	11.6	5.5	9.1	3
HFO-1009	9.1	12.4	7.8	5.1	11.1	9.1	1	8.5	8.1	14.9	10.6	5.9	9.6	1
OL-1977	8.5	9.0	9.5	6.8	8.0	8.4	4	10.2	5.8	14.8	9.0	5.3	9.0	4
HFO-1013	3.8	10.8	6.1	6.2	10.3	7.5	9	8.9	6.4	14.2	10.2	6.3	9.2	2
HFO-1003	6.5	13.9	6.3	5.5	7.9	8.0	6	9.0	6.4	15.7	7.2	6.9	9.0	4
JHO-20-1	7.7	7.0	7.1	4.8	12.5	7.8	7	5.5	6.6	16.4	7.3	5.5	8.2	6
OS-6 (NC)	10.1	8.9	7.2	4.7	13.7	8.9	2	6.7	4.9	12.1	8.2	5.2	7.4	7
Kent (NC)	6.2	9.5	6.9	6.2	8.8	7.5	9	7.7	7.0	18.3	7.5	5.2	9.1	3
OS-403 ZC (NWZ, NEZ, SZ)	11.5	9.4	8.9	3.9	10.0	8.7	3							
RO-11-1 ZC (CZ)								10.2	5.3	15.7	12.1	4.8	9.6	1
Mean	**7.8**	**10.0**	**7.4**	**5.3**	**10.6**	**8.2**		**8.1**	**6.3**	**15.7**	**8.9**	**5.5**	**8.9**	

Table 6.5: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	SZ					All India	
	Hyderabad	Mandya	Coimbatore	Average	Rank	Average	Rank
OL-1980	5.7	5.4	5.1	5.4	2	8.3	2
JO-08-37	5.3	2.9	5.4	4.5	6	8.3	2
SKO-244	4.1	3.1	6.9	4.7	5	8.3	2
HFO-1009	4.6	3.5	4.1	4.1	7	8.6	1
OL-1977	5.0	3.1	6.8	5.0	4	8.6	1
HFO-1013	4.7	3.7	5.7	4.7	5	7.9	3
HFO-1003	5.4	5.6	5.6	5.5	1	8.3	2
JHO-20-1	4.9	3.1	4.0	4.0	8	7.7	4
OS-6 (NC)	3.5	4.5	5.6	4.5	6	7.7	4
Kent (NC)	3.4	2.8	4.7	3.6	9	7.9	3
OS-403 ZC (NWZ, NEZ, SZ)	5.4	5.6	4.7	5.2	3		
Mean	**4.7**	**3.9**	**5.3**	**4.7**		**8.2**	

Table 6.6: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	HZ		NWZ					
	Palampur	Rank	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank
OL-1980	10.2	2	11.0	9.7	7.4	8.8	9.2	2
JO-08-37	9.6	4	7.2	9.1	9.9	10.5	9.2	2
SKO-244	9.6	4	8.8	8.3	8.5	9.6	8.8	5
HFO-1009	9.9	3	7.4	9.0	9.4	10.5	9.1	3
OL-1977	9.3	5	7.2	8.4	8.8	10.5	8.7	6
HFO-1013	9.3	5	7.6	9.2	6.6	10.5	8.5	7
HFO-1003	9.3	5	6.9	7.6	6.4	11.4	8.1	8
JHO-20-1	10.5	1	8.6	9.3	7.1	9.6	8.7	6
OS-6 (NC)	9.9	3	12.2	7.6	6.2	9.6	8.9	4
Kent (NC)	9.9	3	5.5	8.4	9.6	10.5	8.5	7
SKO-225 ZC (HZ)	10.5	1						
OS-403 ZC (NWZ, NEZ, SZ)			10.4	9.1	7.6	10.5	9.4	1
Mean	**9.8**		**8.4**	**8.7**	**8.0**	**10.2**	**8.8**	

Table 6.6: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	NEZ							CZ						
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Imp-hal	Aver-age	Ra-nk	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
OL-1980	11.3	12.3	9.6	9.7	9.2	10.4	1	8.6	7.8	10.8	8.1	8.4	8.7	4
JO-08-37	10.8	10.4	9.1	5.1	9.3	8.9	8	8.3	7.9	11.1	8.0	8.4	8.7	4
SKO-244	14.2	9.6	9.4	6.5	8.5	9.6	6	8.0	6.9	11.6	8.3	7.1	8.4	6
HFO-1009	12.4	11.6	9.1	7.2	9.2	9.9	4	8.7	8.0	9.7	8.2	8.6	8.6	5
OL-1977	11.3	10.4	8.9	10.6	8.8	10.0	3	10.6	6.2	10.5	8.2	8.5	8.8	3
HFO-1013	13.2	9.8	9.4	7.2	8.9	9.7	5	10.8	6.7	10.3	8.2	9.6	9.1	1
HFO-1003	11.9	12.6	8.8	7.6	8.5	9.9	4	10.4	6.3	10.6	8.0	8.8	8.8	3
JHO-20-1	13.5	10.3	9.3	6.0	11.1	10.1	2	6.2	7.1	10.1	8.1	8.7	8.0	7
OS-6 (NC)	12.2	12.3	8.8	5.8	10.2	9.9	4	7.7	6.2	11.4	8.2	8.6	8.4	6
Kent (NC)	12.2	11.4	9.8	8.8	8.1	10.1	2	9.6	7.0	10.9	8.1	9.5	9.0	2
OS-403 ZC (NWZ, NEZ, SZ)	14.1	11.7	9.1	4.6	7.9	9.5	7							
RO-11-1 ZC (CZ)								8.2	7.3	9.5	8.3	8.5	8.4	6
Mean	**12.5**	**11.1**	**9.2**	**7.2**	**9.1**	**9.8**		**8.8**	**7.0**	**10.6**	**8.1**	**8.6**	**8.6**	

Table 6.6: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	SZ					All India	
	Hyderabad	Mandya	Coimbatore	Average	Rank	Average	Rank
OL-1980	8.8	9.2	6.6	8.2	2	9.3	1
JO-08-37	7.4	7.0	7.0	7.1	7	8.7	5
SKO-244	8.4	8.3	7.4	8.0	3	8.8	4
HFO-1009	9.2	8.7	5.3	7.7	4	9.0	2
OL-1977	7.9	7.9	7.4	7.7	4	9.0	2
HFO-1013	8.4	9.6	7.4	8.5	1	9.0	2
HFO-1003	8.8	9.2	7.4	8.5	1	8.9	3
JHO-20-1	8.4	7.9	6.6	7.6	5	8.8	4
OS-6 (NC)	8.4	8.7	7.0	8.0	3	8.9	3
Kent (NC)	7.4	7.4	7.0	7.3	6	8.9	3
OS-403 ZC (NWZ, NEZ, SZ)	7.8	7.4	5.7	7.0	8		
Mean	**8.3**	**8.3**	**6.8**	**7.8**		**8.9**	

Table 6.7: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Palampur	Srinagar	Bikaner	Ludhiana	Pantnagar	Meerut
OL-1980	136.7	103.8	166.8	144.3	156.3	200.0
JO-08-37	129.7	102.4	126.2	135.4	180.4	210.0
SKO-244	147.7	103.9	152.8	136.7	146.8	200.0
HFO-1009	130.3	101.8	136.6	145.8	173.2	200.0
OL-1977	131.3	97.3	147.4	134.6	156.7	220.0
HFO-1013	129.7	100.0	152.0	135.9	161.5	210.0
HFO-1003	122.3	98.5	139.0	143.0	174.2	210.0
JHO-20-1	131.7	84.4	144.4	143.5	149.8	210.0
OS-6 (NC)	141.0	91.1	156.6	133.8	169.2	215.0
Kent (NC)	116.3	96.3	143.0	147.1	153.4	180.0
SKO-225 ZC (HZ)	126.3	95.0				
OS-403 ZC (NWZ, NEZ, SZ)			164.4	143.8	176.5	230.0
Mean	**131.2**	**97.7**	**148.1**	**140.4**	**163.5**	**207.7**

Table 6.7: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Imp-hal
OL-1980	115.3	182.7	117.3	152.1	147.7	154.6
JO-08-37	151.2	161.6	138.3	112.4	137.3	163.3
SKO-244	118.9	142.8	144.5	120.4	138.7	161.2
HFO-1009	123.7	156.5	140.5	142.7	155.7	154.2
OL-1977	115.7	162.1	152.5	142.4	143.3	167.0
HFO-1013	127.1	176.3	105.4	151.4	164.0	170.6
HFO-1003	128.3	184.1	125.5	146.6	160.0	155.0
JHO-20-1	141.3	164.9	134.2	148.8	153.3	163.9
OS-6 (NC)	140.2	166.3	135.4	147.8	146.7	163.0
Kent (NC)	116.3	161.5	130.2	147.4	141.0	157.8
OS-403 ZC (NWZ, NEZ, SZ)	166.5	163.9	149.7	160.8	158.7	176.2
Mean	**131.3**	**165.7**	**133.9**	**143.0**	**149.7**	**162.4**

Table 6.7: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
OL-1980	137.7	122.1	133.8	110.2	142.5	120.5	136.9	136.7	100.3	95.3	121.5	123.0	135.8	4
JO-08-37	138.6	115.2	141.1	116.3	144.2	113.3	131.3	138.3	90.3	88.9	120.0	118.0	133.5	5
SKO-244	118.3	110.6	122.4	109.0	128.3	144.2	117.1	120.7	68.2	83.3	132.5	109.0	128.2	8
HFO-1009	142.1	110.6	123.6	121.9	139.1	141.8	130.2	123.0	94.4	80.5	118.5	109.0	133.2	6
OL-1977	146.0	125.6	121.7	102.5	143.1	135.3	143.6	142.7	100.2	76.2	128.5	124.0	135.8	4
HFO-1013	117.4	126.6	130.2	113.5	138.5	139.9	150.0	139.3	93.4	83.4	121.5	128.0	136.1	3
HFO-1003	133.1	116.4	141.0	123.9	136.2	115.4	144.2	147.3	92.9	96.1	130.0	127.0	137.1	2
JHO-20-1	137.6	126.4	114.9	126.8	137.9	116.7	134.9	138.3	90.9	68.4	123.0	119.0	133.5	5
OS-6 (NC)	155.2	122.0	129.0	115.5	137.7	130.0	128.1	141.3	101.9	85.1	129.0	123.0	137.7	1
Kent (NC)	130.1	125.8	114.2	120.9	132.8	116.9	125.9	129.0	87.1	72.3	118.5	119.0	128.5	7
RO-11-1 ZC (CZ)	144.1	133.8	139.1	128.3	136.9	155.1	148.8	148.7						
OS-403 ZC (NWZ, NEZ, SZ)									113.4	103.8	129.0	116.0		
Mean	**136.4**	**121.4**	**128.3**	**117.2**	**137.9**	**129.9**	**135.5**	**136.8**	**93.9**	**84.8**	**124.7**	**119.5**	**133.9**	

Table 6.8: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Palampur	Srinagar	Bikaner	Hisar	Ludhiana	Pantnagar
OL-1980	0.38	0.30	0.77	0.52	0.71	0.63
JO-08-37	0.45	0.31	0.97	0.56	0.61	0.62
SKO-244	0.44	0.27	0.78	0.52	0.75	0.63
HFO-1009	0.31	0.29	0.87	0.61	0.83	0.59
OL-1977	0.34	0.30	1.07	0.61	0.77	0.55
HFO-1013	0.32	0.34	1.23	0.63	0.71	0.71
HFO-1003	0.53	0.32	0.99	0.62	0.61	0.52
JHO-20-1	0.33	0.36	0.99	0.60	0.75	0.77
OS-6 (NC)	0.31	0.30	1.17	0.65	0.60	0.58
Kent (NC)	0.62	0.28	0.71	0.62	0.60	0.46
SKO-225 ZC (HZ)	0.34	0.40				
OS-403 ZC (NWZ, NEZ, SZ)			0.97	0.49	0.77	0.96
Mean	**0.40**	**0.32**	**0.96**	**0.58**	**0.70**	**0.64**

Table 6.8: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Imphal
OL-1980	1.26	1.09	0.92	0.42	0.42	0.20
JO-08-37	1.23	0.86	1.30	0.46	0.43	0.18
SKO-244	1.31	0.97	1.34	0.47	0.44	0.18
HFO-1009	1.10	0.84	1.27	0.40	0.59	0.19
OL-1977	1.28	1.02	1.20	0.51	0.48	0.14
HFO-1013	1.55	0.89	0.97	0.45	0.38	0.19
HFO-1003	1.09	0.87	0.95	0.45	0.40	0.17
JHO-20-1	1.45	0.66	1.12	0.46	0.46	0.19
OS-6 (NC)	1.18	0.71	1.14	0.45	0.42	0.16
Kent (NC)	1.50	0.91	1.10	0.39	0.45	0.19
OS-403 ZC (NWZ, NEZ, SZ)	1.31	0.98	1.18	0.52	0.45	0.16
Mean	**1.30**	**0.89**	**1.14**	**0.45**	**0.45**	**0.18**

Table 6.8: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Rah-uri	Urulikan-chan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
OL-1980	0.45	0.41	0.42	1.08	0.62	0.41	1.02	0.48	0.60	0.38	0.50	0.61	6
JO-08-37	0.62	0.39	0.60	1.12	0.51	0.31	0.98	0.54	0.53	0.40	0.60	0.63	4
SKO-244	0.59	0.39	0.49	1.72	0.74	0.40	0.97	0.31	0.47	0.45	0.60	0.66	3
HFO-1009	0.47	0.39	0.44	1.07	0.70	0.38	1.11	0.42	0.48	0.38	0.60	0.62	5
OL-1977	0.55	0.46	0.49	1.38	0.65	0.27	0.91	0.28	0.46	0.40	0.40	0.63	4
HFO-1013	0.38	0.29	0.52	1.52	0.70	0.31	1.49	0.49	0.46	0.38	0.40	0.67	2
HFO-1003	0.43	0.33	0.55	2.03	0.57	0.46	0.82	0.43	0.61	0.37	0.40	0.63	4
JHO-20-1	0.49	0.48	0.46	1.25	0.57	0.42	0.65	0.39	0.44	0.34	0.50	0.61	6
OS-6 (NC)	0.32	0.50	0.43	2.85	0.64	0.58	1.03	0.27	0.57	0.40	0.40	0.68	1
Kent (NC)	0.59	0.39	0.48	1.00	0.58	0.58	1.00	0.36	0.41	0.33	0.40	0.61	6
RO-11-1 ZC (CZ)	0.42	0.29	0.46	1.02	0.76	0.35	1.05						
OS-403 ZC (NWZ, NEZ, SZ)								0.38	0.59	0.41	0.60		
Mean	**0.48**	**0.39**	**0.49**	**1.46**	**0.64**	**0.41**	**1.00**	**0.40**	**0.51**	**0.39**	**0.49**	**0.64**	

Table 6.9: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): NDF (%)

Entries	NDF (%)							
	Pantnagar	Ludhiana	Anand	Rahuri	Palampur	Ranchi	Average	Rank
OL-1980	65.2	66.4	68.8	61.4	65.4	41.6	61.5	7
JO-08-37	62.6	58.9	69.3	54.6	64.0	47.6	59.5	1
SKO-244	64.0	63.7	67.0	62.2	65.4	44.5	61.1	5
HFO-1009	63.8	59.4	68.7	61.5	63.8	42.9	60.0	2
OL-1977	65.8	62.7	68.0	60.8	64.6	40.3	60.4	3
HFO-1013	64.0	64.5	69.6	61.2	63.8	46.8	61.6	8
HFO-1003	61.0	65.8	69.6	60.7	64.2	47.6	61.5	7
JHO-20-1	62.2	63.1	69.0	63.0	63.6	46.8	61.3	6
OS-6 (NC)	65.8	64.5	69.3	61.7	62.2	46.8	61.7	9
Kent (NC)	65.8	60.4	70.3	60.8	62.6	45.9	61.0	4
SKO-225 ZC (HZ)					64.8			
OS-403 ZC (NWZ, NEZ, SZ)	64.6	65.1				51.2		
RO-11-1 ZC (CZ)			70.9	61.2				
Mean	**64.1**	**63.1**	**69.1**	**60.8**	**64.0**	**45.6**	**61.0**	

Table 6.9: AVTO-1 (SC): Advanced Varietal Trial in Oat (Single Cut): ADF (%) & IVDMD (%)

Entries	ADF (%)								IVDMD (%)				
	Pant-nagar	Ludh-iana	Ana-nd	Rah-uri	Palam-pur	Ran-chi	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Ran-chi	Aver-age	Ra-nk
OL-1980	56.2	46.6	39.4	41.6	53.0	31.2	44.7	5	44.7	56.0	65.0	55.2	5
JO-08-37	53.4	38.4	37.5	31.1	54.0	36.4	41.8	9	46.9	64.4	61.1	57.5	1
SKO-244	54.0	41.5	37.9	43.1	56.6	34.2	44.6	6	45.8	54.9	62.7	54.5	6
HFO-1009	54.6	37.8	38.8	41.7	53.8	31.6	43.1	8	46.8	56.0	64.7	55.8	3
OL-1977	56.2	42.5	39.2	45.7	54.6	29.5	44.6	6	46.8	52.8	66.3	55.3	4
HFO-1013	54.6	44.8	41.1	39.2	53.4	35.6	44.8	4	43.8	58.0	61.7	54.5	7
HFO-1003	53.4	45.8	40.8	38.07	55.4	35.8	44.9	3	41.6	58.9	61.5	54.0	8
JHO-20-1	54.0	42.8	39.0	44.5	56.2	35.8	45.4	2	42.5	53.8	61.5	52.6	10
OS-6 (NC)	54.6	47.5	39.9	41.7	55.4	35.4	45.8	1	40.9	56.0	61.8	52.9	9
Kent (NC)	56.8	39.4	41.6	38.2	55.8	34.5	44.4	7	49.3	58.8	62.5	56.9	2
SKO-225 ZC (HZ)					55.0								
OS-403 ZC (NWZ, NEZ, SZ)	54.6	43.4				38.5			41.5		59.4		
RO-11-1 ZC (CZ)			40.8	42.8						55.1			
Mean	**54.8**	**42.8**	**39.6**	**40.7**	**54.8**	**34.4**	**44.4**		**44.6**	**56.8**	**62.6**	**54.9**	

7. AVTO (SC)-2: SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT)

(Reference tables 7.1 to 7.9)

In Second Advanced Varietal Trial Oat (Single cut)comprising of three entries JO-07-28, HFO-904 and HFO-906 along with two national checks (OS-6 and Kent) and one zonal check (SKO-96 for HZ, OS-403 for NWZ, NEZ, SZ and RO-11-1 for CZ) for respective zones were evaluated at 26 locations across the five zones. There were 3 locations in HZ, 5 in NWZ, 6 in NEZ, 8 in CZ and 4 locations in South zone.

In Hill zone, for GFY entries HFO-904 and JO-07-28 showed marginal superiority over the best check OS-6 by margins of 3.4% and 3.2% respectively. For DMY, entries JO-07-28, HFO-904 were superior by margins of 11.6% and 4.7% respectively over the best check. For crude protein yield, entries JO-07-28 and HFO-904 with value of 6.3% were marginally superior over the best check with value of 6.2%. For CP%, entry HFO-904 and check OS-6 were joint top ranker.

In NWZ for GFY, marginal superiority was shown by entries HFO-904 and HFO-906. For DMY, entry HFO-904 was superior by a margin of 5.8% over the best check. For crude protein yield as well as CP%, the zonal check was best performer.

In NEZ, for GFY and DMY as well as CPY, national check OS-6 was best performer. For CP% also, the national check was best.

In CZ, for GFY entry HFO-906 showed marginal superiority. For DMY, the national check was best. For CPY, the zonal check was best. For CP%, the national check performed best.

In SZ, the zonal or national check was best for GFY and DMY as well as CPY and CP%.

At all India level for GFY, entries HFO-904, HFO-906 and JO-07-28 showed superiority over the best national check Kent by margins of 9.2%, 6.6% and 1.5% respectively. For DMY, entries HFO-904, HFO-906 and JO-07-28 showed superiority over the best national check Kent by margins of 10.4%, 3.7% and 1.4% respectively. For CPY, entries HFO-906 and HFO-904 were marginally superior over the best check. For CP% entry HFO-906 was marginally superior over the checks.

For per day productivity, entries HFO-904 followed by HFO-906 with values of 5.14 and 5.07 respectively were marginally superior over the best check with value of 4.97 q/ha/day for green matter. For dry matter, entry HFO-904 (1.13) was superior over the best check Kent 1.06) and entry HFO-906 (1.06 q/ha/day). For plant height and leafiness, entry HFO-904 was top ranker followed by check. For other quality parameters, entry HFO-906 was best whereas checks were best for ADF% and IVDMD%.

8. AVTO (SC)-2 (SEED): SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) FOR SEED

(Reference table 8.1)

In Second Advanced Varietal Trial Oat (Single cut) for seed, comprising of three entries JO-07-28, HFO-904, HFO-906 along with two national checks (OS-6 and Kent) and one zonal check (SKO-96 for HZ, OS-403 for NWZ, NEZ, SZ and RO-11-1 for CZ) for respective zones were evaluated at 11 locations across the five zones. There were 2 locations in HZ, 2 in NWZ, 3 in NEZ, 2 in CZ and 2 locations in South zone.

Entry HFO-906 was top ranker in CZ showing marginal superiority over the best check. Entry JO-07-28 showed superiority of 8.6% in south zone. At all India level, entry HFO-904 and national check were joint first. In all other zones, the checks were superior.

Table 7.1: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	Hill Zone						North West Zone							
	Palampur	**Srinagar**	**Rajouri**	**Average**	**Rank**	**Superiority%**	**Bikaner**	**Hisar**	**Ludhiana**	**Pantnagar**	**Meerut**	**Average**	**Rank**	**Superiority (%)**
JO-07-28	303.7	362.3	270.0	312.0	2	3.2	349.4	570.1	555.8	588.2	500.4	512.8	5	
HFO-904	276.8	370.3	290.0	312.4	1	3.4	431.7	562.3	584.5	718.7	568.4	573.1	1	2.9
HFO-906	223.1	361.0	318.0	300.7	4		481.4	591.7	611.7	623.9	507.0	563.1	2	1.1
OS-6 (NC)	229.8	352.0	325.0	302.3	3		382.3	539.0	500.1	576.8	362.1	472.1	6	
Kent (NC)	275.0	346.7	252.0	291.2	5		430.8	617.0	558.9	656.4	406.9	534.0	4	
SKO-96 ZC (HZ)	281.1		293.0	287.1	6									
OS-403 ZC (NWZ, NEZ, SZ)							505.3	546.7	554.0	666.6	512.3	557.0	3	
Mean	**264.9**	**358.5**	**291.3**	**300.9**			**430.2**	**571.1**	**560.8**	**638.4**	**476.2**	**535.3**		
CD at 5%	**29.3**	**11.7**	**2.4**				79.3	**N/A**	**57.5**	**59.6**				
CV%	**6.6**	**1.9**	**8.1**				10.7	**7.69**	**11.3**	**9.7**				

Table 7.1: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	North East Zone								
	Jorhat	**Kalyani**	**Bhubaneswar**	**Ranchi**	**Pusa**	**Imphal**	**Average**	**Rank**	**Superiority (%)**
JO-07-28	280.7	391.6	302.0	371.7	563.3	431.1	390.1	5	
HFO-904	290.2	447.7	392.0	361.3	553.3	462.2	417.8	3	
HFO-906	281.3	388.3	326.0	343.7	540.0	488.9	394.7	4	
OS-6 (NC)	438.6	386.6	348.0	406.3	556.7	528.9	444.2	1	2.3
Kent (NC)	274.0	395.0	335.0	369.0	473.3	460.0	384.4	6	
OS-403 ZC (NWZ, NEZ, SZ)	422.3	372.2	432.0	425.7	466.7	486.7	434.3	2	
Mean	**331.2**	**396.9**	**355.8**	**379.6**	**525.6**	**476.3**	**410.9**		
CD at 5%	**2.9**	**23.5**	**31.9**	**45.3**	**49.7**	**17.8**			
CV%	**2.5**	**9.2**	**5.4**	**7.1**	**5.6**	**2.2**			

Table 7.1: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	Central Zone										
	Jhansi	**Rahuri**	**Urulikanchan**	**Anand**	**Jabalpur**	**Raipur**	**Dhari**	**** Karjat**	**Average**	**Rank**	**Superiority%**
JO-07-28	506.5	417.7	448.8	881.4	536.7	244.4	383.4	124.9	488.4	4	
HFO-904	552.8	416.6	567.7	897.8	426.7	339.4	380.6	164.8	511.7	3	
HFO-906	506.9	432.9	643.5	974.7	523.3	256.9	389.0	193.0	532.5	1	2.6
OS-6 (NC)	429.2	402.0	476.6	711.1	450.0	294.4	355.6	187.7	445.6	6	
Kent (NC)	435.6	441.6	494.2	877.2	436.7	311.1	419.5	210.8	488.0	5	
RO-11-1 ZC (CZ)	499.1	519.4	388.6	841.7	650.0	291.0	444.5	131.8	519.2	2	
Mean	**488.3**	**438.4**	**503.2**	**864.0**	**503.9**	**289.6**	**395.4**	**168.8**	**497.5**		
CD at 5%	**22.1**	**50.5**	52.2	**150.9**	**5.7**	**41.2**		**39.3**			
CV%	**13.2**	**6.9**	6.1	**10.1**	**6.8**	**8.1**		**12.0**			

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 7.1: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	**Mandya**	**Coimbatore**	**Mattupetty**	**Average**	**Rank**	**Average**	**Rank**	**Superiority%**
JO-07-28	252.1	197.9	350.0	440.0	310.0	3	420.0	3	1.5
HFO-904	254.0	295.8	438.9	417.0	351.4	2	451.9	1	9.2
HFO-906	318.5	184.8	318.1	397.0	304.6	4	441.3	2	6.6
OS-6 (NC)	243.2	212.4	398.6	363.0	304.3	5	410.7	5	
Kent (NC)	243.6	187.9	309.7	337.0	269.6	6	413.8	4	
OS-403 ZC (NWZ, NEZ, SZ)	324.6	301.9	425.0	493.0	386.1	1			
Mean	**272.7**	**230.1**	**373.4**	**407.8**	**321.0**		**427.5**		
CD at 5%	**48.6**	**36.4**	**40.1**	**11.3**					
CV%	**10.3**	**10.0**	**6.4**	**1.7**					

Table 7.2: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	Hill Zone					North West Zone						
	Palampur	Srinagar	Average	Rank	Superiority%	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank	Superiority (%)
JO-07-28	74.2	67.7	71.0	1	10.7	70.2	132.4	118.4	111.7	108.2	4	
HFO-904	63.6	69.7	66.6	2	3.9	95.0	131.1	122.2	163.9	128.0	1	5.8
HFO-906	56.4	67.9	62.2	6		97.2	127.4	130.9	115.4	117.7	3	
OS-6 (NC)	57.5	69.7	63.6	4		84.1	124.1	99.0	122.3	107.4	5	
Kent (NC)	58.2	67.5	62.9	5		81.9	135.3	119.6	147.2	121.0	2	
SKO-96 ZC (HZ)	64.1		64.1	3								
OS-403 ZC (NWZ, NEZ, SZ)						94.5	128.6	114.1	146.7	121.0	2	
Mean	**62.3**	**68.5**	**65.1**			**87.2**	**129.8**	**117.4**	**134.5**	**117.2**		
CD at 5%	**7.1**	**8.5**				**16.1**	**NA**	**36.8**	**15.2**			
CV%	**6.8**	**7.6**				**10.7**	**6.0**	**9.7**	**12.2**			

Table 7.2: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	North East Zone							
	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Imphal	Average	Rank
JO-07-28	51.9	84.0	68.9	76.2	138.9	107.9	88.0	4
HFO-904	56.5	101.1	88.5	70.5	136.1	110.1	93.8	3
HFO-906	50.6	88.0	70.0	65.9	132.1	116.7	87.2	5
OS-6 (NC)	83.2	72.6	81.6	80.6	137.2	134.6	98.3	1
Kent (NC)	51.4	82.8	71.1	70.7	116.0	107.8	83.3	6
OS-403 ZC (NWZ, NEZ, SZ)	82.5	80.3	98.8	85.1	114.4	126.6	98.0	2
Mean	**62.7**	**84.8**	**79.8**	**74.8**	**129.1**	**117.3**	**91.4**	
CD at 5%	**3.1**	**16.9**	**6.6**		**12.6**	**17.1**		
CV%	**6.3**	**11.5**	**4.9**		**5.8**	**8.7**		

Table 7.2: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	Central Zone									
	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	** Kar-jat	Aver-age	Ra-nk
JO-07-28	74.5	90.5	76.0	161.7	148.3	57.3	105.5	34.7	106.5	5
HFO-904	86.5	97.8	102.0	159.9	125.5	72.6	119.4	41.0	112.9	3
HFO-906	80.6	94.6	117.3	164.1	144.7	56.8	102.7	47.8	113.4	2
OS-6 (NC)	80.8	86.6	79.1	106.5	131.1	60.1	105.5	45.4	94.8	6
Kent (NC)	75.2	79.7	100.8	168.6	123.1	54.5	122.2	54.4	108.1	4
RO-11-1 ZC (CZ)	88.4	123.7	72.1	165.7	164.6	56.3	127.7	34.5	118.4	1
Mean	**81.0**	**95.5**	**91.2**	**154.4**	**139.6**	**59.6**	**113.8**	**43.0**	**109.0**	
CD at 5%	**13.2**	**10.8**	**8.9**	**26.2**	**1.2**	**9.5**		**9.4**		
CV%	**7.9**	**6.8**	**5.8**	**10.3**	**6.5**	**8.9**		**11.5**		

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 7.2: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Coimbatore	Mattupetty	Average	Rank	Average	Rank	Superiority%
JO-07-28	55.7	49.5	76.0	110.1	72.8	3	91.6	3	1.5
HFO-904	54.5	72.4	90.7	104.2	80.5	2	99.7	1	10.4
HFO-906	66.6	39.5	69.7	99.2	68.8	4	93.7	2	3.7
OS-6 (NC)	41.4	51.4	80.7	91.0	66.1	5	89.6	5	
Kent (NC)	45.9	37.6	67.1	92.5	60.8	6	90.3	4	
OS-403 ZC (NWZ, NEZ, SZ)	69.5	75.1	82.1	123.4	87.5	1			
Mean	**55.6**	**54.3**	**77.7**	**103.4**	**72.7**		**93.0**		
CD at 5%	**13.6**	**9.7**	**8.9**	**10.0**					
CV%	**14.0**	**11.8**	**6.8**	**5.9**					

Table 7.3: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa
JO-07-28	3.60	4.94	4.40	5.94	3.12	4.00	4.25	4.04	6.43
HFO-904	4.45	4.82	4.60	7.19	3.22	4.57	5.30	3.91	6.46
HFO-906	4.96	5.01	4.80	6.37	3.13	3.96	4.72	3.68	6.21
OS-6 (NC)	3.94	4.63	3.90	5.89	5.16	3.94	5.04	4.58	6.57
Kent (NC)	4.44	5.24	4.40	6.77	3.34	4.03	4.93	4.21	5.48
OS-403 ZC (NWZ, NEZ, SZ)	5.21	4.70	4.40	6.41	4.45	3.80	5.84	4.36	5.49
Mean	**4.43**	**4.89**	**4.42**	**6.43**	**3.74**	**4.05**	**5.01**	**4.13**	**6.11**

Table 7.3: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Ana-nd	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
JO-07-28	4.62	4.82	5.22	1.92	9.79	2.75	4.60	3.33	2.72	4.12	9.80	4.72	5
HFO-904	5.04	4.66	6.38	2.70	9.65	3.81	4.30	3.39	3.98	5.16	9.20	5.14	1
HFO-906	4.65	5.09	8.04	2.76	10.95	2.95	4.90	4.13	2.50	3.74	8.80	5.07	2
OS-6 (NC)	3.97	5.11	6.11	3.03	8.57	3.93	4.60	3.53	3.11	4.86	8.10	4.93	4
Kent (NC)	3.97	5.54	6.34	3.10	10.57	3.99	5.30	3.19	2.52	3.87	8.20	4.97	3
RO-11-1 ZC (CZ)	4.51	5.56	4.09	1.88	9.15	3.13	5.00						
OS-403 ZC (NWZ, NEZ, SZ)								4.33	4.04	4.67	10.90		
Mean	**4.46**	**5.13**	**6.03**	**2.57**	**9.78**	**3.43**	**4.78**	**3.65**	**3.15**	**4.40**	**9.17**	**4.97**	

Table 7.4: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa
JO-07-28	0.72	1.15	0.90	1.13	0.58	0.86	0.97	0.83	1.59
HFO-904	0.98	1.12	1.00	1.64	0.63	1.03	1.20	0.76	1.59
HFO-906	1.00	1.08	1.00	1.18	0.56	0.90	1.01	0.71	1.52
OS-6 (NC)	0.87	1.06	0.80	1.25	0.98	0.74	1.18	0.91	1.62
Kent (NC)	0.84	1.15	0.90	1.52	0.63	0.84	1.05	0.81	1.34
OS-403 ZC (NWZ, NEZ, SZ)	0.97	1.11	0.90	1.41	0.87	0.82	1.33	0.87	1.35
Mean	**0.90**	**1.11**	**0.92**	**1.36**	**0.71**	**0.87**	**1.12**	**0.81**	**1.50**

Table 7.4: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Ana-nd	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
JO-07-28	0.68	1.04	0.88	0.53	1.80	0.64	1.30	0.74	0.68	0.89	2.40	1.02	4
HFO-904	0.79	1.09	1.15	0.67	1.72	0.82	1.40	0.73	0.98	1.07	2.30	1.13	1
HFO-906	0.74	1.11	1.47	0.68	1.84	0.65	1.30	0.87	0.54	0.82	2.20	1.06	2
OS-6 (NC)	0.75	1.10	1.01	0.73	1.28	0.80	1.40	0.60	0.75	0.98	2.00	1.04	3
Kent (NC)	0.69	1.00	1.29	0.80	2.03	0.70	1.50	0.60	0.50	0.84	2.10	1.06	2
RO-11-1 ZC (CZ)	0.80	1.33	0.76	0.49	1.80	0.61	1.40						
OS-403 ZC (NWZ, NEZ, SZ)								0.93	1.01	0.90	2.50		
Mean	**0.74**	**1.11**	**1.09**	**0.65**	**1.75**	**0.70**	**1.38**	**0.75**	**0.74**	**0.92**	**2.25**	**1.06**	

Table 7.5: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	HZ		NWZ					
	Palampur	Rank	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank
JO-07-28	6.3	1	6.5	11.2	10.7	10.8	9.8	4
HFO-904	6.3	1	5.4	10.6	7.9	14.3	9.6	5
HFO-906	5.5	5	8.7	11.7	12.0	11.1	10.9	2
OS-6 (NC)	5.7	4	10.3	9.4	6.1	11.8	9.4	6
Kent (NC)	5.8	3	4.5	11.3	11.5	15.5	10.7	3
SKO-96 ZC (HZ)	6.2	2						
OS-403 ZC (NWZ, NEZ, SZ)			9.8	11.7	8.7	15.4	11.4	1
Mean	**5.9**		**7.5**	**11.0**	**9.5**	**13.1**		

Table 7.5: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	NEZ							CZ						
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Imp-hal	Aver-age	Ra-nk	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
JO-07-28	6.1	10.0	6.3	3.9	7.8	6.8	5	10.2	5.0	18.0	10.0	4.0	7.7	5
HFO-904	6.9	13.5	8.1	4.2	9.1	8.4	3	5.9	7.7	15.8	7.6	7.2	7.9	4
HFO-906	6.4	11.5	6.8	3.4	9.5	7.5	4	6.8	9.3	19.1	9.6	5.5	8.3	2
OS-6 (NC)	10.1	8.9	7.2	4.7	13.7	8.9	1	6.7	4.9	12.1	8.2	5.2	7.7	5
Kent (NC)	6.2	9.5	6.9	6.2	8.8	7.5	4	7.7	7.0	18.3	7.5	5.2	8.0	3
OS-403 ZC (NWZ, NEZ, SZ)	11.5	9.4	8.9	3.9	10.0	8.7	2							
RO-11-1 ZC (CZ)								10.2	5.3	15.7	12.1	4.8	8.9	1
Mean	**7.9**	**10.4**	**7.4**	**4.4**	**9.8**	**8.0**		**7.9**	**6.5**	**16.5**	**9.2**	**5.3**	**8.1**	

Table 7.5: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	SZ					All India	
	Hyderabad	Mandya	Coimbatore	Average	Rank	Average	Rank
JO-07-28	4.6	3.9	4.0	4.2	3	7.7	3
HFO-904	3.6	4.4	5.5	4.5	2	8.0	2
HFO-906	4.7	2.9	4.9	4.2	3	8.3	1
OS-6 (NC)	3.5	4.5	5.6	4.5	2	7.7	3
Kent (NC)	3.4	2.8	4.7	3.6	4	7.9	4
OS-403 ZC (NWZ, NEZ, SZ)	5.4	5.6	4.7	5.2	1		
Mean	**4.2**	**4.0**	**4.9**	**4.4**		**7.9**	

Table 7.6: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	HZ		NWZ					
	Palampur	Rank	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank
JO-07-28	8.5	3	9.3	8.5	9.0	9.6	9.1	3
HFO-904	9.9	1	5.7	8.1	6.5	8.8	7.3	6
HFO-906	9.6	2	8.9	9.2	9.2	9.6	9.2	2
OS-6 (NC)	9.9	1	12.2	7.6	6.2	9.6	8.9	4
Kent (NC)	9.9	1	5.5	8.4	9.6	10.5	8.5	5
SKO-96 ZC (HZ)	9.6	2						
OS-403 ZC (NWZ, NEZ, SZ)			10.4	9.1	7.6	10.5	9.4	1
Mean	**9.6**		**8.7**	**8.5**	**8.0**	**9.8**	**8.7**	

Table 7.6: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	NEZ							CZ						
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Imp-hal	Aver-age	Ra-nk	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
JO-07-28	12.0	11.9	9.1	5.1	7.2	9.0	5	11.3	6.5	11.1	8.2	7.0	8.8	3
HFO-904	12.3	13.3	9.2	6.0	8.3	9.8	3	6.8	7.5	9.9	8.1	9.9	8.4	4
HFO-906	12.9	13.1	9.7	5.1	8.1	9.8	3	7.2	7.9	11.6	8.2	9.7	8.9	2
OS-6 (NC)	12.2	12.3	8.8	5.8	10.2	9.9	2	7.7	6.2	11.4	8.2	8.6	8.4	4
Kent (NC)	12.2	11.4	9.8	8.8	8.1	10.1	1	9.6	7.0	10.9	8.1	9.5	9.0	1
OS-403 ZC (NWZ, NEZ, SZ)	14.1	11.7	9.1	4.6	7.9	9.5	4							
RO-11-1 ZC (CZ)								8.2	7.3	9.5	8.3	8.5	8.4	4
Mean	**12.6**	**12.3**	**9.3**	**5.9**	**8.3**	**9.7**		**8.5**	**7.1**	**10.7**	**8.2**	**8.9**	**8.7**	

Table 7.6: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	SZ					All India	
	Hyderabad	Mandya	Coimbatore	Average	Rank	Average	Rank
JO-07-28	8.2	7.9	5.3	7.1	3	8.6	3
HFO-904	6.6	6.1	6.1	6.3	5	8.3	4
HFO-906	7.0	7.4	7.0	7.1	3	9.0	1
OS-6 (NC)	8.4	8.7	7.0	8.0	1	8.9	2
Kent (NC)	7.4	7.4	7.0	7.3	2	8.9	2
OS-403 ZC (NWZ, NEZ, SZ)	7.8	7.4	5.7	7.0	4		
Mean	**7.6**	**7.5**	**6.4**	**7.1**		**8.8**	

Table 7.7: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Palam-pur	Sri-nagar	Bika-ner	Ludh-iana	Pant-nagar	Mee-rut	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa
JO-07-28	114.3	83.1	142.0	147.9	173.8	205.0	136.7	167.6	119.2	156.2	135.0
HFO-904	145.7	111.4	141.8	150.3	166.6	210.0	130.1	174.5	143.0	142.9	160.7
HFO-906	133.7	101.4	154.0	133.0	163.9	215.0	130.1	182	127.7	150.1	155.0
OS-6 (NC)	141.0	91.1	156.6	133.8	169.2	215.0	140.2	166.3	135.4	147.8	146.7
Kent (NC)	116.3	96.3	143.0	147.1	153.4	180.0	116.3	161.5	130.2	147.4	141.0
SKO-96 ZC (HZ)	117.7										
OS-403 ZC (NWZ, NEZ, SZ)			164.4	143.8	176.5	230.0	166.5	163.9	149.7	160.8	158.7
Mean	**128.1**	**96.7**	**150.3**	**142.7**	**167.2**	**209.2**	**136.7**	**169.3**	**134.2**	**150.9**	**149.5**

Table 7.7: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Imp-hal	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
JO-07-28	166.2	141.8	123.9	132.7	109.3	137.1	139.1	139.8	140.0	103.5	84.4	120.5	127.0	135.3	4
HFO-904	169.4	165.7	121.9	129.0	124.1	138.4	117.4	140.6	134.0	93.2	94.6	128.5	117.0	139.6	1
HFO-906	168.8	142.8	115.9	120.0	105.9	140.9	136.5	140.7	138.0	99.3	74.1	127.5	129.0	136.9	3
OS-6 (NC)	163.0	155.2	122.0	129.0	115.5	137.7	130.0	128.1	141.3	101.9	85.1	129.0	123.0	137.7	2
Kent (NC)	157.8	130.1	125.8	114.2	120.9	132.8	116.9	125.9	129.0	87.1	72.3	118.5	119.0	128.5	5
OS-403 ZC (NWZ, NEZ, SZ)	176.2									113.4	103.8	129.0	116.0		
RO-11-1 ZC (CZ)		144.1	133.8	139.1	128.3	136.9	155.1	148.8	148.7						
Mean	**166.9**	**146.6**	**123.9**	**127.3**	**117.3**	**137.3**	**132.5**	**137.3**	**138.5**	**99.7**	**85.7**	**125.5**	**121.8**	**135.6**	

Table 7.8: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Palampur	Srinagar	Bikaner	Hisar	Ludhiana	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Imphal
JO-07-28	0.42	0.34	0.83	0.48	0.75	0.51	1.45	0.56	1.08	0.40	0.50	0.23
HFO-904	0.38	0.25	1.35	0.68	0.85	0.62	1.47	0.86	1.21	0.48	15.64	0.17
HFO-906	0.28	0.32	0.96	0.57	0.75	0.54	1.12	0.51	1.05	0.46	0.38	0.18
OS-6 (NC)	0.31	0.30	1.17	0.65	0.60	0.58	1.18	0.71	1.14	0.45	0.42	0.16
Kent (NC)	0.62	0.28	0.71	0.62	0.60	0.46	1.50	0.91	1.10	0.39	0.45	0.19
SKO-96 ZC (HZ)	0.43											
OS-403 ZC (NWZ, NEZ, SZ)			0.97	0.49	0.77	0.96	1.31	0.98	1.18	0.52	0.45	0.16
Mean	**0.41**	**0.30**	**1.00**	**0.58**	**0.72**	**0.61**	**1.34**	**0.76**	**1.13**	**0.45**	**2.97**	**0.18**

Table 7.8: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Karjat	Anand	Jabalpur	Raipur	Dhari	Hyderabad	Mandya	Coimbatore	Mattupetty	Average	Rank
JO-07-28	0.39	0.33	0.51	1.63	0.67	0.32	1.03	0.48	0.56	0.40	0.50	0.62	3
HFO-904	0.59	0.42	0.52	1.52	0.60	0.37	1.19	0.44	0.59	0.43	0.60	1.36	1
HFO-906	0.41	0.57	0.48	1.38	0.66	0.27	1.22	0.39	0.44	0.37	0.50	0.60	5
OS-6 (NC)	0.32	0.50	0.43	2.85	0.64	0.58	1.03	0.27	0.57	0.40	0.40	0.68	2
Kent (NC)	0.59	0.39	0.48	1.00	0.58	0.58	1.00	0.36	0.41	0.33	0.40	0.61	4
RO-11-1 ZC (CZ)	0.42	0.29	0.46	1.02	0.76	0.35	1.05						
OS-403 ZC (NWZ, NEZ, SZ)								0.38	0.59	0.41	0.60		
Mean	**0.45**	**0.42**	**0.48**	**1.57**	**0.65**	**0.41**	**1.09**	**0.39**	**0.53**	**0.39**	**0.50**	**0.77**	

Table 7.9: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): NDF (%)

Entries	NDF (%)							
	Pantnagar	Ludhiana	Anand	Rahuri	Palampur	Ranchi	Average	Rank
JO-07-28	63.4	59.8	69.1	61.4	64.2	48.5	61.1	3
HFO-904	62.6	66.4	70.0	67.2	63.0	46.5	62.6	5
HFO-906	63.2	61.2	68.8	62.4	62.2	47.5	60.9	1
OS-6 (NC)	65.8	64.5	69.3	61.7	62.2	46.8	61.7	4
Kent (NC)	65.8	60.4	70.3	60.8	62.6	45.9	61.0	2
SKO-96 ZC (HZ)					64.0			
OS-403 ZC (NWZ, NEZ, SZ)	64.6	65.1				51.2		
RO-11-1 ZC (CZ)			70.9	61.2				
Mean	**64.2**	**62.9**	**69.7**	**62.4**	**63.0**	**47.7**	**61.4**	

Table 7.9: AVTO-2 (SC): Second Advanced Varietal Trial in Oat (Single Cut): ADF (%) & IVDMD (%)

Entries	ADF (%)								IVDMD (%)				
	Pant-nagar	Ludh-iana	Ana-nd	Rah-uri	Palam-pur	Ran-chi	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Ran-chi	Aver-age	Ra-nk
JO-07-28	55.8	39.7	42.1	40.3	55.8	37.6	45.2	2	45.8	57.1	60.1	54.3	2
HFO-904	53.6	45.7	40.1	44.8	54.0	33.5	45.3	3	41.7	53.6	63.3	52.9	4
HFO-906	54.0	40.7	41.4	44.1	57.6	36.4	45.7	4	44.7	54.1	61.1	53.3	3
OS-6 (NC)	54.6	47.5	39.9	41.7	55.4	35.4	45.8	5	40.9	56.0	61.8	52.9	4
Kent (NC)	56.8	39.4	41.6	38.2	55.8	34.5	44.4	1	49.3	58.8	62.5	56.9	1
SKO-96 ZC (HZ)					55.8								
OS-403 ZC (NWZ, NEZ, SZ)	54.6	43.4				38.5			41.5		59.4		
RO-11-1 ZC (CZ)			40.8	42.8						55.1			
Mean	**54.9**	**42.7**	**41.0**	**42.0**	**55.7**	**36.0**	**45.3**		**44.0**	**55.8**	**61.4**	**54.1**	

Table 8.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oats (Single Cut) (Seed): Seed Yield (q/ha)

Entries	Seed Yield (q/ha)							
	Hill Zone				North West Zone			
	Palampur	Srinagar	Average	Rank	Hisar	Ludhiana	Average	Rank
HFO-904	28.7	21.3	25.0	3	28.6	27.7	28.2	3
HFO-906	27.3	20.6	23.9	4	26.7	28.2	27.4	5
JO-07-28	24.8	22.6	23.7	5	28.3	27.8	28.1	4
OS-6 (NC)	29.6	21.4	25.5	2	24.2	29.9	27.0	6
Kent (NC)	30.1	23.0	26.5	1	31.1	28.7	29.9	2
SKO-96 ZC (HZ)	23.8	21.1	22.4	6				
OS-403 ZC (NWZ, NEZ, SZ)					31.7	29.3	30.5	1
Mean	**27.4**	**21.7**	**24.5**		**28.4**	**28.6**	**28.5**	
CD at 5%	**3.7**	**1.40**			**N/A**	**2.2**		
CV%	**7.3**	**4.43**			**18.7**	**7.7**		

Table 8.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oats (Single Cut) (Seed): Seed Yield (q/ha)

Entries	Seed Yield (q/ha)														
	North East Zone					Central Zone			South Zone					All India	
	Jor-hat	Ka-lyani	Ran-chi	Aver-age	Ra-nk	** Rah-uri	Urulikan-chan	Ra-nk	Hydera-bad	Man-dya	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk
HFO-904	14.2	10.2	32.9	19.1	2	10.4	25.0	3	9.7	10.8	10.3	3		20.9	1
HFO-906	13.5	8.1	29.9	17.2	4	9.2	26.2	1	10.2	10.1	10.2	4		20.1	3
JO-07-28	12.4	9.5	26.0	16.0	5	8.9	19.0	5	11.2	12.9	12.1	1	8.6	19.4	4
OS-6 (NC)	14.4	9.8	34.8	19.6	1	12.4	25.1	2	7.5	12.5	10.0	5		20.9	1
Kent (NC)	9.5	9.2	26.8	15.1	6	10.9	22.7	4	12.0	10.2	11.1	2		20.3	2
OS-403 ZC (NWZ, NEZ, SZ)	15.0	12.5	24.8	17.4	3				8.5	11.1	9.8	6			
RO-11-1 ZC (CZ)						10.4	15.3	6							
Mean	**13.1**	**9.9**	**29.2**	**17.4**		**10.3**	**22.2**		**9.9**	**11.3**	**10.6**			**20.3**	
CD at 5%	**0.8**		**5.2**			**2.0**	**3.3**		**2.1**	**1.7**					
CV%	**6.0**		**11.9**			**12.8**	**9.9**		**14.1**	**10.1**					

Note: ** Data is not included in zonal and all India average due to low yield of data

9. IVTO-MC: INITIAL VARIETAL TRIAL IN OAT (MULTI CUT)

(Reference tables 9.1 to 9.9)

In **Initial Varietal Trial in Oat (Multi cut)** [**IVTO-MC],** fourteen (14) entries were evaluated against two national checks (RO-19 and UPO-212) at 15 locations in four zones (HZ, NWZ, NEZ, and CZ). There were 2 locations in HZ, 3 in NWZ, 5 in NEZ and 5 in central zone.

In Hill zone for GFY, all entries performed better than the checks. The margin of superiority over the best check were FO-21-2 (22.0%), HFO-1121 (17.4%), HFO-1123 (16.9%), UPO-21-2 (15.4%), JHO-21-3 (13.9%), OL-1969 (13.4%), BAUO-103 (13.1%), JHO-21-4 (10.4%), JO-08-335 (10.3%), BAUO-104 (10.1%), FO-21-1 (8.1%), OL-1931-2 (7.1%). For DMY, the margin of superiority over the best check were FO-21-2 (11.9%), HFO-1121 (9.0%), FO-21-1 (8.8%), JHO-21-3 (7.8%), OL-1969 (7.6%), HFO-1123 (5.3%), For CPY, almost all the entries performed better than the national checks. Top ranking entries include HFO-1121 (4.2), FO-21-2 (4.1), BAUO-103 (4.0), and OL-1969 (4.0) as compared to 2.8q/ha of best check UPO-212. For CP% the national check ranked first.

In NWZ for GFY, entries showing more than 5% superiority over the best check were OL-1969 (10.7%), OL-1931-2 (7.2%), and FO-21-1 (6.9%). For DMY, entries showing more than 5% superiority over the best check were OL-1969 (9.7%), OL-1931-2 (6.0%), and FO-21-1 (5.0%). Entry OL-1969 showed marginal superiority over the best check for CPY. For CP% entry JHO-21-4 was marginally better than the best check.

In NEZ for GFY and DMY as well as CPY, national check RO-19 ranked first. Entry FO-21-1 was slightly better than the best check for CP%.

In CZ for GFY, national check RO-19 ranked first. For DMY entry JO-08-335 showed marginal superiority over the best check. For CPY, entry JO-08-335 was the only entry showing more than 5% superiority over the best check. Entries OL-1975, FO-21-2, OL-1931-2 showed more than 5% improvement over the best check UPO-212 (9.4%) for CP%.

At all India level for GFY and DMY as well as CPY, national check RO-19 ranked first. For CP% entry JHO-21-4 was marginally better than the best check.

For per day productivity, entry OL-1931-2 followed by national check RO-19 for green matter and national check RO-19 for dry matter were best performers. For plant height, national check RO-19 ranked first. For leafiness, the best performing entry was JHO-21-4 followed by FO-21-1.

For other quality parameters, the best ranking entries were PLP-29 for NDF%, JHO-21-4 for ADF% and IVDMD%

Table 9.1: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha)

Entries	Hill Zone					North West Zone					
	Palampur	**Srinagar**	**Average**	**Rank**	**Superiority (%)**	**Ludhiana**	**Hisar**	**Jalore**	**Average**	**Rank**	**Superiority%**
BAUO-103	216.2	285.0	250.6	7	13.1	562.8	628.1	509.1	566.7	5	3.0
FO-21-2	224.8	316.0	270.4	1	22.0	570.4	601.1	508.3	559.9	6	1.8
HFO-1121	227.6	292.7	260.1	2	17.4	563.7	600.3	536.3	566.8	4	3.0
JHO-21-4	164.8	324.3	244.5	8	10.4	525.2	564.8	265.2	451.7	16	
UPO-21-2	189.5	321.7	255.6	4	15.4	557.8	558.1	326.0	480.6	15	
BAUO-104	157.1	330.7	243.9	10	10.1	517.8	632.9	361.6	504.1	12	
JO-08-335	190.5	298.3	244.4	9	10.3	587.2	559.6	328.5	491.8	14	
OL-1975	144.8	314.3	229.5	14	3.6	650.2	642.5	376.9	556.5	7	1.1
HFO-1123	193.3	324.7	259.0	3	16.9	629.6	604.8	422.6	552.3	8	0.4
JHO-21-3	169.5	335.0	252.3	5	13.9	598.3	667.7	387.7	551.2	9	0.2
PLP-29	174.3	300.7	237.5	12	7.2	581.5	563.7	343.8	496.3	13	
OL-1969	187.6	314.7	251.1	6	13.4	656.5	702.2	468.3	609.0	1	10.7
OL-1931-2	164.8	309.7	237.2	13	7.1	589.1	707.7	472.4	589.7	2	7.2
FO-21-1	164.8	314.3	239.5	11	8.1	680.3	597.4	486.3	588.0	3	6.9
UPO-212 (NC)	104.3	305.0	204.6	16		483.9	651.8	388.3	508.0	11	
RO-19 (NC)	144.8	298.3	221.5	15		589.4	627.0	434.4	550.3	10	
Mean	**176.2**	**311.6**	**243.9**			**584.0**	**619.3**	**413.5**	**538.9**		
CD at 5%	**58.7**	**9.6**				**61.5**	**68.2**				
CV%	**19.9**	**1.9**				**12.2**	**6.6**				

Table 9.1: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha)

Entries	North East Zone						
	Jorhat	Bhubaneswar	Ranchi	Pusa	Imphal	Average	Rank
BAUO-103	411.6	331.9	352.4	680.0	498.3	454.9	8
FO-21-2	399.1	293.3	262.2	563.3	550.7	413.7	14
HFO-1121	472.0	298.6	380.9	640.0	537.0	465.7	4
JHO-21-4	295.6	288.9	287.1	723.3	454.3	409.8	16
UPO-21-2	372.8	468.6	343.5	623.3	446.5	450.9	11
BAUO-104	491.6	343.3	241.8	530.0	512.9	423.9	14
JO-08-335	436.3	357.9	266.7	653.3	540.6	451.0	10
OL-1975	449.6	302.6	355.1	510.0	523.4	428.1	13
HFO-1123	491.2	348.6	266.7	673.3	509.5	457.9	7
JHO-21-3	465.7	435.9	351.5	523.3	572.5	469.8	2
PLP-29	430.8	320.6	278.7	533.3	500.2	412.7	15
OL-1969	434.7	412.6	268.4	616.7	531.2	452.7	9
OL-1931-2	539.0	388.6	317.3	616.7	482.6	468.8	3
FO-21-1	406.9	457.2	354.7	610.0	474.1	460.6	5
UPO-212 (NC)	367.7	285.3	317.8	650.0	568.2	437.8	12
RO-19 (NC)	458.2	491.9	320.9	546.7	628.4	489.2	1
Mean	**432.7**	**364.1**	**310.4**	**605.8**	**520.7**	**446.7**	
CD at 5%	**5.9**	**34.4**	**49.7**	**51.5**			
CV%	**4.6**	**5.7**	**9.6**	**5.0**			

Table 9.1: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha)

Entries	Central Zone							All India	
	Jhansi	Rahuri	Anand	Jabalpur	Urulikanchan	Average	Rank	Average	Rank
BAUO-103	435.2	597.3	629.3	621.9	553.6	567.5	13	487.5	10
FO-21-2	400.0	551.2	819.3	607.4	461.3	567.8	12	475.2	14
HFO-1121	431.9	685.9	780.7	597.2	617.0	622.5	6	510.8	3
JHO-21-4	407.9	519.9	711.5	520.8	475.2	527.0	14	435.2	15
UPO-21-2	435.6	762.7	577.8	594.1	598.4	593.7	11	478.4	12
BAUO-104	460.6	630.4	647.4	636.7	654.9	606.0	8	476.6	13
JO-08-335	467.1	675.7	858.5	692.8	608.0	660.4	2	501.4	8
OL-1975	475.5	665.4	710.7	706.0	584.5	628.4	5	494.1	9
HFO-1123	465.7	700.9	712.6	698.9	528.5	621.3	7	504.7	6
JHO-21-3	457.4	641.9	656.3	730.5	679.4	633.1	3	511.5	4
PLP-29	442.6	673.8	790.0	667.2	592.0	633.1	3	479.5	11
OL-1969	465.7	658.3	707.0	648.6	501.8	596.3	10	505.0	5
OL-1931-2	450.9	684.0	670.4	695.7	641.6	628.5	4	515.4	2
FO-21-1	431.9	586.3	816.3	726.5	432.5	598.7	9	502.6	7
UPO-212 (NC)	368.5	355.6	647.4	489.0	531.7	478.5	15	434.3	16
RO-19 (NC)	466.7	724.7	710.0	719.5	693.3	662.8	1	523.6	1
Mean	**441.5**	**632.1**	**715.3**	**647.0**	**572.1**	**601.6**		**489.7**	
CD at 5%	**25.0**	**68.1**	**125.4**		**93.8**				
CV%	**15.0**	**6.6**	**10.5**		**9.8**				

Table 9.2: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Dry Matter Yield (q/ha)

Entries	Hill Zone					North West Zone					
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority (%)	Ludh-iana	His-ar	Jal-ore	Aver-age	Ra-nk	Superi-ority%
BAUO-103	38.8	60.0	49.4	11	1.0	114.8	175.3	89.1	126.4	4	3.5
FO-21-2	43.8	65.7	54.8	1	11.9	117.5	165.3	88.7	123.8	6	1.4
HFO-1121	41.9	64.8	53.3	2	9.0	109.4	163.9	93.5	122.3	8	0.1
JHO-21-4	34.3	67.2	50.7	9	3.7	99.3	149.1	47.0	98.5	15	
UPO-21-2	33.4	68.1	50.7	9	3.7	101.5	144.1	57.4	101.0	14	
BAUO-104	28.2	64.0	46.1	14		106.7	175.4	64.1	115.4	11	
JO-08-335	37.7	62.9	50.3	10	2.8	124.5	152.7	58.3	111.9	12	
OL-1975	26.4	68.5	47.5	13		130.0	178.1	65.7	124.6	5	2.0
HFO-1123	33.8	69.2	51.5	6	5.3	130.3	160.0	74.1	121.5	10	
JHO-21-3	36.9	68.6	52.7	4	7.8	124.5	173.0	69.7	122.4	7	0.2
PLP-29	34.8	67.2	51.0	8	4.2	120.9	142.4	60.4	107.9	13	
OL-1969	36.3	69.0	52.6	5	7.6	136.5	181.7	83.8	134.0	1	9.7
OL-1931-2	30.4	72.1	51.3	7		122.5	182.7	83.3	129.5	2	6.0
FO-21-1	33.7	72.7	53.2	3	8.8	141.5	156.7	86.6	128.2	3	5.0
UPO-212 (NC)	24.5	65.6	45.1	15		92.4	174.9	67.6	111.6	13	
RO-19 (NC)	26.4	71.4	48.9	12		122.6	167.4	76.4	122.1	9	
Mean	**33.8**	**67.3**	**50.6**			**118.4**	**165.2**	**72.9**	**118.8**		
CD at 5%	**5.3**	**3.6**				**22.6**	**18.8**				
CV%	**9.4**	**3.2**				**10.6**	**6.8**				

Table 9.2: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Dry Matter Yield (q/ha)

Entries	North East Zone						
	Jorhat	Bhubaneswar	Ranchi	Pusa	Imphal	Average	Rank
BAUO-103	77.1	74.4	59.5	120.1	67.2	79.6	6
FO-21-2	74.2	62.3	45.2	91.5	83.2	71.3	15
HFO-1121	82.8	66.4	66.7	112.0	90.1	83.6	2
JHO-21-4	57.1	61.9	48.4	135.4	72.2	75.0	14
UPO-21-2	68.4	100.2	59.7	115.4	63.3	81.4	9
BAUO-104	90.9	76.2	41.7	93.7	74.3	75.4	12
JO-08-335	82.3	76.5	46.7	119.1	76.1	80.1	10
OL-1975	86.0	64.2	59.9	101.4	81.5	78.6	13
HFO-1123	91.4	75.9	46.0	120.9	74.9	81.8	7
JHO-21-3	87.6	93.8	59.8	93.1	80.1	82.9	5
PLP-29	80.0	67.4	44.2	85.5	76.9	70.8	16
OL-1969	77.2	87.9	43.3	113.2	81.4	80.6	11
OL-1931-2	99.5	85.3	55.9	105.2	72.6	83.7	4
FO-21-1	73.4	100.0	60.7	110.1	80.8	85.0	3
UPO-212 (NC)	66.3	60.3	50.8	128.5	98.1	80.8	8
RO-19 (NC)	89.5	108.7	55.0	110.1	91.0	90.9	1
Mean	**80.2**	**78.8**	**52.7**	**109.7**	**79.0**	**80.1**	
CD at 5%	**2.7**	**7.5**		**12.6**			
CV%	**4.9**	**5.7**		**5.0**			

Table 9.2: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Dry Matter Yield (q/ha)

Entries	Central Zone								All India	
	Jhansi	Rahuri	Anand	Jabalpur	Urulikanchan	Average	Rank	Superiority	Average	Rank
BAUO-103	80.0	107.7	107.6	125.9	97.1	103.7	13		93.0	9
FO-21-2	56.9	104.3	123.5	125.5	78.3	97.7	14		88.4	13
HFO-1121	74.9	137.7	122.8	123.4	123.5	116.5	5		98.2	4
JHO-21-4	55.4	95.4	121.5	104.1	74.0	90.1	15		81.5	15
UPO-21-2	59.5	161.6	93.2	122.5	94.8	106.3	12		89.5	11
BAUO-104	67.2	130.9	106.2	131.9	126.7	112.6	7		91.9	10
JO-08-335	59.3	148.9	141.3	145.6	124.4	123.9	1	1.7	97.1	7
OL-1975	61.2	119.5	109.8	148.9	104.6	108.8	10		93.7	8
HFO-1123	64.0	163.2	120.1	146.1	103.4	119.3	4		98.2	4
JHO-21-3	66.1	134.5	107.1	153.7	139.6	120.2	3		99.2	2
PLP-29	60.5	127.5	123.1	138.9	104.6	110.9	9		89.0	12
OL-1969	69.5	129.8	123.3	135.1	101.3	111.8	8		97.9	5
OL-1931-2	67.6	123.3	102.6	145.8	128.3	113.5	6		98.5	3
FO-21-1	64.7	125.3	122.5	152.1	78.9	108.7	11		97.3	6
UPO-212 (NC)	51.2	70.8	117.8	93.6	91.9	85.1	16		83.6	14
RO-19 (NC)	68.0	152.2	119.0	151.7	118.3	121.9	2		101.9	1
Mean	**64.1**	**127.0**	**116.3**	**134.0**	**105.6**	**109.4**			**93.7**	
CD at 5%	**15.9**	**13.4**	**20.9**		**17.0**					
CV%	**9.5**	**6.4**	**10.8**		**9.6**					

Table 9.3: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Green Forage Yield (q/ha/day)

Entries	Ludhiana	Hisar	Jorhat	Bhubaneswar	Ranchi	Pusa	Rahuri	Anand	Urulikanchan	Average	Rank
BAUO-103	4.60	5.17	3.88	4.10	3.50	8.04	6.16	5.47	9.23	5.57	10
FO-21-2	4.70	5.04	3.53	3.71	2.68	6.38	5.01	7.12	7.69	5.10	14
HFO-1121	4.60	4.99	4.18	3.64	3.55	7.37	7.46	7.10	10.28	5.91	3
JHO-21-4	4.30	4.68	2.87	3.61	2.43	8.56	5.00	6.19	5.00	4.74	16
UPO-21-2	4.60	4.65	3.24	5.78	3.16	7.48	7.48	5.16	9.97	5.72	6
BAUO-104	4.20	5.37	4.59	4.09	2.35	6.27	6.24	5.63	10.91	5.52	12
JO-08-335	4.80	4.62	3.79	4.59	2.42	7.54	6.97	7.67	10.13	5.84	4
OL-1975	5.30	5.34	3.98	3.78	3.08	6.05	7.00	6.40	9.74	5.63	8
HFO-1123	5.20	4.98	4.35	4.10	2.33	7.93	6.80	6.48	8.81	5.66	7
JHO-21-3	4.90	5.48	4.35	5.52	3.30	5.99	6.36	6.08	7.15	5.46	13
PLP-29	4.80	4.62	3.99	4.06	2.64	6.2	6.95	7.18	9.87	5.59	9
OL-1969	5.40	5.92	4.06	5.36	2.62	7.06	7.16	6.49	8.36	5.83	5
OL-1931-2	4.80	5.93	4.94	4.98	3.06	7.22	7.28	6.04	10.69	6.10	1
FO-21-1	5.60	4.96	3.77	5.38	3.13	7.01	5.58	7.10	7.21	5.53	11
UPO-212 (NC)	4.00	5.55	3.47	3.66	3.02	7.73	4.00	6.11	5.60	4.79	15
RO-19 (NC)	4.80	5.31	3.98	5.93	2.86	6.38	6.97	6.64	11.55	6.05	2
Mean	**4.79**	**5.16**	**3.94**	**4.52**	**2.88**	**7.08**	**6.40**	**6.43**	**8.89**	**5.56**	

Table 9.4: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Hisar	Jorhat	Bhubaneswar	Pusa	Rahuri	Anand	Urulikanchan	Average	Rank
BAUO-103	0.90	1.44	0.73	0.92	1.42	1.11	0.94	1.62	1.13	9
FO-21-2	1.00	1.39	0.68	0.79	1.04	0.95	1.07	1.31	1.03	11
HFO-1121	0.90	1.36	0.68	0.81	1.29	1.50	1.12	2.06	1.21	5
JHO-21-4	0.80	1.23	0.75	0.77	1.60	0.92	1.06	0.78	0.99	13
UPO-21-2	0.80	1.20	0.67	1.24	1.39	1.58	0.83	1.58	1.16	7
BAUO-104	0.90	1.49	0.72	0.91	1.11	1.30	0.92	2.11	1.18	6
JO-08-335	1.00	1.26	0.67	0.98	1.37	1.54	1.26	2.07	1.27	2
OL-1975	1.10	1.48	0.68	0.80	1.20	1.26	0.99	1.74	1.16	7
HFO-1123	1.10	1.32	0.68	0.89	1.42	1.58	1.09	1.72	1.23	4
JHO-21-3	1.00	1.42	0.72	1.19	1.07	1.33	0.99	1.47	1.15	8
PLP-29	1.00	1.17	0.71	0.85	0.99	1.31	1.12	1.74	1.11	10
OL-1969	1.10	1.53	0.72	1.14	1.30	1.41	1.13	1.69	1.25	3
OL-1931-2	1.00	1.53	0.76	1.09	1.23	1.31	0.92	2.14	1.25	3
FO-21-1	1.20	1.30	0.71	1.18	1.27	1.19	1.06	1.31	1.15	8
UPO-212 (NC)	0.80	1.49	0.73	0.77	1.53	0.80	1.11	0.97	1.02	12
RO-19 (NC)	1.00	1.42	0.67	1.31	1.28	1.46	1.11	1.97	1.28	1
Mean	**0.98**	**1.38**	**0.71**	**0.98**	**1.28**	**1.28**	**1.05**	**1.64**	**1.16**	

Table 9.5: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Crude Protein Yield (q/ha)

Entries	HZ		NWZ			
	Palampur	Rank	Ludhiana	Hisar	Average	Rank
BAUO-103	4.0	3	18.4	14.3	16.3	9
FO-21-2	4.1	2	17.0	13.9	15.4	11
HFO-1121	4.2	1	15.0	14.1	14.5	12
JHO-21-4	3.2	8	20.7	12.5	16.6	8
UPO-21-2	3.2	8	14.7	13.2	13.9	13
BAUO-104	3.0	10	13.0	13.5	13.3	14
JO-08-335	3.7	5	15.4	12.4	13.9	13
OL-1975	2.6	13	23.8	13.9	18.8	4
HFO-1123	3.1	9	20.2	13.0	16.6	8
JHO-21-3	3.8	4	16.8	14.7	15.7	10
PLP-29	3.6	6	21.4	12.0	16.7	7
OL-1969	4.0	3	24.0	15.0	19.5	1
OL-1931-2	2.9	11	22.4	15.9	19.1	3
FO-21-1	3.3	7	21.4	12.7	17.1	5
UPO-212 (NC)	2.8	12	18.9	15.1	17.0	6
RO-19 (NC)	2.4	14	24.2	14.2	19.2	2
Mean	**3.4**		**19.2**	**13.8**	**16.5**	

Table 9.5: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Crude Protein Yield (q/ha)

Entries	NEZ						CZ						All India	
	Jor-hat	Bhuban-eswar	Ran-chi	Imp-hal	Aver-age	Ra-nk	Rah-uri	Ana-nd	Jabal-pur	Urulikan-chan	Aver-age	Ra-nk	Aver-age	Ra-nk
BAUO-103	4.1	6.1	4.0	6.9	5.3	5	7.3	14.6	10.0	8.0	10.0	13	8.9	10
FO-21-2	4.0	5.4	2.9	7.8	5.0	8	9.6	18.6	9.9	6.7	11.2	10	9.1	8
HFO-1121	4.2	5.5	3.1	7.6	5.1	7	10.2	16.6	9.7	8.7	11.3	9	9.0	9
JHO-21-4	3.1	5.3	3.0	6.7	4.5	9	9.4	18.3	8.0	6.0	10.4	12	8.7	12
UPO-21-2	3.7	8.6	3.6	6.3	5.5	4	13.1	14.1	9.8	6.5	10.8	11	8.8	11
BAUO-104	5.1	6.3	2.9	6.1	5.1	7	11.3	15.5	10.5	10.8	12.0	5	8.9	10
JO-08-335	4.6	6.6	3.6	7.4	5.5	4	9.6	20.3	11.6	10.3	13.0	1	9.6	5
OL-1975	5.1	5.6	4.6	7.7	5.7	3	13.5	15.4	11.9	8.4	12.3	3	10.2	2
HFO-1123	5.1	6.4	2.4	7.1	5.3	5	10.0	17.1	11.7	7.8	11.6	7	9.4	7
JHO-21-3	4.8	8.0	3.6	6.5	5.7	3	9.3	16.5	12.3	11.3	12.3	3	9.8	4
PLP-29	5.3	5.9	3.4	6.8	5.3	5	8.4	19.1	11.0	7.3	11.5	8	9.5	6
OL-1969	4.2	7.6	2.5	6.6	5.2	6	13.9	16.2	10.7	6.8	11.9	6	10.1	3
OL-1931-2	5.3	7.1	2.7	5.6	5.2	6	12.4	15.2	11.6	10.3	12.4	2	10.1	3
FO-21-1	3.9	8.4	3.1	7.9	5.8	2	12.8	16.1	12.2	6.6	11.9	6	9.8	4
UPO-212 (NC)	3.4	5.3	3.6	8.9	5.3	5	5.6	16.5	7.2	7.5	9.2	14	8.6	13
RO-19 (NC)	5.4	9.0	2.3	8.5	6.3	1	11.6	15.6	12.1	9.1	12.1	4	10.4	1
Mean	**4.4**	**6.7**	**3.2**	**7.1**	**5.4**		**10.5**	**16.6**	**10.6**	**8.2**	**11.5**		**9.4**	

Table 9.6:IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Crude Protein (%)

Entries	HZ		NWZ				NEZ					
	Palam-pur	Ra-nk	Ludh-iana	His-ar	Aver-age	Ra-nk	Bhuban-eswar	Imp-hal	**Ran-chi	**Jor-hat	Aver-age	Ra-nk
BAUO-103	10.2	4	16.0	8.1	12.1	7	8.2	11.1	6.7	5.3	9.6	3
FO-21-2	9.3	7	14.5	8.4	11.4	10	8.7	10.5	6.5	5.4	9.6	3
HFO-1121	9.9	5	13.7	8.6	11.2	11	8.3	9.6	4.6	5.0	8.9	7
JHO-21-4	9.3	7	20.9	8.4	14.6	1	8.6	10.8	6.2	5.4	9.7	2
UPO-21-2	9.6	6	14.5	9.2	11.8	8	8.5	10.6	6.0	5.4	9.6	3
BAUO-104	10.5	3	12.2	7.7	10.0	14	8.3	9.6	6.9	5.6	8.9	7
JO-08-335	9.9	5	12.4	8.1	10.3	13	8.6	9.9	7.6	5.6	9.3	4
OL-1975	9.6	6	18.3	7.8	13.1	5	8.7	9.7	7.6	5.9	9.2	5
HFO-1123	9.0	8	15.5	8.1	11.8	8	8.4	9.6	5.3	5.6	9.0	6
JHO-21-3	10.2	4	13.5	8.5	11.0	12	8.5	8.8	6.0	5.5	8.6	9
PLP-29	10.2	4	17.7	8.5	13.1	5	8.8	9.6	7.6	6.6	9.2	5
OL-1969	11.1	2	17.6	8.3	12.9	6	8.6	9.0	5.8	5.4	8.8	8
OL-1931-2	9.6	6	18.3	8.7	13.5	4	8.4	8.6	4.9	5.3	8.5	10
FO-21-1	9.9	5	15.1	8.1	11.6	9	8.4	11.1	5.1	5.3	9.8	1
UPO-212 (NC)	11.4	1	20.4	8.6	14.5	2	8.7	10.7	7.2	5.1	9.7	2
RO-19 (NC)	9.0	8	19.7	8.5	14.1	3	8.3	9.5	4.2	6.0	8.9	7
Mean	**9.9**		**16.3**	**8.3**	**12.3**		**8.5**	**9.9**	**6.1**	**5.5**	**9.2**	

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 9.6: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Crude Protein (%)

Entries	CZ						All India	
	Rahuri	Anand	Jabalpur	Urulikanchan	Average	Rank	Average	Rank
BAUO-103	6.8	13.6	7.9	8.2	9.1	8	10.0	8
FO-21-2	9.2	15.1	7.9	8.5	10.2	2	10.2	6
HFO-1121	7.4	13.5	7.8	7.0	8.9	10	9.5	11
JHO-21-4	9.9	15.1	7.7	8.2	10.2	2	11.0	1
UPO-21-2	8.1	15.1	7.9	6.8	9.5	5	10.0	8
BAUO-104	8.6	14.6	7.9	8.5	9.9	3	9.8	9
JO-08-335	6.5	14.4	7.9	8.3	9.3	7	9.6	10
OL-1975	11.3	13.9	8.0	8.0	10.3	1	10.6	3
HFO-1123	6.1	14.3	8.0	7.5	9.0	9	9.6	10
JHO-21-3	6.9	15.4	8.0	8.1	9.6	4	9.8	9
PLP-29	6.6	15.5	7.9	7.0	9.3	7	10.2	6
OL-1969	10.7	13.1	7.9	6.8	9.6	4	10.3	5
OL-1931-2	10.0	14.8	7.9	8.0	10.2	2	10.5	4
FO-21-1	10.2	13.2	8.0	8.4	9.9	3	10.3	5
UPO-212 (NC)	7.9	14.0	7.7	8.1	9.4	6	10.8	2
RO-19 (NC)	7.6	13.2	7.9	7.7	9.1	8	10.1	7
Mean	**8.4**	**14.3**	**7.9**	**7.8**	**9.6**		**10.1**	

Table 9.7: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Plant Height (cm)

Entries	Palampur	Srinagar	Ludhiana	Jalore	Jorhat	Bhubaneswar	Ranchi	Pusa	Imphal
BAUO-103	53.8	107.4	122.6	86.7	91.8	101.3	107.6	131.7	98.6
FO-21-2	46.7	99.5	119.7	70.9	80.9	87.7	51.5	137.7	86.6
HFO-1121	63.5	108.1	126.1	83.4	101.9	95.1	100.0	116.7	103.6
JHO-21-4	41.2	94.3	139.7	70.2	70.0	90.2	70.7	155.0	83.1
UPO-21-2	52.2	98.1	122.4	93.0	90.2	125.5	107.5	99.7	105.9
BAUO-104	55.2	103.8	142.5	69.3	101.1	103.2	103.0	154.3	101.3
JO-08-335	56.3	107.5	136.4	101.3	103.3	108.5	126.5	145.0	103.8
OL-1975	57.7	112.8	117.8	93.3	102.9	96.5	118.6	165.0	98.1
HFO-1123	55.5	108.9	122.6	96.8	116.0	110.2	124.2	157.3	106.1
JHO-21-3	55.5	111.5	119.7	107.8	106.4	116.1	119.4	173.0	101.1
PLP-29	55.8	100.4	126.1	102.3	92.7	98.6	107.4	156.0	99.6
OL-1969	53.5	104.8	122.4	85.8	100.0	112.7	132.4	150.0	103.0
OL-1931-2	57.3	103.3	142.5	91.4	117.3	105.6	134.5	156.7	106.2
FO-21-1	44.7	92.8	122.6	88.3	78.9	121.8	69.3	106.7	77.2
UPO-212 (NC)	49.8	100.1	119.7	65.7	94.7	92.5	101.4	161.7	106.3
RO-19 (NC)	53.8	101.2	136.4	94.7	104.4	118.6	150.7	188.0	108.5
Mean	**53.3**	**103.4**	**127.5**	**87.6**	**97.0**	**105.2**	**107.8**	**147.1**	**99.3**

Table 9.7: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Plant Height (cm)

Entries	Jhansi	Rahuri	Anand	Jabalpur	Urulikanchan	Average	Rank
BAUO-103	117.0	77.4	84.5	67.1	87.3	95.3	10
FO-21-2	113.2	65.5	71.0	72.4	55.0	82.7	15
HFO-1121	131.9	75.6	78.5	64.1	85.3	95.3	10
JHO-21-4	109.1	68.1	68.4	60.3	55.9	84.0	13
UPO-21-2	112.9	92.7	78.6	69.7	84.3	95.2	11
BAUO-104	122.7	77.8	76.8	71.2	80.9	97.4	9
JO-08-335	126.8	80.5	83.6	74.0	81.4	102.5	5
OL-1975	115.7	73.7	79.5	77.4	69.6	98.5	8
HFO-1123	132.4	81.9	86.7	76.9	83.1	104.2	4
JHO-21-3	133.8	81.8	77.8	77.4	84.6	104.7	2
PLP-29	132.1	78.8	77.7	72.4	80.2	98.6	7
OL-1969	135.1	85.1	80.0	72.5	82.2	101.4	6
OL-1931-2	122.1	84.2	75.9	72.4	95.3	104.6	3
FO-21-1	101.9	63.8	58.3	80.1	57.1	83.1	14
UPO-212 (NC)	119.2	77.0	69.1	63.8	64.0	91.8	12
RO-19 (NC)	135.1	95.2	82.6	70.9	94.2	109.6	1
Mean	**122.6**	**78.7**	**76.8**	**71.4**	**77.5**	**96.8**	

Table 9.8: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Leaf Stem Ratio

Entries	Palampur	Srinagar	Ludhiana	Hisar	Jorhat	Bhubaneswar	Ranchi	Pusa	Imphal
BAUO-103	0.27	0.33	1.13	0.51	1.40	1.01	0.39	0.35	1.31
FO-21-2	0.33	0.33	1.33	0.57	1.52	0.89	0.45	0.34	1.26
HFO-1121	0.29	0.31	1.29	0.53	1.32	0.92	0.40	0.38	1.06
JHO-21-4	0.31	0.31	1.23	0.57	1.19	0.87	0.41	0.42	2.51
UPO-21-2	0.47	0.33	1.19	0.50	1.25	1.21	0.39	0.32	1.01
BAUO-104	0.32	0.34	1.03	0.53	1.02	1.04	0.39	0.38	1.10
JO-08-335	0.40	0.33	0.93	0.54	1.27	1.09	0.39	0.43	1.09
OL-1975	0.41	0.34	1.13	0.51	1.19	0.95	0.42	0.44	1.35
HFO-1123	0.34	0.36	1.33	0.52	1.38	1.07	0.37	0.49	1.09
JHO-21-3	0.34	0.40	1.29	0.50	1.33	1.18	0.42	0.46	0.92
PLP-29	0.28	0.40	1.18	0.52	1.32	0.98	0.49	0.46	1.46
OL-1969	0.47	0.37	1.23	0.54	1.11	1.16	0.43	0.42	1.18
OL-1931-2	0.31	0.30	1.19	0.54	1.24	1.13	0.44	0.51	1.39
FO-21-1	0.42	0.33	0.93	0.55	1.22	1.34	0.40	0.52	1.35
UPO-212 (NC)	0.19	0.31	1.18	0.55	1.32	0.84	0.42	0.42	1.60
RO-19 (NC)	0.51	0.30	1.03	0.54	1.25	1.24	0.38	0.45	0.81
Mean	**0.35**	**0.34**	**1.16**	**0.53**	**1.27**	**1.06**	**0.41**	**0.42**	**1.28**

Table 9.8: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): Leaf Stem Ratio

Entries	Rahuri	Anand	Jabalpur	Urulikanchan	Average	Rank
BAUO-103	0.74	2.85	0.57	1.00	0.91	6
FO-21-2	0.68	2.23	0.59	1.76	0.94	5
HFO-1121	0.63	1.99	0.63	1.54	0.87	8
JHO-21-4	0.54	2.82	0.64	1.64	1.03	1
UPO-21-2	0.41	1.94	0.64	0.94	0.82	11
BAUO-104	0.36	1.34	0.65	1.33	0.76	13
JO-08-335	0.39	2.59	0.65	1.16	0.87	9
OL-1975	0.57	2.33	0.65	2.19	0.96	4
HFO-1123	0.52	1.21	0.67	1.17	0.81	12
JHO-21-3	0.38	1.97	0.68	1.06	0.84	10
PLP-29	0.70	2.11	0.68	1.58	0.94	5
OL-1969	0.66	2.14	0.70	1.30	0.90	7
OL-1931-2	0.90	2.15	0.70	0.89	0.90	7
FO-21-1	0.43	3.65	0.67	1.27	1.01	2
UPO-212 (NC)	0.45	2.33	0.63	2.82	1.00	3
RO-19 (NC)	0.54	2.67	0.72	1.05	0.88	8
Mean	**0.56**	**2.27**	**0.65**	**1.42**	**0.90**	

Table 9.9: IVT Oat (MC): Initial Varietal Trial in Oat (Multi Cut): NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)				ADF (%)				IVDMD (%)	
	Ludhiana	Anand	Average	Rank	Ludhiana	Anand	Average	Rank	Ludhiana	Rank
BAUO-103	56.4	67.1	61.8	6	35.4	36.1	35.8	4	58.6	9
FO-21-2	61.5	65.0	63.2	9	36.4	33.5	34.9	2	57.2	12
HFO-1121	56.7	68.0	62.4	8	35.4	37.3	36.4	7	56.8	13
JHO-21-4	57.8	66.8	62.3	7	33.6	35.4	34.5	1	64.8	1
UPO-21-2	59.7	67.8	63.8	11	36.8	35.0	35.9	5	58.7	8
BAUO-104	61.5	68.5	65.0	15	41.2	35.8	38.5	11	55.8	14
JO-08-335	60.2	68.5	64.4	13	38.7	36.5	37.6	9	57.8	11
OL-1975	56.4	68.1	62.3	7	34.2	35.9	35.0	3	61.5	5
HFO-1123	59.2	68.5	63.9	12	38.7	34.8	36.8	8	59.8	7
JHO-21-3	60.7	68.5	64.6	14	36.4	36.3	36.4	7	58.4	10
PLP-29	53.8	67.1	60.5	1	37.8	35.0	36.4	7	60.4	6
OL-1969	54.6	68.8	61.7	5	35.8	36.5	36.1	6	63.7	2
OL-1931-2	55.4	67.8	61.6	4	36.4	35.4	35.9	5	61.5	5
FO-21-1	59.8	66.7	63.3	10	39.8	36.1	38.0	10	62.5	3
UPO-212 (NC)	53.6	68.8	61.2	3	33.7	36.1	34.9	2	62.4	4
RO-19 (NC)	53.0	68.6	60.8	2	34.2	37.4	35.8	4	64.8	1
Mean	**57.5**	**67.8**	**62.7**		**36.5**	**35.8**	**36.2**		**60.3**	

10. AVTO (MC)-1: FIRST ADVANCED VARIETAL TRIAL IN OAT (MULTI CUT)

(Reference tables 10.1 to 10.9)

In **First Advance Varietal Trial in Oat (Multi cut)** [**AVTO-1 (MC)]** six entries were evaluated against two national checks (RO-19 and UPO-212) at 7locations in two zones (HZ and NWZ). There were 3 locations in HZ and 4 locations in NWZ.

For GFY (q/ha), entry HFO-915 was better than the best check by a margin of 5.5% in Hill zone. Other entries were either inferior or marginally superior over the best check in HZ and NWZ. For DMY (q/ha), entries PLP-27 (5.0%), HFO-915 (4.2%), OL-1949 (3.7%), JO-08-329 (2.9%) were better than the best check in Hill zone. Other entries were inferior to the best check in HZ and NWZ.

For CPY entry JHO -20-3 and JO-08-329 with values of 12.1 and 12.0 were better than the best check RO-19 with value of 11.4 q/ha. For CP%, entries JO-08-329, JHO-20-3, OL-1949, PLP-27 with values of 13.3%, 12.9%, 12.0%, 11.9% were better than the best check with value of 11.8%. For other quality parameters, national check RO-19 for ADF%, entry UPO-20-2 for ADF%, JHO-20-3 for IVDMD were best.

For per day productivity, national check RO-19 was top ranked for both green and dry matter. For plant height also, national check RO-19 was best. For leafiness, entry JO-08-329 performed best.

11. AVTO (MC)-2: SECOND ADVANCED VARIETAL TRIAL IN OAT (MULTI CUT)

(Reference tables 11.1 to 11.9)

In **Second Advance Varietal Trial in Oat (Multi cut)** [**AVTO-2 (MC)]** two entries JO-07-310 and PLP-24 were evaluated against two national checks (RO-19 and UPO-212) at 3 locations in hill and 5 locations in central zone.

In hill zone, both the entries showed marginal improvement over the checks for GFY. Entry PLP-24 and entry JO-07-310 were better than the best check by margins of 7.5% and 2.3% respectively for DMY.

In central zone, the national check was best for GFY and DMY. For green and dry fodder production potential (q/ha/day) also, national checks ranked first. National check RO-19 ranked first for plant height whereas national check UPO-212 was best for leafiness.

For quality parameters, for CPY, the national checks were better than the tested entries in both the zones. For CP%, national check ranked first in hill zone whereas entry PLP-24 with a value of 10.5% was better than the best check UPO-212 having a value of 10.1%. National check RO-19 ranked first for NDF%, ADF% and IVDMD%.

Table 10.1: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	Hill Zone					
	Palampur	Srinagar	Almora	Average	Rank	Superiority%
HFO-915	276.5	354.3	196.7	275.8	1	5.5
JHO-20-3	259.4	336.3	122.1	239.3	7	
PLP-27	265.9	343.7	177.6	262.4	3	0.4
JO-08-329	232.0	341.0	182.0	251.7	5	
OL-1949	222.4	351.7	224.5	266.2	2	1.8
UPO-20-2	233.9	351.3	166.2	250.5	6	
RO-19 (NC)	259.6	344.3	180.4	261.5	4	
UPO-212 (NC)	201.1	349.7	127.6	226.1	8	
Mean	**243.9**	**346.5**	**172.1**	**254.2**		
CD at 5%	**25.1**	**11.1**	**10.6**			
CV%	**5.8**	**1.3**	**14.0**			

Table 10.1: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	North West Zone						All India	
	Pantnagar	Hisar	Jalore	Ludhiana	Average	Rank	Average	Rank
HFO-915	672.3	397.7	612.6	735.7	604.6	2	463.7	2
JHO-20-3	648.5	359.0	686.3	675.8	592.4	4	441.1	4
PLP-27	581.6	421.7	496.7	648.5	537.1	6	419.4	6
JO-08-329	559.4	402.5	625.5	697.1	571.1	5	434.2	5
OL-1949	574.7	433.1	689.1	683.5	595.1	3	454.1	3
UPO-20-2	492.4	426.7	575.2	629.7	531.0	7	410.8	7
RO-19 (NC)	781.9	369.0	670.0	743.1	641.0	1	478.3	1
UPO-212 (NC)	609.3	432.3	460.1	536.4	509.5	8	388.0	8
Mean	**615.0**	**405.2**	**601.9**	**668.7**	**572.7**		**436.2**	
CD at 5%	**63.4**	**43.1**		**57.6**				
CV%	**11.4**	**6.0**		**11.3**				

Table 10.2: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	Hill Zone					
	Palampur	Srinagar	Almora	Average	Rank	Superiority%
HFO-915	61.6	69.6	42.8	58.0	2	4.2
JHO-20-3	57.1	74.7	29.3	53.7	7	
PLP-27	62.2	71.5	41.6	58.4	1	5.0
JO-08-329	60.2	69.3	42.3	57.3	4	2.9
OL-1949	53.1	70.8	49.2	57.7	3	3.7
UPO-20-2	52.1	75.0	35.9	54.3	6	
RO-19 (NC)	59.6	71.1	36.3	55.6	5	
UPO-212 (NC)	43.5	69.0	27.0	46.5	8	
Mean	**56.2**	**71.4**	**38.0**	**55.2**		
CD at 5%	**10.6**	**4.0**	**7.8**			
CV%	**10.7**	**3.2**	**14.0**			

Table 10.2: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	North West Zone						All India	
	Pantnagar	Hisar	Jalore	Ludhiana	Average	Rank	Average	Rank
HFO-915	139.4	81.5	105.9	144.9	117.9	2	92.2	2
JHO-20-3	137.5	72.6	118.0	134.5	115.6	3	89.1	4
PLP-27	110.4	90.9	85.0	119.3	101.4	7	83.0	6
JO-08-329	109.1	85.4	108.4	133.1	109.0	5	86.8	5
OL-1949	116.2	89.6	119.0	137.4	115.5	4	90.7	3
UPO-20-2	106.3	85.6	97.1	126.6	103.9	6	82.6	7
RO-19 (NC)	158.3	73.3	112.3	153.8	124.4	1	94.9	1
UPO-212 (NC)	127.9	83.3	81.0	100.3	98.1	8	76.0	8
Mean	**125.6**	**82.8**	**103.3**	**131.2**	**110.7**		**86.9**	
CD at 5%	**10.6**	**9.6**		**15.7**				
CV%	**8.8**	**6.5**		**9.9**				

Table 10.3: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha/day)

Entries	Pantnagar	Hisar	Ludhiana	Average	Rank
HFO-915	5.60	3.27	5.90	4.92	2
JHO-20-3	5.40	2.99	5.40	4.60	4
PLP-27	4.85	3.53	5.20	4.53	5
JO-08-329	4.66	3.34	5.60	4.53	5
OL-1949	4.79	3.59	5.50	4.63	3
UPO-20-2	4.10	3.56	5.00	4.22	7
RO-19 (NC)	6.52	3.10	5.90	5.17	1
UPO-212 (NC)	5.08	3.64	4.30	4.34	6
Mean	**5.13**	**3.38**	**5.35**	**4.62**	

Table 10.4: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha/day)

Entries	Pantnagar	Hisar	Ludhiana	Average	Rank
HFO-915	1.16	0.67	1.20	1.01	2
JHO-20-3	1.14	0.61	1.10	0.95	3
PLP-27	0.92	0.76	1.00	0.89	6
JO-08-329	0.91	0.71	1.10	0.91	5
OL-1949	0.97	0.74	1.10	0.94	4
UPO-20-2	0.89	0.71	1.00	0.87	7
RO-19 (NC)	1.32	0.61	1.20	1.04	1
UPO-212 (NC)	1.07	0.7	0.80	0.86	8
Mean	**1.05**	**0.69**	**1.06**	**0.93**	

Table 10.5: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Crude Protein Yield (q/ha)

Entries	Palampur	Pantnagar	Hisar	Ludhiana	Average	Rank
HFO-915	6.5	13.4	7.7	16.8	11.1	4
JHO-20-3	5.8	14.9	7.5	20.3	12.1	1
PLP-27	6.7	11.6	8.9	16.5	10.9	5
JO-08-329	6.8	12.4	8.6	20.3	12.0	2
OL-1949	5.7	10.2	8.8	18.6	10.8	6
UPO-20-2	5.0	10.2	8.3	18.2	10.4	7
RO-19 (NC)	5.7	13.9	7.1	19.1	11.4	3
UPO-212 (NC)	4.4	13.4	8.2	14.4	10.1	8
Mean	**11.9**	**24.6**	**16.4**	**36.5**	**22.4**	

Table 10.6: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Crude Protein (%)

Entries	Palampur	Pantnagar	Hisar	Ludhiana	Average	Rank
HFO-915	10.5	9.6	9.4	16.8	11.6	6
JHO-20-3	10.2	10.8	10.3	20.3	12.9	2
PLP-27	10.79	10.5	9.8	16.5	11.9	4
JO-08-329	11.37	11.4	10.1	20.3	13.3	1
OL-1949	10.79	8.8	9.8	18.6	12.0	3
UPO-20-2	9.62	9.6	9.7	18.2	11.8	5
RO-19 (NC)	9.62	8.8	9.7	19.1	11.8	5
UPO-212 (NC)	10.2	10.5	9.8	14.4	11.2	7
Mean	**10.4**	**10.0**	**9.8**	**18.0**	**12.1**	

Table 10.7: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Palampur	Srinagar	Pantnagar	Jalore	Ludhiana	Average	Rank
HFO-915	77.0	99.8	140.3	82.7	125.1	105.0	5
JHO-20-3	63.4	88.6	134.5	117.0	127.0	106.1	4
PLP-27	68.3	82.2	145.8	79.3	116.7	98.5	8
JO-08-329	71.0	96.0	141.2	107.8	125.0	108.2	3
OL-1949	75.8	101.2	146.5	102.0	132.4	111.6	2
UPO-20-2	51.0	97.2	126.9	102.6	117.5	99.0	7
RO-19 (NC)	69.2	107.7	168.6	104.5	134.4	116.9	1
UPO-212 (NC)	76.0	91.1	149.4	81.0	119.5	103.4	6
Mean	**69.0**	**95.5**	**144.2**	**97.1**	**124.7**	**106.1**	

Table 10.8: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Leaf Stem Ratio

Entries	Palampur	Srinagar	Pantnagar	Hisar	Ludhiana	Average	Rank
HFO-915	0.36	0.35	0.45	0.54	1.17	0.57	2
JHO-20-3	0.32	0.34	0.53	0.55	1.13	0.57	2
PLP-27	0.43	0.32	0.57	0.59	0.77	0.54	4
JO-08-329	0.45	0.35	0.65	0.64	1.13	0.64	1
OL-1949	0.23	0.35	0.58	0.61	1.07	0.57	2
UPO-20-2	0.25	0.30	0.48	0.64	1.11	0.56	3
RO-19 (NC)	0.30	0.29	0.46	0.52	1.07	0.53	5
UPO-212 (NC)	0.30	0.30	0.51	0.56	1.11	0.56	3
Mean	**0.33**	**0.33**	**0.53**	**0.58**	**1.07**	**0.57**	

Table 10.9: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): ADF (%), NDF (%) & IVDMD (%)

Entries	NDF (%)					ADF (%)					IVDMD (%)	
	Palampur	Pantnagar	Ludhiana	Average	Rank	Palampur	Pantnagar	Ludhiana	Average	Rank	Ludhiana	Rank
HFO-915	64.6	64.0	55.4	61.3	7	55.6	54.0	34.9	48.2	5	62.2	6
JHO-20-3	63.8	65.4	51.7	60.3	4	54.0	55.8	32.4	47.4	2	65.4	1
PLP-27	65.6	61.8	54.0	60.5	5	54.0	52.6	35.4	47.3	1	63.8	4
JO-08-329	66.0	66.0	50.2	60.7	6	56.6	56.2	31.2	48.0	4	64.5	2
OL-1949	62.6	63.8	57.4	61.3	7	56.2	53.8	34.9	48.3	6	60.5	7
UPO-20-2	64.2	65.0	50.2	59.8	3	57.2	57.0	32.9	49.0	8	62.8	5
RO-19 (NC)	63.0	63.6	49.8	58.8	1	54.6	55.0	33.5	47.7	3	64.2	3
UPO-212 (NC)	62.2	65.4	51.3	59.6	2	53.8	55.4	36.5	48.6	7	59.2	8
Mean	**64.0**	**64.4**	**52.5**	**60.3**		**55.3**	**55.0**	**34.0**	**48.1**		**62.8**	

Table 11.1: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	Hill Zone					
	Palampur	Srinagar	** Almora	Average	Rank	Superiority (%)
JO-07-310	295.1	232.0	104.2	263.6	1	1.6
PLP-24	295.1	228.5	105.8	261.8	2	1.0
RO-19 (NC)	289.8	228.8	94.7	259.3	3	
UPO-212 (NC)	224.0	229.7	107.0	226.9	4	
Mean	**276.0**	**229.8**	**102.9**	**252.9**		
CD at 5%	**27.4**	**8.4**	**NS**			
CV%	**7.1**	**1.7**	**8.0**			

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 11.1: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha)

Entries	Central Zone							All India	
	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Average	Rank
JO-07-310	368.1	671.8	552.2	595.2	492.9	536.0	2	458.2	2
PLP-24	369.4	713.7	443.71	528.8	532.9	517.7	3	444.6	3
RO-19 (NC)	381.0	710.8	648.5	606.9	475.7	564.6	1	477.4	1
UPO-212 (NC)	387.0	996.5	335.2	421.3	398.2	507.6	4	427.4	4
Mean	**376.4**	**773.2**	**494.9**	**538.1**	**474.9**	**531.5**		**451.9**	
CD at 5%	**9.4**	**124.3**		**66.7**	**83.3**				
CV%	**5.2**	**11.7**		**9.0**	**12.6**				

Table 11.2: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	Hill Zone					
	Palampur	Srinagar	** Almora	Average	Rank	Superiority (%)
JO-07-310	57.3	58.3	23.6	57.8	2	2.3
PLP-24	61.7	59.8	24.8	60.7	1	7.5
RO-19 (NC)	60.2	52.8	21.8	56.5	3	
UPO-212 (NC)	47.0	62.0	24.0	54.5	4	
Mean	**56.5**	**58.2**	**23.5**	**57.4**		
CD at 5%	**8.3**	**4.0**	**NS**			
CV%	**10.6**	**4.9**	**9.0**			

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 11.2: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)

Entries	Central Zone							All India	
	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Average	Rank
JO-07-310	50.8	99.0	154.5	128.9	106.0	107.8	2	93.5	2
PLP-24	53.5	107.4	129.3	111.3	96.7	99.7	3	88.5	3
RO-19 (NC)	50.9	117.4	183.7	143.5	86.2	116.3	1	99.2	1
UPO-212 (NC)	50.9	165.6	97.7	92.6	71.1	95.6	4	83.8	4
Mean	**51.5**	**122.4**	**141.3**	**119.1**	**90.0**	**104.8**		**91.3**	
CD at 5%	**8.8**	**21.4**		**14.8**	**13.6**				
CV%	**4.8**	**12.7**		**9.0**	**12.2**				

Table 11.3: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha/day) & DMY (q/ha/day)

Entries	GFY (q/ha/day)					DMY (q/ha/day)				
	Anand	Rahuri	Urulikanchan	Average	Rank	Anand	Rahuri	Urulikanchan	Average	Rank
JO-07-310	5.89	5.41	5.19	5.50	3	0.87	1.17	1.12	1.05	3
PLP-24	6.37	5.13	5.61	5.70	2	0.96	1.08	1.02	1.02	4
RO-19 (NC)	6.52	5.57	5.01	5.70	2	1.08	1.32	0.91	1.10	1
UPO-212 (NC)	9.40	4.43	4.19	6.01	1	1.56	0.97	0.75	1.09	2
Mean	**7.05**	**5.14**	**5.00**	**5.73**		**1.12**	**1.14**	**0.95**	**1.07**	

Table 11.4: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Crude Protein Yield (q/ha)

Entries	HZ		CZ						All India	
	Palampur	Rank	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Average	Rank
JO-07-310	6.1	3	14.4	13.2	11.3	8.6	11.9	2	10.7	2
PLP-24	6.2	2	18.0	10.7	10.5	7.2	11.6	3	10.5	3
RO-19 (NC)	6.7	1	17.4	15.8	11.8	5.8	12.7	1	11.5	1
UPO-212 (NC)	5.1	4	26.1	8.0	7.8	5.7	11.9	2	10.5	3
Mean	**6.0**		**19.0**	**11.9**	**10.3**	**6.8**	**12.0**			

Table 11.6: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Crude Protein (%)

Entries	HZ		CZ						All India	
	Palampur	Rank	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Average	Rank
JO-07-310	10.7	3	14.6	8.5	8.8	8.1	10.0	3	10.2	3
PLP-24	10.0	4	16.8	8.4	9.4	7.5	10.5	1	10.4	1
RO-19 (NC)	11.2	1	15.0	8.6	8.2	6.7	9.6	4	9.9	4
UPO-212 (NC)	10.8	2	15.7	8.4	8.4	8.0	10.1	2	10.3	2
Mean	**10.7**		**15.6**	**8.5**	**8.7**	**7.6**	**10.1**			

Table 11.7: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Palampur	Srinagar	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
JO-07-310	54.9	101.9	118.7	91.3	121.9	77.9	75.3	91.7	2
PLP-24	53.1	108.2	117.8	99.5	117.6	62.0	66.6	89.2	3
RO-19 (NC)	58.6	103.4	120.1	97.1	130.3	79.3	78.3	95.3	1
UPO-212 (NC)	56.7	101.3	127.0	87.5	114.8	63.0	70.5	88.7	4
Mean	**55.8**	**103.7**	**120.9**	**93.9**	**121.1**	**70.5**	**72.7**	**91.2**	

Table 11.8: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Leaf Stem Ratio

Entries	Palampur	Srinagar	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
JO-07-310	0.38	0.26	1.24	0.66	0.40	1.17	0.69	4
PLP-24	0.49	0.26	1.79	0.66	0.53	1.39	0.85	2
RO-19 (NC)	0.41	0.26	1.50	0.72	0.45	1.09	0.74	3
UPO-212 (NC)	0.66	0.25	2.35	0.61	0.49	1.47	0.97	1
Mean	**0.49**	**0.26**	**1.72**	**0.66**	**0.47**	**1.28**	**0.81**	

Table 11.9: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)					ADF (%)					IVDMD (%)	
	Anand	Rahuri	Palampur	Average	Rank	Anand	Rahuri	Palampur	Average	Rank	Rahuri	Rank
JO-07-310	66.9	60.5	63.8	63.7	3	34.5	42.6	53.6	43.5	3	55.3	2
PLP-24	65.7	60.9	64.2	63.6	2	33.2	43.0	54.0	43.4	2	55.0	3
RO-19 (NC)	67.5	61.3	65.4	64.7	4	33.9	43.3	54.2	43.8	4	54.7	4
UPO-212 (NC)	66.5	55.8	65.8	62.7	1	34.1	40.2	55.6	43.3	1	57.2	1
Mean	**66.6**	**59.6**	**64.8**	**63.7**		**33.9**	**42.3**	**54.4**	**43.5**		**55.6**	

12. AVTO (MC)-2 (SEED): SECOND ADVANCED VARIETAL TRIAL IN OAT (MULTI CUT) FOR SEED

(Reference tables 12.1)

In **Second Advance Varietal Trial in Oat (Multi cut)** [**AVTO-2 (MC)] for seed** two entries JO-07-310 and PLP-24 were evaluated against two national checks (RO-19 and UPO-212) at 2 locations in Hill and 3 locations in central zone.

For seed yield (q/ha), entry JO-07-310 was top ranked for hill zone and NWZ showing a superiority of 17.7% and 1.9% over the best check.

13. IVTO (DUAL): INITIAL VARIETAL TRIAL IN OAT (DUAL)

(Reference tables 13.1 to 13.10)

An **Initial Varietal Trial in Oat (Dual)** [**IVTO (DUAL)]** comprising of nine entries along with two national checks (UPO-212 and JHO-822) was conducted at 13centres located at three zones (NW, NE and central zones). There were 4 locations in NWZ, 4 locations in NEZ and 5 locations in CZ.

In NWZ for GFY and DMY, entry OL-1874-2 showed superiority of 10.8% and 6.3% over the best check. Other entries were either marginally superior or inferior to the best check for GFY and DMY. Entry OL-1874-2 showed marginal superiority over the best check for CPY. For crude protein %, national check was best. For seed yield, national check JHO 822 was best.

In NEZ for GFY, entries HFO-1008 (23.5%), OL-1967-1 (18.0%), UPO-21-3 (16.6%), OL-1874-2 (15.0%), OL-1982-2 (10.2%), and JHO-21-6 (7.2%) were superior over the best check UPO-212. For DMY, entries HFO-1008 (18.6%), JHO-21-6 (15.8%) OL 1967-1 (14.1%), UPO-21-3 (13.3%), OL-1982-2 (8.4%), JO-13-518 (8.3%), OL-1874-2 (7.2%), were superior over the best check UPO-212. For CPY, entries HFO-1108 (5.6), UPO-21-3 (5.0), OL-1967-1 (4.8), JHO-21-6 (4.8), JO-13-518 (4.8), OL-1874-2 (4.7) showed more than 5% superiority over the best check JHO 822 (4.3 q/ha). Entries JHO-21-5 and OL-1982-2 were marginally superior over the best check for crude protein %. For seed yield, entries HFO-1108 and HFO-1119 showed superiority by margins of 4.0% and 3.4% over the best check.

In CZ for GFY, national check JHO-822 was best. For DMY, only marginal superiority was observed in a few entries. For CPY, entry JO-13-518 (6.2), OL-1874-2 (6.1), OL-1967-1 (5.9) were marginally superior or equal to the best check JHO-822 (5.9q/ha). For crude protein%, Check UPO-212 and entry JHO-21-5 were joint first. Check JHO-822 ranked first for seed yield.

For fodder production potential (q/ha/day), entry HFO-1108 followed by OL-1982-2 for green matter and entry HFO-1108 followed by OL-1874-2 for dry matter were best performers. For plant height, entry OL-1982-2 ranked first followed by entry HFO-1108. For leafiness, entry JHO-21-5 ranked first followed by entry HFO-1108.

Entries OL-1967-1 and JHO-21-5 ranked joint first for NDF%. Entries JHO-21-5 and UPO-21-3 ranked joint first for ADF%, whereas entry JHO-21-5 ranked first for IVDMD %.

Table 12.1: AVTO-2 (MC) (Seed): Second Advanced Varietal Trial in Oat (Multi cut) (Seed): Seed Yield (q/ha)

Entries	Seed Yield (q/ha)												
	Hill Zone				Central Zone						All India		
	** Sri-nagar	Palam-pur	Ra-nk	Superi-ority%	Jha-nsi	Rah-uri	**Jabal-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
JO-07-310	7.5	24.0	1	17.7	8.9	11.0	2.6	10.0	1	1.9	14.6	1	11.8
PLP-24	10.6	22.0	2	7.9	8.6	9.8	2.0	9.2	4		13.4	2	2.6
RO-19 (NC)	8.5	20.4	3		9.3	9.6	1.8	9.5	3		13.1	3	
UPO-212 (NC)	9.0	17.7	4		8.5	11.1	1.9	9.8	2		12.4	4	
Mean	**8.9**	**21.0**			**8.8**	**10.4**	**2.1**	**9.6**			**13.4**		
CD at 5%	**1.2**	**1.5**			**2.0**	**1.4**	**0.26**						
CV%	**10.08**	**5.3**			**1.1**	**9.5**	**8.90**						

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 131.1: IVTO (Dual) Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	North West Zone							North East Zone						
	His-ar	Ludh-iana	Pant-nagar	Bika-ner	Aver-age	Ra-nk	Superi-ority%	Jor-hat	Bhuban-eswar	Pu-sa	Ran-chi	Aver-age	Ra-nk	Superi-ority%
HFO-1108	342.9	124.6	229.6	298.4	248.9	3	3.2	242.6	341.3	360.0	144.9	272.2	1	23.5
OL-1967-1	388.1	116.5	200	281.9	246.6	4	2.3	239.9	271.3	396.7	132.9	260.2	2	18.0
UPO-21-3	397.4	75.7	163.1	142.4	194.6	8		228.9	303.3	383.3	112.4	257.0	3	16.6
OL-1982-2	348.5	127.4	164.8	343.0	245.9	5	2.0	167.8	267.3	385.7	151.1	243.0	5	10.2
JHO-21-5	367.7	65.7	171.1	106.4	177.7	11		147.0	240.6	300.7	107.1	198.8	11	
HFO-1119	427.7	93.1	198.2	259.2	244.6	6	1.4	156.3	294.6	280.7	129.8	215.3	9	
OL-1874-2	416.3	97.0	223.7	331.8	267.2	1	10.8	207.8	289.3	356.7	160.4	253.5	4	15.0
JHO-21-6	333.7	73.3	166.6	165.2	184.7	10		228.5	275.3	326.7	114.7	236.3	6	7.2
JO-13-518	438.1	93.9	196.3	271.8	250.0	2	3.7	252.1	245.9	286.7	130.2	228.7	7	3.7
JHO-822 (NC)	365.5	124.6	222.2	252.1	241.1	7		182.7	229.3	306.7	111.6	207.5	10	
UPO-212 (NC)	448.1	65.0	195.6	64.6	193.3	9		111.3	331.3	336.7	102.7	220.5	8	
Mean	**388.5**	**96.1**	**193.7**	**228.8**	**226.8**			**196.8**	**280.8**	**338.2**	**127.1**	**235.7**		
CD at 5%	**N/A**	**49.2**	**20.2**	**35.3**				**3.5**	**24.0**	**24.4**	**30.7**			
CV%	**12.9**	**9.9**	**9.8**	**9.0**				**4.4**	**5.0**	**6.4**	**14.2**			

Table 13.1: IVTO (Dual) Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	Central Zone							All India	
	Jhansi	Jabalpur	Rahuri	Raipur	** Anand	Average	Rank	Average	Rank
HFO-1108	304.6	183.3	233.5	331.5	509.3	263.2	3	261.4	3
OL-1967-1	309.3	173.3	210.3	272.2	517.4	241.3	6	249.4	4
UPO-21-3	297.7	112.4	109.2	170.4	284.8	172.4	9	208.0	8
OL-1982-2	326.4	102.2	256.6	351.9	494.8	259.2	4	249.4	4
JHO-21-5	316.2	81.1	101.7	127.8	194.4	156.7	10	177.8	11
HFO-1119	317.1	201.1	216.6	251.9	440.7	246.7	5	235.5	7
OL-1874-2	300.9	184.4	257.7	318.5	444.1	265.4	2	262.0	2
JHO-21-6	304.2	106.6	165.2	224.1	353.3	200.0	8	207.0	9
JO-13-518	311.1	131.1	204.9	281.5	466.7	232.1	7	237.0	6
JHO-822 (NC)	300.0	774.2	244.5	318.5	446.3	409.3	1	286.0	1
UPO-212 (NC)	317.6	81.1	69.0	81.5	151.9	137.3	11	183.7	10
Mean	**309.6**	**193.7**	**188.1**	**248.1**	**391.2**	**234.9**		**232.5**	
CD at 5%	**26.1**	**1.6**	**35.9**	**60.9**	**100.4**				
CV%	**15.6**	**9.0**	**11.2**	**14.4**	**15.1**				

Table 13.2 : IVTO (Dual) : Initial Varietal Trial in Oat (Dual) : Dry Matter Yield (q/ha)

Entries	North West Zone							North East Zone					
	His-ar	Ludh-iana	Pant-nagar	Bika-ner	Aver-age	Ra-nk	Superi-ority%	Jor-hat	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk	Superi-ority%
HFO-1108	22.1	23.2	36.7	33.1	28.8	2	2.2	45.9	74.0	88.7	69.5	1	18.6
OL-1967-1	24.3	20.5	31.1	31.0	26.7	5		43.4	58.7	98.8	66.9	3	14.1
UPO-21-3	25.5	14.2	25.8	17.8	20.8	8		41.8	64.1	93.5	66.4	4	13.3
OL-1982-2	22.2	22.2	27.7	34.6	26.7	5		30.5	59.5	100.8	63.6	5	8.4
JHO-21-5	22.2	11.8	30.5	12.2	19.2	9		27.0	51.8	75.2	51.3	11	
HFO-1119	25.9	16.9	34.3	25.9	25.7	6		30.0	63.9	72.6	55.5	9	
OL-1874-2	25.9	17.3	40.7	35.8	29.9	1	6.3	40.4	62.6	85.6	62.9	7	7.2
JHO-21-6	20.0	13.2	30.5	20.5	21.1	7		43.7	60.4	99.7	67.9	2	15.8
JO-13-518	26.5	17.7	34.4	30.4	27.2	4		47.2	53.2	90.2	63.5	6	8.3
JHO-822 (NC)	23.2	22.6	36.6	30.2	28.2	3		34.0	49.5	77.6	53.7	10	
UPO-212 (NC)	27.9	12.0	35.6	7.8	20.8	8		19.8	73.5	82.6	58.7	8	
Mean	**24.1**	**17.4**	**33.1**	**25.4**	**25.0**			**36.7**	**61.0**	**87.8**	**61.8**		
CD at 5%	**N/A**	**9.9**	**3.6**	**3.9**				**1.9**	**5.1**	**12.4**			
CV%	**13.9**	**11.1**	**12.5**	**9.0**				**5.6**	**4.9**	**7.3**			

Table 13.2: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Jabal-pur	Rah-uri	Rai-pur	**Ana-nd	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
HFO-1108	75.2	34.4	46.2	57.0	66.5	53.2	1	1.8	48.8	1	11.1
OL-1967-1	74.9	32.4	45.2	46.9	69.6	49.9	6		46.1	4	5.0
UPO-21-3	72.1	20.8	22.1	28.3	47.9	35.8	9		38.7	9	
OL-1982-2	80.9	18.9	47.4	63.4	66.6	52.6	3	0.8	46.2	3	5.2
JHO-21-5	76.4	14.7	20.6	22.0	29.6	33.4	10		33.1	11	
HFO-1119	78.2	38.0	40.5	43.4	60.6	50.0	5		42.7	7	
OL-1874-2	70.7	34.7	48.3	58.0	58.6	52.9	2	1.3	47.3	2	7.7
JHO-21-6	74.9	19.8	29.5	36.5	42.4	40.2	8		40.8	8	
JO-13-518	75.4	24.3	41.2	52.2	64.8	48.3	7		44.8	5	2.0
JHO-822 (NC)	74.0	34.8	45.8	54.3	59.3	52.2	4		43.9	6	
UPO-212 (NC)	78.9	14.7	14.0	14.0	23.3	30.4	11		34.6	10	
Mean	**75.6**	**26.1**	**36.4**	**43.3**	**53.6**	**45.4**			**42.4**		
CD at 5%	**6.6**	**0.3**	**7.2**	**11.5**	**14.4**						
CV%	**3.9**	**9.1**	**11.5**	**15.6**	**15.8**						

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 13.3: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha/day)

Entries	Hisar	Ludhiana	Pantnagar	Bikaner	Jorhat	Bhubaneswar	Pusa	Ranchi	Anand	Rahuri	Raipur	Average	Rank
HFO-1108	3.01	1.80	3.64	4.66	3.73	6.21	4.94	1.43	4.32	4.17	5.52	3.95	1
OL-1967-1	3.40	1.70	3.17	4.41	3.69	4.93	5.45	1.27	4.58	3.76	4.54	3.72	4
UPO-21-3	3.46	1.10	2.72	2.23	3.52	5.51	5.30	1.12	2.69	1.95	2.84	2.95	9
OL-1982-2	3.07	1.80	2.62	5.36	2.58	4.86	5.32	1.48	4.38	4.58	5.86	3.81	2
JHO-21-5	3.21	1.00	2.72	1.66	2.26	4.38	4.06	0.96	1.66	1.82	2.13	2.35	10
HFO-1119	3.85	1.30	3.15	4.05	2.40	5.36	4.28	1.26	3.94	3.87	4.20	3.42	7
OL-1874-2	3.60	1.40	3.55	5.19	3.20	5.26	4.20	1.50	3.83	4.60	5.31	3.79	3
JHO-21-6	2.87	1.10	2.64	2.58	3.52	5.01	5.70	1.01	3.07	2.95	3.73	3.11	8
JO-13-518	3.80	1.40	3.12	4.25	3.88	4.47	5.42	1.13	3.89	3.66	4.69	3.61	5
JHO-822 (NC)	3.23	1.80	3.53	3.94	2.81	4.17	4.39	1.13	4.02	4.37	5.31	3.52	6
UPO-212 (NC)	3.87	0.90	3.1	1.01	1.71	6.02	4.25	0.98	1.34	1.23	1.36	2.34	11
Mean	**3.40**	**1.39**	**3.09**	**3.58**	**3.03**	**5.11**	**4.85**	**1.21**	**3.43**	**3.36**	**4.14**	**3.32**	

Table 13.4: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha/day)

Entries	Hisar	Ludhiana	Pantnagar	Bikaner	Jorhat	Bhubaneswar	Pusa	Anand	Rahuri	Raipur	Average	Rank
HFO-1108	0.19	0.30	0.58	0.52	0.71	1.35	1.21	0.56	0.83	0.95	0.72	1
OL-1967-1	0.21	0.30	0.49	0.49	0.67	1.07	1.34	0.62	0.81	0.78	0.68	3
UPO-21-3	0.22	0.20	0.41	0.28	0.64	1.17	1.30	0.45	0.40	0.47	0.55	8
OL-1982-2	0.20	0.30	0.44	0.54	0.47	1.08	1.31	0.59	0.85	1.06	0.68	3
JHO-21-5	0.19	0.20	0.48	0.19	0.41	0.94	1.00	0.25	0.37	0.37	0.44	10
HFO-1119	0.23	0.20	0.54	0.41	0.46	1.16	1.05	0.54	0.72	0.72	0.60	6
OL-1874-2	0.22	0.30	0.65	0.56	0.62	1.14	1.03	0.50	0.86	0.97	0.69	2
JHO-21-6	0.17	0.20	0.48	0.32	0.67	1.10	1.40	0.37	0.53	0.61	0.58	7
JO-13-518	0.23	0.30	0.55	0.48	0.73	0.97	1.33	0.54	0.74	0.87	0.67	4
JHO-822 (NC)	0.21	0.30	0.58	0.47	0.52	0.90	1.08	0.53	0.82	0.90	0.63	5
UPO-212 (NC)	0.24	0.20	0.57	0.12	0.30	1.34	1.04	0.21	0.25	0.23	0.45	9
Mean	**0.21**	**0.25**	**0.52**	**0.40**	**0.56**	**1.11**	**1.19**	**0.47**	**0.65**	**0.72**	**0.61**	

Table 13.5: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein Yield (q/ha)

Entries	NWZ					NEZ			
	Hisar	Ludhiana	Bikaner	Average	Rank	Jorhat	Bhubaneswar	Average	Rank
HFO-1108	2.1	3.2	3.7	3.0	4	5.4	5.9	5.6	1
OL-1967-1	2.1	3.3	3.8	3.1	3	4.9	4.7	4.8	3
UPO-21-3	2.4	2.8	1.6	2.2	8	4.8	5.2	5.0	2
OL-1982-2	2.1	3.8	3.4	3.1	3	3.8	4.6	4.2	7
JHO-21-5	2.1	2.4	0.9	1.8	10	3.4	4.2	3.8	9
HFO-1119	2.4	2.9	2.0	2.4	6	3.6	5.1	4.4	5
OL-1874-2	2.4	3.3	4.6	3.4	1	4.4	5.0	4.7	4
JHO-21-6	1.9	2.2	2.7	2.3	7	4.9	4.7	4.8	3
JO-13-518	2.3	3.2	3.2	2.9	5	5.4	4.2	4.8	3
JHO-822 (NC)	2.2	4.1	3.5	3.3	2	4.7	3.9	4.3	6
UPO-212 (NC)	2.6	2.4	1.1	2.0	9	2.4	5.7	4.0	8
Mean	**2.2**	**3.1**	**2.8**	**2.7**		**4.3**	**4.8**	**4.6**	

Table 13.5: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein Yield (q/ha)

Entries	CZ						All India	
	Anand	Jabalpur	Rahuri	Raipur	Average	Rank	Average	Rank
HFO-1108	8.1	3.0	4.2	7.6	5.7	4	4.8	2
OL-1967-1	9.0	2.8	4.1	7.8	5.9	3	4.7	3
UPO-21-3	5.6	1.8	2.3	4.7	3.6	7	3.5	6
OL-1982-2	9.7	1.6	3.4	9.9	6.2	1	4.7	3
JHO-21-5	4.9	1.2	2.0	3.6	2.9	8	2.7	7
HFO-1119	7.8	3.3	3.9	6.3	5.4	5	4.2	4
OL-1874-2	7.4	3.0	4.9	8.9	6.1	2	4.9	1
JHO-21-6	6.2	1.7	3.2	6.1	4.3	6	3.7	5
JO-13-518	8.4	2.1	4.3	9.8	6.2	1	4.8	2
JHO-822 (NC)	8.1	3.0	4.2	8.4	5.9	3	4.7	3
UPO-212 (NC)	3.1	1.3	1.5	2.6	2.1	9	2.5	8
Mean	**7.1**	**2.3**	**3.5**	**6.9**	**4.9**		**4.1**	

Table 13.6: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein (%)

Entries	NWZ					NEZ			
	Hisar	Ludhiana	Bikaner	Average	Rank	Jorhat	Bhubaneswar	Average	Rank
HFO-1108	9.3	13.6	11.2	11.4	9	11.8	7.9	9.9	5
OL-1967-1	8.5	16.3	12.3	12.4	6	11.4	8.0	9.7	7
UPO-21-3	9.4	19.4	8.7	12.5	5	11.8	8.1	9.9	5
OL-1982-2	9.5	17.0	9.7	12.1	8	12.8	7.7	10.3	2
JHO-21-5	9.2	20.1	7.7	12.3	7	12.7	8.2	10.4	1
HFO-1119	9.2	17.2	7.6	11.3	10	12.3	8.0	10.2	3
OL-1874-2	9.3	18.9	12.8	13.7	2	11.1	8.0	9.5	9
JHO-21-6	9.7	16.7	13.3	13.2	3	11.3	7.8	9.6	8
JO-13-518	8.6	18.0	10.4	12.3	7	11.6	8.0	9.8	6
JHO-822 (NC)	9.3	18.0	11.6	13.0	4	12.5	8.0	10.2	3
UPO-212 (NC)	9.3	20.4	13.8	14.5	1	12.3	7.8	10.0	4
Mean	**9.2**	**17.8**	**10.8**	**12.6**		**12.0**	**7.9**	**10.0**	

Table 13.6: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein (%)

Entries	CZ						All India	
	Anand	Jabalpur	Rahuri	Raipur	Average	Rank	Average	Rank
HFO-1108	12.3	8.7	9.0	13.4	10.8	7	10.8	10
OL-1967-1	12.9	8.7	9.1	16.7	11.8	4	11.5	7
UPO-21-3	11.5	8.6	10.2	16.7	11.7	5	11.6	6
OL-1982-2	14.6	8.6	7.1	15.7	11.5	6	11.4	8
JHO-21-5	16.4	8.3	9.9	16.5	12.8	1	12.1	3
HFO-1119	12.9	8.7	9.7	14.5	11.5	6	11.1	9
OL-1874-2	12.6	8.7	10.2	15.3	11.7	5	11.9	4
JHO-21-6	14.5	8.6	10.7	16.7	12.6	3	12.2	2
JO-13-518	13.0	8.6	10.5	18.8	12.7	2	11.9	4
JHO-822 (NC)	13.7	8.7	9.2	15.5	11.8	4	11.8	5
UPO-212 (NC)	13.5	8.5	10.8	18.4	12.8	1	12.7	1
Mean	**13.4**	**8.6**	**9.7**	**16.2**	**12.0**		**11.7**	

Table 13.7: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Plant Height (cm)

Entries	Ludh-iana	Pant-nagar	Bika-ner	Jor-hat	Bhuban-eswar	Pu-sa	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Rai-pur	Aver-age	Ra-nk
HFO-1108	130.5	96.2	87.8	81.7	117.7	155.0	108.1	114.4	57.6	69.3	106.0	102.2	2
OL-1967-1	132.7	98.3	74.6	98.0	108.0	158.3	115.7	108.7	57.4	60.9	103.6	101.5	3
UPO-21-3	131.2	96.1	77.2	81.3	119.3	133.0	107.5	92.8	54.8	65.4	106.2	96.8	5
OL-1982-2	127.2	92.6	92.0	95.7	103.1	160.7	110.6	123.3	52.3	73.1	104.7	103.2	1
JHO-21-5	85.6	61.4	58.2	90.0	102.7	160.0	86.3	63.3	50.5	47.6	64.4	79.1	11
HFO-1119	123.2	72.2	70.4	89.1	111.1	124.3	124.5	102.9	60.7	58.7	94.6	93.8	7
OL-1874-2	95.8	87.3	82.2	91.9	106.5	158.3	102.7	122.5	59.0	81.1	111.8	99.9	4
JHO-21-6	86.6	76.1	51.8	93.9	104.3	148.3	92.3	89.3	53.0	67.7	92.3	86.9	9
JO-13-518	131.6	85.3	58.0	97.0	104.0	126.7	85.5	96.7	56.1	59.3	95.8	90.5	8
JHO-822 (NC)	95.0	93.8	77.2	72.0	101.9	156.7	111.9	99.4	61.1	64.2	106.3	94.5	6
UPO-212 (NC)	73.2	78.9	54.8	91.4	114.5	161.7	113.1	78.1	51.9	47.5	79.8	85.9	10
Mean	**110.2**	**85.3**	**71.3**	**89.3**	**108.4**	**149.4**	**105.3**	**99.2**	**55.9**	**63.2**	**96.8**	**94.0**	

Table 13.8: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Leaf Stem Ratio

Entries	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Bhuban-eswar	Pu-sa	Ana-nd	Jabal-pur	Rah-uri	Rai-pur	Aver-age	Ra-nk
HFO-1108	0.63	1.41	1.05	1.15	1.25	0.46	1.70	0.68	0.60	0.94	0.99	2
OL-1967-1	0.49	1.28	0.77	1.36	1.06	0.49	2.23	0.65	0.43	0.95	0.97	3
UPO-21-3	0.63	1.32	0.81	0.98	1.19	0.41	1.94	0.63	0.66	0.70	0.93	5
OL-1982-2	0.61	1.44	0.66	0.97	1.03	0.42	1.63	0.60	0.77	0.88	0.90	8
JHO-21-5	0.63	1.46	0.78	1.03	0.9	0.49	3.76	0.49	0.49	0.63	1.07	1
HFO-1119	0.61	1.21	0.84	1.01	1.16	0.38	1.44	0.72	0.64	0.88	0.89	9
OL-1874-2	0.68	1.18	0.73	0.98	1.12	0.47	1.78	0.68	0.70	0.77	0.91	7
JHO-21-6	0.56	1.36	0.96	0.82	1.07	0.37	1.50	0.62	0.69	0.88	0.88	10
JO-13-518	0.56	1.40	0.85	1.11	0.98	0.48	1.27	0.64	0.64	0.92	0.89	9
JHO-822 (NC)	0.61	1.44	0.80	1.31	0.94	0.38	1.86	0.74	0.64	0.83	0.95	4
UPO-212 (NC)	0.61	1.26	1.02	0.96	1.21	0.41	1.70	0.58	0.54	0.93	0.92	6
Mean	**0.60**	**1.34**	**0.84**	**1.06**	**1.08**	**0.43**	**1.89**	**0.64**	**0.62**	**0.85**	**0.94**	

Table 13.9: IVTO (Dual): Initial Varietal Trial in Oat (Dual): NDF (%), ADF (%), and IVDMD (%)

Entries	NDF (%)				ADF (%)				IVDMD (%)	
	Ludhiana	Anand	Average	Rank	Ludhiana	Anand	Average	Rank	Ludhiana	Rank
HFO-1108	55.4	66.0	60.7	6	33.5	40.1	36.8	10	59.8	9
OL-1967-1	51.4	67.2	59.3	1	32.4	39.7	36.1	8	61.5	7
UPO-21-3	51.2	69.4	60.3	4	30.5	36.5	33.5	1	63.5	4
OL-1982-2	54.8	67.0	60.9	7	31.4	39.1	35.3	2	60.5	8
JHO-21-5	52.7	65.8	59.3	1	32.1	35.0	33.5	1	64.8	1
HFO-1119	53.8	67.0	60.4	5	32.5	39.4	36.0	7	58.2	10
OL-1874-2	54.1	68.2	61.1	8	32.5	39.4	35.9	6	63.9	3
JHO-21-6	56.2	67.1	61.6	9	34.5	38.4	36.4	9	61.8	6
JO-13-518	53.6	67.1	60.4	5	34.8	40.3	37.6	11	62.8	5
JHO-822 (NC)	53.2	67.2	60.2	3	31.5	39.4	35.4	5	54.9	11
UPO-212 (NC)	53.2	66.6	59.9	2	31.2	37.0	34.1	2	64.0	2
Mean	**53.6**	**67.1**	**60.4**		**32.4**	**38.6**	**35.5**		**61.4**	

Table 13.10: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	North West Zone						North East Zone						
	His-ar	Ludh-iana	Pant-nagar	Bika-ner	Aver-age	Ra-nk	Jor-hat	Bhuban-eswar	Pu-sa	Ran-chi	Aver-age	Ra-nk	Superi-ority%
HFO-1108	22.2	26.6	21.1	13.9	21.0	8	14.9	11.7	19.2	32.7	19.6	1	4.0
OL-1967-1	26.7	25.4	24.5	12.2	22.2	5	12.6	10.1	18.8	31.0	18.1	6	
UPO-21-3	24.1	26.2	16.1	23.4	22.4	4	9.2	11.5	19.2	27.7	16.9	7	
OL-1982-2	30.4	27.6	13.2	9.4	20.1	9	11.0	10.9	18.6	23.9	16.1	10	
JHO-21-5	24.4	28.3	19.7	15.8	22.1	6	11.9	8.9	18.8	26.0	16.4	9	
HFO-1119	24.8	25.3	20.2	17.3	21.9	7	12.4	12.1	20.6	32.9	19.5	2	3.4
OL-1874-2	22.6	29.0	12.3	11.1	18.7	11	14.3	10.5	21.3	29.4	18.9	3	
JHO-21-6	24.8	28.6	13.4	11.4	19.6	10	14.1	11.3	22.4	27.2	18.7	4	
JO-13-518	24.1	28.8	28.8	9.5	22.8	2	13.4	9.7	19.7	30.1	18.2	5	
JHO-822 (NC)	23.4	26.9	23.3	19.7	23.3	1	14.4	9.1	18.4	33.5	18.9	3	
UPO-212 (NC)	29.6	28.3	15.8	16.1	22.5	3	14.6	12.5	19.3	20.4	16.7	8	
Mean	**25.2**	**27.4**	**18.9**	**14.5**	**21.5**		**13.0**	**10.7**	**19.7**	**28.6**	**18.0**		
CD at 5%	**N/A**	**2.1**		**2.2**			**1.0**	**0.9**	**1.6**	**7.2**			
CV%	**20.7**	**12.0**		**8.9**			**5.0**	**5.0**	**5.3**	**14.8**			

Table 13.10: IVTO (Dual): Initial Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	Central Zone							All India	
	Jhansi	Jabalpur	Rahuri	Raipur	**Anand	Average	Rank	Average	Rank
HFO-1108	10.6	19.4	9.8	7.9	3.6	11.9	8	15.5	3
OL-1967-1	8.8	18.7	11.0	8.6	6.7	11.8	9	16.2	3
UPO-21-3	7.3	19.0	11.9	8.8	16.9	11.7	10	15.9	5
OL-1982-2	11.8	28.0	6.5	7.7	2.4	13.5	4	15.9	5
JHO-21-5	8.9	20.8	13.2	9.6	22.6	13.1	6	16.2	3
HFO-1119	13.0	22.3	10.3	7.9	3.3	13.4	5	16.1	2
OL-1874-2	6.1	26.0	7.3	7.9	3.6	11.8	9	15.6	6
JHO-21-6	12.2	22.8	10.8	8.5	2.3	13.6	3	16.2	3
JO-13-518	13.6	22.7	9.9	9.9	11.5	14.0	2	16.8	2
JHO-822 (NC)	15.0	25.8	13.2	11.5	4.3	16.4	1	17.5	1
UPO-212 (NC)	6.1	22.0	12.7	10.8	15.0	12.9	7	16.1	4
Mean	**10.3**	**22.5**	**10.6**	**9.0**	**8.4**	**13.1**		**16.2**	
CD at 5%	**5.1**	**0.00**	**1.8**		**2.4**				
CV%	**3.1**	**0.05**	**10.1**		**16.9**				

Note: ** Data is not included in zonal and all India average due to low yield of data

14. AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual)

(Reference tables 14.1 to 14.10)

In **first advance varietal trial in oat (dual),** five (05) entries were evaluated against two national checks UPO-212 and JHO-822 at 8 locations comprising 4 each in NWZ, NEZ.

In NWZ for GFY, entries HFO-917, HFO-1014, OL-1931 showed marginal superiority over the best check. For DMY, entries JO-03-513 (9.9%), HFO-1014 (4.1%), HFO-917 (4.1%) and OL-1931 (3.3%) were superior over the best check. For CPY, entries HFO-1014 (4.7), JO-030513 (4.1), HFO-917 (4.0) and OL-1931 (3.8) were superior over the best check JHO-822 (3.6q/ha). For crude protein%, entries HFO-1014 (15.6%), JHO-20-2 (14.2%), HFO-917 (13.9%), OL-1931 (13.1%), and JO-03-513 (12.9%) were superior as compared to the best check UPO-212 with value of 12.4%. For seed yield, entries HFO-1014 (5.7%0 and OL-1931 (0.8%) were better yielder than the best check.

In NEZ, entries JO-03-513 (6.3%), OL-1931 (4.0%) and entry HFO-917 (1.3%) were superior over the best check. For DMY, entries HFO-917 (5.1%), JO-03-513 (4.0%), OL-1931 (3.2%) were superior over the best check. For CPY, entries JO-03-513 (5.2), HFO-917 (4.7) were superior over the best check JHO-822 (4.5 q/ha). For crude protein %, entries JHO-202 (10.1%), HFO-1014 (10.0%), HFO-817 (10.0%), OL-1931 (9.9%), and JO-03-513 (9.7%) were superior over the best check UPO-212 (9.6%). Entry HFO-917 performed slightly better than the best check by a margin of 0.8%.

For per day productivity, entry HFO-917 followed by JO-03-513 were top performers for green matter whereas entry HFO-917 and JO-03-513 ranked first followed by OL-1931 for dry matter. For plant height and leafiness, entry HFO-917 followed by OL-1931 were top rankers.

For NDF%, entry HFO-917 followed by entry HFO-1014 were best performers. For ADF% and IVDMD% entry HFO-1014 followed by HFO-917 were best performers.

15. VT LUCERNE PERENNIAL: VARIETAL TRIAL IN LUCERNE PERENNIAL (2^{ND} YEAR)

(Reference tables 15.1 to 15.9)

A varietal trial in Lucerne (Perennial) was established in 2020 with 5 entries. The data of this year was reported from seven locations including 2 locations in NWZ, 2 in CZ and 3 in south zone.

For GFY and DMY (q/ha), in NWZ entry VTLu-1 was best performer followed by VTLu-4. In central zone, entry VTLu-2 was best followed by entry VTLu-3. In south zone, entry VTLU-5 was best followed by entry VTLu-2.

For production potential (q/ha/day) entry VTLu-2 ranked first for green matter followed by entry VTLu-3, whereas for dry matter entry VTLu-3 was top ranked followed by entry VTLu-2. For plant height, VTLu-5 was best whereas VTLu-1 and VTLu-2 was best for leafiness.

For crude protein yield (q/ha) entry VTLu-2 ranked first (48.5q/ha) followed by VTLu-3 (42.0 q/ha). For crude protein content, entries VTLu-1and VTLu-2 ranked joint first with a value of 19.9%. Entry VTLu-1 ranked first for NDF whereas entry VTLu-5 was best performer for ADF % and IVDMD.

The entries are coded and will be decoded after the completion of trial. The trial will continue in coded form.

Table 14.1: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	North West Zone						
	Hisar	Ludhiana	Pantnagar	Bikaner	Average	Rank	Superiority%
OL-1931	104.0	137.9	166.6	309.4	179.5	3	1.3
JO-03-513	112.4	153.2	145.8	292.0	175.8	5	
JHO-20-2	101.3	86.7	154.1	157.2	124.8	6	
HFO-1014	97.7	155.0	179.2	292.8	181.2	2	2.3
HFO-917	101.2	140.3	171.7	321.7	183.7	1	3.7
UPO-212 (NC)	102.0	68.2	128.3	67.2	91.4	7	
JHO-822 (NC)	97.3	163.5	136.6	311.1	177.1	4	
Mean	**102.3**	**129.3**	**154.6**	**250.2**	**159.1**		
CD at 5%	**N/A**	**34.7**	**13.2**	**38.5**			
CV%	**10.1**	**13.9**	**8.2**	**8.6**			

Table 14.1: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	North East Zone							All India		
	Jorhat	Bhubaneswar	Pusa	Ranchi	Average	Rank	Superiority%	Average	Rank	Superiority%
OL-1931	185.4	264.0	386.7	150.4	246.6	2	4.0	213.1	2	2.9
JO-03-513	201.9	345.6	326.7	134.2	252.1	1	6.3	214.0	1	3.3
JHO-20-2	150.6	248.0	343.3	104.5	211.6	7		168.2	6	
HFO-1014	185.1	255.0	346.7	141.1	232.0	5		206.6	5	
HFO-917	167.4	325.0	360.0	108.3	240.2	3	1.3	212.0	3	2.4
UPO-212 (NC)	142.8	275.0	380.0	110.3	227.0	6		159.2	7	
JHO-822 (NC)	194.9	311.0	326.7	115.6	237.1	4		207.1	4	
Mean	**175.5**	**289.1**	**352.9**	**123.5**	**235.2**			**197.2**		
CD at 5%	**4.3**	**32.0**	**48.7**	**23.7**						
CV%	**6.9**	**6.2**	**7.4**	**10.8**						

Table 14.2: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	North West Zone						
	Hisar	Ludhiana	Pantnagar	Bikaner	Average	Rank	Superiority%
OL-1931	21.9	25.8	28.3	35.3	27.8	3	3.3
JO-03-513	23.1	29.4	28.0	38.0	29.6	1	9.9
JHO-20-2	20.0	15.6	26.5	19.6	20.4	5	
HFO-1014	20.5	28.5	31.6	31.6	28.1	2	4.1
HFO-917	21.0	25.0	30.9	35.4	28.1	2	4.1
UPO-212 (NC)	20.1	12.7	23.1	8.1	16.0	6	
JHO-822 (NC)	19.4	29.1	25.1	34.2	27.0	4	
Mean	**20.9**	**23.7**	**27.6**	**28.9**	**25.3**		
CD at 5%	**N/A**	**12.7**	**3.3**	**4.5**			
CV%	**11.4**	**11.2**	**12.2**	**8.7**			

Table 14.2: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	North East Zone						All India		
	Jorhat	Bhubaneswar	Pusa	Average	Rank	Superiority%	Average	Rank	Superiority%
OL-1931	34.6	57.1	102.4	64.7	3	3.2	43.6	3	4.1
JO-03-513	38.5	76.8	80.3	65.2	2	4.0	44.9	1	7.0
JHO-20-2	26.2	55.7	84.4	55.4	7		35.4	7	
HFO-1014	33.3	52.8	85.2	57.1	6		40.5	5	
HFO-917	32.0	72.3	93.4	65.9	1	5.1	44.3	2	5.6
UPO-212 (NC)	27.7	59.6	100.7	62.7	4		36.0	6	
JHO-822 (NC)	33.2	67.3	85.2	61.9	5		41.9	4	
Mean	**32.2**	**63.1**	**90.2**	**61.8**			**40.9**		
CD at 5%	**1.1**	**7.2**	**12.0**						
CV%	**4.1**	**6.5**	**7.4**						

Table 14.3: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha/day)

Entries	Hisar	Ludhiana	Pantnagar	Bikaner	Jorhat	Bhubaneswar	Pusa	Ranchi	Average	Rank
OL-1931	0.91	2.00	2.82	4.69	2.73	4.80	4.79	1.50	3.03	3
JO-03-513	0.96	2.20	2.47	4.42	2.97	6.28	3.77	1.32	3.05	2
JHO-20-2	0.86	1.20	2.61	2.38	2.22	4.51	4.12	1.06	2.37	6
HFO-1014	0.83	2.20	3.04	4.44	2.72	4.64	4.04	1.36	2.91	5
HFO-917	0.89	2.00	2.91	4.87	2.46	5.91	4.58	1.02	3.08	1
UPO-212 (NC)	0.88	1.00	2.17	1.02	2.10	5.00	4.94	1.07	2.27	7
JHO-822 (NC)	0.82	2.30	2.32	4.71	2.87	5.66	4.16	1.18	3.00	4
Mean	**0.88**	**1.84**	**2.62**	**3.79**	**2.58**	**5.26**	**4.34**	**1.22**	**2.82**	

Table 14.4: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha/day)

Entries	Hisar	Ludhiana	Pantnagar	Bikaner	Jorhat	Bhubaneswar	Pusa	Average	Rank
OL-1931	0.20	0.40	0.48	0.56	0.51	1.04	1.18	0.62	2
JO-03-513	0.21	0.40	0.48	0.60	0.57	1.40	0.93	0.65	1
JHO-20-2	0.18	0.20	0.45	0.31	0.39	1.01	1.01	0.51	6
HFO-1014	0.18	0.40	0.54	0.50	0.49	0.96	0.99	0.58	4
HFO-917	0.19	0.40	0.52	0.56	0.47	1.31	1.12	0.65	1
UPO-212 (NC)	0.19	0.20	0.39	0.13	0.41	1.08	1.21	0.52	5
JHO-822 (NC)	0.17	0.40	0.43	0.54	0.49	1.22	1.02	0.61	3
Mean	**0.19**	**0.34**	**0.47**	**0.46**	**0.47**	**1.15**	**1.07**	**0.59**	

Table 14.5: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Crude Protein Yield (q/ha)

Entries	NWZ					NEZ				All India	
	Hisar	Ludhiana	Bikaner	Average	Rank	Jorhat	Bhubaneswar	Average	Rank	Average	Rank
OL-1931	2.9	4.3	4.3	3.8	4	4.1	4.5	4.3	4	4.0	3
JO-03-513	2.8	5.0	4.5	4.1	2	4.4	5.9	5.2	1	4.5	1
JHO-20-2	2.6	2.9	2.8	2.7	6	3.2	4.3	3.7	7	3.1	5
HFO-1014	3.1	6.1	4.9	4.7	1	3.9	4.4	4.1	5	4.5	1
HFO-917	3.1	5.1	4.0	4.0	3	3.9	5.6	4.7	2	4.3	2
UPO-212 (NC)	2.3	2.0	0.9	1.7	7	3.1	4.7	3.9	6	2.6	6
JHO-822 (NC)	2.5	4.5	3.8	3.6	5	3.6	5.4	4.5	3	3.9	4
Mean	**2.7**	**4.3**	**3.6**	**3.5**		**3.7**	**5.0**	**4.4**		**3.9**	

Table 14.6: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Crude Protein (%)

Entries	NWZ					NEZ				All India	
	Hisar	Ludhiana	Bikaner	Average	Rank	Jorhat	Bhubaneswar	Average	Rank	Average	Rank
OL-1931	10.3	16.8	12.2	13.1	4	11.8	8.0	9.9	3	10.9	4
JO-03-513	10.0	17.0	11.8	12.9	5	11.7	7.7	9.7	4	10.9	4
JHO-20-2	9.6	18.7	14.1	14.2	2	12.5	7.7	10.1	1	11.3	2
HFO-1014	9.9	21.4	15.6	15.6	1	11.7	8.3	10.0	2	11.9	1
HFO-917	9.9	20.5	11.2	13.9	3	12.2	7.7	10.0	2	11.2	3
UPO-212 (NC)	9.8	15.9	11.6	12.4	6	11.2	7.9	9.6	5	10.7	5
JHO-822 (NC)	9.9	15.4	11.0	12.1	7	11.1	8.0	9.5	6	10.6	6
Mean	**9.9**	**18.0**	**12.5**	**13.5**		**11.7**	**7.9**	**9.8**			

Table 14.7: AVTO-1(Dual): First Advanced Varietal Trial in Oat (Dual): Plant Height (cm)

Entries	Ludhiana	Pantnagar	Bikaner	Jorhat	Bhubaneswar	Pusa	Ranchi	Average	Rank
OL-1931	138.5	105.6	81.4	106.6	101.5	147.7	132.4	116.2	2
JO-03-513	142.3	96.2	75.6	95.9	121.4	149.0	112.7	113.3	4
JHO-20-2	108.8	98.3	68	96.5	107.7	175.7	108.2	109.0	5
HFO-1014	88.5	104.2	74.2	97.6	109.5	146.0	106.1	103.7	7
HFO-917	134.3	112.8	85.2	103.1	119.2	162.3	104.2	117.3	1
UPO-212 (NC)	104.8	92.4	56.2	82.7	113.5	170.0	123.5	106.1	6
JHO-822 (NC)	136.8	102.6	77.6	100.6	117.7	137.7	129.6	114.6	3
Mean	**122.0**	**101.7**	**74.0**	**97.6**	**112.9**	**155.5**	**116.7**	**111.5**	

Table 14.8: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Leaf Stem Ratio

Entries	Hisar	Ludhiana	Pantnagar	Jorhat	Bhubaneswar	Pusa	Average	Rank
OL-1931	0.67	1.32	0.81	0.88	1.07	0.49	0.87	2
JO-03-513	0.65	1.39	0.62	0.86	1.25	0.41	0.86	3
JHO-20-2	0.63	1.17	0.69	0.86	0.94	0.47	0.79	7
HFO-1014	0.65	1.09	0.75	1.08	0.98	0.36	0.82	5
HFO-917	0.65	1.35	0.70	1.04	1.20	0.41	0.89	1
UPO-212 (NC)	0.66	1.15	0.63	0.89	1.12	0.42	0.81	6
JHO-822 (NC)	0.63	0.97	0.77	1.10	1.16	0.38	0.84	4
Mean	**0.65**	**1.21**	**0.71**	**0.96**	**1.10**	**0.42**	**0.84**	

Table 14.9: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): NDF (%), ADF (%), IVDMD (%)

Entries	NDF (%)		ADF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
OL-1931	55.4	5	36.2	4	63.3	3
JO-03-513	53.8	3	34.5	3	61.2	5
JHO-20-2	54.2	4	32.8	2	62.2	4
HFO-1014	53.4	2	31.5	1	66.4	1
HFO-917	51.3	1	32.8	2	65.4	2
UPO-212 (NC)	58.2	7	37.4	6	60.1	7
JHO-822 (NC)	56.6	6	36.8	5	60.8	6
Mean	**54.7**		**34.6**		**62.8**	

Table 14.10: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	North West Zone						
	Hisar	Ludhiana	Pantnagar	Bikaner	Average	Rank	Superiority%
OL-1931	26.5	27.5	22.9	11.1	22.0	2	0.8
JO-03-513	18.5	29.7	21.8	14.0	21.0	6	
JHO-20-2	22.8	27.8	21.2	13.8	21.4	5	
HFO-1014	20.8	26.9	28.3	16.3	23.1	1	5.7
HFO-917	18.9	28.3	24.8	14.1	21.5	4	
UPO-212 (NC)	22.4	29.0	20.6	15.3	21.8	3	
JHO-822 (NC)	20.0	29.8	18.5	15.2	20.9	7	
Mean	**21.4**	**28.4**	**22.6**	**14.3**	**21.7**		
CD at 5%	**N/A**	**2.1**	**2.4**	**1.5**			
CV%	**20.4**	**8.8**	**11.2**	**6.0**			

Table 14.10: AVTO-1 (Dual): First Advanced Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	North East Zone							All India		
	Jorhat	Bhubaneswar	Pusa	Ranchi	Average	Rank	Superiority%	Average	Rank	Superiority%
OL-1931	14.9	9.0	15.4	24.2	15.9	5		18.9	5	
JO-03-513	14.4	12.0	18.2	27.1	17.9	3		19.5	3	0.2
JHO-20-2	9.2	9.5	17.4	25.7	15.5	6		18.4	6	
HFO-1014	14.1	8.7	15.5	28.7	16.8	4		19.9	1	2.6
HFO-917	13.4	11.5	17.6	30.0	18.1	1	0.8	19.8	2	2.1
UPO-212 (NC)	12.6	10.8	16.3	20.0	14.9	7		18.4	6	
JHO-822 (NC)	14.3	12.5	19.1	26.0	18.0	2		19.4	4	
Mean	**13.3**	**10.6**	**17.1**	**25.9**	**16.7**			**19.2**		
CD at 5%	**1.0**	**1.4**	**0.9**	**5.2**						
CV%	**5.8**	**7.5**	**5.7**	**11.2**						

Table 15.1: VT Lucerne Perennial: Varietal Trial in Lucerne Perennial- 2nd Year: Green Forage Yield (q/ha)

Entries	North West Zone				Central Zone			
	Ludhiana	Bikaner	Average	Rank	Rahuri	Urulikanchan	Average	Rank
VTLu-1	995.4	667.1	831.3	1	627.3	1067.2	847.3	4
VTLu-2	823.8	588.6	706.2	4	1004.5	1318.5	1161.5	1
VTLu-3	828.8	601.3	715.1	3	894.0	1345.4	1119.7	2
VTLu-4	927.1	602.3	764.7	2	657.4	1116.5	887.0	3
VTLu-5	384.8	562.5	473.7	5	507.4	1038.1	772.7	5
Mean	**792.0**	**604.4**	**698.2**		**738.1**	**1177.1**	**957.6**	
CD at 5%	**23.1**	**65.5**			**94.8**	**104.5**		
CV%	**7.81**	**7.0**			**8.3**	**5.5**		

Table 15.1: VT Lucerne Perennial: Varietal Trial in Lucerne Perennial- 2nd Year: Green Forage Yield (q/ha)

Entries	South Zone					All India	
	Hyderabad	Coimbatore	Dharwad	Average	Rank	Average	Rank
VTLu-1	311.7	1094.3	654.4	686.8	4	773.9	3
VTLu-2	335.8	1190.6	675.4	733.9	2	848.2	1
VTLu-3	314.0	1212.5	624.8	717.1	3	831.5	2
VTLu-4	324.4	963.5	598.5	628.8	5	741.4	4
VTLu-5	405.6	1324.1	603.3	777.7	1	689.4	5
Mean	**338.3**	**1157.0**	**631.3**	**708.9**		**776.9**	
CD at 5%	**33.2**	**92.4**	**18.8**				
CV%	**6.3**	**5.2**	**1.9**				

Table 15.2: VT Lucerne Perennial: Varietal Trial in Perennial Lucerne -2nd Year: Dry Matter Yield (q/ha)

Entries	North West Zone				Central Zone			
	Ludhiana	Bikaner	Average	Rank	Rahuri	Urulikanchan	Average	Rank
VTLu-1	189.1	140.1	164.6	1	131.6	240.4	186.0	4
VTLu-2	149.9	117.7	133.8	4	223.7	367.1	295.4	1
VTLu-3	161.6	144.3	153.0	3	192.9	304.6	248.8	2
VTLu-4	185.4	132.5	159.0	2	143.7	262.5	203.1	3
VTLu-5	71.2	112.5	91.9	5	109.8	247.8	178.8	5
Mean	**151.4**	**129.4**	**140.4**		**160.3**	**284.5**	**222.4**	
CD at 5%	**15.6**	**14.0**			**20.4**	**8.0**		
CV%	**6.9**	**7.0**			**8.3**	**5.6**		

Table 15.2: VT Lucerne Perennial: Varietal Trial in Perennial Lucerne -2nd Year: Dry Matter Yield (q/ha)

Entries	South Zone					All India	
	Hyderabad	Coimbatore	Dharwad	Average	Rank	Average	Rank
VTLu-1	63.9	255.5	178.4	165.9	4	171.3	3
VTLu-2	73.7	274.9	173.0	173.9	2	197.1	1
VTLu-3	67.7	283.3	170.4	173.8	3	189.3	2
VTLu-4	69.3	217.9	163.2	150.1	5	167.8	4
VTLu-5	88.0	312.8	162.6	187.8	1	157.8	5
Mean	**72.5**	**268.9**	**169.5**	**170.3**		**176.7**	
CD at 5%	**8.3**	**21.4**	**5.8**				
CV%	**7.3**	**5.2**	**2.2**				

Table 15.3: VT Lucerne Perennial: Varietal Trial in Perennial Lucerne -2nd Year : Green Forage Yield (q/ha/day)

	Bikaner	Rahuri	Coimbatore	Dharwad	Average	Rank
VTLu-1	1.83	1.75	2.90	2.34	2.21	3
VTLu-2	1.61	2.81	3.16	2.41	2.50	1
VTLu-3	1.65	2.50	3.22	2.23	2.40	2
VTLu-4	1.65	1.84	2.56	2.14	2.05	5
VTLu-5	1.54	1.42	3.51	2.15	2.15	4
Mean	**1.66**	**2.06**	**3.07**	**2.25**	**2.26**	

Table 15.4: VT Lucerne Perennial: Varietal Trial in Perennial Lucerne -2nd Year: Dry Matter Yield (q/ha/day)

Entries	Bikaner	Rahuri	Coimbatore	Dharwad	Average	Rank
VTLu-1	0.38	0.37	0.68	0.64	0.52	3
VTLu-2	0.32	0.62	0.73	0.62	0.57	2
VTLu-3	0.40	0.54	0.75	0.61	0.58	1
VTLu-4	0.36	0.40	0.58	0.58	0.48	5
VTLu-5	0.31	0.31	0.83	0.58	0.51	4
Mean	**0.35**	**0.45**	**0.71**	**0.61**	**0.53**	

Table 15.5: VT Lucerne Perennial: Varietal Trial in Perennial Lucerne -2nd Year: Crude Protein Yield (q/ha)

Entries	Ludhiana	Rahuri	Urulikanchan	Coimbatore	Dharwad	** Bikaner	Average	Rank
VTLu-1	35.7	29.8	52.7	42.4	35.1	17.4	39.1	3
VTLu-2	24.9	50.2	80.9	54.2	32.5	15.7	48.5	1
VTLu-3	30.5	43.7	62.4	40.8	32.8	18.5	42.0	2
VTLu-4	32.1	30.2	55.6	39.0	28.6	17.2	37.1	4
VTLu-5	13.8	22.0	49.8	57.6	29.9	11.9	34.6	5
Mean	**27.4**	**35.2**	**60.3**	**46.8**		**16.1**	**40.3**	

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 15.6 VT Lucerne Perennial: Varietal Trial in Perennial Lucerne-2nd Year: Crude Protein (%)

Entries	Ludhiana	Rahuri	Urulikanchan	Coimbatore	Dharwad	**Bikaner	Average	Rank
VTLu-1	18.9	22.6	21.9	16.6	19.7	12.4	19.9	1
VTLu-2	16.6	22.4	22.0	19.7	18.8	13.3	19.9	1
VTLu-3	18.9	22.6	20.5	14.4	19.3	12.8	19.1	3
VTLu-4	17.3	21.0	21.2	17.9	17.5	13.0	19.0	4
VTLu-5	19.4	20.0	20.1	18.4	18.4	10.6	19.3	2
Mean	**18.2**	**21.8**	**21.1**	**17.4**	**18.7**	**12.4**	**19.5**	

Table 15.7 VT Lucerne Perennial: Varietal Trial in Perennial Lucerne -2nd Year: Plant Height (cm)

Entries	Ludhiana	Bikaner	Rahuri	Urulikanchan	Hyderabad	Coimbatore	Average	Rank
VTLu-1	94.0	90.8	61.8	81.2	83.2	70.4	80.2	2
VTLu-2	86.0	82.4	70.0	70.0	76.3	73.5	76.4	5
VTLu-3	85.0	86.1	70.9	76.9	66.1	75.0	76.7	4
VTLu-4	87.0	88.7	67.4	77.8	73.3	72.2	77.7	3
VTLu-5	88.0	93.2	67.5	81.9	84.5	78.6	82.3	1
Mean	**88.0**	**88.2**	**67.5**	**77.6**	**76.7**	**73.9**	**78.7**	

Table 15.8 VT Lucerne Perennial: Varietal Trial in Perennial Lucerne -2nd Year: Leaf Stem Ratio

Entries	Ludhiana	Bikaner	Rahuri	Urulikanchan	Hyderabad	Coimbatore	Average	Rank
VTLu-1	1.11	1.27	0.92	0.78	0.61	0.48	0.86	1
VTLu-2	1.07	1.54	0.73	0.76	0.58	0.49	0.86	1
VTLu-3	1.05	1.04	0.74	0.81	0.71	0.51	0.81	3
VTLu-4	1.03	1.11	0.78	0.84	0.50	0.49	0.79	4
VTLu-5	1.11	1.16	0.76	0.82	0.59	0.52	0.83	2
Mean	**1.07**	**1.22**	**0.79**	**0.80**	**0.60**	**0.50**	**0.83**	

Table 15.9 VT Lucerne Perennial: Varietal Trial in Perennial Lucerne -2nd Year: ADF (%), NDF (%), & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
VTLu-1	33.5	1	61.9	3	54.9	2
VTLu-2	35.3	3	63.1	5	53.4	4
VTLu-3	35.6	4	61.2	2	54.6	3
VTLu-4	36.4	5	63.0	4	52.0	5
VTLu-5	34.7	2	60.5	1	55.8	1
Mean	**35.1**		**61.9**		**54.1**	

16 AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne

(Reference tables 16.1 to 16.8)

A **second advanced Varietal Trial in Lucerne (annual)** comprising of single entry LLC-6 along with two national checks (Anand-2 and RL-88) was conducted at 6 centres located at two zones. There were 2 locations in NWZ and 4 locations in SZ.

Entry LLC-6 was superior by margin of 21.2% and 24.8% for GFY and DMY respectively over the best check (RL-88) in NW zone. In south zone, the national check RL-88 was best for GFY as well as DMY.

For fodder production potential (q/ha/day), entry LLC-6 ranked first for both green and dry matter. Entry LLC-6 ranked first for plant height. National check Anand-2was first followed by LLC-6 for leafiness.

For quality parameters, entry LLC-6 (18.5 q/ha) ranked first followed by both the national checks (16.0 q/ha) for crude protein yield. National check Anand-2 was superior for crude protein content. National check Anand-2 was superior for NDF% and ADF%. Entry LL-6 was best for IVDMD%.

17 AVT-2 (seed) Lucerne Annual: Varietal Trial in Annual Lucerne (seed)

(Reference tables 17.1)

A **second advanced Varietal Trial (seed) in Lucerne (annual)** comprising of single entry LLC-6 along with two national checks (Anand-2 and RL-88) was conducted at 4 centres located at two zones. There were 2 locations each in NWZ and SZ.

For seed yield (q/ha), national check Anand-2 was best for both the zones.

Table 16.1: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): Green Forage Yield (q/ha)

Entries	North West Zone					South Zone						All India		
	Ludh-iana	Bika-ner	Aver-age	Ra-nk	Superi-ority%	Hydera-bad	Coimb-atore	Man-dya	Dhar-wad	Aver-age	Ra-nk	Aver-age	Ra-nk	Superi-ority%
LLC-6	828.0	474.8	651.4	1	21.2	224.9	389.4	418.6	192.5	306.3	3	421.4	1	4.4
RL-88 (NC)	657.2	417.6	537.4	2		214.2	501.1	397.2	234.9	336.8	1	403.7	2	
Anand-2 (NC)	590.6	436.4	513.5	3		252.3	408.8	349.8	234.6	311.4	2	378.8	3	
Mean	**691.9**	**442.9**	**567.4**			**230.5**	**433.1**	**388.5**	**220.7**	**318.2**		**401.3**		
CD at 5%	**27.7**	**38.0**				**14.6**	**29.9**	**42.1**	**35.7**					
CV%	**7.3**	**7.3**				**5.4**	**5.9**	**9.2**	**9.1**					

Table 16.2: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): Dry Matter Yield (q/ha)

Entries	North West Zone					South Zone						All India		
	Ludh-iana	Bika-ner	Aver-age	Ra-nk	Superi-ority%	Hydera-bad	Coimb-atore	Man-dya	Dhar-wad	Aver-age	Ra-nk	Aver-age	Ra-nk	Superi-ority%
LLC-6	192.1	86.9	139.5	1	24.8	43.9	93.8	115.6	52.4	76.4	2	97.5	1	10.8
RL-88 (NC)	126.2	75.2	100.7	3		44.3	117.3	101.3	63.2	81.5	1	87.9	2	
Anand-2 (NC)	147.6	75.9	111.8	2		51.5	94.1	84.9	63.6	73.5	3	86.3	3	
Mean	**155.3**	**79.3**	**117.3**			**46.6**	**101.7**	**100.6**	**59.7**	**77.2**		**90.5**		
CD at 5%	**11.0**	**6.8**				**4.8**	**6.9**	**12.0**	**9.4**					
CV%	**6.7**	**7.3**				**8.7**	**5.9**	**10.1**	**8.8**					

Table 16.3: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): Green Forage Yield (q/ha/day)

Entries	Ludhiana	Bikaner	Coimbatore	Dharwad	Average	Rank
LLC-6	4.43	2.99	2.33	2.29	3.01	1
RL-88 (NC)	3.51	2.63	3.00	2.79	2.98	2
Anand-2 (NC)	3.16	2.74	2.45	2.79	2.78	3
Mean	**3.70**	**2.79**	**2.59**	**2.62**	**2.93**	

Table 16.4: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Bikaner	Coimbatore	Dharwad	Average	Rank
LLC-6	1.03	0.55	0.56	0.62	0.69	1
RL-88 (NC)	0.67	0.47	0.70	0.75	0.65	2
Anand-2 (NC)	0.79	0.48	0.56	0.76	0.65	2
Mean	**0.83**	**0.50**	**0.61**	**0.71**	**0.66**	

Table 16.5: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): Crude Protein Yield (q/ha)

Entries	Ludhiana	Bikaner	Hyderabad	Mandya	Coimbatore	Average	Rank
LLC-6	35.7	10.4	8.3	21.3	16.6	18.5	1
RL-88 (NC)	20.7	7.8	8.5	19.3	23.8	16.0	2
Anand-2 (NC)	26.3	8.1	10.3	17.1	18.2	16.0	2
Mean	**27.6**	**8.8**	**9.0**	**19.2**	**19.5**	**16.8**	

Table 16.6: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): Crude Protein (%)

Entries	Ludhiana	Hyderabad	Mandya	Coimbatore	** Bikaner	Average	Rank
LLC-6	18.6	18.8	18.4	17.7	12.0	18.4	3
RL-88 (NC)	16.4	19.3	19.0	20.3	10.4	18.8	2
Anand-2 (NC)	17.8	20.1	20.1	19.3	10.6	19.3	1
Mean	**17.6**	**19.4**	**19.2**	**19.1**	**11.0**	**18.8**	

Note: ** Data is not included in zonal and all India average due to low yield of data

Table 16.7: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): Plant Height (cm)

Entries	Ludhiana	Bikaner	Hyderabad	Mandya	Coimbatore	Average	Rank
LLC-6	85.0	43.2	75.4	66.7	73.0	68.7	1
RL-88 (NC)	77.0	44.6	68.3	59.1	77.5	65.3	2
Anand-2 (NC)	73.0	53.8	66.2	61.9	70.5	65.1	3
Mean	**78.3**	**47.2**	**70.0**	**62.6**	**73.7**	**66.3**	

Table 16.8: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): Leaf Stem Ratio

Entries	Ludhiana	Bikaner	Hyderabad	Mandya	Coimbatore	Average	Rank
LLC-6	1.17	1.50	1.00	0.61	0.48	0.95	2
RL-88 (NC)	1.12	1.56	0.90	0.53	0.52	0.93	3
Anand-2 (NC)	1.15	1.54	1.40	0.51	0.51	1.02	1
Mean	**1.15**	**1.53**	**1.10**	**0.55**	**0.50**	**0.97**	

Table 16.9: AVT-2 Lucerne Annual: Varietal Trial in Annual Lucerne (New): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
LLC-6	35.4	3	59.9	2	53.8	1
RL-88 (NC)	34.5	2	60.1	3	52.3	3
Anand-2 (NC)	33.2	1	58.4	1	53.4	2
Mean						

Table 17.1: AVT-2 Lucerne Annual (Seed): Varietal Trial in Annual Lucerne (Seed): Seed Yield (q/ha)

Entries	North West Zone				South Zone				All India	
	Ludhiana	Bikaner	Average	Rank	Hyderabad	Coimbatore	Average	Rank	Average	Rank
LLC-6	2.5	0.7	1.6	2	1.4	2.3	1.9	2	1.7	2
RL-88 (NC)	2.1	0.6	1.4	3	1.1	2.1	1.6	3	1.5	3
Anand-2 (NC)	2.2	1.1	1.7	1	1.5	3.0	2.2	1	2.0	1
Mean	**2.3**	**0.8**	**1.6**		**1.3**	**2.5**	**1.9**		**1.7**	
CD at 5%	**1.7**	**13.2**			**0.2**	**2.2**				
CV%	**6.0**	**13.5**			**14.6**	**7.8**				

18. IVT Lathryus: Initial varietal trial in forage Lathyrus

(Reference tables 18.1 to 18.8)

In **Initial Varietal Trial in fodder Lathyrus,** nine (09) entries were tested against the two national checks Mahteora and Prateek at seven locations across the country.

For green forage yield, entries JCL-21-3 (13.3%), IPLa-2021-01 (10.0%), JCL-21-1 (5.2%), BL-3 (5.0%), showed superiority over the best check. Other entries were also marginally superior over the check.

For dry matter yield, entries JCL-21-3 (21.9%), IPLa-2021-01 (8.6%), IPLa-2021-03 (6.2%), JCL-21-1 (5.9%), showed superiority over the best check. Other entries were also marginally superior over the check.

For crude protein yield, entries JCL -21-3, BL-5, IPLa-2021-01, JCL-21-2, BL-3, BL-1, JCL-21-1 showed more than 5% superiority over the best check. For crude protein content also, BL-5, BL-1, and BL-3 showed more than 5% superiority over the best check.

For per day productivity entry IPLa-2021-01 top ranked followed by BL-3 for green fodder with values of 3.20 and 3.02 respectively as against the best check with value of 2.80. For dry matter yield, JCL-21-3 top ranked with value of 0.72 followed by IPLa 2021-01 with value of 0.70 as against the best check value of 0.61 q/ha/day. For plant height JCL-21-3 followed by IPLa-2021-01 were best performers. For leafiness, entries IPLa-2021-03 and IPLa-202-02 were top rankers.

19. AVT-1 Lathyrus – First advanced varietal trial in forage Lathyrus

(Reference tables 19.1 to 19.8)

In **first Advanced Varietal Trial in fodder Lathyrus,** one entry KL-5 was evaluated against 2 national checks Mahateora and Prateek at seven (7) locations across the country.

The entry KL-5 performed better than the two national checks by showing 7.4% and 11.3% superiority over the best check for GFY and DMY respectively.

For crude protein yield it showed superiority over the best check by a margin of 44.2% and For crude protein % KL-5 had CP content of 19.0% as compared to best check Prateek having value of 17.4%.

For per day productivity also, it top ranked with a value of 2.88 and 0.68 q/ha/day for GFY and DMY as compared to best check Mahateora with values of 2.80 and 0.61 resepctively. For plant height as well as leaf stem ratio, it was superior to the checks.

Table 18.1: IVT Lathyrus (New): Green Forage Yield (q/ha)

Entries	Jorhat	Kalyani	Ranchi	Pusa	Jhansi	Jabalpur	Raipur	Average	Rank	Superiority (%)
BL-5	281.3	145.8	132.0	94.0	217.7	252.6	128.6	178.8	5	2.7
JCL-21-1	236.9	160.2	112.0	125.0	240.0	208.7	199.9	183.2	3	5.2
JCL-21-3	257.2	163.8	122.0	177.0	255.6	186.5	218.8	197.3	1	13.3
IPLa 2021-01	256.6	155.9	136.3	148.7	253.1	238.5	151.8	191.6	2	10.0
IPLa 2021-03	223.9	144.4	142.0	162.0	255.5	181.2	141.2	178.6	6	2.6
IPLa 2021-02	215.5	156.1	121.3	98.2	232.1	167.1	126.4	159.5	10	
JCL-21-2	212.0	165.5	126.7	118.8	273.3	162.3	184.6	177.6	7	2.0
BL-1	229.4	153.8	144.0	124.5	235.6	181.8	159.2	175.5	8	0.8
BL-3	265.6	155.5	166.0	149.5	234.7	169.7	139.2	182.9	4	5.0
Mahateora (NC)	219.6	161.6	132.3	115.5	282.2	178.2	129.3	174.1	9	
Prateek (NC)	233.8	140.5	148.0	94.0	197.9	153.3	146.4	159.1	11	
Mean	**239.3**	**154.8**	**134.8**	**127.9**	**243.4**	**189.1**	**156.8**	**178.0**		
CD at 5%	**3.3**	**10.2**	**26.9**	**27.7**	**14.8**	**1.5**	**24.1**			
CV%	**3.6**	**8.4**	**11.7**	**12.7**	**16.3**	**4.9**	**9.1**			

Table 18.2: IVT Lathyrus (New): Dry Matter Yield (q/ha)

Entries	Jorhat	Kalyani	Pusa	Jhansi	Jabalpur	Raipur	Average	Rank	Superiority (%)
BL-5	54.5	31.5	23.1	53.6	71.7	24.3	43.1	5	2.4
JCL-21-1	43.1	32.2	30.7	54.7	69.7	37.3	44.6	4	5.9
JCL-21-3	50.4	34.3	43.5	64.4	69.0	46.4	51.3	1	21.9
IPLa 2021-01	49.5	32.7	36.5	54.0	71.2	30.2	45.7	2	8.6
IPLa 2021-03	40.3	29.3	39.8	64.4	67.9	26.5	44.7	3	6.2
IPLa 2021-02	39.3	33.3	24.1	46.0	66.3	21.8	38.5	9	
JCL-21-2	39.0	34.8	29.2	51.3	65.8	38.4	43.1	5	2.4
BL-1	43.9	30.9	30.6	46.9	68.3	29.7	41.7	8	
BL-3	51.7	31.6	36.7	47.1	66.6	23.9	42.9	6	2.0
Mahateora (NC)	42.2	35.2	28.4	53.1	67.7	26.0	42.1	7	
Prateek (NC)	44.4	28.0	23.1	43.9	63.3	26.7	38.2	10	
Mean	**45.3**	**32.2**	**31.4**	**52.7**	**67.9**	**30.1**	**43.3**		
CD at 5%	**3.0**	**4.3**	**6.9**	**7.5**		**4.1**			
CV%	**7.6**	**6.8**	**12.8**	**18.0**		**8.1**			

Table 18.3: IVT Lathyrus (New): Green Forage Yield (q/ha/day)

Entries	Jorhat	Kalyani	Ranchi	Pusa	Jhansi	Raipur	Average	Rank
BL-5	5.24	1.49	1.64	1.18	4.84	2.11	2.75	6
JCL-21-1	4.11	1.63	1.29	1.48	5.22	1.96	2.62	7
JCL-21-3	4.71	1.67	1.38	2.13	5.36	2.19	2.91	3
IPLa 2021-01	4.56	1.59	2.32	2.10	5.75	2.86	3.20	1
IPLa 2021-03	3.54	1.47	1.77	2.20	5.94	2.24	2.86	4
IPLa 2021-02	3.35	1.59	1.43	1.40	5.53	2.18	2.58	9
JCL-21-2	3.33	1.69	1.54	1.40	5.82	1.81	2.60	8
BL-1	3.93	1.57	1.84	1.62	5.24	2.61	2.80	5
BL-3	4.80	1.59	2.68	1.77	5.50	1.81	3.02	2
Mahateora (NC)	3.58	1.65	1.54	1.38	6.14	2.49	2.80	5
Prateek (NC)	4.05	1.43	2.44	1.32	4.60	2.66	2.75	6
Mean	**4.11**	**1.58**	**1.81**	**1.63**	**5.45**	**2.27**	**2.81**	

Table 18.4: IVT Lathyrus (New): Dry Matter Yield (q/ha/day)

Entries	Jorhat	Kalyani	Pusa	Jhansi	Raipur	Average	Rank
BL-5	1.02	0.32	0.29	1.19	0.40	0.64	4
JCL-21-1	0.75	0.33	0.36	1.19	0.37	0.60	7
JCL-21-3	0.92	0.35	0.52	1.35	0.46	0.72	1
IPLa 2021-01	0.88	0.33	0.51	1.23	0.57	0.70	2
IPLa 2021-03	0.64	0.30	0.54	1.50	0.42	0.68	3
IPLa 2021-02	0.61	0.34	0.34	1.10	0.38	0.55	10
JCL-21-2	0.61	0.36	0.34	1.09	0.38	0.56	9
BL-1	0.75	0.32	0.40	1.04	0.49	0.60	7
BL-3	0.93	0.32	0.43	1.10	0.31	0.62	5
Mahateora (NC)	0.69	0.36	0.34	1.15	0.50	0.61	6
Prateek (NC)	0.77	0.29	0.32	1.02	0.49	0.58	8
Mean	**0.78**	**0.33**	**0.40**	**1.18**	**0.43**	**0.62**	

Table 18.5: IVT Lathyrus (New): Crude Protein Yield (q/ha)

Entries	Jorhat	Kalyani	Raipur	Average	Rank
BL-5	7.5	5.5	6.1	6.3	2
JCL-21-1	5.5	5.1	5.8	5.5	6
JCL-21-3	6.4	4.9	9.0	6.8	1
IPLa 2021-01	6.9	5.4	6.6	6.3	2
IPLa 2021-03	4.7	4.9	5.7	5.1	8
IPLa 2021-02	4.8	5.7	4.7	5.1	8
JCL-21-2	5.6	5.1	7.5	6.1	3
BL-1	5.6	5.4	6.1	5.7	5
BL-3	7.2	4.4	6.2	5.9	4
Mahateora (NC)	5.2	4.6	5.9	5.2	7
Prateek (NC)	6.3	4.0	5.2	5.2	7
Mean	**6.0**	**5.0**	**6.2**	**5.7**	

Table 18.6: IVT Lathyrus (New): Crude Protein (%)

Entries	Jorhat	Kalyani	Ranchi	Raipur	Average	Rank
BL-5	17.9	17.3	21.7	25.1	20.5	1
JCL-21-1	12.9	15.8	21.7	15.6	16.5	10
JCL-21-3	17.0	14.3	20.8	19.4	17.8	5
IPLa 2021-01	14.2	16.5	12.7	21.5	16.2	11
IPLa 2021-03	13.8	16.9	18.5	21.3	17.6	6
IPLa 2021-02	12.5	17.1	21.3	21.5	18.1	4
JCL-21-2	14.4	14.6	20.8	19.5	17.3	8
BL-1	16.0	17.6	21.0	20.7	18.8	3
BL-3	16.1	13.9	21.7	25.9	19.4	2
Mahateora (NC)	15.6	13.2	17.1	22.5	17.1	9
Prateek (NC)	14.3	14.3	21.5	19.3	17.4	7
Mean	**15.0**	**15.6**	**19.9**	**21.1**	**17.9**	

Table 18.7: IVT Lathyrus (New): Plant Height (cm)

Entries	Jorhat	Kalyani	Pusa	Ranchi	Jhansi	Raipur	Average	Rank
BL-5	75.7	73.2	47.0	44.6	51.2	56.4	58.0	7
JCL-21-1	37.9	66.2	62.5	30.5	54.3	66.9	53.0	11
JCL-21-3	74.9	74.8	88.5	42.2	62.6	69.5	68.7	1
IPLa 2021-01	58.9	75.7	74.3	53.5	59.3	57.2	63.2	2
IPLa 2021-03	59.6	64.6	81.0	54.5	55.3	51.2	61.0	4
IPLa 2021-02	53.7	76.6	49.1	49.6	57.8	48.1	55.8	9
JCL-21-2	39.1	76.0	59.4	37.1	60.7	61.5	55.6	10
BL-1	53.9	65.1	62.3	61.0	56.1	63.3	60.3	5
BL-3	70.9	75.3	74.8	41.2	55.8	56.8	62.5	3
Mahateora (NC)	54.9	65.4	57.8	58.0	51.2	59.8	57.8	8
Prateek (NC)	51.6	76.0	47.0	60.5	49.6	63.8	58.1	6
Mean	**57.4**	**71.7**	**64.0**	**48.4**	**55.8**	**59.5**	**59.5**	

Table 18.8: IVT Lathyrus (New): Leaf Stem Ratio

Entries	Jorhat	Kalyani	Pusa	Jabalpur	Raipur	Average	Rank
BL-5	1.11	2.16	0.65	0.69	0.66	1.05	7
JCL-21-1	1.31	2.13	0.70	0.61	0.81	1.11	2
JCL-21-3	1.36	1.89	0.72	0.59	0.88	1.09	4
IPLa 2021-01	1.22	2.03	0.66	0.69	0.93	1.11	2
IPLa 2021-03	1.25	2.12	0.75	0.59	0.88	1.12	1
IPLa 2021-02	1.63	1.93	0.66	0.55	0.82	1.12	1
JCL-21-2	1.06	2.08	0.61	0.55	0.89	1.04	8
BL-1	1.30	2.09	0.71	0.59	0.67	1.07	6
BL-3	1.52	2.14	0.60	0.56	0.68	1.10	3
Mahateora (NC)	1.48	2.16	0.64	0.57	0.57	1.08	5
Prateek (NC)	1.27	2.11	0.74	0.52	0.82	1.09	4
Mean	**1.32**	**2.08**	**0.68**	**0.59**	**0.78**	**1.09**	

Table 19.1: AVT-1 Lathyrus: Green Forage Yield (q/ha)

Entries	Jorhat	Kalyani	Ranchi	Pusa	Jhansi	Jabalpur	Raipur	Average	Rank	Superiority (%)
KL-5	228.3	196.5	139.3	122.5	263.3	210.6	148.3	187.0	1	7.4
Mahateora (NC)	219.6	161.6	132.3	115.5	282.2	178.2	129.3	174.1	2	
Prateek (NC)	233.8	140.5	148.0	94.0	197.9	153.3	146.4	159.1	3	
Mean	**227.2**	**166.2**	**139.9**	**110.7**	**247.8**	**180.7**	**141.3**	**173.4**		
CD at 5%	**3.3**	**10.2**	**26.9**	**27.7**	**14.8**	**1.5**	**24.1**			
CV%	**3.6**	**8.4**	**11.7**	**12.7**	**16.3**	**4.9**	**9.1**			

Table 19.2: AVT-1 Lathyrus: Dry Matter Yield (q/ha)

Entries	Jorhat	Kalyani	Pusa	Jhansi	Jabalpur	Raipur	Average	Rank	Superiority (%)
KL-5	44.1	47.9	30.1	62.7	71.1	25.4	46.9	1	11.3
Mahateora (NC)	42.2	35.2	28.4	53.1	67.7	26.0	42.1	2	
Prateek (NC)	44.4	28.0	23.1	43.9	63.3	26.7	38.2	3	
Mean	**43.6**	**37.0**	**27.2**	**53.2**	**67.4**	**26.0**	**42.4**		
CD at 5%	**3.0**	**4.3**	**6.9**	**7.5**		**4.1**			
CV%	**7.6**	**6.8**	**12.8**	**18.0**		**8.1**			

Table 19.3: AVT-1 Lathyrus: Green Forage Yield (q/ha/day)

Entries	Jorhat	Kalyani	Ranchi	Pusa	Jhansi	Raipur	Average	Rank
KL-5	3.80	2.01	1.77	1.50	5.85	2.35	2.88	1
Mahateora (NC)	3.58	1.65	1.54	1.38	6.14	2.49	2.80	2
Prateek (NC)	4.05	1.43	2.44	1.32	4.60	2.66	2.75	3
Mean	**3.81**	**1.70**	**1.92**	**1.40**	**5.53**	**2.50**	**2.81**	

Table 19.4: AVT-1 Lathyrus: Dry Matter Yield (q/ha/day)

Entries	Jorhat	Kalyani	Pusa	Jhansi	Raipur	Average	Rank
KL-5	0.73	0.49	0.37	1.39	0.40	0.68	1
Mahateora (NC)	0.69	0.36	0.34	1.15	0.50	0.61	2
Prateek (NC)	0.77	0.29	0.32	1.02	0.49	0.58	3
Mean	**0.73**	**0.38**	**0.34**	**1.19**	**0.46**	**0.62**	

Table 19.5: AVT-1 Lathyrus: Crude Protein Yield (q/ha)

Entries	Jorhat	Kalyani	Raipur	Average	Rank
KL-5	6.3	9.5	6.7	7.5	1
Mahateora (NC)	5.2	4.6	5.9	5.2	2
Prateek (NC)	6.3	4.0	5.2	5.2	2
Mean	**5.9**	**6.0**	**5.9**	**6.0**	

Table 19.6: AVT-1 Lathyrus: Crude Protein (%)

Entries	Jorhat	Kalyani	Ranchi	Raipur	Average	Rank
KL-5	14.4	19.8	15.7	26.3	19.0	1
Mahateora (NC)	15.6	13.2	17.1	22.5	17.1	3
Prateek (NC)	14.3	14.3	21.5	19.3	17.4	2
Mean	**14.8**	**15.8**	**18.1**	**22.7**	**17.8**	

Table 19.7: AVT-1 Lathyrus (New): Plant Height (cm)

Entries	Jorhat	Kalyani	Pusa	Ranchi	Jhansi	Raipur	Average	Rank
KL-5	60.9	88.7	61.3	44.5	53.1	59.7	61.4	1
Mahateora (NC)	54.9	65.4	57.8	58.0	51.2	59.8	57.8	3
Prateek (NC)	51.6	76.0	47.0	60.5	49.6	63.8	58.1	2
Mean	**55.8**	**76.7**	**55.3**	**54.3**	**51.3**	**61.1**	**59.1**	

Table 19.8: AVT-1 Lathyrus (New): Leaf Stem Ratio

Entries	Jorhat	Kalyani	Pusa	Jabalpur	Raipur	Average	Rank
KL-5	1.36	2.27	0.69	0.62	0.81	1.15	1
Mahateora (NC)	1.48	2.16	0.64	0.57	0.57	1.08	3
Prateek (NC)	1.27	2.11	0.74	0.52	0.82	1.09	2
Mean	**1.37**	**2.18**	**0.69**	**0.57**	**0.73**	**1.11**	

20. IVT BAJRA (MULTICUT): INITIAL VARIETAL TRIAL IN FODDER BAJRA (MULTICUT) IN SUMMER

(Reference tables 20.1 to 20.7)

In **Initial Varietal Trial on multicut summer Bajra,** ten (10) entries were evaluated against three national checks Giant Bajra, BAIF Bajra-1, Moti Bajra at 4 locations in central zone and 3 lcoations in south zone.

In central zone, none of entries could surpass the national check for green and dry fodder yield.

In south zone, entries Alamdar-12 (20.7%), BAIF Bajra-9 (18.4%), ADV 2184 (17.8%), IIMR-FB-MC-2022-2 (16.4%), SBH-104 (15.8%), BAIF Bajra -10 (15.7%) HTBH-4904 (11.9%) showed superiority over the best check. Other entries were either inferior or marginally superior over the best check. For dry matter yield also in south zone, entries BAIF Bajra -10 (34.0%), IIMR-FB-MC-2022-2 (22.8%), Alamdar-12 (22.3%), BAIF Bajra-9 (17.9%), SBH-104 (17.6 %), ADV 2184 (16.2%), HTBH-4904 (13.5%) showed superiority over the best check. Other entries were either inferior or marginally superior over the best check.

For per day productivity, for green matter, entry SBH-104 top ranked with a value of 7.57 followed by ADV 2184 with value of 6.95 against the best check BAIF Bajra -1 with value of 6.77q/ha/day. For dry matter per day productivity, entry HTBH- 4904 top ranked with a value of 1.44 followed by SBH-104 with value of 1.441 against the best check BAIF Bajra -1 with value of 1.28 q/ha/day.

For crude protein yield and crude protein content, Check Moti Bajra top ranked.

For plant height, check Giant Bajra was top ranked. For leafiness, entry SBH-104 was best performer followed by entry Alamdar-12.

21. AVT-1 BAJRA (MULTICUT): FIRST ADVANCED VARIETAL TRIAL IN FODDER BAJRA (MULTICUT) IN SUMMER

(Reference tables 21.1 to 21.8)

In First stage Advanced Varietal Trial on Summer Bajra Multicut, two entries SBH-103 and 16-ADV175020 were evaluated along with 3 checks (Giant Bajra, Moti Bajra, and BAIF Bajra-1) at four locations in central zone and 3 locations in south zone.

For GFY (q/ha), DMY (q/ha), none of the entries shows superiority of more than 5% over the best national check in central and south zone.

For fodder production potential (q/ha/day), entry SBH-103 ranked first for green and dry matter. National checks ranked first for plant height and leafiness.

For quality parameters, national check Moti Bajra ranked first for crude protein yield, whereas entry SBH-103ranked first with marginal superiority over the best check for crude protein content. National check Giant Bajra ranked first in ADF %, NDF % and IVDMD %.

Table 20.1: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Green Forage Yield (q/ha)

Entries	Central Zone						
	Rahuri	Urulikanchan	Anand	Jabalpur	Average	Rank	Superiority%
IIMR-FB-MC-2022-2	501.5	695.3	953.2	516.9	666.7	12	
BAIF Bajra-10	592.3	835.8	1029.6	585.6	760.8	9	
BAIF Bajra-9	756.3	860.3	978.2	515.5	777.6	7	
HTBH-4904	732.5	890.5	1067.1	428.1	779.6	6	
SBH-104	781.7	850.5	1252.8	448.2	833.3	1	0.3
Alamdar-12	679.7	826.0	1143.1	548.1	799.2	5	
AFB-54	481.3	894.6	1200.0	483.1	764.7	8	
ADV 2184	610.5	897.9	1131.9	642.3	820.6	3	
AFB-45	466.4	783.5	1182.9	525.2	739.5	11	
IIMR-FB-MC-2022-1	481.1	678.9	951.9	462.4	643.6	13	
Giant Bajra (NC)	615.5	988.6	893.1	473.9	742.8	10	
BAIF Bajra-1 (NC)	753.5	1005.7	996.8	504.4	815.1	4	
Moti Bajra (NC)	663.1	974.7	1117.6	568.9	831.1	2	
Mean	**624.3**	**860.2**	**1069.1**	**515.6**	**767.3**		
CD at 5%	**112.1**	**145.8**	**177.0**	**10.3**			
CV%	**10.7**	**10.0**	**9.8**	**8.1**			

Table 20.1: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Green Forage Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Vellayani	Average	Rank	Superiority%	Average	Rank	Superiority%
IIMR-FB-MC-2022-2	509.7	399.7	202.0	370.5	4	16.4	539.8	12	
BAIF Bajra-10	472.6	443.5	188.0	368.0	6	15.7	592.5	8	
BAIF Bajra-9	565.3	377.4	188.0	376.9	2	18.4	605.9	5	
HTBH-4904	509.7	333.3	225.0	356.0	7	11.9	598.0	7	
SBH-104	583.8	264.9	257.0	368.6	5	15.8	634.1	1	4.2
Alamdar-12	667.2	306.3	179.0	384.2	1	20.7	621.3	3	2.1
AFB-54	458.7	234.9	178.0	290.5	13		561.5	11	
ADV 2184	588.4	254.8	281.0	374.7	3	17.8	629.5	2	3.4
AFB-45	514.3	235.6	225.0	325.0	8		561.8	9	
IIMR-FB-MC-2022-1	417.0	359.2	160.0	312.1	11		501.5	13	
Giant Bajra (NC)	407.7	337.7	156.0	300.5	12		553.2	12	
BAIF Bajra-1 (NC)	472.6	215	267.0	318.2	9		602.1	6	
Moti Bajra (NC)	486.5	280	170.0	312.2	10		608.7	4	
Mean	**511.8**	**310.9**	**205.8**	**342.9**			**585.4**		
CD at 5%	**59.5**	**48.0**	**67.9**						
CV%	**6.9**	**8.9**	**29.2**						

Table 20.2: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Dry Matter Yield (q/ha)

Entries	Central Zone						
	Rahuri	Urulikanchan	Anand	Jabalpur	Average	Rank	Superiority%
IIMR-FB-MC-2022-2	118.4	144.2	168.3	198.2	157.3	12	
BAIF Bajra-10	128.0	182.3	166.3	234.4	177.8	3	
BAIF Bajra-9	163.1	202.0	144.3	198.2	176.9	4	
HTBH-4904	173.7	184.8	171.4	147.0	169.2	5	
SBH-104	140.7	159.6	175.5	174.3	162.5	11	
Alamdar-12	135.7	138.5	177.5	217.8	167.4	6	
AFB-54	105.8	165.8	206.7	174.6	163.2	10	
ADV 2184	132.0	189.1	177.2	256.9	188.8	1	0.6
AFB-45	107.5	163.8	196.0	200.3	166.9	7	
IIMR-FB-MC-2022-1	114.2	125.9	174.9	172.7	146.9	13	
Giant Bajra (NC)	137.1	222.8	122.4	182.0	166.1	8	
BAIF Bajra-1 (NC)	145.0	193.6	127.7	190.4	164.2	9	
Moti Bajra (NC)	146.8	197.8	179.7	226.2	187.6	2	
Mean	**134.5**	**174.6**	**168.3**	**197.9**	**168.8**		
CD at 5%	**23.9**	**29.9**	**31.9**	**7.5**			
CV%	**10.6**	**10.1**	**11.2**				

Table 20.2: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Dry Matter Yield (q/ha)

Entries	South Zone						All India		
	Hyderabad	Mandya	Vellayani	Average	Rank	Superiority%	Average	Rank	Superiority%
IIMR-FB-MC-2022-2	114.8	94.0	50.5	86.4	2	22.8	126.9	8	
BAIF Bajra-10	107.5	128.4	47.1	94.3	1	34.0	142.0	2	4.0
BAIF Bajra-9	121.3	80.8	46.8	83.0	4	17.9	136.6	3	0.1
HTBH-4904	115.4	68.0	56.3	79.9	7	13.5	130.9	6	
SBH-104	129.8	53.4	65.2	82.8	5	17.6	128.4	7	
Alamdar-12	151.3	62.2	44.8	86.1	3	22.3	132.5	5	
AFB-54	96.5	45.4	44.6	62.2	13		119.9	12	
ADV 2184	121.2	54.0	70.2	81.8	6	16.2	142.9	1	4.7
AFB-45	106.8	46.0	56.2	69.7	10		125.2	9	
IIMR-FB-MC-2022-1	89.5	81.3	40.1	70.3	9		114.1	13	
Giant Bajra (NC)	86.7	75.3	38.9	67.0	12		123.6	11	
BAIF Bajra-1 (NC)	100.4	44.0	66.8	70.4	8		124.0	10	
Moti Bajra (NC)	104.1	58.8	42.5	68.5	11		136.5	4	
Mean	**111.2**	**68.6**	**51.5**	**77.1**			**129.5**		
CD at 5%	**15.0**	**13.8**	**17.4**						
CV%	**7.9**	**11.5**	**29.8**						

Table 20.3: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)						DMY (q/ha/day)					
	Rah-uri	Hydera-bad	Vella-yani	Ana-nd	Aver-age	Ra-nk	Rah-uri	Hydera-bad	Vella-yani	Ana-nd	Aver-age	Ra-nk
IIMR-FB-MC-2022-2	5.90	4.25	4.50	8.01	5.67	11	1.39	0.96	1.13	1.41	1.22	8
BAIF Bajra-10	6.97	3.94	4.20	8.65	5.94	9	1.51	0.90	1.10	1.40	1.23	7
BAIF Bajra-9	8.90	4.71	4.20	8.22	6.51	6	1.92	1.01	1.03	1.21	1.29	4
HTBH-4904	8.62	4.25	5.00	8.97	6.71	5	2.04	0.96	1.30	1.44	1.44	1
SBH-104	9.20	4.87	5.70	10.53	7.57	1	1.65	1.08	1.45	1.48	1.41	2
Alamdar-12	8.00	5.56	4.00	9.61	6.79	3	1.60	1.26	0.90	1.49	1.31	3
AFB-54	5.66	3.82	3.90	10.08	5.87	10	1.24	0.80	0.90	1.74	1.17	9
ADV 2184	7.18	4.90	6.20	9.51	6.95	2	1.55	1.01	1.60	1.49	1.41	2
AFB-45	5.49	4.29	5.00	9.94	6.18	8	1.26	0.89	1.20	1.65	1.25	12
IIMR-FB-MC-2022-1	5.66	3.48	3.40	8.00	5.13	13	1.34	0.75	0.90	1.47	1.12	10
Giant Bajra (NC)	7.24	3.40	3.40	7.51	5.39	12	1.61	0.72	0.87	1.03	1.06	11
BAIF Bajra-1 (NC)	8.86	3.94	5.90	8.38	6.77	4	1.71	0.84	1.50	1.07	1.28	5
Moti Bajra (NC)	7.80	4.05	3.80	9.39	6.26	7	1.73	0.87	0.90	1.51	1.25	6
Mean	**7.34**	**4.27**	**4.55**	**8.98**	**6.29**		**1.58**	**0.93**	**1.14**	**1.41**	**1.26**	

Table 20.4: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Crude Protein Yield (q/ha)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Mandya	Average	Rank
IIMR-FB-MC-2022-2	10.0	8.0	20.8	19.4	7.4	13.1	8
BAIF Bajra-10	12.3	10.6	19.6	23.1	9.5	15.0	2
BAIF Bajra-9	15.8	11.5	16.8	19.6	6.7	14.1	4
HTBH-4904	17.1	12.3	19.0	14.8	5.0	13.6	5
SBH-104	14.7	9.7	20.6	16.9	2.8	12.9	9
Alamdar-12	11.5	8.7	21.2	21.6	4.6	13.5	6
AFB-54	8.8	13.0	24.2	16.9	3.0	13.2	7
ADV 2184	12.4	12.8	19.9	24.9	4.2	14.8	3
AFB-45	9.3	11.1	24.0	19.6	3.6	13.5	6
IIMR-FB-MC-2022-1	9.1	9.3	20.4	16.7	6.0	12.3	10
Giant Bajra (NC)	14.6	15.2	14.0	17.6	6.2	13.5	6
BAIF Bajra-1 (NC)	10.3	12.2	14.9	18.3	3.5	11.8	11
Moti Bajra (NC)	15.0	14.8	21.0	22.4	5.4	15.7	1
Mean	**12.4**	**11.5**	**19.7**	**19.4**	**5.2**	**13.6**	

Table 20.5: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Crude Protein (%)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Mandya	Average	Rank
IIMR-FB-MC-2022-2	8.4	5.5	12.7	9.8	7.9	8.9	5
BAIF Bajra-10	9.6	5.8	12.8	9.8	7.4	9.1	3
BAIF Bajra-9	9.7	5.7	12.1	9.9	8.3	9.1	3
HTBH-4904	9.8	6.7	11.2	10.0	7.4	9.0	4
SBH-104	10.4	6.1	11.9	9.7	5.3	8.7	7
Alamdar-12	8.5	6.3	12.1	9.9	7.4	8.8	6
AFB-54	8.3	7.8	12.1	9.7	6.6	8.9	5
ADV 2184	9.4	6.8	11.8	9.7	7.9	9.1	3
AFB-45	8.7	6.8	12.5	9.8	7.9	9.1	3
IIMR-FB-MC-2022-1	7.9	7.4	12.0	9.6	7.4	8.9	5
Giant Bajra (NC)	10.6	6.8	12.0	9.7	8.3	9.5	2
BAIF Bajra-1 (NC)	7.1	6.3	12.6	9.6	7.9	8.7	7
Moti Bajra (NC)	10.2	7.5	12.3	9.9	9.2	9.8	1
Mean	**9.1**	**6.6**	**12.1**	**9.8**	**7.6**	**9.0**	

Table 20.6: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Plant Height (CM)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Mandya	Vellayani	Average	Rank
IIMR-FB-MC-2022-2	123.1	130.8	135.9	59.3	163.4	160.0	128.7	9
BAIF Bajra-10	122.5	141.4	138.6	62.6	177.1	180.0	137.0	2
BAIF Bajra-9	128.6	129.2	132.9	59.1	167.7	160.0	129.6	8
HTBH-4904	129.2	155.8	140.4	54.2	146.7	160.0	131.0	7
SBH-104	93.6	127.3	136.0	55.6	121.3	140.0	112.3	13
Alamdar-12	101.6	129.4	133.1	60.4	123.3	150.0	116.3	12
AFB-54	119.7	153.0	162.6	58.0	135.5	170.0	133.1	3
ADV 2184	121.1	154.9	155.4	62.7	121.3	180.0	132.6	4
AFB-45	114.3	161.8	155.2	60.1	127.0	170.0	131.4	6
IIMR-FB-MC-2022-1	110.1	137.5	140.6	56.9	164.8	150.0	126.6	10
Giant Bajra (NC)	127.3	155.6	151.3	57.9	157.0	180.0	138.2	1
BAIF Bajra-1 (NC)	97.0	121.1	130.2	58.1	116.0	180.0	117.1	11
Moti Bajra (NC)	123.1	152.8	143.2	61.4	134.1	180.0	132.4	5
Mean	**116.2**	**142.3**	**142.7**	**58.9**	**142.7**	**166.2**	**128.2**	

Table 20.7: IVT Bajra (Multi cut): Initial Varietal Trial in fodder bajra (multi cut) in summer: Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Mandya	Vellayani	Average	Rank
IIMR-FB-MC-2022-2	0.26	0.44	0.94	0.65	0.42	0.30	0.50	11
BAIF Bajra-10	0.34	0.32	0.99	0.72	0.48	0.40	0.54	9
BAIF Bajra-9	0.48	0.42	1.02	0.61	0.45	0.60	0.60	6
HTBH-4904	0.44	0.44	1.57	0.50	0.39	0.50	0.64	3
SBH-104	0.57	0.38	1.45	0.55	0.36	0.90	0.70	1
Alamdar-12	0.47	0.44	1.31	0.67	0.32	0.80	0.67	2
AFB-54	0.42	0.52	1.27	0.60	0.27	0.60	0.61	5
ADV 2184	0.33	0.40	0.98	0.77	0.28	0.40	0.53	10
AFB-45	0.40	0.44	1.08	0.66	0.22	0.60	0.57	7
IIMR-FB-MC-2022-1	0.25	0.44	0.84	0.56	0.40	0.30	0.47	12
Giant Bajra (NC)	0.33	0.44	1.16	0.58	0.38	0.40	0.55	8
BAIF Bajra-1 (NC)	0.47	0.44	1.32	0.61	0.24	0.70	0.63	4
Moti Bajra (NC)	0.35	0.42	1.50	0.71	0.37	0.50	0.64	3
Mean	**0.39**	**0.43**	**1.19**	**0.63**	**0.35**	**0.54**	**0.59**	

Table 21.1: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Green Forage Yield (q/ha)

Entries	Central Zone						
	Rahuri	**Urulikanchan**	**Anand**	**Jabalpur**	**Average**	**Rank**	**Superiority%**
SBH-103	555.8	815.8	1204.4	637.9	803.5	1	2.6
16-ADV175020	529.3	907.6	1189.8	575.8	800.6	2	2.2
Giant Bajra (NC)	443.8	791.0	931.7	511.2	669.4	5	
BAIF Bajra-1 (NC)	630.8	805.1	1199.8	456.9	773.1	4	
Moti Bajra (NC)	477.6	819.8	1146.5	689.8	783.4	3	
Mean	**527.4**	**827.9**	**1134.4**	**574.3**	**766.0**		
CD at 5%	**54.3**	**NS**	**119.8**	**12.6**			
CV%	**6.7**	**11.5**	**6.9**	**7.3**			

Table 21.1: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Green Forage Yield (q/ha)

Entries	South Zone					All India		
	Hyderabad	**Mandya**	**Vellayani**	**Average**	**Rank**	**Average**	**Rank**	**Superiority%**
SBH-103	623.7	398.3	231.0	417.7	2	638.1	1	1.4
16-ADV175020	576.2	449.1	198.0	407.8	3	632.3	2	0.4
Giant Bajra (NC)	602.1	375.8	196.0	391.3	5	550.2	5	
BAIF Bajra-1 (NC)	562.3	438.0	206.0	402.1	4	614.1	4	
Moti Bajra (NC)	605.6	479.9	188.0	424.5	1	629.6	3	
Mean	**594.0**	**428.2**	**203.8**	**408.7**		**612.9**		
CD at 5%	**NS**	**54.3**	**62.8**					
CV%	**5.4**	**8.5**	**35.8**					

Table 21.2: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Dry Matter Yield (q/ha)

Entries	Central Zone					
	Rahuri	**Urulikanchan**	**Anand**	**Jabalpur**	**Average**	**Rank**
SBH-103	101.6	138.4	178.6	132.0	137.6	2
16-ADV175020	98.0	155.6	153.6	118.0	131.3	3
Giant Bajra (NC)	103.4	153.4	138.9	104.4	125.0	5
BAIF Bajra-1 (NC)	121.4	145.4	158.5	92.8	129.5	4
Moti Bajra (NC)	101.5	150.1	157.6	143.5	138.2	1
Mean	**105.2**	**148.6**	**157.4**	**118.1**	**132.3**	
CD at 5%	**10.2**	**NS**	**22.4**	**6.4**		
CV%	**6.3**	**11.6**	**9.2**	**8.9**		

Table 21.2: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Dry Matter Yield (q/ha)

Entries	South Zone					All India	
	Hyderabad	**Mandya**	**Vellayani**	**Average**	**Rank**	**Average**	**Rank**
SBH-103	139.5	95.0	56.7	97.1	2	120.3	2
16-ADV175020	114.9	108.8	48.7	90.8	4	113.9	4
Giant Bajra (NC)	137.9	84.8	48.1	90.3	5	110.1	5
BAIF Bajra-1 (NC)	129.9	103.9	50.6	94.8	3	114.6	3
Moti Bajra (NC)	142.4	134.3	45.9	107.5	1	125.0	1
Mean	**132.9**	**105.4**	**50.0**	**96.1**		**116.8**	
CD at 5%	**10.7**	**5.2**	**15.7**				
CV%	**5.2**	**9.9**	**36.4**				

Table 21.3: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)						DMY (q/ha/day)					
	Rahuri	**Hyderabad**	**Vellayani**	**Anand**	**Average**	**Rank**	**Rahuri**	**Hyderabad**	**Vellayani**	**Anand**	**Average**	**Rank**
SBH-103	6.54	5.12	5.10	10.12	6.72	1	1.20	1.15	1.30	1.50	1.29	1
16-ADV175020	6.23	4.78	4.40	10.00	6.35	2	1.15	1.02	1.10	1.29	1.14	4
Giant Bajra (NC)	5.22	5.20	4.30	7.83	5.64	4	1.22	1.18	1.10	1.17	1.17	3
BAIF Bajra-1 (NC)	7.42	4.76	4.60	10.08	6.72	1	1.43	1.02	1.10	1.33	1.22	2
Moti Bajra (NC)	5.62	5.11	4.40	9.63	6.19	3	1.19	1.16	1.00	1.33	1.17	3
Mean	**6.21**	**4.99**	**4.56**	**9.53**	**6.32**		**1.24**	**1.11**	**1.12**	**1.32**	**1.20**	

Table 21.4: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Crude Protein Yield (q/ha)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Mandya	Average	Rank
SBH-103	11.6	7.3	21.6	10.6	7.9	11.8	2
16-ADV175020	7.9	8.9	18.9	9.6	7.6	10.6	4
Giant Bajra (NC)	9.6	9.7	16.9	8.4	5.2	10.0	5
BAIF Bajra-1 (NC)	10.2	9.2	19.1	7.5	8.2	10.8	3
Moti Bajra (NC)	10.0	11.5	18.8	11.7	9.4	12.3	1
Mean	**9.9**	**9.3**	**19.1**	**9.5**	**7.7**	**11.1**	

Table 21.5: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Crude Protein (%)

Entries	Rahuri	Urulikanchan	Jabalpur	Anand	Mandya	Average	Rank
SBH-103	11.4	5.2	8.1	12.6	8.3	9.1	1
16-ADV175020	8.1	5.7	8.1	12.5	7.0	8.3	5
Giant Bajra (NC)	9.3	6.3	8.1	12.8	6.1	8.5	4
BAIF Bajra-1 (NC)	8.4	6.3	8.0	12.6	7.9	8.7	3
Moti Bajra (NC)	9.9	7.7	8.1	12.5	7.0	9.0	2
Mean	**9.4**	**6.2**	**8.1**	**12.6**	**7.3**	**8.7**	

Table 21.6: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Plant Height (CM)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Mandya	Vellayani	Average	Rank
SBH-103	132.2	144.9	154.3	148.7	93.4	180.0	142.2	3
16-ADV175020	120.3	138.9	160.6	148.6	105.3	170.0	140.6	4
Giant Bajra (NC)	147.6	144.5	157.0	145.2	89.9	170.0	142.4	2
BAIF Bajra-1 (NC)	119.4	118.2	148.5	133.8	111.3	180.0	135.2	5
Moti Bajra (NC)	146.8	143.4	163.9	156.4	114.1	150.0	145.8	1
Mean	**133.2**	**138.0**	**156.9**	**146.5**	**102.8**	**170.0**	**141.2**	

Table 21.7: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Mandya	Vellayani	Average	Rank
SBH-103	0.31	0.42	0.95	0.69	0.44	0.40	0.54	5
16-ADV175020	0.32	0.42	1.21	0.66	0.52	0.80	0.66	4
Giant Bajra (NC)	0.30	1.20	1.53	0.64	0.42	0.90	0.83	1
BAIF Bajra-1 (NC)	0.40	1.44	1.07	0.60	0.55	0.70	0.79	2
Moti Bajra (NC)	0.29	0.49	1.25	0.73	0.60	0.90	0.71	3
Mean	**0.32**	**0.79**	**1.20**	**0.66**	**0.51**	**0.74**	**0.71**	

Table 21.8: AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in fodder bajra (multi cut) in summer: ADF (%), NDF (%) and IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank
SBH-103	44.4	3	64.3	3	53.9	3
16-ADV175020	42.7	2	62.3	2	55.2	2
Giant Bajra (NC)	41.0	1	60.1	1	56.6	1
BAIF Bajra-1 (NC)	47.7	5	67.4	5	51.3	5
Moti Bajra (NC)	45.6	4	64.5	4	53.0	4
Mean	**44.3**		**63.7**		**54.0**	

22. VT Orchard Grass: (New) (HZ)

The trial was established at 8 locations with 07 entries. The year being the establishment year, the data will be reported from next year onwards. It is a perennial trials and will continue in coded form.

23. VT Sainfoin: (New) (HZ)

The trial was established at 8 locations with 07 entries. The year being the establishment year, the data will be reported from next year onwards. It is a perennial trials and will continue in coded form.

24. VT Tall Fescue Grass: (HZ)

The trial was established at 8 locations with 09 entries along with 02 checks. The year being the establishment year, the data will be reported from next year onwards. It is a perennial trials and will continue in coded form.

CHAPTER-2

FORAGE CROP PRODUCTION

FORAGE CROP PRODUCTION

The forage crop production programme was executed at 61 locations in five zones. In total 17 experiments were conducted, out of which 11 were in network (9 coordinated and 4 AVT based) and 6were in location specific mode. The main emphasis was to increase the system productivity and resource use optimization as well as quality improvement in forages and forage based cropping systems. The data and findings are duly supported with soil parameters and economic data wherever required. The chapter includes the research results on cutting and nitrogen management of new oat cultivars, potassic fertilizers for enhanced resource use efficiency and economy in fodder maize, standardization of planting geometry, nitrogen levels and cutting regimes in Moringa, yield and quality dynamics of organic fodder production from cowpea-maize and rice bean-oat system under irrigated situation, efficacy of plant growth regulators in improving the system productivity of maize-oat cropping sequence. The trials were also conducted on precision nitrogen management for enhancing yield, quality and resource use efficiency, comparative performance of natural farming vs organic nutrition in round the year fodder production systems in terms of productivity, forage quality and soil health under multi locational trials. Development of standard agronomical practices of hedge lucerne for commercial scale seed production is under study. In forage conservation aspect, study was carried out on enrichment of silage quality through amalgamation with legume fodder and shrubs. Elaborative data of four AVT-2 (Agronomy) trials on multicut berseem, multicut oat, single cut oat and multicult Annual Lucerne have also been presented. The salient research achievements of the forage crop production trials during Rabi 2021-22 are as follows:

(A): Coordinated Trials

R-19 AST 1: Effect of cutting and splitting of nitrogen doses on growth, yield and quality of fodder oat cultivars

[Table Reference: R-19-AST-1 (a)-(m)]

Locations (4): Raipur, Ranchi, Ayodhya, Pantnagar

Majority of recommended fodder oat varieties have been released based on their single cut performance, but now the farmers are preferring 2-3 cuts in according to their need. Harvest from single cut crop is obtained in bulk, which may pose storage issue before the farmer. Therefore, assessment of oat varieties for multi cut behavior is the need of farmers. Nitrogen plays an important role in increasing all the growth and growth attributing characters, which finally leads to higher green fodder yield. Nitrogen enhances the photosynthesis, biomass accumulations as well as quick regeneration. For better yield potential knowledge of splitting of nitrogen in proper ratio is necessary for the oat crop for quick regeneration. Therefore, present study on oat cultivars with cutting and splitting of nitrogen doses was taken in the study**.**

A Field experiment was initiated during *Rabi* 2019-20 at four locations *i.e.*, Raipur, Ranchi, Ayodhya and Pantnagar to assess the performance of different oat cultivars with cutting and split doses of nitrogen with the objectives to study the effect of splitting of nitrogen dose and cutting management on fodder yield and quality of oat cultivars. To study the interaction effect on oat cultivars and splitting of nitrogen, cutting management on fodder oat and to work out the economics of different treatments of oat cultivars.

The experiment was laid out in split plot design with three replications. Oat cultivars RO-19, JHO-851 and UPO-212 was taken at Ranchi, Raipur, Ayodhya and UPO-06-1, JHO 851 and UPO-212 were taken at Pantnagar center. Two cuts and three cuts of oat cultivars with the splitting of nitrogen, two cut + 60% basal+40% at 1st cut, two cut + 50% basal+50% at 1st cut, three cut + 50% basal+25% at 1st cut+25% at 2nd cut and three cut + 40% basal+30% at 1st cut+30% at 2nd cut was applied. For cutting management in case of two cuts, first cut was taken at 50DAS and second cut at 50% flowering. Whereas, for three cuts, first cut was taken at 50DAS second cut at 35 days after first cut and third cut was taken at 50% flowering. The crops were supplemented with 140:60:40 kg NPK ha^{-1}

Third year's results indicated that plant height of different oat cultivars differed greatly at different cuts. Number of leaves was influenced significantly by oat cultivars at 1st and 2nd cut and 3rd cut. Maximum green fodder yield at Ranchi, Raipur and Ayodhya was obtained with oat cultivar RO-19 i.e. 420, 549 and 591 q/ha, respectively. The corresponding dry matter yields per hectare were 83.78, 82.5 and 99.0 q/ha, respectively.

At Pantnagar green fodder yield was maximum in UPO-06-1. Result of cutting and splitting of N- management shows that at Raipur and Ranchi significantly maximum green fodder yield was recorded with three cut + 50% basal+25% at 1st cut+25% at 2nd cut. At Ayodhya maximum green fodder yield was obtained with three cut + 40% N as basal+30% at 1st cut+30% at 2nd cut. Whereas, at Pantnagar higher green fodder yield was obtained with two cut + 50% N as basal+50% at 1st cut. Mean result of three centers indicated that maximum green fodder yield was produced by cultivar RO-19.

In case of cutting scheduling, three cuts gave higher GFY as compared two cuts. Per day productivity of green fodder (q/ha/day) was maximum in RO-19 at Raipur and Ayodhya (8.4 and 4.9 and 5.2).Whereas, per day productivity of dry fodder was0.77 and 0.78 q/ ha/day at Raipur and Ayodhya center. Crude protein yield (7.4, 10.2 and 12.1 q/ha) was recorded with oat cultivar RO-19 at Ranchi, Raipur and Ayodhya. However, at Pantnagar maximum crude protein yield (9.94 q/ha) was recorded with cultivar UPO-212.

Table: R-19-AST-1 (a): Effect of cutting and splitting of nitrogen doses on total GFY (q/ha) of fodder oat cultivars

Varieties	Ranchi	Raipur	Ayodhya	Pantnagar	Mean
RO-19	446	591	665	433	534
JHO-851	384	487	656	529	514
UPO-212	420	549	591	508	517
SE(m) ±	0.99	9.60	14.57	7.82	
C.D.(p=0.05)	3.97	39.00	58.74	31.52	
Cutting and splitting of N- management					
Two cut + 60% Basal+40% at 1st cut	409	451	550	514	481
Two cut + 50% Basal+50% at 1st cut	415	462	536	523	484
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	421	639	718	462	560
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	421	619	745	460	561
SE(m) ±	4.01	10.00	12.72	8.54	
C.D.(p=0.05)	NS	29.90	38.08	25.58	
Interaction(VXN)	NS	S	S	S	

RO -19 Cultivars was not at Pantnagar, At Pantnagar it was UPO-06-1.

Table: R-19-AST-1 (b): Effect of cutting and splitting of nitrogen doses on DMY (q/ha) of fodder oat cultivars

Varieties	Ranchi	Raipur	Ayodhya	Pantnagar	Mean
RO-19	88.83	92.5	115.5	75.0	93.0
JHO-851	76.21	79.6	112.0	92.5	90.1
UPO-212	83.78	82.5	99.0	100.0	91.5
SE(m) ±	0.13	1.64	2.52	1.43	
C.D.(p=0.05)	0.51	6.62	10.14	5.75	
Cutting and splitting of N- management					
Two cut + 60% Basal+40% at 1st cut	82.25	71.7	88.8	99.7	85.6
Two cut + 50% Basal+50% at 1st cut	82.82	75.2	86.8	99.4	86.1
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	83.94	98.7	127.9	80.5	97.8
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	82.74	94	131.9	77.9	96.7
SE(m) ±	0.8	1.81	2.21	2.14	
C.D.(p=0.05)	NS	5.44	6.63	6.42	
Interaction(VXN)	NS	S	S	S	

Table: R-19-AST-1 (c): Effect of cutting and splitting of nitrogen doses on GFY Per day productivity (q/ ha/day) of fodder oat cultivars

Varieties	Raipur	Ayodhya	Pantnagar	Mean
RO-19	4.9	5.2	3.1	4.39
JHO-851	4.0	5.1	3.8	4.29
UPO-212	4.5	4.7	3.6	4.26
SE(m) ±	0.068	0.11	0.06	
C.D.(p=0.05)	0.216	NS	0.22	
Cutting and splitting of N- management				
Two cut + 60% Basal+40% at 1st cut	4.0	4.4	3.7	4.02
Two cut + 50% Basal+50% at 1st cut	4.1	4.2	3.7	4.03
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	5.0	5.6	3.3	4.62
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	4.9	5.7	3.3	4.64
SE(m) ±	0.058	0.1	0.06	
C.D.(p=0.05)	0.171	0.3	0.18	
Interaction(VXN)	NS	S	S	

Table: R-19-AST-1 (d): Effect of cutting and splitting of nitrogen doses on DFY Per day productivity (q/ ha/day)of fodder oat cultivars

Varieties	Raipur	Ayodhya	Pantnagar	Mean
RO-19	0.77	0.781	0.54	0.70
JHO-851	0.66	0.753	0.66	0.69
UPO-212	0.69	0.667	0.72	0.69
SE(m) ±	0.034	0.02	0.01	
C.D.(p=0.05)	0.107	0.07	0.04	
Cutting and splitting of N- management				
Two cut + 60% Basal+40% at 1st cut	0.64	0.47	0.71	0.61
Two cut + 50% Basal+50% at 1st cut	0.67	0.46	0.71	0.61
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	0.78	0.99	0.58	0.78
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	0.74	1.01	0.56	0.77
SE(m) ±	0.027	0.02	0.02	
C.D.(p=0.05)	0.078	0.05	0.05	
Interaction(VXN)	NS	S	S	

Table: R-19-AST-1 (e): Effect of cutting and splitting of nitrogen doses on Total crude protein yield (q ha^{-1}) of fodder oat cultivars

Varieties	Ranchi	Raipur	Ayodhya	Pantnagar	Mean
RO-19	7.4	10.2	12.1	7.6	9.3
JHO-85	5.7	8.1	12.0	9.2	8.7
UPO-212	6.4	9.3	10.2	9.9	8.9
SE(m) ±	0.03	0.25	0.26	0.16	
C.D.(p=0.05)	0.14	0.89	1.06	0.64	
Cutting and splitting of N- management					
Two cut + 60% Basal+40% at 1st cut	6.3	8.0	10.1	9.6	8.5
Two cut + 50% Basal+50% at 1st cut	7.5	8.3	9.7	9.9	8.9
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	6.3	10.6	12.8	8.1	9.5
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	5.8	10.0	13.1	7.9	9.2
SE(m) ±	0.08	0.16	0.23	0.22	
C.D.(p=0.05)	0.24	0.5	0.67	0.67	
Interaction(VXN)	NS	S	S	NS	

Table: R-19-AST-1 (f): Effect of cutting and splitting of nitrogen doses on gross and net monitory return of fodder oat cultivars

Varieties	Gross monitory return (Rs./ha)					Net monitory return (Rs./ha)				
	Ran-chi	Rai-pur	Ayod-hya	Pant-nagar	Mean	Ran-chi	Rai-pur	Ayod-hya	Pant-nagar	Mean
RO-19	89195	118263	96598	86680	97684	63510	83530	76,487	51,900	68857
JHO-851	76699	97430	104904	105712	96186	51014	62697	75012	70932	64914
UPO-212	84068	109812	94572	101517	97492	58383	75079	64680	66737	66220
SE(m) ±	197	1986	6844	1563		194	1986	1679	1563	
C.D.(p=0.05)	793	8008	NS	6303		781	8008	6768	6303	
Cutting and splitting of N- management										
Two cut + 60% Basal+40% at 1st cut	81832	90185	87973	102811	90700	58082	58234	59093	69406	61204
Two cut + 50% Basal+50% at 1st cut	82949	92314	85723	104656	91411	59199	60364	56843	71251	61914
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	84282	127722	101891	92427	101581	56662	90206	84028	56272	71792
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	84219	123787	119178	91984	104792	56599	86271	88274	55829	71743
SE(m) ±	803	1881	5811	1709		803	1881	1465	1709	
C.D.(p=0.05)	NS	5632	17398	5116		NS	5632	4387	5116	
Interaction(VXN)	NS	S	NS	NS		NS	S	S	NS	

Table: R-19-AST-1 (g): Effect of cutting and splitting of nitrogen on B: C ratio and cost of cultivation (Rs) on fodder oat cultivars

Varieties	B:C(Gross)					Cost of Cultivation (Rs)			
	Ranchi	Raipur	Ayodhya	Pantnagar	Mean	Raipur	Ayodhya	Pantnagar	Mean
RO-19	3.5	3.4	3.5	2.5	3.2	34733	29893	34780	33135
JHO-851	3.0	2.8	3.5	3.1	3.1	34733	29893	34780	33135
UPO-212	3.3	3.1	3.2	2.9	3.1	34733	29893	34780	33135
SE(m) ±	0.01	0.04	0.08	0.05		--	--	--	--
C.D.(P=0.05)	0.02	0.16	0.31	0.19		--	--	--	--
Cutting and splitting of N- management									
Two cut + 60% Basal+40% at 1st cut	3.5	2.8	3.1	3.1	3.1	31951	28880	33405	31412
Two cut + 50% Basal+50% at 1st cut	3.5	2.9	3.0	3.1	3.1	31951	28880	33405	31412
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	3.1	3.4	3.7	2.6	3.2	37516	30905	36155	34859
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	3.1	3.3	3.9	2.5	3.2	37516	30905	36155	34859
SE(m) ±	0.03	0.05	0.07	0.05	--	--	--	--	--
C.D.(p=0.05)	0.1	0.16	0.2	0.15	--	--	--	--	--
Interaction(VXN)	NS	S	S	NS	--	--	--	--	--

Table: R-19-AST-1 (h): Green fodder yield as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatment	Green fodder yield (q ha^{-1})											
	Raipur				Ayodhya				Pantnagar			
	1st cut	2nd cut	3rd cut	Total	1st cut	2nd cut	3rd cut	Total	1st cut	2nd cut	3rd cut	Total
Main plot : Variety												
RO-19	298	214	159	591	209	332	248	665	77	40	316	433
JHO-851	166	242	158	487	179	368	219	656	68	85	376	529
UPO-212	269	212	137	549	183	322	173	591	98	42	368	508
SE(m) ±	9.6	6.8	4.3	9.6	4.1	7.7	5.9	14.6	4.32	1.66	9.14	7.82
C.D.(p=0.05)	34.06	NS	17.4	39.0	16.6	31.1	23.7	58.7	17.43	6.68	36.84	31.52
Cutting management and splitting of nitrogen												
C_1: Two cutting+60% Basal+40% at 1st cut	248	203	0	451	205	345	0	550	90	0	424	514
C_2: Two cutting+50% Basal+50% at 1st cut	253	208	0	462	182	354	0	536	85	0	438	523
C_3:Three cutting +50% Basal+25% at 1st cut+25%at 2nd cut	243	244	152	639	182	328	208	718	76	116	270	462
C_4:Three cutting +40% Basal+30% at 1st cut+30%at 2nd cut	233	235	151	619	192	335	218	745	73	106	281	460
SE(m) ±	7.99	7.1	5.8	10.0	3.74	6.39	5.11	12.72	3.35	2.22	8.00	8.54
C.D.(p=0.05)	NS	21.2	NS	29.9	11.21	NS	NS	38.08	10.03	6.65	23.96	25.58
Interaction	S	NS	NS	S	S	NS	NS	S	NS	S	S	S

Table: R-19-AST-1 (i): Dry fodder yield as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatment	Dry fodder yield (q ha^{-1})											
	Raipur				Ayodhya				Pantnagar			
	1st cut	2nd cut	3rd cut	Total	1st cut	2nd cut	3rd cut	Total	1st cut	2nd cut	3rd cut	Total
Main plot : Variety												
RO-19	36.5	38.2	17.8	92.5	27.1	63.9	56.0	27.1	7.5	6.2	61.3	75.0
JHO-851	23.1	39.6	16.8	79.6	23.2	70.3	47.1	23.2	6.6	11.8	74.1	92.5
UPO-212	32.6	36.6	13.3	82.5	23.5	62.5	33.9	23.5	9.9	6.7	84.1	100.7
SE(m) ±	1.60	1.08	1.95	1.64	0.5	1.5	1.3	0.5	0.43	0.23	1.6	1.43
C.D.(p=0.05)	5.65	3.19	NS	6.62	2.144	5.962	5.14	2.144	1.75	0.92	6.43	5.75
Cutting management and splitting of nitrogen												
C_1: Two cutting+60% Basal+40% at 1st cut	31.9	39.8	0.0	71.7	26.5	67.2	0.0	26.5	8.8	0.0	90.9	99.7
C_2: Two cutting+50% Basal+50% at 1st cut	33.0	42.2	0.0	75.2	23.6	68.9	0.0	23.6	8.3	0.0	91.1	99.5
C_3:Three cutting +50% Basal+25% at 1st cut+25%at 2nd cut	30.7	36.0	31.9	98.7	23.5	62.6	44.8	23.5	7.5	17.1	55.8	80.5
C_4:Three cutting +40% Basal+30% at 1st cut+30%at 2nd cut	27.5	34.4	32.1	94.0	24.8	63.6	46.6	24.8	7.3	15.8	54.9	78.0
SE(m) ±	1.16	1.24	1.22	1.81	0.483	1.233	1.11	0.483	0.31	0.4	2.2	2.14
C.D.(p=0.05)	NS	NS	NS	5.44	1.447	3.692	NS	1.447	0.91	1.84	6.58	6.42
Interaction	S	S	NS	S	S	NS	NS	S	NS	S	S	S

Table: R-19-AST-1 (j): Dry matter content as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatment	Dry matter content (%)					
	Raipur			Ayodhya		
	1st cut	2nd cut	3rd cut	1st cut	2nd cut	3rd cut
Main plot : Variety						
RO-19	12.2	35.8	22.4	19.3	19.3	22.6
JHO-851	13.9	33.2	21.3	12.9	19.1	21.6
UPO-212	12.1	35.3	19.3	12.9	19.4	19.7
SE(m) ±	0.32	0.30	0.78	0.28	0.42	0.57
C.D.(p=0.05)	1.30	NS	NS	NS	NS	2.28
Cutting management and splitting of nitrogen						
C_1: Two cutting+60% Basal+40% at 1st cut	13.0	19.7	0.0	12.92	19.50	0.00
C_2: Two cutting+50% Basal+50% at 1st cut	13.1	20.3	0.0	12.94	19.47	0.00
C_3:Three cutting +50% Basal+25% at 1st cut+25%at 2nd cut	12.8	14.8	20.8	12.93	19.07	21.33
C_4:Three cutting +40% Basal+30% at 1st cut+30%at 2nd cut	12.1	14.7	21.2	12.90	18.97	21.2
SE(m) ±	0.37	0.29	0.28	0.28	0.37	0.50
C.D.(p=0.05)	NS	0.87	NS	NS	NS	NS
Interaction	NS	NS	NS	S	S	NS

Table: R-19-AST-1 (k): Plant height as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatment	Plant height (cm)								
	Raipur			Ayodhya			Pantnagar		
	1st cut	2nd cut	3rd cut	1st cut	2nd cut	3rd cut	1st cut	2nd cut	3rd cut
Main plot : Variety									
RO-19	118	112	95	87	124	119	46	29	159
JHO-851	66	104	88	60	101	100	62	51	156
UPO-212	99	106	95	69	120	122	56	30	159
SE(m) ±	3.5	3.51	4.06	1.48	2.37	2.83	2	1	4
C.D.(p=0.05)	14.11	NS	NS	5.97	9.55	11.4	8.08	5.37	NS
Cutting management and splitting of nitrogen									
C_1Two cut (N60+40)	96	127	0	77	122	0	55.71	0.00	165.73
C_2Two cut (N50+50)	95	125	0	72	112	0	55.62	0.00	171.78
C_3Three cut (N50+25+25)	93	90	89	69	114	116	54.91	75.67	147.04
C_4Three cut (N40+30+30)	93	88	97	69	111	110	52.38	71.09	147.23
SE(m) ±	2.39	3.19	1.97	1.45	2.29	2.72	0.95	0.84	2.12
C.D.(P=0.05)	NS	9.57	6.95	4.33	6.85	NS	NS	2.5	6.36
Interaction	NS	NS	NS	NS	NS	NS	NS	S	NS

Table: R-19-AST-1 (l): Number of leaves m^{-1} as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatment	No of Leaves m^{-1}					
	Raipur			Ayodhya		
	1st cut	2nd cut	3rd cut	1st cut	2nd cut	3rd cut
Main plot : Variety						
RO-19	570.8	435.5	410.3	705.0	744.8	575.0
JHO-851	1160.9	620.4	458.5	790.0	886.8	402.5
UPO-212	846.3	435.8	374.0	711.0	729.0	807.0
SE(m) ±	40.26	16.56	23.12	16.42	18.11	13.50
C.D.(P=0.05)	162.31	66.79	NS	66.20	73.02	54.44
Cutting management and splitting of nitrogen						
C_1Two cut (N60+40)	911.7	370.9	0.0	776.67	846.33	0.00
C_2Two cut (N50+50)	820.7	410.3	0.0	731.67	782.00	0.00
C_3Three cut (N50+25+25)	821.2	607.3	414.6	732.33	765.67	501.33
C_4Three cut (N40+30+30)	883.8	600.3	413.9	700.67	753.33	688.33
SE(m) ±	42.68	12.92	4.56	13.57	14.25	15.92
C.D.(P=0.05)	NS	38.70	NS	40.62	42.68	56.15
Interaction	NS	S	NS	NS	NS	S

Table: R-19-AST-1 (m): Interaction effect of GFY and DMY of oat cultivars as influenced by cutting management and splitting of nitrogen at Raipur

Treatment	GFY (q ha^{-1})				DMY(q ha^{-1})			
	RO-19	**JHO 851**	**UPO 212**	**Mean**	**RO19**	**JHO 851**	**UPO 212**	**Mean**
C_1:Two cutting+60% Basal+40% at 1st cut	500	386	467	451	78.1	63.9	73.0	71.7
C_2:Two cutting+50% Basal+50% at 1st cut	522	399	464	462	82.8	69.4	73.4	75.2
C_3:Three cutting +50% Basal+25% at 1st cut+25%at 2nd cut	674	586	656	639	104.4	94.6	96.9	98.7
C_4:Three cutting +40% Basal+30% at 1st cut+30%at 2nd cut	669	578	610	619	104.8	90.4	86.7	94.0
Mean	591	487	549		92.5	79.6	82.5	
	SE(m) ±	C.D.(P=0.05)			SE(m) ±	C.D.(P=0.05)		
Cutting management and splitting of nitrogen at same level of oat cultivars	19.38	57.96			3.288	10.303		
Cultivars at same level of cutting management and splitting of nitrogen	17.87	51.23			3.185	10.417		

R-19 AST-2: Effect of different potasic fertilizer sources on green fodder production and quality of fodder maize

[Table Reference: R-19-AST-2 (a)-(b)]

Locations (2) Anand, Hyderabad

An experiment was conducted at Anand and Hyderabad location to study the effect of *schonite as* potassic fertilizer on green fodder yield and quality of fodder maize during *Rabi* season with 11 (eleven) different potassic fertilizer treatment under Randomized block design and experiment was replicated three time. **T_1 :** Control (Only N and P applied), **T_2 :** 1% schoenite foliar spray (at 30 and 45 DAS), **T_3 :** 100 % RDK through KCL, **T_4 :** 100 % RDK through KCL + 1 % schoenite foliar spray (at 30 and 45 DAS), **T_5 :** 75 % RDK through KCL + 1 % schoenite foliar spray (at 30 and 45 DAS),**T_6 :** 100 % RDK through K_2So_4,**T_7 :** 100 % RDK through K_2So_4 +1 % schoenite foliar spray (at 30 and 45 DAS), **T_8 :** 75 % RDK through K_2So_4 +1 % schoenite foliar spray (at 30 and 45 DAS), **T_9 :** 100 % RDK through Potassium schoenite, **T_{10} :** 100 % RDK through Potassium schoenite +1% schoenite foliar spray (at 30 and 45 DAS), **T_{11} :** 75 % RDK through Potassium schoenite + 1 % schoenite foliar spray (at 30 and 45 DAS). Except treatments standard and uniform agronomic package of practices were followed for the crop production. Potassium Schoenite is a double sulphate of potassium and magnesium. It is composed of 22.24% potassium oxide and 90% magnesium oxide. The crop was given 90:40 kgN & P_2O_5/ha. Thenet plot size was 18 sq m with three replications.

Pooled statistical analysis of data on growth attributes, green fodder yield and crude protein content indicated that, at Anand, the tallest plants at harvest (227 cm) were observed with the treatment **T_{10} :** 100 % RDK through Potassium schoenite +1% schoenite foliar spray (30 and 45 DAS),which were on par with**T_5, T_7 ,T_8& T_{11}**. At Anand**T_{11} :** 75 % RDK through Potassium schoenite + 1 % schoenite foliar spray (at 30 and 45 DAS) recorded maximum GFY and DFY (721.0 q and 158.71q/ha, respectively), which was on par with **T_5, T_7, T_8& T_{10}.** The CP content and yield in forages also improved with potash supplementation.**T_{11}:**75 % RDK through Potassium schoenite + 1 % schoenite foliar spray (30 and 45 DAS)recorded significantly higher CP yield (9.04 q/ha).The potassic supplementation also improved the economic parameters. The maximum net return was recordedwith **T_5:** 75 % RDK through KCL + 1 % schoenite foliar spray at 30 and 45 DAS, (Rs 104302) with BC ratio of 4.33.

At Hyderabad, the tallest plants at harvest (206 cm) were observed with the treatment **T_{10}:**100 % RDK through Potassium schoenite +1% schoenite foliar spray (at 30 and 45 DAS). Treatment **T_9 :**100 % RDK through Potassium schoenite, recorded maximum GFY and DFY (427.1 q and 70.16 q/ha, respectively), **T_{11} :** 75 % RDK through Potassium schoenite + 1 % schoenite foliar spray (at 30 and 45 DAS)recorded significantly higher CP yield (9.04 q/ha).The potassic supplementation also improved the economic parameters. The maximum net return was recorded with **T_9:** 100 % RDK through Potassium schoenite, (Rs 81187) with BC ratio of 2.28.

On locational mean basis, highest green fodder yield of maize was observed (542.2 q/ha) with the treatment **T_{11} :** 75 % RDK through Potassium schoenite + 1 % schoenite foliar spray (at 30 and 45 DAS) which was on par with **T_5, T_7 ,T_8& T_{10}**. With respect to the crude protein content in the maize fodder, it was found statistically higher in treatment **T_9 :** 100 % RDK through Potassium schoenite &**T_{10} :** 100 % RDK through Potassium schoenite +1% schoenite foliar spray (at 30 and 45 DAS). The maximum net return was recorded with **T_5:** 75 % RDK through KCL + 1 % schoenite foliar spray at 30 and 45 DAS, (Rs 86838) with BC ratio of 3.24.

Table R-19 AST-2 (a): Effect of treatment on growth, and yield of fodder maize

(**Pooled of Three year)**

Treatment	Plant height at harvest (cm)			Green Fodder yield (q/ha)			Dry matter yield (q/ha)		
	Anand	Hyderabad	Mean	Anand	Hyderabad	Mean	Anand	Hyderabad	Mean
T_1	191.7	177.7	184.7	518.0	256.9	387.5	95.3	42.2	68.7
T_2	216.1	176.5	196.3	527.0	351.4	439.2	92.7	58.9	75.8
T_3	205.3	181.7	193.5	617.0	385.1	501.1	114.9	63.3	89.1
T_4	215.3	158.2	186.7	632.0	388.7	510.4	115.8	64.3	90.1
T_5	220.8	177.8	199.3	678.0	378.2	528.1	133.9	61.7	97.8
T_6	206.9	189.4	198.2	608.0	392.2	500.1	105.8	67.0	86.4
T_7	220.9	196.1	208.5	652.0	394.8	523.4	132.3	68.6	100.4
T_8	221.3	184.5	202.9	697.0	380.5	538.8	138.1	63.7	100.9
T_9	204.8	198.5	201.6	623.0	431.3	527.2	110.5	72.4	91.5
T_{10}	227.5	206.0	216.8	657.0	427.4	542.2	129.3	70.2	99.8
T_{11}	224.1	184.7	204.4	721.0	364.7	542.9	158.7	61.0	109.9
SE(m) ±	3.91	9.05		24	18.44		6.56	3.55	
C.D.(p=0.05)	10.96	NS		71	54.81		19.34	10.54	

Table R-19 AST-2 (b): Effect of treatment on quality and economics of fodder maize

Treatment	CP (%)			CPY (q/ha)			Gross return (Rs./ha)			Net return (Rs./ha)			B:C		
	Anand	Hyd.	Mean	Anand	Hyd.		Anand	Hyd.	Mean	Anand	Hyd.	Mean	Anand	Hyd.	Mean
T_1	5.33	7.23	6.28	5.07	3.07	4.07	103600	77063	90332	75072	34965	55019	3.63	1.16	2.40
T_2	5.42	8.00	6.71	5.06	4.70	4.88	105400	105437	105419	76121	62186	69154	3.60	2.02	2.81
T_3	5.43	7.96	6.70	6.22	5.07	5.65	123400	115516	119458	92427	72112	82270	3.98	2.25	3.12
T_4	5.57	8.43	7.00	6.45	5.43	5.94	126400	116627	121514	94481	72070	83276	3.96	2.12	3.04
T_5	5.50	8.20	6.85	7.43	5.06	6.25	135600	113452	124526	104302	69375	86839	4.33	2.14	3.24
T_6	5.47	7.90	6.69	5.78	5.23	5.51	121600	117659	119630	85172	74180	79676	3.34	2.19	2.77
T_7	5.50	8.06	6.78	7.31	5.50	6.41	130400	118452	124426	93027	73820	83424	3.49	2.13	2.81
T_8	5.64	8.33	6.99	7.85	5.30	6.58	139400	114167	126784	104001	69879	86940	3.94	2.17	3.06
T_9	5.47	8.66	7.07	6.06	6.26	6.16	124600	129405	127003	82161	81187	81674	2.94	2.28	2.61
T_{10}	5.60	8.43	7.02	7.31	5.93	6.62	131400	128214	129807	88016	78843	83430	3.03	2.17	2.60
T_{11}	5.63	8.26	6.95	9.04	5.03	7.04	144200	77063	110632	104293	34965	69629	3.61	1.16	2.39
SE(m) ±	0.085	0.25		0.46	0.27		-	-		-	-		-	-	
C.D.(p=0.05)	NS	NS		1.34	9.39		-	-		-	-		-	-	

R-19 AST 3: Fodder productivity of Moringa (*Moringa oleifera*) as influenced by planting geometry, nitrogen levels and cutting regimes

[Table Reference: R-19-AST-3 (a)-(l)]

Locations (4): Mandya, Dharwad, Ranchi and Hyderabad

A Field experiment was initiated during 2019 (Rabi) at three locations and 2020(Rabi) at one location (Hyderabad) to assess the performance of Moringa with a view to standardize the plant population, nitrogen requirement and cutting regimes on quantity and quality of green forage. The experiment was laid out in Split – Split Plot Design with three replications. The treatments consisted of three planting geometry (P_1-22.5cm x 15cm, P_2-30cm x 30 cm, P_3-45cm X 30cm), two nitrogen levels (N_1- 100 Kg/ha and N_2- 150 Kg/ha) and three cutting regimes (C_1-45 days Interval, C_2-60 days Interval and C_3-75 days Interval). The results of pooled data of two years revealed that green forage yield and quality of Moringa was significantly influenced by planting geometry, nitrogen levels and cutting regimes. On the location mean basis (Mandya and Dharwad) planting geometry at 45cm X 30cm recorded higher GFY, DMY, CPY and CFY (569.5 q, 121.9 q, 25.4 q and 19.6 q/ha respectively.) The 11.2 % improvement in GFY was observed with wider spacing. Among the locations Dharwad recorded higher GFY with planting geometry of 30cm x 30 cm (648.3 q/ha). The trend was similar with respect to DMY (134.2 q/ha), CPY (28.6 q/ha) and CFY (20.5 q/ha).Whereas at Mandya centre planting geometry of 45 cm x 30 cm recorded higher GFY (502.7 q/ha), DMY (117.1 q/ha), CPY (23.5 q/ha) and CFY (19.2 q/ha). On the location mean basis application of nitrogen 150 kg/ha recorded higher GFY (561.8 q/ha) over nitrogen 100 kg/ha (526.8 q/ha). The 6.6 % improvement in GFY with nitrogen 150 kg/ha was observed. The trend was similar with respect to DMY (119.9 q/ha), CPY (24.9 q/ha) and CFY (18.8 q/ha). Among the locations Dharwad recorded higher GFY (643.5 q/ha) followed by Mandya (480.1q/ha). The trend was similar with respect to DMY, CPY and CFY.As regards to cutting regimes on the location mean basis cutting intervals of 75 days recorded higher GFY (574.1 q/ha) which is closely followed by cutting intervals of 60 days (556.5 q/ha). The trend was similar with respect to DMY, CPY and CFY (125 q, 26.2 q and 21.3 q/ha,respectively). Among the locations, higher GFY (651.9 q/ha) with 60 days cutting interval was recorded at Dharwad. Whereas cutting interval of 75 days recorded higher DMY, CPY and CFY (133.2 q, 30.5 q and 23.1 q/ha respectively). At Mandya centre cutting interval of 75 days recorded higher GFY (509.4 q/ha), DMY (116.7 q/ha), CPY (21.8 q/ha) and CFY (19.5 q/ha).However the CPY was on par with cutting interval of 60 das (20.5 q/ha).

On the location mean basis planting geometry at 45 x 30 cm recorded higher net monetary returns and B:C ratio (104245 Rs./ha and 2.3, respectively). Among the locations Dharwad recorded higher net monetary returns (134819 Rs./ha) with planting geometry at 30 x 30 cm. Whereas, higher B:C ratio(2.6) was recorded with planting geometry at 45 x 30 cm. At Mandya higher net monetary returns (74549 Rs./ha) and B:C ratio (1.99) was observed with planting geometry at 45 x 30 cm. On the location mean basis nitrogen 150 kg/ha recorded higher net monetary returns (98763 Rs./ha) and B:C ratio (2.1) over nitrogen 100 kg/ha (Rs.88263/ha and 2.0 respectively). The trend was similar at both the locations. As regards to cutting intervals on the location mean basis cutting at 75 days intervals recorded higher net monetary returns (107664 Rs./ha) and B:C ratio (2.3). The trend was similar at both the locations.

Hyderabad center recorded higher GFY, DMY, CPY and CFY with planting geometry at 45 x 30 cm (478.9 q, 103.5 q, 19.1 q and 18.1 q/ha respectively).Application of 150 kg nitrogen recorded higher GFY, DMY, CPY and CFY (468.3 q, 101.9 q, 20.5 q and 18.6 q/ha respectively). As regards to cutting intervals at 75 days recorded higher GFY, DMY, CPY and CFY (543.8q, 122.5 q, 24.8 q and 23.1 q/ha respectively). The planting geometry at 45 x 30 cm recorded higher net monetary returns (97557 Rs./ha) and B:C ratio of (3.10). Application of 150 kg nitrogen recorded higher net monetary returns (93164 Rs./ha) and B:C ratio of (2.96).The cutting regimes at 75 days interval recorded higher net monetary returns (113824 Rs./ha) and B:C ratio of (3.31).

Ranchi center recorded higher GFY, DMY, CPY and CFY with planting geometry at 45 x 30 cm (253.45 q, 44.89 q, 6.85 q and 14.37 q/ha respectively).Application of 150 kg nitrogen recorded higher GFY, DMY, CPY and CFY (265.8 q, 47.24 q, 6.87 q and 14.46 q/ha respectively). As regards to cutting intervals at 75 days recorded higher GFY, DMY, CPY and CFY (267.23 q, 48.16 q, 6.96 q and 14.65 q/ha respectively). Interaction between the treatments differed significantly with different parameters among different locations.

Table R-19-AST-3 (a): Green forage yield (q/ha) of moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Treatments	Mandya			Dharwad			Hyderabad			Ranchi		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
A) Planting geometry												
P_1-22.5cm x 15cm	408.5	392.4	**400.5**	629.7	618.1	**623.9**	-	401.5	**401.5**	54.7	425.0	**239.9**
P_2-30cm x 30 cm	498.8	409.6	**454.2**	653.5	643.2	**648.3**	-	426.6	**426.6**	72.5	363.3	**217.9**
P_3-45cm X 30cm	550.4	454.9	**502.7**	632.4	640.3	**636.3**	-	478.9	**478.9**	129.8	377.0	**253.4**
SE(m) ±	11.8	9.49	**6.74**	3.15	6.72	**3.74**	-	4.3	**4.30**	0.96	5.00	**2.49**
C.D.(p=0.05)	37.2	27.27	**19.38**	9.05	19.31	**10.54**	-	12.5	**12.50**	**2.76**	**14.39**	**7.17**
B) Nitrogen levels (Kg/ha)												
N_1 - 100	449.3	400.3	**424.8**	634.4	623.4	**628.9**	-	403.2	**403.2**	76.16	340.6	**208.3**
N_2 – 150	522.6	437.6	**480.1**	642.6	644.4	**643.5**	-	468.3	**468.3**	95.25	436.4	**265.8**
SE(m) ±	9.6	7.75	**5.5**	2.57	5.49	**3.05**	-	3.5	**3.5**	0.78	4.08	**2.04**
C.D.(p=0.05)	30.3	22.28	**15.8**	7.39	15.76	**8.61**	-	10.2	**10.2**	2.25	11.74	**5.82**
C) Cutting regimes (days)												
C_1-45 days Interval	450.4	323.14	**386.8**	623.7	611.9	**617.8**	-	346.3	**346.3**	78.47	349.5	**213.9**
C_2-60 days Interval	494.2	428.14	**461.2**	657.7	646.1	**651.9**	-	417	**417**	82.60	377.5	**230.0**
C_3-75 days Interval	513.2	505.58	**509.4**	634.1	643.7	**638.9**	-	543.8	**543.8**	96.05	438.4	**267.2**
SE(m) ±	9.2	9.49	**6.7**	3.15	6.72	**3.74**	-	4.3	**4.3**	0.96	5.00	**2.49**
C.D.(p=0.05)	26.7	27.28	**19.4**	9.05	19.31	**10.54**	-	12.5	**12.5**	3.90	14.38	**7.16**
Interaction												
A x B	NS	NS	NS	NS	NS	NS	-	NS	NS	3.90	20.34	10.14
A x C	NS	NS	NS	*	NS	*	-	21.6	21.6	4.78	24.91	12.41
B x C	NS	NS	NS	NS	NS	NS	-	17.6	17.6	3.90	20.34	10.14
A x B x C	NS	NS	NS	NS	NS	NS	-	NS	NS	6.75	35.22	17.56

Table R-19-AST-3 (b): Dry matter yield (q/ha) of moringa as influenced by planting geometry, nitrogen levels and cutting intervals

	Mandya			Dharwad			Hyderabad			Ranchi		
Treatments	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**
A) Planting geometry												
P_1-22.5cm x 15cm	89.2	85.26	**87.2**	127.6	125.2	**126.4**	**-**	88.8	**88.8**	10.33	78.22	**44.70**
P_2-30cm x 30 cm	112.5	86.27	**99.4**	135.3	133.2	**134.2**	**-**	92.1	**92.1**	13.38	66.12	**39.93**
P_3-45cm X 30cm	134.6	99.59	**117.1**	125.9	127.5	**126.7**	**-**	103.5	**103.5**	23.18	66.33	**44.89**
SE(m) ±	5.2	2.68	**2.5**	0.62	1.15	**0.66**	**-**	1.0	**1.0**	0.25	0.96	**0.49**
C.D.(p=0.05)	16.3	7.7	**7.2**	1.78	3.30	**1.86**	**-**	3.0	**3.0**	0.72	2.75	**1.48**
B) Nitrogen levels (Kg/ha)												
N_1 **-** 100	102.3	85.49	**93.9**	128.3	126.0	**127.1**	**-**	87.7	**87.7**	14.35	63.26	**39.10**
N_2 – 150	121.9	95.26	**108.6**	130.9	131.3	**131.1**	**-**	101.9	**101.9**	16.90	77.19	**47.24**
SE(m) ±	4.2	2.19	**2.0**	0.50	0.94	**0.54**	**-**	0.8	**0.8**	0.20	0.78	**0.39**
C.D.(p=0.05)	13.3	6.28	**5.9**	1.45	2.69	**1.52**	**-**	2.4	**2.4**	0.59	2.25	**1.14**
C) Cutting regimes (days)												
C_1-45 days Interval	100.6	63.93	**82.3**	122.2	119.8	**121.0**	**-**	71.2	**71.2**	14.66	164.16	**39.80**
C_2-60 days Interval	117.5	92.15	**104.8**	134.3	132.0	**133.1**	**-**	90.7	**90.7**	15.10	176.31	**41.55**
C_3-75 days Interval	118.3	115.04	**116.7**	132.2	134.1	**133.2**	**-**	122.5	**122.5**	17.12	204.70	**48.16**
SE(m) ±	2.4	2.68	**2.5**	0.62	1.15	**0.66**	**-**	1.0	**1.0**	0.25	0.96	**0.49**
C.D.(p=0.05)	6.7	7.7	**7.2**	1.78	3.30	**1.86**	**-**	3.0	**3.0**	0.72	2.75	**1.40**
Interaction												
A x B	NS	NS	**NS**	NS	NS	**NS**	**-**	NS	**NS**	NS	3.89	**1.98**
A x C	NS	NS	**NS**	*	*	*****	**-**	5.2	**5.2**	1.25	4.77	**2.43**
B x C	NS	NS	**NS**	NS	NS	**NS**	**-**	NS	**NS**	1.02	3.89	**1.98**
A x B x C	NS	NS	**NS**	NS	NS	**NS**	**-**	7.4	**7.4**	1.76	6.74	**3.43**

Table R-19-AST-3 (c): Dry matter content (%) of moringa as influenced by planting geometry, nitrogen levels and cutting intervals

	Mandya			Dharwad			Hyderabad			Ranchi		
Treatments	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**
A) Planting geometry												
P_1-22.5cm x 15cm	21.7	21.55	**21.6**	20.3	21.9	**21.1**	**-**	22.1	**22.1**	19.03	18.41	**18.72**
P_2-30cm x 30 cm	22.6	20.88	**21.7**	20.7	20.9	**20.8**	**-**	21.8	**21.8**	18.57	18.34	**18.46**
P_3-45cm X 30cm	24.5	21.56	**23.0**	19.9	20.0	**19.9**	**-**	21.9	**21.9**	17.91	17.60	**17.75**
SE(m) ±	0.82	0.4	**0.4**	0.07	0.42	**0.22**	**-**	0.5	**0.5**	0.17	0.06	**0.08**
C.D.(p=0.05)	NS	NS	**1.06**	0.20	1.22	**0.62**	**-**	NS	**NS**	0.48	0.18	**0.24**
B) Nitrogen levels (Kg/ha)												
N_1 **-** 100	22.51	21.12	**21.8**	20.2	20.8	**20.5**	**-**	21.9	**21.9**	19.06	18.56	**18.83**
N_2 – 150	23.29	21.54	**22.4**	20.4	21.0	**20.7**	**-**	22	**22**	17.94	17.64	**17.79**
SE(m) ±	0.67	0.3	**0.3**	0.06	0.35	**0.18**	**-**	0.41	**0.41**	0.14	0.05	**0.07**
C.D.(p=0.05)	NS	NS	**NS**	NS	NS	**NS**	**-**	NS	**NS**	0.39	0.15	**0.20**
C) Cutting regimes (days)												
C_1-45 days Interval	22.19	19.78	**21.0**	19.6	20.8	**20.2**	**-**	22.2	**22.2**	19.00	18.40	**18.70**
C_2-60 days Interval	23.67	21.51	**22.6**	20.4	21.1	**20.7**	**-**	21.2	**21.2**	18.50	17.86	**18.18**
C_3-75 days Interval	22.85	22.7	**22.8**	20.8	20.9	**20.9**	**-**	21.8	**21.8**	17.99	18.08	**18.04**
SE(m) ±	0.46	0.37	**0.4**	0.07	0.42	**0.22**	**-**	1.03	**1.03**	0.17	0.06	**0.08**
C.D.(p=0.05)	NS	1.05	**1.1**	0.20	NS	**NS**	**-**	0.51	**0.51**	0.48	0.18	**0.24**
Interaction												
A x B	NS	NS	**NS**	NS	NS	**NS**	**-**	NS	**NS**	NS	0.26	**0.41**
A x C	NS	NS	**NS**	*	NS	*****	**-**	NS	**NS**	NS	0.31	**NS**
B x C	NS	NS	**NS**	NS	NS	**NS**	**-**	NS	**NS**	NS	0.26	**NS**
A x B x C	NS	NS	**NS**	NS	NS	**NS**	**-**	NS	**NS**	NS	0.44	**0.59**

Table R-19-AST-3 (c): Crude protein content (%) of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

	Mandya			Dharwad			Hyderabad			Ranchi		
Treatments	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**
A) Planting geometry												
P_1-22.5cm x 15cm	18.46	18.57	**18.5**	20.3	19.9	**20.1**	-	19.7	**19.7**	13.39	13.78	13.59
P_2-30cm x 30 cm	19.29	19.79	**19.5**	21.4	21.1	**21.3**	-	20.3	**20.3**	13.88	14.28	14.08
P_3-45cm X 30cm	20.3	20.04	**20.2**	21.3	21.7	**21.5**	-	18.4	**18.4**	15.00	15.44	15.22
SE(m) ±	0.22	0.21	**0.2**	0.14	0.22	**0.13**	-	0.2	**0.2**	0.11	0.11	0.11
C.D.(p=0.05)	0.69	0.56	**0.5**	0.39	0.65	**0.37**	-	0.6	**0.6**	0.31	0.32	0.32
B) Nitrogen levels (Kg/ha)												
N_1 - 100	19.02	19.1	**19.1**	20.5	20.2	**20**	-	19	**19**	13.87	14.28	14.08
N_2 – 150	19.69	19.83	**19.8**	21.5	21.6	**22**	-	19.9	**19.9**	14.30	14.73	14.51
SE(m) ±	0.18	0.17	**0.2**	0.11	0.18	**0.11**	-	0.2	**0.2**	0.08	0.09	0.09
C.D.(p=0.05)	0.56	0.49	**0.4**	0.32	0.53	**0.30**	-	0.5	**0.5**	0.23	0.26	0.26
C) Cutting regimes (days)												
C_1-45 days Interval	20.21	20.21	**20.2**	19.2	18.8	**19.0**	-	19.1	**19.1**	13.94	14.35	14.14
C_2-60 days Interval	19.35	19.45	**19.4**	21.2	20.8	**21.0**	-	19.0	**19.0**	14.11	14.52	14.32
C_3-75 days Interval	18.49	18.74	**18.6**	22.7	23.1	**22.9**	-	20.2	**20.2**	14.22	14.64	14.43
SE(m) ±	0.2	0.21	**0.2**	0.14	0.22	**0.13**	-	0.2	**0.2**	0.82	0.11	0.11
C.D.(p=0.05)	0.58	0.56	**0.5**	0.39	0.65	**0.37**	-	0.6	**0.6**	0.18	NS	NS
Interaction												
A x B	*	*	*	NS	NS	*	-	0.8	0.8	NS	NS	NS
A x C	NS	NS	NS	NS	NS	NS	-	NS	NS	NS	NS	NS
B x C	*	*	*	NS	NS	NS	-	0.8	0.8	NS	NS	NS
A x B x C	*	*	*	NS	NS	*	-	1.5	1.5	NS	NS	NS

Table R-19-AST-3 (d): Crude protein yield (q/ha) of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Treatments	Mandya			Dharwad			Hyderabad			Ranchi		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
A) Planting geometry												
P_1-22.5cm x 15cm	16.54	15.83	**16.2**	26.0	25.1	**25.53**	-	17.7	**17.7**	1.39	10.82	6.09
P_2-30cm x 30 cm	21.68	16.93	**19.3**	29.0	28.3	**28.65**	-	18.9	**18.9**	1.86	9.47	5.64
P_3-45cm X 30cm	27.26	19.76	**23.5**	26.9	27.8	**27.37**	-	19.1	**19.1**	3.48	10.28	6.85
SE(m) ±	1.24	0.56	**0.6**	0.24	0.49	**0.28**	-	0.3	**0.3**	0.05	0.17	0.10
C.D.(p=0.05)	3.92	1.56	**1.7**	0.68	1.42	**0.78**	-	0.8	**0.8**	0.14	0.48	0.28
B) Nitrogen levels (Kg/ha)												
N_1 - 100	19.63	16.36	**18.0**	26.4	25.5	**25.95**	-	16.6	**16.6**	2.03	9.03	5.52
N_2 – 150	24.03	18.69	**21.4**	28.2	28.6	**28.42**	-	20.5	**20.5**	2.46	11.36	6.87
SE(m) ±	1.02	0.45	**0.5**	0.19	0.40	**0.23**	-	0.2	**0.2**	0.04	0.14	0.08
C.D.(p=0.05)	3.2	1.31	**1.4**	0.55	1.16	**0.64**	-	0.7	**0.7**	0.11	0.39	0.23
C) Cutting regimes (days)												
C_1-45 days Interval	20.49	12.96	**16.7**	23.5	22.6	**23.02**	-	13.6	**13.6**	2.09	9.23	5.67
C_2-60 days Interval	22.93	18.02	**20.5**	28.5	27.5	**28.00**	-	17.3	**17.3**	2.16	9.72	5.96
C_3-75 days Interval	22.06	21.6	**21.8**	30.0	31.0	**30.53**	-	24.8	**24.8**	2.47	11.63	6.96
SE(m) ±	0.55	0.56	**0.6**	0.24	0.49	**0.28**	-	0.3	**0.3**	0.05	0.17	0.10
C.D.(p=0.05)	1.6	1.56	**1.7**	0.68	1.42	**0.78**	-	0.8	**0.8**	0.14	0.48	0.27
Interaction												
A x B	NS	*	NS	NS	NS	NS	-	NS	NS	NS	0.67	0.39
A x C	NS	NS	NS	*	NS	NS	-	NS	NS	2.40	0.83	0.48
B x C	NS	NS	NS	NS	NS	NS	-	1.2	1.2	NS	0.68	0.39
A x B x C	NS	NS	NS	NS	NS	*	-	NS	NS	NS	1.17	0.68

Table R-19-AST-3 (e): Crude fiber content (%) of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

	Mandya			Dharwad			Hyderabad			Ranchi		
Treatments	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**
A) Planting geometry												
P_1-22.5cm x 15cm	16.3	16.51	**16.4**	15.2	15.0	**15.10**	**-**	20.3	**20.3**	26.59	30.92	28.76
P_2-30cm x 30 cm	16.2	15.89	**16.0**	15.3	15.1	**15.23**	**-**	18.6	**18.6**	27.57	31.90	29.74
P_3-45cm X 30cm	16.3	16.49	**16.4**	15.6	15.8	**15.73**	-	17.4	**17.4**	29.80	34.13	31.97
SE(m) ±	0.11	0.2	**0.2**	0.11	0.19	**0.11**	-	0.1	**0.1**	0.21	0.21	0.21
C.D.(p=0.05)	NS	NS	**NS**	NS	0.54	**0.31**	-	0.3	**0.3**	0.61	0.61	0.61
B) Nitrogen levels (Kg/ha)												
N_1 - 100	16.6	16.56	**16.6**	15.5	15.2	**15.35**	-	19.2	**19.2**	27.57	31.90	29.73
N_2 – 150	16	16.04	**16.0**	15.3	15.4	**15.35**	-	18.4	**18.4**	28.41	32.74	30.58
SE(m) ±	0.1	0.17	**0.1**	0.09	0.15	**0.09**	-	0.8	**0.8**	0.17	0.17	0.17
C.D.(p=0.05)	0.3	0.48	**0.4**	NS	NS	**NS**	-	0.2	**0.2**	0.50	0.50	0.50
C) Cutting regimes (days)												
C_1-45 days Interval	15.6	15.84	**15.7**	13.8	13.5	**13.63**	-	18.6	**18.6**	27.70	32.03	29.86
C_2-60 days Interval	16.3	16.38	**16.3**	15.2	15.0	**15.09**		18.9	**18.9**	28.02	32.35	30.19
C_3-75 days Interval	16.9	16.68	**16.8**	17.2	17.5	**17.33**	-	19.0	**19.0**	28.25	32.58	30.41
SE(m) ±	0.13	0.2	**0.2**	0.11	0.19	**0.11**	-	0.1	**0.1**	0.21	0.21	0.21
C.D.(p=0.05)	0.4	0.59	**0.4**	0.31	0.54	**0.31**	-	0.3	**0.3**	NS	NS	NS
Interaction							-					
A x B	NS	NS	NS	NS	NS	NS	-	0.4	0.4	NS	NS	NS
A x C	NS	NS	NS	NS	NS	NS	-	0.5	0.5	NS	NS	NS
B x C	NS	NS	NS	NS	*	*		0.4	0.4	NS	NS	NS
A x B x C	NS	*	*	NS	NS	NS	-	0.7	0.7	NS	NS	NS

Table R-19-AST-3 (f): Crude fiber yield (q/ha) of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Treatments	Mandya			Dharwad			Hyderabad			Ranchi		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
A) Planting geometry												
P_1-22.5cm x 15cm	14.6	14.11	**14.4**	19.5	18.9	**19.18**	-	18.1	**18.1**	2.76	24.25	12.89
P_2-30cm x 30 cm	18.3	13.78	**16.0**	20.8	20.2	**20.49**	-	17.1	**17.1**	3.70	21.12	11.89
P_3-45cm X 30cm	21.9	16.47	**19.2**	19.7	20.4	**20.06**	-	18.1	**18.1**	6.92	22.66	14.37
SE(m) ±	0.8	0.44	**0.4**	0.19	0.40	**0.22**	-	0.2	**0.2**	0.10	0.34	0.19
C.D.(p=0.05)	2.6	1.3	**1.2**	0.53	1.14	**0.62**	-	0.7	**0.7**	0.27	0.98	0.54
B) Nitrogen levels (Kg/ha)												
N_1 - 100	16.9	14.2	**15.6**	19.9	19.3	**19.60**	-	16.9	**16.9**	4.03	20.13	11.64
N_2 – 150	19.5	15.37	**17.4**	20.1	20.4	**20.22**	-	18.6	**18.6**	4.89	25.21	14.46
SE(m) ±	0.7	0.36	**0.3**	0.15	0.32	**0.18**	-	0.2	**0.2**	0.08	0.28	0.15
C.D.(p=0.05)	2.2	1.02	**1.0**	NS	0.93	**0.51**	-	0.6	**0.6**	0.22	0.80	0.44
C) Cutting regimes (days)												
C_1-45 days Interval	15.7	10.15	**12.9**	16.8	16.2	**16.51**	-	13.18	**13.18**	4.16	20.55	11.95
C_2-60 days Interval	19.2	15.05	**17.1**	20.5	19.8	**20.11**		17	**17**	4.30	21.61	12.55
C_3-75 days Interval	19.9	19.15	**19.5**	22.7	23.5	**23.11**	-	23.1	**23.1**	4.92	25.85	14.65
SE(m) ±	0.4	0.44	**0.4**	0.19	0.40	**0.22**	-	0.2	**0.2**	0.10	0.34	0.19
C.D.(p=0.05)	1.2	1.25	**1.2**	0.53	1.14	**0.62**	-	0.7	**0.7**	0.27	0.98	0.54
Interaction							-					
A x B	NS	NS	**NS**	NS	NS	**NS**	-	NS	**NS**	NS	NS	NS
A x C	*	NS	**NS**	*	NS	*****	-	1.1	**1.1**	0.47	1.70	0.92
B x C	NS	NS	**NS**	NS	NS	**NS**		NS	**NS**	NS	NS	NS
A x B x C	NS	NS	**NS**	NS	NS	**NS**	-	NS	**NS**	NS	NS	NS

Table R-19-AST-3 (g): Economics of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Total cost of cultivation (Rs./ha)												
Treatments	**Mandya**			**Dharwad**			**Hyderabad**			**Ranchi**		
	2020	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**
A) Planting geometry												
P_1-22.5cm x 15cm	92978	71171	**82075**	137628	58154	**137628**	**-**	44386	**44386**	85196	59308	72252
P_2-30cm x 30 cm	88128	69389	**78759**	89532	58154	**89532**	**-**	47438	**47438**	28548	34308	31428
P_3-45cm X 30cm	84595	67910	**76253**	78173	58154	**78173**	**-**	46498	**46498**	23548	29308	**26428**
B) Nitrogen levels (Kg/ha)												
N_1 - 100	91065	69073	**80069**	101477	57854	**101477**	**-**	45065	**45065**	35058	40818	**37938**
N_2 – 150	92818	69907	**81363**	102078	58454	**102078**	**-**	47149	**47149**	35371	41131	**38251**
C) Cutting regimes (days)												
C_1-45 days Interval	94194	71252	**82723**	104777	61154	**104777**	**-**	45423	**45423**	37048	44608	**40828**
C_2-60 days Interval	89156	69794	**79475**	101777	58154	**101777**	**-**	46233	**46233**	35148	40548	**37848**
C_3-75 days Interval	83435	67425	**75430**	98777	55154	**98777**	**-**	46666	**46666**	33448	37768	**35608**

Table R-19-AST-3 (h): Economics of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Gross returns (Rs./ha)												
Treatments	**Mandya**			**Dharwad**			**Hyderabad**			**Ranchi**		
	2020	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**	**2020**	**2021**	**Mean**
A) Planting geometry												
P_1-22.5cm x 15cm	122556	117705	**120131**	157418	185425	**171421**	**-**	128478	**128478**	10950	85010	47980
P_2-30cm x 30 cm	149640	12283	**80962**	163363	192973	**178168**	**-**	128008	**128008**	14508	72660	43584
P_3-45cm X 30cm	165135	136468	**150802**	158093	192094	**175093**	**-**	143692	**143692**	25965	75414	50690
B) Nitrogen levels (Kg/ha)												
N_1 - 100	134781	120080	**127431**	158595	187017	**172806**	**-**	120964	**120964**	15232	68121	41677
N_2 – 150	156771	131291	**144031**	160654	193310	**176982**	**-**	140488	**140488**	19050	87268	53159
C) Cutting regimes (days)												
C_1-45 days Interval	135123	96938	**116031**	155913	183571	**169742**	**-**	103891	**103891**	15695	69902	42798
C_2-60 days Interval	148257	128444	**138351**	164428	193820	**179124**	**-**	125128	**125128**	16519	75500	46010
C_3-75 days Interval	153948	151675	**152812**	158533	193100	**175817**	**-**	163159	**163159**	19209	87681	53445

Table R-19-AST-3 (i): Economics of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Treatments	Net returns (Rs./ha)											
	Mandya			Dharwad			Hyderabad			Ranchi		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
A) Planting geometry												
P_1-22.5cm x 15cm	29578	46534	**38056**	19790	127271	**127271**	-	74915	**74915**	-42598	25702	**-8448**
P_2-30cm x 30 cm	61512	53493	**57503**	73831	134819	**134819**	-	81073	**81073**	-14040	38352	**12156**
P_3-45cm X 30cm	80540	68558	**74549**	79921	133940	**133940**	-	97557	**97557**	2417	46106	**24262**
B) Nitrogen levels (Kg/ha)												
N_1 - 100	43716	51007	**47362**	57118	129163	**129163**	-	75866	**75866**	-19826	27302	**3738**
N_2 – 150	63953	61384	**62669**	58576	134856	**134856**	-	93164	**93164**	-16321	46137	**14908**
C) Cutting regimes (days)												
C_1-45 days Interval	40929	25686	**33308**	51135	122417	**122417**	-	59429	**59429**	-21353	25294	**1970**
C_2-60 days Interval	59101	58650	**58876**	62650	135666	**135666**	-	80293	**80293**	-18629	34952	**8162**
C_3-75 days Interval	70513	84249	**77381**	59756	137946	**137946**	-	113824	**113824**	-14239	49913	**17837**
A x B x C	NS	NS	-	NS	NS	-	NS	NS	-			

Table R-19-AST-3 (j): Economics of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Treatments	B:C											
	Mandya			Dharwad			Hyderabad			Ranchi		
	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean	2020	2021	Mean
A) Planting geometry												
P_1-22.5cm x 15cm	1.32	1.67	**1.50**	1.14	3.20	**2.17**	-	3.53	**3.53**	0.20	1.45	0.86
P_2-30cm x 30 cm	1.70	1.79	**1.75**	1.83	3.33	**2.58**	-	2.71	**2.71**	0.50	2.15	1.40
P_3-45cm X 30cm	1.95	2.02	**1.99**	2.03	3.31	**2.67**	-	3.10	**3.10**	1.11	2.60	1.93
B) Nitrogen levels (Kg/ha)												
N_1 - 100	1.48	1.76	**1.62**	1.66	3.24	**2.45**	-	2.68	**2.68**	0.55	1.83	1.24
N_2 – 150	1.69	1.89	**1.79**	1.67	3.32	**2.49**	-	2.96	**2.96**	0.67	2.30	1.55
C) Cutting regimes (days)												
C_1-45 days Interval	1.43	1.36	**1.40**	1.57	3.00	**2.29**	-	3.26	**3.26**	0.23	2.40	1.18
C_2-60 days Interval	1.66	1.85	**1.76**	1.72	3.33	**2.52**	-	2.79	**2.79**	0.58	2.76	1.34
C_3-75 days Interval	1.85	2.27	**2.06**	1.71	3.50	**2.60**	-	3.31	**3.31**	0.71	3.46	1.67

Table R-19-AST-3 (k): Quality of moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Treatments	Crude protein content (%)			Crude protein yield (q/ha)			Crude fiber content (%)			Crude fiber yield (q/ha)		
	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean
A) Planting geometry												
P_1-22.5cm x 15cm	18.5	20.1	**19.3**	16.2	25.5	**20.9**	16.4	15.1	**15.8**	14.4	19.2	**16.8**
P_2-30cm x 30 cm	19.5	21.3	**20.4**	19.3	28.6	**24.0**	16.0	15.2	**15.6**	16.0	20.5	**18.2**
P_3-45cm X 30cm	20.2	21.5	**20.9**	23.5	27.4	**25.4**	16.4	15.7	**16.1**	19.2	20.0	**19.6**
SE(m) ±	0.2	0.13	-	0.6	0.28	-	0.2	0.11	-	0.4	0.22	-
C.D.(p=0.05)	0.5	0.37	-	1.7	0.78	-	NS	0.31	-	1.2	0.62	-
B) Nitrogen levels (Kg/ha)												
N_1 - 100	19.1	20	**19.6**	18.0	26.0	**22.0**	16.6	15.4	**16.0**	15.6	19.6	**17.6**
N_2 – 150	19.8	22	**20.9**	21.4	28.4	**24.9**	16.0	15.4	**15.7**	17.4	20.2	**18.8**
SE(m) ±	0.2	0.11	-	0.5	0.23	-	0.1	0.09	-	0.3	0.18	-
C.D.(p=0.05)	0.4	0.30	-	1.4	0.64	-	0.4	NS	-	1.0	0.51	-
C) Cutting regimes (days)												
C_1-45 days Interval	20.2	19.0	**19.6**	16.7	23.0	**19.9**	15.7	13.6	**14.7**	12.9	16.5	**14.7**
C_2-60 days Interval	19.4	21.0	**20.2**	20.5	28.0	**24.3**	16.3	15.0	**15.7**	17.1	20.1	**18.6**
C_3-75 days Interval	18.6	22.9	**20.8**	21.8	30.5	**26.2**	16.8	17.3	**17.1**	19.5	23.1	**21.3**
SE(m) ±	0.2	0.13	-	0.6	0.28	-	0.2	0.11	-	0.4	0.22	-
C.D.(P=0.05)	0.5	0.37	-	1.7	0.78	-	0.4	0.31	-	1.2	0.62	-
Interaction												
A x B	*	*	-	NS	NS	-	NS	NS	-	NS	NS	-
A x C	NS	NS	-	NS	NS	-	NS	NS	-	NS	*	-
B x C	*	NS	-	NS	NS	-	NS	*	-	NS	NS	-
A x B x C	*	*	-	NS	*	-	*	NS	-	NS	NS	-

Table R-19-AST-3 (l): Economics of Moringa as influenced by planting geometry, nitrogen levels and cutting intervals

Treatments	Total cost of cultivation (Rs./ha)			Gross returns (Rs./ha)			Net returns (Rs./ha)			B:C ratio		
	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean
A) Planting geometry												
P_1-22.5cm x 15cm	82075	137628	**109852**	120131	171421	**145776**	38056	127271	**82664**	1.50	2.17	**1.8**
P_2-30cm x 30 cm	78759	89532	**84146**	80962	178168	**129565**	57503	134819	**96161**	1.75	2.58	**2.2**
P_3-45cm X 30cm	76253	78173	**77213**	150802	175093	**162948**	74549	133940	**104245**	1.99	2.67	**2.3**
B) Nitrogen levels (Kg/ha)												
N_1 **-** 100	80069	101477	**90773**	127431	172806	**150119**	47362	129163	**88263**	1.62	2.45	**2.0**
N_2 – 150	81363	102078	**91721**	144031	176982	**160507**	62669	134856	**98763**	1.79	2.49	**2.1**
C) Cutting regimes (days)												
C_1-45 days Interval	82723	104777	**93750**	116031	169742	**142887**	33308	122417	**77863**	1.40	2.29	**1.8**
C_2-60 days Interval	79475	101777	**90626**	138351	179124	**158738**	58876	135666	**97271**	1.76	2.52	**2.1**
C_3-75 days Interval	75430	98777	**87104**	152812	175817	**164315**	77381	137946	**107664**	2.06	2.60	**2.3**

K-19-AST-1: Studies on organic source of nutrients on forage yield and quality of Fodder cowpea-maize system under irrigated situation

[Table Reference: K-19-AST-1 (a)-(e)]

Locations (4): Mandya, Coimbatore, Vellayani and Hyderabad

Preamble: The current agriculture system is largely affected due to unsustainability in food and fodder production due to over use of toxic chemicals, pesticides, fertilizers, which resulted in deterioration of soil health, pollution of ground water sources and more soil erosion which leads to leaching of mobile nutrients resulted in low soil productivity and decreased farm income. Hence there is need for farmers to adopt a healthier way of crop production by utilizing locally available organic source of nutrients so that soil and plant health will be retained and rejuvenated. Apart from these organically grown products fetches more value than normal. Therefore organic agriculture gaining importance in present food & fodder production. Keeping these things in view, the present investigation was carried out to know the effect of different organic source of nutrients on fodder yields and quality and soil health in fodder cowpea –maize cropping system.

A field experiment was started during *kharif*-2019 at four locations to study the effect of organic source of nutrients on forage yield, quality, soil properties and to compare the economics of organic source with inorganic in fodder cowpea-Maize cropping system. The treatments included are T_1-100% RDN through inorganic fertilizers, T_2-100% RDN through FYM, , T_3-75% RDN through FYM+ 25% RDN through vermi compost, T_4-75% RDN through FYM + 25% RDN through bio-compost, T_5-50% RDN through FYM + 50% RDN through vermi compost, T_6-50% RDN through FYM + 50% RDN through bio-compost, T_7-75% RDN of T_2 (both source), T_8-75% RDN of T_3 (both source), T_9-75% RDN of T_4 (both source), T_{10}-75% of RDN T_5 (both source), T_{11}-75% RDN of T_6 (both source) and T_{12}-50% RDN through FYM+ 25% RDN through vermi compost + 25% RDN through bio-compost. The trial was laid out in Randomized block design with replicated thrice.

The data revealed that, on location mean basis, application of 100% RDN through inorganic fertilizer recorded higher green fodder and dry matter yieldsof fodder cowpea (221.1 q and 49.5 q /ha respectively) and fodder maize (420.9 q, 92.0 q/ha respectively). The same treatment recorded higher system productivity of green fodder and dry matter yield (643 q and 141.5 q /h,a respectively) and net returns (84042 Rs./ha) with B:C of 2.50.

Among organic source of nutrients the higher productivity with respect to green fodder, dry matter and crude protein yield were higher with application of 50% RDN through farm yard manure and remaining 50% RDN through vermi-compost (630.6 q, 134.9 q and 14.7 q/ha respectively). Application of 50% RDN through farm yard manure and remaining 50% RDN through bio-compost resulted in higher net returns (63321 Rs./ha), and B:C of 2.10.

The data revealed that on centers mean basis, at Mandya centre among organic nutrient sources application of 50% RDN through FYM + 50% RDN through bio-compost (T_6) recorded higher total green forage (661.8 q/ha), dry matter yield (155.5q/ha) and crude protein yield (18.8 q/ha). The same treatment recorded higher net monetary returns (93137 Rs/ha) and B: C (2.7).

At Coimbatore centre among organic nutrient sources application of 50% RDN through FYM + 50% RDN through vermin compost (T_5) recorded higher total green forage (605.0 q/ha), dry matter (149.7 q/ha) and crude protein yield (14.0 q/ha). The same treatment recorded higher net monetary returns (37443 Rs/ha) and B: C (1.9).

At Vellayani centre among organic nutrient sources application of 75% RDN of T_3 (both source of FYM and Vermi compost)(T_8) recorded higher total green forage , dry matter yield, net monitory returns and B: C (630.3 q , 117.5 q/ha,71598 Rs/ha and 2.02 respectively). Whereas crude protein yield was higher (14.8 q/ha) with application of 75% RDN through FYM + 25% RDN through vermi-compost (T_3).

At Hyderabad centre, among organic nutrient sources application of 50% RDN through FYM + 50% RDN through vermin compost (T_5) recorded higher system productivity of green forage yield (641.1 q/ha), dry matter (124.1 q/ha) and crude protein yield (13.1 q/ha). The higher net monetary returns (74289 Rs/ha) and B: C (2.34) was recorded with 50% RDN through FYM + 50% RDN through bio-compost (T_6).

K-19-AST-1(a): Green forage yield as influenced by organic source of nutrients in fodder cowpea-maize system

Treatments	Green forage yield (q/ha)														
	Fodder Cowpea					Fodder Maize					System Total				
	Man-dya	Coim-batore	Vella-yani	Hydera bad	Mean	Man-dya	Coim-batore	Vella-yani	Hydera bad	Mean	Man-dya	Coim—batore	Vella-yani	Hydera bad	Mean
T_1	260.9	284	182.0	161.5	222.1	413.2	440	368.7	461.7	420.9	674.0	724.0	550.7	623.2	643.0
T_2	241.7	184	182.7	148.1	189.1	375.8	352	285.0	410	355.7	617.5	536.0	467.7	558.1	544.8
T_3	236.3	200	240.0	151.4	206.9	389.2	357	387.3	430	390.9	625.4	557.0	627.3	581.4	597.8
T_4	244.9	186	155.0	154.5	185.1	381.5	334	369.0	423.3	377.0	626.4	520.0	524	577.8	562.1
T_5	254.2	224	197.3	167.8	210.8	395.7	381	429.0	473.3	419.8	649.8	605.0	626.3	641.1	630.6
T_6	257.5	190	238.3	166.8	213.2	404.3	321	338.7	440	376.0	661.8	511.0	577	606.8	589.2
T_7	200.4	164	225.0	137	181.6	262.4	294	298.0	316.7	292.8	462.8	458.0	523	453.7	474.4
T_8	199.6	175	215.0	144.2	183.5	271.0	309	415.3	363.3	339.7	470.6	484.0	630.3	507.5	523.1
T_9	205.8	168	195.0	124.5	173.3	271.7	302	244.3	373.3	297.8	477.5	470.0	439.3	497.8	471.2
T_{10}	201.7	179	208.7	115.5	176.2	258.0	318	354.0	378.3	327.1	459.7	497.0	562.7	493.8	503.3
T_{11}	206.3	172	177.3	102.8	164.6	224.5	307	324.8	373.3	307.4	430.8	479.0	502.1	476.1	472.0
T_{12}	242.5	184	228.3	150.3	201.3	343.5	341	353.7	425	365.8	586.0	525.0	582	575.3	567.1
SE(m) ±	**18.9**	**8.27**	**2.38**	**5.5**	11.2	**21.5**	**11.17**	**11.40**	**11.6**	17.5	**31.1**	**23.19**	**10.27**	**14.7**	24.2
C.D.(p=0.05)	**55.3**	**23.71**	**7.02**	**16.3**	32.3	**63.0**	**32.43**	**33.65**	**34.3**	50.6	**91.2**	**66.32**	**30.31**	**43.6**	70.1

K-19-AST-1(b): Dry matter yield as influenced by organic source of nutrients in fodder cowpea-maize system

Treatments	Dry Matter yield (q/ha)														
	Fodder Cowpea					Fodder Maize					System Total				
	Man-dya	Coim-b atore	Vella-yani	Hydera -bad	Mean	Man-dya	Coim-batore	Vella-yani	Hyder abad	Mean	Man-dya	Coimb atore	Vella-yani	Hydera bad	Mean
T_1	53.6	67.4	39.9	37.0	49.5	104.6	109.8	72.9	80.7	92.0	158.2	177.2	112.8	117.7	141.5
T_2	46.7	43.6	28.9	30.8	37.5	89.6	89.5	54.8	75.7	77.4	136.4	133.1	83.7	106.5	114.9
T_3	48.9	47.5	42.1	33.0	42.9	94.7	90.7	75.4	78.0	84.7	143.5	138.2	117.5	111.0	127.6
T_4	48.0	44.0	23.3	35.2	37.6	95.2	84.9	71.9	74.4	81.6	143.2	128.9	95.2	109.6	119.2
T_5	52.8	53.1	31.6	38.7	44.1	95.6	96.6	85.8	85.4	90.9	148.4	149.7	117.4	124.1	134.9
T_6	53.7	45.0	28.8	37.3	41.2	101.9	81.6	65.5	77.0	81.5	155.6	126.6	94.3	114.3	122.7
T_7	38.1	38.9	37.5	27.1	35.4	58.9	74.8	59.9	54.5	62.0	97.0	113.7	97.4	81.6	97.4
T_8	37.6	41.6	36.8	27.7	35.9	65.7	78.4	80.7	64.2	72.3	103.3	120	117.5	91.9	108.2
T_9	39.8	39.8	31.3	22.3	33.3	66.8	76.6	44.5	70.5	64.6	106.6	116.4	75.8	92.8	97.9
T_{10}	38.8	42.3	34.6	22.6	34.6	59.7	80.8	72.8	69.0	70.6	98.6	123.1	107.4	91.6	105.2
T_{11}	38.2	40.7	27.7	20.6	31.8	54.7	77.9	64.8	68.0	66.4	92.9	118.6	92.5	88.6	98.2
T_{12}	47.9	43.6	36.1	31.7	39.8	86.8	86.6	71.8	79.0	81.1	134.7	130.2	107.9	110.7	120.9
SE(m) ±	4.7	1.43	0.92	1.8	2.4	6.2	2.79	1.37	2.5	4.5	8.7	4.12	1.69	4.0	6.0
C.D.(p=0.05)	13.9	4.36	2.71	5.33	7.0	18.3	8.21	4.04	7.4	13.1	25.4	12.57	4.89	11.7	17.4

K-19-AST-1(c): Crude protein yield as influenced by organic source of nutrients in fodder cowpea-maize system

Treatments	Crude Protein Yield (q/ha)														
	Fodder Cowpea					Fodder Maize					System Total				
	Man-dya	Coimba tore	Vellay ani	Hydera bad	Mean	Man-dya	Coimb atore	Vellay ani	Hyder abad	Mean	Man-dya	Coimb-atore	Vellay ani	Hydera bad	Mean
T_1	8.8	8.6	5.5	5.4	7.1	7.8	8.20	6.6	6.8	7.4	16.7	16.80	12.0	12.2	14.4
T_2	6.9	5.5	5.5	3.7	5.4	5.9	6.40	4.9	5.5	5.7	12.8	11.90	10.4	9.2	11.1
T_3	7.5	6.0	8.0	4.4	6.5	7.0	6.50	6.8	5.9	6.6	14.5	12.50	14.8	10.3	13.0
T_4	7.1	5.6	4.5	4.7	5.5	7.1	5.80	6.5	5.7	6.3	14.2	11.40	11.0	10.4	11.8
T_5	10.3	6.7	5.7	5.6	7.1	7.9	7.30	7.7	7.5	7.6	18.2	14.00	13.4	13.1	14.7
T_6	10.8	5.7	7.2	5.3	7.3	8.0	5.40	5.9	6.5	6.5	18.8	11.10	13.1	11.8	13.7
T_7	5.4	4.9	6.9	2.7	5.0	4.4	4.50	5.4	3.5	4.5	9.8	9.40	12.3	6.2	9.4
T_8	5.8	5.3	7.0	3.3	5.4	4.6	5.00	7.3	4.6	5.4	10.4	10.30	14.3	7.9	10.7
T_9	5.7	5.1	5.6	2.3	4.7	4.9	4.70	4.0	5.1	4.7	10.7	9.80	9.7	7.4	9.4
T_{10}	6.1	5.4	6.3	2.8	5.2	3.9	5.30	6.6	5.3	5.3	10.0	10.70	12.8	8.1	10.4
T_{11}	5.8	5.2	5.0	2.4	4.6	4.0	4.90	5.8	4.7	4.9	9.9	10.10	10.8	7.1	9.5
T_{12}	9.6	5.5	7.2	4.0	6.6	6.8	6.00	6.5	6.1	6.4	16.4	11.50	13.6	10.1	12.9
SE(m) ±	0.7	0.22	0.55	0.26	0.50	0.6	0.41	0.39	0.21	0.39	1.0	0.71	0.23	0.4	0.8
C.D.(p=0.05)	2.2	0.63	0.19	0.77	1.50	1.8	1.27	0.13	0.70	1.12	2.9	2.11	0.68	1.1	2.4

K-19-AST-1(d): Plant height (cm) as influenced by organic source of nutrients in fodder cowpea-maize system

Treatments	Plant height (cm)									
	Fodder Cowpea					Fodder Maize				
	Mandya	Coimbatore	Vellayani	Hyderabad	Mean	Mandya	Coimbatore	Vellayani	Hyderabad	Mean
T_1	82.7	116.9	105.0	186.0	122.7	196.3	241.6	218.0	218.9	218.7
T_2	74.8	93.3	103.7	146.0	104.5	178.1	234.6	219.3	208.3	210.1
T_3	77.6	107.3	108.7	119.3	103.2	187.4	216.2	229.7	210.0	210.8
T_4	76.1	98.2	108.7	137.7	105.2	182.4	218.5	218.3	205.8	206.3
T_5	79.5	102.3	110.7	178.3	117.7	200.6	236.2	235.7	223.1	223.9
T_6	74.5	105.7	146.7	185.0	128.0	194.9	220.1	249.7	219.6	221.1
T_7	56.3	82.9	105.0	125.7	92.5	169.0	195.0	207.0	195.3	191.6
T_8	56.1	93.3	109.7	103.7	90.7	160.6	200.8	220.7	192.6	193.7
T_9	54.7	79.4	97.7	145.0	94.2	157.1	215.7	210.3	196.4	194.9
T_{10}	49.5	90.4	120.0	122.3	95.6	154.4	203.7	230.3	196.3	196.2
T_{11}	51.3	81.7	118.0	159.6	102.7	150.0	199.4	210.3	201.3	190.3
T_{12}	74.4	99.8	124.3	179.3	119.5	196.7	220.1	227.3	211.3	213.9
SE(m) ±	2.7	3.57	2.34	10.7	7.2	11.5	7.91	2.43	6.9	4.4
C.D.(p=0.05)	7.9	10.34	6.90	31.8	20.7	33.6	22.91	7.17	20.4	12.7

Table K-19-AST-1(e): Economics of fodder Cowpea-Maize system

Treatments	Economics of fodder Cowpea-Maize system														
	Gross Returns (Rs./ha)					Net Returns (Rs./ha)					B: C ratio				
	Man-dya	Coimb atore	Vella-yani	Hydera bad	Mean	Man-dya	Coimb-atore	Vella-yani	Hyder-abad	Mean	Man-dya	Coimb atore	Vella yani	Hyder abad	Mean
T_1	147852	159138	123907	132715	140903	99618	85358	66792	84401	84042	3.07	2.16	2.17	2.75	2.5
T_2	135583	116508	105232	119025	119087	76932	33763	33907	56579	50295	2.31	1.41	1.47	1.91	1.8
T_3	136896	121525	141142	123850	130853	79791	32816	61532	59315	58364	2.40	1.37	1.77	1.92	1.9
T_4	137529	113336	117900	123285	123013	83893	27380	49119	64357	56187	2.56	1.32	1.71	2.09	1.9
T_5	142675	132115	140917	136610	138079	85500	37443	57012	69987	62486	2.50	1.40	1.68	2.05	1.9
T_6	145242	111749	129825	129700	129129	93137	22582	63275	74289	63321	2.79	1.25	1.95	2.34	2.1
T_7	102588	99925	117675	97590	104445	50754	20850	50900	40755	40815	1.98	1.26	1.76	1.72	1.7
T_8	104096	105560	141817	108710	115046	52192	22010	71598	50321	49030	2.01	1.26	2.02	1.86	1.8
T_9	105792	102361	98842	105785	103195	57076	20876	35231	51597	41195	2.17	1.26	1.55	1.95	1.7
T_{10}	102017	108266	126607	104535	110356	50674	20241	51647	44599	41790	1.99	1.23	1.69	1.74	1.7
T_{11}	96463	104269	112972	100360	103516	49679	20377	51254	48808	42530	2.06	1.24	1.83	1.95	1.8
T_{12}	129325	114165	130950	122575	124254	75300	27292	55561	61907	55015	2.39	1.31	1.74	2.02	1.9

K-19-AST-2: Studies on organic source of nutrient on green forage yield and quality of Rice bean-oat under irrigated situation

[Table Reference: K-19-AST-2 (a)-(h)]

Locations (4): Kalyani, Imphal, Pusa and Ranchi

A field experiment was started in Kharif 2019 and it was third year of experimentation. It was conducted at four locations to assess the effect of organic sources of nutrient on forage productivity and quality of rice bean – oat cropping system under irrigated condition. The treatments consisted of twelve nutrient management combinations of inorganic fertilizer and organic sources like FYM, vermicompost and bio compost. The treatments were T_1- 100% RDN through inorganic fertilizers, T_2- 100% RDN through FYM , T_3- 75% RDN through FYM + 25% RDN through vermicompost, T_4- 75% N through FYM + 25% RDN through Bio-compost, T_5- 50% RDN through FYM + 50% RDN through vermicompost, T_6- 50% RDN through FYM + 50% RDN through Bio-compost, T_7- 75% of T_2, T_8- 75% of T_3 (both sources), T_9- 75% of T_4 (both sources), T_{10}- 75% of T_5 (both sources), T11 - 75% of T_6 (both sources) and T12 - 50% N through FYM + 25% RDN through vermicompost + 25% RDN through Poultry manure as top dress at 30 DAS.

The treatments were replicated thrice in randomized block design (RBD). The rice bean was sown during kharif, 2021 in 25 cm apart lines using 30 kg seed/ha. Succeeding crop of oat was sown during Rabi. The results indicated that all the treatments improved the green and dry biomass yield significantly over control.This was the thirdyear of experimentation.The highest GFY recorded in T_5 - 50% RDN through FYM + 50% RDN through vermicompost followed by T_6- 50% RDN through FYM + 50% RDN through Bio-compostat all the centres and followed by$\mathbf{T_{12}}$: 50% N through FYM+ 25% RDN through VC+ 25% RDN through PM for Pusa and except Ranchi where T_3 recorded the highest GFY followed by T_1.In respect of dry matter yield the highest DMY were recorded in T_5 at Imphal, Kalyani, Pusa. However, at Ranchi the highest DMY was recorded in T_1followed by T_3 (but statistically at par). In respect of CPY, the highest total CPY was recorded in T_6 at Imphal and Kalyani.On the other hand at Pusa T_5, but atRanchi the highest total CPY was recorded in T_1.Economic analysis of the experiment indicated that atImphal, Kalyani and Pusa, the highest gross income was obtained in T_5 followed by $T_6$and T_{12} for Pusa. On the other hand the highest gross income at Ranchi was recorded in T_1 followed by T_3.The highest net income was recorded in T_5 at Imphal and Kalyani and at Pusa T_{12} and at Ranchi T_1 recorded the highest net income.B: C ratio of different treatments revealed that at Imphal T_9 recorded the highest B: C ratio and at Kalyani the highest B: C ratio was recorded in T_3but at Pusa and Ranchi T_1 recorded the highest B:C ratio.In respect of soil fertility status after completion of the sequence, slight increase in pH and Organic carbon was noted as compared to initial status. However there were variations in N, P and K status after the sequence depending upon treatments. However, there was increase in the value of MBC at Kalyani and the highest being observed in T_5 (189 mg/kg) as compared to initial value of MBC (148 mg/kg).

Treatments

$\mathbf{T_1}$: 100% RDN through inorganic fertilizers
$\mathbf{T_2}$: 100% RDN through FYM
$\mathbf{T_3}$: 75% RDN through FYM+ 25% RDN through vermicompost
$\mathbf{T_4}$: 75% N through FYM+ 25% RDN through Bio-compost
$\mathbf{T_5}$: 50% RDN through FYM+ 50% RDN through vermicompost
$\mathbf{T_6}$: 50% RDN through FYM+ 50% RDN through Bio-compost
$\mathbf{T_7}$: 75% of $\mathbf{T_2}$
$\mathbf{T_8}$: 75% of $\mathbf{T_3}$
$\mathbf{T_9}$: 75% of $\mathbf{T_4}$
$\mathbf{T_{10}}$: 75% of $\mathbf{T_5}$
$\mathbf{T_{11}}$: 75% of $\mathbf{T_6}$
$\mathbf{T_{12}}$: 50% N through FYM+ 25% RDN through VC+ 25% RDN through PM

Table K-19-AST- 2(a): Effect of organic source of nutrients on green forage yield (q/ha) of rice bean-oat system

Treatment	Imphal			Kalyani			Pusa			Ranchi			Mean		
	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total
T_1	329.83	315.28	645.1	324.0	302.4	626.4	264.7	386.0	650.7	245.11	422.00	667.1	290.9	356.4	647.3
T_2	338.37	301.67	640.0	320.0	299.7	619.7	256.4	316.3	572.7	167.15	423.33	590.5	270.5	335.3	605.7
T_3	353.43	353.33	706.8	346.2	321.4	667.6	293.7	336.7	630.4	197.09	473.67	670.8	297.6	371.3	668.9
T_4	351.53	324.72	676.3	340.4	316.8	657.2	281.7	323.0	604.7	168.59	423.61	592.2	285.6	347.0	632.6
T_5	394.7	429.72	824.4	400.2	379.4	779.6	363.2	381.3	744.5	161.46	463.13	624.6	329.9	413.4	743.3
T_6	362.3	399.17	761.5	369.5	341.5	711.0	329.8	363.8	693.6	139.59	397.74	537.3	300.3	375.6	675.9
T_7	301.5	197.78	499.3	292.8	225.7	518.5	223.2	263.3	486.5	112.45	297.92	410.4	232.5	246.2	478.7
T_8	282.7	284.17	566.9	312.7	249.3	562.0	241.2	298.0	539.2	120.20	295.76	416.0	239.2	281.8	521.0
T_9	317.9	289.72	607.6	310.2	235.4	545.6	232.1	276.1	508.2	106.45	290.31	396.8	241.7	272.9	514.6
T_{10}	324.4	298.33	622.7	314.6	279.8	594.4	249.3	335.0	584.3	134.31	326.84	461.2	255.7	310.0	565.7
T_{11}	226.2	268.06	494.3	312.0	264.7	576.7	235.3	312.3	547.6	99.70	302.56	402.3	218.3	286.9	505.2
T_{12}	231.67	310.83	542.5	318.4	310.2	628.6	347.6	382.7	730.3	155.71	331.86	487.6	263.3	333.9	597.3
SE(m) ±	6.48	5.49	9.65	2.65	4.22	6.82	8.1	16.8	21.2	4.94	10.59	13.81	--	--	--
C.D.(p=0.05)	18.99	16.12	28.29	7.95	12.7	20.5	23.9	49.3	62.2	14.58	31.26	40.76	--	--	--

Table K-19-AST- 2(b): Effect of organic source of nutrients on dry matter yield (q/ha) of rice bean-oat system

Treatment	Imphal			Kalyani			Pusa			Ranchi			Mean		
	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total
T_1	52.49	49.14	101.6	60.6	59.9	120.5	46.7	80.6	127.3	53.82	81.47	135.3	53.4	67.8	121.2
T_2	64.18	49.17	113.4	68.2	67.4	135.6	45.0	68.3	113.3	37.02	81.75	118.8	53.6	66.7	120.3
T_3	55.73	52.77	108.5	76.5	75.2	151.7	55.2	76.0	131.2	43.43	91.39	134.8	57.7	73.8	131.6
T_4	46.74	50.43	97.2	74.5	71.6	146.1	51.7	70.2	121.9	37.20	81.92	119.1	52.5	68.5	121.1
T_5	71.48	59.21	130.7	106.1	105.5	211.6	72.9	93.5	166.4	35.67	89.57	125.2	71.5	86.9	158.5
T_6	64.68	64.22	128.9	87.9	88.4	176.3	64.4	84.3	148.7	30.83	77.26	108.1	62.0	78.5	140.5
T_7	44.54	32.33	76.9	49.2	42.7	91.9	37.5	50.4	87.9	24.87	57.65	82.5	39.0	45.8	84.8
T_8	52.05	42.62	94.7	53.8	45.6	99.4	41.2	68.1	109.3	26.61	57.21	83.8	43.4	53.4	96.8
T_9	55.26	46.09	101.4	51.2	41.7	92.9	39.6	60.2	99.8	23.47	56.13	79.6	42.4	51.0	93.4
T_{10}	55.07	57.1	112.2	63.9	63.8	127.7	44.5	77.3	121.8	29.59	63.18	92.8	48.3	65.3	113.6
T_{11}	39.1	51.49	90.6	61.5	55.3	116.8	40.3	68.7	109.0	22.03	58.89	80.9	40.7	58.6	99.3
T_{12}	42.96	58.25	101.2	63.4	63.9	127.3	68.9	92.5	161.4	34.5	64.46	99.0	52.4	69.8	122.2
SE(m) ±	4.39	1.86	4.52	2.43	2.62	4.88	2	5.1	5.9	1.05	2.01	2.78	--	--	--
C.D.(p=0.05)	12.87	5.46	13.26	7.3	7.86	14.6	5.8	15	17.3	3.1	5.93	8.22	--	--	--

Table K-19-AST- 2(c): Effect of organic source of nutrients on CPY (q/ha) of rice bean-oat system

Treatment	Imphal			Kalyani			Pusa			Ranchi			Mean		
	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total	Rice bean	Oat	Total
T_1	7.56	4.56	12.1	8.79	9.5	18.3	6.8	8.5	15.3	10.73	7.38	18.1	8.5	7.5	16.0
T_2	9.21	5.21	14.4	11.39	12.0	23.4	6.2	6.5	12.7	8.11	6.81	14.9	8.7	7.6	16.4
T_3	7.69	5.81	13.5	9.49	10.3	19.8	7.7	7.5	15.2	9.28	7.04	16.3	8.5	7.7	16.2
T_4	6.69	6.00	12.7	11.77	12.8	24.6	7.1	6.8	13.9	7.21	7.24	14.5	8.2	8.2	16.4
T_5	9.41	5.80	15.2	10.72	13.0	23.7	10.6	9.7	20.3	6.50	7.66	14.2	9.3	9.0	18.4
T_6	9.3	6.36	15.7	13.01	14.1	27.1	9.3	8.5	17.8	6.94	6.45	13.4	9.6	8.9	18.5
T_7	6.47	3.35	9.8	8.17	7.4	15.6	5.0	4.3	9.3	4.44	4.66	9.1	6.0	4.9	11.0
T_8	7.96	4.35	12.3	6.67	6.3	13.0	5.5	6.0	11.5	4.82	4.24	9.1	6.2	5.2	11.5
T_9	8.01	4.47	12.5	5.53	5.1	10.6	5.3	5.3	10.6	3.73	4.28	8.0	5.6	4.8	10.4
T_{10}	8	5.43	13.4	9.14	9.6	18.7	6.0	6.9	12.9	5.84	4.97	10.8	7.2	6.7	14.0
T_{11}	5.55	5.06	10.6	10.46	10.1	20.6	5.4	6.0	11.4	4.15	4.49	8.6	6.4	6.4	12.8
T_{12}	6.13	5.66	11.8	7.8	8.8	16.6	9.9	9.6	19.5	6.52	5.22	11.7	7.6	7.3	14.9
SE(m) ±	0.65	0.23	0.67	0.25	0.3	0.62	0.4	0.4	0.6	0.25	0.24	0.4	--	--	--
C.D.(p=0.05)	1.91	0.67	1.97	0.75	0.9	1.86	1.1	1.3	1.9	0.75	0.69	1.18	--	--	--

Table K-19-AST- 2(d): Effect of organic source of nutrients on gross return (Rs/ha), Net Income (Rs/ha) and B: C ratio of rice bean-oat system

Treatment	Imphal			Kalyani			Pusa			Ranchi			Mean		
	Gross Income	Net Income	B:C ratio	Gross Income	Net Income	B:C ratio	Gross Income	Net Income	B:C ratio	Gross Income	Net Income	B:C ratio	Gross Income	Net Income	B:C ratio
T_1	145514	80214	1.23	94090	45990	1.90	130140	78538	2.52	145678	99356	3.15	128856	76025	2.20
T_2	144925	69225	0.91	103860	50120	1.86	114547	54979	1.92	126454	71733	2.31	122447	61514	1.75
T_3	159025	80525	1.03	118280	62495	2.03	126087	58696	1.87	144005	82395	2.34	136849	71028	1.82
T_4	152828	82068	1.16	113180	59300	2.02	120940	59706	1.98	126869	73726	2.39	128454	68700	1.89
T_5	184619	103379	1.27	132785	69204	2.02	148907	73144	1.97	132992	57194	1.76	149826	75730	1.76
T_6	170408	88848	1.09	121160	60790	1.94	138713	75263	2.19	114445	62779	2.22	136182	71920	1.86
T_7	114931	68471	1.47	83675	41939	1.89	97307	42139	1.76	87695	36723	1.72	95902	47318	1.71
T_8	127508	79188	1.64	90980	46595	1.97	107840	46807	1.77	89203	30102	1.51	103883	50673	1.72
T_9	137419	85859	1.67	86358	40214	1.8	101633	45216	1.8	84673	34884	1.7	102521	51543	1.74
T_{10}	140767	78107	1.25	98390	45363	1.79	116867	49965	1.75	98945	32166	1.48	113742	51400	1.57
T_{11}	110161	57101	1.08	94606	46406	1.91	109527	51859	1.9	85436	36755	1.76	99933	48030	1.66
T_{12}	120083	53743	0.81	100489	46579	1.78	146053	80881	2.24	105299	49353	1.88	117981	57639	1.68
SE(m) ±	2208	2208	0.04	1550	1285	0.03	4243	4243	0.07	2762	2967	0.06	-	-	-
C.D.(p=0.05)	6475	6475	0.11	4656	3855	0.09	12444	12444	0.20	8152	8758	0.18	-	-	-

Table K-19-AST- 2(e): Effect of organic source of nutrients on plant height (cm) of rice bean and oat

Treatment	Imphal		Kalyani		Pusa		Ranchi		Mean	
	Rice bean	Oat	Rice bean	Oat	Rice bean	Oat	Rice bean	Oat	Rice bean	Oat
T_1	164.67	114.89	103.2	151.9	122.6	154.6	174.3	123.45	141.2	136.2
T_2	158.44	108.00	105.6	132.2	117.3	138.0	153.80	110.36	133.8	122.1
T_3	144.44	111.78	119.3	123.4	125.8	147.7	136.56	106.69	131.5	122.4
T_4	152.11	107.22	110.5	132.6	123.0	144.7	131.11	104.67	129.2	122.3
T_5	156.44	117.67	120.6	119.5	129.7	152.3	135.07	111.92	135.5	125.3
T_6	163.33	122.56	120.8	126.7	126.2	150.2	136.20	102.83	136.6	125.6
T_7	149.78	112.78	102.3	128.6	111.4	134.3	122.86	87.58	121.6	115.8
T_8	155.22	104.56	106.7	127.9	115.9	136.7	124.21	84.80	125.5	113.5
T_9	156.89	101.44	105.4	121.8	113.3	136.2	125.32	83.26	125.2	110.7
T_{10}	150.33	103.22	110.3	139.5	117.1	138.2	120.77	88.93	124.6	117.5
T_{11}	158.56	101.44	106.3	128.9	115.5	136.3	121.79	82.10	125.5	112.2
T_{12}	153.11	103.33	115.2	128.2	125.2	153.1	133.92	92.69	131.9	119.3
SE(m) ±	3.37	3.8	0.54	1.47	3.8	4.4	2.658	1.33	--	--
C.D.(p=0.05)	9.87	11.13	1.62	4.41	11.3	13	7.847	3.94	--	--

Table K-19-AST- 2(f): Effect of organic source of nutrients on soil properties after harvest of fodder oat (CAU, Imphal) (3rd year)

Treatment	Soil properties		Available nutrient (kg/ha)		
	OC (%)	pH	N	P	K
T1	0.96	5.29	560.2	10.9	149.2
T2	1.11	5.33	267.3	12.1	143.8
T3	1.48	5.28	261.9	12.8	152.6
T4	1.05	5.41	260.8	12.3	161.3
T5	1.11	5.30	272.3	13.7	163.2
T6	1.13	5.31	261.8	11.8	153.9
T7	1.06	5.32	258.7	10.9	163.4
T8	1.09	5.31	256.8	11.2	165.8
T9	1.02	5.34	263.9	12.8	163.3
T10	1.03	5.29	262.3	12.3	158.3
T11	1.02	5.42	269.4	11.9	160.8
T12	1.01	5.33	260.8	12.1	162.3
Initial	**1.09**	**5.35**	**266.2**	**12.8**	**153.8**

Table K-19-AST- 2(g): Effect of organic source of nutrients on soil properties after harvest of fodder oat (BCKV, Kalyani) (3rd year)

Treatments	pH	EC (dS m^{-1})	OC (%)	Available macro-nutrients (kg/ha)			MBC (mg/kg)
				N	P	K	
T_1	6.87	0.15	0.48	156.1	32.3	162.8	152
T_2	6.88	0.16	0.50	174.6	39.2	174.7	184
T_3	6.88	0.16	0.49	177.5	38.7	176.2	176
T_4	6.90	0.16	0.50	181.4	35.1	178.1	178
T_5	6.91	0.15	0.51	184.4	39.8	166.7	189
T_6	6.86	0.16	0.51	176.3	37.2	172.5	176
T_7	6.87	0.15	0.50	163.6	36.6	167.6	178
T_8	6.87	0.16	0.50	156.8	37.3	175.8	169
T_9	6.88	0.16	0.49	166.5	36.6	168.2	176
T_{10}	6.87	0.17	0.50	175.4	34.7	165.4	172
T_{11}	6.88	0.16	0.51	157.7	34.1	169.4	177
T_{12}	6.85	0.16	0.52	175.6	35.5	169.7	185
SE(m) ±	0.19	0.11	0.01	2.32	0.7	3.5	3.7
C.D.(p=0.05)	NS	NS	0.03	6.96	2.1	10.5	11.1
Initial value	6.88	0.17	0.53	195.6	44.8	218.2	148

Table K-19-AST- 2 (h): Effect of organic source of nutrients on soil properties after harvest of fodder oat (RPCAU, Pusa)

Treatments	pH	EC (dS m^{-1})	OC (%)	Available macro-nutrients (kg/ha)		
				N	P	K
T_1	8.29	0.43	0.52	281.2	17.7	129.9
T_2	8.24	0.47	0.63	302.5	19.7	139.5
T_3	8.25	0.45	0.65	305.1	20.0	142.5
T_4	8.24	0.46	0.60	294.1	19.6	140.2
T_5	8.27	0.46	0.65	308.9	24.8	146.1
T_6	8.26	0.47	0.61	296.7	23.5	142.8
T_7	8.26	0.44	0.61	295.9	19.3	137.4
T_8	8.27	0.45	0.56	287.3	19.5	138.7
T_9	8.27	0.45	0.56	285.3	19.3	137.8
T_{10}	8.28	0.45	0.58	291.4	19.8	139.9
T_{11}	8.28	0.46	0.57	289.5	19.6	138.1
T_{12}	8.26	0.46	0.63	303.7	22.4	143.3
SE(m) ±	0.04	0.02	0.02	5.9	0.7	2.3
C.D.(p=0.05)	NS	NS	0.05	NS	2.0	6.7
Initial value	8.31	0.45	0.55	290.0	18.35	135.5

K-20-AST-1c: Efficacy of plant growth regulators on forage yield and quality of maize-oat cropping system

[Table reference: K-20-AST-1C (a) – (l)]

Locations (6): Urulikanchan, Srinagar, Pusa, Raipur, Hisar and Ranchi

Preamble

In India, only 4% of the total cultivated area is under fodder production. To increase the fodder availability, it is required to increase the area under the fodder cultivation by 8-10% or the productivity per unit area. Use of various plant growth regulators is one of the ways to increase productivity and break yield plateau. The plant growth regulators play an important role in increasing growth characters like plant height, leaf area index, green and dry biomass. Hence, the study on efficacy of different plant growth regulators on forage yield and quality of fodder maize-oat cropping system is proposed.

A field trial was initiated at six locations namely, Urulikanchan, Srinagar, Pusa, Raipur, Hisar and Ranchi to find out the effect of different plant growth regulators on forage yield and quality of maize and oat and work out the economic feasibility of plant growth regulators. The trial was initiated during Kharif 2020 for three years and this was the second year of the experiment. The eleven treatments included T_1: Triacontanol @ 10 ppm, T_2: Triacontanol @ 20 ppm, T_3: Mepiquat, chloride @ 200 ppm, T_4: Mepiquat chloride @ 300 ppm, T_5: Salicylic acid 100 ppm, T_6: Salicylic acid 200 ppm, T_7: NAA @ 20 ppm, T_8: Fenoxaprop at 4g a.i./ha, T_9 - GA_3 200 ppm, T_{10} - GA_3 400 ppm and T_{11}: Control- spray of water. The treatments were replicated thrice in Randomized Complete Block Design. Different plant growth regulators were sprayed at 30 day stage on foliage of each crop *i.e.*, Maize and Oat.Standard package of practices and recommended dose offertilizers were (considering suitable correction in low or high nutrient availability soils) were followed for raising the crop with a plot size of 12 m^2 (4 m × 3 m).

Data on forage maize indicated that application mepiquat chloride at 300 ppm (436.0 q/ha) produced the highest average green forage yield over locations but the highest average dry matter yield (96.7 q/ha) and crude protein yield (7.6 q/ha) over locations were recorded with the application of GA_3 at 400 ppm. The increment in averagegreen forage yield across locations with Mepiquat chloride at 300 ppm was 18.06% over control, whereas, the increment in average dry matter yield and crude protein yield across locations withGA_3 at 400 ppmwas 23.18 and 33.33%, respectively. Economic analysis indicated that the highest average net return (Rs. 56814/ha) and B:C ratio (2.61) over locations was achieved with T_6-Salicylic acid at 200 ppm with respective increments of 27.43 and 14.47percent over control.In case of forage oat, application of growth regulators increased the average green forage and dry matter yield over locations except T_8-Fenoxaprop at 4g a.i./ha. The highest average green forage yield (421.0 q/ha), dry matter yield (90.0 q/ha) and crude protein yield (8.3 q/ha) over locations among treatments was achieved with T_6*i.e.*application of Salicylic acid at 200 ppmwith respective increments of 16.72, 18.26 and 27.69%.This treatment also recorded the highest average net return (Rs.53216/ha) and B:C (2.59) with per cent increments of 28.07 and 15.1, respectively over control.

Table K-20-AST-1C (a): Effect of different PGRs on forage yields of fodder maize

Treatments	GFY (q/ha)							DMY (q/ha)						
	Urulikan-chan	Pusa	Rai-pur	Hisar	Ran-chi	Sri-nagar	Mean	Urulikan-chan	Pusa	Raipur	His-ar	Ran-chi	Sri-nagar	Mean
T1-Triacontanol at 10 ppm	446.9	335.0	375.8	360.3	416.3	461.1	399.2	83.5	61.3	78.2	93.0	108.3	91.1	85.9
T2-Triacontanol at 20 ppm	453.8	331.4	342.2	385.5	456.0	466.1	405.8	83.6	60.6	68.9	102.1	118.7	92.0	87.6
T3-Mepiquat chloride at 200 ppm	479.6	344.1	386.5	357.8	437.3	451.8	409.5	97.8	65.0	82.5	92.5	114.8	86.4	89.8
T4-Mepiquat chloride at 300 ppm	559.7	381.4	369.7	360.6	491.3	453.1	436.0	84.6	72.3	75.9	93.6	129.1	82.8	89.7
T5-Salicylic acid at 100 ppm	503.3	356.8	385.0	368.3	443.7	427.1	414.0	106.3	67.2	82.0	94.5	116.2	83.6	91.6
T6-Salicylic acid at 200 ppm	527.8	343.9	366.7	407.5	446.7	432.2	420.8	113.2	64.9	76.9	105.4	117.3	86.4	94.0
T7-NAA at 20 ppm	488.6	352.6	403.3	373.6	421.6	441.2	413.5	72.0	66.7	82.7	96.9	112.5	80.9	85.3
T8-Fenoxaprop at 4g a.i./ha	311.7	326.3	110.0	356.9	411.3	423.1	323.2	56.5	59.8	22.7	92.8	109.7	85.2	71.1
T9-GA3 at 200 ppm	472.2	332.5	409.4	352.2	414.4	445.6	404.4	120.1	60.5	83.7	93.0	110.5	86.2	92.3
T10-GA3 at 400 ppm	510.6	349.5	418.6	376.4	424.7	449.9	421.6	126.4	64.6	89.1	99.7	113.3	86.9	96.7
T11-Waterspray (control)	417.5	305.5	354.4	341.1	402.0	395.0	369.3	65.0	55.1	73.4	91.4	107.2	78.7	78.5
SE(m) ±	14.1	12.2	11.7	10.9	5.4	5.2		2.6	2.3	3.7	2.8	1.4	1.0	
C.D.(p=0.05)	41.9	35.9	34.6	32.3	16.1	14.9		7.7	6.8	11.0	8.4	4.2	2.7	

Table K-20-AST-1C (b): Effect of different PGRs on crude protein content and yield of fodder maize

Treatments	CP content (%)							CPY (q/ha)						
	Urulikan-chan	Pusa	Rai-pur	Hisar	Ran-chi	Sri-nagar	Mean	Urulikan-chan	Pusa	Rai-pur	His-ar	Ran-chi	Sri-nagar	Mean
T1-Triacontanol at 10 ppm	6.32	7.28	8.10	10.24	6.55	7.00	7.58	5.3	4.5	6.3	9.5	7.1	6.4	6.5
T2-Triacontanol at 20 ppm	9.70	7.18	7.90	11.03	6.30	6.71	8.14	8.1	4.4	5.4	11.3	7.5	6.2	7.1
T3-Mepiquat chloride at 200 ppm	8.13	8.11	8.35	10.43	6.55	7.36	8.16	8.0	5.3	6.9	9.7	7.5	6.4	7.3
T4-Mepiquat chloride at 300 ppm	7.44	7.95	8.50	10.78	6.86	7.23	8.13	6.3	5.8	6.5	10.1	8.9	6.0	7.2
T5-Salicylic acid at 100 ppm	8.41	7.47	8.44	11.18	5.82	7.63	8.16	8.9	5.0	6.9	10.6	6.8	6.4	7.4
T6-Salicylic acid at 200 ppm	7.46	7.39	8.31	11.25	5.29	7.60	7.88	8.4	4.8	6.4	11.9	6.2	6.6	7.4
T7-NAA at 20 ppm	9.21	8.04	8.50	10.50	5.05	7.53	8.14	6.6	5.4	7.0	10.2	5.7	6.1	6.8
T8-Fenoxaprop at 4g a.i./ha	7.99	7.19	7.77	10.32	6.79	7.60	7.94	4.5	4.3	1.8	9.6	7.4	6.5	5.7
T9-GA3 at 200 ppm	6.32	7.24	8.51	10.92	5.87	7.44	7.72	7.6	4.4	7.1	10.2	6.5	6.4	7.0
T10-GA3 at 400 ppm	8.51	7.26	8.38	11.19	4.47	7.39	7.87	10.8	4.7	7.5	11.1	5.1	6.5	7.6
T11-Waterspray (control)	7.57	7.05	8.19	9.14	4.59	8.00	7.42	4.9	3.9	6.0	8.3	4.9	6.3	5.7
SE(m) ±	-	0.16	0.18	0.15	0.07	0.21		0.2	0.2	0.4	0.3	0.1	0.1	
C.D.(p=0.05)	-	0.49	0.52	0.45	0.22	0.64		0.6	0.5	1.1	1.0	0.4	N.S	

Table K-20-AST-1C (c): Effect of different PGRs on plant height and leaf stem ratio of fodder maize at harvest

Treatments	Plant height (cm)							L:S					
	Urulikan-chan	Pusa	Rai-pur	Hisar	Ran-chi	Sri-nagar	Mean	Urulikan chan	Pusa	Rai-pur	His-ar	Ran-chi	Mean
T1-Triacontanol at 10 ppm	279.3	185.5	278.2	247.0	188.7	284.5	243.9	0.57	0.52	0.30	0.25	0.17	0.36
T2-Triacontanol at 20 ppm	264.1	183.2	283.3	258.5	193.7	287.2	245.0	0.50	0.51	0.23	0.28	0.16	0.34
T3-Mepiquat chloride at 200 ppm	297.5	198.4	291.9	236.0	186.3	279.1	248.2	0.63	0.57	0.34	0.21	0.14	0.38
T4-Mepiquat chloride at 300 ppm	275.1	184.9	280.6	237.2	207.0	283.8	244.8	0.50	0.53	0.28	0.23	0.19	0.35
T5-Salicylic acid at 100 ppm	264.8	191.2	313.5	249.2	198.7	264.1	246.9	0.52	0.55	0.34	0.26	0.15	0.36
T6-Salicylic acid at 200 ppm	257.1	188.7	290.7	260.3	188.0	266.5	241.9	0.56	0.52	0.31	0.28	0.14	0.36
T7-NAA at 20 ppm	266.1	193.1	294.9	248.2	182.3	272.6	242.9	0.56	0.56	0.38	0.26	0.18	0.39
T8-Fenoxaprop at 4g a.i./ha	147.1	181.6	207.1	242.7	179.7	261.8	203.3	0.57	0.50	0.27	0.24	0.15	0.35
T9-GA3 at 200 ppm	292.9	192.3	313.9	241.1	180.3	274.1	249.1	0.46	0.50	0.39	0.24	0.15	0.35
T10-GA3 at 400 ppm	273.8	192.8	316.4	255.8	183.3	276.1	249.7	0.47	0.51	0.40	0.27	0.17	0.36
T11-Waterspray (control)	280.4	176.2	284.6	233.0	164.3	253.6	232.0	0.55	0.47	0.29	0.22	0.18	0.34
SE(m) ±	-	4.1	9.7	3.5	3.0	4.2		-	0.02	0.04	0.01	3.00	
C.D.(p=0.05)	-	12.0	28.5	10.5	8.9	11.8		-	0.06	0.11	0.03	NS	

Table K-20-AST-1C (d): Effect of different PGRs on number of leaves of fodder maize at harvest

Treatments	Number of leaves per plant					
	Urulikanchan	Pusa	Raipur	Hisar	Ranchi	Mean
T1-Triacontanol at 10 ppm	14.67	13.1	11.13	13	11	12.58
T2-Triacontanol at 20 ppm	14.44	12.4	11.33	14.33	10.67	12.63
T3-Mepiquat chloride at 200 ppm	16.11	14.4	11.63	13.22	12.67	13.61
T4-Mepiquat chloride at 300 ppm	15.34	14.1	11.47	13.44	11.67	13.20
T5-Salicylic acid at 100 ppm	14.89	14	12	13.56	10.67	13.02
T6-Salicylic acid at 200 ppm	13.78	13.4	11.47	14.44	12.67	13.15
T7-NAA at 20 ppm	14	14.2	11.6	13.45	11.67	12.98
T8-Fenoxaprop at 4g a.i./ha	13.22	11.9	9.6	13.34	10.67	11.75
T9-GA3 at 200 ppm	15.33	13	12.63	13.44	12.67	13.41
T10-GA3 at 400 ppm	14	13.6	12.8	14.22	11.67	13.26
T11-Waterspray (control)	15.11	11.4	11.33	12.67	12	12.50
SE(m) ±	-	0.5	0.41	0.25	0.51	
C.D.(p=0.05)	-	1.6	1.21	0.74	1.50	

Table K-20-AST-1C (e): Effect of different PGRs on economic parameters of fodder maize

Treatments	Cost of cultivation (Rs./ha)						Gross return (Rs./ha)						
	Urulikan-chan	Pusa	Rai-pur	His-ar	Sri-nagar	Mean	Urulikan-chan	Pusa	Rai-pur	Hisar	Ran-chi	Sri-nagar	Mean
T1-Triacontanol at 10 ppm	50409	35121	32607	49012	25965	38623	111725	67000	75166	72056	83267	92200	83569
T2-Triacontanol at 20 ppm	56002	40621	38607	54636	31465	44266	113461	66280	68444	77106	91200	93220	84952
T3-Mepiquat chloride at 200 ppm	48050	32261	29007	46088	23105	35702	119895	68820	77305	71556	87467	90360	85901
T4-Mepiquat chloride at 300 ppm	50917	33581	30207	47437	24425	37313	139911	76284	73944	72111	89333	90620	90367
T5-Salicylic acid at 100 ppm	46353	29731	26705	43501	20575	33373	125818	71360	77000	73667	88733	85420	87000
T6-Salicylic acid at 200 ppm	46633	29841	26802	43613	20685	33515	131946	68773	73333	81500	98267	86440	90043
T7-NAA at 20 ppm	45758	29875	26893	43648	20719	33379	122142	70520	80666	74722	84320	88240	86768
T8-Fenoxaprop at 4g a.i./ha	41971	29742	26725	43511	20585	32507	77921	65250	22000	71389	82253	84640	67242
T9-GA3 at 200 ppm	50751	34945	31931	48832	25789	38450	118057	66500	81889	70433	82873	89020	84795
T10-GA3 at 400 ppm	56534	40269	37255	54276	31113	43889	127656	69900	83722	75278	84940	89980	88579
T11-Waterspray (control)	45087	29621	26607	43388	20465	33034	104372	61097	70889	68222	80393	79000	77329
SE(m) ±	-	-	-	-	-	-		2437	2385		3209		
C.D.(p=0.05)	-	-	-	-	-	-		7189	7037		1080		

Lot of variation in cost of cultivation over the locations?

Table K-20-AST-1C (f): Effect of different PGRs on economic parameters of fodder maize

Treatments	Net return(Rs./ha)							B:C						
	Urulikan-chan	Pusa	Rai-pur	Hisar	Ran-chi	Sri-nagar	Mean	Urulikan-chan	Pusa	Rai-pur	His-ar	Ran-chi	Sri-nagar	Mean
T1-Triacontanol at 10 ppm	61316	31879	42559	23044	51837	66235	46145	2.22	1.91	1.97	1.47	2.65	2.55	2.13
T2-Triacontanol at 20 ppm	57458	25659	29837	22470	59570	61755	42792	2.03	1.63	1.44	1.41	2.88	1.96	1.89
T3-Mepiquat chloride at 200 ppm	71844	36559	48298	25468	55917	67255	50890	2.49	2.13	2.33	1.55	2.77	2.91	2.36
T4-Mepiquat chloride at 300 ppm	88994	42703	43737	24674	57583	66195	53981	2.75	2.27	2.11	1.52	2.81	2.71	2.36
T5-Salicylic acid at 100 ppm	79465	41629	50295	30166	57133	64845	53922	2.71	2.40	2.55	1.69	2.81	3.14	2.55
T6-Salicylic acid at 200 ppm	85313	38932	46531	37887	66467	65755	56814	2.83	2.30	2.40	1.87	3.09	3.17	2.61
T7-NAA at 20 ppm	76384	40645	53773	31074	52770	67521	53695	2.67	2.36	2.67	1.71	2.67	3.25	2.56
T8-Fenoxaprop at 4g a.i./ha	35951	35508	-4725	27878	50603	64055	34878	1.86	2.19	0.49	1.64	2.60	3.11	1.98
T9-GA3 at 200 ppm	67305	31555	49958	21601	51073	63231	47454	2.33	1.90	2.23	1.44	2.61	2.45	2.16
T10-GA3 at 400 ppm	71122	29631	46467	21002	52990	58867	46680	2.26	1.74	1.91	1.39	2.66	1.89	1.98
T11-Waterspray (control)	59284	31476	44282	24834	49093	58535	44584	2.31	2.06	2.33	1.57	2.57	2.86	2.28
SE(m) ±	3447	2437	2385		3209			0.07	0.08	0.08		0.10		
C.D.(p=0.05)	10242	7189	7037		1080			0.21	0.22	0.22		0.03		

Table K-20-AST-1C (g): Effect of different PGRs on forage yields of fodder oat

Treatments	GFY (q/ha)							DMY (q/ha)						
	Urulikan-chan	Pusa	Rai-pur	His-ar	Ran-chi	Sri-nagar	Mean	Urulikan-chan	Pusa	Rai-pur	His-ar	Ran-chi	Sri-nagar	Mean
T1-Triacontanol at 10 ppm	520.8	342.2	404.0	354.7	454.5	384.3	410.1	92.3	98.1	87.0	76.4	81.9	81.1	86.1
T2-Triacontanol at 20 ppm	486.9	324.4	351.0	360.3	487.8	407.6	403.0	81.3	93.1	78.1	77.8	86.8	82.4	83.3
T3-Mepiquat chloride at 200 ppm	527.4	343.9	382.0	339.4	475.1	371.6	406.6	88.8	106.7	90.3	74.5	84.2	75.2	86.6
T4-Mepiquat chloride at 300 ppm	576.0	356.7	357.0	365.8	467.9	364.3	414.6	87.2	98.8	85.2	83.0	84.0	73.7	85.3
T5-Salicylic acid at 100 ppm	480.0	397.8	345.0	382.4	463.2	330.0	399.7	80.7	111.0	77.9	88.5	83.4	66.7	84.7
T6-Salicylic acid at 200 ppm	537.2	370.0	406.0	400.8	451.6	360.6	421.0	92.8	103.9	94.3	94.7	82.6	71.9	90.0
T7-NAA at 20 ppm	535.1	348.3	428.0	361.9	433.5	357.0	410.6	92.7	104.4	95.0	79.0	79.3	71.8	87.0
T8-Fenoxaprop at 4g a.i./ha	252.9	342.2	294.0	338.1	422.9	347.0	332.8	45.1	101.1	60.6	75.9	77.4	71.8	72.0
T9-GA3 at 200 ppm	529.0	357.8	401.0	381.4	426.1	382.6	413.0	86.9	108.7	89.0	89.0	77.9	77.7	88.2
T10-GA3 at 400 ppm	496.3	335.8	408.0	396.4	436.7	397.6	411.8	89.0	101.8	89.0	93.2	79.9	81.3	89.0
T11-Waterspray (control)	439.1	317.8	363.0	328.1	413.3	302.6	360.7	70.1	92.8	80.5	75.3	75.6	62.5	76.1
SE(m) ±	31.2	9.1	12.2	7.8	3.4	8.9		5.21	3.1	3.3	2.5	0.96	2.02	
C.D.(p=0.05)	92.6	26.9	35.9	23.1	10.2	26.1		15.48	9.1	9.74	7.3	2.85	6	

Table K-20-AST-1C (h): Effect of different PGRs on crude protein content and yield of fodder oat

Treatments	CP (%)							CPY (q/ha)						
	Urulikan-chan	Pusa	Rai pur	His-ar	Ran-chi	Sri-nagar	Mean	Urulikan-chan	Pusa	Rai-pur	His-a r	Ran-chi	Sri-nagar	Mean
T1-Triacontanol at 10 ppm	7.95	9.86	9.70	9.39	9.94	8.60	9.24	7.3	9.7	8.4	7.2	8.1	7.0	8.0
T2-Triacontanol at 20 ppm	8.63	9.68	9.20	10.13	7.18	8.10	8.82	7.0	9.0	7.2	7.9	6.2	6.7	7.3
T3-Mepiquat chloride at 200 ppm	8.18	10.35	9.10	9.68	10.43	8.90	9.44	7.3	11.0	8.3	7.2	8.8	6.7	8.2
T4-Mepiquat chloride at 300 ppm	8.20	9.75	9.10	10.08	9.25	8.60	9.16	7.2	9.6	7.8	8.4	7.8	6.4	7.8
T5-Salicylic acid at 100 ppm	7.96	10.13	9.50	10.28	9.38	9.60	9.48	6.4	11.2	7.4	9.1	7.8	6.4	8.1
T6-Salicylic acid at 200 ppm	8.21	10.03	10.00	10.35	7.17	9.00	9.13	7.6	10.4	9.5	9.8	5.9	6.5	8.3
T7-NAA at 20 ppm	8.83	9.59	10.30	9.64	9.16	9.10	9.44	8.2	10.0	9.8	7.6	7.3	6.6	8.2
T8-Fenoxaprop at 4g a.i./ha	8.61	9.02	10.20	9.42	7.63	9.20	9.01	3.9	9.1	6.2	7.2	5.9	6.6	6.5
T9-GA3 at 200 ppm	8.09	8.78	10.10	10.21	9.72	8.90	9.30	7.0	9.8	9.0	9.1	7.6	6.9	8.2
T10-GA3 at 400 ppm	7.46	8.99	10.50	10.29	8.32	8.26	8.97	6.6	8.9	9.4	9.6	6.7	6.7	8.0
T11-Waterspray (control)	7.47	8.92	9.40	8.09	7.63	9.70	8.54	5.2	8.3	7.6	6.1	5.8	6.1	6.5
SE(m) ±	-	0.17	0.09	0.19	0.08	0.33		0.4	0.3	0.1	0.3	0.1	0.3	
C.D.(p=0.05)	-	0.50	0.27	0.57	0.23	1.00		1.27	0.9	0.27	0.82	0.27	NS	

Table K-20-AST-1C (i): Effect of different PGRs on Plant height and Leaf stem ratio of fodder oatat harvest

Treatments	Plant height (cm)							L:S ratio					
	Urulikanchan	Pusa	Raipur	Hisar	Ranchi	Srinagar	Mean	Urulikanchan	Pusa	Raipur	Hisar	Ranchi	Mean
T1-Triacontanol at 10 ppm	111.7	156.2	142.6	112.0	129.5	112.6	127.4	0.45	0.36	0.51	1.16	0.72	0.64
T2-Triacontanol at 20 ppm	111.8	150.9	129.4	115.6	135.7	118.6	127.0	0.44	0.39	0.54	1.21	0.70	0.66
T3-Mepiquat chloride at 200 ppm	112.9	150.8	134.3	109.9	129.1	109.6	124.4	0.41	0.40	0.53	1.15	0.61	0.62
T4-Mepiquat chloride at 300 ppm	108.8	153.0	135.1	118.2	128.4	108.3	125.3	0.49	0.40	0.45	1.21	0.61	0.63
T5-Salicylic acid at 100 ppm	104.3	159.9	129.6	124.3	136.2	101.0	125.9	0.54	0.38	0.53	1.22	0.69	0.67
T6-Salicylic acid at 200 ppm	106.9	158.9	141.7	128.9	132.3	107.3	129.3	0.42	0.38	0.60	1.24	0.70	0.67
T7-NAA at 20 ppm	108.8	150.1	144.9	118.3	126.8	105.6	125.7	0.37	0.39	0.59	1.18	0.70	0.65
T8-Fenoxaprop at 4g a.i./ha	112.7	151.2	120.1	114.0	124.7	104.0	121.1	0.37	0.39	0.48	1.17	0.61	0.60
T9-GA3 at 200 ppm	109.1	158.9	142.9	124.0	123.8	110.0	128.1	0.38	0.38	0.56	1.22	0.61	0.63
T10-GA3 at 400 ppm	106.0	155.9	141.9	126.0	125.6	114.3	128.3	0.39	0.32	0.57	1.23	0.69	0.64
T11-Waterspray (control)	103.1	149.6	138.1	100.3	113.2	99.3	117.3	0.43	0.37	0.54	1.05	0.70	0.62
SE(m) ±		2.5	3.9	1.8	1.6	4.2			0.02	0.04	0.01	0.04	
C.D.(p=0.05)		7.5	11.4	5.2	4.8	12.3			0.04	0.12	0.02	NS	

Table K-20-AST-1C (j): Effect of different PGRs on economic parameters of fodder oat

Treatments	Cost of cultivation (Rs./ha)						Gross return (Rs./ha)						
	Urulikan-chan	Pusa	Rai-pur	Hisar	Sri-nagar	Mean	Urulikan-chan	Pusa	Rai-pur	His-ar	Ran-chi	Sri-nagar	Mean
T1-Triacontanol at 10 ppm	59279	36267	30850	40753	25965	38623	114584	68444	80844	70944	90890	76860	83761
T2-Triacontanol at 20 ppm	64208	41767	36850	46377	31465	44133	107125	64889	70144	72056	97550	81520	82214
T3-Mepiquat chloride at 200 ppm	57574	33407	27250	37829	23105	35833	116022	68778	76386	67889	95016	74320	83069
T4-Mepiquat chloride at 300 ppm	61005	34727	28450	39179	24425	37557	126717	71333	71333	73167	93574	72860	84831
T5-Salicylic acid at 100 ppm	54287	30877	24948	35242	20575	33186	105597	79556	68955	76472	92642	66000	81537
T6-Salicylic acid at 200 ppm	54756	30987	25045	35355	20685	33366	118179	74000	81141	80167	90317	72120	85987
T7-NAA at 20 ppm	55440	31021	25136	35389	20719	33541	117730	69667	85600	72389	86704	72600	84115
T8-Fenoxaprop at 4g a.i./ha	41526	30888	24968	35252	20585	30644	55630	68444	58850	67611	84579	69400	67419
T9-GA3 at 200 ppm	59687	36091	30174	40574	25789	38463	116382	71556	80250	76278	85217	76520	84367
T10-GA3 at 400 ppm	63564	41415	35498	46017	31113	43521	109192	67156	81587	79278	87342	79520	84013
T11-Waterspray (control)	51668	30767	24850	35130	20465	32576	96610	63556	72522	65611	82667	60520	73581
SE(m) ±	-	-	-	-	-	-		1826	2433	-	687	-	
C.D.(p=0.05)	-	-	-	-	-	-		5386	7177	-	2040	-	

Table K-20-AST-1C (k): Effect of different PGRs on economic parameters of fodder oat

Treatments	Net return (Rs./ha)							B:C ratio						
	Urulikan-chan	Pusa	Rai-pur	His-ar	Ran-chi	Sri-nagar	Mean	Urulikan-chan	Pusa	Rai-pur	His-ar	Ran-chi	Sri-nagar	Mean
T1-Triacontanol at 10 ppm	55305	32177	49994	30191	61460	50895	46670	1.93	1.89	2.60	1.74	3.09	1.96	2.20
T2-Triacontanol at 20 ppm	42917	23121	33294	25678	67920	50055	40498	1.67	1.55	1.90	1.55	3.29	1.59	1.93
T3-Mepiquat chloride at 200 ppm	58448	35370	49136	30060	65466	51215	48283	2.02	2.06	2.80	1.79	3.22	2.21	2.35
T4-Mepiquat chloride at 300 ppm	65712	36606	42883	33988	63824	48435	48575	2.08	2.05	2.50	1.87	3.15	1.98	2.27
T5-Salicylic acid at 100 ppm	51310	48678	44008	41230	63042	45425	48949	1.94	2.58	2.80	2.17	3.13	2.2	2.47
T6-Salicylic acid at 200 ppm	63423	43013	56096	44812	60517	51435	53216	2.16	2.39	3.20	2.27	3.03	2.48	2.59
T7-NAA at 20 ppm	62289	38645	60464	36999	57154	51881	51239	2.12	2.25	3.40	2.05	2.93	2.5	2.54
T8-Fenoxaprop at 4g a.i./ha	14104	37557	33882	32359	54929	48815	36941	1.34	2.22	2.40	1.92	2.85	2.37	2.18
T9-GA3 at 200 ppm	56694	35464	50076	35704	55417	50731	47348	1.95	1.98	2.70	1.88	2.86	1.96	2.22
T10-GA3 at 400 ppm	45628	25740	46089	33260	57392	48407	42753	1.72	1.62	2.30	1.72	2.92	1.55	1.97
T11-Waterspray (control)	44942	32788	47672	30481	53367	40055	41551	1.86	2.07	2.90	1.87	2.82	1.95	2.25
SE(m) ±	6513	1826	2433	-	687	-		0.12	0.05	0.08	-	0.02	-	
C.D.(p=0.05)	19347	5386	7177	-	2040	-		0.36	0.16	0.23	-	0.07	-	

Table K-20-AST-1C (l): Effect of different PGRs on ADF, NDF and IVDMD of fodder maize and oat at Ranchi

Treatments	Maize			Oat		
	ADF (%)	NDF (%)	IVDMD (%)	ADF (%)	NDF (%)	IVDMD (%)
T1-Triacontanol at 10 ppm	43.63	59.60	54.11	41.6	56.8	56.1
T2-Triacontanol at 20 ppm	41.00	64.29	56.20	45.6	63.4	53.4
T3-Mepiquat chloride at 200 ppm	42.65	66.30	55.15	40	58.5	57.6
T4-Mepiquat chloride at 300 ppm	43.21	67.56	54.40	42.3	56.4	55.6
T5-Salicylic acid at 100 ppm	44.30	68.53	53.60	42.3	56.7	56.8
T6-Salicylic acid at 200 ppm	45.20	69.88	52.74	45.9	61.9	54.3
T7-NAA at 20 ppm	44.39	67.53	53.54	42.9	57.9	58.2
T8-Fenoxaprop at 4g a.i./ha	43.51	68.62	54.00	44.6	60.1	55.6
T9-GA3 at 200 ppm	44.28	69.86	53.23	41.9	58.2	56.8
T10-GA3 at 400 ppm	42.88	68.62	54.29	44.6	61.5	55.4
T11-Waterspray (control)	47.23	69.27	51.18	45.9	60.2	54.9
SE(m) ±	0.25	0.12	0.30	0.94	0.98	0.23
C.D.(p=0.05)	0.74	0.37	0.89	2.79	2.90	0.69

K-20-AST-6: Precision nitrogen management for enhancing fodder yield and nitrogen use efficiency in forages

Location (2): Mandya and Dharwad

[(Table Reference: K-20-AST-6 (a-c)]

Preamble

Fodder grasses are highly responsive to nitrogen application in terms of growth, quality and yield. Fertilizer nitrogen is a common input used by farmers in different agro-climatic conditions in India with varied use efficiency (30-50%). Nitrogen exhibits high synergistic effect in combination with water and other inputs. Application of inadequate dose of nitrogen results in yield reduction and application in excess leads to increased cost of cultivation and environmental pollution. Hence, the present study on precision management of nitrogen for efficient management and increasing NUE is proposed.

A field experiment was started during *Rabi* 2020 at Mandya and RRS, IGFRI Dharwad centres to assess the Precision Nitrogen Management for enhancing fodder yield and nitrogen use efficiency in forage maize. The experiment consisted of fourteen treatments and was laid out in Randomized complete block design with 3 Replication. The treatments *viz*.,**T_1** (No N), **T_2** 50 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 40), **T_3** 50 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 50), **T_4** 50 kg N/ha (40% N basal) + remaining based on LCC 4, **T_5** 50 kg N/ha (40% N basal) + remaining based on LCC 5, **T_6** 100 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 40), **T_7** 100 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 50), **T_8** 100 kg N/ha (40% N basal + remaining based on LCC 4), **T_9** 100 kg N/ha (40% N basal + remaining based on LCC 5), **T_{10}** 150 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 40), **T_{11}** 150 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 50), **T_{12}** 150 kg N/ha (40% N basal + remaining based on LCC 4), **T_{13}**150 kg N/ha (40% N basal+ remaining based on LCC 5), **T_{14}** As per local recommended package of practices (50% N as basal, remaining 50% at 30 days after sowing).

The results indicated that on the location mean basis the treatment **T_{11}** (150 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 50) recorded significantly higher green forage yield (461.0 q/ha), gross returns (98094 Rs/ha), Net returns (58157 Rs/ha) and B:C ratio (2.57) which is closely followed by **T_{13}** (150 kg N/ha (40% N basal+ remaining based on LCC 5), which recorded green forage yield (455.4 q/ha), gross returns (97046 Rs/ha), Net returns (56962 Rs/ha) and B:C ratio (2.51). The similar treatment (**T_{13}**) recorded higher dry matter yield (120 q/ha), Crude protein yield (8.53 q/ha) which is closely followed by **T_{11}**recorded dry matter yield of (119.1 q/ha), Crude protein yield (8.26 q/ha). The higher agronomic efficiency of nitrogen (258.5 kg GFY/kg Nitrogen) was observed with **T_5** 50 kg N/ha (40% N basal) + remaining based on LCC 5).Application of 150 kg N/ha based on SPAD meter critical value of 50 (**T_{11}**) or LCC 5 recorded to the tune of 7 to 8.34% improvement in GFY as compared to local recommended package of practices (**T_{14}**). Application of recommended nitrogen based on LCC5 or SPAD value of 50 recorded improvement in Green forage yield to the tune of 7 to 8.34 % over blanket recommended local package of practices

Among the locations Mandya recorded higher GFY (446.5 q/ha), DMY(112.5 q/ha), Net monetary returns(57788 Rs/ha) and B:C ratio (2.91) with **T_{11}**(150 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 50)which is closely followed by **T_{13}** 150 kg N/ha (40% N basal+ remaining based on LCC 5) which recorded GFY (435.6 q/ha), DMY(107.5q/ha), Net monetary returns(55334 Rs/ha) and B:C ratio (2.80).Numerically higher CPY(8.51 q/ha), CP content(7.89%) was observed with **T_{13}** followed by **T_{11}**which recorded CPY of 8.49q/ha and CP content of 7.62%. The higher agronomic efficiency of nitrogen (217.2 kg GFY/kg of Nitrogen) recorded with **T_9** 100 kg N/ha (40% N basal + remaining based on LCC 5).Application of recommended nitrogen based on LCC5 or SPAD value of 50 recorded improvement in Green forage yield to the tune of 7.6 to 10.3 % over blanket recommended local package of practices.

At Dharwad **T_{11}**(150 kg N/ha (40% N basal + remaining based on SPAD meter critical value of 50)) recorded higher GFY (475.6 q/ha) and B:C ratio (2.24) which is closely followed by **T_{13}** 150 kg N/ha (40% N basal+ remaining based on LCC 5) which recorded GFY of 475.2 q/ha and B:C ratio of 2.23.Whereas **T_{13}** recorded higher DMY (132.6 q/ha),CPY(8.55q/ha), Net monetary returns (106975). The higher agronomic efficiency of nitrogen (378 kg GFY/kg of Nitrogen) was recorded with **T_5** 50 kg N/ha (40% N basal) + remaining based on LCC 5. Application of recommended nitrogen based on LCC5 or SPAD value of 50 recorded improvements in Green forage yield to the tune of 6.5 % over blanket recommended local package of practices.

Recommendation:

The application of 150 kg N/ha i.e, 40% N as basal and remaining 60% nitrogen in two equal splits (30% each) at 30 and 60 DAS based on SPAD value of 50 recorded higher GFY (461 q/ha), DMY (119.1 q/ha), CPY (8.26 q/ha), net monetary returns(58157 Rs/ha) and B:C (2.57) which was closely followed by the application of 150 kg N/ha i.e, 40% N as basal and remaining 60% nitrogen in two equal splits (30% each) at 30 and 60 DAS based on LCC-5 which recorded GFY (455.4 q/ha), DMY (120 q/ha), CPY (8.53 q/ha), Net monetary returns(56962 Rs/ha) and B:C Ratio(2.51).

In the context of practical feasibility, applicability and availability of the Leaf Color Chart , the application of 150 kg N/ha i.e, 40% N as basal and remaining 60% Nitrogen in two equal splits (30% each) at 30 and 60 DAS based on the LCC-5 can be recommended for nitrogen management in fodder maize.

Table K-20-AST-6 (a): Growth and yield of fodder maize as influenced by Precision Nitrogen Management

Treatments	Plant Height (cm)			Leaf stem ratio			Green Forage Yield (q/ha)			Dry Matter Yield (q/ha)			Dry Matter Content (%)		
	Man-dya	Dhar-wad	Mean	Man-dya	Dhar--wad	Mean	Man-dya	Dhar-wad	Mean	Man-dya	Dhar-wad	Mean	Man-dya	Dhar-wad	Mean
T1	113.3	167.9	140.6	0.25	0.36	0.30	167.7	244.1	205.9	32.3	53.5	42.9	19.2	19.0	19.1
T2	140.1	239.0	189.5	0.35	0.43	0.39	221.2	389.9	305.5	48.5	96.8	72.6	22.0	23.0	22.5
T3	151.6	258.5	205.0	0.36	0.45	0.40	226.5	428.2	327.3	56.6	112.3	84.4	25.0	26.7	25.9
T4	147.6	239.6	193.6	0.38	0.42	0.40	221.7	408.4	315.1	46.4	103.8	75.1	21.0	24.9	22.9
T5	168.9	251.0	209.9	0.41	0.47	0.44	237.3	433.1	335.2	52.3	114.9	83.6	22.1	25.1	23.6
T6	197.9	235.7	216.8	0.48	0.40	0.44	356.9	361.2	359.0	85.0	81.8	83.4	23.7	24.2	23.9
T7	194.1	274.6	234.3	0.51	0.45	0.48	370.5	455.8	413.1	80.3	123.2	101.8	21.8	23.9	22.8
T8	198.4	239.5	218.9	0.49	0.43	0.46	373.0	417.5	395.2	87.7	105.7	96.7	23.5	24.9	24.2
T9	198.9	272.3	235.6	0.47	0.45	0.46	385.0	456.0	420.5	91.0	125.0	108.0	23.6	25.9	24.7
T10	224.2	241.6	232.9	0.54	0.41	0.48	428.8	383.2	406.0	105.6	85.6	95.6	24.6	24.8	24.7
T11	203.7	287.1	245.4	0.57	0.45	0.51	446.5	475.6	461.0	112.5	125.8	119.1	25.3	24.3	24.8
T12	227.0	266.6	246.8	0.53	0.44	0.48	426.6	440.0	433.3	97.2	113.2	105.2	22.9	27.0	25.0
T13	233.3	283.5	258.4	0.57	0.47	0.52	435.6	475.2	455.4	107.5	132.6	120.0	24.7	26.4	25.5
T14	220.7	268.3	244.5	0.54	0.44	0.49	404.8	446.1	425.5	101.0	119.7	110.3	25.0	27.1	26.0
SE(m) ±	9.5	8.2	13.5	0.02	0.02	0.04	13.7	15.6	39.3	4.7	3.4	11.9	0.9	1.4	0.7
C.D.(p=0.05)	27.7	24.7	41.6	0.06	0.06	NS	40.1	46.9	121.5	13.7	10.5	36.8	2.6	4.0	2.3

Table K-20-AST-6 (b): Quality parameters of fodder maize as influenced by Precision Nitrogen Management

Treatment	Crude protein content (%)			Crude protein yield (q/ha)			AEN (Kg GFY / Kg N)		
	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean
T1	5.70	5.63	5.67	1.84	2.83	2.34	-	-	-
T2	6.09	5.84	5.96	2.95	5.37	4.16	107.0	291.5	199.2
T3	6.50	6.42	6.46	3.66	6.78	5.22	117.5	368.1	242.8
T4	6.64	6.70	6.67	3.08	6.66	4.87	108.0	328.6	218.3
T5	5.79	6.72	6.25	2.97	7.49	5.23	139.1	378.0	258.5
T6	6.65	5.77	6.21	5.68	4.64	5.16	189.1	117.1	153.1
T7	6.70	6.75	6.72	5.39	7.84	6.62	202.8	211.7	207.2
T8	7.17	5.77	6.47	6.23	5.94	6.08	205.3	173.4	189.3
T9	6.09	6.83	6.46	5.48	8.19	6.83	217.2	211.9	214.5
T10	7.67	5.67	6.67	7.80	4.90	6.35	174.1	92.7	133.4
T11	7.62	6.82	7.22	8.49	8.03	8.26	185.9	154.3	170.1
T12	7.75	6.20	6.97	7.68	6.89	7.28	172.6	130.6	151.6
T13	7.89	6.83	7.36	8.51	8.55	8.53	178.6	154.1	166.3
T14	7.59	6.38	6.98	7.68	7.25	7.46	158.1	134.7	146.4
SE(m) ±	0.20	0.13	0.44	0.38	0.22	1.07	-	-	-
C.D.(p=0.05)	0.60	0.41	NS	1.11	0.67	NS	-	-	-

Table K-20-AST-6 (c): Economics of fodder maize as influenced by Precision Nitrogen Management

Treatments	Gross return (Rs./ha)			Net returns (Rs./ha)			B:C		
	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean	Mandya	Dharwad	Mean
T1	33542	55090	44316	7052	11374	9213	1.29	1.26	1.27
T2	44232	87953	66093	16455	40866	28660	1.63	1.87	1.75
T3	45290	96372	70831	17455	48696	33075	1.66	2.04	1.85
T4	44337	91761	68049	17245	44832	31038	1.67	1.98	1.82
T5	47451	97356	72403	19754	49683	34718	1.77	2.06	1.92
T6	71375	81305	76340	42518	34979	38748	2.54	1.76	2.15
T7	74091	102487	88289	44910	54459	49685	2.61	2.16	2.38
T8	74593	94005	84299	44889	46778	45833	2.57	2.01	2.29
T9	77005	102482	89744	47204	54441	50822	2.65	2.16	2.40
T10	85754	86186	85970	54442	39473	46957	2.81	1.86	2.33
T11	89297	106891	98094	57788	58527	58157	2.91	2.24	2.57
T12	85321	98699	92010	53845	51118	52481	2.78	2.10	2.44
T13	87117	106975	97046	55334	58590	56962	2.80	2.23	2.51
T14	80961	100283	90622	50513	52787	51650	2.71	2.11	2.41

(B): Location Specific Trials

K-20-AST-4b: Organic nutrient management for soil health and sustainability of round the year fodder production system

[Table Reference: Table K-20-AST-4b (a)-(d)]

Location (1): Palampur

Preamble

Forage-based cropping systems are high-input demanding and mainly grown under inorganic nutrition conditions. However, high cost of fertilizers and concern about soil exhaustion, environmental deterioration and nutritional imbalance arising from continuous use of inorganic fertilizers, necessitate the research on other sources of nutrition. Organic nutrient management can help in arresting the decline in productivity through correction of deficiency of secondary and micro nutrients and improving the physical and biological health of the soil as well. Recently, a concept of "Natural Farming" embedding farming *with* nature and *without* chemicals has been promoted. In this system, soil is supplemented with the inoculums like *Beejamrut* and *Jeevamrut*to accelerate the propagation of existing soil micro flora. The information on the comparative performance of organic and natural farming systems nutrient on the productivity of forage-based cropping system is not available; therefore, the present study was undertaken with the objectives to study the effect of organic systems of nutrition on forage yield quality, economics soil properties of forage based cropping systems.

A field experiment was started during Kharif, 2021 at Palampur centre in Sorghum- rye grass cropping system (with two rows of Setaria grass on both side of field boundaries) to see the effect of treatments on productivity, soil health and also to maintain round the year fodder supply . The treatments consisted of seven combinations of different organic nutrition approaches. These were T_1 - FYM @10 t/ha, T_2- Natural farming with mulch, T_3- Natural farming without mulch, T_4 - FYM @ 5 t/ha basal + natural farming (T_2), T_5- FYM @ 5 t/ha basal + natural farming (T_3), T_6- FYM @ 5 t/ha + foliar application of compost tea and T_7 – Control. Natural farming included *Beejamrit* (seed treatment with *beejamrit*); basal application of *Ghana jeevamrit* @500 kg/ha; mulching @10 t/ha; Foliar application of 10% *Jeevamrit*4 weeks after sowing and after each cut i.e. 10 days after cut in kharif and 15 days after cut in *rabi* crops. Foliar application of compost tea was done after 4 weeks of sowing and after each cut i.e. 10 days after cut in kharif and 15 days after cut in rabi crops. Treatments were imposed in both the crops. The treatments were replicated thrice in randomized block design.

In sorghum two cuts and in rye grass three cut were taken. Three cut of Setaria grass were also taken. Application of FYM @ 10 t/ha (T_1) resulted in significantly higher plant height (166.3 cm, 41.9 cm, respectively), green (499.4 q/ha, 420.3 q/ha, respectively) and dry fodder yield (132.4 q/ha, 92.5 q/ha, respectively) of both the crops consequently resulted in higher green fodder (919.7 q/ha) and dry fodder yield (224.9 q/ha) of system. Application of FYM @10 t/ha increased total green fodder yield of system by 46.85%, 59.78%, 24.91%, 41%, 36.09% and 117.34% over Natural farming with mulch (T_2), Natural farming without mulch (T_3), FYM @ 5 t/ha basal+ - Natural farming with mulch (T_4), FYM @ 5 t/ha basal + Natural farming without mulch (T_5), FYM @ 5 t/ha + foliar application of compost tea (T_6) and Control (T_7), respectively. Similar trend was also observed in terms crude protein yield (21.38 q/ha), ADF yield (100.75 q/ha) and NDF yield (127.81 q/ha), net return (Rs. 181771/ha) and benefit cost ratio (2.30). All the treatments had shown improvement in soil properties over their initial values except control (T_7). Maximum improvement in soil available nitrogen (258 kg/ha), phosphorus (20.78 kg/ha), potassium (181 kg/ha), organic carbon (0.81%), microbial population i.e. bacteria (23.5 No.* 10^2) cfu/g), fungi (9.68 No. * 10^2) cfu/g) and actinomycetes (58 No. * 10^2) cfu/g) was observed with the application of FYM @ 10 t/ha (T_1).

Table K-20-AST-4b (a): Effect of organic nutrient management on growth and fodder production under sorghum-rye grass cropping system

Treatments	Emergence count m^{-2}		Mean Plant height(cm)		GFY(q/ha)			DMY(q/ha)		
	Sorghum	Rye grass	Sorghum	Rye grass	Sorghum+ Setaria grass	Rye grass	Total	Sorghum+ Setaria grass	Rye grass	Total
T_1	56.0	130.6	166.3	41.9	499.43	420.33	919.77	132.44	92.54	224.97
T_2	59.3	137.0	112.2	33.2	359.29	267.04	626.33	89.82	58.71	148.53
T_3	62.3	126.0	102.5	31.1	335.69	239.94	575.63	87.41	52.37	139.78
T_4	63.6	132.0	133.8	37.8	395.95	340.35	736.30	99.75	75.35	175.10
T_5	59.0	127.3	119.3	34.5	375.91	276.37	652.28	98.76	59.73	158.49
T_6	58.6	123.3	122.5	36.9	370.13	305.70	675.83	98.08	66.77	164.85
T_7	57.3	123.3	166.3	24.8	288.11	135.07	423.18	77.10	30.90	107.99
SE(m) ±	-	2.2	2.1	0.6	4.694	4.03	5.68	1.218	0.874	1.39
C.D.(p=0.05)	NS	6.701	6.8	2.0	14.625	12.55	17.72	3.794	2.721	4.34

Table K-20-AST-4b (b): Effect of organic nutrient management on quality parameters under sorghum-rye grass cropping system

Treatments	CP (%)		CPY(q/ha)			ADF yield (q/ha)			NDF yield (q/ha)		
	Sorghum+ Setaria grass	Rye grass	Sorghum+ Setaria grass	Rye grass	Total	Sorghum+ Setaria grass	Rye grass	Total	Sorghum+ Setaria grass m	Rye grass	Total
T_1	8.87	10.48	11.73	9.66	21.38	61.88	38.87	100.75	78.47	49.34	127.81
T_2	8.62	10.36	7.72	6.06	13.78	41.27	24.21	65.48	52.92	31.14	84.07
T_3	8.47	10.26	7.40	5.36	12.76	40.69	21.71	62.40	51.34	27.67	79.01
T_4	8.70	10.39	8.68	7.87	16.55	45.66	31.29	76.96	58.88	39.96	98.83
T_5	8.53	10.30	8.44	6.15	14.60	45.57	24.96	70.54	58.16	31.57	89.72
T_6	8.83	10.54	8.67	7.04	15.72	44.86	27.48	72.35	57.08	34.89	91.97
T_7	8.07	9.91	6.20	9.66	9.28	34.84	12.43	47.28	44.88	16.17	61.04
SE(m) ±	0.122	0.068	0.171	0.097	0.22	0.631	0.519	0.77	0.911	0.58	1.18
C.D.(p=0.05)	0.38	0.21	0.53	0.30	0.67	1.96	1.62	2.39	2.837	1.83	1.18

Table K-20-AST-4b (c): Effect of organic nutrient management on monetary returns under sorghum-rye grass cropping system

Treatments	Cost of cultivation (Rs./ha)			GMR (Rs./ha)			NMR (Rs./ha)			B: C ratio of the system
	Sorghum+ Setaria grass	Rye grass	Total	Sorghum+ Setaria grass	Rye grass	Total	Sorghum+ Setaria grass	Rye grass	Total	
T_1	68229	71920	140149	174801	147119	321920	106572	75199	181771	2.30
T_2	50744	54435	105179	125751	93466	219216	75007	39030	114037	2.08
T_3	46244	49935	96179	117493	83979	201472	71249	34044	105293	2.09
T_4	63854	67545	131399	138581	119126	257707	74727	51580	126308	1.96
T_5	59354	63045	122399	131567	96731	228299	72213	33686	105899	1.87
T_6	62319	66010	128329	129545	106996	236541	67227	40985	108212	1.84
T_7	42009	45700	87709	100837	47277	148114	58829	1577	60406	1.69
SE(m) ±	-	-	-	1642	1411	1991	1642	1411	1992	0.02
C.D.(p=0.05)	-	-	-	5116	4396	6201	5116	4397	6205	0.06

Table K-20-AST-4b (d): Effect of organic nutrient management on physicochemical and biological properties of soil after harvest of the crops under sorghum-oat cropping system

Treatments	Soil pH	Available nutrients (kg/ha)			OC (%)	Microbial population (No. * 10^2) cfu/g		
		N	P	K		Bacteria	Fungi	Actinomycetes
T_1	5.61	258	20.78	181	0.81	23.5	9.68	58
T_2	5.49	249	12.32	132	0.70	22.5	8.96	41
T_3	5.49	181	13.18	126	0.72	19.9	7.98	40
T_4	5.62	218	16.64	168	0.75	21.5	8.68	42
T_5	5.62	212	15.44	178	0.75	21.1	8.47	44
T_6	5.51	218	13.21	162	0.73	20.6	8.91	39
T_7	5.47	186	10.17	124	0.64	16.4	5.27	19
Initial	5.47	232	17.64	172	0.70	18.5	7.30	32

K-20-AST-4c: studies on the performance of organic nutrient management practices on soil health and sustainability of round the year fodder production of sorghum-Oat cropping system

[Table Reference: K-20-AST-4c (a)-(d)]

Location (1): Ayodhya

Preamble

Forage-based cropping systems are high-input demanding and mainly grown under inorganic nutrition conditions. However, high cost of fertilizers and concern about soil exhaustion, environmental deterioration and nutritional imbalance arising from continuous use of inorganic fertilizers, necessitate the research on other sources of nutrition. Organic nutrient management can help in arresting the decline in productivity through correction of deficiency of secondary and micro nutrients and improving the physical and biological health of the soil as well. Recently, a concept of "Natural Farming" embedding farming *with* nature and *without* chemicals has been promoted. In this system, soil is supplemented with the inoculums like *beejamrut* and *Jeevamrut*to accelerate the propagation of existing soil micro flora. The information on the comparative performance of organic and natural farming systems nutrient on the productivity of forage-based cropping system is not available; therefore, the present study was carried out at GPB Farm ANDUAT Ayodhya with the following objectives and treatments

The treatments consisted of seven combinations of different organic nutrition approaches. These were T_1 - FYM @10 t/ha, T_2- Natural farming with mulch, T_3- Natural farming without mulch, T_4 - FYM @ 5 t/ha basal + natural farming (T_2), T_5- FYM @ 5 t/ha basal + natural farming (T_3), T_6- FYM @ 5 t/ha + foliar application of compost tea and T_7 – Control. Natural farming included *Beejamrit* (seed treatment with *beejamrit*); basal application of *Ghana jeevamrit* @500 kg/ha; mulching @10 t/ha; Foliar application of 10% *Jeevamrit*4 weeks after sowing and after each cut i.e. 10 days after cut in Kharif and 15 days after cut in rabi crops. Foliar application of compost tea was done after 4 weeks of sowing and after each cut i.e. 10 days after cut in Kharif and 15 days after cut in Rabi crops. All the treatments were imposed in both the crops. The treatments were replicated thrice in randomized block design.

The data of Kharif (Sorghum) and Rabi (oat) revealed that the significantly higher GFY (472.5 q/ha) was recorded with FYM 10 t/ha which was at par with FYM 5 t/ha basal + natural farming with mulch and FYM 5 t/ha + natural farming without mulch while significantly higher than rest of treatments. Maximum DMY (113.03q/ha), CPY (8.96q/ha), NR (Rs 32840) and B:C (1.89) recorded with FYM 5 t/ha basal + natural farming with mulch. CP %, ADF % and NDF % did not influenced significantly. However, Maximum recorded with FYM 10t/ha. Maximum available N, P K, soil organic carbon content and minimum pH after harvest recorded with FYM 5 t/ha basal + natural farming with mulch while maximum microbial population recorded with FYM 10 t/ha closely followed by FYM 5t/ha basal + natural farming with mulch.

Table K-20-AST-4c (a): Effect of nutrient management on growth and biomass yield of sorghum-oat cropping system

Treatments	Emergence (m^{-1})		Plant height (cm)			GFY (q/ha)			DMY (q/ha)		
	Sorghum	Oat	Sorghum	Oat		Sorghum	Oat	Total	Sorghum	Oat	Total
				55DAS	Harvest						
T1	30	37	149	57	108	247	225.50	472.50	65.27	47.2	112.47
T2	28	35	141	52	106	231	213.00	444.00	65.40	46.5	111.90
T3	31	34	135	56	104	204	187.50	391.50	52.17	38.2	90.37
T4	28	38	145	58	109	247	217.60	464.60	65.73	47.3	113.03
T5	32	37	139	50	104	228	209.40	437.40	61.17	42.9	104.07
T6	30	35	138	48	104	215	200.50	415.50	55.27	41.2	96.47
T7	29	34	127	47	92	187	155.90	342.90	46.53	31.50	78.03
SE(m) ±	1.4	1.17	3.13	1.77	3.41	5.76	6.15	13.99	2.73	1.40	3.34
C.D.(p=0.05)	NS	NS	9.75	5.51	NS	17.95	18.83	43.60	8.51	4.35	10.42
C.V. (%)	8.15	5.69	3.90	5.83	5.69	4.48	5.29	5.72	8.04	5.75	5.74

TableK-20-AST-4c (b): Effect of organic nutrient management on quality parameters

Treatments	CP (%)		CPY (q/ha)			ADF (%)		NDF (%)	
	Sorghum	Oat	Sorghum	Oat	Total	Sorghum	Oat	Sorghum	Oat
T1	8.37	7.30	5.46	3.45	8.91	38.82	44.00	63.00	69.00
T2	7.60	7.00	4.72	3.25	7.97	38.10	41.90	61.33	68.10
T3	7.77	7.00	4.05	2.67	6.72	37.20	39.80	61.00	65.80
T4	8.47	7.30	5.51	3.45	8.96	38.50	43.20	62.67	69.10
T5	7.93	7.00	4.85	3.00	7.85	37.90	41.60	61.67	67.50
T6	7.83	6.90	4.33	2.84	7.17	37.45	41.00	61.00	66.50
T7	7.40	6.80	3.49	2.14	5.63	36.80	39.10	60.00	64.50
SE(m) ±	0.51	0.33	0.28	0.10	0.26	1.85	1.36	1.85	2.20
C.D.(p=0.05)	NS	NS	0.87	0.31	0.80	NS	NS	NS	NS
C.V. (%)	11.13	5.68	10.47	5.83	5.85	8.48	5.68	5.20	5.66

Table K-20-AST-4c (c): Effect of organic nutrient management on monetary returns

Treatments	Cost of cultivation (Rs.)			GMR (Rs.)			NMR (Rs.)			B: C
	Sorghum	Oat	Total	Sorghum	Oat	Total	Sorghum	Oat	Total	
T1	19100	25500	44600	37050	33825	70875	17950	8325	26275	1.59
T2	15650	22225	37875	34650	31950	66600	19000	9725	28725	1.76
T3	12950	20400	33350	30600	28125	58725	17650	7725	25375	1.76
T4	15650	21200	36850	37050	32640	69690	21400	11440	32840	1.89
T5	16100	20575	36675	34200	31410	65610	18100	10835	28935	1.79
T6	16150	20750	36900	32235	30075	62310	16085	9325	25410	1.69
T7	10950	19750	30700	28050	23385	51435	17100	3635	20735	1.68

Table K-20-AST-4c (d): Effect of organic nutrient management on physicochemical and biological properties of soil after harvest of crop under sorghum-Oat cropping system

Physical and Biological property of soil after harvest						Microbial population (cfu/100gm)	
Treatments	**PH**	**N**	**P**	**K**	**OC %**	**Bacteria**	**Fungi**
T1	8.6	129.5	17.8	270	0.27	22.8	11.2
T2	8.7	129.2	17.2	269	0.26	22.9	10.9
T3	8.8	125.5	16.9	269	0.26	20.4	10.2
T4	8.6	131.2	17.9	270	0.28	21.9	11.2
T5	8.7	129.3	17.3	268	0.26	20.8	10.2
T6	8.7	125.8	16.8	265	0.27	20.2	9.9
T7	8.9	116.5	15.6	242	0.24	18.5	9.5
Initial	**8.9**	**116.5**	**15.6**	**242**	**0.24**	**18.5**	**9.5**

K-20-AST-4d: Optimizing production technology for sustainable organic fodder production and soil health

[Table Reference: K-20-AST-4d (a)-(d)]

Location (1): Pantnagar

The field trial was initiated in Kharif season 2021 at G B pant University of Agriculture & Technology, Pantnagar. The objective was to find out the effect of different components of organic cultivation on forage yield and quality and assess the economic feasibility and sustainability of different organic farming systems. The treatments included four Organic production systems- OP_1 - Organic farming: Vermicompost @ 5 t/ha, OP_2 - Zero budget natural farming: '*Bijamruta'* (seed treatment) '*Jivamruta'* (soil treatment) and foliar spray (3%), OP_3 - PanchgavyaKrishi: Bio enhencer i.e.*'Panchgavya'*@ 3% foliar spray and OP_4 - Rishi krishi: '*Amritpani'* and 'virgin soil' (3%). The treatments were imposed on three cropping sequences; C_1 - Sorghum – Berseem - Maize+ Cowpea, C_2 - B N hybrid + (Cowpea - Berseem –Ricebean) and C_3 - Maize (sweet corn) – Berseem + Mustard – Maize (sweet corn). The plot size was 4.2 x 5.0 m . The treatments were replicated thrice in RBD. The soil was loam with initial soil pH 7.16, EC 0.190 dS/m, organic carbon 0.47% and available nitrogen, phosphorus and potassium, 282.5, 28.2 and 235kg/ha, respectively. The initial bacterial population was 2.01 cfu x 10^4, fungi 2.56 cfu x 10^2 and actinomycetes 041 cfu x 10^4. The results indicated that the organic fodder production systems influenced plant height, no. of shoots/m row length and L:S ratio plant height of fodder crops. The plant height of kharif crops was affected significantly with the highest value at application of Vermicompost followed by rishi krishi system. The plant height of rabi and summer crops were not affected significantly by organic production system, however the higher values were found under rishi krishi followed by Vermicompost application. The number of shoots/m row length was statistically at par among organic production systems, however the highest value was found in rishi krishi in *kharif* season and in both *rab*i and *summer* seasons in ZBNF. The L:S ratio of *kharif*, *rabi* and *summer* crops was affected significantly and the highest values were observed under vermicompost application that was at par with *rishi krishi*. The lowest values of plant height, no of shoots and L:S ratio were recorded under *panchgavya* systems.

The green and fodder yield of Kharif, rabi and summer crops were affected significantly by organic production systems (Table.2). Significantly highest green fodder yield was recorded under Vermicompost application followed by rishi krishi systems. The trend of green fodder yield in *rab*i and *summer* was same but the green fodder yield system was statistically at par in both Vermicompost and rishi krishi system. The panchgavya system had the lowest values in all three seasons. The higher green fodder yield was contributed by taller plants and more number of shoots/m row length. The dry fodder yield was recorded significantly higher under vermicompost system that was significantly similar with rishi krishi system but in *rabi* and *summ*er season, the rishi krishi system gave little higher than Vermicompost system, being both were non-significant to each other. The ZBNF gave higher green and dry fodder yield than panchgavya system**.**

The gross return, net return and B:C ratio were affected significantly by organic production systems. The highest gross return was found under vermicompost application that had significantly highest value than other organic production systems *in kharif* season but the vermicompost and rishi krishi systems had significantly similar gross return during *rabi* and *summer* seasons.

The net return was also recorded significantly highest in vermicompost system in *khari*f season but rishi krishi gave significantly higher net return that was statistically at par with Vermicompost system. The B:C ratio was observed significantly highest in vermicompost and ZBNF system in *kharif* and *rabi* season, respectively but in summer it was significantly and numerically similar in ZBNF and rishi krishi systems. The higher values of gross and net returns were due to higher green fodder yield. The higher B:C values was attributed to comparatively higher green fodder yield and lower cost of cultivation**.**

The growth attributes i.e. plant height, number of plants or shoots/m row length differed with crops and seasons (Table.1). In kharif season, the plant height of sorghum in C_1 cropping system was measured significantly highest followed by maize (sweet corn). In rabi and *summer* season, the highest plant height was recorded again in C_1 that had significantly equal values than C_3 cropping systems. The number of shoots/plants/m row were recorded significantly highest in C_2, C_1 and C_2 cropping systems in *Kharif, Rabi*and *Summer*seasons, respectively. The L:S ratio was recorded highest in C2 cropping systems in all three seasons but it was significantly differed in *Khari*f and *Rab*i seasons only. The variations in growth attributes were attributed to different crops in different seasons in three different cropping systems.

The green and dry fodder yield differed significantly in all three seasons among cropping systems. Significantly highest green fodder yield in C2, C3 and C2 cropping system in *Khari*f, *Rabi*and *summer* seasons, respectively. The higher green fodder yield was attributed to intercrops that were grown in C2 and C3 cropping systems. In Kharif season the intercropping of BN hybrid +cowpea in C1, in Rabi season, berseem+forage mustard in C2 and BN hybrid+ricebean in summer season again in C2 cropping systems contributed to total green fodder yield. The dry fodder yield was recorded significantly highest in c2 cropping system in all three season mainly due to higher dry matter content in BN hybrid of the system.

The gross and net returns as well as B:C ratio differed significantly among seasons and cropping systems. (Table.3). The gross and net returns were found significantly highest in C2, C3 and C2 during *Kharif, Rabi*and *summe*r season, respectively mainly contributed by higher green fodder yield and lower cost of cultivation, respectively. The B:C ratio also followed the similar trend as the highest values were observed in C2, C3 and C2

The green and dry fodder yield was recorded highest under application of Vermicompost @ 6t/ha followed by *rishi krishi* and ZBNF and the lowest in Panchgavyakrishi. The gross return was also recorded highest under Vermicompost application followed by *rishi krishi* mainly because of higher green fodder yield. The net return was found higher under *rishi krishi*followed by vermicompost application and ZBNF. The B:C ratio was observed highest under ZBNF followed by *rishi krishi* because of lower cost of cultivation.

Among the cropping systems, the C2- BN Hybrid +Cowpea/Berseem/Ricebean had the highest green and dry fodder yield mainly contributed by BN hybrid. The gross return, net return as well as B:C ratio followed by C3- Maize (sweet corn) -B+Mustard -Maize (sweet corn) . The higher green and dry fodder yield was attributed to BN hybrid and maize (sweet corn, respectively. The gross and net return as well as B:C ratio was also found highest under C2- BN Hybrid +Cowpea/Berseem/Ricebean cropping systems mainly because of higher green fodder yield of the system.

K-20-AST-4d (a): Effect of organic production systems and cropping systems on growth attributes of fodder crops

Treatment	Plant height (cm) *			No. of shoots/plant/m row*			L S Ratio (Main crop)*		
	Kharif	Rabi	Summer	Kharif	Rabi	Summer	Kharif	Rabi	Summer
OP1-organic farming vermicompost	199.0	53.8	172.5	25.48	53.5	22.3	0.45	0.89	0.35
OP2- Zero budget natural farming	180.75	55.5	171.5	23.76	54.0	23.2	0.41	0.87	0.34
OP3- PanchGavya	169.8	53.5	168.8	21.76	50.8	22.3	0.48	0.87	0.32
Op4- Rishi Krishi	193.5	55.1	179.8	25.68	49.2	21.8	0.44	0.87	0.34
SE(m) ±	3.7	0.8	2.5	0.87	1.3	0.6	0.01	0.003	0.01
C.D.(p=0.05)	13.0	NS	NS	NS	NS	NS	0.03	0.01	0.02
Cropping systems									
C1-Sorghum-Berseem- Maize + Cowpea	218.0	56.2	198.2	15.42	63.9	12.1	0.28	0.82	0.28
C2-BN Hybrid +Cowpea/Berseem/Ricebean	164.36	51.7	136.5	46.01	33.9	44.7	0.58	1.0	0.43
C3-M(sweet corn)-B+Mustard -Maize (sweet corn)	174.92	55.5	184.4	11.08	57.8	10.4	0.47	0.82	0.30
SE(m) ±	3.4	0.9	2.2	0.60	1.2	1.8	0.01	0.002	0.01
C.D.(p=0.05)	10.3	2.7	6.8	1.82	3.7	5.5	0.3	0.01	0.02

***Main crop of the rotation**

K-20-AST-4d (b): Effect of organic production systems and cropping systems on fodder yield

Treatment	Green fodder yield (q/ha)			Dry Fodder yield (q/ha)		
	Kharif	Rabi	Summer	Kharif	Rabi	Summer
OP1-organic farming Vermicompost	513.47	468.99	413.03	89.66	84.89	75.84
OP2- Zero budget natural farming	440.98	416.24	398.39	79.91	73.16	49.06
OP3- PanchGavya	347.13	396.06	341.43	64.61	70.85	35.73
Op4- Rishi Krishi	456.08	465.25	427.78	89.20	85.00	77.26
SE(m) ±	9.40	8.40	10.07	3.79	1.61	1.86
C.D.(p=0.05)	33.17	29.64	35.51	11.18	5.70	6.56
Cropping systems						
C1-Sorghum-Berseem- Maize + Cowpea	305.27	393.56	377.54	61.13	69.63	56.39
C2-BN Hybrid +Cowpea/Berseem/Ricebean	528.53	360.36	623.53	136.8	95.71	90.08
C3-M(sweet corn)-B+Mustard -Maize (sweet corn)	484.44	555.95	184.00	44.61	69.78	31.94
SE(m) ±	6.25	8.97	9.87	3.28	1.83	1.52
C.D.(p=0.05)	18.88	27.12	29.83	9.69	5.34	4.59

K-20-AST-4d (c): Effect of organic production systems and cropping systems on economics

Treatment	Gross return (Rs/ha)			Net return (Rs/ha)			B:C ratio		
	Kharif	Rabi	Summer	Kharif	Rabi	Summer	Kharif	Rabi	Summer
Organic systems									
OP1-organic farming Vermicompost	102,693	140,697	89,276	51,704	75,612	40,109	2.00	2.16	1.77
OP2- Zero budget natural farming	88,196	124,873	86,344	47,429	69,788	44,678	2.16	2.27	2.04
OP3- PanchGavya	69,426	118,818	74,953	28,326	62,233	31,953	1.66	2.10	1.68
Op4- Rishi Krishi	91,216	139,573	92,222	43,549	81,988	47,555	1.90	2.43	2.03
SE(m) ±	1,881	2521	2012	1,918	2521	2012	0.04	0.04	0.05
C.D.(p=0.05)	6,634	8894	7100	6,766	8894	7100	0.15	0.15	0.16
Cropping systems									
C1-Sorghum-Berseem- Maize + Cowpea	61,053	118,068	75,508	117,169	59,358	31,758	1.56	2.01	1.72
C2-BN Hybrid +Cowpea/Berseem/Ricebean	105,705	108,109	124,708	188,862	49,424	75458	2.32	1.85	2.54
C3-M(sweet corn)-B+Mustard-Maize (sweet corn)	96,722	166,795	56,880	171,537	108,435	15,505	1.91	2.86	1.38
SE(m) ±	1,249	2690	1973	1,257	2690	1973	0.03	0.05	0.05
C.D.(p=0.05)	3,776	8135	5966	3,800	8135	5966	0.09	0.14	0.14

Note: Sale rate of green fodder= Rs. 200- per quintal.

K-20-AST-4d (d): Effect of organic production systems and cropping systems on fodder yield and economics of fodder crops

Treatment	Green fodder yield (q/ha)	Dry fodder yield (q/ha)	Economics (Rs/ha)			Cost of cultivation (Rs/ha)
			Gross return	Net return	B:C ratio	
OP1-organic farming Vermicompost	1395.49	250.39	332,666	167,425	1.89	165,599
OP2- Zero budget natural farming (ZBNF)	1255.61	202.13	299,413	161,895	2.18	137,583
OP3- PanchGavyaKrishi	1084.62	171.19	263,197	122,512	1.85	142,075
Op4- Rishi Krishi	1349.11	251.46	323,011	173,092	2.14	150,260
SE(m) ±	-	-	-	-	-	-
C.D.(p=0.05)	-	-	-	-	-	-
Cropping systems	-	-	-			
C1-Sorghum-Berseem- Maize + Cowpea	1076.37	187.15	254,629	208,285	1.80	141,159
C2-BN Hybrid +Cowpea/Berseem/Ricebean	1512.42	322.59	338,522	313,744	2.21	153,498
C3-M(sweet corn)-B+Mustard -Maize (sweet corn)	1224.39	146.33	320,397	295,477	2.13	150,375
SE(m) ±	-	-	-	-	-	-
C.D.(p=0.05)	-	-	-	-	-	-

K-21-AST-1: Enrichment of BN hybrids and Maize silage quality by amalgamation with legume tree and fodder crops

[(Table Reference:K-21-AST-1 (a to e)]

Location (1): Hyderabad

The experiment was initiated in 2021 with the objective to study the effect of different legume fodder and trees on silage quality and to see the effect of cereal-legume mixture on silage quality and its stability. The treatments are T_1 –APBN 1 (Sole crop), T_2-APBN 1+Subabul (3:1), T_3-APBN 1+Sesbania (3:1), T_4-APBN 1+Moringa (3:1), T_5- APBN 1+ Cowpea(3:1), T_6- APBN 1+ Lucerne (3:1), T_7- APBN 1+ Hedge Lucerne(3;1), T_8-APBN 1+Subabul(5:1), T_9- APBN 1+Sesbania (5:1), T_{10}-APBN 1+Moringa (5:1), T_{11}- APBN 1+ Cowpea(5:1), T_{12}- APBN 1+ Lucerne (5:1), T_{13}- APBN 1+ Hedge Lucerne (5;1) T_{14}-Maize (Sole crop), T_{15}- Maize +Subabul (3:1), T_{16}- Maize +Sesbania (3:1), T_{17}- Maize +Moringa (3:1), T_{18}- Maize + Cowpea(3:1), T_{19}-Maize + Lucerne (3:1), T_{20}- Maize + Hedge Lucerne (3:1), T_{21}- Maize +Subabul (5:1), T_{22}- Maize +Sesbania (5:1), T_{23}- Maize +Moringa(5:1), T_{24}- Maize + Cowpea (5:1), T_{25}- Maize + Lucerne (5:1) and T_{26}- Maize + Hedge Lucerne (5:1). The trial was conducted in Randomized Block Design with three replications. The silage was prepared in polythene bags.

Silage made from APBN -1 has green colour while the silage from maize has brown colour. Addition of tree fodders and fodder legumes darken the colour of silage. Increased quantity of legume resulted in more the dark colour. Smell is acidic in nature. As the legume component increase the soft ness increased.

Silage prepared from fodder maize reported the lower pH levels when compared to APBN 1 silage. Sole APBN 1(T1) has shown pH of 4.26 while the highest 5.03 was reported in T10 (APBN-1+Moringa (5:1)).In case of maize Sole crop (T14) reported 3.97 and highest 4.94 was in T17 (Maize + Cowpea (3:1)). While the lowest always found in sole crop. Crude protein content was highly influenced by the legume component. Lowest was observed in sole crops T1 (ABPN1) 7.8% and in T14 (Sole Maize) 6.8%.while the highest was observed with the T7 (APBN-1+Hedge Lucerne (3:1)) 15.4% and T20 (Maize + Hedge Lucerne (3:1)) 14.5%.

The experiment was conducted to study the keeping quality after opening of the silage bags. In APBN1 treatments T_4 (APBN-1+Moringa (3:1)) and T_{13} (APBN-1+Hedge Lucerne (5:1)) were infected after 10 days. In case of fodder maize T15 (Maize + Subabul (3:1)), T_{17} (Maize + Moringa (3:1) and T_{23} (Maize +Moringa (5:1)) were damaged after 10days. Remaining treatments maintained their quality up to 20 days.

K-21-AST-1 (a): Influence of different legume crops and trees on physical properties of the silage prepared from APBN 1 and Fodder maize

APBN 1				FODDER MAIZE			
Treatment	**COLOUR**	**TEXTURE**	**ODOUR**	**Treatment**	**COLOUR**	**TEXTURE**	**ODOUR**
T1	Light Green	soft, leafy	Acidic	T14	Light brown	Soft, leafy	Pleasantly acidic, sour
T2	Medium to Dark Green	soft, smooth, sticky, leafy and fibrous	Mild acidic	T15	Medium to dark brown	Soft, smooth, sticky, leafy and fibrous	Mild acidic
T3	Medium to Dark Green	soft, smooth, sticky, leafy and fibrous	Mild acidic	T16	Medium to dark brown	Soft, smooth, sticky, leafy and fibrous	Mild acidic
T4	Medium to Dark Green	soft, smooth, sticky, leafy and fibrous	Mild acidic	T17	Medium to dark brown	Soft, smooth, sticky, leafy and fibrous	Mild acidic
T5	Medium to Dark Green	soft, smooth, leafy and fibrous	Mild acidic	T18	Medium to dark brown	Soft, smooth, leafy and fibrous	Mild acidic
T6	Medium to Dark Green	soft, smooth, leafy and fibrous	Mild acidic	T19	Medium to dark brown	Soft, Smooth, leafy and fibrous	Pleasantly acidic
T7	Medium to Dark Green	soft, smooth, leafy and fibrous	Pleasantly acidic	T20	Medium to dark brown	Soft, smooth, leafy and fibrous	Pleasantly acidic
T8	Light to medium green	soft, smooth, less sticky, leafy, and fibrous	Pleasantly acidic	T21	Light to medium brown	Soft, smooth, less sticky, leafy, and fibrous	Pleasantly acidic
T9	Light to medium green	soft, smooth, less sticky, leafy and fibrous	Pleasantly acidic	T22	Light to medium brown	Soft, smooth, less sticky, leafy, and fibrous	Pleasantly acidic
T10	Light to medium green	soft, smooth, less sticky, leafy and fibrous	Pleasantly acidic	T23	Light to medium brown	Soft, smooth, less sticky, leafy, and fibrous	Pleasantly acidic
T11	Light to medium green	Soft smooth, leafy and fibrous	Pleasantly acidic	T24	Light to medium brown	Soft, smooth, leafy and fibrous	Pleasantly acidic
T12	Light to medium green	soft, smooth, leafy and fibrous	Pleasantly acidic	T25	Light to medium brown	Soft, smooth, leafy and fibrous	Pleasantly acidic
T13	Light to medium green	soft, smooth, leafy and fibrous	Pleasantly acidic	T26	Light to medium brown	Soft, smooth, leafy and fibrous	Pleasantly acidic

K-21-AST-1 (b): Influence of different legume crops and trees on pH, Dry matter and Crude protein content of the silage prepared from APBN 1

Treatment	pH	Dry matter (%)	Crude protein (%)	ADF%	NDF%	Ash %
T1	4.26	30.8	7.8	39.6	61.8	9.5
T2	4.57	31.3	13.5	38.5	58.1	8.6
T3	4.51	29.1	11.5	39.2	57.6	8.9
T4	4.79	27.6	10.3	38.5	53.6	8.8
T5	4.34	29.6	14.5	36.2	57.6	9.3
T6	4.50	29.8	10.2	37.5	57.6	9.4
T7	4.95	30.9	15.4	39.0	58.4	9.5
T8	4.60	30.9	11.9	39.5	59.4	8.9
T9	4.25	28.7	10.9	39.5	59.3	9.0
T10	5.03	28.8	9.3	38.2	57.2	9.3
T11	4.56	29.9	11.2	37.5	59.6	9.5
T12	4.33	30.2	9.7	38.3	58.5	9.5
T13	4.96	31.2	13.5	39.0	60.0	9.4
SE(m) ±	0.136	0.921	0.312	0.64	1.10	0.19
C.D.(p=0.05)	0.399	NS	0.915	1.88	3.23	0.55

K-21-AST-1 (c): Influence of different legume crops and trees on pH, Dry matter and Crude protein content of the silage prepared from Fodder Maize

Treatment	pH	Dry matter (%)	Crude protein (%)	ADF%	NDF%	Ash %
T14	3.97	28.6	6.8	35.0	56.0	5.6
T15	4.48	29.2	12.5	35.2	47.5	5.7
T16	4.49	26.2	13.4	35.8	48.8	7.1
T17	4.94	26.1	9.7	35.0	51.3	6.0
T18	4.20	27.9	13.8	32.1	53.2	6.4
T19	3.98	28.0	9.2	36.0	57.5	6.5
T20	4.27	29.2	14.5	35.5	54.6	6.6
T21	4.77	28.9	10.5	35.0	52.5	5.8
T22	4.38	26.6	10.8	35.8	52.4	6.6
T23	4.85	25.9	9.2	34.6	53.2	5.9
T24	4.36	28.2	10.3	34.2	54.8	6.1
T25	4.37	28.4	8.9	35.6	58.2	6.4
T26	4.45	30.1	12.5	35.2	55.1	6.2
SE(m) ±	0.103	0.659	0.327	0.66	0.64	0.23
C.D.(p=0.05)	0.302	1.936	0.961	1.95	1.9	0.7

K-21-AST-1 (d): Influence of different legume crops and trees on keeping quality during the feed out phase of the silage prepared from APBN 1

Treatment	Observance of fungus growth during the feed out phase			pH values during the feed out phase		
	0 days	10 days	20days	0 days	10 days	20days
T1				4.27	4.52	4.68
T2				4.57	4.96	5.12
T3				4.51	4.82	5.01
T4			Fungus**	4.80	5.1	6.24
T5				4.34	4.98	4.86
T6				4.50	4.65	4.97
T7				4.95	5.1	5.24
T8				4.60	4.65	5.10
T9				4.26	4.6	5.64
T10				5.03	5.12	5.75
T11				4.56	4.75	5.25
T12				4.33	4.86	4.92
T13			Fungus*	4.96	4.95	5.42

K-21-AST-1 (e): Influence of different legume crops and trees on keeping quality during the feed out phase of the silage prepared from Maize

Treatment	Observance of fungus growth during the feed out phase			pH values during the feed out phase		
	0 days	**10 days**	**20days**	**0 days**	**10 days**	**20days**
T14				3.97	4.4	4.62
T15			fungus*	4.48	4.95	5.25
T16				4.49	4.78	5.12
T17		fungus*	Fungus*	4.95	5.2	6.5
T18				4.20	4.67	4.9
T19				3.98	4.58	4.86
T20				4.27	4.65	5.1
T21				4.78	4.65	5.1
T22				4.38	4.86	5.23
T23			fungus*	4.85	5	5.5
T24				4.36	4.5	4.9
T25				4.38	4.55	5.1
T26				4.45	4.6	5.3

K-21-AST-2: Evaluation of Hedge Lucerne for optimum seed rate and spacing for Seed Production

[Table Reference: K-21-AST-2 (a)-(c)]

Location (1): Hyderabad

The experiment was initiated during *Kharif* 2021 at Hyderabad to study the effect of spacing and seed rate on seed yield and its contributing traits in Hedge Lucerne (*Desmanthusvirgatus* L.,) *var*. Telangana Dasarath (THSL-1). The Treatments consisting of five row to row spacing i.e., 60 cm, 80 cm, 100 cm, 120 cm and Broad casting and 3 seed rates (3 Kg ha^{-1} , 6 Kg ha^{-1} and 9 Kg ha^{-1}). The experiment was laid out in factorial RBD Design with three replications. Total of four picking were taken up during the year for seed yield.

The results of first year experimentation revealed that the plant height was not influenced by spacing and seed rate. However, the significantly higher number of pods per plant were recorded at 100 cm spacing. Highest pods per plant was observed with a seed rate 3 kg ha^{-1}. As regards to seed yield, row spacing of 100 cm yielded highest seed yield (8.7q ha^{-1}) compared to other spacing and lowest was reported with 60cm (4.9 q ha^{-1}), while in case of seed rate, 3 Kg ha^{-1} found best but was on par with 9 kg ha^{-1}. The interactioneffect between spacing and seed rate indicated that the treatment 100 cm spacing along with 9 Kg ha^{-1} seed rate was superior over other treatments with a seed yield of (9.1 q ha^{-1}) and on par with 100cm spacing with 6 kg ha^{-1} seed rate. The treatment 6 Kg ha^{-1} + 100 cm and 6 Kg ha^{-1} + 120 cm recorded higher net monetary return as well as BC ratio.

Table: K-21-AST-2 (a): Growth and seed yield contributing parameters of Hedge Lucerne as influenced by seed rate and spacing

Treatments	Plant height (cm)	Pod length (cm)	Number of pods per plant	Number of seeds per pods	Seed Yield (q ha^{-1})	Stover Yield (q ha^{-1})
A) Spacing (5):						
60 cm	218.4	3.8	280.4	15.1	4.9	5.2
80 cm	206.7	3.9	380.5	18.8	5.9	6.1
100 cm	207.8	4.5	523.5	27.8	8.7	6.7
120 cm	205.1	4.3	348.1	19.5	6.0	6.8
Broad casting	210.1	4.0	414.9	27.1	5.9	7.0
SE(m) ±	5.3	0.13	16.6	0.74	0.15	0.16
C.D.(p=0.05)	NS	0.38	48.5	2.10	0.44	0.47
B) Seed rates (3):						
3 Kg ha^{-1}	207.4	3.8	418.3	20.3	6.3	6.0
6 Kg ha^{-1}	211.3	4.3	380.8	22.9	6.0	6.5
9 Kg ha^{-1}	210.2	4.1	369.4	21.7	6.6	6.5
SE(m) ±	4.1	0.10	12.9	0.60	0.11	0.12
C.D.(p=0.05)	NS	0.29	37.5	1.65	0.34	0.36
Interaction A x B						
SE(m) ±	9.2	0.22	28.8	1.30	0.26	0.28
C.D.(p=0.05)	NS	0.66	83.9	3.70	0.76	0.81

Table: K-21-AST-2 (b): Economics of Hedge Lucerne as influenced by seed rate and spacing

Treatments	Gross Returns (Rs.)	Net Returns (Rs.)	B:C ratio
T_1 : R_1S_1(3 Kg ha^{-1} + 60 cm)	264341	153641	2.4
T_2 : R_1S_2 (3 Kg ha^{-1} + 80 cm)	318021	208571	2.9
T_3 : R_1S_3 (3 Kg ha^{-1} + 100 cm)	368231	259531	3.4
T_4 : R_1S_4 (3 Kg ha^{-1} + 120 cm)	405203	297253	3.8
T_5 : Broadcasting @3 Kg ha-1	261400	155450	2.5
T_6 : R_2S_1(6 Kg ha^{-1} + 60 cm)	492464	359814	3.7
T_7 :R_2S_2 (6 Kg ha^{-1} + 80 cm)	532178	400778	4.1
T_8 : R_2S_3 (6 Kg ha^{-1} + 100 cm)	579831	449181	4.4
T_9 :R_2S_4 (6 Kg ha^{-1} + 120 cm)	589600	459700	4.5
$T1_0$: Broadcasting @6 Kg ha^{-1}	428963	301063	3.4
T_{11} : R_3S_1(9 Kg ha^{-1} + 60 cm)	338196	213596	2.7
T_{12} :R_3S_2 (9 Kg ha^{-1} + 80 cm)	407412	284062	3.3
T_{13} : R_3S_3 (9 Kg ha^{-1} + 100 cm)	419447	296847	3.4
T_{14} :R_3S_4 (9 Kg ha^{-1} + 120 cm)	445801	323951	3.7
T_{15} : Broadcasting @ 9 Kg ha^{-1}	299318	179468	2.5

Table K-21-AST-2 (c): Interaction effect of Seed yield and Stover yield

Treatments	Seed yield (q ha^{-1})				Stover yield (q ha^{-1})			
	Seed rate			Mean	Seed rate			
Spacing (5)	**3 Kg ha^{-1}**	**6 Kg ha^{-1}**	**9 Kg ha^{-1}**		**3 Kg ha^{-1}**	**6 Kg ha^{-1}**	**9 Kg ha^{-1}**	**Mean**
60 cm	4.1	4.9	5.7	4.9	5.3	5.0	5.2	5.2
80 cm	6.2	4.0	7.6	5.9	4.8	6.6	6.8	6.1
100 cm	8.2	8.9	9.1	8.7	6.6	6.8	6.7	6.7
120 cm	6.6	5.2	6.3	6.0	6.7	7.1	6.4	6.8
Broad casting	6.4	6.9	4.6	5.9	6.5	7.2	7.3	7.0
Mean	6.3	6.0	6.6		6.0	6.5	6.5	
Interactions	**Spacing**	**Seed rate**	**Interaction**		**Spacing**	**Seed rate**	**Interaction**	
SE(m) ±	0.15	0.12	0.26		0.16	0.12	0.28	
C.D.(p=0.05)	0.44	0.34	0.76		0.47	036	0.81	

K-21- AST-3: Intensive Fodder based cropping system for year round fodder supply
[Table Reference: K-21-AST-3 (a)-(b)]

Location (1): Hyderabad

A field experiment was carried out during *Kharif*, 2021 to study the effect of intensive fodder based cropping system for year round on fodder yield, quality and economics. The trial was executed with seven treatments *viz*., T_1:BN Hybrid (APBN-1) + Hedge Lucerne (4:2), T_2 : BN Hybrid (APBN-1) + *Sesbania grandiflora* sole (4:2), T_3: Super Napier + Hedge Lucerne (4:2), T_4: Supper Napier + *Sesbania grandiflora* (4:2), T_5: Sorghum (P) + Hedge Lucerne (4: 2), T_6: Sorghum (P) + *Sesbania grandiflora* (4:2), T_7: Sorghum (MC) + Cowpea (4:2) – Maize + Cow pea (4:2) – Bajra (MC) + Cow pea (4:2). The treatments were replicated thrice in Randomized Block Design. The results revealed that on location mean basis among the main crops, bajra napier Hybrids APBN-1 (T_1, T_2) and Super Napier (T_3, T_4)remained at par but significantly superior to other crops in terms of green fodder, dry fodder and crude protein yields. Among leguminous inter crops, fodder cowpea in annual based cropping system has shown significantly superiority in green fodder, dry fodder and crude protein yields. As regards to total productivity of the system, Bajra Napier hybrids inter cropped with Hedge Lucerne and *Sesbania grandiflora* (Agase) (T_1, T_2, T_3, T_4) in 4: 2 ratio have been found to be Superior and recorded on par green fodder and crude protein yields. The annual based cropping system (T_7) has shown on par green fodder yield with the treatments T_2 andT_4. However, for dry fodder yield, the treatment T_1 - BN Hybrid (APBN - 1) + Hedge Lucerne (4: 2) recorded significant superiorly and has shown on par dry fodder yield with T_2 and T_3. In the first year of study, the annual based cropping system T_7: Sorghum (MC) + Cowpea (4: 2) – Maize+ Cowpea (4: 2) – Bajra (MC) + Cow pea (4: 2) has been found to be remunerative with highest B:C ratio of 3.91.

Table K-21- AST-3 (a): Fodder yield and quality in Intensive Fodder based cropping system

Treatments	GFY (q ha^{-1})			DFY (q ha^{-1})			CPY (q ha^{-1})		
	Main Crop	Inter Crop	Pooled	Main Crop	Inter Crop	Pooled	Main Crop	Inter Crop	Pooled
T_1 :BN Hybrid (APBN-1) + Hedge Lucerne (4: 2)	1548.5	83.7	1632.2	395.2	21.4	416.6	44.2	1.30	45.5
T_2 :BN Hybrid (APBN - 1) + Sesbania grandiflora (4:2)	1400.5	86.5	1487.0	330.3	20.4	350.7	39.9	1.39	41.3
T_3 :Supper Napier + Hedge Lucerne (4: 2)	1510.7	83.8	1594.6	368.1	20.5	388.6	45.6	1.24	46.8
T_4 :Supper Napier + Sesbania grandiflora(4: 2)	1374.1	66.8	1441.0	323.1	15.7	338.8	42.9	1.11	44.0
T_5 :Sorghum (P) + Hedge Lucerne (4: 2)	480.8	111.6	593.4	120.4	27.9	148.3	6.3	1.65	7.9
T_6 :Sorghum (P) + Sesbania grandiflora(4: 2)	470.8	75.8	546.6	109.2	17.6	126.8	6.0	1.29	7.2
T_7 :Sorghum (MC) + Cowpea (4: 2) – Maize + Cow pea (4: 2) – Bajra (MC) + Cow pea (4: 2)	1213.9	172.4	1386.3	282.7	40.2	322.8	15.0	2.19	17.2
SE(m) ±	67.1	3.2	68.1	17.4	1.1	18.0	2.2	0.1	2.2
C.D.(p=0.05)	209.1	10.0	212.3	54.3	3.35	56.1	6.9	0.2	6.9

Table K-21- AST-3 (b): Economics of the Intensive Fodder based cropping system

Treatments	Gross Returns (Rs)	Net Returns (Rs)	B:C ratio
T_1 :BN Hybrid (APBN - 1) + Hedge Lucerne (4: 2)	274143	209133	4.22
T_2 :BN Hybrid (APBN - 1) + Sesbania grandiflora (4:2)	253315	187805	3.87
T_3 :Supper Napier + Hedge Lucerne (4: 2)	268539	203529	4.13
T_4 :Supper Napier + Sesbania grandiflora(4: 2)	239547	174037	3.66
T_5 :Sorghum (P) + Hedge Lucerne (4: 2)	152171	94661	2.65
T_6 :Sorghum (P) + Sesbania grandiflora(4: 2)	132089	74579	2.30
T_7 :Sorghum (MC) + Cowpea (4: 2) – Maize + Cow pea (4: 2) – Bajra (MC) + Cow pea (4: 2)	328990	261980	4.91

(C): AVT-2 Trials

R-21-AST-3: Effect of P levels on forage yield of promising entries of Berseem (AVTB-2-MC) [Table Reference: R-21-AST-3 (a)-(m)]

Locations: (10)
HZ: Palampur, Srinagar
NWZ: Pantnagar, Hisar, Ludhiana
CZ: Jabalpur,Raipur
NEZ: Kalyani, Pusa

AVT trial on berseem was conducted in four zones of the country (Hill, North East, North West and Central Zone) to study the effect of phosphorus fertilizer on yield and quality of promising entries of berseem under multicut cut system. In the trial two entries (BM-14 & JB-07-15) along with one national check (Wardan -NC) and three zonal checks *viz.*, BB-2 (NWZ and CZ), BL-22 (HZ) and BB-3 ZC (NEZ), were evaluated at nine locations in the country. The trial failed at Srinagar centre. The three phosphorus levels (60, 80 and 100 kg /ha) were imposed on entries to see the response. The entire dose of phosphorus was applied in strip as basal near to crop. The experiment was conducted in split plot design with entries in main plot and replicated thrice.

In hill zone, entry JB-07-15proved significantly superior and recorded maximum GFY (291.5 q/ha) and DFY (60.19 q/ha). It recorded 12.6 and 16.9% higher green and dry matter yield over best check Wardan (NC). Entry JB-07-15 also recorded maximum crude protein yield (12.05 q/ha) followed by Wardan (NC).

In North West Zone, Wardan (NC) proved significantly superior and recorded maximum GFY and DFY. No entry could surpass the national check.

In Central zone, entry JB-07-15 proved significantly superior and recorded maximum GFY (634.4 q/ha) and DFY (93.12 q/ha). It recorded 13.4 and 11.5% higher green and dry matter yield over best check Wardan (NC). Entry JB-07-15 also recorded maximum crude protein yield (17.27 q/ha) followed by Wardan (NC).

In North East zone, entry JB-07-15 proved significantly superior and recorded maximum GFY (361.1 q/ha) and DFY (58.10 q/ha). It recorded 15.1 and 21.0 % higher green and dry matter yield over best check Wardan (NC). Entry JB-07-15 also recorded maximum crude protein yield (9.75 q/ha) followed by Wardan (NC).

On national mean across the zone basis, entry JB-07-15proved higher yielder and recorded 532.2 q green and 77.97 q dry matter per hectare, which was 2.9 and 3.5 % higher over national check in terms of green and dry matter, respectively. In terms of crude protein yields, all the entries were at par to national check.

The interaction effect of entries with phosphorus remained significant at some centre in terms of GFY, DMY and CP Yields.

As regards to response of entries to increasing level of phosphorus, all the entries responded significantly to increasing level. On overall mean, the significant response was noted up to 100 kg Phosphorus /ha, in terms of green and dry matter yields. Application of 100 kg Phosphorus per hectare produced 539.2 q green and 80.31q dry matter per hectare. The increase was to the tune of 6.6 and 4.5% over 80 kg Phosphorus /ha in GFY on overall mean basis.

The response equation, Agronomic Maxima, Agronomic Optima was worked for different zone and across the zones and given in table

Polynomial response equation for different zones and across the zone based on green forage yield of promising entries of Berseem (AVTB-2-MC)

Zones	Polynomial response equation	Y_{Maxima}	Y_{Optima}
HZ	$y = -0.0814x^2 + 15.757x - 470.4$	96.8	92.1
	$R^2 = 1$		
NWZ	$y = -0.046x^2 + 8.385x + 241.2$	78.3	73.3
	$R^2 = 1$		
CZ	$y = -0.0499x^2 + 9.2025x + 124.3$	111.3	95.5
	$R^2 = 1$		
National Mean	$y = -0.0405x^2 + 8.455x + 98.7$	104.4	95.0
	$R^2 = 1$		

R-21-AST-3 (a): Effect of phosphorus levels on green forage yield of promising entries of Berseem (AVTB-2-MC)

Entries	Green fodder yield (q/ha)											Overall Mean
	HZ	NWZ				CZ			NEZ			
	Palam-pur	Pant-nagar	His-ar	Ludh-iana	Mean	Jabal-pur	Rai-pur	Mean	Kal-yani	Pu-sa	Mean	
BM-14	222.3	493.4	638.0	880.5	670.6	718.2	478.9	598.5	234.3	444.1	339.2	513.7
JB-07-15	291.5	431.3	674.9	869.4	658.5	768.2	500.5	634.4	258.9	463.2	361.1	532.2
Wardan (NC)	258.9	447.7	739.1	943.9	710.2	669.6	449.4	559.5	239.2	388.2	313.7	517.0
BL-22 ZC (HZ)	218.1											
BB-2 ZC (NWZ &CZ)		356.6	565.8	824.4	582.3	685.7	422.8	554.2				
BB-3 ZC (NEZ)									210.8	373.6	292.2	
SE(m) ±	5.96	10.41	28.47	18.60		22.36	14.10		4.64	6.00		
C.D.(p=0.05)	21.01	36.73	100.44	64.30		54.23	49.75		11.13	20.80		
Phosphorus levels (kg /ha)												
60	182.1	405.0	568.9	810.3	594.7	669.2	437.4	553.3	211.6	396.8	304.2	460.2
80	269.4	429.9	680.8	901.8	670.8	732.7	453.4	593.1	235.8	423.1	329.5	515.9
100	291.6	461.8	714.3	926.5	700.9	729.3	497.9	613.6	260.0	431.9	346.0	539.2
SE(m) ±	2.57	4.70	6.59	8.60	6.63	7.23	8.27		5.82	3.20	4.51	5.87
C.D.(p=0.05)	7.76	14.20	19.93	25.80		21.54	25.01		13.96	9.70		
Interaction												
Factor(A) at same level of B												
SE(m) ±	7.29		30.44	17.20		18.75						
C.D.(p=0.05)	24.48	NS	NS	NS		46.89	NS			NS		

Table -R-21-AST-3 (b): Effect of phosphorus levels on dry matter yield of promising entries of Berseem (AVTB-2-MC)

Entries	Dry matter yield (q/ha)											Overall Mean
	HZ	NWZ				CZ			NEZ			
	Palam-pur	Pant-nagar	His-ar	Ludh-iana	Mean	Jabal-pur	Rai-pur	Mean	Kal-yani	Pu-sa	Mean	
BM-14	45.44	77.34	88.91	105.70	90.65	89.70	86.00	87.85	39.40	67.60	53.50	75.01
JB-07-15	60.19	67.93	94.70	98.50	87.04	94.98	91.26	93.12	48.20	68.00	58.10	77.97
Wardan (NC)	51.50	73.12	106.93	107.50	95.85	84.04	83.66	83.85	41.30	54.70	48.00	75.34
BL-22 ZC (HZ)	44.10											
BB-2 ZC (NWZ and CZ)		56.50	77.13	104.20	79.28	85.45	76.72	81.09				
BB-3 ZC (NEZ)									34.30	54.00	44.15	
SE(m) ±	1.88	1.80	4.39	2.20		2.36	2.51		0.68	1.30		
C.D.(p=0.05)	6.61	6.34	15.50	7.60		6.68	8.82		1.63	4.60		
Phosphorus levels (kg /ha)												
60	35.07	64.14	78.25	90.00	77.46	86.27	79.98	83.13	32.00	55.40	43.70	65.14
80	54.76	68.49	96.38	108.50	91.12	92.65	81.77	87.21	40.50	62.70	51.60	75.72
100	61.09	73.55	101.13	113.40	96.03	86.71	91.48	89.10	50.00	65.10	57.55	80.31
SE(m) ±	0.90	0.63	1.35	1.00	0.99	0.66	1.85	1.26	0.72	0.70	0.71	0.98
C.D.(p=0.05)	2.75	1.89	4.08	3.10		1.18	5.60		1.72	2.00		
Interaction												
Factor(A) at same level of B												
SE(m) ±			1.66	2.10		0.85						
C.D.(p=0.05)		S	4.91	6.20		2.24	NS			NS		

Table -R-21-AST-3 (c): Effect of phosphorus levels on crude protein yield of promising entries of Berseem (AVTB-2-MC)

Entries	Crude protein yield (q/ha)											Overall Mean
	HZ	NWZ				CZ			NEZ			
	Palam-pur	Pant-nagar	His-ar	Ludh-iana	Mean	Jabal-pur	Rai-pur	Mean	Kal-yani	Pusa	Mean	
BM-14	8.85	14.89	17.86	19.90	17.55	15.90	17.51	16.71	5.97	11.90	8.94	14.10
JB-07-15	12.05	12.69	19.76	19.10	17.18	16.72	17.82	17.27	7.60	11.90	9.75	14.71
Wardan (NC)	9.17	13.98	22.52	22.20	19.57	14.63	16.16	15.40	6.42	9.60	8.01	14.34
BL-22 ZC (HZ)	8.30											
BB-2 ZC (NWZ and CZ)		9.48	14.90	22.20	15.53	15.19	15.12	15.16				
BB-3 ZC (NEZ)									5.09	9.40	7.25	
SE(m) ±	0.39	0.34	0.89	0.41		0.23	0.55		0.35	0.40		
C.D.(p=0.05)	1.39	1.20	3.14	1.44		0.56	1.95		0.84	1.30		
Phosphorus levels (kg /ha)												
60	6.55	11.38	14.58	16.50	14.15	14.94	15.38	15.16	4.17	9.60	6.89	11.64
80	10.49	12.74	19.89	22.00	18.21	16.25	16.19	16.22	6.10	11.00	8.55	14.33
100	11.74	14.16	21.81	24.10	20.02	15.64	18.39	17.02	8.55	11.50	10.03	15.74
SE(m) ±	0.19	0.14	0.24	0.21	0.20	0.12	0.38	0.25	0.42	0.10	0.26	0.23
C.D.(p=0.05)	0.57	0.41	0.73	0.63		0.36	1.16		1.01	0.40		
Interaction												
SE(m) ±			0.97	0.42		0.28			1.77			
C.D.(p=0.05)		S	3.36	1.26		0.54	NS		5.23	NS		

Table -R-21-AST-3 (d): Effect of phosphorus levels on per day green forage yield of promising entries of Berseem (AVTB-2-MC)

Entries	Green forage yield (q/ha/day)					
	HZ	NWZ		CZ	NEZ	Mean
	Palampur	Pantnagar	Ludhiana	Raipur	Pusa	
BM-14	1.32	3.50	5.12	3.19	3.76	3.38
JB-07-15	1.73	3.06	5.05	3.34	3.93	3.42
Wardan (NC)	1.54	3.18	5.49	3.00	3.29	3.30
BL-22 ZC (HZ)	1.30					
BB-2 ZC (NWZ and CZ)		2.53	4.79	2.82		
BB-3 ZC (NEZ)					3.17	
SE(m) ±	0.04	0.07	0.11	0.09	0.05	
C.D.(p=0.05)	0.13	0.26	0.37	0.34	0.18	
Phosphorus levels (kg /ha)						
60	1.09	2.87	4.71	2.92	3.36	2.99
80	1.60	3.05	5.24	3.02	3.59	3.30
100	1.74	3.28	5.39	3.32	3.66	3.48
SE(m) ±	0.02	0.03	0.05	0.05	0.03	0.06
C.D.(p=0.05)	0.05	0.10	0.15	0.16	0.08	
Interaction						
Factor(A) at same level of B						
SE(m) ±			0.10			
C.D.(p=0.05)		NS	NS	NS	NS	

Table -R-21-AST-3 (e): Effect of phosphorus levels on per day dry matter yield of promising entries of Berseem (AVTB-2-MC)

Entries	Dry matter yield (q/ha/day)					
	HZ	NWZ		CZ	NEZ	Mean
	Palampur	Pantnagar	Ludhiana	Raipur	Pusa	
BM-14	0.27	0.55	0.61	0.57	0.57	0.51
JB-07-15	0.36	0.48	0.57	0.61	0.58	0.52
Wardan (NC)	0.31	0.52	0.62	0.56	0.46	0.49
BL-22 ZC (HZ)	0.26					
BB-2 ZC (NWZ and CZ)		0.40	0.61	0.51		
BB-3 ZC (NEZ)					0.46	
SE(m) ±	0.01	0.01	0.01	0.02	0.01	
C.D.(p=0.05)	0.04	0.45	0.04	0.06	0.04	
Phosphorus levels (kg /ha)						
60	0.27	0.45	0.52	0.53	0.47	0.45
80	0.36	0.49	0.63	0.55	0.53	0.51
100	0.26	0.52	0.66	0.61	0.55	0.52
SE(m) ±	0.01	0.01	0.01	0.01	0.01	0.01
C.D.(p=0.05)	0.02	0.01	0.02	0.04	0.02	
Interaction						
SE(m) ±	2.39		0.01			
C.D.(p=0.05)	7.97	S	0.04	NS	NS	

Table -R-21-AST-3 (f): Effect of phosphorus levels on Crude protein content of promising entries of Berseem (AVTB-2-MC)

Entries	Crude protein (%)							
	HZ	NWZ			CZ	NEZ		
	Palampur	Pantnagar	Hisar	Ludhiana	Raipur	Kalyani	Pusa	Mean
BM-14	19.46	19.21	20.02	18.70	20.34	14.90	17.51	18.59
JB-07-15	19.95	18.60	20.79	19.30	19.52	15.50	17.44	18.73
Wardan (NC)	17.74	19.10	21.05	20.50	19.30	15.20	17.47	18.62
BL-22 ZC (HZ)	18.79							
BB-2 ZC (NWZ and CZ)		16.77	19.20	21.20	19.68			
BB-3 ZC (NEZ)						14.50	17.48	
SE(m) ±	0.09	0.94	0.16		0.11	0.12	0.29	
C.D.(p=0.05)	0.33	0.33	0.56		0.41	0.28	NS	
Phosphorus levels (kg /ha)								
60	18.67	17.66	18.63	18.30	19.22	13.00	17.23	17.53
80	19.11	18.48	20.59	20.30	19.79	15.00	17.54	18.69
100	19.17	19.12	21.58	21.30	20.11	17.10	17.65	19.43
SE(m) ±	0.09	0.14	0.10		0.06	0.16	0.10	0.11
C.D.(p=0.05)	0.28	0.43	0.29		0.18	0.38	0.29	
Interaction								
SE(m) ±			0.23			2.11		
C.D.(p=0.05)		NS	0.74		NS	6.23	NS	

Table -R-21-AST-3 (g): Effect of phosphorus levels on Plant height of promising entries of Berseem (AVTB-2-MC)

Entries	Plant Height (cm)								
	HZ	NWZ			CZ		NEZ		Mean
	Palampur	Pantnagar	Hisar	Ludhiana	Jabalpur	Raipur	Kalyani	Pusa	
BM-14	44.68	52.56	57.96	48.80	59.16	57.90	53.80	50.10	53.12
JB-07-15	43.48	50.14	59.00	50.10	60.83	64.60	56.00	53.20	54.67
Wardan (NC)	45.44	54.80	62.38	53.60	49.88	59.50	56.20	48.60	53.80
BL-22 ZC (HZ)	43.60								
BB-2 ZC (NWZ and CZ)		47.77	55.27	45.10	55.19	53.10			
BB-3 ZC (NEZ)							54.00	46.70	
SE(m) ±	1.51	0.79	2.36	1.40	0.45		0.32	0.70	
C.D.(p=0.05)	NS	2.80	NS	5.00	1.18		0.76	2.20	
Phosphorus levels (kg /ha)									
60	40.66	49.62	54.31	41.60	53.38	57.10	55.80	47.20	49.96
80	45.17	51.53	59.81	51.30	59.05	59.00	54.30	50.50	53.83
100	47.08	52.81	61.83	55.40	56.37	60.30	54.90	51.30	55.00
SE(m) ±	1.37	0.55	0.71	1.10	0.15		0.12	0.60	0.66
C.D.(p=0.05)	4.41	1.65	2.16	3.30	0.45		0.28	1.80	
Interaction									
SE(m) ±			2.63	2.20	0.32				
C.D.(p=0.05)		NS	NS	NS	0.99			NS	

Table -R-21-AST-3 (h): Effect of phosphorus levels on leaf stem ratio of promising entries of Berseem (AVTB-2-MC)

Entries	Leaf stem ratio						
	HZ	**NWZ**		**CZ**	**NEZ**		**Mean**
	Palampur	**Pantnagar**	**Ludhiana**	**Raipur**	**Kalyani**	**Pusa**	
BM-14	0.72	0.82	0.92	0.42	1.06	0.75	0.78
JB-07-15	0.73	0.76	0.93	0.37	0.98	0.65	0.74
Wardan (NC)	0.71	0.75	0.94	0.34	1.11	0.68	0.76
BL-22 ZC (HZ)	0.71						
BB-2 ZC (NWZ and CZ)		0.75	1.03	0.37			
BB-3 ZC (NEZ)					1.04	0.79	
SE(m) ±	0.02	0.04	0.03		0.03	0.01	
C.D.(p=0.05)	NS	NS	0.10		0.07	0.04	
Phosphorus levels (kg /ha)							
60	0.63	0.78	0.88	0.36	1.03	0.69	0.73
80	0.70	0.75	0.92	0.38	1.04	0.73	0.75
100	0.83	0.79	1.06	0.39	1.07	0.74	0.81
SE(m) ±	0.01	0.03	0.03		0.04	0.01	0.02
C.D.(p=0.05)	0.03	NS	0.09		0.09	0.03	
Interaction							
SE(m) ±			0.06				
C.D.(p=0.05)		NS	NS			NS	

Table -R-21-AST-3 (i): Effect of phosphorus levels on growth parameters of promising entries of Berseem (AVTB-2-MC)

Entries	No. of Tillers per meter row length				
	Hisar	**Ludhiana**	**Palampur**	**Raipur**	**Mean**
BM-14	58.04	112.50	76.00	66.40	78.24
JB-07-15	59.60	125.30	69.11	69.07	80.77
Wardan (NC)	62.50	136.90	68.00	66.71	83.03
BL-22 ZC (HZ)			66.00		
BB-2 ZC (NWZ and CZ)	52.05	127.00		60.37	
SE(m) ±	0.89	3.90	0.95	2.19	
C.D.(p=0.05)	3.12	13.60	3.37	NS	
Phosphorus levels (kg /ha)					
60	50.83	117.80	57.92	65.00	72.89
80	60.07	127.50	70.08	65.63	80.82
100	63.24	131.00	81.33	66.28	85.46
SE(m) ±	0.87	1.30	1.34	1.06	1.14
C.D.(p=0.05)	2.62	3.90	4.05	NS	
Interaction					
SE(m) ±	1.67	2.60			
C.D.(p=0.05)	NS	NS		NS	

Table R 21- AST-3 (j): Interaction effect of entries and P levels on Green fodder and Dry matter yield at Pantnagar

Entries	Green fodder yield (q/ha)					Dry matter yield (q/ha)			
	P levels (kg/ha)					P levels (kg/ha)			
	60		80	100	Mean	60	80	100	Mean
BM-14	451.133		494.000	535.033	493.389	70.697	77.800	83.537	77.344
JB-07-15	394.833		425.433	473.600	431.289	61.093	66.750	75.943	67.929
Wardan (NC)	430.600		448.833	463.667	447.700	70.153	73.487	75.727	73.122
BB-2 ZC (NWZ)	343.400		351.467	375.000	356.622	54.597	55.903	58.993	56.498
Mean	404.992		429.933	461.825		64.135	68.485	73.550	
	Varieties	**P levels**	**V X P**				**Varieties**	**P levels**	**V X P**
SE(m) ±	10.411	4.696	12.931			SE(m) ±	1.797	0.626	2.068
C.D.(p=0.05)	36.728	14.200	N/A			C.D. P=0.05)	6.341	1.892	7.039

Table -R-21-AST-3 (k): Interaction Effect of phosphorus levels on green forage and dry matter yield (q/ha) of Berseem Palampur

Entries	GFY (q/ha)				DMY (q/ha)			
	P levels(kg/ha)				P levels(kg/ha)			
	60	80	100	Mean	60	80	100	Mean
BM-14	172.79	234.85	259.13	222.26	33.11	48.28	54.94	45.44
JB-07-15	194.84	325.85	353.77	291.49	37.78	66.97	75.80	60.19
Wardan (NC)	181.18	285.60	309.94	258.90	35.05	57.02	62.43	51.50
BL-22 ZC (HZ)	179.39	231.46	243.50	218.12	34.32	46.77	51.20	44.10
Mean	182.05	269.44	291.59		35.07	54.76	61.09	
	Varieties	**P levels**	**V X P**		**Varieties**	**P levels**	**V X P**	
SE(m) ±	5.96	2.57	7.29	SE(m) ±	1.88	0.90	2.39	
C.D.(p=0.05)	21.01	7.76	24.48	C.D.(P=0.05)	6.61	2.75	7.97	

Table R 21- AST-3(l): Interaction effect of entries and P levels on Green fodder and Dry matter yield at Ludhiana

Entries	Green fodder yield (q/ha)					Dry matter yield (q/ha)			
	P levels (kg/ha)					P levels (kg/ha)			
	60		80	100	Mean	60	80	100	Mean
BM-14	833.1		893.3	915.0	880.5	96.6	105.1	115.4	105.7
JB-07-15	791.7		886.1	930.6	869.4	84.9	102.8	107.9	98.5
Wardan (NC)	867.5		962.5	1001.7	943.9	92.9	112.4	117.2	107.5
BB-2 ZC (NWZ)	749.2		865.3	858.9	824.4	85.7	113.8	113.0	104.2
Mean	810.3		901.8	926.5		90.0	108.5	113.4	
	Varieties	**P levels**	**V X P**			**Varieties**	**P levels**	**V X P**	
SE(m) ±	18.6	8.6	17.2		SE(m) ±	2.2	1.0	2.1	
C.D.(p=0.05)	64.3	25.8	NS		C.D.(P=0.05)	7.6	3.1	6.2	

Table R 21- AST-3(m): Interaction effect of entries and P levels on green fodder and Dry matter yield at Jabalpur

Entries	Green fodder yield (q/ha)					Dry matter yield (q/ha)			
	P levels (kg/ha)					P levels (kg/ha)			
	60		80	100	Mean	60	80	100	Mean
BM-14	680.91		743.01	730.62	718.18	85.09	93.31	90.68	89.70
JB-07-15	721.02		789.66	794.01	768.23	94.27	98.96	91.70	94.98
Wardan (NC)	643.03		685.03	680.77	669.61	80.72	88.20	83.21	84.04
BB-2 ZC (CZ)	631.92		713.14	711.94	685.67	84.99	90.11	81.24	85.45
Mean	**669.22**		**732.71**	**729.33**		**86.27**	**92.65**	**86.71**	
	Varieties	**P levels**	**V X P**			**Varieties**	**P levels**	**V X P**	
SE(m) ±	22.36	7.23	18.75		SE(m) ±	2.36	0.66	0.85	
C.D.(p=0.05)	54.23	21.54	46.89		C.D.(P=0.05)	6.68	1.18	2.24	

R-21-AST-4: Effect of N levels on forage yield of promising entries of single cut oat (AVT-2 SC) [Table Reference: R-21-AST-4(a)-(s)]

Locations: (11)
HZ: Palampur, Srinagar
NWZ: Pantnagar, Ludhiana
NEZ: Imphal, Pusa
CZ: Urulikanchan, Raipur
SZ: Hyderabad, Mandya, Coimbatore

AVT trial on single cut oat was conducted at 11 locations in all five zones of the country (Hill, Central, North West, North East and South Zone) to study the effect of nitrogen nutrition on yield and quality of promising entries of single cut oat. In the trial, three (JO-07-28, HFO-904 and HFO-906) along with two national check (Kent andOS-6) and three zonal checks *viz.*, SKO-96 (HZ) RO-11-1(CZ) OS-403 (NWZ, NEZ, SZ), were evaluated. The three nitrogen levels (40, 80 and 120 kg /ha) were imposed on entries to see the response. The entire dose of nitrogen was applied as basal near to crop strip. The experiment was conducted in split plot design with entries in main plot and replicated thrice.

The data presented in following tables, indicates that in Hill Zone, no entry could surpass the checks in GFY, DMY or CP yields.

In North West zone all the entries out yielded the national checks but proved inferior to Zonal Check OS-403.

In North East and Central zone, entry JO-07-28 yielded maximum green fodder, dry matter yields (448.8 & 105.2 q/ha). In North East zone, JO-07-28 recorded 5.3& 6.9 % higher green fodder and dry matter yields, respectively, over best check OS-6. However, as regards to CPY, national check OS-6 proved better.

In South zone JO-07-28 (279.1 q green & 56.0 q dry matter/ha) and HFO-904 (275.8 q green & 54.8 q dry matter/ha) proved higher yielder, but both the entries remained on par with zonal check OS-403.

On national level across the zone the entryHFO-904 proved the best and recorded maximum green fodder (416.4 q/ha), dry matter (84.1 q/ha) and crude protein yields (6.54 q/ha). However, it remained on par with JO-07-28 in all the above parameters.

On overall mean basis, linear response to nitrogen application was noted up to 120 kg N/ha which produced (428.4 q green, 89.4 q dry matter and 7.17 q CP yield per hectare). All the growth parameters also showed improvement with increasing dose of nitrogen supplementation up to 120 kg/ha. The response equation, Agronomic Maxima, Agronomic Optima was worked for across the zones is given in table.

Polynomial response equation based on green forage yield of promising entries of single cut Oat

Zones	**Polynomial response equation**	**Y_{Maxima}**	**Y_{Optima}**
Overall Mean Basis	$y = -0.0309x^2 + 8.1775x - 108.3$	132.3	130.7
	$R^2 = 1$		

R-21-AST-4 (a): Effect of nitrogen levels on green forage yield of promising entries of single cut Oat (AVTO-2)

Entries	Green forage yield (q/ha)																
	HZ			NWZ			NEZ			CZ			SZ				Overall mean
	Palam-pur	Sri-nagar	Mean	Pant-nagar	Ludh-iana	Mean	Imp-hal	Pusa	Mean	Urulikan-chan	Rai-pur	Mean	Hydera-bad	Man-dya	Coimb-atore	Mean	
JO-07-28	221.9	330.2	276.0	520.0	661.6	590.8	501.2	396.4	448.8	642.4	402.0	522.2	246.4	251.0	292.5	279.1	410.3
HFO-904	218.3	322.7	218.3	598.8	675.9	637.4	473.5	359.4	416.5	641.5	369.0	505.2	246.8	254.5	340.0	275.8	416.4
HFO-906	233.4	307.5	270.5	604.9	695.4	650.1	423.1	363.9	393.5	619.4	331.0	475.2	227.1	233.1	355.0	238.2	390.3
Kent (NC)	203.5	309.1	256.3	468.2	601.9	535.0	465.6	357.8	411.7	459.6	349.0	404.3	192.6	191.3	310.8	225.5	353.7
OS-6 (NC)	221.5	341.7	281.6	456.3	630.6	543.5	533.6	318.5	426.0	471.2	337.0	404.1	272.0	274.4	326.1	285.7	378.9
OS-403 NWZ, NEZ, SZ)				586.3	789.8	688.1	445.3	327.6	386.5				230.3	236.2	254.5	273.8	
SKO-96 (HZ)	208.3	334.4	271.3														
RO-11-1 (CZ)										680.3	356.0	518.2					
SE(m) ±	4.23	4.33		14.79	24.10		4.91	10.20		14.35	5.37		9.66	8.18	1.73		
C.D.(p=0.05)	13.49	13.81		47.19	75.90		15.48	32.30		45.83	18.31		27.88	26.12	3.85		
Nitrogen levels (kg N/ha)																	
40	184.6	191.0	187.8	505.9	602.5	554.2	477.5	328.9	403.2	556.6	326.0	441.3	183.1	185.2	290.3	219.5	348.3
80	229.5	384.8	307.1	540.3	692.8	616.5	468.0	361.9	414.9	582.8	363.0	472.9	236.3	238.3	310.4	261.7	400.7
120	239.4	396.7	318.0	571.1	732.2	651.7	475.7	371.0	423.4	617.8	384.0	500.9	288.6	296.6	338.8	308.0	428.4
SE(m) ±	2.78	3.06		4.07	14.30		2.16	6.60		6.89	4.85		6.83	6.84	2.23		
C.D.(p=0.05)	8.16	8.98		11.96	40.90		6.30	19.20		20.24	15.20		19.71	20.10	4.59		
Interaction																	
M x S																	
SE(m) ±					35.00		6.54			20.03				14.17	4.76		
C.D.(p=0.05)		S		NS	NS		19.95	NS		61.09	NS		16.73	NS	9.96		

Table R-21-AST-4 (b): Effect of nitrogen levels on Dry matter yield of promising entries of single cut Oat (AVTO-2)

Entries	Dry matter yield (q/ha)																
	HZ			NWZ			NEZ			CZ			SZ				Overall mean
	Palam-pur	Sri-nagar	Mean	Pant-nagar	Ludh-iana	Mean	Imp-hal	Pusa	Mean	Urulikan-chan	Rai-pur	Mean	Hydera-bad	Man-dya	Coimb-atore	Mean	
JO-07-28	44.3	66.0	55.2	99.5	132.3	115.9	122.0	88.5	105.2	130.4	95.2	112.8	48.9	50.4	51.88	56.0	86.0
HFO-904	42.6	64.4	53.5	123.2	135.2	129.2	118.0	76.8	97.4	111.8	88.7	100.2	47.8	50.0	66.63	54.8	84.1
HFO-906	45.8	61.5	53.6	113.1	139.1	126.1	104.0	85.4	94.7	107.5	91.5	99.5	44.3	46.2	68.83	47.5	80.9
Kent (NC)	40.1	61.8	51.0	82.6	120.4	101.5	103.8	87.7	95.8	75.5	83.2	79.3	39.3	39.5	62.58	45.9	72.1
OS-6 (NC)	43.0	68.3	55.7	83.3	126.1	104.7	121.0	75.9	98.4	85.3	92.8	89.1	54.5	55.7	66.28	57.6	79.0
OS-403(NWZ, NEZ, SZ)				114.2	158.0	136.1	105.5	85.6	95.6				47.2	49.0	58.81	54.2	
SKO-96 (HZ)	39.0	66.9	53.0							138.7	77.4	108.0					
RO-11-1 (CZ)																	
SE(m) ±	0.8	0.9		3.1	4.8		4.6	2.7		2.8	2.8		2.0	1.6	0.22		
C.D.(p=0.05)	2.6	2.8		9.8	15.2		14.5	8.6		8.8	9.0		5.7	5.0	0.48		
Nitrogen levels (kg N/ha)																	
40	36.5	38.1	37.3	98.3	120.5	109.4	109.7	72.7	91.2	103.5	78.6	91.1	32.9	33.7	58.29	41.6	71.2
80	45.0	70.3	57.7	102.5	138.6	120.6	110.7	86.5	98.6	109.3	89.7	99.5	47.4	48.3	61.41	52.4	82.7
120	45.9	76.9	61.4	107.1	146.4	126.7	116.7	90.7	103.7	111.7	96.1	103.9	60.7	63.4	67.78	64.0	89.4
SE(m) ±	0.5	0.6		1.2	2.9		1.9	1.7		1.4	2.2		1.4	1.5	0.32		
C.D.(p=0.05)	1.6	1.8		3.6	8.2		5.4	5.0		4.0	6.4		4.1	4.4	0.65		
Interaction																	
M x S																	
SE(m) ±					7.0		5.9			3.90			3.4	2.7	0.67		
C.D.(p=0.05)		S			NS		18.1	NS		11.9	NS		NS	NS	1.39		

Table R-21-AST-4 (c): Effect of nitrogen levels on Crude protein yield of promising entries of single cut Oat (AVTO-2)

Entries	Crude protein yield (q/ha)																
	HZ			NWZ			NEZ			CZ			SZ				Overall mean
	Palampur	Srinagar	Mean	Pantnagar	Ludhiana	Mean	Imphal	Pusa	Mean	Urulikanchan	Raipur	Mean	Hyderabad	Mandya	Coimbatore	Mean	
JO-07-28	4.00	5.71	4.86	9.74	8.97	9.36	8.88	8.70	8.79	7.45	6.83	7.14	2.80	3.10	3.93	3.76	6.50
HFO-904	3.87	5.74	4.80	11.63	8.30	9.97	9.36	6.81	8.09	8.11	6.35	7.23	3.10	3.50	5.30	3.93	6.54
HFO-906	4.03	5.80	4.91	10.41	8.83	9.62	9.63	7.79	8.71	8.50	6.41	7.46	2.70	3.00	5.37	3.21	6.46
Kent (NC)	3.78	5.60	4.69	7.60	9.55	8.58	8.39	8.89	8.64	5.40	5.68	5.54	2.40	2.60	4.84	3.17	5.85
OS-6 (NC)	4.04	4.95	4.50	8.04	8.05	8.05	11.10	7.43	9.27	7.12	6.96	7.04	3.30	3.80	5.20	3.98	6.33
OS-403 (NWZ, NEZ, SZ)				10.81	10.33	10.57	8.58	8.03	8.31				3.00	3.30	4.51	3.87	
SKO-96 (HZ)	3.95	5.67	4.81														
RO-11-1 (CZ)										7.95	5.99	6.97					
SE(m) ±	0.09	0.13		0.26	0.34		0.34	0.31		0.17	0.25		0.16	0.12	0.23		
C.D.(p=0.05)	NS	0.43		0.83	1.09		1.08	0.97		0.56	0.81		0.45	0.38	0.51		
Nitrogen levels (kg N/ha)																	
40	3.18	3.05	3.11	8.63	8.04	8.34	8.82	6.64	7.73	6.96	5.24		1.90	2.10	4.49	2.83	5.37
80	4.14	6.80	5.47	9.78	9.30	9.54	9.18	8.31	8.75	7.81	6.39		2.90	3.30	4.76	3.65	6.61
120	4.51	6.88	5.69	10.71	9.68	10.20	9.96	8.88	9.42	7.49	7.49		3.80	4.20	5.31	4.44	7.17
SE(m) ±	0.07	0.11		0.16	0.19		0.20	0.20		0.09	0.18		0.11	0.14	0.18		
C.D.(p=0.05)	0.23	0.32		0.46	0.55		0.60	0.58		0.25	0.52		0.32	0.41	0.37		
Interaction																	
M x S																	
SE(m) ±					0.47		0.53			0.25			0.27	0.20	0.42		
C.D.(p=0.05)		S		NS	1.34		1.61	NS		0.75	NS		NS	NS	NS		

Table R-21-AST-4 (d): Effect of nitrogen levels on per day productivity of promising entries of single cut Oat (AVTO-2)

Entries	Green forage yield (q/ha/day)								Overall mean
	HZ		NWZ		NEZ	CZ		SZ	
	Palam-pur	Sri-nagar	Pant-nagar	Ludh-iana	Pusa	Urulikan-chan	Rai-pur	Coimb-atore	
JO-07-28	1.88	2.54	4.48	5.85	3.92	7.65	4.73	3.10	4.40
HFO-904	1.85	2.47	5.08	5.98	3.50	7.21	4.20	4.15	4.28
HFO-906	1.98	2.36	5.12	6.15	3.62	8.15	3.99	4.33	4.31
Kent (NC)	1.72	2.38	4.03	5.33	3.90	5.97	4.48	3.79	3.92
OS-6 (NC)	1.81	2.62	3.93	5.58	3.26	6.28	4.44	3.98	3.96
OS-403 (NWZ, NEZ, SZ)			4.69	6.99	3.00		3.83	3.57	
SKO-96 (HZ)	1.55	2.57							
RO-11-1 (CZ)						7.16			
SE(m) ±	0.03	0.03	0.13	0.21	0.12		0.068	0.02	
C.D.(p=0.05)	0.12	0.10	0.40	0.67	0.37		0.216	0.05	
Nitrogen levels (kg N/ha)									
40	1.53	1.46	4.26	5.33	3.30	6.71	3.89	3.54	3.75
80	1.90	2.95	4.57	6.13	3.61	7.05	4.34	3.79	4.29
120	1.98	3.06	4.83	6.48	3.69	7.46	4.60	4.13	4.53
SE(m) ±	0.02	0.06	0.03	0.13	0.06		0.058	0.03	
C.D.(p=0.05)	0.07	0.189	0.10	0.36	0.19		0.171	0.06	
Interaction									
M x S									
SE(m) ±				0.31				0.06	
C.D.(p=0.05)		S	NS	NS	NS		NS	0.12	

Table R-21-AST-4 (e): Effect of nitrogen levels on Plant height (cm) of promising entries of single cut Oat (AVTO-2)

Entries	Plant Height (cm)																
	HZ			NWZ			NEZ			CZ			SZ				Overall mean
	Palampur	Srinagar	Mean	Pantnagar	Ludhiana	Mean	Imphal	Pusa	Mean	Urulikanchan	Raipur	Mean	Hyderabad	Mandya	Coimbatore	Mean	
JO-07-28	145.3	123.3	134.3	183.3	128.3	155.8	168.6	160.0	164.3	132.4	153.6	143.0	112.2	108.5	85.0	101.9	136.4
HFO-904	137.8	125.2	131.5	181.4	131.3	156.3	171.5	157.6	164.6	135.9	152.3	144.1	100.1	104.3	92.0	98.8	135.4
HFO-906	140.9	104.2	122.5	191.4	129.9	160.7	165.9	163.3	164.6	120.1	148.6	134.4	100.9	99.7	95.0	98.5	132.7
Kent (NC)	121.8	117.1	119.4	161.6	124.7	143.1	155.3	150.1	152.7	105.5	142.8	124.2	100.5	95.9	92.0	96.1	124.3
OS-6 (NC)	133.5	129.5	131.5	177.5	124.0	150.8	157.2	161.4	159.3	118.6	147.4	133.0	106.7	104.8	92.0	99.2	131.5
OS-403 (NWZ, NEZ, SZ)				229.7	141.5	185.6	161.7	158.8	160.2				100.7	96.9	86.0	96.5	
SKO-96 (HZ)	90.9	126.2	108.6														
RO-11-1 (CZ)										161.7	152.3	157.0					
SE(m) ±	0.82	1.94		6.51	3.3		1.27	2.2			0.84		3.31	1.8	4.83		
C.D.(p=0.05)	2.62	6.19		20.78	10.4		3.99	7.1			2.7		NS	5.7	NS		
Nitrogen levels (kg N/ha)																	
40	121.6	103.2	112.4	179.7	125.3	152.5	166.9	154.2	160.6	132.1	145.7	138.9	87.7	84.6	90.3	87.5	126.5
80	129.2	128.0	128.6	187.9	130.4	159.1	163.5	160.0	161.8	126.9	149.2	138.1	105.5	104.2	90.3	100.0	134.1
120	134.2	130.9	132.6	194.9	134.2	164.5	159.6	161.4	160.5	128.1	153.7	140.9	117.4	116.3	90.3	108.0	138.3
Interaction																	
SE(m) ±	0.69	1.83		1.45	2.6		0.67	1.7			0.81		2.34	2.23	9.30		
C.D.(p=0.05)	2.02	5.37		4.24	7.4		1.94	5.0			2.38		6.77	6.55	NS		

Table R-21-AST-4 (f): Effect of nitrogen levels on No. of tillers per row meter length of promising entries of single cut Oat (AVTO-2)

Entries	**No. of Tillers / row meter Length**				
	HZ	**NWZ**		**NEZ**	**Overall mean**
	Palam-pur	**Pant-nagar**	**Ludh-iana**	**Pusa**	
JO-07-28	60	120.58	105.1	108.4	79.64
HFO-904	58	102.89	97.4	122.3	76.93
HFO-906	61	112.66	103.8	108.0	77.89
Kent (NC)	59	117.66	94.3	106.6	76.35
OS-6 (NC)	64	146.91	99.0	119.6	86.73
OS-403 (NWZ, NEZ, SZ)		131.46	110.5	113.0	
SKO-96 (HZ)	55				
SE(m) ±	1.74	4.98	3.5	3.1	
C.D.(p=0.05)	5.58	15.88	10.9	9.8	
Nitrogen levels (kg N/ha)					
40	57	114.21	91.3	105.9	74.50
80	59	122.36	102.0	115.0	80.52
120	62	129.51	111.8	118.1	85.11
SE(m) ±	1.66	2.86	2.1	1.4	
C.D.(p=0.05)	4.88	8.41	5.9	4.2	
Interaction					
M x S					
SE(m) ±			5.1		
C.D.(p=0.05)		NS	14.4	NS	

Table R-21-AST-4 (g): Effect of nitrogen levels on Leaf stem ratio of promising entries of single cut Oat (AVTO-2)

Entries	Leaf stem ratio																
	HZ			NWZ			NEZ			CZ			SZ				Overall mean
	Palam-pur	Sri-nagar	Mean	Pant-nagar	Ludh-iana	Mean	Imp-hal	Pusa	Mean	Urulikan-chan	Rai-pur	Mean	Hydera-bad	Man-dya	Coimb-atore	Mean	
JO-07-28	0.72	0.77	0.75	0.32	0.44	0.38	0.22	0.41	0.32	0.31	0.67	0.49	51.00	0.57	0.30	17.32	5.07
HFO-904	0.72	0.77	0.74	0.38	0.58	0.48	0.25	0.49	0.37	0.39	0.72	0.56	0.51	0.59	0.40	0.50	0.53
HFO-906	0.63	0.73	0.68	0.34	0.54	0.44	0.26	0.35	0.31	0.77	0.64	0.71	0.46	0.50	0.45	0.42	0.50
Kent (NC)	0.61	0.74	0.67	0.34	0.51	0.43	0.15	0.33	0.24	0.52	0.67	0.60	0.39	0.47	0.34	0.39	0.46
OS-6 (NC)	0.74	0.87	0.81	0.32	0.52	0.42	0.13	0.29	0.21	0.44	0.64	0.54	0.51	0.63	0.38	0.49	0.49
OS-403 (NWZ, NEZ, SZ)				0.23	0.57	0.40	0.29	0.40	0.35				0.41	0.47	0.31	0.44	
SKO-96 (HZ)	1.31	0.78	1.04														
RO-11-1 (CZ)										0.45	0.60	0.53					
SE(m) ±	0.02	0.02		0.01	0.03		0.01	0.01			0.03		0.02	0.02	0.00		
C.D.(p=0.05)	0.05	0.06		0.04	0.09		0.04	0.04			NS		0.05	0.05	0.01		
Nitrogen levels (kg N/ha)																	
40	0.67	0.59	0.63	0.31	0.44	0.38	0.21	0.33	0.27	0.47	0.63	0.55	0.41	0.45	0.34	0.40	0.44
80	0.79	0.83	0.81	0.32	0.49	0.41	0.21	0.39	0.30	0.49	0.65	0.57	0.47	0.55	0.37	0.46	0.51
120	0.91	0.91	0.91	0.34	0.65	0.50	0.22	0.41	0.32	0.49	0.68	0.59	0.52	0.62	0.39	0.51	0.56
SE(m) ±	0.01	0.02		0.00	0.03		0.01	0.01			0.02		0.10	0.01	0.00		
C.D.(p=0.05)	0.03	0.04		0.01	0.07		NS	0.02			NS		0.05	0.02	0.01		
Interaction																	
M x S																	
SE(m) ±					0.06		0.02						0.03	0.03	0.01		
C.D.(p=0.05)		S		S	NS		NS	NS			NS		NS	0.05	0.02		

Table R-21-AST-4 (h): Effect of nitrogen levels on Crude protein content of promising entries of single cut Oat (AVTO-2)

Entries	Crude protein content (%)															
	HZ			**NWZ**			**NEZ**			**CZ**				**SZ**		
	Palam-pur	**Sri-nagar**	**Mean**	**Pant-nagar**	**Ludh-iana**	**Mean**	**Imp-hal**	**Pusa**	**Mean**	**Urulikan-chan**	**Rai-pur**	**Mean**	**Hydera-bad**	**Man-dya**	**Coimb-atore**	**Mean**
JO-07-28	9.01	8.54	8.77	9.77	6.80	8.29	7.28	9.81	8.55	5.68	7.09	6.39	5.70	6.10	7.57	5.90
HFO-904	9.06	8.85	8.96	9.43	6.10	7.77	7.93	8.82	8.38	7.22	7.13	7.18	6.30	6.90	7.80	6.60
HFO-906	8.77	9.25	9.01	9.19	6.30	7.75	9.32	9.09	9.21	7.96	6.98	7.47	6.30	6.70	7.98	6.50
Kent (NC)	9.40	9.01	9.20	9.20	7.90	8.55	8.08	10.13	9.11	7.15	6.80	6.98	6.20	6.60	7.73	6.40
OS-6 (NC)	9.34	7.18	8.26	9.64	6.40	8.02	9.18	9.74	9.46	8.32	7.46	7.89	6.10	6.90	7.80	6.50
OS-403 (NWZ, NEZ, SZ)				9.44	6.50	7.97	8.13	9.37	8.75				6.20	6.60	7.67	6.40
SKO-96 (HZ)	10.01	8.40	9.20													
RO-11-1 (CZ)										5.72	7.71	6.72				
SE(m) ±	0.15	0.13		0.11			0.16	0.16			0.07		0.16	0.14	0.40	
C.D.(p=0.05)	0.47	0.41		0.34			0.50	0.52			0.25		NS	0.44	NS	
Nitrogen levels (kg N/ha)																
40	8.75	8.08	8.41	8.81	6.70	7.76	8.03	9.13	8.58	6.87	6.67	6.77	5.90	6.40	7.70	6.15
80	9.22	8.67	8.94	9.55	6.80	8.18	8.37	9.59	8.98	7.37	7.12	7.25	6.20	6.80	7.75	6.50
120	9.82	8.87	9.34	9.98	6.60	8.29	8.56	9.75	9.16	6.80	7.79	7.30	6.20	6.60	7.83	6.40
SE(m) ±	0.12	0.14		0.08			0.11	0.09			0.04		0.11	0.13	0.28	
C.D.(p=0.05)	0.35	0.41		0.25			0.33	0.27			0.13		NS	NS	NS	
Interaction																
M x S																
SE(m) ±							0.28						0.27	0.24	0.70	
C.D.(p=0.05)		NS		S			0.83	NS			NS		0.78	0.98	NS	

Table R-21-AST-4 (i): Effect of nitrogen levels on dry matter content of promising entries of single cut Oat (AVTO-2)

Entries	Dry matter (%)			
	Raipur	Pusa	Mandya	Mean
JO-07-28	23.70	22.31	19.90	21.97
HFO-904	24.00	21.32	19.50	21.61
HFO-906	27.60	23.43	19.60	23.54
Kent (NC)	23.80	24.41	20.50	22.90
OS-6 (NC)	27.40	23.69	19.90	23.66
OS-403 (NWZ, NEZ, SZ)		26.14	20.50	
RO-11-1 (CZ)	21.80			
SE(m) ±	0.78	0.60	0.26	
C.D.(p=0.05)	2.50	1.90	NS	
Nitrogen levels (kg N/ha)				
40	24.30	22.14	18.20	21.55
80	24.80	24.00	20.30	23.03
120	25.10	24.52	21.40	23.67
SE(m) ±	0.48	0.22	0.15	
C.D.(p=0.05)	NS	0.65	0.44	
Interaction				
M x S				
SE(m) ±			0.44	
C.D.(p=0.05)	NS	NS	NS	

R 21- AST-4(j): Interaction effect of entries and nitrogen levels on green fodder and dry matter yield (q/ha) at Mandya

Entries	Green fodder yield				Dry matter yield			
	N levels (kg/ha)				N levels (kg/ha)			
	40	**80**	**120**	**Mean**	**40**	**80**	**120**	**Mean**
JO-07-28	201.0	260.07	291.90	**250.99**	35.6	53.0	62.6	**50.4**
HFO-904	189.9	269.17	304.40	**254.49**	33.6	53.0	63.5	**50.0**
HFO-906	177.7	215.80	305.83	**233.10**	32.2	43.1	63.3	**46.2**
Kent (NC)	162.8	191.50	219.60	**191.29**	30.8	39.2	48.5	**39.5**
OS-6 (NC)	193.1	264.37	365.57	**274.36**	35.2	53.7	78.2	**55.7**
OS-403 (NWZ, NEZ, SZ)	186.8	229.00	292.60	**236.15**	34.8	48.0	64.3	**49.0**
Mean	**185.2**	**238.32**	**296.65**		**33.7**	**48.3**	**63.4**	
	Varieties	**Nitrogen**	**Interaction**	**Interaction**	**Varieties**	**Nitrogen**	**Interaction**	**Interaction**
SE(m) ±	8.18	6.84	14.17	15.95	1.55	1.51	2.69	3.39
C.D.(p=0.05)	26.12	20.10	NS	NS	4.95	4.42	NS	NS

Table R 21- AST-4(k): Interaction effect of entries and nitrogen levels on green forage and dry matter yield (q/ha) at Imphal

Varieties	Green fodder yield				Dry matter yield			
	N levels (kg/ha)				N levels (kg/ha)			
	40	**80**	**120**	**Mean**	**40**	**80**	**120**	**Mean**
JO-07-28	517.69	496.15	489.74	**501.20**	116.85	125.61	123.45	**121.97**
HFO-904	492.31	466.67	461.54	**473.50**	112.72	118.56	122.56	**117.95**
HFO-906	374.36	428.21	466.67	**423.08**	92.03	102.95	116.91	**103.96**
Kent (NC)	467.44	483.08	446.41	**465.64**	102.34	104.40	104.63	**103.79**
OS-6 (NC)	546.41	538.72	515.64	**533.59**	124.96	119.99	117.97	**120.97**
OS-403 (NWZ, NEZ, SZ)	466.67	394.87	474.36	**445.30**	109.43	92.50	114.60	**105.51**
Mean	**477.48**	**467.95**	**475.73**		**109.72**	**110.67**	**116.69**	
	Varieties	**Nitrogen**	**Interaction**	**Interaction**	**Varieties**	**Nitrogen**	**Interaction**	**Interaction**
SE(m) ±	4.91	2.16	6.54	5.29	4.59	1.86	5.90	4.55
C.D.(p=0.05)	15.48	6.30	19.95	15.44	14.46	5.42	18.05	13.26

Table R-21-AST-4 (l): Interaction effect of entries and nitrogen levels on green forage and dry matter yield (q/ha)at Pusa

Entries	Green fodder yield				Dry matter yield			
	N levels (kg/ha)				N levels (kg/ha)			
	40	**80**	**120**	**Mean**	**40**	**80**	**120**	**Mean**
JO-07-28	357.0	417.8	414.3	**396.4**	78.6	93.7	93.1	**88.5**
HFO-904	342.7	381.5	354.1	**359.4**	66.7	84.0	79.8	**76.8**
HFO-906	353.0	363.6	375.1	**363.9**	75.4	88.5	92.3	**85.4**
Kent (NC)	315.7	356.8	401.0	**357.8**	72.6	88.7	101.8	**87.7**
OS-6 (NC)	277.7	315.7	362.2	**318.5**	59.7	76.4	91.5	**75.9**
OS-403 (NWZ, NEZ, SZ)	327.3	336.0	319.3	**327.6**	83.3	87.8	85.7	**85.6**
Mean	**328.9**	**361.9**	**371.0**		**72.7**	**86.5**	**90.7**	
	Varieties	**Nitrogen**			**Varieties**	**Nitrogen**		
SE(m) ±	10.2	6.6			2.7	1.7		
C.D.(p=0.05)	32.3	19.2			8.6	5.0		

Table R-21-AST-4 (n): Interaction effect of entries and nitrogen levels on green forage and dry matter yield (q/ha)at Pantnagar

Varieties	Green fodder yield				Dry matter yield			
	N levels (kg/ha)				N levels (kg/ha)			
	40	**80**	**120**	**Mean**	**40**	**80**	**120**	**Mean**
JO-07-28	486.0	514.5	559.6	520.0	92.2	98.2	108.0	99.5
HFO-904	573.5	596.4	626.5	598.8	120.3	124.0	125.3	123.2
HFO-906	576.2	603.9	634.4	604.8	108.7	112.4	118.2	113.1
Kent (NC)	427.1	469.8	507.6	468.2	76.7	83.2	87.7	82.6
OS-6 (NC)	429.0	460.9	479.0	456.3	79.4	83.8	86.7	83.3
OS-403 (NWZ, NEZ, SZ)	543.4	596.1	619.5	586.3	112.5	113.6	116.4	114.2
Mean	**505.9**	**540.3**	**571.1**		**98.3**	**102.5**	**107.1**	
	Varieties	**Nitrogen**	**V X N**			**Varieties**	**Nitrogen**	**V X N**
SE(m) ±	14.8	4.1	16.9		SE(m) ±	3.1	1.2	3.9
C.D.(p=0.05)	47.2	12.0	NS		C.D.(p=0.05)	9.8	3.6	NS

Table R-21-AST-4 (o): Interaction effect of entries and nitrogen levels on green forage (q/ha) at Raipur

GFY (q/ha)							
Varieties							
N Levels	**Kent (NC)**	**JO-07-28**	**RO-11-1 (CZ)**	**OS-6 (NC)**	**HFO-904**	**HFO-906**	**Mean**
N1	303	356	339	300	350	307	**326**
N2	351	412	356	351	368	337	**363**
N3	393	437	375	361	390	350	**384**
Mean	**349**	**402**	**356**	**337**	**369**	**331**	
						C.D.(P=0.05)	SE(m) ±
Factor(B)at same level of A						**9.93**	**NS**
Factor(A)at same level of B						**4.85**	**NS**

Table R-21-AST-4 (o): Interaction effect of entries and nitrogen levels on dry matter yield (q/ha) at Raipur

DMY (q/ha)							
Varieties							
N Levels	**Kent (NC)**	**JO-07-28**	**RO-11-1 (CZ)**	**OS-6 (NC)**	**HFO-904**	**HFO-906**	**Mean**
N1	71.92	80.96	71.24	80.45	80.12	86.84	**78.6**
N2	84.01	97.19	81.07	97.79	89.97	88.40	**89.7**
N3	93.68	107.60	80.00	100.09	96.12	99.26	**96.1**
Mean	**83.20**	**95.25**	**77.44**	**92.77**	**88.74**	**91.50**	
						C.D.(P=0.05)	SE(m) ±
Factor(B)at same level of A						**NS**	**4.89**
Factor(A)at same level of B						**NS**	**5.19**

Table R-21-AST-4 (p): Interaction effect of N levels on forage yield of single cuto at (q/ha) at Urulikanchan

Varieties	Green fodder yield N levels (kg/ha)				Dry matter yield N levels (kg/ha)			
	40	80	120	Mean	40	80	120	Mean
JO-07-28	588.65	639.7	698.75	**642.37**	111.25	137.15	142.69	**130.36**
HFO-904	598.17	617.98	708.28	**641.48**	108.69	105.67	120.9	**111.76**
HFO-906	561.98	601.22	694.94	**619.38**	90.65	105.15	126.76	**107.52**
Kent (NC)	437.01	459.49	482.35	**459.61**	78.14	72.87	75.34	**75.45**
OS-6 (NC)	467.49	505.97	440.06	**471.17**	85.46	90.77	79.69	**85.31**
OS-403 (NWZ, NEZ, SZ)	686.18	672.47	682.37	**680.34**	146.84	144.04	125.08	**138.65**
Mean	**556.58**	**582.8**	**617.79**		**103.5**	**109.28**	**111.74**	
	Varieties	**Nitrogen**	**Interaction**			**Varieties**	**Nitrogen**	**Interaction**
SE(m) ±	14.35	6.89	20.8		SE(m) ±	2.76	1.36	4.05
C.D.(p=0.05)	45.83	20.24	61.09		C.D.(p=0.05)	8.81	4	11.89

Table R-21-AST-4 (q): Interaction effect of N levels on forage yield of single cut oat (q/ha)) at Ludhiana

Varieties	Green fodder yield N levels (kg/ha)				Dry matter yield N levels (kg/ha)			
	40	80	120	Mean	40	80	120	Mean
JO-07-28	593.1	669.4	722.2	**661.6**	118.6	133.9	144.4	**132.3**
HFO-904	601.4	693.1	733.3	**675.9**	120.3	138.6	146.7	**135.2**
HFO-906	583.3	737.5	765.3	**695.4**	116.7	147.5	153.1	**139.1**
Kent (NC)	556.9	601.4	647.2	**601.9**	111.4	120.3	129.4	**120.4**
OS-6 (NC)	570.8	673.6	647.2	**630.6**	114.2	134.7	129.4	**126.1**
OS-403 (NWZ, NEZ, SZ)	709.7	781.9	877.8	**789.8**	141.9	156.4	175.6	**158.0**
Mean	**602.5**	**692.8**	**732.2**		**120.5**	**138.6**	**146.4**	
	Varieties	**Nitrogen**	**Interaction**			**Varieties**	**Nitrogen**	**Interaction**
SE(m) ±	24.1	14.3	35.0		SE(m) ±	4.8	2.9	7.0
C.D.(p=0.05)	75.9	40.9	NS		C.D.(p=0.05)	15.2	8.2	NS

Table R-21-AST-4 (r): Interaction effect of N levels on biomass yield of single cut oat (q/ha) at Palampur

Varieties	Green fodder yield				Dry matter yield			
	N levels (kg/ha)				N levels (kg/ha)			
	40	**80**	**120**	**Mean**	**40**	**80**	**120**	**Mean**
JO-07-28	197.77	228.33	239.50	**221.87**	41.68	45.76	45.42	**44.29**
HFO-904	195.67	227.80	231.40	**218.29**	39.20	44.65	44.04	**42.63**
HFO-906	191.53	245.90	262.87	**233.43**	38.37	49.02	49.86	**45.75**
Kent (NC)	181.83	207.97	220.83	**203.54**	34.61	41.66	44.02	**40.10**
OS-6 (NC)	186.33	241.33	236.87	**221.51**	36.27	46.82	45.95	**43.02**
SKO-96 (HZ)	154.50	225.50	245.00	**208.33**	28.58	42.17	46.31	**39.02**
Mean	**184.61**	**229.47**	**239.41**		**36.45**	**45.01**	**45.93**	
	Varieties	**Nitrogen**	**Interaction**			**Varieties**	**Nitrogen**	**Interaction**
SE(m) ±	4.23	2.78	6.98		SE(m) ±	0.81	0.54	1.35
C.D.(p=0.05)	13.49	8.16	21.15		C.D.(p=0.05)	2.58	1.58	4.07

Table R-21-AST-4 (s): Interaction effect of N levels on green forage and dry matter yield (q/ha) of single cut oat at Coimbatore

Varieties	Green fodder yield				Dry matter yield			
	N levels (kg/ha)				N levels (kg/ha)			
	40	**80**	**120**	**Mean**	**40**	**80**	**120**	**Mean**
JO-07-28	256.67	230.83	275.83	254.44	48.00	52.62	55.00	51.87
HFO-904	325.01	332.99	362.00	340.00	58.80	68.40	72.68	66.63
HFO-906	300.00	371.66	393.33	355.00	66.50	67.00	73.00	68.83
Kent (NC)	307.51	311.66	313.34	310.84	64.24	62.33	61.00	62.52
OS-6 (NC)	281.67	340.83	355.83	326.11	58.20	62.84	77.80	66.28
OS-403 ZC (SZ)	270.84	274.16	332.50	292.50	54.00	55.25	67.20	58.82
Mean	**290.28**	**310.36**	**338.81**	**313.15**	**58.29**	**61.41**	**67.78**	**62.49**
	Varieties	**Nitrogen**	**Interaction**			**Varieties**	**Nitrogen**	**Interaction**
SE(m) ±	1.73	2.23	4.76		**SEm±**	0.22	0.32	0.67
C.D.(p=0.05)	3.85	4.59	9.96		**CD at 5%**	0.48	0.65	1.39

R-21 AST-5: Effect of N levels on forage yield of promising entries of Multi cut oat (AVT-2 MC) Table Reference: R-21-AST-5(a)-(l)]

Locations: (5)
HZ: Palampur, Srinagar
CZ: Anand, Jabalpur, Rahuri

AVT trial on Multi cut oat was conducted at five locations spread in Hill and Central Zone of the country to study the response of nitrogen fertilizer on yield and quality of promising entries of oat under fodder and seed purpose. In the trial, two multi cut entries (PLP-24, JO-07-310) along with two national checks namely; UPO-212 and RO-19 were evaluated for their responsiveness to nitrogen fertilizer. The four nitrogen levels (80, 100,120 and 140 kg N /ha) were imposed on entries to see the response. The nitrogen was applied in three splits i.e., 1st at 55 DAS, 2nd at 85 DAS, 3rd at 50% flowering as top dressing. The experiment was conducted in split plot design with entries in main plot.

In Hill zone, both the entries (PLP-24 and JO-07-310)were on par with each other but proved higher yielder than checks. The best entry JO-07-310 produced 299.5 q GFY and 59.2 q DMY/ha. It recorded 5.3 and 7.2 % higher GFY and DMY, respectively than best check RO-19 (NC). Both the entries also contained marginally higher crude protein content as well as significantly higher CP yields than checks. Both the entries recorded 5.07q CP yields which was 12.1% higher over best check -RO-19 (NC).

In central zone, on locational mean as well as at centre basis no entry could perform better than national check RO-19 (NC).

On overall mean basis, linear response to nitrogen application was noted up to 140 kg N/ha which produced (403.9 q green, 77.2 q dry matter and 7.61q CP yield per hectare). All the growth parameters also showed improvement with increasing dose of nitrogen supplementation up to 140 kg/ha.
The response equation for Hill zone was worked out to be $y = -0.0035x^2 + 1.744x + 135.01$ ($R^2 = 0.9994$) with Agronomic Maxima of 249.1 kg N ha^{-1} and Agronomic Optima 237.7 kg N ha^{-1}.

R-21-AST-5 (a): Effect of N levels on forage yield of promising entries of Multi cut oat (AVT-2 MC)

Entries	Green fodder yield (q/ha)							Overall Mean
	HZ			CZ				
	Palampur	Srinagar	Mean	Anand	Jabalpur	Rahuri	Mean	
PLP-24	251.9	333.4	292.6	352.4	430.2	454.8	412.5	364.5
JO-07-310	288.8	310.3	299.5	476.9	488.4	497.3	487.5	412.3
UPO-212 (NC)	211.2	297.8	254.5	83.5	378.7	411.4	291.2	276.5
RO-19 (NC)	253.5	315.0	284.3	478.1	568.1	551.2	532.5	433.2
SE(m) ±	2.21	3.31		1.86	4.56	9.40		
C.D.(p=0.05)	7.81	11.68		6.44	13.34	32.40		
Nitrogen levels (kg/ha)								
80	206.6	297.3	251.9	309.0	394.6	433.7	379.1	328.2
100	239.8	310.3	275.1	345.1	445.0	480.1	423.4	364.1
120	269.0	317.4	293.2	359.5	519.1	486.7	455.1	390.3
140	290.0	331.5	310.8	377.3	506.7	514.2	466.1	403.9
SE(m) ±	3.08	1.774		1.61	5.67	17.8		
C.D.(p=0.05)	9.05	5.208		4.7	15.67	51.9		
Interaction								
SE(m) ±	5.78	3.62		3.22	7.80	35.60		
C.D.(p=0.05)	17.46	11.54		9.39	21.45	NS		

Table R-21-AST-5 (b): Effect of N levels on per day productivity of promising entries of Multi cut oat (AVT-2 MC)

Entries	Dry matter yield (q/ha)							Overall Mean
	HZ			CZ				
	Palampur	Srinagar	Mean	Anand	Jabalpur	Rahuri	Mean	
PLP-24	49.07	66.37	57.7	42.34	88.6	98.19	76.4	68.9
JO-07-310	56.39	62.08	59.2	53.29	95.9	109.67	86.3	75.5
UPO-212 (NC)	40.77	59.58	50.2	11.78	77.9	88.46	59.4	55.7
RO-19 (NC)	47.37	63.00	55.2	59.7	115.4	122.95	99.4	81.7
SE(m) ±	0.75	0.65		1.21	1.34	3.10		
C.D.(p=0.05)	2.65	2.29		4.19	3.89	10.7		
Nitrogen levels (kg/ha)								
80	39.56	59.45	49.5	37.6	80.11	91.61	69.8	61.7
100	46.12	61.79	54.0	41.9	88.71	104.03	78.2	68.5
120	52.29	63.49	57.9	43.86	105.16	107.43	85.5	74.4
140	55.64	66.30	61.0	43.76	103.84	116.21	87.9	77.2
SE(m) ±	0.81	0.40		0.88	1.21	4.343		
C.D.(p=0.05)	2.39	1.18		2.56	3.69	12.17		
Interaction								
SE(m) ±	1.6	1.30		1.75	1.81	8.69		
C.D.(p=0.05)	NS	2.57		5.12	4.21	NS		

Table R-21-AST-5 (c): Effect of N levels on crude protein yield (q/ha) of promising entries of Multi cut oat (AVT-2 MC)

Entries	Crude protein yield (q/ha)							Overall Mean
	HZ			CZ				
	Palampur	Srinagar	Mean	Anand	Jabalpur	Rahuri	Mean	
PLP-24	4.77	5.38	5.07	7.35	7.07	8.54	7.65	6.62
JO-07-310	5.43	4.70	5.07	7.74	7.56	10.15	8.48	7.12
UPO-212 (NC)	3.91	3.93	3.92	2.18	6.28	7.23	5.23	4.71
RO-19 (NC)	4.63	4.41	4.52	9.18	9.11	11.82	10.04	7.83
SE(m) ±	0.82	0.09		0.24	0.45	0.51		
C.D.(p=0.05)	2.62	0.33		0.83	1.12	1.78		
Nitrogen levels (kg/ha)								
80	3.60	4.18	3.89	5.59	6.38	7.07	6.35	5.36
100	4.46	4.39	4.43	6.58	7.00	8.93	7.50	6.27
120	5.18	4.64	4.91	6.95	8.37	10.04	8.45	7.04
140	5.51	5.24	5.37	7.33	8.28	11.69	9.10	7.61
SE(m) ±	0.69	0.05		0.16	0.22	0.48		
C.D.(p=0.05)	2.02	0.16		0.46	0.67	1.39		
Interaction								
SE(m) ±		0.19		0.31	0.88	0.96		
C.D.(p=0.05)		0.35		0.91	2.24	NS		

Table R-21-AST-5 (d): Effect of N levels on growth parameters of promising entries of Multi cut oat (AVT-2 MC)

Entries	Green fodder yield (q/ha/day)				Dry fodder yield (q/ha/day)			
	Palampur	Srinagar	Rahuri	Mean	Palampur	Srinagar	Rahuri	Mean
PLP-24	1.85	2.22	3.92	2.66	0.36	0.44	0.85	0.55
JO-07-310	2.19	2.07	4.29	2.85	0.15	0.41	0.95	0.50
UPO-212 (NC)	1.65	1.99	3.55	2.40	0.15	0.40	0.76	0.44
RO-19 (NC)	1.87	2.10	4.75	2.91	0.14	0.42	1.06	0.54
SE(m) ±	0.02	0.02	0.081		0.003	0.00	0.027	
C.D.(p=0.05)	0.06	0.08	0.279		0.01	0.02	0.092	
Nitrogen levels (kg/ha)								
80	1.55	1.98	3.74	2.42	0.19	0.40	0.79	0.46
100	1.8	2.07	4.14	2.67	0.19	0.41	0.9	0.50
120	2.02	2.12	4.2	2.78	0.21	0.42	0.93	0.52
140	2.18	2.21	4.43	2.94	0.21	0.44	1	0.55
SE(m) ±	0.02	0.01	0.153		0.003	0.00	0.037	
C.D.(p=0.05)	0.07	0.04	0.447		0.01	0.01	0.109	
Factor(A) at same level of B								
SE(m) ±		0.04	0.307			0.01	0.075	
C.D.(p=0.05)		0.08	NS			0.02	NS	

Table R-21-AST-5 (e): Effect of N levels on crude protein content of promising entries of Multi cut oat (AVTO-2 MC)

Entries	Crude protein (%)						Overall Mean
	HZ			CZ			
	Palampur	Srinagar	Mean	Anand	Rahuri	Mean	
PLP-24	9.70	8.08	8.89	17.33	8.64	12.99	10.94
JO-07-310	9.60	7.58	8.59	14.50	9.17	11.84	10.21
UPO-212 (NC)	9.50	6.58	8.04	18.38	8.10	13.24	10.64
RO-19 (NC)	9.70	6.99	8.35	15.37	9.51	12.44	10.39
SE(m) ±	0.10	0.18		0.51	0.23		
C.D.(p=0.05)	NS	0.62		1.76	0.81		
Nitrogen levels (kg/ha)							
80	9.10	6.99	8.05	15.42	7.67	11.55	9.80
100	9.70	7.09	8.40	16.23	8.49	12.36	10.38
120	9.90	7.28	8.59	16.54	9.27	12.91	10.75
140	9.90	7.85	8.88	17.39	9.98	13.69	11.28
SE(m) ±	0.10	0.08		0.18	0.14		
C.D.(p=0.05)	0.31	0.23		0.52	0.40		
Factor(A) at same level of B							
SE(m) ±					0.28		
C.D.(p=0.05)				NS	NS		

Table R-21-AST-5 (f): Effect of N levels on growth parameters of promising entries of Multi cut oat (AVTO-2 MC)

Entries	Plant Height (cm)							Overall Mean
	HZ			CZ				
	Palampur	Srinagar	Mean	Anand	Jabalpur	Rahuri	Mean	
PLP-24	72.80	124.92	98.86	97.03	96.13	80.05	65.33	78.74
JO-07-310	80.10	100.25	90.18	135.85	92.34	84.84	67.45	76.54
UPO-212 (NC)	72.50	90.75	81.63	72.50	91.93	79.52	61.71	69.68
RO-19 (NC)	76.50	113.83	95.17	136.67	96.47	87.88	69.58	79.82
SE(m) ±	0.96	1.43		0.78	0.50	0.92		
C.D.(p=0.05)	3.89	5.05		2.69	1.12	3.20		
Nitrogen levels (kg/ha)								
80	66.90	98.00	82.45	104.10	92.23	77.68	63.66	71.18
100	70.70	100.17	85.43	106.53	92.51	83.87	65.78	73.64
120	77.10	111.42	94.26	113.23	103.55	83.44	69.10	79.16
140	87.20	120.17	103.68	118.18	88.57	87.29	65.53	80.79
SE(m) ±	0.68	1.90		0.47	2.12	0.80		
C.D.(p=0.05)	2.01	5.59		1.38	6.32	2.33		
Interaction								
SE(m) ±		2.86		0.94	0.89	1.60		
C.D.(p=0.05)		11.54		2.76	2.49	NS		

Table R-21-AST-5 (g): Effect of N levels on growth parameters of promising entries of Multi cut oat (AVT-2 MC)

Entries	Leaf Stem Ratio				Plant population/m row length				
	Palampur	Srinagar	Rahuri	Mean	Anand	Jabalpur	Rahuri	Palampur	Mean
PLP-24	1.12	0.44	0.72	0.76	29.9	78.0	94.7	92.4	73.7
JO-07-310	1.19	0.41	0.75	0.78	32.6	76.4	121.0	92.7	80.7
UPO-212 (NC)	0.86	0.41	0.70	0.66	11.3	77.8	89.8	55.0	58.5
RO-19 (NC)	1.28	0.44	0.78	0.83	32.0	79.3	126.8	86.8	81.2
SE(m) ±	0.03	0.01	0.01		0.5		3.1	1.0	
C.D.(p=0.05)	0.11	NS	0.05		1.6		10.9	3.5	
Nitrogen levels (kg/ha)									
80	0.81	0.40	0.63	0.61	28.1	78.3	94.7	70.6	67.9
100	1.02	0.41	0.71	0.71	26.3	76.7	105.5	78.6	71.8
120	1.22	0.44	0.76	0.81	26.3	78.2	112.7	85.1	75.6
140	1.37	0.45	0.85	0.89	25.1	78.2	119.4	92.4	78.8
SE(m) ±	0.04	0.01	0.01		0.4		1.8	1.0	
C.D.(p=0.05)	0.11	0.03	0.03		1.1		5.2	3.0	
Factor(A) at same level of B									
SE(m) ±		0.02	0.02				3.6		
C.D.(p=0.05)		NS	NS		NS		NS		

Table R-21-AST-5 (h): Interaction effect of entries and nitrogen levels on green fodder and dry matter yield (q/ha) at Palampur

Entries	GFY (q/ha)					DMY (q/ha)				
	Nitrogen levels (kg/ha)					Nitrogen levels (kg/ha)				
	80	**100**	**120**	**140**	**Mean**	**80**	**100**	**120**	**140**	**Mean**
PLP-24	221.67	232.50	267.50	285.83	**251.88**	42.17	46.60	53.30	54.20	**49.07**
JO-07-310	231.67	278.33	314.17	330.83	**288.75**	45.30	53.77	60.77	65.73	**56.39**
UPO-212 (NC)	178.75	201.67	221.67	242.50	**211.15**	34.07	39.50	42.90	46.60	**40.77**
RO-19 (NC)	194.17	246.67	272.50	300.83	**253.54**	36.70	44.60	52.17	56.00	**47.37**
Mean	**206.56**	**239.79**	**268.96**	**290.00**		**39.56**	**46.12**	**52.28**	**55.63**	
	Varieties	**N Levels**	**V X N**				**Varieties**	**N Levels**	**V X N**	
SE(m) ±	2.21	3.08	5.78			SE(m) ±	0.75	0.81	1.60	
C.D.(p=0.05)	7.81	9.05	17.46			C.D.(p=0.05)	2.65	2.39	NS	

Table R-21-AST-5 (i): Interaction effect of entries and nitrogen levels on green fodder and dry matter yield (q/ha) at Jabalpur

Entries	GFY (q/ha)					DMY (q/ha)				
	Nitrogen levels (kg/ha)					Nitrogen levels (kg/ha)				
	80	**100**	**120**	**140**	**Mean**	**80**	**100**	**120**	**140**	**Mean**
PLP-24	346.58	346.56	545.82	482.01	**430.2**	70.81	67.73	114.84	101.14	**88.6**
JO-07-310	363.55	515.2	545.82	528.93	**488.4**	69.13	100.76	108.43	105.35	**95.9**
UPO-212 (NC)	319.61	361.11	396.26	437.8	**378.7**	65.6	75.12	78.28	92.66	**77.9**
RO-19 (NC)	548.75	557.01	588.3	578.21	**568.1**	114.89	111.21	119.1	116.2	**115.4**
Mean	**394.6**	**445.0**	**519.1**	**506.7**		**80.11**	**88.71**	**105.16**	**103.84**	
	Varieties	**N Levels**	**V X N**				**Varieties**	**N Levels**	**V X N**	
SE(m) ±	4.56	5.67	7.8			SE(m) ±	1.34	1.21	1.81	
C.D.(p=0.05)	13.34	15.67	21.45			C.D.(p=0.05)	3.89	3.69	4.21	

Table R-21-AST-5 (j): Interaction effect of entries and nitrogen levels on green and dry matter yield (q/ha) at Rahuri

Nitrogen Levels	GFY (q/ha)					DMY (q/ha)				
	Varieties					Varieties				
	PLP-24	**UPO-212 (NC)**	**RO-19 (NC)**	**JO-07-310**	**Mean**	**PLP-24**	**UPO-212 (NC)**	**RO-19 (NC)**	**JO-07-310**	**Mean**
80	446.22	378.25	462.58	447.67	**433.68**	92.93	80.34	103.09	90.05	**91.61**
100	447.42	410.78	559.61	502.69	**480.13**	92.89	87.81	123.67	111.74	**104.03**
120	441.31	424.11	566.11	515.39	**486.73**	98.32	90.70	127.28	113.40	**107.43**
140	484.08	432.64	616.58	523.44	**514.19**	108.62	95.00	137.76	123.46	**116.21**
Mean	**454.76**	**411.44**	**551.22**	**497.30**		**98.19**	**88.46**	**122.95**	**109.67**	
	Varieties	**N Levels**	**V X N**	**N X V**			**Varieties**	**N Levels**	**V X N**	**N X V**
SE(m) ±	9.4	17.8	35.6	51.1		SE(m) ±	3.094	4.343	8.686	12.668
C.D.(p=0.05)	32.4	51.9	NS	NS		C.D.(p=0.05)	10.70	12.17	NS	NS

Table R-21-AST-5 (k): Interaction effect of entries and nitrogen levels on green fodder and dry matter yield at Anand

Varieties	Green Fodder yield (q/ha)				Dry matter yield (q/ha)			
	Level of nitrogen (kg/ha)				Level of nitrogen (kg/ha)			
	80 kg	**100 kg**	**120 kg**	**140 kg**	**80 kg**	**100 kg**	**120 kg**	**140 kg**
PLP-24	333.06	374.17	346.94	355.42	37.73	46.27	41.64	43.73
UPO-212 (NC)	66.11	79.72	85.83	102.22	9.69	12.38	11.20	13.84
RO-19 (NC)	415.56	460.56	506.11	530.05	51.32	58.94	68.66	59.89
JO-07-310	421.11	465.82	499.17	521.67	51.66	50.01	53.93	57.56
SE(m) ±	3.22				SE(m) ±	1.75		
C.D.(p=0.05)	9.39				C.D.(p=0.05)	5.12		

R-21 AST-6: Effect of P levels on forage yield of promising entries of Annual Lucerne
Table Reference: R-21-AST-6(a)-(i)]

Locations: (5)
NWZ: Ludhiana, Bikaner
SZ: Hyderabad, Coimbatore, Mandya

AVT trial on Annual Lucerne was conducted at five locations in two zones (North West and South zone) of the country to study the response of phosphorus fertilizer on yield and quality of promising entries of Annual Lucerne for fodder purpose. In the trial, one entry (LLC-6) along with two national checks namely; RL-88 (NC) and Anand-2 (NC) were evaluated for their responsiveness to phosphorus fertilizer. The three phosphorus levels (60, 80 and 100kgP_2O_5 /ha) were imposed on entries to see the response. The phosphorus was applied as basal in strips near crop row. The experiment was conducted in randomized block design with three replications.

The results indicated that in North West Zone, on locational mean basis the entry, LLC-6 outyielded the national check varieties in terms of green fodder yield. The entries LLC-6recorded maximum green fodder yield (444.7 q/ha) followed by RL-88 (NC- 417.5q/ha). It was 6.5 % higher over best check RL-88 (NC). As regards to dry matter and crude protein yields, RL-88 (NC) proved better and recorded 105.2 q DMY and 25.30q CP yields in comparison to 99.86q dry matter and 22.99 q CP yields/ha recorded by LLC-6.

In South Zone, on locational mean basis the entry LLC-6 out yielded the national checks varieties in terms of green fodder yield. The entries LLC-6 recorded maximum green fodder yield (355.8 q/ha) followed by Anand-2 (NC-323.2 q/ha). It was 10.1 % higher over best check Anand-2 (NC). As regards to dry matter and crude protein yields also the entry proved better. It recorded 90.0 q DMY and 18.37q CP yields which was 20.0 and 21.7percent higher over best check Anand-2 (NC).

On overall mean basis of both the zones, the entry LLC-6 out yielded the national checks varieties in terms of green fodder yield. The entries LLC-6 recorded maximum green fodder yield (391.3 q/ha) followed by Anand-2 (NC) (348.5/ha). It was 12.3 % higher over best check Anand-2 (NC). As regards to dry matter and crude protein yields also the entry proved better. It recorded 90.0 q DMY and 18.37q CP yields which was 11.0 and 8.6 percent higher over best check Anand-2 (NC) in terms of DMY and CPY respectively.

On overall mean basis, linear response to phosphorus application was noted up to 100 kg P_2O_5/ha which produced (384.4 q green, 96.5 q dry matter and 21.4 q CP yield per hectare). All the growth parameters also showed improvement with increasing dose of phosphorus supplementation up to 100 kg/ha.
The response equation for overall mean basis was worked out to be $y = -0.0015x^2 + 1.355x + 263.9$, ($R^2 = 1.0$) with Agronomic Maxima of 451.7 kg N ha^{-1} and Agronomic Optima 197.1 kg P_2O_5 ha^{-1}.

R-21-AST-6 (a): Effect of phosphorus levels on Green forage yield of promising entries of Annual Lucerne

Entries	Green fodder yield (q/ha)							Overall Mean
	NWZ			SZ				
	Ludhiana	Bikaner	Mean	Hyderabad	Coimbatore	Mandya	Mean	
LLC-6	631.8	257.5	444.7	302.6	392.3	372.5	355.8	391.3
RL-88 (NC)	608.1	226.8	417.5	266.2	330.7	303.1	300.0	347.0
Anand-2 (NC)	540.9	232.1	386.5	293.9	359.3	316.5	323.2	348.5
SE(m) ±	12.50	4.43		7.40	4.7	5.2		
C.D.(p=0.05)	37.40	13.28		22.45	10.0	20.9		
Phosphorus levels (kg/ha)								
60	557.1	231.4	394.3	273.8	348.5	288.0	303.4	339.8
80	593.6	230.7	412.1	296.5	356.6	336.3	329.8	362.7
100	630.2	254.4	442.3	292.3	377.2	367.8	345.8	384.4
SE(m) ±	12.50	4.43		7.40	4.7	11.5		
C.D.(p=0.05)	37.40	13.28		NS	10.0	35.8		
Factor(A) at same level of B								
SE(m) ±	21.60			12.86	8.2	9.0		
C.D.(P=0.05)	NS			NS	17.4	NS		

R-21-AST-6 (b): Effect of phosphorus levels on Dry matter yield of promising entries of Annual Lucerne

Entries	Dry matter yield (q/ha)							Overall Mean
	NWZ			SZ				
	Ludhiana	Bikaner	Mean	Hyderabad	Coimbatore	Mandya	Mean	
LLC-6	123.20	76.52	99.86	79.56	88.21	102.3	90.0	94.0
RL-88 (NC)	142.90	67.49	105.20	63.45	74.41	74.9	70.9	84.6
Anand-2 (NC)	129.80	68.77	99.29	69.23	80.77	74.9	75.0	84.7
SE(m) ±	2.90	1.80		3.01	1.07	1.46		
C.D.(p=0.05)	8.70	5.38		9.10	2.28	5.89		
Phosphorus levels (kg/ha)								
60	123.70	71.68	97.69	61.75	78.38	60.8	67.0	79.3
80	132.20	67.70	99.95	72.30	80.19	85.3	79.3	87.5
100	140.10	73.40	106.75	78.38	84.82	106	89.7	96.5
SE(m) ±	2.90	1.80		3.01	1.07	3.49		
C.D.(p=0.05)	8.70	5.38		9.10	2.28	10.89		
Factor(A) at same level of B								
SE(m) ±	5.00			5.21	1.86	2.53		
C.D.(p=0.05)	NS			NS	3.94	NS		

R-21-AST-6 (c): Effect of phosphorus levels on Crude protein yield of promising entries of annual Lucerne

Entries	Crude protein yield (q/ha)							Overall Mean
	NWZ			SZ				
	Ludhiana	Bikaner	Mean	Hyderabad	Coimbatore	Mandya	Mean	
LLC-6	27.50	18.47	22.99	15.37	18.94	20.80	18.37	20.22
RL-88 (NC)	31.50	19.09	25.30	12.08	14.87	15.50	14.15	18.61
Anand-2 (NC)	27.10	18.79	22.95	13.45	16.94	14.90	15.10	18.24
SE(m) ±	0.60	0.18		0.57	0.35	0.36		
C.D.(p=0.05)	1.70	0.54		1.74	0.75	1.45		
Phosphorus levels (kg/ha)								
60	25.50	18.76	22.13	11.52	16.19	12.30	13.34	16.85
80	28.90	18.73	23.82	13.96	16.67	17.50	16.04	19.15
100	31.60	18.87	25.24	15.43	17.88	21.40	18.24	21.04
SE(m) ±	0.60	0.18		0.57	0.35	0.86		
C.D.(p=0.05)	1.70	NS		1.74	0.75	2.68		
Factor(A) at same level of B								
SE(m) ±	1.00			0.99	0.61	0.62		
C.D.(p=0.05)	NS			NS	NS	4.75		

R-21-AST-6 (d): Effect of phosphorus levels on per day productivity of promising entries of Annual Lucerne

Entries	Green forage yield (q/ha/day)				Dry matter yield (q/ha/day)			
	NWZ		SZ		NWZ		SZ	
	Ludhiana	Bikaner	Coimbatore	Mean	Ludhiana	Bikaner	Coimbatore	Mean
LLC-6	3.74	1.51	3.14	2.80	0.73	0.45	0.71	0.63
RL-88 (NC)	3.60	1.33	2.65	2.53	0.85	0.40	0.60	0.62
Anand-2 (NC)	3.20	1.37	2.87	2.48	0.77	0.40	0.64	0.60
SE(m) ±	0.07	0.03	0.04		0.02	0.01	0.01	
C.D.(p=0.05)	0.22	0.08	0.08		0.05	0.03	0.02	
Phosphorus levels (kg/ha)								
60	3.30	1.36	2.79	2.48	0.73	0.42	0.63	0.59
80	3.51	1.36	2.85	2.57	0.78	0.40	0.64	0.61
100	3.73	1.50	3.02	2.75	0.83	0.43	0.68	0.65
SE(m) ±	0.07	0.03	0.04		0.02	0.01	0.01	
C.D.(p=0.05)	0.22	0.08	0.08		0.05	NS	0.02	
Factor(A) at same level of B								
SE(m) ±	0.13		0.06		0.03		0.02	
C.D.(p=0.05)	NS		0.14		NS		0.03	

R-21-AST-6 (e): Effect of phosphorus levels on Plant of promising entries of Annual Lucerne

Entries	Plant Height (cm)							Overall Mean
	NWZ			SZ				
	Ludhiana	Bikaner	Mean	Hyderabad	Coimbatore	Mandya	Mean	
LLC-6	63.80	47.78	55.79	58.10	64.97	59.60	60.89	58.85
RL-88 (NC)	61.30	47.34	54.32	54.90	61.18	57.90	57.99	56.52
Anand-2 (NC)	54.50	46.02	50.26	55.20	63.97	56.80	58.66	55.30
SE(m) ±	1.50	1.37		1.58	1.24	1.70		
C.D.(p=0.05)	4.30	NS		NS	2.63	NS		
Phosphorus levels (kg/ha)								
60	43.40	46.99	45.20	53.50	62.29	54.10	56.63	52.06
80	66.10	46.91	56.51	56.30	63.62	58.90	59.61	58.37
100	70.00	47.24	58.62	58.40	64.20	61.30	61.30	60.23
SE(m) ±	1.50	1.37		1.58	1.24	1.79		
C.D.(p=0.05)	4.30	NS		NS	NS	5.59		
Factor(A) at same level of B								
SE(m) ±	2.50			2.75	2.15	2.86		
C.D.(p=0.05)	NS			NS	NS	NS		

R-21-AST-6 (f): Effect of phosphorus levels on Crude protein content of promising entries of Annual Lucerne

Entries	Crude protein (%)							Overall Mean
	NWZ			SZ				
	Ludhiana	Bikaner	Mean	Hyderabad	Coimbatore	Mandya	Mean	
LLC-6	22.30	18.47	20.39	19.21	21.47	20.10	20.26	20.31
RL-88 (NC)	22.00	19.09	20.55	19.06	19.98	20.70	19.91	20.17
Anand-2 (NC)	20.80	18.79	19.80	19.45	20.96	20.00	20.14	20.00
SE(m) ±		0.18		0.28	0.43	0.25		
C.D.(p=0.05)		0.54		NS	0.92	NS		
Phosphorus levels (kg/ha)								
60	20.60	18.76	19.68	18.77	20.61	20.30	19.89	19.81
80	21.90	18.73	20.32	19.35	20.77	20.60	20.24	20.27
100	22.60	18.87	20.74	19.60	21.04	20.00	20.21	20.42
SE(m) ±		0.18		0.28	0.43	0.29		
C.D.(p=0.05)		NS		NS	NS	NS		
Factor(A) at same level of B								
SE(m) ±				0.49	0.75	0.43		
C.D.(p=0.05)				1.48	NS	1.68		

R-21-AST-6 (g): Effect of phosphorus levels on Leaf stem ratio of promising entries of Annual Lucerne

Entries	Leaf stem ratio				
	NWZ	SZ			
	Bikaner	Hyderabad	Coimbatore	Mandya	Mean
LLC-6	1.34	0.62	0.68	0.73	0.84
RL-88 (NC)	1.19	0.52	0.65	0.66	0.76
Anand-2 (NC)	1.22	0.54	0.67	0.67	0.78
SE(m) ±	0.03	0.01	0.03	0.01	
C.D.(p=0.05)	0.09	0.04	NS	0.05	
Phosphorus levels (kg/ha)					
60	1.21	0.52	0.65	0.64	0.76
80	1.25	0.57	0.67	0.69	0.80
100	1.28	0.60	0.67	0.74	0.82
SE(m) ±	0.03	0.01	0.03	0.02	
C.D.(p=0.05)	NS	0.04	NS	0.06	
Factor(A) at same level of B					
SE(m) ±		0.02	0.06	0.02	
C.D.(p=0.05)		NS	NS	NS	

Table R-21-AST-6 (i): Interaction effect of entries and phosphorus levels on green fodder dry matter yield at Mandya

Entries	GFY (q/ha)				DMY (q/ha)			
	Phosphorous levels (Kg/ha)				Phosphorous levels (Kg/ha)			
	60	**80**	**100**	**Mean**	**60**	**80**	**100**	**Mean**
LLC-6	313.5	383.9	420.1	**372.5**	70.8	105.4	130.8	**102.3**
RL-88 (NC)	254.7	297.8	356.7	**303.1**	50.4	73.3	101.1	**74.9**
Anand-2 (NC)	295.8	327.1	326.5	**316.5**	61.1	77.4	86.2	**74.9**
Mean	**288.0**	**336.3**	**367.8**		**60.8**	**85.3**	**106.0**	
	Varieties	**Phosphorous**	**Interaction**	**Interaction**	**Varieties**	**Phosphorous**	**Interaction**	**Interaction**
			P X V	**V X P**			**P X V**	**V X P**
SE(m) ±	5.19	11.50	8.99	17.07	1.46	3.49	2.53	5.15
C.D.(p=0.05)	20.93	35.83	NS	NS	5.89	10.89	NS	NS

CHAPTER-3

FORAGE CROP PROTECTION

FORAGE CROP PROTECTION

PPT-1: Monitoring of diseases and insect pests in Rabi forage crops

Objective: To record the occurrence and abundance of major diseases and insect-pests in Berseem, Lucerne and Oat.

Locations: Ludhiana, Rahuri, Palampur, Jhansi, Bhubaneswar

Plot size: 4x4 m^2 per crop **Replication:** 4 per crop

Observations: Disease/insect-pest progression on rabi forages starting from date of appearance till crop maturity at weekly interval on 10 randomly selected plants/replication/crop using standard rating scale and calculation of disease severity/incidence/insect damage.

Results:

Ludhiana

Stem rot on berseem was observed on variety BL-43. Its appearance was first observed in end of December. Disease progressed at faster rate till first week of April with maximum disease incidence of 61.7% due to favourable weather conditions. Leaf blight of oat was appeared on OL-11 variety in the 1st week of January. Disease development was fast upto first week of April with highest disease severity of 49.3%. Downy mildew of Lucerne on variety LLC 5 was observed in the first week of January, 2022. Disease progressed at faster rate till first week of April. Highest disease severity was 44.7% (Table Ludhiana PPT1a).

Entomological observations:

The population of lepidopteran insect pests green semilooper, *Trichoplusia orichalcea*, gram caterpillar, *Helicoverpa armigera* and *Spodoptera exigua* was recorded under unprotected conditions from berseem plots by counting the number of larvae per meter row length starting from the time of appearance of pest (from mid-February till mid May). The population of oat aphid was recorded from the plots of oat varieties by counting the number of aphids per tiller at weekly intervals from February till March. Observations on number of lucerne weevils per plant and *H. armigera* larvae per m row length were also recorded from mid-February to mid-May on lucerne crop (Tables Ludhiana PPT 1b-1d).

Table Ludhiana PPT1a: Monitoring of diseases associated with Berseem, Lucerne and Oat ecosystems

Crop	Disease	Percent Disease Incidence / Severity observed in different standard meteorological weeks														
		Standard meteorological weeks														
		52	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Berseem	Stem Rot (*Sclerotinia trifoliorum*)	4.1	7.7	11.8	17.2	26.2	27.5	34.4	42.6	46.3	53.4	55.4	56.3	60.4	60.8	61.7
Oat	Leaf Blight (*Drechslera avenae*)		5.2	6.7	8.7	10.4	15.4	21.2	26.5	30.7	34.8	39.9	43.0	45.2	48.2	49.3
Lucerne	Downy Mildew (*Peronospora trifoliorum*)			2.0	4.8	8.2	11.4	15.7	22.6	27.1	32.6	38.0	40.8	42.0	44.1	44.7

*DOA: Date of appearance

Table Ludhiana PPT1b: Population dynamics of insect pests associated with *rabi* forages: Incidence of lepidopteran insect pests in different varieties of berseem

Variety	**No. of *T. orichalcea* larvae per m row length**													
	7	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
BL-10	0	0.1	0.33	0.66	1.00	1.00	1.66	1.33	0.66	0.33	0.33	0	0	0
BL-42	0.10	0.33	0.33	0.66	1.00	1.33	1.66	1.00	0.66	0.33	0	0	0	0
	No. of *H. armigera* larvae per m row length													
BL-10	0	0	0	0	0	0.33	1.00	1.33	2.66	3.66	3.66	2.66	1.66	1.00
BL-42	0	0	0	0	0.10	0.33	1.33	1.33	2.33	3.33	3.66	2.66	1.33	0.66
	No. of *Spodoptera exigua* larvae per m row length													
BL-10	0	0	0	0	0	0	0	0.33	0.50	0.66	0.50	0.50	0.33	0.33
BL-42	0	0	0	0	0	0	0	0.33	0.50	0.66	0.50	0.33	0.33	0.33

Table Ludhiana PPT1c: Incidence of insect pests in Lucerne

No. of lucerne weevils per plant												
7	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
0.33	0.66	1.00	1.33	1.66	2.00	2.00	1.33	1.00	0.33	0	0	0
No. of *H. armigera* larvae per m row length												
0	0	0	0	0	0.33	0.66	0.66	1.00	1.66	1.00	0.66	0.33
No. of *Spodoptera exigua* larvae per m row length												
0	0	0	0	0	0.33	0.33	0.66	0.66	1.00	0.66	0.33	0.33

Table Ludhiana PPT1d: Incidence of oat aphid (*Rhopalosiphum padi*) in different varieties of oats

Variety	**No. of aphids per tiller**								
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
OL-10	0	0.33	0.66	1.33	3.66	3.00	2.66	2.33	1.00
Kent	0	0.66	0.66	1.66	4.00	3.66	3.00	2.33	0.83

Rahuri

Lucerne

Aphids: The population of pea aphid (*Acyrthosiphon pisum*) was noticed on lucerne during December (2.20 aphids/tiller) and increased steadily at its peak level upto March, 2022 (76 aphids/tiller). Thereafter the decreasing trend of pea aphid population noticed upto April (3.40 aphids/tiller). Population of cowpea aphid (*Aphis craccivora*) observed on Lucerne during 2nd week of January (4.60 aphids/tiller) and reached at its peak during March with 143 aphids/tiller. Thereafter, decreasing trend of aphid population was observed. Simultaneously, population of spotted aphid (*Therioaphis maculata*) observed on Lucerne during November, 2021 (2.60 aphids/tiller) and reached at its peak during March, 2022 with 342 aphids/tiller. During the aphid infestation, population of predatory lady bird beetles was observed low to high level (0.40 to 9.60 grubs/tiller) (Table Rahuri PPT1a).

Lepidopteran pests: The *Spodoptera litura* become major and regular pests on Lucerne during summer season. Larval population was noticed during January with 0.20 larva/m^2. Thereafter, population increased steadily and reached to its peak population (5.60 larvae/m^2) during March, 2022. After that the population of *S. litura* was declined and recorded minimum population (2.20 during April). The population of *H. armigera* was noticed on lucerne seed crop during February, 2022 (0.60 larva/m^2) and showed increasing trend up to April, 2022 with high pest population of 4.20 larvae/m^2. After that population declined and showed minimum population during April, 2022 (4.00 larvae/m^2) (Table Rahuri PPT1a).

Rust: Rust (caused by the fungus *Uromyces striatus*) severity was noticed on lucerne crop during 2nd week of January (6.2%) and showed increasing trend up to Marchwith high disease severity of 52.3%. After that severity declined (Table Rahuri PPT1a).

Oat

Aphid: Periodic abundance of oat aphid (*Rhopalosiphum padi* L.) was observed during the investigation. The data on average number of aphids per tiller recorded from December 2021 to March, 2022 in the range of 0.80 to 320 aphids/tiller. The population increased at faster rate and reached its peak (320 aphids/tiller) during the February, 2022. Then it started declining and recorded nil aphid population at the end of observations (Table Rahuri PPT1b).

Natural enemies

C. carnea

The population of *Chrysoperla carnea* was observed in the range of 0.40 to 2.40 per tiller throughout the crop period. The maximum population noticed during the sever infestation of aphids on oat.

Coccinellid predators

The initial population of LBB (*Coccinella septempunctata*, *Coccinella sexmaculata*) grub and adults was recorded during January with 0.80 grub/tiller. The population of the grubs increased very slowly with its maximum (4.20 grubs/tiller) level during 7th MW of February. Thereafter, the population of the grubs started decreasing and disappeared from second week of March, 2022.

Berseem

Aphids

The population of pea aphid (*Acyrthosiphon pisum*) noticed on berseem during January (0.40 aphids/tiller) and increased steadily at its peak level up to the February (3.80 aphids/tiller). Thereafter, the decreasing trend of pea aphid population noticed up to 13th March, 2022 (0.20 aphids/tiller). Population of cowpea aphid (*Aphis craccivora*) observed on berseem during December (0.80 aphids/tiller) and reached at its peak during February with 3 aphids/tiller. Thereafter decreasing trend of aphid population was observed. Population of spotted aphid (*Therioaphis maculata*) observed on berseem during December, 2021 (0.60 aphids/tiller) and reached at its peak during February with 23 aphids/tiller. During the aphid infestation, population of predatory lady bird beetles was at low to moderate level (0.20 to 2.80 grubs/tiller) (Table Rahuri PPT1c).

Lepidopteran pests

In berseem crop, lepidopteran pests (i.e. *Spodoptera litura*, *Helicoverpa armigera*, Hairy caterpillar, *Spilosoma obliqua*) were not observed throughout the crop period.

Table Rahuri PPT1a: Population dynamics of insect pests associated with *rabi* forages: Incidence of insect pests in Lucerne

SMW	No. aphids/tiller				Lady bird beetle grubs/tiller	No. of larvae/m²		Rust severity (%)
	Pea aphid (*Acyrthosiphon pisum*)	Cowpea aphid (*Aphis craccivora*)	Spotted aphid (*Therioaphis maculata*)	Total		*S. litura*	*H. armigera*	
44	0.00	0.00	2.60	2.60	0.40	0.00	0.00	0.00
45	0.00	0.00	2.00	2.00	0.60	0.00	0.00	0.00
46	0.00	0.00	2.20	2.20	1.00	0.00	0.00	0.00
47	0.00	0.00	1.20	1.20	1.80	0.00	0.00	0.00
48	0.00	0.00	2.40	2.40	0.80	0.00	0.00	0.00
49	2.20	0.00	1.80	4.00	0.40	0.00	0.00	0.00
50	1.80	0.00	1.80	3.60	0.60	0.00	0.00	0.00
51	1.80	0.00	1.80	3.60	1.20	0.00	0.00	0.00
52	1.80	0.00	2.20	4.00	1.00	0.00	0.00	0.00
1	2.00	0.00	1.40	3.40	1.00	0.00	0.00	0.00
2	6.00	4.60	2.80	13.40	2.20	0.00	0.00	6.2
3	4.80	11.60	1.80	18.20	1.20	0.20	0.00	10.4
4	13.00	24.00	17.60	54.60	3.20	0.40	0.00	14.0
5	32.40	51.40	26.40	110.20	3.40	1.00	0.00	22.2
6	47.00	63.00	63.60	173.60	3.80	1.20	0.60	30.5
7	52.60	68.80	74.20	195.60	4.20	2.00	1.00	37.7
8	61.00	92.00	131.00	284.00	4.40	2.60	1.20	45.2
9	76.00	143.00	181.00	400.00	7.20	3.20	2.00	52.3
10	48.40	68.00	282.00	398.40	8.20	4.00	2.80	40.0
11	29.40	42.00	342.00	413.40	9.60	4.80	3.20	31.0
12	18.20	27.80	254.00	300.00	6.00	5.60	3.60	18.6
13	6.60	6.80	182.00	195.40	5.60	3.40	4.00	12.3
14	11.00	5.00	115.00	131.00	4.00	2.40	4.20	10.7
15	9.80	4.40	74.00	88.20	3.20	2.20	4.00	8.20
16	3.40	3.60	37.40	44.40	3.00	0.00	0.00	6.00

Table Rahuri PPT1b: Population dynamics of insect pests associated with *rabi* forages: Incidence of insect pests in Oat

Standard meterological week	No. aphids/tiller	Natural enemies/tiller		
		C. carnea	Lady Bird Beetle grubs	Syrphid fly larvae
49	0.00	0.00	0.00	0.00
50	0.00	0.00	0.00	0.00
51	0.80	0.00	0.00	0.00
52	1.40	0.00	0.00	0.00
1	4.40	0.40	0.80	0.00
2	6.80	0.80	1.00	0.00
3	17.20	1.00	2.10	1.00
4	31.60	1.00	2.20	1.20
5	92.20	1.40	3.00	1.40
6	168.00	2.00	3.00	2.00
7	320.00	2.30	4.20	2.10
8	202.00	2.40	3.10	0.80
9	134.00	2. 00	1.20	0.00
10	77.00	1.20	0.80	0.00
11	31.80	1.00		

Table Rahuri PPT1c: Population dynamics of insect pests associated with *rabi* forages: Incidence of insect pests in Berseem

SMW	No. aphids/tiller				Lady bird beetle grubs/tiller
	Pea aphid (*Acyrthosiphon pisum*)	Cowpea aphid (*Aphis craccivora*)	Spotted aphid (*Therioaphis maculata*)	Total	
49	0.00	0.00	0.00	0.00	0.00
50	0.00	0.00	0.00	0.00	0.00
51	0.00	0.80	0.60	1.40	0.20
52	0.00	1.00	1.80	2.80	0.80
1	0.00	1.60	1.40	3.00	0.60
2	0.40	2.20	1.60	4.20	1.40
3	0.40	1.60	1.60	3.60	1.40
4	0.60	1.20	7.80	9.60	1.60
5	1.80	3.00	18.60	23.40	1.80
6	3.80	1.40	23.00	28.20	2.40
7	3.60	1.00	17.00	21.60	2.60
8	1.80	0.80	11.20	13.80	2.80
9	0.20	1.20	9.60	11.00	2.00
10	1.40	0.60	5.40	7.40	1.40
11	1.00	0.00	3.00	4.00	1.20
12	0.40	0.00	3.00	3.40	1.20
13	0.20	0.00	3.00	3.20	1.00

Palampur: Oat crop was severely affected by powdery mildew (45% severity), followed by leaf blights (18%) and sucking pests (16%). In berseem, low incidence of root rot (5%), moderate intensity of leaf spot (12%) and defoliating beetles (3%) was observed. Defoliating beetles (12%) and leaf spot (14%) was observed on Lucerne (Table Palampur PPT-1).

Bhubaneswar: In Oat, maximum leaf blight recorded was 50.6% and maximum root rot incidence was 24.4%. Maximum leaf defoliators were recorded 7.6/10 plants. The Berseem leaf spot and blight severity recorded 38.4% towards 1st week of February, whereas root rot incidence was 30.0% during last week of January. Maximum defoliator recorded was 6.4/10 plants in 4th meteorological week (Table Bhubaneswar PPT-1).

Coimbatore: In Lucerne, the major pests observed were leaf folder, leaf miner, aphids and stink bug. Apart from that natural enemies viz., coccinellids and rove beetles were also observed. The leaf folder incidence was noticed from first week of October to third week of June. Leaf folder incidence was less when compared to leafminor damage. The maximum incidence of leaf folder was noticed during second week of May (0.30 larvae/plant). Leaf miner percent damage was ranged from 0.00 to 25.00. The maximum percent damage of 25% was recorded in March, 2022. Aphid population was less than one number per plant during October to March. The population ranged from 0.7 to 1.50 during March-June. Stink bug was noticed throughout the observation period and it was ranged from 0.2 to 0.4 number/plant.

Coccinellid beetles (*Cheilomenes sexmaculata*) recorded minimum during Novembr-December. During April-May the population was 0.30/plant. Rove beetle population was recorded from February onwards and the population ranged from 15.00 to 30.00 number/plant. Damage symptom of Fall armyworm was noticed in Bajra Napier and minimum leaf folder damage was noticed in *Cenchrus* sp. (Table Coimbatore PPT-1).

Jhansi: In Berseem, incidence of stem rot started from 4th week of January and continued to increase up to 3rd week of February with a maximum disease incidence of 27.8%. In Oat, leaf blight was the major disease and it appeared during 3rd week of January and maximum severity of 71.5% was observed during 2nd week of March (Table Jhansi PPT-1).

Table Palampur PPT-1: Monitoring of diseases and insect pests associated with berseem, Lucerne and oat ecosystem

Crop	Diseases/ insect-pests	Percent Disease Incidence / Severity observed in different standard meteorological weeks									
		Standard meteorological week									
		9	10	11	12	13	14	15	16	17	Max
Oats	Powdery mildew (*Blumeria graminis* f. sp. *avenae*)	9	15	20	25	25	39	40	45	45	45
	Leaf blight (*Drechslera avenae*)	8	8	10	10	12	15	16	16	18	18
	Aphids & Thrips	6	10	15	16	16	-	-	-	-	16
Berseem	Root rot (*Rhizoctonia solani*)	4	5	-	-	-	-	-	-	-	5
	Leaf spot (*Curvularia trifolii*)	2	5	5	10	10	12	-	-	-	12
	Defoliating beetles	-	-	-	1	2	2	3	3	3	3
Lucerne	Leaf spot (*Pseudopeziza medicaginis*)	6	8	10	10	12	12	14	14	14	14
	Defoliating beetles	-	-	2	3	5	10	12	12	12	12

Table Bhubaneswar PPT-1: Monitoring of diseases and insect pests associated with berseem and oat ecosystem

Crop/insect-pest and disease	Percent Disease Incidence / Severity observed in different standard meteorological weeks									
	Standard meteorological week									
Oat	**48**	**49**	**50**	**51**	**52**	**1**	**2**	**3**	**4**	**5**
Leaf blight (*Drechslera avenae*)	-	-	5.8	12.6	20.2	32.4	38.0	42.2	47.4	50.6
Root rot (*Sclerotium rolfsii*)	-	4.6	6.2	10.2	17.8	20.6	24.4	-	-	-
Leaf defoliators (No./10 Plants)	-	-	2.4	4.6	6.6	6.8	7.0	7.2	7.6	-
Berseem										
Leaf spot & blight (*Curvularia trifolii*)	-	-	4.8	6.8	11.2	14.6	21.6	26.6	34.2	38.4
Root rot (*Rhizoctonia solani*)	-	-	4.0	7.2	11.8	16.2	20.8	24.4	30.0	-
Leaf defoliators (No./10 Plants)	-	-	2.4	2.6	3.6	4.4	5.0	5.2	6.4	-

Table Coimbatore PPT-1: Seasonal occurrence of the insect pests and diseases on Rabi forage crops

SMW	Leaf folder Mean No. of Larvae/plant	Leaf miner (% damage)	Aphids Mean No. of aphids / plant	Stink bug Mean No. of nymphs and adults/plant	Natural enemies		Fall armyworm (% damage)	Leaf folder (% damage)
					Coccinellid beetle Mean no. of grubs and adult/plant	Rove beetles Mean no. of adults/plant		
Lucerne							**Bajra Napier**	***Cenchhrus sp.***
40	0.07	10.00	0.50	0.30	0.10	0.00	0.00	0.00
41	0.03	5.00	0.40	0.20	0.20	0.00	0.00	0.00
42	0.07	5.00	0.50	0.30	0.20	0.00	0.00	0.00
43	0.07	10.00	0.40	0.20	0.10	0.00	0.00	0.00
44	0.03	5.00	0.40	0.30	0.20	0.00	0.00	0.00
45	0.10	10.00	0.20	0.40	0.10	0.00	0.00	0.00
46	0.03	0.00	0.20	0.50	0.10	0.00	0.00	0.00
47	0.17	5.00	0.30	0.40	0.20	0.00	0.00	0.00
48	0.03	10.00	0.30	0.20	0.10	0.00	0.00	0.00
49	003	5.00	0.20	0.30	0.00	0.00	0.00	0.00
50	0.07	5.00	0.30	0.30	0.00	0.00	0.00	0.00

51	0.03	10.00	0.20	0.20	0.10	0.00	0.00	0.00
52	0.10	10.00	0.10	0.20	0.20	0.00	0.00	0.00
1	0.03	5.00	0.30	0.20	0.00	0.00	0.00	0.00
2	0.03	10.00	0.20	0.30	0.10	0.00	0.00	0.00
3	0.10	15.00	0.20	0.30	0.00	0.00	0.00	0.00
4	0.10	15.00	0.20	0.30	0.10	0.00	0.00	0.00
5	0.03	10.00	0.30	0.20	0.20	0.00	0.00	0.00
6	0.17	15.00	0.30	0.40	0.10	0.00	0.00	0.00
7	0.13	20.00	0.30	0.40	0.00	0.00	0.00	0.00
8	0.17	15.00	0.20	0.30	0.10	0.00	0.00	0.00
9	0.13	20.00	0.20	0.40	0.20	15.00	0.00	0.00
10	0.20	25.00	0.60	0.70	0.10	13.00	0.00	0.00
11	0.23	20.00	0.80	0.90	0.20	15.00	0.00	0.00
12	0.23	25.00	0.80	0.70	0.20	20.00	0.00	0.00
13	0.20	20.00	0.80	0.70	0.30	22.00	0.00	0.00
14	0.23	0.00	1.20	1.20	0.10	25.00	0.00	0.00
15	0.27	0.00	1.10	1.30	0.30	30.00	0.00	0.00
16	0.27	20.00	1.20	1.20	0.30	30.00	0.00	0.00
17	0.23	5.00	1.20	1.30	0.20	25.00	0.00	0.00
18	0.23	5.00	1.20	1.40	0.30	30.00	0.00	0.00
19	0.27	5.00	1.10	1.30	0.30	25.00	5.00	1.00
20	0.30	0.00	1.30	1.30	0.20	25.00	7.00	2.00
21	0.10	0.00	1.30	1.30	0.30	30.00	5.00	2.00
22	0.13	0.00	1.20	1.50	0.30	25.00	4.00	1.50
23	0.07	10.00	1.20	1.30	0.30	30.00	0.00	0.00
24	0.03	5.00	1.20	0.80	0.20	25.00	0.00	0.00
25	0.07	10.00	1.20	0.70	0.30	30.00	0.00	0.00

Table Jhansi PPT-1: Monitoring of diseases and insect pests associated with berseem and oat ecosystem

Crop/insect-pest and disease	Percent Disease Incidence / Severity observed in different standard meteorological weeks									
	Standard meteorological week									
	1	2	3	4	5	6	7	8	9	10
Oat										
Leaf blight (*Drechslera avenae*)	0.0	0.0	6.8	19.4	33.5	45.2	58.6	65.9	68.2	71.5
Berseem										
Stem rot (*Sclerotinia trifoliorum*)	0	0	0	2.6	9.5	18.3	27.8	-	-	- -

PPT-2: Evaluation of Rabi forage crops breeding materials for prevalent diseases and insect pests under natural conditions

Objective: Screening of various contributed entries along with national and zonal checks for their reaction to diseases and insect pests under natural conditions using standard disease/insect-pest rating scales.

Locations: Ludhiana, Rahuri, Palampur, Bhubaneswar, Coimbatore, Jhansi

Crops: Berseem, Oat, Lucerne, white clover, red clover

Results:

BERSEEM

IVTB: Initial Varietal Trial in Berseem

At Ludhiana, All the entries showed moderately resistant disease reaction to stem rot of berseem. All the entries showed moderate larval population of *Helicoverpa armigera* with non-significant differences. **At Rahuri,** all the entries were found moderately susceptible to aphids except BB-2, HFB-18-9, BM-13 and PC-115. **At Palampur,** incidence of root rot of berseem was low during the season and all the entries including checks were resistant to root rot. **At Bhubaneswar,** all the entries showed resistant to moderately resistant disease reaction except JB- 08-19, which showed moderately susceptible reaction to leaf blight.

Combined AVT 1 and AVT 2 in Berseem

At Ludhiana, all the entries showed moderately resistant disease reaction to stem rot. All the entries showed moderate larval population of *Helicoverpa armigera* with non-significant differences. **At Rahuri,** all the entries were found moderately susceptible to aphids except BB-2. **At Palampur,** incidence of root rot of berseem was low during the season and all the entries including checks were resistant to root rot. **At Bhubaneswar,** JHB-20-2 and wardan were moderately susceptible and rest were resistant to moderately resistant against leaf spot and blight.

AVTB-2 (Seed): Second Advanced Varietal Trial in Berseem (Seed)

At Ludhiana, all the entries showed moderately resistant disease reaction to stem rot. All the entries showed moderate larval population of *Helicoverpa armigera* with non-significant differences. **At Palampur,** incidence of root rot of berseem was low during the season and all the entries including checks were resistant to root rot. **At Rahuri,** all the entries were found moderately susceptible against aphids except JB-07-15 which was moderately resistant.

Table: Disease –pest tolerance in IVT Berseem trial

Entries	Ludhiana			Palampur		Bhubaneswar			Rahuri	
	Stem rot incidence (%)	Reaction	*H. armigera*/ m row length	Root rot (% incidence)	Reaction	Leaf spot & blight	Reaction	Leaf defoliators	Mean no. of aphids/tiller	Reaction
HFB 18-3	29.5	MR	2.66	5	R	4.33	R	1.87	45.27	MS
BB-2 (ZC- CZ)									13.13	MR
BL-44 (ZC-NWZ, NEZ)	25.5	MR	2.66			24.13	MR	5.33		
BL-22 (ZC- HZ)				3	R					
HFB-18-9	28.7	MR	3.00	3	R	22.54	MR	6.54	18.60	MR
JB- 08-19	26.1	MR	3.33	3	R	32.87	MS	7.67	26.27	MS
BM-13	27.0	MR	3.00	4	R	6.67	R	2.54	19.33	MR
PC-115	25.5	MR	2.66	7	R	8.33	R	3.24	13.67	MR
Wardan (NC)	25.5	MR	3.00	6	R	6.62	R	3.78	28.47	MS

Table: Disease –pest tolerance in Combined AVT-1 and 2 Berseem trial

Entries	Ludhiana			Palampur		Rahuri		Bhubaneswar		
	Stem rot Incidence (%)	Reaction	Larvae of *H. armigera*/ m row length	Root rot (% incidence)	Reaction	Mean No. of aphids/tiller	Reaction	Leaf spot & blight	Reaction	Leaf defoliators
BM-14	29.5	MR	3.33	4	R	37.40 (6.16)	MS	4.67	R	1.62
JB-08-17	20.5	MR	3.00	4	R	30.93 (5.61)	MS	18.87	MR	3.67
JHB-20-1	23.5	MR	2.66	9	R	26.27 (5.17)	MS	14.64	MR	3.87
JHB-20-2	26.8	MR	2.66	6	R	26.40 (5.19)	MS	33.34	MS	6.33
Wardan (NC)	27.7	MR	3.33	5	R	24.40 (4.99)	MS	31.87	MS	5.42
PC 114	23.0	MR	3.00	5	R	20.80 (4.62)	MS	11.14	MR	3.67
JB-07-15	29.0	MR	3.00	8	R	34.00 (5.87)	MS	8.33	R	2.86
BB-2 (ZC- CZ, NWZ)	28.0	MR	3.33			17.33 (4.22)	MR			
BL-22 (ZC- HZ)				5	R					
BB-2 (ZC- NEZ)								4.64	R	2.54

Table: Disease –pest tolerance in AVT-2 Berseem (Seed) trial

Entries	Ludhiana			Palampur		Rahuri	
	Stem rot incidence (%)	Reaction	Larvae of *H. armigera*/ m row length	Root rot	Reaction	Mean No. of aphids/tiller	Reaction
Wardan (NC)	25.5	MR	3.66	3	R	29.68 (5.49)	MS
JB-07-15	29.0	MR	3.33	9	R	16.16 (4.08)	MR
BB-2 (ZC- CZ, NWZ)	26.7	MR	3.33			30.48 (5.57)	MS
BL-22 (ZC- HZ)				7	R		
BM-14	27.8	MR	3.66	7	R	23.76 (4.93)	MS

OAT

IVTO (SC): Initial Varietal Trial in Oat (Single Cut)

At Ludhiana, all entries showed low resistant disease reaction to leaf blight. **At Rahuri,** all the entries were found susceptible to aphids (*Rhopalosiphum padi*). **At Palampur,** JHO-21-2, SKO-225, OL-1967 and JHO-21-1 were moderately resistant while others were susceptible to powdery mildew. **At Bhubaneswar**, all the entries showed resistant to moderately resistant disease reaction except JHO-21-2, which showed lower resistance reaction to leaf spot and blight, Sclerotium root rot and infestation by leaf defoliator. **At Jhansi,** JHO-21-2 was resistant and UPO-21-1 was low susceptible; rest all entries were in low resistant or mesothetic category against leaf blight.

IVTO-MC: Initial Varietal Trial in Oat (Multi Cut)

At Ludhiana, all entries showed low resistant disease reaction. **At Rahuri,** all the entries were found susceptible to aphids (*Rhopalosiphum padi*). **At Palampur,** JHO-21-4, PLP-29, OL-1969 and OL-1931-2 were moderately resistant while others were susceptible to powdery mildew. **At Bhubaneswar**, all the entries showed resistant to moderately resistant disease reaction except UPO-212 and JHO-21-4, which showed lower resistance reaction to leaf spot and blight, Sclerotium root rot and infestation by leaf defoliator. **At Jhansi,** OL-1931-2 was moderately resistant and rest all entries were in low resistant or mesothetic category against leaf blight.

IVTO (DUAL): Initial Varietal Trial in Oat (Dual)

At Ludhiana, all entries were found low resistant to leaf blight. **At Rahuri,** all the entries were found susceptible to aphids (*Rhopalosiphum padi*). **At Bhubaneswar**, all the entries showed resistant to moderately resistant disease reaction except JHO-822 and JHO-21-5, which showed lower resistance reaction to leaf spot and blight, Sclerotium root rot and infestation by leaf defoliator. **At Jhansi,** all entries were in low resistant or mesothetic category against leaf blight.

Table: Disease –pest tolerance in IVT oat (SC) trial:

Entries	Bhubaneswar				Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	*Sclerotium* root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	Leaf Blight score	Reaction	No. of Aphids/ tiller	Reaction
UPO-21-1	11.24	R	6.33	4.23	35.5	LR	4.00	30	S	6.0	LS	175.67	S
BAUO-105	3.33	HR	4.42	3.67	37.8	LR	4.66	28	S	4.7	M	265.47	S
HFO-1113	24.42	MR	8.14	6.62	40.1	M	3.66	32	S	5.0	M	217.80	S
JHO-21-2	32.13	LR	8.67	7.42	30.0	LR	4.00	20	MR	1.3	R	244.60	S
SKO-225 (ZC-HZ)								15	MR				
OL- 1896 (ZC-NEZ, NWZ, CZ, SZ)	4.27	HR	3.54	2.27	31.2	LR	4.33			4.3	M	335.67	S
BAUO-102	8.67	R	5.33	4.33	42.2	M	4.33	28	S	4.0	LR	220.33	S
OL-1988	22.87	MR	7.67	6.34	41.0	M	4.00	30	S	3.7	LR	227.80	S
OL-1967	7.14	HR	4.11	3.87	38.5	LR	5.00	25	MR	4.2	M	219.27	S
NDO-1925	13.67	R	6.27	5.67	33.4	LR	4.33	40	S	3.3	LR	314.00	S
HFO-1101	7.62	HR	3.11	3.42	30.0	LR	4.66	26	S	3.7	LR	280.33	S
JHO-21-1	6.42	HR	4.13	3.87	37.7	LR	4.66	18	MR	4.4	M	318.40	S
JO-08-41	3.67	HR	3.23	2.67	34.5	LR	4.33	30	S	4.0	LR	250.53	S
OL-1931-1	17.27	MR	7.42	6.64	40.1	M	4.66	36	S	4.5	M	287.67	S
SKO-245	15.33	R	6.13	5.13	41.2	M	4.33	40	S	3.3	LR	244.73	S
OS-6 (NC)	4.67	HR	3.87	2.42	34.5	LR	4.66	35	S	4.1	M	250.53	S

Table: Disease –pest tolerance in IVT oat (MC) trial

Entries	Bhubaneswar				Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	*Sclerotium* root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	Leaf blight score	Reaction	No. of Aphids/ tiller	Reaction
BAUO-103	21.33	MR	6.12	6.33	43.5	M	4.33	35	S	3.3	LR	144.40	S
FO-21-2	26.87	MR	7.33	8.67	34.5	LR	4.66	40	S	3.1	LR	175.93	S
HFO-1121	24.11	MR	7.67	7.42	42.0	M	5.00	35	S	3.7	LR	173.67	S
UPO-212 (NC)	34.67	LR	8.11	9.33	40.5	M	4.33	32	S	4.0	LR	96.80	MS
JHO-21-4	30.23	LR	8.42	8.67	32.0	LR	4.66	24	MR	3.4	LR	175.73	S
UPO-21-2	3.12	HR	3.64	2.42	33.5	LR	4.33	30	S	4.0	LR	154.53	S
BAUO-104	16.67	R	4.23	6.33	34.5	LR	4.66	32	S	3.7	LR	176.00	S
JO-08-335	14.33	R	4.67	5.67	30.2	LR	4.66	40	S	4.5	M	262.60	S
OL-1975	24.87	MR	7.12	7.23	40.5	M	4.33	34	S	4.3	M	255.60	S
HFO-1123	15.42	R	5.33	5.42	37.0	LR	4.00	29	S	4.8	LR	225.13	S
JHO 21-3	6.23	HR	3.64	3.11	31.5	LR	4.33	27	S	4.0	LR	222.20	S
PLP-29	23.87	MR	6.42	7.67	30.3	LR	4.66	24	MR	3.6	LR	191.73	S
OL-1969	10.87	R	4.12	3.42	33.0	LR	4.00	15	MR	3.7	LR	189.47	S
OL-1931-2	12.24	R	4.34	4.33	60.1	MS	4.33	25	MR	2.7	MR	146.00	S
RO-19 (NC)	3.33	HR	2.42	2.11	40.5	M	4.00	35	S	4.0	LR	138.67	S
FO-21-1	4.67	HR	2.33	3.87	38.9	LR	4.33	36	S	4.7	M	144.40	S

Table: Disease –pest tolerance in IVT oat (Dual) trial

Entries	Bhubaneswar				Ludhiana			Jhansi		Rahuri	
	Leaf blight Severity (%)	Reaction	*Sclerotium* root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Leaf blight score	Reaction	No. of Aphids/ tiller	Reaction
HFO-1108	3.12	HR	4.67	3.87	37.5	LR	4.00	4.3	M	176.33	S
JHO-822 (NC)	34.33	LR	10.12	8.64	34.0	LR	4.33	4.0	LR	161.33	S
OL-1967-1	21.16	MR	7.67	5.32	33.0	LR	4.33	4.0	LR	211.40	S
UPO-21-3	4.34	HR	3.62	2.13	31.5	LR	4.00	4.6	M	96.07	MS
OL-1982-2	24.67	MR	8.11	6.23	40.1	M	4.33	3.7	LR	166.00	S
JHO-21-5	32.54	LR	12.67	9.54	38.9	LR	4.33	4.2	M	158.33	S
HFO-1119	6.33	HR	4.33	3.67	42.5	M	4.00	4.3	M	146.93	S
UPO-212 (NC)	3.24	HR	3.23	2.11	35.0	LR	4.33	4.0	LR	94.67	MS
OL-1874-2	11.67	R	6.42	5.67	32.0	LR	4.66	4.1	M	207.67	S
JHO-21-6	16.53	R	5.67	4.27	31.5	LR	4.66	3.3	LR	200.00	S
JO-13-518	27.26	MR	8.54	6.11	37.5	LR	4.66	3.9	LR	188.47	S

Combined AVTOSC-1 and AVTOSC-2: Combined advanced varietal trial 1 and 2 in Oat (Single cut) trial

At Ludhiana, all entries were found low resistant to leaf blight. **At Rahuri,** all the entries were found susceptible to aphids. **At Palampur,** JO-07-28 and JO-08-37 were moderately resistant to powdery mildew and rests were found susceptible. **At Bhubaneswar**, all the entries showed resistant to moderately resistant disease reaction to leaf blight, Sclerotium root rot and infestation by leaf defoliator. **At Jhansi,** RO-11-1 and HFO-1009 were moderately resistant to leaf blight and rest all entries were in low resistant category.

AVTO (SC)-2 (Seed): Second Advanced Varietal Trial in Oat (Single Cut) for seed

At Ludhiana, all entries were found low resistant to leaf blight. **At Rahuri,** all the entries were found susceptible to aphids. **At Palampur,** HFO-904 and JO-07-28 were moderately resistant to powdery mildew and rests were found susceptible. **At Jhansi,** all entries were in low resistant category against leaf blight.

Table: Disease –pest tolerance in Combined AVTOSC-1 and AVTOSC-2 oat (SC) trial

Entries	Bhubaneswar				Ludhiana			Palampur		Rahuri		Jhansi	
	Leaf blight Severity (%)	Reaction	*Sclerotium* root rot (%)	Leaf defoliators (no./10 plants)	Leaf Blight Severity (%)	Reaction	No. of Aphids /tiller	Powdery mildew severity (%)	Reaction	No. of Aphids / tiller	Reaction	Leaf Blight Score	Reaction
OS-403 (ZC -NWZ, NEZ, SZ)	3.67	HR	3.23	1.67	30.1	LR	4.66						
RO-11-1 (ZC-CZ)										209.33	S	3.0	MR
JO-07-28	20.33	MR	11.26	8.00	34.5	LR	4.33	15	MR	209.27	S	3.7	LR
OL-1980	24.11	MR	12.87	8.13	33.0	LR	4.66	29	S	249.67	S	3.8	LR
JO-08-37	8.42	HR	2.12	5.87	36.0	LR	4.66	22	MR	241.40	S	4.0	LR
OS-6 (NC)	13.33	R	6.14	6.12	34.0	LR	4.00	30	S	239.20	S	3.3	LR
SKO-244	4.67	HR	4.42	2.67	45.0	M	4.66	34	S	251.13	S	3.5	LR
HFO-904	4.54	HR	3.67	2.33	33.2	LR	4.00	28	S	190.27	S	3.9	LR
HFO-1009	5.23	HR	4.33	4.12	31.5	LR	4.66	36	S	202.67	S	3.0	MR
OL-1977	3.67	HR	2.84	1.33	45.6	M	4.33	40	S	132.20	S	3.7	LR
HFO-906	12.14	MR	8.42	7.03	30.5	LR	4.66	35	S	275.67	S	3.2	LR
HFO-1013	28.33	MR	10.67	8.12	50.1	LS	4.00	43	S	269.67	S	3.8	LR
HFO-1003	16.11	R	8.32	8.33	32.0	LR	4.66	35	S	165.80	S	4.0	LR
Kent (NC)	16.87	R	8.16	6.11	51.5	LS	4.66	40	S	136.93	S	4.0	LR
JHO-20-1	14.23	R	7.12	5.23	31.5	LR	4.00	28	S	147.07	S	3.5	LR
SKO-225 (ZC-HZ)								35	S				

Table: Disease –pest tolerance in AVTO (SC)-2 (Seed) trial

Entries	Ludhiana			Palampur		Rahuri		Jhansi	
	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	No. of Aphids/ tiller	Reaction	Leaf Blight Severity (%)	Reaction
HFO-904	34.0	LR	4.33	24	MR	156.25	S	3.7	LR
HFO-906	33.5	LR	4.66	38	S	227.73	S	4.0	LR
OS-403 (ZC -NWZ, NEZ, SZ)	37.0	LR	4.66						
RO-11-1 (ZC-CZ)						210.00	S	3.3	LR
SKO-225 (ZC-HZ)				36	S				
OS-6 (NC)	31.0	LR	4.66	28	S	230.07	S	3.5	LR
JO-07-28	30.2	LR	4.33	21	MR	224.47	S	3.9	LR
Kent (NC)	35.0	LR	4.66	30	S	165.53	S	4.0	LR

AVTO (MC)-1: First Advanced Varietal Trial in Oat (Multi Cut)

At Ludhiana, all entries showed low resistant disease reaction to leaf blight. **At Palampur,** all the entries were found susceptible to powdery mildew.

AVTO (MC)-2: Second Advanced Varietal Trial in Oat (Multi Cut)

At Palampur, JO-07-310 showed moderately resistant disease reaction to powdery mildew. **At Rahuri,** all the entries were susceptible to aphids. **At Jhansi,** all entries were in low resistant category against leaf blight except PLP-24 which gave mesothetic reaction.

AVTO-1-DUAL: First Advanced Varietal Trial in Oat (Dual)

At Ludhiana, all entries showed low resistant disease reaction to leaf blight. **At Bhubaneswar,** all the entries showed resistant to moderately resistant disease reaction to leaf blight, Sclerotium root rot and infestation by leaf defoliator.

Table: Disease –pest tolerance in AVTO-1 (MC) trial

Entries	Ludhiana			Palampur	
	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction
HFO-915	41.0	M	4.00	35	S
JHO-20-3	33.6	LR	4.33	35	S
RO-19 (NC)	30.5	LR	4.33	40	S
UPO-212 (NC)	31.0	LR	4.66	38	S
PLP-27	41.5	M	4.33	32	S
JO-08-329	30.5	LR	4.66	35	S
OL- 1949	35.8	LR	4.66	40	S
UPO-20-2	40.1	M	4.33	38	S

Table: Disease –pest tolerance in AVTO-2 (MC) trial

Entries	Palampur		Jhansi		Rahuri	
	Powdery mildew severity (%)	Reaction	Leaf blight score	Reaction	No. of Aphids/ tiller	Reaction
JO-07-310	25	MR	4.0	LR	150.00	S
RO-19 (NC)	28	S	3.7	LR	169.20	S
UPO-212 (NC)	25	MR	4.0	LR	98.32	MS
PLP-24	35	S	4.3	M	192.00	S

Table: Disease –pest tolerance in AVTO-1-(Dual) trial

Entries	Ludhiana			Bhubaneswar			
	Leaf Blight Severity (%)	Disease Reaction	No. of Aphids/tiller	Leaf blight Severity (%)	Reaction	*Sclerotium* root rot (%)	Leaf defoliators (no./10 plants)
OL-1931	34.5	LR	3.66	11.23	R	6.67	5.33
JO-03-513	30.5	LR	4.00	3.11	HR	1.42	3.14
UPO-212 (NC)	36.5	LR	4.33	6.33	HR	4.13	4.64
JHO-20-2	34.0	LR	4.00	16.42	R	8.33	8.13
JHO-822 (NC)	32.0	LR	4.00	5.67	HR	4.12	4.33
HFO-1014	38.2	LR	4.33	14.12	R	6.16	7.67
HFO-917	31.5	LR	4.00	4.87	HR	2.33	3.78

IVT Lucerne: Initial Varietal Trial in Lucerne

At Ludhiana, all the entries were moderately susceptible to downy mildew. **At coimbatore,** all the entries were resistant to leaf miner.

Table: Disease –pest reaction in IVT Lucerne trial

Entry	Ludhiana		Coimbatore	
	Downy mildew severity (%)	**Disease Reaction**	**Leaf miner (No. of larvae/plant)**	**Reaction**
VT Lucerne-1	28.9	MS	0.13	R
VT Lucerne-2	33.1	MS	0.14	R
VT Lucerne-3	30.0	MS	0.14	R
VT Lucerne-4	29.5	MS	0.15	R
VT Lucerne-5	31.2	MS	0.13	R

AVT-2 in Lucerne: Second Advanced Varietal Trial in Lucerne

At Ludhiana, all the entries were moderately susceptible to downy mildew. **At coimbatore,** all the entries were resistant to leaf miner.

Entry	Ludhiana				Coimbatore	
	Downy mildew severity (%)	**Disease Reaction**	**Lucerne weevil/ plant**	***H. armigera*/ metre row length**	**Leaf miner (No. of larvae/plant)**	**Reaction**
LLC-6	25.5	MS	1.36	1.66	0.57	R
Anand-2 (NC)	28.4	MS	1.30	1.33	0.29	R
RL-88 (NC)	30.1	MS	1.46	1.66	0.43	R

IVT Summer Bajra: At Rahuri, no diseases and insect-pests were observed.

AVT-1 Summer Bajra: At Rahuri, no diseases and insect-pests were observed.

PPT-31: Validation of best treatments of the trial "Eco-friendly pest management techniques in berseem ecosystem"

Location: Ludhiana
Design: Paired plot **Replication:** 7 **Plot size:** 10x10 m^2
Treatments:

T1:	Soil application of *Trichoderma viride*@ 1kg/25kg FYM/acre + foliar spray of NSKE @ 5%+ Chickpea as trap crop on border row + Bird perches
T2:	Soil application of *Trichoderma viride*@ 1kg/25kg FYM/acre + foliar spray of NSKE @ 5%
T3:	Control

Observations:

- Number of larvae (*H. armigera* or other lepidopteran larvae) per meter row length on berseem crop.
- Number of larvae/ plant on trap crop.
- Activity of natural enemies on trap as well as berseem crop.
- Disease incidence.
- Green fodder yield and seed yield.
- Economics.

Results: The experiment was conducted for the evaluation of eco-friendly disease and pest management techniques in berseem. The results showed that T1 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + Chickpea as trap crop on border row + Bird perches) exhibited least disease incidence of stem rot (21.10%) with 57.0 percent disease control as compared to control (49.07%) and 16.87 percent increase in green fodder yield. Likewise, treatment T2 provided 50.80 percent disease control with 13.80 percent increase in green fodder yield respectively as compared to untreated control. The number of *H. armigera* larvae per metre row length were minimum in T1 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + chickpea as trap crop on border row + Bird perches) as compared to T1 and T3 (control).The B:C ratio was high in T1 (2.66) as compared to T2 (2.60).

Table PPT 31: Evaluation of eco-friendly disease and pest management techniques in berseem

Treatments	Stem rot Incidence (%)	Disease Control (%)	*H. armigera* larvae/ m row length in berseem	Coccinellids	Spiders	Green Fodder Yield (q/ha)	Percent Increase	Seed Yield (q/ha)	B:C ratio
T1	21.10^{c}	57.00	2.43^{a}	2.20^{b}	1.30^{ab}	591.71^{a}	16.87	3.93^{a}	2.66
T2	24.14^{b}	50.80	4.28^{b}	2.60^{a}	1.30^{ab}	576.14^{b}	13.80	3.26^{b}	2.60
T3	49.07^{a}		7.00^{c}	3.00^{a}	1.60^{a}	506.29^{c}		2.54^{c}	
CD (P=0.05)	1.591		0.58	NS	NS	4.174		0.331	
SE ±(m)	0.511		0.25	0.18	0.21	1.340		0.106	
CV	4.298		12.40	10.92	13.68	0.635		8.553	

PPT-34: Validation of best treatment of trial entitled "Integrated disease management in berseem"

Location: Ludhiana, Bhubaneswar, Palampur, Jhansi

Design: Paired plot **Replication:** 7 **Plot size:** 10x10 m^2

Treatments:

Ludhiana

- **T1:** Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%
- **T2:** Seed treatment with carbendazim @ 0.2 % + foliar spray of Chitosan @ 0.05 %
- **T3:** Control

Palampur

- **T1:** Seed treatment with carbendazim @ 0.2 % + foliar spray of carbendazim @ 0.1 %
- **T2:** Seed treatment with carbendazim @ 0.2 % + foliar spray of Chitosan @ 0.05 %
- **T3:** Control

Jhansi

- **T1:** Seed treatment with *Trichoderma* @ 0.5% + foliar spray of Chitosan @ 0.05 %
- **T2:** Seed treatment with carbendazim @ 0.2 % + foliar spray of carbendazim @ 0.1 %
- **T3:** Control

Bhubaneswar

- **T1:** Seed treatment with Chitosan @ 0.05 % + carbendazim @ 0.1%
- **T2:** Seed treatment with carbendazim @ 0.2 % + foliar spray of carbendazim @ 0.1 %
- **T3:** Control

Target disease: root rot, stem rot, leaf blight

Observations:

- Severity/incidence of diseases.
- Green fodder yield and seed yield.
- Economics

Results:

At Ludhiana, T1 (Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%) showed least stem rot incidence (18.21%) with 63.57 percent disease control and 17.46 percent increase in green fodder yield as compared to control (50.0%). T2 (Seed treatment with carbendazim @ 0.02 % + foliar spray of Chitosan @ 0.05%) provided 21.79 percent stem rot incidence with 14.10 percent increase in green fodder yield respectively. The B:C ratio was high (2.57) in T1 as compared to untreated control (2.43).

At Palampur, T2 (Seed treatment with carbendazim @ 0.2 % + foliar spray of Chitosan @ 0.05 %) showed least root rot incidence (1.00%) and least leaf blight severity (1.93%) with 87.83 and 85.16 percent disease control and 4.65 percent increase in green fodder yield as compared to control. The B:C ratio was 4.6 in T2 as compared to 3.3 in T1.

At Bhubaneswar, T2 (Seed treatment with carbendazim @ 0.2% + foliar application of Carbendazim @ 0.1%) was found the best in reducing the foliar disease by 80.7%, root rot by 59.4% increasing the yield by 28.8% over control. The BC ratio recorded was 1.66 and 1.42 in T2 and T1 respectively (Table PPT 34c).

At Jhansi, T1 (Seed treatment with *Trichoderma* @ 0.5% + foliar spray of Chitosan @ 0.05 %) and T2 (Seed treatment with carbendazim @ 0.2 % + foliar spray of carbendazim @ 0.1 %) were at par with each other in terms of stem rot incidence (16.1% and 15.7% respectively) and green fodder yield (287.80q/ha and 282.20 q/ha) compared to control (24.7% incidence and 243.50q/ha yield). Seed yield in T1 (Seed treatment with *Trichoderma* @ 0.5% + foliar spray of Chitosan @ 0.05 %) was significantly higher (4.16q/ha) compared to T2 (3.97q/ha) and control (3.40q/ha). The B:C ratio was highest in T2 (1.27) as compared to T1 (1.08) and untreated control (0.98).

Table PPT 34a: Validation of best treatment of trial entitled "Integrated disease management in berseem"

	Treatments	Stem rot Incidence (%)	Disease Control (%)	Green Fodder Yield (q/ha)	Percent Increase	Seed Yield (q/ha)	B:C ratio
T_1	Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%	18.21[c]	63.57	618.86[a]	17.46	5.60[a]	2.57
T_2	Seed treatment with carbendazim @ 0.02 % + foliar spray of Chitosan @ 0.05 %	21.79[b]	56.43	601.14[b]	14.10	5.00[b]	2.49
T_3	Control	50.00[a]		526.86[c]		4.10[c]	2.43
CD (P=0.05)		1.375		9.602		0.236	
SE ±(m)		0.441		3.082		0.076	
CV		3.892		1.396		4.027	

Table PPT-34b: Validation of best treatment of trial entitled "Integrated disease management in berseem"

Treatment	Root rot		Leaf Blight		GFY		B:C ratio
	% Incidence	% control	% Severity	% control	Q/ha	% increase	
T1= Seed treatment with carbendazim @ 0.2 % + foliar spray of carbendazim @ 0.1 %	1.71	79.13	3.14	75.82	352.71	6.28	1: 3.3
T2 = Seed treatment with carbendazim @ 0.2 % + foliar spray of Chitosan @ 0.05 %	1.00	87.83	1.93	85.16	347.29	4.65	1: 4.6
T3 =Control	8.21	-	13.00	-	331.86	-	
CD (5%)	0.63		0.82		3.17		
CV	14.72		11.57		0.78		
SE (M)±	0.20		0.26		1.02		

Table PPT-34c: Validation of best treatment of trial entitled "Integrated disease management in berseem"

	Treatments	Leaf blight severity (%)	Disease reduction (%)	Root rot (%)	Disease reduction (%)	GFY (q/ha)	Increase over check (%)	BC Ratio
T_1	Seed treatment with chitosan@0.05% + Carbendazim @0.1%	22.19	45.0	4.57	75.2	395.47	22.4	1.42
T_2	Seed treatment with carbendazim @ 0.2% + foliar application of Carbendazim @0.1%	7.77	80.7	7.47	59.4	416.36	28.8	1.66
T_3	Control	4.37	-	18.40	-	323.21	-	-
	SE (m)+	1.8	-	0.7	-	2.5	-	-
	CD (5%)	5.5	-	2.1	-	7.9	-	-
	CV(%)	19.8		17.5		10.8		-

Table PPT-34d: Validation of best treatment of trial entitled "Integrated disease management in berseem"

Treatments		Stem rot Incidence (%)	Disease Control (%)	Green Fodder Yield (q/ha)	Percent Increase	Seed Yield (q/ha)	B:C ratio
T_1	Seed treatment with *Trichoderma* @ 0.5% + foliar spray of Chitosan @ 0.05 %	16.1[b]	34.68	287.80[b]	18.19	4.16[a]	1.08
T_2	Seed treatment with carbendazim @ 0.2% + foliar application of Carbendazim @0.1%	15.7[b]	36.42	282.20[b]	15.89	3.97[b]	1.27
T_3	Control	24.7[a]		243.50[a]		3.40[c]	0.98
CD (P=0.05)		1.29		6.98		0.15	
CV		3.04		1.13		1.74	

PPT-35: Non chemical management of stem rot of berseem caused by *Sclerotinia trifoliorum*

Location: Ludhiana **Duration:** 4 years

Objective:
To find out antifungal botanicals and organic inputs against *Sclerotiniatrifoliorum* in vitro and their validation under field conditions

Botanicals to be tested: *Ocimum tenuiflorum*, *Ricinus communis*, *Curcuma longa*, *Nicotiana tabacum*, *Murraya koenigii*, *Melia azedarach*, *Azadirachta indica*, *Calotropis gigantean*, *Aegle marmelos*, *Cymbopogon citrates* and *Datura stramonium*

Organic inputs to be tested: Panchgavya, compost tea, NSKE

Methodology:

- Collection, isolation, identification and maintenance of stem rot pathogen (*Sclerotinia trifoliorum*)
- Collection, preservation and preparation of aqueous extracts of botanicals and organic inputs
- Screening of plant extracts and organic inputs against stem rot pathogen under *in vitro* conditions
- Evaluation of antifungal extracts and organic inputs against test pathogens in pot experiments
- Field evaluation of most effective antagonistic plant extracts and organic inputs against stem rot disease

Work plan for Year 2021-22:

Evaluation of antifungal extracts and organic inputs against test pathogens in pot experiments:
The plant extracts and organic inputs which showed strong antifungal activities against the test pathogens under in vitro will be screened under greenhouse in pot experiments.

Results:
The plant extracts and organic inputs showing strong antifungal activities against the test pathogens *in vitro* were screened in pot experiments. Lowest disease incidence was provided by panchgavya (18.33%) followed by Organic formulation 2 (19.33%), *Aegle marmelos* (22.67%) and *Cymbopogan citrates* (23.67%) at 10 % concentration (Table PPT-35).

Table PPT 35: Efficacy of plant extracts and organic formulations against stem rot pathogen

Sr. No.	Treatments	Stem rot incidence (%)			Disease control (%)
		10 DAI	20 DAI	30 DAI	
1	Leaf extract of *Curcuma longai* (10%)	2.83[a]	25.67[b]	32.00[b]	39.39
2	Leaf extract of *Murraya koenigii* (10%)	2.50[a]	24.83[bc]	29.50[b]	44.13
3	Leaf extract of *Aegle marmelos* (10%)	2.97[a]	16.33[d]	22.67[c]	57.07
4	Leaf extract of *Cymbopogan citrates* (10%)	2.53[a]	21.67[c]	23.67[c]	55.18
5	Panchgavya (10%)	2.23[a]	9.33[e]	18.33[e]	65.28
6	Organic Formulation-1 (10%)	2.43[a]	10.83[e]	22.00[cd]	58.33
7	Organic Formulation-2 (10%)	2.30[a]	9.83[e]	19.33[de]	63.38
8	Control	2.73[a]	31.83[a]	52.80[a]	
	CD (P=0.05)	NS	3.283	3.090	
	SE ± (m)	0.318	1.072	1.009	
	CV	21.483	9.879	6.347	

PPT-36: Assessment of yield losses due to insect-pests and diseases in Lucerne

Target Diseases: Crown rot, Rust, Downy mildew
Target insect-pest: Aphids, Weevil (*Hypera postica*), *Spodoptera litura*, *Helicoverpa armigera*

Location: Rahuri, Jhansi, Ludhiana
Treatments: 10 **Replications:** 3 **Design:** RBD
Duration: 2 years **Plot size:** 4x3 m^2 **Variety:** RL-88

Treatments Details
T1: Seed treatment with thiram @ 1g/kg of seed
T2: T1+ spray at 30, 55, 85, 115, 145 days after emergence (DAE)
T3: T1+ spray at 55, 85, 115, 145 DAE
T4: T1+ spray at 30, 85, 115, 145 DAE
T5: T1+ spray at 30, 55, 115, 145 DAE
T6: T1+ spray at 30, 55, 85, 145 DAE
T7: T1+ spray at 30, 55, 85, 115 DAE
T8: T1+ spray at 30, 55, 85 DAE
T9: Spray at 30, 55, 85, 115, 145 DAE
T10: Control
Treatment information:

- Seed treatment with thiram @1gm/kg seed for management of crown rot
- Spray at 30 DAE of imidacloprid 17.8 SL @ 0.3ml/lit of water for management of aphids
- Spray at 55 DAE of Propiconazole @ 1g /lit of water + Ridomil MZ @ 2.5 g/lit of water for management of rust and downy mildew
- Spray at 85 DAE of Quinalphos 25 EC @ 2 ml /lit of water for management of weevil

- Spray at 115 DAE of SlNPV 500 LE, 1000 million POBs/ml @1 ml / lit. of water for management of *Spodoptera litura*
- Spray at 145 DAE of HaNPV 500 LE, 1000 million POBs/ml @1 ml / lit. of water for management of *Helicoverpa armigera*

Observations:

- **Crown rot:** Disease incidence in 10 randomly selected plants/replication at weekly interval.
- **Aphids:** No. of aphids per tiller on 10 randomly selected tillers starting from pest emergence till pest presence on weekly interval.
- **Weevil:** No. of grubs and adult weevils per tiller on 10 randomly selected tillers starting from pest emergence till pest presence on weekly interval.
- **Diseases (Rust and downy mildew):** Disease severity in 10 randomly selected plants/replication at weekly interval starting from disease appearance till its presence.
- **Defoliators (*Helicoverpa armigera*, *Spodoptera litura*):** No. of larvae per tiller on 10 randomly selected tillers starting from pest emergence till pest presence on weekly interval.
- Green fodder yield (q/ha) in different treatments.
- Percent Yield loss in different treatments due to different diseases and insect-pests.

Results:

Rahuri

Aphids, rust, *Spodoptera litura* and *Helicoverpa armigera* were the major insect-pests and diseases (Table Rahuri PPT-36a; 36b; 36c; 36d; 36e).

Aphids started appearing after the first cut (20-January) and were observed to be present upto 6th cut (2-May). Aphid population ranged from 4.91 to 121.76 aphids/tiller. Cumulative average yield loss due to aphid was 6.84%.

Rust started appearing after the second cut (20-January) and was observed to be present upto 5th cut (9-April). Rust severity ranged from 3.48 to 25.96%. Cumulative average yield loss recorded due to rust was 12.21%.

Spodoptera litura started appearing after the 5th cut (16-April) and was observed to be present upto 7th cut (23-May). *S. litura* population ranged from 0.82 to 3.68 larvae/tiller. Cumulative average yield loss due to *S. litura* recorded was 6.15%.

Helicoverpa armigera started appearing after the 6th cut (9-May) and was observed to be present upto 7th cut (23-May). *H. armigera* population ranged from 1.86 to 5.20 larvae/tiller. Cumulative average yield loss due to *H. armigera* recorded was 8.70%.

Cumulative average yield losses due to defoliators (both *S. litura* and *H. armigera*) were 7.00%. Overall average yield losses due to insect-pest and diseases in control were 37.27%.

Ludhiana

Downy mildew and weevil were the major insect-pests and diseases (Table Ludhiana PPT-36a; 36b; 36c; 36d).

Downy mildew started appearing early (15-January) and was observed to be present upto 5-April. Downy mildew severity ranged from 2.8 to 40.00%. Cumulative average yield loss recorded due to downy mildew was 10.4%.

Weevil started appearing after the first cut (12-February) and was observed to be present upto 20-April. Weevil population ranged from 0 to 2.00 larvae/tiller. Cumulative average yield loss recorded due to weevil was 8.1%.

Overall average yield losses due to insect-pest and diseases were 16.7%.

Jhansi

Aphid and weevil were the major insect-pests (Table Jhansi PPT-36a; 36b).

Aphid started appearing early (31-January). Aphid population ranged from 2.7 to 6.1 aphids/tiller.

Weevil started appearing early (31-January) and was observed to be present upto 7 March. Weevil population ranged from 0.5 to 1.7 larvae/tiller. There was no significant yield difference in all the treatments as pest population was very low this year to cause any significant plant damage.

Table Rahuri PPT-36a: Mean no. of aphids/tiller during different observation periods in Lucerne

Treatment	20-Jan	28-Jan	04-Feb	10-Feb	28-Feb	25-Feb	05-Mar	12-Mar	20-Mar	27-Mar	03-Apr	09-Apr	16-Apr	24-Apr	02-May
T1	29.26^{e} (5.45)	32.25^{e} (5.72)	36.58^{e} (6.09)	46.39^{cd} (6.83)	82.23^{de} (9.09)	93.64^{cd} (9.69)	71.05^{c} (8.45)	89.38 ^{c} (9.48)	99.38 ^{c} (9.99)	52.72^{cd} (7.28)	60.72^{ab} (7.82)	63.76^{cd} (8.01)	36.06^{cd} (6.02)	51.61^{ab} (7.20)	56.94^{ab} (7.57)
T2	9.95^{c} (3.23)	12.95^{c} (3.66)	16.95^{ab} (4.17)	35.62^{ab} (6.00)	69.74^{ab} (8.38)	79.81^{ab} (8.95)	56.05^{a} (7.49)	69.72^{a} (8.37)	82.05 ^{a} (9.08)	40.71^{ab} (6.40)	53.07^{a} (7.31)	48.67^{a} (7.01)	29.34^{ab} (5.43)	47.93^{ab} (6.95)	47.69^{a} (6.94)
T3	32.94^{ed} (5.77)	37.01^{ed} (6.11)	41.34^{ed} (6.46)	47.93^{cd} (6.95)	75.17^{d} (8.70)	90.71^{cd} (9.54)	57.88^{ab} (7.62)	75.88^{ab} (8.74)	96.21^{ab} (9.83)	39.39^{ab} (6.29)	55.88^{ab} (7.50)	58.60^{ab} (7.68)	29.30^{ab} (5.46)	47.67^{ab} (6.94)	53.63^{ab} (7.34)
T4	14.06^{cd} (3.81)	17.07^{cd} (4.19)	21.41^{cd} (4.68)	40.28^{c} (6.38)	77.41^{c} (8.81)	87.26^{c} (9.35)	60.18^{ab} (7.77)	75.51^{ab} (8.71)	95.51^{ab} (9.79)	40.06^{ab} (6.35)	55.45^{ab} (7.46)	60.38^{ab} (7.79)	29.17^{ab} (5.41)	48.95^{ab} (7.08)	55.53^{ab} (7.47)
T5	6.25^{ab} (2.58)	9.26^{ab} (3.11)	13.59^{ab} (3.74)	34.34^{ab} (5.90)	64.93^{ab} (8.07)	81.94^{ab} (9.07)	66.26^{ab} (8.15)	81.59^{ab} (9.04)	98.26^{ab} (9.91)	50.39^{cd} (7.11)	68.19^{c} (8.28)	61.04^{ab} (7.83)	35.58^{cd} (5.98)	52.36^{ab} (7.27)	57.38^{ab} (7.60)
T6	6.09^{ab} (2.54)	8.42^{ab} (2.97)	12.75^{ab} (3.63)	32.96^{ab} (5.78)	68.39^{ab} (8.30)	88.58^{cd} (9.42)	59.08^{ab} (7.72)	74.41^{ab} (8.65)	94.74^{ab} (9.76)	40.72^{ab} (6.42)	54.52^{ab} (7.42)	62.95^{c} (7.96)	29.48^{ab} (5.47)	46.53^{ab} (6.84)	54.77^{ab} (7.43)
T7	4.91^{a} (2.24)	7.90^{a} (2.84)	12.56^{a} (3.59)	32.27^{a} (5.71)	62.24^{a} (7.91)	70.93^{a} (8.44)	63.64^{ab} (7.99)	78.31^{ab} (8.86)	98.31^{ab} (9.93)	45.31^{c} (6.74)	58.26^{ab} (7.64)	59.20^{ab} (7.73)	33.48^{c} (5.80)	49.67^{ab} (7.02)	54.11^{ab} (7.39)
T8	8.37^{ab} (2.88)	11.01^{ab} (3.34)	15.34^{ab} (3.95)	39.31^{ab} (6.31)	71.47^{ab} (8.48)	91.25^{cd} (9.57)	56.55^{ab} (7.55)	74.88^{ab} (8.67)	94.88^{ab} (9.76)	38.42^{ab} (6.23)	54.86^{ab} (7.43)	57.09^{ab} (7.56)	25.46^{ab} (5.08)	43.26^{ab} (6.22)	52.06^{ab} (7.22)
T9	11.36^{cd} (3.44)	14.34^{cd} (3.85)	19.34^{c} (4.45)	39.80^{ab} (6.35)	73.20^{ab} (8.58)	94.91^{cd} (9.76)	57.18^{ab} (7.57)	73.84^{ab} (8.62)	97.18^{ab} (9.88)	35.51^{a} (5.97)	53.87^{ab} (7.37)	59.48^{ab} (7.72)	22.54^{a} (4.78)	42.28^{a} (6.53)	48.04^{ab} (6.96)
T10	34.73^{ed} (5.93)	36.03^{ed} (6.04)	42.70^{ed} (6.56)	51.92^{e} (7.23)	83.74^{de} (9.16)	104.40^{cd} (10.23)	75.76^{cd} (8.72)	95.09^{cd} (9.77)	121.76^{cd} (11.05)	54.41^{cd} (7.39)	75.24^{cd} (8.69)	80.40^{e} (8.98)	40.38^{cd} (6.36)	67.01^{c} (8.21)	75.32^{c} (8.69)
SE±	0.30	0.24	0.23	0.22	0.25	0.30	0.26	0.25	0.29	0.25	0.26	0.31	0.28	0.34	0.30
CD	0.88	0.73	0.68	0.65	0.75	0.90	0.78	0.74	0.86	0.73	0.76	0.91	0.85	1.00	0.88
CV	13.51	10.12	8.37	5.99	5.14	5.57	5.76	4.86	5.04	6.46	5.77	6.78	8.84	8.31	6.91

Table Rahuri PPT-36b: Rust severity (%) during different observation periods in Lucerne

Treatment	20-Jan	28-Jan	04-Feb	10-Feb	28-Feb	25-Feb	05-Mar	12-Mar	20-Mar	27-Mar	03-Apr	09-Apr
T1	4.41[a]	9.27[ab]	12.60[c]	3.74[a]	10.27[ab]	17.60[ab]	5.39[cd]	11.94[c]	23.53[c]	2.97[ab]	8.06[ab]	11.63[ab]
T2	3.75[a]	7.39[ab]	9.72[ab]	3.08[a]	8.72[ab]	15.72[ab]	3.41[ab]	9.72[ab]	19.06[a]	2.34[ab]	7.45[ab]	10.45[ab]
T3	3.48[a]	7.59[ab]	9.59[ab]	2.81[a]	8.92[ab]	15.25[ab]	3.15[ab]	9.79[ab]	20.92[ab]	1.85[ab]	6.92[ab]	10.65[ab]
T4	5.35[a]	13.36[c]	15.69[ab]	4.69[a]	15.02[c]	20.69[c]	5.02[c]	15.36[d]	24.02[cd]	3.74[c]	10.33[c]	12.43[ab]
T5	3.81[a]	6.72[a]	8.72[a]	3.14[a]	8.06[a]	14.72[a]	3.47[ab]	9.39[ab]	20.06[ab]	2.45[ab]	8.91[ab]	10.28[ab]
T6	3.57[a]	7.37[ab]	9.04[c]	2.90[a]	8.70[ab]	15.04[ab]	2.24[a]	9.37[a]	19.70[ab]	1.65[a]	6.91[ab]	10.82[ab]
T7	3.69[a]	8.23[ab]	10.23[ab]	3.36[a]	9.56[ab]	16.89[ab]	3.69[ab]	10.23[ab]	20.56[ab]	2.30[ab]	8.02[ab]	10.42[a]
T8	3.93[a]	8.51[ab]	10.18[ab]	3.27[a]	9.84[ab]	16.84[ab]	3.60[ab]	10.18[ab]	20.51[ab]	2.36[ab]	7.61[ab]	10.44[ab]
T9	3.94[a]	7.88[ab]	9.21[ab]	3.27[a]	9.55[ab]	15.21[ab]	3.94[ab]	9.88[ab]	21.55[ab]	2.34[ab]	6.71[a]	10.07[ab]
T10	6.68[a]	14.25[cd]	19.30[cd]	5.35[a]	16.25[cd]	25.96[cd]	6.02[cd]	17.25[de]	31.63[e]	4.09[cd]	11.07[cd]	17.34[c]
SE±	0.89	1.11	1.53	0.57	1.17	1.47	0.74	1.06	1.96	0.48	0.88	1.42
CD	NS	3.29	2.55	NS	3.47	3.35	2.19	2.14	2.83	1.42	2.60	2.21
CV	16.00	21.20	13.23	18.52	19.30	14.59	16.94	16.21	15.34	14.81	18.48	16.42

*NS- Not significant

Table Rahuri PPT-36c: Mean no. of larvae/m² of *Spodoptera litura* and *Helicoverpa armigera* during different observation periods in Lucerne

Treatment	*Spodoptera litura*						*Helicoverpa armigera*		
	16-Apr	**24-Apr**	**02-May**	**9-May**	**17-May**	**23-May**	**9-May**	**17-May**	**23-May**
T1	1.01[a] (1.20)	1.54[ab] (1.42)	1.65[c] (1.45)	2.25[e] (1.64)	2.86[cd] (1.82)	3.56[cd] (2.00)	2.95[a] (1.84)	3.33 [c] (1.96)	4.11[c] (2.13)
T2	0.84[a] (1.15)	0.68[ab] (1.08)	0.93[ab] (1.16)	1.17[ab] (1.29)	0.97[ab] (1.20)	1.04[ab] (1.23)	2.34[a] (1.67)	1.87[ab] (1.49)	0.87[ab] (1.16)
T3	0.91[a] (1.18)	1.07[ab] (1.25)	0.83[ab] (1.15)	1.40[ab] (1.36)	0.89 [a] (1.18)	1.05[ab] (1.24)	2.48[a] (1.71)	1.15[a] (1.25)	0.62[a] (1.05)
T4	0.95[a] (1.20)	1.10[ab] (1.26)	0.94[ab] (1.19)	1.33[ab] (1.35)	1.22[ab] (1.30)	1.14[ab] (1.27)	2.01[a] (1.57)	1.63[ab] (1.41)	0.73[ab] (1.10)
T5	0.82[a] (1.15)	1.01[ab] (1.22)	0.85[ab] (1.11)	1.66[c] (1.47)	1.01[ab] (1.22)	0.96[ab] (1.20)	2.29[a] (1.64)	1.68[ab] (1.45)	0.80[ab] (1.14)
T6	1.16[a] (1.28)	1.41[ab] (1.37)	1.55[ab] (1.42)	2.45[cd] (1.71)	2.31[c] (1.67)	2.93[c] (1.84)	2.12[a] (1.60)	1.58[ab] (1.42)	0.62[ab] (1.05)
T7	0.92[a] (1.19)	0.98[a] (1.21)	0.73[a] (1.11)	0.95[a] (1.20)	0.94[ab] (1.19)	0.87[a] (1.17)	2.78[a] (1.80)	3.03[ab] (1.85)	4.69[cd] (2.26)
T8	1.15[a] (1.28)	1.31[ab] (1.34)	1.56[ab] (1.43)	2.19[cd] (1.64)	2.84[cd] (1.83)	2.99[cd] (1.86)	2.55[a] (1.71)	3.15[ab] (1.85)	4.30 (2.18)
T9	1.02[a] (1.23)	1.17[ab] (1.27)	0.93[ab] (1.19)	1.18[ab] (1.29)	1.12[ab] (1.26)	1.05[ab] (1.24)	1.86[a] (1.51)	1.24[ab] (1.28)	0.72[ab] (1.10)
T10	1.25[a] (1.32)	2.23[c] (1.64)	2.72[d] (1.79)	2.67[ef] (1.78)	3.07[cd] (1.88)	3.68[cd] (2.03)	3.01 [a] (1.86)	4.91[cd] (2.32)	5.20[cd] (2.38)
SE±	0.10	0.10	0.12	0.11	0.10	0.12	0.19	0.23	0.12
CD	NS	0.29	0.33	0.34	0.30	0.36	NS	0.68	0.36
CV	13.91	12.99	15.69	13.29	11.96	13.82	19.20	14.18	13.56

*NS- Not significant

Table Rahuri PPT-36d: Green fodder yield (q/ha) and associated yield loss compared to best treatment in different cuts in Lucerne

Treatments	Green fodder yield (q/ha) and associated yield loss compared to best treatment in each cut												
	1st cut	2nd cut	Yield loss (%)	3rd cut	Yield loss (%)	4th cut	Yield loss (%)	5th cut	Yield loss (%)	6th cut	Yield loss (%)	7th cut	Yield loss (%)
T1	6.10^{a}	50.33^{h}	26.99	53.28^{g}	26.26	51.67^{f}	31.64	63.44^{f}	15.44	58.22^{f}	19.42	54.61^{f}	27.56
T2	5.07^{a}	63.25^{e}	8.26	70.94^{ab}	1.81	75.58^{a}	0.00	72.72^{cd}	3.08	69.75^{cd}	3.46	71.56^{b}	5.09
T3	5.07^{a}	51.72^{g}	24.98	71.33^{ab}	1.27	71.89^{c}	4.88	74.72^{ab}	0.41	70.33^{c}	2.65	69.72^{bc}	7.52
T4	4.80^{a}	64.50^{cd}	6.45	56.39^{f}	21.95	71.39^{cd}	5.55	68.17^{e}	9.15	69.94^{cd}	3.19	75.39^{a}	0.00
T5	5.50^{a}	67.50^{ab}	2.10	71.94^{ab}	0.42	57.72^{e}	23.63	61.00^{g}	18.70	60.67^{e}	16.03	69.47^{d}	7.85
T6	5.20^{a}	68.94^{a}	-	72.25^{a}	-	75.00^{ab}	0.77	72.53^{cd}	3.33	69.56^{cd}	3.73	68.92^{dc}	8.59
T7	5.27^{a}	65.78^{c}	4.59	63.28^{e}	12.42	70.83^{cd}	6.28	72.33^{cd}	3.59	65.39^{e}	9.50	68.83^{dc}	8.70
T8	6.17^{a}	63.83^{cd}	7.41	65.44^{d}	9.42	73.78^{ab}	2.38	73.11^{c}	2.56	71.94^{ab}	0.42	58.83^{e}	21.96
T9	5.70^{a}	59.50^{f}	13.70	69.11^{c}	4.34	69.94^{e}	7.46	75.03^{a}	0.00	72.25^{a}	0.00	70.17^{bc}	6.93
T10	5.57^{a}	38.94^{i}	43.51	41.36^{h}	42.75	44.72^{g}	40.83	52.56^{h}	29.95	49.78^{g}	31.10	48.67^{g}	35.45
SE±	0.54	0.73		0.60		0.62		0.58		0.58		0.65	
CD @5%	NS	2.18		1.79		1.85		1.71		1.71		1.93	
CV%	17.36	17.84		13.70		13.59		12.13		12.64		14.27	

*NS- Not significant

Table Rahuri PPT-36e: Average cumulative yield loss due to different insect-pests and diseases in Lucerne at Rahuri

Insect-pests and disease	Average Yield loss (%)
Aphids	6.84
Rust	12.21
Spodoptera litura	6.15
Helicoverpa armigera	14.08
Spodoptera litura + Helicoverpa armigera	7.00
Control	37.27

Table Ludhiana PPT-36a: Downy mildew severity (%) during different observation periods in Lucerne

Treatment	15.1.22	22.1.22	29.1.22	05.02.22	18.02.22	25.02.22	05.03.22	18.03.22	25.03.22	05.04.22
T1	3.73[a]	11.40[abc]	25.60[c]	32.57[b]	15.83[b]	26.67[b]	28.73[c]	10.17[b]	16.67[ab]	21.33[ab]
T2	3.60[a]	9.17[c]	19.17[d]	23.67[d]	12.50[b]	19.83[de]	22.00[de]	8.00[bc]	13.67[bc]	14.33[c]
T3	2.80[a]	10.67[bc]	19.90[d]	24.17[d]	13.00[b]	21.00[cde]	22.33[de]	8.67[b]	14.17[abc]	15.50[c]
T4	3.70[a]	13.33[ab]	28.83[b]	29.37[c]	20.00[a]	27.00[b]	32.00[b]	12.67[a]	18.17[a]	23.00[a]
T5	3.50[a]	11.83[abc]	20.33[d]	25.83[d]	13.83[b]	21.67[cd]	23.33[de]	10.00[b]	15.00[abc]	17.33[bc]
T6	2.90[a]	13.67[ab]	20.40[d]	26.00[d]	14.80[b]	22.40[c]	23.67[d]	10.00[b]	16.00[abc]	18.23[bc]
T7	2.67[a]	10.67[bc]	20.00[d]	24.67[d]	13.17[b]	21.50[cd]	22.67[de]	9.00[b]	14.33[abc]	16.33[c]
T8	2.80[a]	13.00[ab]	18.00[d]	22.67[d]	12.50[b]	18.50[e]	20.33[e]	5.67[c]	12.17[c]	14.00[c]
T9	3.20[a]	12.33[abc]	20.17[d]	25.33[d]	13.33[b]	21.67[cd]	23.00[de]	9.33[b]	14.67[abc]	17.33[bc]
T10	3.37[a]	14.33[a]	34.33[a]	40.00[a]	20.83[a]	36.17[a]	38.40[a]	13.67[a]	16.00[abc]	25.00[a]
CD (P=0.05)	NS	2.975	2.924	3.20	3.375	2.234	2.871	2.089	NS	4.310
SE±(d)	0.390	0.994	0.976	1.069	1.127	0.746	0.959	0.698	1.304	1.439
CV	20.922	14.296	7.459	6.750	13.033	5.466	6.476	12.436	14.972	13.668

*NS- Not significant

Table Ludhiana PPT-36b: Weevil larvae/tiller during different observation periods in Lucerne

Treatment	7	8	9	10	11	12	13	14	15	16
T1	0.33	0.60[a]	1.00[b]	2.00[c]	0.93[b]	1.66[b]	1.32[c]	1.12[c]	0.84[b]	0.33[b]
T2	0.33	0.60[a]	0.17[a]	0[a]	0[a]	0.20[a]	0.16[a]	0.10[a]	0[a]	0[a]
T3	0.33	0.60[a]	0.17[a]	0[a]	0[a]	0.32[a]	0.22[a]	0.15[a]	0.10[a]	0[a]
T4	0.33	0.60[a]	0.23[a]	0[a]	0[a]	0.26[a]	0.18[a]	0.10[a]	0[a]	0[a]
T5	0.27	0.83[a]	1.83[d]	1.66[b]	1.00[b]	1.77[b]	0.82[b]	0.74[b]	0.72[b]	0.33[b]
T6	0.33	0.83[a]	0.26[a]	0[a]	0[a]	0.16[a]	0.08[a]	0[a]	0[a]	0[a]
T7	0.33	0.80[a]	0.20[a]	0[a]	0[a]	0.33[a]	0.16[a]	0.15[a]	0.10[a]	0.06[a]
T8	0.33	0.60[a]	0.23[a]	0[a]	0[a]	0.16[a]	0.12[a]	0.10[a]	0[a]	0[a]
T9	0.20	0.80[a]	0.21[a]	0[a]	0[a]	0.10[a]	0.05[a]	0[a]	0[a]	0[a]
T10	0.33	0.83[a]	1.00[c]	1.66[b]	1.66[b]	2.00[b]	1.66[c]	1.33[c]	0.66[b]	0.33[b]
CD (P=0.05)	NS	NS	0.20	0.54	0.26	0.47	0.29	0.16	0.23	0.19
SE±(d)	0.08	0.12	0.08	0.14	0.06	0.15	0.08	0.05	0.06	0.05
CV	18.2	17.5	21.5	20.7	22.1	24.5	22.0	24.8	18.3	19.4

*NS- Not significant

Table Ludhiana PPT-36c: Green fodder yield (q/ha) and associated yield loss compared to best treatment in different cuts in Lucerne

Treatment	Green fodder yield (q/ha) and associated yield loss compared to best treatment in each cut							
	1st cut	Yield loss (%)	2nd cut	Yield loss (%)	3rd cut	Yield loss (%)	4th cut	Yield loss (%)
T1	145.00^{fg}	9.4	152.00^{d}	11.1	162.67^{ef}	7.4	154.33^{d}	16.7
T2	156.00^{b}	2.5	170.00^{a}	0.6	173.67^{ab}	1.2	175.00^{b}	5.6
T3	153.33^{bc}	4.2	167.67^{ab}	1.9	172.67^{ab}	1.7	169.67^{c}	8.4
T4	142.00^{g}	11.3	150.33^{d}	12.1	162.00^{f}	7.8	145.00^{e}	21.7
T5	148.67^{de}	7.1	162.33^{c}	5.1	166.67^{cde}	5.1	159.00^{d}	14.2
T6	147.33^{ef}	7.9	160.67^{c}	6.0	165.33^{def}	5.9	156.00^{d}	15.8
T7	151.33^{cd}	5.4	165.33^{bc}	3.3	169.67^{bc}	3.4	167.67^{c}	9.5
T8	160.00^{a}	0.0	171.00^{a}	0.0	175.67^{a}	0.0	185.33^{a}	0.0
T9	149.67^{de}	6.5	163.00^{c}	4.7	168.00^{cd}	4.4	165.00^{c}	11.0
T10	133.67^{h}	16.5	148.00^{d}	13.5	152.00^{g}	13.5	142.00^{e}	23.4
CD (P=0.05)	3.119		4.397		5.079	4.732	4.732	
SE±(d)	1.042		1.469		1.696	1.580	1.580	
CV	1.213		1.580		1.761	1.691	1.691	

Table Ludhiana PPT-36d: Average cumulative yield loss due to different insect-pests and diseases in Lucerne at Ludhiana

Insect-pests and disease	Average Yield loss (%)
Downy mildew	10.4
Weevil	8.1
Control	16.7

Table Jhansi PPT-36a: Mean no. of aphids/tiller during different observation periods in Lucerne

Treatments	Aphids/tiller			Weevil larvae/tiller			
	31-Jan	7-Feb	28-Feb	31-Jan	7-Feb	28-Feb	7-Mar
T1	3.57[a]	5.1	5.8	0.7	1.6	0.7	0.7
T2	2.70[d]	4.9	5.8	0.6	1.5	0.9	0.9
T3	3.20[abcd]	5.1	6.0	0.5	1.5	1.0	1.0
T4	3.03[bcd]	4.9	5.9	0.7	1.2	0.8	0.8
T5	3.27[abc]	5.0	6.0	0.6	1.6	0.8	0.8
T6	3.47[ab]	5.0	6.1	0.6	1.6	0.8	0.8
T7	3.30[abc]	4.6	5.9	0.6	1.4	0.8	0.8
T8	3.03[bcd]	5.2	6.1	0.7	1.7	0.9	0.9
T9	3.17[abcd]	5.3	6.1	0.8	1.5	0.9	0.9
T10	2.93[cd]	5.2	6.0	0.7	1.7	0.7	0.7
CD	0.51	NS	NS	NS	NS	NS	NS
CV	9.49						

*NS- Not significant

Table Jhansi PPT-36b: Green fodder yield (q/ha) and associated yield loss compared to best treatment in different cuts in Lucerne

Treatment	*Green fodder yield (q/ha) and associated yield loss compared to best treatment in each cut		
	1st Cut	2nd cut	3rd cut
T1	50.00	36.67	43.06
T2	51.67	43.33	43.89
T3	49.44	42.22	45.56
T4	47.50	58.33	53.33
T5	46.94	45.83	48.89
T6	51.67	40.28	46.94
T7	48.61	42.50	57.06
T8	47.50	42.78	57.78
T9	51.67	44.44	56.67
T10	42.50	36.94	46.94
CD (P=0.05)	*NS	NS	NS

*NS- Not significant

PPT-3: Development of *Trichoderma* mediated biocontrol strategy for managing leaf blight (*Drechslera avenae*) disease in Oat

Location: Ludhiana, Jhansi, Palampur, Bhubaneswar

Duration: 4 years

Aim:

To find out suitable *Trichoderma* isolate against *Drechslera avenae in vitro* and their validation under field conditions

Objectives:

1. Collection, isolation, identification and maintenance of leaf blight pathogen (*Drechsleraavenae*) from Ludhiana, Jhansi, Palampur and Bhubaneswar.
2. Isolation and characterization of *Trichoderma* isolates from rhizospheric soil of Oat collected from different oat growing areas (Punjab, Maharashtra, Himachal Pradesh, Odisha, and Uttar Pradesh) of India.
3. Screening of different *Trichoderma* isolates against leaf blight pathogen under *in vitro* conditions.
4. Evaluation of promising *Trichoderma* isolates against leaf blight disease in pot experiments.
5. Field evaluation of most effective antagonistic *Trichoderma* isolate against leaf blight disease.

Results:

During 2021-2022, leaf blight infected leaf samples of oat were collected from Ludhiana, Palampur, Bhubaneswar, Rahuri and Jhansi. The infected leaf samples were then sent in paper envelops to the PC-unit. Symptoms were initial small brown oval lesions along leaf veins surrounded by a reddish-purple margin which later coalesced and gives blotch like appearance on the leaf. Infected leaf tissues were taken to laboratory and placed in moist chambers in 16 h light/8 h dark cycle for 48 h at 21°C to induce conidiogenesis. Single conidia from different leaf samples were transferred aseptically onto potato dextrose agar medium and incubated for 10 days at 21 °C. Resulting fungal colonies produced similar fluffy aerial olivaceous grey mycelia growth along with milky white to grayish mycelial tufts. The morpho-cultural characteristics observed were similar to *Drechslera avenae* [Eidam] Scharif (Ellis, 1971), the anamorph of *Pyrenophora chaetamioides* Speg. (Sivanesan, 1987). From infected leaf tissues, a total of 18 isolates of *Drechslera avenae* (3 from Ludhiana, 2 isolates from Jhansi, 7 from Palampur, 4 from Rahuri and 2 from Bhubaneswar) were isolated, purified and maintained for further studies.

Soil samples from oat rhizosphere were collected and sent to PC-unit. From these soil samples, the serial dilution method was used for isolation of *Trichoderma* sp. Isolated fungal strains were cultured on potato-dextrose-agar (PDA; Himedia, Mumbai, India). Pure cultures of each strain were obtained by inoculation of conidia taken from the growing edge of colony on PDA using a fine sterilized needle. Till now, soil samples obtained from Palampur and Ludhiana have been proceesed and *Trichoderma* sp. from these locations have been isolated, purified and maintained for further studies.

PPT-5: Bio intensive management of defoliator insect pests in Lucerne

Objective: To develop bio-based strategy for managing defoliators (*S. litura* and *H. armigera*) in Lucerne

Locations: Rahuri, Coimbatore

Treatments: 9 **Replications:** 3 **Design:** RBD

Plot size: 4x4 m^2 **Variety:** RL-88

Treatments:

T1: Spray of NSKE 3000 ppm @ 2ml/ litre of water
T2: Spray of *Metarhizium* (*Nomuraea*) *rileyi* (1 x10^8 CFU/g) 1.15 WP @ 5 g/lit of water
T3: Spray of *Metarhizium anisopliae* (1 x10^8 CFU/g) 1.15 WP @ 5 g/lit of water
T4: Transplanting of marigold seedling 50 cm apart around and on ridges of field one month after sowing
T5: Installation of 'T' shaped perches for birds @ 2 m distance.
T6: Installation of pheromone traps @ 10-12 traps/ha for S. litura and *H. armigera*.
T7: Spray of *HaNPV*and *SlNPV* 1000 million POBs/ml @ 1 ml/ litre of water
T8: Spray of chlorpyriphos 20EC @ 2 ml/liter of water
T9: Untreated Control

Note: Foliar spray will be given just after the first appearance of the pest in the pheromone traps.

Observations:

- No. of larvae per tiller at 5 randomly selected spots in one running meter starting from pest emergence till pest presence at weekly interval.
- No. of larvae per tiller at 5 randomly selected spots in one running meter before and after 5, 10 and 14 days after spray in different treatments.
- Population of natural enemies (also identify the natural enemies) in different treatments before and after 5, 10 and 14 days after spray.
- Green fodder yield (q/ha) in different treatments.

Results:

At Rahuri

The initial larval population of defoliators (*S. litura* and *H.armigera)* /m^2 before spraying was non-significant and ranged from 4.27 to 4.51 larvae in different treatments. At 5 days after spraying, treatment with chlorpyriphos 20EC recorded statistically lower (1.63 larvae/m^2) number of larval population of defoliators than other treatments. However, this treatment was at par with NSE 3000 ppm, 'T' shaped birds perches and *Nomuraea rileyi* 1.15 WP. These treatments recorded 1.89, 2.59 and 3.12 average number of larvae per square metre area, respectively. The next promising treatment was *HaNPV* and *SlNPV* 500 LE/ha which recorded 3.58 larvae/m^2. The larval population of defoliators at 10 days after spray indicated that the treatment with *Nomuraea rileyi* 1.15 WP recorded lesser (1.93 larvae/m^2) number of larvae per square metre area. However, this treatment was at par with *Metarhizium anisopliae* 1.15 WP, *HaNPV* and *SlNPV* 500 LE/ha, 'T' shaped birds perches, chlorpyriphos 20EC, NSE 3000 ppm and pheromone traps10-12 ha/ha. These treatments recorded 2.04, 2.12, 2.37, 2.55, 2.58 and 3.13 average number of larvae per square metre area, respectively.

At 14 days after spraying, *HaNPV* and *SlNPV* 500 LE/ha was highly promising against defoliator larvae (1.28 larva/ m^2) and it was at par with *Nomuraea rileyi* 1.15 WP (1.58 larvae) and *Metarhizium anisopliae* 1.15 WP (1.70 larvae). The next promising treatment was 'T' shaped birds perches which recorded 1.89 larvae per square metre area. Spraying of *Ha*NPV and *Sl*NPV@ 500 LE/ha gave significantly higher yield (57.50q/ha) compared to other treatment and control (Table PPT-5a).

At Coimbatore

Sowing was taken on 10.01.2022. The plots were randomised as per treatments (9) and replicated as per proceedings. Pheromone traps for *Helicoverpa armigera* and *Spodoptera litura* and bird perches were installed after first harvest and the lure for pheromone trap was changed once in fifteen days. During April 2022, adults of *H. armigera* (1 No.) and *S. litura* (3 Nos.) were observed in pheromone traps. But no larvae were recorded and no adult moths were trapped subsequently, hence treatments were not imposed. Data on green fodder yield is provided in Table PPT-5b.

Table 5a. Evaluation of different components against *Spodoptera litura* and *Helicoverpa armigera*

Treatments	Av. survival population of *S. litura* larvae/m^2 days after treatment				Green Forage Yield(q/ha)
	Precount	5 DAT	10 DAT	14 DAT	
T1	4.27 (2.29)^{a}	1.89 (1.68)^{ab}	2.58 (1.88)^{ab}	3.12 (2.03)^{e}	38.36^{h}
T2	4.41 (2.31)^{a}	3.12 (2.02)^{ab}	1.93 (1.71)^{a}	1.58 (1.59)^{ab}	56.22^{b}
T3	4.38 (2.31)^{a}	3.61 (2.14)^{cd}	2.04 (1.74)^{ab}	1.70 (1.62)^{ab}	53.50^{c}
T4	4.45 (2.32)^{a}	3.81 (2.19)^{cd}	3.35 (2.07)^{c}	3.01 (2.00)^{cd}	40.94^{g}
T5	4.30 (2.30)^{a}	2.59 (1.88)^{ab}	2.37 (1.83)^{ab}	1.89 (1.68)^{c}	47.44^{d}
T6	4.45 (2.32)^{a}	4.03 (2.21)^{cd}	3.13 (2.02)^{ab}	2.79 (1.94)^{cd}	43.83^{e}
T7	4.32 (2.30)^{a}	3.58 (2.13)^{c}	2.12 (1.75)^{ab}	1.28 (1.49)^{a}	57.50^{a}
T8	4.41 (2.32)^{a}	1.63 (1.60)^{a}	2.55 (1.88)^{ab}	2.95 (1.99)^{cd}	42.44^{f}
T9	4.51 (2.34)^{a}	4.73 (2.38)^{cd}	5.49 (2.54)^{d}	5.92 (2.63)^{f}	36.69^{i}
SEm ±	0.14	0.14	0.12	0.11	0.17
CD at 5%	NS	0.43	0.35	0.34	0.51
CV%	10.21	12.16	10.25	10.54	5.32

Figures in the parentheses are $\sqrt{n+1}$ DAT : Days after treatment

Table 5b. Evaluation of different components against *Spodoptera litura* and *Helicoverpa armigera*

Treatments	Green fodder yield (q/ha/harvest)
T1	84.38^{c}
T2	89.06^{bc}
T3	97.92^{ab}
T4	85.94^{c}
T5	97.40^{ab}
T6	98.44^{ab}
T7	81.25^{cd}
T8	106.25^{a}
T9	71.88^{d}
CD (0.05)	1.671

PPT-4: Germplasm evaluation programme against diseases and insect-pests in Rabi forages

Objective: To identify potential resistance donors for their further use in forage breeding programme.

Details of crop, disease/insect-pest and place of screening

Crop	Contributing centres (approx. 25 lines each)	Disease /insect-pest	Place of screening
Berseem	PAU, CCSHAU, JNKVV, IGFRI	Stem rot	Ludhiana
		Leaf blight	Bhubaneswar
		Root rot	Palampur, Bhubaneswar
Lucerne	BAIF, PAU, MPKV, AAU, TNAU, IGFRI	Downy mildew	Ludhiana
		Rust, Aphids, Defoliators	Rahuri, Coimbatore
		Weevil	Ludhiana, Jhansi
Oat	PAU, GBPUAT, CCSHAU, MPKV, SKUAST-K, CSKHPKV, IGFRI	Leaf blight	Ludhiana, Bhubaneswar, Jhansi
		Powdery mildew	Palampur
		Aphids	Rahuri

Design: Augmented design

Crop: Berseem

- Number of entries/lines: 72
- Paired rows for each germplasm in 3 m rows.
- 30 cm row to row.

Crop: Lucerne

- Number of entries/lines: 27
- Paired rows for each germplasm in 3 m rows.
- 30 cm row to row.

Crop: Oat

- Number of entries/lines: 122
- Paired rows for each germplasm in 3 m rows.
- 30 cm row to row and 10 cm plant to plant distance

Observations:

- Disease severity/pest damage reaction in 5 randomly selected plants per entry at 50% flowering stage as per attached rating scales.

Results:

Oat:

In Oat, a total of 122 germplasm lines were tested against different diseases and insect-pest at various locations. At Ludhiana, Jhansi and Bhubaneswar, germplasm lines were screened for leaf blight resistance. At Palampur, germplasm lines were screened for powdery mildew resistance. At Rahuri, germplasm lines were screened for aphid resistance.

At Ludhiana, 68 germplasm lines were found in low resistant category; 48 lines were in mesothetic category and 5 lines were in low susceptible category to leaf blight (Table PPT 4a).

At Bhubaneswar, 26 lines were categorized as resistant; 58 lines were moderately resistant; 33 were low resistant; 5 were low susceptible against leaf blight (Table PPT 4a).

At Jhansi, 8 lines were categorized as resistant; 7 lines were moderately resistant; 43 were low resistant; 39 were mesothetic; 25 were low susceptible against leaf blight (Table PPT 4a).
At Palampur, 27 lines were moderately resistant; 90 were susceptible; 5 were highly susceptible against powdery mildew (Table PPT 4a).
At Rahuri, 9 lines were moderately susceptible and 113 lines were susceptible against aphids (Table PPT 4a).
OGP-2 was found moderately resistant against powdery mildew at Palampur, resistant (against leaf blight) at Jhansi, Bhubaneswar and mesothetic against leaf blight at Ludhiana and thus can serve as effective source of resistance against both powdery mildew and leaf blight disease in oat.

Berseem:

In Berseem, a total of 72 germplasm lines were tested against different diseases and insect-pest at various locations. At Ludhiana, germplasm lines were screened for stem rot resistance. At Palampur, germplasm lines were screened for root rot resistance. At Bhubaneswar, germplasm lines were screened for root rot and leaf blight resistance.
At Ludhiana, 31 germplasm lines were in moderately resistant category; 41 lines were in susceptible category to stem rot (Table PPT 4b).
At Bhubaneswar, 15 lines were categorized as resistant; 29 lines were moderately resistant; 23 were moderately susceptible and 5 were susceptible against leaf blight (Table PPT 4b).
Against root rot, 39 lines were categorized as resistant; 15 lines were moderately resistant; 8 were moderately susceptible; 6 were susceptible and 4 were highly susceptible (Table PPT 4b).
At Palampur, 33 lines were categorized as resistant; 39 lines were moderately resistant against root rot (Table PPT 4b).

Germplasm lines viz, BM-14, PC-114, BL-22, BL-1, BL-10, HFB-20-3, HFB-20-4, JB-06-1, JB-06-2, JB-06-6, JB-15-3, JB-15-4, JBSC-1 were found moderately resistant against stem rot; resistant to moderately resistant against leaf blight as well as root rot and thus can serve as effective source of resistance against stem rot, root rot and leaf blight disease in berseem.

Lucerne:

In Lucerne, a total of 27 germplasm lines were tested against different diseases and insect-pest at various locations. At Ludhiana, germplasm lines were screened for downy mildew resistance. At Jhansi, germplasm lines were screened for weevil resistance. At Rahuri, germplasm lines were screened for rust, aphid and defoliators resistance. At Coimbatore, germplasm lines were screened for aphid and leaf minor resistance.

At Ludhiana, all germplasm lines were in moderately susceptible category against downy mildew. 9 germplasm lines were in resistant category and 18 were in moderately resistant category against weevil (Table PPT 4c).
At Rahuri, 4 lines were categorized as resistant; 23 lines were moderately resistant against rust. (Table PPT 4c). Against aphids, 2 lines were moderately susceptible and 25 were susceptible. Against defoliators, all germplasm lines were resistant (Table PPT 4c).

At Coimbatore, all germplasm lines were in resistant category against aphids and leaf minor (Table PPT 4c).

At Jhansi, 25 germplasm lines were in resistant category and 2 were in moderately resistant category against weevil (Table PPT 4c).

Table PPT-4a: Evaluation of oat germplasm against diseases and insect-pests

Entry No.	Ludhiana		Bhubaneswar		Jhansi		Palampur		Rahuri	
	Leaf blight score	Disease reaction	Leaf blight score	Disease reaction	Leaf blight score	Disease reaction	Powdery mildew score	Disease reaction	No. Aphids/tiller	Reaction
OL-1985	4	LR	4	LR	4.8	M	5	MR	99	MS
OL-1937	4	LR	4	LR	5.8	LS	5	MR	83	MS
OL-14	4	LR	2	R	5.4	LS	7	S	46	MS
OL-931	5	M	3	MR	5.0	M	7	S	226	S
OL-1964	5	M	2	R	4.8	M	7	S	206	S
OL-1896	5	M	3	MR	6.0	LS	5	MR	182	S
OL-1967	5	M	3	MR	5.8	LS	7	S	197	S
OL-12	5	M	2	R	5.2	LS	5	MR	190	S
OL-1960	4	LR	3	MR	5.0	M	7	S	199	S
OL-1983	4	LR	3	MR	5.4	LS	7	S	232	S
OL-1957	5	M	2	R	4.8	M	7	S	128	S
OL-1975	6	LS	3	MR	5.4	LS	7	S	177	S
OL-1990	6	LS	2	R	5.6	LS	7	S	135	S
OL-1802	5	M	2	R	5.0	M	7	S	224	S
OL-1882	5	M	3	MR	5.6	LS	7	S	171	S
OL-1969-1	5	M	4	LR	5.6	LS	5	MR	100	MS
OL-1963	5	M	4	LR	4.8	M	7	S	252	S
OL-1987	5	M	3	MR	3.8	LR	7	S	217	S
OL-1943	4	LR	3	MR	3.4	LR	7	S	196	S
OL-1938	4	LR	4	LR	4.0	LR	7	S	220	S
OL-125	4	LR	4	LR	4.0	LR	7	S	257	S
OL-1804	4	LR	4	LR	4.0	LR	9	HS	233	S
OL-1949	4	LR	2	R	4.2	M	7	S	117	S
OL-1874-1	5	M	4	LR	4.6	M	7	S	139	S
UPO-18-1-3	5	M	3	MR	4.2	M	7	S	149	S

UPO-18-4-4	4	LR	4	LR	2.0	R	7	S	158	S
UPO-10-2	5	M	3	MR	2.0	R	7	S	138	S
UPO-11-1	5	M	3	MR	3.4	LR	5	MR	157	S
UPO-94	4	LR	4	LR	1.4	R	7	S	229	S
UPO-18-1-1	4	LR	4	LR	2.0	R	7	S	194	S
UPO-16-4	4	LR	4	LR	2.0	R	7	S	250	S
UPO-212	4	LR	3	MR	3.6	LR	5	MR	126	S
UPO-06-1	4	LR	6	LS	3.2	LR	5	MR	202	S
OGP-1	4	LR	4	LR	2.6	MR	7	S	156	S
OGP-2	5	M	2	R	2.0	R	5	MR	127	S
OGP-3	5	M	3	MR	4.4	M	7	S	117	S
OGP-4	5	M	3	MR	5.6	LS	5	MR	96	MS
OGP-5	5	M	3	MR	4.0	LR	7	S	121	S
OGP-6	5	M	4	LR	5.6	LS	7	S	155	S
OGP-7	4	LR	3	MR	6.0	LS	5	MR	206	S
OGP-8	4	LR	6	LS	2.0	R	7	S	85	MS
OGP-9	4	LR	2	R	4.0	LR	7	S	106	S
OGP-10	4	LR	3	MR	4.2	M	7	S	135	S
OGP-11	4	LR	3	MR	4.4	M	7	S	115	S
OGP-12	5	M	3	MR	5.2	LS	7	S	140	S
OGP-13	5	M	4	LR	6.0	LS	7	S	157	S
OGP-14	5	M	3	MR	5.8	LS	7	S	155	S
OGP-15	6	LS	3	MR	5.0	M	7	S	135	S
OGP-16	6	LS	4	LR	5.4	LS	5	MR	124	S
OGP-17	5	M	3	MR	5.2	LS	7	S	150	S
OGP-8	6	LS	3	MR	5.0	M	5	MR	128	S
OGP-19	5	M	3	MR	5.6	LS	7	S	141	S
OGP-20	5	M	2	R	4.0	LR	7	S	124	S
OGP-21	5	M	4	LR	5.2	LS	7	S	147	S

HFO-707	5	M	3	MR	3.8	LR	7	S	127	S
OS-7	4	LR	6	LS	4.0	LR	7	S	134	S
OS-403	4	LR	6	LS	4.0	LR	5	MR	125	S
HFO-114	4	LR	2	R	4.6	M	5	MR	118	S
OS-377	4	LR	3	MR	4.8	M	7	S	108	S
OS-427	4	LR	2	R	4.2	M	5	MR	138	S
OS-346	4	LR	2	R	5.6	LS	7	S	155	S
OS-424	5	M	4	LR	3.8	LR	7	S	108	S
HFO-607	5	M	3	MR	3.4	LR	7	S	103	S
HFO-611	5	M	3	MR	2.6	MR	7	S	131	S
HS-8	4	LR	3	MR	4.6	M	7	S	118	S
806	4	LR	2	R	4.8	M	5	MR	136	S
HFO-529	5	M	3	MR	5.0	M	7	S	140	S
906	5	M	3	MR	5.0	M	7	S	117	S
OS-405			2	R	4.6	M	7	S	143	S
OS-6	4	LR	2	R	5.2	LS	9	HS	139	S
RO-11-1	4	LR	2	R	5.2	LS	7	S	128	S
RO-19	4	LR	2	R	4.8	M	5	MR	138	S
JO-15-9	5	M	3	MR	3.8	LR	5	MR	156	S
JO-20-9-2	5	M	4	LR	4.0	LR	7	S	140	S
JO-18-8-5	5	M	3	MR	4.2	M	7	S	130	S
JO-20-5	4	LR	4	LR	3.2	LR	7	S	138	S
JO-18-2	4	LR	3	MR	2.6	MR	7	S	119	S
JO-2	4	LR	4	LR	4.0	LR	5	MR	129	S
JO-5	4	LR	4	LR	4.2	M	7	S	135	S
JO-03-91	4	LR	3	MR	3.6	LR	7	S	134	S
JO-1	5	M	3	MR	3.4	LR	7	S	157	S
JO-03-93	5	M	3	MR	4.0	LR	7	S	133	S
Algerian	5	M	4	LR	4.2	M	7	S	119	S

EC-528890	4	LR	3	MR	3.6	LR	7	S	137	S
IG-01-211	4	LR	3	MR	4.2	M	5	MR	142	S
KRR-AK-36	4	LR	4	LR	4.0	LR	5	MR	133	S
EC-528905	4	LR	3	MR	3.6	LR	7	S	146	S
EC-605838	4	LR	4	LR	4.6	M	7	S	136	S
PLP-21	5	M	2	R	4.0	LR	7	S	141	S
PLP-18	5	M	2	R	3.6	LR	5	MR	134	S
JPO-44	5	M	3	MR	3.8	LR	7	S	145	S
JPO-24	4	LR	3	MR	3.8	LR	7	S	130	S
JPO-28	4	LR	3	MR	3.2	LR	7	S	113	S
JPO-13	4	LR	4	LR	4.6	M	5	MR	144	S
PLP-25	4	LR	6	LS	3.6	LR	7	S	140	S
IG-03-205	4	LR	4	LR	2.8	MR	7	S	135	S
PLP-15	5	M	3	MR	4.8	M	5	MR	123	S
HJ-8	4	LR	4	LR	3.4	LR	7	S	118	S
IG-03-254	4	LR	4	LR	4.0	LR	7	S	121	S
PLP-23	5	M	4	LR	2.6	MR	7	S	140	S
PLP-17	4	LR	3	MR	3.8	LR	7	S	118	S
PLP-20	4	LR	3	MR	3.4	LR	7	S	119	S
PLP-1	4	LR	3	MR	4.0	LR	7	S	129	S
JPO-10	4	LR	3	MR	3.4	LR	7	S	108	S
PLP-22	4	LR	2	R	4.2	M	7	S	139	S
PLP-16	4	LR	2	R	3.2	LR	9	HS	113	S
SKO-225	4	LR	3	MR	2.4	MR	7	S	90	MS
SKO-20	5	M	2	R	2.0	R	7	S	111	S
SKO-90	5	M	3	MR	4.2	M	7	S	127	S
SKO-96	5	M	4	LR	5.4	LS	7	S	124	S

Kent	4	LR	3	MR	3.2	LR	7	S	131	S
JHO-2010-1	4	LR	3	MR	4.8	M	7	S	103	S
JHO-851	4	LR	3	MR	3.2	LR	7	S	130	S
JHO-2004	4	LR	3	MR	4.6	M	9	HS	123	S
JHO-99-1	4	LR	4	LR	3.8	LR	7	S	93	MS
JHO-99-2	4	LR	3	MR	4.8	M	7	S	78	MS
JHO-2015-1	4	LR	3	MR	3.0	MR	7	S	114	S
JHO-2009-1	5	M	4	LR	4.4	M	5	MR	130	S
JHO-2012-1	4	LR	3	MR	4.2	M	5	MR	132	S
JHO-822	4	LR	2	R	3.6	LR	9	HS	121	S
SKO-108	4	LR	2	R	4.6	M	7	S	122	S
Sabzar	4	LR	2	R	5.4	LS	7	S	146	S

Table PPT-4b: Evaluation of Berseem germplasm against diseases and insect-pests

Entry	Ludhiana		Palampur		Bhubaneswar			
	Stem rot incidence (%)	Disease reaction	Root rot incidence (%)	Disease reaction	Leaf blight score	Reaction	Root rot score	Reaction
BM-14	28.9	MR	10	R	1	R	3	R
BM-13	25.5	MR	5	R	3	MS	5	MS
BM-12	29.0	MR	12	MR	4	S	6	S
BM-15	30.5	S	15	MR	2	MR	3	R
BM-16	33.5	S	10	R	3	MS	4	MR
BL-42	28.5	MR	10	R	3	MS	4	MR
BM-3	25.5	MR	7	R	4	S	4	MR
PC-114	30.0	MR	7	R	1	R	3	R
BL-43	31.2	S	10	R	1	R	2	R
PC-128	33.0	S	12	MR	3	MS	6	S
PC-115	34.0	S	15	MR	2	MR	3	R
BL-44	35.5	S	10	R	1	R	2	R
BL-180	40.7	S	15	MR	2	MR	2	R
BL-22	29.5	MR	10	R	2	MR	3	R
BL-1	25.5	MR	15	MR	2	MR	3	R
BL-10	28.8	MR	10	R	2	MR	3	R
HB-2	30.5	S	10	R	2	MR	3	R
Wardan	32.0	S	10	R	1	R	2	R
Mescavi	33.0	S	7	R	2	MR	6	S
HFB-20-3	29.0	MR	15	MR	2	MR	3	R
HB-1	28.5	MR	10	R	2	MR	6	S
HFB-20-4	29.4	MR	12	MR	2	MR	3	R
HFB-20-6	32.5	S	8	R	1	R	2	R
HFB-20-2	30.6	S	15	MR	2	MR	3	R
HFB-20-1	31.0	S	15	MR	1	R	2	R
HFB-20-5	33.0	S	10	R	3	MS	3	R

JB-12-9	28.0	MR	12	MR	3	MS	3	R
JB-12-24	26.5	MR	10	R	4	S	4	MR
JB-16-5	33.2	S	14	MR	3	MS	4	MR
JB-16-17	30.5	S	15	MR	2	MR	3	R
JB-06-1	29.0	MR	12	MR	2	MR	3	R
JB-06-2	30.0	MR	15	MR	1	R	3	R
JB-06-3	31.0	S	14	MR	3	MS	4	MR
JB-06-4	29.5	MR	10	R	3	MS	2	R
JB-06-5	27.5	MR	15	MR	3	MS	5	MS
JB-06-6	26.5	MR	14	MR	1	R	2	R
JB-06-7	30.5	S	15	MR	1	R	2	R
JB-06-8	34.5	S	10	R	2	MR	3	R
JB-06-9	37.0	S	10	R	2	MR	3	R
JB-06-10	38.5	S	15	MR	3	MS	3	R
JB-06-11	34.0	S	15	MR	1	R	3	R
JB-06-12	33.2	S	11	MR	1	R	3	R
JB-06-13	30.5	S	16	MR	2	MR	3	R
JB-06-14	31.0	S	15	MR	2	MR	2	R
JB-15-1	30.0	S	10	R	2	MR	4	MR
JB-15-2	30.5	S	15	MR	1	R	3	R
JB-15-3	29.5	MR	10	R	1	R	3	R
JB-15-4	26.0	MR	16	MR	1	R	2	R
JB-15-5	29.0	MR	13	MR	2	MR	5	MS
JB-15-6	35.5	S	12	MR	3	MS	5	MS
JB-15-7	36.8	S	10	R	3	MS	5	MS
JB-15-8	38.5	S	10	R	3	MS	5	MS
JB-15-9	33.4	S	8	R	2	MR	4	MR
JB-15-10	30.2	S	12	MR	2	MR	5	MS
JB-13-51	34.5	S	15	MR	2	MR	4	MR

JB-13-52	33.0	S	12	MR	3	MS	4	MR
JB-13-53	29.5	MR	10	R	4	S	6	S
JB-13-54	30.5	S	15	MR	3	MS	4	MR
JB-13-55	28.4	MR	7	R	3	MS	4	MR
JB-13-56	25.5	MR	15	MR	3	MS	7	HS
JB-1	30.0	MR	14	MR	3	MS	4	MR
JB-5	34.5	S	10	R	3	MS	3	R
JB-05-9	33.2	S	10	R	2	MR	4	MR
JB-1	26.6	MR	7	R	3	MS	4	MR
JB-5	30.0	MR	12	MR	4	S	5	MS
JB-05-9	28.5	MR	7	R	2	MR	6	S
JBSC-1	30.0	MR	15	MR	2	MR	3	R
JHB-18-1	33.5	S	15	MR	3	MS	7	HS
JHB-17-1	36.5	S	13	MR	2	MR	7	HS
JHB-17-2	40.6	S	9	R	2	MR	7	HS
BB-3	27.5	MR	10	R	3	MS	3	R
BB-2	34.5	S	12	MR	2	MR	3	R

Table PPT-4c: Evaluation of Lucerne germplasm against diseases and insect-pests

Entries	Rahuri						Ludhiana				Coimbatore			Jhansi	
	Rust		No. Aphids/tiller		Defoliators		Downy mildew (%)	Disease reaction	Weevil incidence (5 plants/entry)	Reaction	Leaf Miner (No. of larvae/plant)	Aphids (No. of nymphs & adults/plant)	Reaction	Weevil incidence (5 plants/entry)	Reaction
	Score	Reaction	Aphids	Reaction	Number	Reaction									
LLP-10	1.5	MR	247	S	2.3	R	28.5	MS	1.00	R	0.00	0.71	R	1.0	R
LLC-5	1.7	MR	234	S	2.42	R	25.5	MS	1.33	MR	0.00	0.57	R	1.2	MR
LLP-20	1.3	R	228	S	2.36	R	30.7	MS	1.66	MR	0.00	0.57	R	0.8	R
LLP-8	1.74	MR	168	S	2.48	R	33.5	MS	1.33	MR	0.03	0.29	R	0.8	R
LLP-11	1.62	MR	172	S	2.46	R	30.5	MS	1.00	R	0.06	1.14	R	0.8	R
LLC-7	1.74	MR	194	S	2.38	R	29.5	MS	1.66	MR	0.00	0.43	R	1.0	R
LLC-6	1.64	MR	139	S	2.52	R	25.5	MS	1.33	MR	0.06	0.57	R	0.4	R
RL-88	1.32	R	118	S	2.44	R	30.5	MS	1.00	R	0.11	0.43	R	1.0	R
Krishna	1.54	MR	139	S	2.56	R	33.8	MS	1.33	MR	0.00	0.29	R	0.8	R
AL-4	1.74	MR	191	S	2.5	R	34.0	MS	1.00	R	0.26	0.43	R	1.0	R
AL-3	1.94	MR	183	S	2.68	R	31.0	MS	1.66	MR	0.06	0.43	R	1.0	R
Anand-2	2	MR	188	S	2.46	R	30.0	MS	1.33	MR	0.20	1.14	R	0.6	R
BRL-15-7	1.58	MR	124	S	2.5	R	33.5	MS	1.00	R	0.29	0.14	R	1.2	MR
BRL-3	1.54	MR	195	S	2.7	R	28.0	MS	1.00	R	0.14	0.00	R	1.0	R
ALS-3	1.1	R	204	S	2.2	R	29.5	MS	1.33	MR	0.20	0.57	R	0.6	R
BRL-15-1	1.22	R	200	S	2.28	R	26.7	MS	1.66	MR	0.06	0.14	R	0.8	R
BRL-15-4	1.64	MR	207	S	2.72	R	25.0	MS	1.00	R	0.17	0.00	R	0.8	R
BRL-15-6	1.7	MR	99	MS	2.58	R	26.0	MS	0.66	R	0.06	0.00	R	0.2	R
RLG-08-10	1.46	MR	89	MS	2.46	R	30.5	MS	1.33	MR	0.11	0.00	R	0.6	R
RLG-08-5	1.5	MR	170	S	2.38	R	31.0	MS	1.66	MR	0.03	0.00	R	0.8	R
RLG-08-6	1.74	MR	180	S	2.76	R	34.0	MS	1.66	MR	0.03	0.00	R	1.0	R
ALS-12	1.6	MR	212	S	2.3	R	33.0	MS	1.00	R	0.00	0.00	R	0.8	R
BAL-08-09	1.82	MR	168	S	2.58	R	30.5	MS	1.33	MR	0.06	0.00	R	0.6	R
BAL-08-06	2	MR	179	S	2.6	R	32.0	MS	1.33	MR	0.09	0.00	R	0.4	R
BGL-16-4	1.8	MR	171	S	2.78	R	30.5	MS	1.66	MR	0.09	0.00	R	0.6	R
ALS-2	1.9	MR	175	S	2.46	R	31.0	MS	1.33	MR	0.06	0.00	R	1.0	R
ALS-9	2.22	MR	165	S	2.46	R	29.5	MS	1.66	MR	0.06	0.00	R	0.8	R

CHAPTER-4

BREEDER SEED PRODUCTION

Forage Crops Breeder Seed Production

[Indent year Rabi 2022-23]
[Production year Rabi 2021-22]
(Table Reference: Tables BSP 1, 2)

The indent for Breeder Seed Production was received from DAC, GOI for 38 varieties in four forage crops *viz*., Oat (22), Berseem (10), Lucerne (4) and Hedge Lucerne (2). The total quantity allocated was 525.97 q. The production target was assigned to different Breeder Seed producing centers of the SAUs/ NGO/ ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (438.88 q) followed by Berseem (80.99 q) and Lucerne (3.10 q) and Hedge Lucerne (3.00 q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centres revealed that only in Oat the overall breeder seed production was more than the allocated quantity. In other three crops the total breeder seed production is less than the indented quantity. The overall breeder seed production was 536.46 q against the indent of 525.97 q (Table BSP 1 & 2) which is 10.49 q surplus (an increase of 1.99%).

In Oat, the production was 485.08q against the allocation of 438.88 q making a surplus of 46.20 q. The total indent was for 22 varieties. In seven varieties there was deficit in production and in all other cases there was surplus or equal production. The indent was allocated to 10 centers in 09 states / UT.

Indent of eight varieties were allocated to PAU Ludhiana for production of a total of 70.80 q of oat. The total production was 50.80 q thereby a deficit of 20 q was observed. In three varieties *viz.,*OL 1876-2, OL 1861, OL 1802-1 the deficit production was observed which was reported to be due to very high temperature of day and night during month of March resulted into forced maturity of oats resulting into very poor seed yield. In four varieties *viz.*, OL 1896, OL 1869-1, OL 1769-1, OL -10 the production equaled the allocated quantity. Surplus production was observed in case of OL 14.

In case of variety UPO-212, GBPUAT Pantnagar reported and production of 75q against the allocation of 82.50 q thereby making a shortfall of 7.50 q. MPKV, Rahuri also could not fulfill the target of Phule Surabhi (RO-11-1) and Kent. BAIF Uralikanchan was allocated 35 q seeds of variety Kent and it produced 36 q, thereby surplus of 1 q. AAU, Anand fulfilled the target of 35q seed of variety Kent. ICAR- IGFRI was allocated four varieties of oat seed production and only in JHO-99-2 it could not meet the target. In other three varieties it produced surplus seed. CCSHAU Hisar was allocated seeds of three varieties. The production was deficit in OS-403, surplus in HJ-8 and met the target in OS-377. SKUAST-K was allocated 25q seed of SKO-20 and production was 25.5 q. JNKVV, Jabalpur could not meet the target in 2 allocated varieties. CSKHPKV was allocated 2.0q seed production target of variety Palalmpur-1 which was achieved.

Breeder seed of non-indented varieties was also produced by many centers and they are available for allocation in place of shortfall seeds of indented varieties. MPKV Rahuri produced 8.0q seeds of Phule Harita (RO-19); IGFRI, Jhansi produced 10 q of JHO 200-4, 2.25 q of JHO 2012-2, 10.50 q of JHO 2010-1, 4.0 q of JHO 2015-1, 2.58 q of JHO 851. JNKVV, Jabalpur produced 9.23q of variety JO-1

In Berseem, the total production was 48.05 q against the indent of 80.99 q making a deficit of 32.94 q. There was indent of 10 varieties and were allocated to 4 centers located in 4 different states. PAU, Ludhiana produced surplus or equal seed in all four allocated varieties. IGFRI, Jhansi was allocated 4 varieties target and in 3 cases the production was deficit and target was achieved in variety Wardan. JNKVV, Jabalpur and GBPUAT, Pantnagar could not meet target of variety JB-05-9 and UPB -110 respectively.

In Lucerne, the target of (3.10 q) in four varieties was allotted to three centers in three states. The total production was 2.33 q which was 0.77 q lower than the indent of 3.10 q. AAU, Anand and TNAU, Coimbatore achieved the target in three varieties. SKRAU, Bikaner failed to meet the target. Out of 4 varieties, the target was achieved in Anand-2, GAUL-3, and Lucerne Co-3. In RBB-07-01 (Krishna), the target was not met by SKRAU, Bikaner.

In Hedge Lucerne, there was indent of 3.00 q seed of two varieties and it was allocated to 2 centers. PJTSAU, Hyderabad was able to achieve their production target of 0.50q of variety THSL-1, whereas TNAU, Coimbatore could produce only 0.50q against the indent of 2.50 q of variety TND 1308.

Table BSP1: Forage Crop/Centre wise Breeder Seed Production (q) during *Rabi 2021-22*

[Indent year Rabi 2022-23]

[Production year Rabi 2021-22]

Crop: Oats

SN	Centre	Variety	DAC Indent (q)	BSP Allocation (q)	Production (q)	Surplus/ Deficit (q)
1	PAU, Ludhiana	OL-1876-2	10.00	10.00	7.00	-3.00
		OL-1896	10.00	10.00	10.00	0.00
		OL- 1869-1 (OL-13)	1.30	1.30	1.30	0.00
		OL-1861	10.00	10.00	2.50	-7.50
		OL-1802-1 (OL-12)	29.00	29.00	19.00	-10.00
		OL-1769-1	2.00	2.00	2.00	0.00
		OL-10	7.00	7.00	7.00	0.00
		OL 14	1.50	1.50	2.00	0.50
		Total	**70.80**	**70.80**	**50.80**	**-20.00**
2	GBPUAT, Pantnagar	UPO-212	82.50	82.50	75.00	-7.50
		Total	**82.50**	**82.50**	**75.00**	**-7.50**
3	MPKV, Rahuri	P. Surbhi (RO 11-1)	13.50	13.50	2.00	-11.50
		Kent	134.00	25.00	19.00	-6.00
		Harita (RO-19)			8.00	8.00
		Total	**147.50**	**38.50**	**29.00**	**-9.50**
4	BAIF, Urulikanchan	Kent	0.00	35.00	36.00	1.00
		Total	**0.00**	**35.00**	**36.00**	**1.00**
5	AAU, Anand	Kent	0.00	35.00	35.00	0.00
		Total	**0.00**	**35.00**	**35.00**	**0.00**
6	IGFRI, Jhansi	Kent	0.00	39.00	24.50	-14.50
		JHO-99-2	5.00	5.00	1.50	-3.50
		JHO-2009-1	7.50	7.50	27.74	20.24
		JHO-99-1	5.00	5.00	6.50	1.50
		JHO-822	47.50	47.50	97.50	50.00
		JHO 2000-4	0.00	0.00	10.00	10.00
		JHO 2012-2	0.00	0.00	2.25	2.25
		JHO 2010-1	0.00	0.00	10.50	10.50
		JHO 2015-1	0.00	0.00	4.00	4.00
		JHO 851	0.00	0.00	2.58	2.58
		Total	**65.00**	**104.00**	**187.07**	**83.07**
7	CCSHAU, Hisar	OS-403	37.50	37.50	20.50	-17.00
		OS-377	4.50	4.50	4.50	0.00
		HJ-8	4.00	4.00	10.00	6.00
		Total	**46.00**	**46.00**	**35.00**	**-11.00**
8	SKUAST K, Srinagar	Shalimar Fodder oat-1 (SKO-20)	25.00	25.00	25.50	0.50
		Total	**25.00**	**25.00**	**25.50**	**0.50**
9	JNKVV, Jabalpur	Jawahar Oat 04-315 (JO 04-315)	0.04	0.04	0.04	0.00
		Jawahar Oat 5	0.04	0.04	0.04	0.00
		JO 1			9.23	9.23
		Total	**0.08**	**0.08**	**9.31**	**9.23**
10	CSKHPKV, Palampur	Palampur-1	2.00	2.00	2.40	0.40
		Total	**2.00**	**2.00**	**2.40**	**0.40**
		Grand Total	**438.88**	**438.88**	**485.08**	**46.20**

Crop: Berseem

SN	Centre Name	Variety	DAC Indent (q)	BSP Allocation (q)	Production (q)	Surplus/ Deficit (q)
1	PAU, Ludhiana	BL-44	10.40	10.40	10.40	0.00
		BL-43	9.13	9.13	9.15	0.02
		BL-42	1.68	1.68	2.00	0.32
		BL-10	1.50	1.50	1.80	0.30
		Total	**22.71**	**22.71**	**23.35**	**0.64**
2	IGFRI, Jhansi	JBSC-1	7.34	7.34	6.00	-1.34
		Bundel Berseem -2 (JHB 146)	7.15	7.15	2.50	-4.65
		Bundel Berseem -3	5.00	5.00	3.00	-2.00
		Wardan	13.00	13.00	13.00	0.00
		JHB 17-1 (Bundel Berseem -6)	0.00	0.00	0.10	0.10
		JHB 17-2 (Bundel Berseem- 5)	0.00	0.00	0.10	0.10
		Total	**32.49**	**32.49**	**24.70**	**-7.79**
3	JNKVV, Jabalpur	Jawahar Berseem 05 – 9 (JB 05-9)	15.19	15.19	0.00	-15.19
		Total	**15.19**	**15.19**	**0.00**	**-15.19**
4	GBPUAT, Pantnagar	UPB -110	10.60	10.60	0.00	-10.60
		Total	**10.60**	**10.60**	**0.00**	**-10.60**
		Grand Total	**80.99**	**80.99**	**48.05**	**-32.94**

Crop: Lucerne

SN	Centre	Variety	DAC Indent (q)	BSP Allocation (q)	Production (q)	Surplus/ Deficit (q)
1	AAU, Anand	Anand-2	1.75	1.75	1.75	0.00
		GAUL-3 (AL-3)	0.20	0.20	0.20	0.00
		Total	**1.95**	**1.95**	**1.95**	**0.00**
2	TNAU, Coimbatore	Lucerne Co 3	0.15	0.15	0.15	0.00
		Total	**0.15**	**0.15**	**0.15**	**0.00**
3	SKRAU, Bikaner	Krishna RBB-07-01	1.00	1.00	0.23	-0.77
		Total	**1.00**	**1.00**	**0.23**	**-0.77**
		Grand Total	**3.10**	**3.10**	**2.33**	**-0.77**

Crop: Hedge Lucerne

Sl. No.	Centre	Variety	DAC Indent (q)	BSP Allocation (q)	Production (q)	Surplus/ Deficit (q)
1	PJTSAU, Hyderabad	THSL-1 (Telangana Dasharath)	0.50	0.50	0.50	0.00
		Total	**0.50**	**0.50**	**0.50**	**0.00**
2	TNAU, Coimbatore	CO 2 (TND 1308)	2.50	2.50	0.50	-2.00
		Total	**2.50**	**2.50**	**0.50**	**-2.00**
		Grand Total	**3.00**	**3.00**	**1.00**	**-2.00**

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2021-22

[Indent year Rabi 2022-23]
[Production year Rabi 2021-22]

Crop: Forage Oat

S N	Variety	Produced by	Allocation as per DAC	Allocation BSP-1	Production	Surplus (+) / Deficit (-)
1	OL-1876-2	PAU, Ludhiana	10.00	10.00	7.00	-3.00
2	OL-1896		10.00	10.00	10.00	0.00
3	OL- 1869-1 (OL-13)		1.30	1.30	1.30	0.00
4	OL-1861		10.00	10.00	2.50	-7.50
5	OL-1802-1 (OL-12)		29.00	29.00	19.00	-10.00
6	OL-1769-1		2.00	2.00	2.00	0.00
7	OL-10		7.00	7.00	7.00	0.00
8	OL 14		1.50	1.50	2.00	0.50
		Total	**70.80**	**70.80**	**50.80**	**-20.00**
9	Kent	BAIF, Uralikanchan	134.00	35.00	36.00	1.00
		AAU, Anand		35.00	35.00	0.00
		MPKV, Rahuri		25.00	19.00	-6.00
		IGFRI, Jhansi		39.00	24.50	-14.50
		Total	**134.00**	**134.00**	**114.50**	**-19.50**
10	RO 11-1 (P. Surabhi)	MPKV, Rahuri	13.50	13.50	2.00	-11.50
11	RO- 19 (Harita)				8.00	8.00
12	UPO- 212	GBPUAT, Pantnagar	82.50	82.50	75.00	-7.50
13	JHO-2009-1	IGFRI, Jhansi	7.50	7.50	27.74	20.24
14	JHO-99-1		5.00	5.00	6.50	1.50
15	JHO-99-2		5.00	5.00	1.50	-3.50
16	JHO-822		47.50	47.50	97.50	50.00
17	JHO 2000-4		0.00	0.00	10.00	10.00
18	JHO 2012-2		0.00	0.00	2.25	2.25
19	JHO 2010-1		0.00	0.00	10.50	10.50
20	JHO 2015-1		0.00	0.00	4.00	4.00
21	JHO 851		0.00	0.00	2.58	2.58
22	OS - 403	CCS HAU, Hisar	37.50	37.50	20.50	-17.00
23	OS- 377		4.50	4.50	4.50	0.00
24	HJ- 8		4.00	4.00	10.00	6.00
25	JO 04-315	JNKVV, Jabalpur	0.04	0.04	0.04	0.00
26	JO 5		0.04	0.04	0.04	0.00
27	JO 1		0.00	0.00	9.23	9.23
28	SKO- 20	SKUAST, Srinagar	25.00	25.00	25.50	0.50
29	Palampur-1	CSKHPKV, Palampur	2.00	2.00	2.40	0.40
		Grand Total	**438.88**	**438.88**	**485.08**	**46.20**

Reasons for shortfall as provided by respective centers

- **PAU, Ludhiana for oat varieties -** Very high temperature of day and night during month of March resulted into forced maturity of oats resulting into very poor seed yield
- **IGFRI for oat varieties -** Due to extreme rise in temperature during March crop yield affected.

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2021-22……Contd.

Crop: Berseem

SN	Variety	Produced by	Allocation as per DAC	Allocation BSP-1	Production	Surplus (+) / Deficit (-)
1	BL-44	PAU, Ludhiana	10.40	10.40	10.40	0.00
2	BL-43		9.13	9.13	9.15	0.02
3	BL-42		1.68	1.68	2.00	0.32
4	BL-10		1.50	1.50	1.80	0.30
5	JBSC-1	IGFRI, Jhansi	7.34	7.34	6.00	-1.34
6	Bundel Berseem -2 (JHB 146)		7.15	7.15	2.50	-4.65
7	Bundel Berseem -3		5.00	5.00	3.00	-2.00
8	Wardan		13.00	13.00	13.00	0.00
9	JHB 17-1 (Bundel Berseem -6)		0.00	0.00	0.10	0.10
10	JHB 17-2 (Bundel Berseem- 5)		0.00	0.00	0.10	0.10
11	JB 05-09	JNKVV, Jabalpur	15.19	15.19	0.00	-15.19
12	UPB -110	GBPUAT, Pantnagar	10.60	10.60	0.00	-10.60
Grand Total			**80.99**	**80.99**	**48.05**	**-32.94**

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2021-22……Contd.

Crop: Lucerne

SN	Variety	Produced by	Allocation as per DAC	Allocation BSP-1	Production	Surplus / Deficit
1	Anand - 2	AAU, Anand	1.75	1.75	1.75	0.00
2	AL- 3	AAU, Anand	0.20	0.20	0.20	0.00
3	Lucerne Co 3	TNAU, Coimbatore	0.15	0.15	0.15	0.00
4	RBB 07-01 (Krishna)	SKRAU, Bikaner	1.00	1.00	0.23	-0.77
Grand Total			**3.10**	**3.10**	**2.33**	**-0.77**

Crop: Hedge Lucerne

SN	Variety	Produced by	Allocation as per DAC	Allocation BSP-1	Production	Surplus / Deficit
1	THSL-1 (Telangana Dasharath)	PJTSAU, Hyderabad	0.50	0.50	0.50	0.00
2	CO 2 (TND 1308)	TNAU, Coimbatore	2.50	2.50	0.50	-2.00
Grand Total			**3.00**	**3.00**	**1.00**	**-2.00**

Reasons for shortfall as provided by respective centers

- **IGFRI – Jhansi - For berseem varieties -** Due to extreme increase in temperature during April which affected honey bee visit adversely and outburst of *Helicoverpaarmigera* at seed filling stage
- **JNKVV, Jabalpur for Berseem variety –** Crop failed
- **GBPUAT, Pantnagar for Berseem variety –** No Nucleus seed
- **SKRAU- Bikaner for Lucerne Variety:** Poor seed set due to high temperature
- **TNAU, Coimbatore – for Hedge Lucerne variety -** Since the breeder seed crop met with rain during flowering. Severe flower drop was experienced.

MISCELLANEOUS

Quality profiling of forage varieties & advanced breeding lines

Crop: Napier lines

No. of entries: 16

Sample grown at PJTSAU, Hyderabad during Kharif 2021

Samples analysed by: CSK HPKV, Palampur Centre

Napier Fodder samples: Mineral nutrient profiling of napier forage at 50% flowering stage

S. No	Napier lines	Parameters										
		N	**P**	**K**	**S**	**Ca**	**Mg**	**Zn**	**Cu**	**Fe**	**Mn**	**B**
		Percentage						PPM				
1	IP22238	0.73	0.46	0.42	0.26	0.33	0.38	56.5	23.7	1300	36.5	14.72
2	IP22243	0.56	0.37	0.54	0.24	0.50	0.51	42.5	24.4	942	6.3	13.48
3	IP22239	1.12	0.46	0.91	0.29	0.55	0.58	65.0	24.6	1722	51.8	17.19
4	IP22235	0.45	0.40	0.66	0.27	0.45	0.48	52.5	29.3	1131	7.0	15.54
5	IP22234	-	-	-	-	-	-	-	-	-	-	-
6	IP22237	0.73	0.42	0.36	0.30	0.34	0.37	20.0	20.4	618	7.5	13.48
7	IP22233	0.50	0.44	0.68	0.28	0.44	0.46	35.5	19.5	1057	30.8	15.95
8	IP22242	0.67	0.48	0.76	0.29	0.53	0.55	50.0	21.2	1247	25.8	15.54
9	IP21966	0.73	0.40	0.43	0.20	0.32	0.38	10.0	11.8	152	5.8	11.83
10	IP21965	0.45	0.42	0.41	0.24	0.36	0.38	33.8	21.0	778	6.8	16.37
11	IP21970	0.62	0.46	1.58	0.28	0.73	0.71	54.3	21.2	1199	21.0	15.95
12	IP21783	1.01	0.44	0.56	0.24	0.44	0.48	38.0	26.7	987	33.8	16.78
13	IP21972	0.78	0.47	0.51	0.24	0.44	0.47	41.8	23.4	1522	19.0	14.92
14	IP21969	0.67	0.49	0.49	0.31	0.36	0.39	30.0	21.8	914	27.5	13.89
15	IP21784	0.56	0.45	0.89	0.26	0.51	0.55	36.0	25.1	969	25.5	18.01
16	IP21963	0.95	0.34	0.67	0.24	0.41	0.43	64.0	42.7	1874	47.8	15.75

Crop: Napier lines

No. of entries: 15

Sample grown at AICRP on Forage Crops, PJTSAU, Hyderabad during Kharif 2021

Samples analysed by: Quality Control Lab, PJTSAU, Hyderabad for oxalate, AICRP PJTSAU for quality profiling

Quality and anti-quality profiling of Napier male parent lines

S. No	Napier line	CP (%)	NDF (%)	ADF (%)	ADL (%)	Hemi cellulose (%)	Ash (%)	Oxalate content (mg/100g)
1	IP22238	5.25	62.80	48.90	21.30	13.90	7.44	3.38
2	IP22243	4.38	65.62	46.55	18.80	19.07	10.69	3.59
3	IP22239	3.94	65.17	45.92	12.80	19.25	9.02	3.68
4	IP22235	3.50	64.71	44.83	26.25	19.88	12.41	3.63
5	IP22234	7.00	66.82	47.04	12.35	19.78	4.79	3.59
6	IP22237	3.94	64.25	51.82	21.60	12.43	7.81	3.65
7	IP22233	2.63	59.70	50.91	32.73	8.79	12.13	4.00
8	IP22242	7.44	65.77	47.19	18.71	18.58	7.86	4.00
9	IP21966	5.69	60.25	46.98	20.69	13.27	14.08	3.76
10	IP21965	4.81	67.08	54.46	31.47	12.62	13.83	3.59
11	IP21970	3.94	65.42	48.50	23.60	16.92	9.60	3.56
12	IP21783	4.38	66.65	47.60	19.80	19.05	7.90	3.32
13	IP21972	3.50	67.86	46.52	21.50	21.34	8.40	4.00
14	IP21969	4.38	62.68	48.48	28.60	14.20	11.60	3.59
15	IP21784	3.50	64.95	46.24	24.30	18.71	9.50	4.03

Crop: Napier lines

No. of entries: 10

Sample grown at MPKV, Rahuri during Kharif 2021

Samples analysed by: CSK HPKV, Palampur Centre

Napier Fodder samples: Mineral nutrient profiling of napier forage at 50% flowering stage

S. No	Napier male parents	Parameters										
		Percentage						PPM				
		N	P	K	S	Ca	Mg	Zn	Cu	Fe	Mn	B
1	FD-468-2	0.67	0.52	3.65	0.29	0.27	0.76	22.7	37.6	285	35.3	15.95
2	FD-483	0.67	0.49	2.28	0.33	0.40	0.53	33.3	38.6	379	52.1	15.75
3	FD-461	0.73	0.49	3.10	0.35	0.44	0.67	38.2	36.1	310	36.8	15.13
4	GBN-2001-4	0.84	0.57	7.24	0.40	0.59	1.47	53.3	45.0	356	33.5	18.84
5	PTI-890/443-317	0.67	0.50	3.30	0.36	0.22	1.36	38.3	34.2	225	42.5	16.16
6	GBN-2001-3	0.73	0.51	2.81	0.31	0.39	0.55	22.2	35.4	136	19.1	16.37
7	GBN-2001-2	0.62	0.50	3.90	0.32	0.38	0.72	51.0	35.6	229	27.5	15.33
8	PTI/890*443-1	0.95	0.57	2.90	0.39	0.34	0.75	48.4	42.3	594	74.5	18.01
9	FD 477-2	0.62	0.58	1.15	0.37	0.43	0.60	58.9	33.7	359	60.2	17.81
10	GBN-2001-1	0.78	0.63	3.05	0.40	0.52	0.38	64.4	43.3	367	57.8	19.66

Crop: Napier lines

No. of entries: 10

Sample grown at AICRP FC&U center MPKV, Rahuri during Kharif 2021

Samples analysed by: MPKV, Rahuri (only oxalate analysis done at PJTSAU, Hyderabad)

Napier Fodder samples: quality and anti-quality profiling of Napier forage at 50% flowering stage

SN	Napier mail parents	CP (%)	ADF (%)	NDF (%)	HC (%)	ADL (%)	Ash (%)	Ox. Acid (%)	Nitrate-N (PPM)	Non Protein-N (%)	Oxalate content (mg/100g)
1	FD-468-2	5.29	49.2	71.7	22.5	14.2	17.2	1.75	23	0.10	3.11
2	FD--483	5.79	47.8	69.5	21.7	13.4	16.1	1.63	48	0.22	3.11
3	FD-461	5.04	47.7	67.1	19.4	13.4	16.6	2.75	269	0.22	3.11
4	GBN-2001-4	5.54	49.3	71.0	21.7	12.6	17.8	3.00	34	0.24	3.56
5	PTI 890X 443-317	4.78	44.3	65.3	21.0	11.6	16.1	2.00	68	0.16	4.45
6	GBN-2001-3	5.54	49.0	71.7	22.7	13.2	15.9	2.50	31	0.15	3.56
7	GBN-2001-2	5.79	49.1	71.9	22.8	12.5	15.7	2.38	34	0.25	1.38
8	PTI 890X 443-1	6.55	45.6	66.2	20.6	11.9	17.1	1.75	66	0.28	4.40
9	FD-477-2	5.29	50.6	73.1	22.5	14.5	13.9	1.88	54	0.21	3.02
10	GBN-2001-1	5.79	48.0	66.6	18.6	12.1	16.6	1.38	39	0.15	3.11

Crop: Fodder Pearl millet

No. of entries: 13

Sample grown at PJTSAU, Hyderabad during Kharif 2021

Samples analysed by : CSK HPKV, Palampur Centre

Pearl millet Fodder samples: Mineral nutrient profiling of pearl millet forage at 50% flowering stage

S. No	Pearl millet lines	Parameters										
		Percentage						PPM				
		N	P	K	S	Ca	Mg	Zn	Cu	Fe	Mn	B
1	NDFB 942	0.9	0.48	1.32	0.27	0.46	0.48	25.5	29.1	441	12	15.54
2	Moti bajra	0.84	0.45	1.19	0.26	0.45	0.48	45.8	33.2	1031	16	18.43
3	Giant bajra	0.73	0.46	0.86	0.25	0.58	0.64	46.8	32.3	809	31	15.95
4	BAIF Bajra -1	0.78	0.44	0.74	0.26	0.55	0.61	39.8	28.9	805	30.3	16.57
5	TSFB -1610	0.62	0.44	0.95	0.24	0.49	0.53	29.8	29.9	770	27.5	16.37
6	TSFB15-8	0.56	0.44	0.91	0.28	0.46	0.51	40.5	30.6	1059	25.5	16.16
7	BAIF Bajra-6	0.67	0.42	0.68	0.26	0.49	0.58	37	31.3	794	26	15.33
8	ICMV 1610	0.67	0.45	0.57	0.26	0.39	0.41	44	29.5	997	13	15.33
9	NDFB-3	0.95	0.41	0.79	0.3	0.56	0.6	51.8	31.2	725	49.3	15.75
10	TSFB15-4	0.78	0.42	1.03	0.33	0.65	0.69	58.5	38.6	639	68.8	16.98
11	BAIF Bajra 7	0.73	0.39	1.51	0.29	0.54	0.56	43.8	36.4	946	45	15.13
12	NDFB 2	0.67	0.47	0.89	0.31	0.59	0.65	40.5	35.4	744	29.3	15.33
13	BAIF Bajra 5	0.67	0.4	1.03	0.31	0.49	0.51	37.8	34.1	806	24.5	14.51

Crop: Fodder Pearl millet

No. of entries: 14

Sample grown at MPKV, Rahuri during Kharif 2021

Samples analysed by: CSK HPKV, Palampur Centre

Pearl millet Fodder samples: Mineral nutrient profiling of pearl millet forage at 50% flowering stage

S. No	Pearl millet lines	Parameters										
		Percentage						PPM				
		N	P	K	S	Ca	Mg	Zn	Cu	Fe	Mn	B
1	NDFB 942	0.62	0.5	1.39	0.24	0.34	0.65	25.9	27.1	186	12.2	11.62
2	Moti bajra	0.78	0.49	1.06	0.29	0.36	0.58	25.6	33.4	236	16.6	12.04
3	Giant bajra	0.84	0.47	1.6	0.22	0.25	0.51	29	25.8	158	5.4	15.33
4	BAIF Bajra -1	0.56	0.48	1.36	0.25	0.41	0.49	28	30.6	231	17.6	14.72
5	TSFB -1610	0.67	0.53	1.04	0.32	0.26	0.34	33.8	29.2	365	3.2	16.57
6	TSFB15-8	0.78	0.44	1.99	0.28	0.38	0.42	20.8	29	320	4.3	15.33
7	BAIF Bajra-6	0.56	0.47	1.29	0.27	0.4	0.74	25.6	27.5	356	24	17.6
8	ICMV 1610	0.9	0.49	1.45	0.31	0.33	0.49	37.7	27.8	337	3.7	12.86
9	NDFB-3	0.73	0.45	1.23	0.26	0.42	0.71	51.9	29.7	265	28.1	12.45
10	TSFB15-4	0.73	0.45	1.31	0.24	0.34	0.48	33.6	30.3	243	8.4	15.95
11	BAIF Bajra 7	0.67	0.44	1.61	0.28	0.38	0.81	46.1	71.4	281	21	13.27
12	NDFB 2	0.9	0.52	2.26	0.34	0.43	1.12	23.6	30.1	188	28.5	18.43
13	BAIF Bajra 5	0.84	0.51	1.11	0.24	0.38	0.48	34.1	36.7	250	16.5	16.78
14	RBB-1	0.62	0.41	1.03	0.26	0.26	0.33	25.5	28.4	435	7.5	15.13

Crop: Fodder Pearl millet

No. of entries: 14

Sample grown at MPKV, Rahuri during Kharif 2021

Samples analysed by: CSK HPKV, Palampur Centre

Pearl millet seed samples: Mineral nutrient profiling of pearl millet seed

S. No	Pearl millet lines	Parameters										
		Percentage						PPM				
		N	P	K	S	Ca	Mg	Zn	Cu	Fe	Mn	B
1	NDFB 942	0.5	0.44	0.48	0.23	0.17	0.24	40	40.2	46	7.8	11.83
2	Moti bajra	0.73	0.45	0.46	0.27	0.16	0.18	37.9	51.4	74	7.7	11.83
3	Giant bajra	0.56	0.46	0.49	0.21	0.18	0.22	37.6	51.6	58	8.7	15.54
4	BAIF Bajra -1	0.5	0.45	0.45	0.24	0.18	0.25	36.9	45.2	62	8.2	13.89
5	TSFB -1610	0.62	0.52	0.47	0.29	0.16	0.34	33.8	19.3	87	3.4	13.27
6	TSFB15-8	0.67	0.4	0.43	0.26	0.13	0.2	35.6	38.9	46	9.5	14.3
7	BAIF Bajra-6	0.62	0.42	0.5	0.25	0.19	0.22	32.9	39.5	32	10.3	16.78
8	ICMV 1610	0.73	0.46	0.48	0.28	0.19	0.2	40.3	43.2	59	7.6	14.92
9	NDFB-3	0.67	0.44	0.49	0.24	0.15	0.12	39.3	51.8	102	9.9	12.24
10	TSFB15-4	0.67	0.44	0.47	0.23	0.18	0.24	38.2	46.7	65	7.1	13.69
11	BAIF Bajra 7	0.56	0.4	0.44	0.25	0.11	0.27	32.6	87	54	4.2	10.59
12	NDFB 2	0.78	0.49	0.45	0.29	0.14	0.21	39.7	56.7	112	11.2	15.33
13	BAIF Bajra 5	0.78	0.5	0.47	0.22	0.17	0.13	40.9	61.5	88	8	15.54
14	RBB-1	0.67	0.42	0.46	0.24	0.15	0.26	34.9	37.8	73	6.6	14.3

Crop: Fodder pearl millet

No. of entries: 14

Sample grown at AICRP FC&U center MPKV, Rahuri during Kharif 2021

Samples analysed by: AICRP FC&U center MPKV, Rahuri. For oxalate, analysis done at PJTSAU, Hyderabad

Pearl millet Fodder samples: quality profiling of pearl millet forage at 50% flowering stage

SN	Pearl millet (Forage)	CP (%)	ADF (%)	NDF (%)	HC (%)	ADL (%)	Ash (%)	Ox. Acid (%)	Oxalate content (mg/100g)
1	NDFB 942	8.82	41.2	68.3	27.1	5.7	8.0	0.46	0.44
2	Motibajra	10.33	43.7	69.3	25.6	5.4	8.4	0.46	1.79
3	Giant bajra	6.31	46.3	68.7	22.4	3.6	8.2	0.51	1.34
4	BAIF Bajra -1	7.56	40.9	64.8	23.9	4.8	9.1	0.52	1.78
5	TSFB -16-10	7.3	42.3	64.9	22.6	5.0	9.1	0.62	1.34
6	TSFB15-8	9.82	49.5	71.7	22.2	5.8	7.6	0.46	-
7	BAIF Bajra-6	9.32	45.3	67.4	22.1	5.1	8.5	0.48	1.70
8	ICMV 1610	7.3	42.9	67.9	25.0	5.5	8.6	0.47	1.34
9	NDFB-3	8.31	38.4	64.5	26.1	4.3	9.2	0.64	0.45
10	TSFB15-4	7.05	43.8	65.8	22.0	5.7	7.4	0.54	0.94
11	BAIF Bajra 7	8.82	43.7	69.1	25.4	5.1	9.3	0.59	1.61
12	NDFB 2	8.56	43.1	68.4	25.3	5.6	9.2	0.65	0.89
13	BAIF Bajra 5	8.31	41.7	67.0	25.3	5.5	8.9	0.51	1.66
14	RBB-1	8.31	41.1	67.2	26.1	5.6	9.2	0.52	1.34

Crop: Fodder pearl millet

No. of entries: 14

Sample grown at AICRP FC&U center MPKV, Rahuri during Kharif 2021

Samples analysed by: AICRP FC&U center MPKV, Rahuri. For oxalate, analysis done at PJTSAU, Hyderabad

Pearl millet seed samples: quality profiling of pearl millet seed

SN	Pearl millet (Seed)	CP (%)	Crude Fibre (%)	Carbohydrates (%)	Phytic acid (%)	Oxalate content (mg/100g)
1	NDFB-942	8.98	3.2	59.6	0.100	0.89
2	Moti Bajra	3.72	4.8	56.1	0.106	0.53
3	Giant Bajra	4.82	6.7	57	0.024	-
4	BAIF Bajra-1	5.69	4.7	54.3	0.210	1.87
5	TSFB-16-10	4.6	6.5	61.4	0.059	1.33
6	TSFB-15-8	4.82	5.3	56.5	0.130	0.89
7	BAIF-Bajra-6	4.6	4	63.2	0.130	0.45
8	ICMV-1610	4.82	6.9	61.4	0.165	0.44
9	NDFB-3	4.82	6.7	60.1	0.194	0.93
10	TSFB-15-04	3.07	4.8	54.7	0.088	0.45
11	BAIF-Bajra-7	5.04	5.1	61.4	0.236	-
12	NDFB-2	5.26	5	55.6	0.212	3.56
13	BAIF Bajra-5	4.82	4.2	53	0.130	1.42
14	RBB-1	5.69	5.3	55.6	0.012	0.58

Crop: Fodder Pearl millet

No. of entries: 14

Sample grown at AICRP on Forage Crops, PJTSAU, Hyderabad during Kharif 2021

Samples analysed by: Quality Control Lab, PJTSAU, Hyderabad for oxalate, AICRP PJTSAU for quality profiling

Quality and anti-quality profiling of fodder bajra lines from Hyderabad Center

		Samples grown at PJTSAU Hyderabad		
S. No	Variety	Oxalate content (mg/100g)	Crude fiber (%)	Crude Protein (%)
1	NDFB 942	1.79	24.5	8.5
2	Moti Bajra	1.79	28.8	10.8
3	Giant Bajra	1.33	26.7	10.6
4	BAIF Bajra-1	1.51	27.5	9.8
5	TSFB -1610	1.78	29.3	9.6
6	TSFB15-8	1.78	23.8	10.2
7	BAIF Bajra-6	1.65	26.5	9.4
8	ICMV 1610	1.78	25.7	10.1
9	NDFB-3	1.82	25.4	8.6
10	TSFB15-4	1.33	25.2	9.6
11	BAIF Bajra 7	1.78	28.3	9.2
12	NDFB 2	1.78	27.7	8.8
13	BAIF Bajra 5	1.38	25.4	9.0
14	RBB-1	-	-	-

Crop: Bajra x Napier hybrids

No. of entries: 10
Sample grown at MPKV, Rahuri during Kharif 2021
Samples analysed by: CSK HPKV, Palampur Centre
BxN Fodder samples: Mineral nutrient profiling of BxN forage

S. No	BXN lines	Parameters										
		Percentage						PPM				
		N	P	K	S	Ca	Mg	Zn	Cu	Fe	Mn	B
1	**RBN-14-26**	0.73	0.57	4.56	0.39	0.5	1.05	19.3	37.9	930	30.8	18.43
2	**RBN16-61**	0.56	0.53	1.21	0.37	0.5	0.7	18.2	39.5	373	26.1	15.13
3	**RBN 2014-95/12**	0.62	0.49	1.21	0.36	0.51	1.27	22.9	35.5	689	41.3	15.33
4	**RBN 16-33**	0.62	0.5	2.38	0.33	0.65	0.72	64.4	48.7	1602	56.8	15.95
5	**RBN 14-48**	0.78	0.58	2.69	0.4	0.45	0.59	78.6	44.7	765	68.4	18.01
6	**RBN 2014-265/1**	0.67	0.52	1.08	0.33	0.48	1.01	32.7	38	845	59.9	16.57
7	**RBN 2018/04**	0.67	0.5	1.41	0.3	0.67	1.17	29.3	36.7	579	44.8	15.33
8	**RBN 2014-95/10**	0.73	0.55	1.51	0.38	0.53	1.53	19.6	38.2	592	33.8	17.6
9	**RBN 2017-35**	0.73	0.56	1.08	0.39	0.53	1.41	30	37.7	1782	72.2	16.37
10	**RBN 2017-21**	0.56	0.46	1.1	0.32	0.2	0.3	9.7	26.5	162	18.8	14.3

Crop: Bajra x Napier hybrids

No. of entries: 10
Sample grown at AICRP FC&U center MPKV, Rahuri during Kharif 2021
Samples analysed by: MPKV, Rahuri (only Oxalate content analysed at PJTSAU, Hyderabad)
Bajra X Napier Fodder samples: quality and anti-quality profiling of BxN forage

SN	B x N Crosses	CP (%)	ADF (%)	NDF (%)	HC (%)	ADL (%)	Ash (%)	Ox. Acid (%)	Nitrate-N (PPM)	Oxalate content (mg/100g)
1	RBN-14-26	6.80	48.3	73.5	25.2	9.2	13	1.38	45	3.59
2	RBN-16-61	6.55	52.6	69.8	17.2	9.8	13.4	1.63	50	3.56
3	RBN-2014-95/12	5.79	53.2	66.3	13.1	10.1	14.9	1.13	48	3.14
4	RBN-16-33	7.06	51.6	67.9	16.3	9.6	11.4	1.63	79	3.11
5	RBN-14-48	7.06	48.8	64.0	15.2	8.8	15.8	1.50	31	3.14
6	RBN-2014-265/1	8.31	55.1	65.8	10.7	10.5	15.1	1.63	61	3.11
7	RBN-2018-04	7.30	40.7	63.8	23.1	8.2	15.4	1.13	37	3.14
8	RBN-2014-95/10	6.04	47.7	66.8	19.1	9.1	14.2	1.75	134	3.11
9	RBN-2017-35	6.55	40.6	61.8	21.2	8.1	14.6	2.00	92	3.14
10	RBN-2017-21	6.04	42.1	65.1	23	8.7	13.8	2.13	57	3.11

Crop: Fodder maize

No. of entries: 25

Sample grown at UAS (B) ZARS, Mandya AICRP FC&U center during Kharif 2021

Samples analysed by: CSK HPKV, Palampur Centre

Maize Fodder samples: Mineral nutrient profiling of Maize forage at 50% flowering stage

S.No	Maize lines	Percentage						PPM				
		N	P	K	S	Ca	Mg	Zn	Cu	Fe	Mn	B
1	IC-4	1.6	0.37	0.86	0.09	0.32	0.30	20.4	8.1	379	51.7	16.8
2	African Tall	1.5	0.27	1.49	0.09	0.35	0.31	23.4	9.1	308	33.9	15.8
3	Advance-4 F4	1.4	0.40	0.86	0.18	0.35	0.30	16.7	5.3	201	38.4	15.1
4	IC-12	1.5	0.28	0.88	0.07	0.29	0.22	13.0	4.5	151	35.0	16.6
5	BAIF-283	1.8	0.30	1.13	0.09	0.35	0.31	22.1	6.8	188	33.4	16.2
6	MFM20-3551	1.4	0.29	0.86	0.12	0.38	0.35	22.9	7.8	345	47.8	15.8
7	MFM-20-332-3	1.4	0.28	0.97	0.08	0.36	0.35	11.3	5.4	132	37.3	17.0
8	Advance line-1	1.0	0.31	0.84	0.11	0.45	0.32	16.3	10.2	202	38.4	16.0
9	PFM-12	1.5	0.29	1.00	0.08	0.32	0.25	10.1	7.4	264	30.7	15.5
10	SRG-11	1.7	0.32	1.32	0.12	0.29	0.18	22.6	8.8	231	36.5	17.0
11	BAIF-255	1.4	0.31	0.99	0.15	0.31	0.26	21.2	11.3	323	28.2	15.3
12	Advance line -4	1.6	0.36	0.86	0.07	0.32	0.32	22.4	10.7	251	38.2	17.2
13	JC-1445	1.2	0.35	0.84	0.10	0.41	0.35	12.2	9.5	371	42.3	16.8
14	BAIF206	1.8	0.31	0.89	0.12	0.39	0.24	23.9	10.9	309	39.3	15.8
15	BAIF-206	1.3	0.32	0.95	0.11	0.41	0.33	21.1	9.9	300	35.3	16.2
16	J-1007	1.2	0.38	0.99	0.09	0.36	0.24	22.3	10.1	254	29.9	17.4
17	MFM-18-8	1.5	0.30	0.90	0.13	0.42	0.28	23.8	10.6	391	35.8	15.8
18	J-1006	1.3	0.38	1.16	0.15	0.40	0.30	21.3	11.4	228	31.2	16.6
19	JH-17026	1.2	0.31	1.38	0.25	0.43	0.33	23.3	11.0	202	27.2	17.2
20	TSPM-15.5	1.1	0.33	1.14	0.20	0.39	0.30	19.9	12.7	138	40.6	16.2
21	Advance line 2(F3)	1.4	0.29	0.86	0.16	0.31	0.27	23.9	10.8	235	31.4	16.8
22	MFM-20-353-3	1.5	0.31	1.08	0.06	0.33	0.27	16.2	11.0	219	32.9	15.5
23	SRG-25	1.8	0.39	1.06	0.16	0.37	0.29	22.1	12.5	138	26.1	16.4
24	BAIF-256	1.4	0.37	1.02	0.12	0.32	0.30	17.7	12.5	166	26.5	15.5
25	MFM-20-342-1	1.3	0.32	0.98	0.07	0.36	0.26	18.1	12.3	301	33.4	15.8

Crop: Fodder Maize

No. of entries: 25

Sample grown at AICRP FC&U center ZARS Mandya during Kharif 2021

Samples analysed by PAU, Ludhiana.

Maize Fodder samples: quality profiling of Maize forage at 50% flowering stage

S.No	Maize lines	CP (%)	ADF (%)	NDF (%)	IVDMD (%)
1	IC-4	6.0	29.3	52.8	52.6
2	African Tall	6.5	34.5	58.1	46.2
3	Advance-4 F4	6.5	29.1	56.8	51.6
4	IC-12	5.6	32.1	51.3	48.6
5	BAIF-283	6.5	26.1	54.4	49.2
6	MFM20-3551	6.0	31.2	59.3	48.0
7	MFM-20-332-3	6.2	30.8	51.0	50.6
8	Advance line-1	6.9	26.8	51.2	52.6
9	PFM-12	6.9	29.9	59.1	52.2
10	SRG-11	6.2	30.0	58.3	49.6
11	BAIF-255	6.5	31.2	56.9	51.2
12	Advance line -4	5.6	35.2	62.9	49.2
13	Jc-1445	7.0	27.4	58.8	53.6
14	BAIF 206	6.2	31.0	61.2	47.2
15	BAIF-206	6.9	32.8	59.7	47.4
16	J-1007	5.6	37.5	60.1	44.0
17	MFM-18-8	7.2	32.2	56.5	51.2
18	J-1006	7.0	29.5	56.4	53.0
19	JH-17026	6.0	34.7	57.5	47.6
20	TSPM-15.5	6.3	32.6	58.4	48.5
21	Advance line 2(F3)	7.4	30.6	55.8	54.5
22	MFM-20-353-3	6.3	32.4	57.5	53.6
23	SRG-25	7.4	28.0	54.8	52.2
24	BAIF 256	5.5	38.4	60.2	47.6
25	MFM-20-342-1	6.0	35.4	58.9	55.6

Crop: Fodder cowpea

No. of entries: 28

Sample grown at UAS (B) ZARS, Mandya AICRP FC&U center during Kharif 2021

Samples analysed by: CSK HPKV, Palampur Centre

Cowpea Fodder samples: Mineral nutrient profiling of cowpea forage at 50% flowering stage

S. No	Cowpea lines	N	P	K	S	Ca	Mg	Zn	Cu	Fe	Mn	B
1	UPC 618	0.9	0.30	0.98	0.09	0.53	0.25	12.2	22.3	189	36.0	15.8
2	MFC-08-14	1.2	0.39	0.73	0.09	0.39	0.23	12.8	21.2	124	34.3	16.2
3	TFSC-20-6	1.6	0.24	0.54	0.10	0.39	0.19	15.1	20.9	155	27.4	15.5
4	UPC-18-8	1.2	0.25	0.84	0.11	0.49	0.23	13.9	25.0	169	45.1	16.0
5	UPC-607	0.8	0.24	0.96	0.10	0.55	0.30	14.6	23.7	134	52.1	16.8
6	UPC-621	0.7	0.22	0.70	0.09	0.52	0.26	16.5	20.9	145	39.7	16.0
7	UPC-628	1.8	0.23	0.63	0.09	0.36	0.19	10.7	20.6	123	25.1	14.9
8	MFC-09-1	1.2	0.32	0.83	0.10	0.49	0.20	9.4	19.5	191	35.7	15.8
9	UPC-18-3	0.9	0.42	0.49	0.10	0.69	0.21	8.4	19.7	141	41.8	16.8
10	MFC-09-3	2.4	0.29	0.67	0.11	0.40	0.29	10.8	24.8	118	35.6	16.4
11	UPC-622	0.9	0.42	0.49	0.10	0.69	0.21	8.4	19.7	141	41.8	16.8
12	Cowpea Vijay	0.8	0.43	0.50	0.09	0.34	0.21	33.9	24.1	119	26.6	16.6
13	UPC-4200	1.8	0.42	0.92	0.10	0.52	0.23	23.3	24.5	141	32.2	15.5
14	UPC-5287	2.0	0.24	0.83	0.12	0.47	0.24	14.3	22.6	105	27.7	16.4
15	UPC-802	2.5	0.38	0.44	0.11	0.31	0.25	8.3	21.3	114	21.4	17.2
16	UPC-801	2.3	0.34	0.56	0.10	0.33	0.14	8.8	22.3	155	19.5	16.2
17	MFC-18-5	2.3	0.36	0.24	0.13	0.36	0.18	10.9	22.5	211	26.5	17.4
18	UPC-9202	1.4	0.32	0.32	0.10	0.29	0.14	11.3	24.8	168	15.8	16.4
19	UPC-803	2.4	0.27	0.62	0.11	0.32	0.24	20.1	23.1	81	16.8	15.8
20	UPC-18-2	0.9	0.47	0.60	0.12	0.42	0.20	12.8	25.2	198	35.0	16.0
21	UPC-87-05	0.8	0.24	0.88	0.10	0.52	0.15	11.9	25.1	165	39.4	16.6
22	UPC 5286	2.4	0.26	0.27	0.10	0.23	0.18	14.2	21.4	124	18.9	17.6
23	MFC-18-4	0.8	0.42	0.27	0.11	0.39	0.22	15.5	21.2	98	34.6	17.0
24	UPC-305	1.1	0.40	0.64	0.12	0.38	0.21	20.4	22.4	94	30.4	18.4
25	UPC-304	1.9	0.26	0.63	0.10	0.41	0.21	28.7	21.6	158	35.0	17.0
26	UPC-287	2.0	0.41	0.72	0.13	0.58	0.28	17.5	25.2	158	43.7	15.8
27	UPC-625	2.4	0.27	0.63	0.12	0.48	0.24	15.6	29.0	99	37.4	17.0
28	RCC-48	2.6	0.39	0.37	0.12	0.41	0.27	28.4	18.8	103	36.3	17.4

Crop: Fodder Cowpea

No. of entries: 28

Sample grown at AICRP FC&U center ZARS Mandya during Kharif 2021

Samples analysed by: PAU, Ludhiana

Cowpea Fodder samples: quality profiling of cowpea forage at 50% flowering stage

S. No	Cowpea lines	CP (%)	ADF (%)	NDF (%)	IVDMD (%)
1	UPC 618	21.7	25.0	42.3	73.0
2	MFC-08-14	15.7	30.4	48.6	65.4
3	TFSC-20-6	19.0	27.7	45.8	71.4
4	UPC-18-8	14.0	28.3	49.5	64.2
5	UPC-607	20.6	26.3	39.7	70.4
6	UPC-621	22.2	22.5	39.3	72.2
7	UPC-628	21.1	30.6	38.2	70.2
8	MFC-09-1	17.8	30.8	43.2	67.2
9	UPC-18-3	22.7	31.3	37.2	74.4
10	MFC-09-3	23.1	23.1	38.5	72.4
11	UPC-622	22.9	22.0	35.0	72.2
12	Cowpea Vijay	14.7	33.1	47.4	65.1
13	UPC-4200	16.6	24.7	44.2	67.1
14	UPC-5287	14.1	35.8	49.5	66.4
15	UPC-802	15.4	32.2	50.7	68.4
16	UPC-801	17.6	32.6	43.4	69.4
17	MFC-18-5	17.5	31.7	42.1	70.5
18	UPC-9202	18.3	30.8	39.1	69.5
19	UPC-803	14.1	32.5	47.6	64.1
20	UPC-18-2	16.6	31.5	45.0	68.4
21	UPC-87-05	16.9	27.5	41.6	68.8
22	UPC 5286	18.0	32.2	40.9	70.1
23	MFC-18-4	18.3	33.2	39.9	71.1
24	UPC-305	16.8	35.4	44.8	65.4
25	UPC-304	15.4	31.1	46.5	68.4
26	UPC-287	15.0	33.6	46.6	65.4
27	UPC-625	22.2	23.7	38.8	74.4
28	RCC-48	21.3	27.2	39.9	73.2

Quality profiling of forage varieties & advanced breeding lines

Crop: Oat
No. of entries: 72
Sample Grown: Rabi 2021-22 at CSK HPKV, Palampur
Samples analysed by: AICRP (FCU) unit, CSK HPKV, Palampur Centre (during July to Oct 2022)
Oat Fodder samples: Quality profiling of oat forage at 50% flowering stage

S. No	Oat entries	CP %	NDF%	ADF %	Hemi- cellulose %	ADL%	Ash%
1	**707**	8.40	59.2	47.8	11.4	3.8	8.5
2	**806**	7.70	56.8	45.2	11.6	3.9	8.4
3	**1003**	8.40	57.6	46.4	11.2	3.8	8.7
4	**1013**	8.05	55.4	46.8	8.6	4.0	8.5
5	**1876-2**	7.35	57.6	46.8	10.8	3.8	8.6
6	**HJ-8**	7.35	56.8	45.6	11.2	4.1	8.3
7	**KENT**	8.05	58.8	46.6	12.2	3.9	8.1
8	**SABZAR**	8.05	57.0	44.8	12.2	4.0	8.5
9	**HFO-114**	8.75	59.6	48.0	11.6	3.7	8.4
10	**HFO-529**	7.70	56.0	44.8	11.2	3.9	8.4
11	**HFO-607**	8.05	59.4	47.6	11.8	4.2	8.6
12	**HFO-611**	7.70	55.8	43.2	12.6	3.8	8.2
13	**HFO-904**	8.05	60.2	47.8	12.4	4.0	8.1
14	**JHO-2004**	8.40	58.6	46.0	12.6	3.9	8.4
15	**JHO-2009-1**	8.75	60.2	47.8	12.4	4.2	8.2
16	**JHO-2010-1**	8.05	58.6	46.8	11.8	4.0	8.4
17	**JHO-2012-2**	8.05	58.4	47.6	10.8	4.1	8.5
18	**JHO-2015-1**	8.40	57.8	45.2	12.6	4.2	8.3
19	**JHO-822**	9.10	59.8	47.2	12.6	4.1	8.4
20	**JHO-851**	8.05	58.6	47.2	11.4	4.0	8.2
21	**JHO-99-1**	8.40	59.2	46.6	12.6	4.1	8.4
22	**JHO-99-2**	8.40	58.0	47.2	10.8	3.9	8.3
23	**JO-03-91**	8.05	58.0	46.4	11.6	4.1	8.6
24	**JO-03-93**	7.00	60.2	48.2	12.0	4.3	8.1
25	**JO-1**	7.70	58.4	45.4	13.0	3.8	8.4
26	**JO-15-9**	8.75	57.8	46.0	11.8	3.8	8.5
27	**JO-18-2**	7.35	59.0	45.8	13.2	3.9	8.6
28	**JO-18-8-5**	7.35	58.6	46.0	12.6	4.0	7.9
29	**JO-2**	8.40	60.2	48.8	11.4	3.8	8.6
30	**JO-20-5**	7.70	57.2	45.2	12.0	4.0	8.3
31	**JO-20-9-2**	8.05	58.2	46.6	11.6	3.8	7.9
32	**JO-5**	7.70	59.6	47.0	12.6	3.7	8.0
33	**OL-10**	8.40	58.0	46.4	11.6	4.0	8.6
34	**OL-11**	8.05	59.6	46.0	13.6	4.0	8.9
35	**OL-12**	8.75	59.0	46.8	12.2	4.2	8.7
36	**OL-13**	8.75	58.4	46.2	12.2	4.3	8.2
37	**OL-14**	8.05	57.8	45.8	12.0	3.9	8.4
38	**OL-15**	8.40	58.0	45.8	12.2	4.2	8.8
39	**OL-1931**	8.05	57.8	46.2	11.6	4.3	8.7
40	**OL-1949**	9.10	58.4	47.0	11.4	4.0	8.5
41	**OL-1977**	8.75	59.2	46.8	12.4	4.2	8.4
42	**OL-1980**	8.05	56.8	47.8	9.0	4.1	8.4

43	**OS-346**	8.05	61.6	48.8	12.8	4.1	8.4
44	**OS-377**	7.70	58.4	46.2	12.2	4.2	8.9
45	**OS-403**	7.35	59.6	47.2	12.4	4.0	8.7
46	**OS-405**	7.70	59.4	47.4	12.0	4.3	8.8
47	**OS-424**	8.40	60.4	48.0	12.4	4.0	8.3
48	**OS-427**	7.35	58.2	46.8	11.4	4.4	8.0
49	**OS-6**	7.70	59.8	47.6	12.2	4.2	8.2
50	**OS-7**	7.35	59.0	47.4	11.6	4.5	8.6
51	**PLP-1**	8.05	55.4	42.6	12.8	4.2	8.4
52	**PLP-10**	8.05	59.6	48.0	11.6	4.0	8.4
53	**PLP-11**	7.70	57.8	42.8	15.0	4.2	8.2
54	**PLP-12**	8.05	59.6	46.4	13.2	4.2	8.6
55	**PLP-13**	8.75	58.2	46.8	11.4	4.3	8.3
56	**PLP-14**	8.40	55.8	43.4	12.4	4.1	8.5
57	**RO-11-1**	8.05	59.4	44.8	14.6	4.2	8.4
58	**RO-19**	7.00	58.6	44.0	14.6	4.2	8.3
59	**SKO-108**	7.70	59.2	46.8	12.4	4.1	8.4
60	**SKO-20**	8.05	59.6	45.8	13.8	4.0	8.1
61	**SKO-225**	7.35	58.0	47.0	11.0	4.2	8.2
62	**SKO-90**	8.40	58.4	46.2	12.2	4.2	8.0
63	**SKO-96**	7.00	58.0	44.4	13.6	4.0	8.2
64	**UPO-06-1**	7.70	59.6	47.8	11.8	4.2	8.2
65	**UPO-10-2**	7.70	58.6	47.8	10.8	4.1	7.8
66	**UPO-11-1**	7.35	59.2	47.6	11.6	3.6	7.6
67	**UPO-16-4**	8.05	56.2	43.6	12.6	4.4	7.3
68	**UPO-18-1-1**	8.05	57.4	48.2	9.2	3.9	7.0
69	**UPO-18-1-3**	8.05	56.6	45.8	10.8	4.0	8.3
70	**UPO-18-4-4**	7.00	57.6	43.8	13.8	3.7	8.4
71	**UPO-212**	8.05	58.4	44.6	13.8	3.9	6.9
72	**UPO-94**	8.40	57.6	44.2	13.4	3.9	7.5

Oat Seed samples

Sample Grown: Rabi 2021-22 at CSK HPKV, Palampur

Crop: Oat

No. of entries: 72

Samples analysed by: AICRP (FCU) unit, CSK HPKV, Palampur Centre (during July to Oct 2022)

Mineral analysis done at CSK HPKV Palampur analysis lab

Oat seed samples: Quality profiling of oat seeds

S. No	Oat entries/ varieties	Parameters													
		CP %	CF (%)	Total Carbohydrates (%)	β-glucan (%)	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	S (%)	Cu ppm	Fe ppm	Mn ppm	Zn ppm
1	**707**	11.55	3.40	65.41	2.34	3.2	0.10	0.39	0.18	0.27	0.21	47.0	388	62.3	48.6
2	**806**	11.90	2.65	67.07	3.21	3.6	0.12	0.33	0.13	0.28	0.11	39.7	102	44.5	29.1
3	**1003**	12.25	3.65	66.02	2.60	3.2	0.15	0.43	0.15	0.23	0.43	45.0	199	58.9	52.6
4	**1013**	11.55	2.85	66.47	3.26	2.1	0.18	0.31	0.18	0.30	0.14	35.8	239	57.6	45.1
5	**1876-2**	11.90	3.30	64.14	2.58	3.1	0.15	0.27	0.11	0.33	0.19	47.0	205	52.5	38.5
6	**HJ-8**	11.55	3.85	65.49	2.31	2.1	0.11	0.23	0.09	0.14	0.14	47.0	123	25.6	19.7
7	**KENT**	11.90	3.10	66.62	2.41	2.8	0.13	0.36	0.07	0.28	0.26	35.9	171	52.9	39.5
8	**SABZAR**	12.25	2.65	66.02	2.65	2.6	0.14	0.28	0.09	0.26	0.18	38.8	198	44.4	32.9
9	**HFO-114**	11.55	3.90	67.37	2.66	3.2	0.25	0.31	0.14	0.27	0.14	20.9	193	53.6	38.1
10	**HFO-529**	11.55	3.10	70.53	2.62	2.9	0.16	0.28	0.12	0.20	0.26	31.7	205	51.4	35.0
11	**HFO-607**	11.55	2.75	68.65	2.35	2.6	0.17	0.28	0.11	0.21	0.14	43.3	267	58.3	33.1
12	**HFO-611**	11.90	2.95	72.71	3.20	2.0	0.12	0.27	0.18	0.21	0.11	38.3	125	56.3	45.4
13	**HFO-904**	11.20	2.90	72.48	2.59	1.3	0.14	0.22	0.13	0.24	0.10	33.5	81	51.1	37.9
14	**JHO-2004**	11.55	2.50	73.98	2.35	3.4	0.17	0.31	0.14	0.26	0.13	29.5	253	53.2	32.2
15	**JHO-2009-1**	12.25	3.65	74.74	2.42	2.7	0.17	0.30	0.11	0.28	0.14	40.6	242	57.0	28.6
16	**JHO-2010-1**	11.20	2.60	72.03	2.42	2.8	0.14	0.43	0.17	0.29	0.29	47.4	181	51.7	33.0
17	**JHO-2012-2**	11.55	2.55	74.66	2.41	2.9	0.16	0.26	0.15	0.30	0.11	23.7	188	55.1	22.2
18	**JHO-2015-1**	11.55	3.85	65.71	3.13	1.5	0.17	0.22	0.17	0.31	0.12	30.5	226	58.1	48.7
19	**JHO-822**	10.85	2.80	73.68	3.20	2.4	0.16	0.31	0.09	0.26	0.11	21.0	208	54.3	40.3
20	**JHO-851**	11.55	2.75	65.56	3.16	2.2	0.16	0.32	0.12	0.30	0.12	24.1	278	52.9	40.2
21	**JHO-99-1**	11.90	3.95	64.96	2.60	3.5	0.17	0.25	0.11	0.31	0.11	17.9	288	55.8	25.0
22	**JHO-99-2**	11.90	4.00	69.25	2.54	2.2	0.26	0.48	0.22	0.30	0.35	44.4	244	58.1	28.4
23	**JO-03-91**	11.20	2.85	66.02	3.12	3.5	0.17	0.35	0.14	0.19	0.14	35.8	194	56.8	38.8
24	**JO-03-93**	11.90	3.15	66.99	2.58	2.6	0.18	0.28	0.13	0.16	0.11	40.2	152	47.9	37.6
25	**JO-1**	12.60	3.20	66.54	2.38	2.2	0.16	0.27	0.12	0.22	0.12	38.6	135	56.6	39.7
26	**JO-15-9**	10.50	3.65	67.89	3.24	3.6	0.16	0.27	0.14	0.15	0.12	42.9	189	49.7	34.2
27	**JO-18-2**	11.20	3.10	66.32	3.20	2.5	0.15	0.28	0.15	0.21	0.12	47.4	196	59.9	39.0
28	**JO-18-8-5**	11.55	3.85	65.19	3.17	3.5	0.11	0.24	0.10	0.15	0.12	29.5	108	22.2	15.1
29	**JO-2**	10.85	2.70	74.44	2.62	3.4	0.14	0.26	0.14	0.09	0.10	35.6	125	55.3	30.3
30	**JO-20-5**	11.20	3.20	67.44	2.44	3.0	0.19	0.34	0.13	0.26	0.12	47.1	161	27.4	41.0
31	**JO-20-9-2**	12.25	3.90	69.62	2.50	2.3	0.15	0.28	0.13	0.24	0.13	39.7	146	59.2	37.3
32	**JO-5**	11.15	3.00	68.20	2.57	1.8	0.15	0.26	0.11	0.23	0.40	38.2	158	46.3	40.3
33	**OL-10**	11.55	3.00	66.54	2.42	2.1	0.10	0.30	0.12	0.24	0.29	49.1	152	35.1	28.3
34	**OL-11**	11.20	2.60	67.29	2.36	1.9	0.10	0.26	0.14	0.26	0.10	47.2	241	58.3	42.0
35	**OL-12**	11.20	2.40	63.01	2.66	2.8	0.18	0.28	0.15	0.32	0.16	46.8	200	58.9	45.9
36	**OL-13**	11.20	2.90	65.86	3.10	2.5	0.15	0.21	0.11	0.26	0.13	35.8	173	36.1	33.5
37	**OL-14**	11.90	3.15	70.98	2.40	2.5	0.12	0.27	0.12	0.28	0.13	48.0	280	47.2	39.1
38	**OL-15**	11.90	3.75	65.34	2.56	2.7	0.14	0.28	0.13	0.26	0.10	45.8	84	33.8	26.0
39	**OL-1931**	12.25	2.95	65.41	2.44	2.5	0.18	0.55	0.29	0.31	0.13	48.9	241	54.4	47.6
40	**OL-1949**	11.90	2.30	67.52	2.37	1.8	0.13	0.24	0.09	0.31	0.11	39.9	195	48.8	49.7

41	**OL-1977**	11.55	2.70	65.56	3.11	2.7	0.14	0.26	0.08	0.28	0.10	43.9	224	53.3	51.1
42	**OL-1980**	11.90	3.95	63.53	2.49	2.7	0.12	0.28	0.11	0.33	0.09	40.0	159	35.3	36.3
43	**OS-346**	11.90	3.40	67.22	2.57	2.9	0.14	0.26	0.09	0.25	0.11	34.1	231	45.2	30.2
44	**OS-377**	11.55	2.95	70.08	3.24	2.3	0.12	0.27	0.08	0.26	0.09	35.0	119	28.7	30.2
45	**OS-403**	11.20	3.00	68.57	2.40	2.1	0.15	0.33	0.14	0.27	0.11	38.0	263	53.1	41.5
46	**OS-405**	11.55	2.45	66.17	2.38	2.2	0.09	0.12	0.08	0.18	0.41	33.9	65	25.3	27.6
47	**OS-424**	12.25	3.75	65.04	2.38	2.2	0.18	0.32	0.11	0.25	0.20	37.1	116	55.2	37.7
48	**OS-427**	11.55	2.80	67.67	3.21	2.5	0.13	0.27	0.09	0.26	0.12	32.8	205	35.1	35.8
49	**OS-6**	10.85	2.85	69.55	2.35	2.1	0.18	0.36	0.15	0.28	0.13	42.9	307	55.3	45.3
50	**OS-7**	11.20	3.15	69.92	2.39	2.4	0.11	0.30	0.10	0.26	0.12	44.5	99	48.7	39.0
51	**PLP-1**	11.55	3.15	66.54	2.36	2.3	0.08	0.24	0.13	0.32	0.12	46.5	158	41.3	36.7
52	**PLP-10**	11.20	2.95	66.47	2.58	2.5	0.17	0.37	0.09	0.43	0.22	47.7	144	24.9	48.3
53	**PLP-11**	11.55	3.40	65.79	2.58	2.7	0.18	0.23	0.10	0.35	0.11	42.7	107	47.9	36.8
54	**PLP-12**	10.85	3.10	64.81	2.51	2.4	0.23	0.30	0.23	0.36	0.15	44.3	148	59.0	50.3
55	**PLP-13**	11.90	3.60	66.17	2.62	2.8	0.13	0.27	0.08	0.27	0.11	47.6	143	40.0	40.3
56	**PLP-14**	12.25	3.75	66.02	3.19	2.9	0.14	0.29	0.09	0.27	0.13	47.9	144	57.3	47.1
57	**RO-11-1**	11.90	3.55	66.32	2.33	2.2	0.23	0.31	0.14	0.39	0.31	46.0	237	52.8	33.8
58	**RO-19**	12.25	3.80	67.67	2.64	2.7	0.15	0.26	0.15	0.26	0.13	31.8	94	47.4	36.9
59	**SKO-108**	11.55	2.85	64.59	2.47	3.2	0.10	0.18	0.06	0.20	0.09	43.5	97	33.9	30.9
60	**SKO-20**	10.50	3.95	64.74	2.63	2.7	0.13	0.25	0.13	0.26	0.14	40.1	195	38.6	25.4
61	**SKO-225**	11.20	2.20	64.06	3.17	3.6	0.12	0.23	0.04	0.13	0.08	16.6	151	20.0	16.5
62	**SKO-90**	10.85	3.80	66.09	2.42	3.1	0.13	0.27	0.09	0.32	0.12	32.9	34	26.1	27.7
63	**SKO-96**	10.85	2.70	64.14	2.50	2.5	0.14	0.28	0.16	0.30	0.13	33.5	92	55.4	47.0
64	**UPO-06-1**	11.20	3.75	72.56	2.36	3.3	0.15	0.29	0.13	0.22	0.14	43.5	98	53.0	30.5
65	**UPO-10-2**	11.55	2.90	68.57	3.24	3.6	0.12	0.25	0.10	0.12	0.11	32.0	143	36.7	27.8
66	**UPO-11-1**	11.55	2.95	74.36	2.62	3.0	0.15	0.30	0.17	0.26	0.09	40.8	111	48.6	26.0
67	**UPO-16-4**	11.90	2.65	72.71	3.26	3.5	0.12	0.25	0.10	0.11	0.16	38.7	117	49.7	32.0
68	**UPO-18-1-1**	11.55	2.60	72.41	2.43	3.2	0.14	0.29	0.19	0.22	0.14	38.4	105	50.1	33.5
69	**UPO-18-1-3**	12.25	2.75	74.29	2.39	3.4	0.16	0.26	0.27	0.17	0.33	42.4	158	41.2	28.6
70	**UPO-18-4-4**	12.25	3.95	70.68	2.36	2.2	0.17	0.28	0.13	0.14	0.11	45.1	190	55.9	28.7
71	**UPO-212**	11.20	3.15	72.56	2.46	2.5	0.15	0.40	0.20	0.21	0.11	37.3	213	50.3	31.6
72	**UPO-94**	11.20	2.40	72.93	2.44	3.0	0.17	0.31	0.16	0.23	0.10	44.9	164	49.1	27.9

Crop: Oat

No. of entries: 72

Sample Grown and anlayzed: Rabi 2021-22 at Anand Agricultural University, Anand,

Oat Fodder samples: Quality profiling of oat forage at 50% flowering stage

S. No.	Oat entries/ Varieties	Parameters					
		Dry Matter (%)	Crude Protein (%)	NDF (%)	ADF (%)	Hemi Cellulose (%)	Ash (%)
1	707	14.8	8.2	65.7	43.8	21.8	9.4
2	806	14.6	7.4	68.7	39.6	29.2	10.1
3	1003	14.2	7.8	66.0	40.1	26.0	10.1
4	1013	18.5	6.1	66.2	44.8	21.6	12.4
5	1876-2	13.6	8.0	68.1	41.6	26.7	11.0
6	HJ-8	18.7	8.0	67.4	36.4	31.1	11.9
7	KENT	16.4	8.2	68.0	39.7	28.4	9.9
8	SABZAR	12.7	8.2	65.5	43.1	22.6	11.3
9	HFO-114	12.8	8.4	65.5	38.2	27.4	11.6
10	HFO-529	13.9	6.2	68.4	39.3	29.2	10.9
11	HFO-607	17.6	8.0	66.0	39.2	26.9	10.4
12	HFO-611	17.8	7.0	66.7	39.7	27.1	10.7
13	HFO-904	18.3	8.8	67.9	39.1	28.9	12.2
14	JHO-2004	13.3	6.2	69.9	40.8	29.2	10.4
15	JHO-2009-1	14.9	9.9	65.0	40.1	25.0	13.2
16	JHO-2010-1	20.2	7.4	68.7	41.9	26.9	11.2
17	JHO-2012-2	14.7	8.4	67.9	40.4	27.6	10.3
18	JHO-2015-1	14.2	9.6	63.9	41.0	23.0	13.5
19	JHO-822	11.8	8.7	64.9	41.9	23.1	12.4
20	JHO-851	22.1	5.7	68.6	38.5	30.3	11.8
21	JHO-99-1	14.9	10.0	66.7	41.5	25.4	12.1
22	JHO-99-2	18.4	8.1	68.7	41.9	26.9	10.7
23	JO-03-91	18.8	8.0	66.5	43.4	23.3	13.2
24	JO-03-93	21.4	7.0	68.5	42.2	26.5	11.6
25	JO-1	17.5	7.3	65.9	41.9	24.1	11.7
26	JO-15-9	16.8	6.5	67.3	41.0	26.4	11.6
27	JO-18-2	19.9	7.2	68.3	44.0	24.4	11.1
28	JO-18-8-5	15.8	14.2	65.4	33.7	31.8	10.2
29	JO-2	16.7	6.6	67.3	40.4	27.0	11.7
30	JO-20-5	15.2	6.6	68.2	41.4	26.9	9.4
31	JO-20-9-2	16.3	6.4	67.9	42.5	25.5	12.3
32	JO-5	19.4	7.1	67.8	44.7	23.2	11.6
33	OL-10	12.8	9.1	69.5	37.3	32.2	10.8
34	OL-11	15.5	7.0	69.2	39.6	29.7	11.9
35	OL-12	16.0	8.0	66.6	40.5	26.2	10.8
36	OL-13	17.9	7.9	67.1	40.6	26.6	12.3
37	OL-14	20.3	8.4	68.4	39.7	28.8	11.2
38	OL-15	19.1	7.8	69.2	38.9	30.4	11.6
39	OL-1931	15.3	7.7	66.9	42.0	25.0	11.6
40	OL-1949	20.6	6.6	68.0	43.9	24.2	10.2
41	OL-1977	14.2	16.3	62.1	33.5	28.8	12.2
42	OL-1980	19.2	7.3	69.0	40.6	28.4	10.2
43	OS-346	14.8	8.0	67.4	39.4	28.2	10.6
44	OS-377	18.9	6.7	68.3	40.3	28.1	10.8
45	OS-403	24.1	5.5	70.5	40.2	30.4	10.6

46	OS-405	22.9	6.8	69.2	40.6	28.7	10.1
47	OS-424	15.4	9.7	66.8	37.9	29.0	11.4
48	OS-427	19.1	7.5	67.8	39.5	28.4	10.6
49	OS-6	19.4	10.4	66.8	39.1	27.8	9.8
50	OS-7	26.2	7.1	67.0	44.0	23.1	11.7
51	PLP-1	16.1	12.3	65.8	35.4	30.6	11.3
52	PLP-10	15.9	9.2	67.2	38.5	28.9	11.2
53	PLP-11	18.6	7.7	69.9	43.6	26.4	11.3
54	PLP-12	14.3	8.2	67.3	40.7	26.6	10.6
55	PLP-13	16.5	8.1	67.6	40.2	27.6	13.2
56	PLP-14	23.3	6.6	69.7	40.1	29.7	10.5
57	RO-11-1	17.2	8.2	69.2	41.7	27.6	11.4
58	RO-19	19.5	7.3	68.5	40.2	28.4	11.8
59	SKO-108	18.9	7.9	65.8	39.7	26.3	11.1
60	SKO-20	14.7	8.1	63.9	38.4	25.6	14.6
61	SKO-225	14.6	8.7	67.8	40.7	27.2	19.4
62	SKO-90	14.7	11.4	62.8	40.3	22.6	12.3
63	SKO-96	16.7	7.5	68.4	38.5	30.0	11.0
64	UPO-06-1	20.8	9.0	67.1	41.0	26.2	9.7
65	UPO-10-2	20.7	7.9	68.7	43.5	25.2	11.2
66	UPO-11-1	19.3	7.3	67.8	42.6	25.4	11.7
67	UPO-16-4	27.6	9.2	66.9	42.1	24.9	10.3
68	UPO-18-1-1	20.8	7.3	70.1	40.7	29.5	10.1
69	UPO-18-1-3	19.7	9.1	68.0	39.4	28.7	10.6
70	UPO-18-4-4	18.0	7.3	68.4	39.5	29.0	10.2
71	UPO-212	15.3	8.9	66.0	41.5	24.6	11.5
72	UPO-94	14.1	7.0	63.9	40.9	25.7	11.1

Crop: Oat
No. of entries: 72
Sample Grown and anlayzed: Rabi 2021-22 at Anand Agricultural University, Anand,
Oat seed samples: Quality profiling of oat seeds

Sr. No.	Oat entries/ varieties	Parameters		
		Crude Protein (%)	Total Carbohydrate (%)	Crude Fibre (%)
1	707	14.7	9.8	24.0
2	806	12.1	10.4	25.0
3	1003	11.6	9.6	26.5
4	1013	13.5	11.0	23.0
5	1876-2	13.7	11.6	23.0
6	HJ-8	14.2	7.9	28.5
7	KENT	14.2	14.0	23.0
8	SABZAR	14.6	8.5	21.5
9	HFO-114	13.7	11.2	25.5
10	HFO-529	12.3	8.3	21.0
11	HFO-607	14.6	7.8	24.0
12	HFO-611	13.9	7.9	21.5
13	HFO-904	14.7	8.9	24.5
14	JHO-2004	11.1	7.2	21.0
15	JHO-2009-1	13.5	6.8	24.0
16	JHO-2010-1	14.2	8.9	24.5
17	JHO-2012-2	14.9	10.9	23.0

18	JHO-2015-1	11.4	12.6	23.5
19	JHO-822	13.2	8.3	20.0
20	JHO-851	11.9	9.6	25.0
21	JHO-99-1	14.7	7.3	31.0
22	JHO-99-2	14.2	7.0	31.5
23	JO-03-91	14.4	6.7	38.0
24	JO-03-93	15.8	6.7	36.0
25	JO-1	14.4	7.4	39.0
26	JO-15-9	10.7	7.0	29.5
27	JO-18-2	13.3	6.4	27.5
28	JO-18-8-5	13.3	6.4	24.5
29	JO-2	12.1	7.2	26.5
30	JO-20-5	13.9	7.0	26.5
31	JO-20-9-2	15.6	6.9	30.0
32	JO-5	11.9	6.7	35.0
33	OL-10	14.4	6.2	35.5
34	OL-11	13.5	6.9	30.0
35	OL-12	14.2	7.4	24.5
36	OL-13	14.7	8.2	26.5
37	OL-14	14.9	6.9	34.5
38	OL-15	11.9	7.9	29.5
39	OL-1931	12.6	14.7	36.5
40	OL-1949	11.6	10.3	34.5
41	OL-1977	10.2	15.8	32.0
42	OL-1980	14.9	12.4	30.0
43	OS-346	10.2	10.3	29.0
44	OS-377	13.0	8.5	32.5
45	OS-403	13.5	9.6	28.5
46	OS-405	13.7	8.0	36.5
47	OS-424	16.3	11.5	26.0
48	OS-427	13.9	9.4	30.5
49	OS-6	14.0	8.8	29.5
50	OS-7	14.2	8.9	30.5
51	PLP-1	16.3	11.5	41.0
52	PLP-10	12.8	8.8	43.5
53	PLP-11	9.5	7.5	41.5
54	PLP-12	13.7	6.5	44.0
55	PLP-13	14.6	8.0	43.5
56	PLP-14	14.6	11.4	42.5
57	RO-11-1	15.1	10.6	34.5
58	RO-19	11.4	10.3	32.5
59	SKO-108	14.0	11.6	34.0
60	SKO-20	13.2	14.0	35.5
61	SKO-225	13.7	9.0	29.5
62	SKO-90	10.9	11.1	31.0
63	SKO-96	7.7	8.9	32.5
64	UPO-06-1	14.9	10.1	37.0
65	UPO-10-2	16.5	11.7	27.0

66	UPO-11-1	12.5	11.0	29.5
67	UPO-16-4	16.1	15.2	31.0
68	UPO-18-1-1	17.0	11.0	26.0
69	UPO-18-1-3	14.0	8.8	27.0
70	UPO-18-4-4	14.4	11.2	27.5
71	UPO-212	14.6	8.8	25.5
72	UPO-94	20.7	12.8	37.0

Crop: Oat

No. of entries: 72
Sample Grown: Rabi 2021-22 at PAU, Ludhiana
Samples analysed by: PAU, Ludhiana
Oat Fodder samples: Quality profiling of oat forage at 50% flowering stage
Oat seed samples: Quality profiling of oat seed

		Fodder						Seed			
S. No	Oat entries	CP%	ADF%	NDF%	ADL%	IVDMD%	ASH%	CP%	CF	Beta-glucan%	T. sugars%
1	707	9.50	48.7	68.2	14.7	55.8	7.7	9.5	21.7	4.60	4.13
2	806	8.70	42.0	64.4	7.9	54.4	4.7	10.9	18.0	3.60	3.72
3	1003	8.50	42.6	69.2	9.8	51.4	8.8	9.8	19.8	4.30	3.00
4	1013	8.50	46.4	64.7	10.4	54.2	8.5	10.3	16.2	3.90	0.53
5	1876-2	9.90	41.6	62.3	10.5	56.6	7.8	12.5	17.2	4.70	3.07
6	HJ-8	7.40	45.4	69.7	7.1	50.0	7.7	10.2	19.8	4.50	3.51
7	KENT	7.80	44.2	64.7	11.0	52.2	8.3	11.0	21.0	5.70	3.04
8	SABZAR	8.30	47.2	66.9	8.6	57.6	7.2	8.4	16.4	5.80	3.00
9	HFO-114	7.60	48.4	73.9	12.7	54.0	6.3	10.3	21.0	5.60	1.25
10	HFO-529	7.30	45.4	70.0	13.1	50.8	8.6	10.3	20.3	6.40	5.12
11	HFO-607	6.60	47.7	76.2	6.5	47.6	6.7	10.5	16.9	4.90	5.88
12	HFO-611	6.70	42.7	63.3	7.8	50.0	8.5	9.6	22.0	5.80	3.66
13	HFO-904	8.00	40.0	71.7	7.9	54.6	8.8	10.5	19.8	4.50	2.57
14	JHO-2004	9.70	42.2	66.2	11.4	56.8	7.9	12.4	21.6	4.40	7.04
15	JHO-2009-1	9.90	43.5	69.1	9.1	56.4	7.9	11.6	19.6	5.30	5.88
16	JHO-2010-1	7.80	46.0	67.4	9.5	48.6	8.3	8.8	18.8	4.60	6.80
17	JHO-2012-2	9.70	42.0	67.0	10.1	58.6	8.6	10.2	22.1	4.60	2.38
18	JHO-2015-1	8.70	40.7	73.2	8.1	49.6	7.4	9.5	14.5	4.80	3.16
19	JHO-822	6.00	46.4	67.4	11.0	49.4	7.9	12.5	19.9	6.10	2.50
20	JHO-851	7.60	44.8	70.2	8.9	47.0	8.5	12.3	15.6	3.60	3.98
21	JHO-99-1	7.60	41.7	77.8	7.2	52.8	6.4	8.4	21.2	5.30	6.20
22	JHO-99-2	6.20	48.2	75.1	9.1	46.6	8.9	9.3	23.8	4.60	2.28
23	JO-03-91	9.80	40.0	70.7	10.7	55.2	7.7	9.1	12.9	6.90	3.38
24	JO-03-93	9.20	40.5	65.7	7.7	58.2	6.7	10.3	18.3	5.80	3.85
25	JO-1	6.40	47.3	61.8	12.8	48.2	7.2	9.3	13.8	4.60	3.66
26	JO-15-9	5.90	44.7	74.7	11.8	45.6	7.0	10.7	21.3	3.60	1.13
27	JO-18-2	6.90	42.2	73.9	11.2	50.4	7.6	10.3	23.5	5.70	3.79
28	JO-18-8-5	9.70	46.0	68.8	12.8	59.2	9.6	9.8	19.5	3.50	5.32
29	JO-2	6.70	49.4	73.1	9.9	46.8	7.9	9.5	17.8	6.40	4.01
30	JO-20-5	9.90	46.5	68.3	8.9	52.0	8.1	8.9	21.4	4.60	3.82

31	JO-20-9-2	9.00	44.2	67.8	8.9	59.2	8.1	10.2	15.4	4.60	2.75
32	JO-5	9.90	44.4	67.8	12.0	53.6	9.4	9.5	17.2	4.70	3.38
33	OL-10	8.30	45.0	66.6	8.8	55.4	7.3	10.3	22.6	3.80	5.58
34	OL-11	8.30	42.0	64.7	12.7	56.2	6.7	9.1	16.6	5.40	4.04
35	OL-12	7.70	46.8	67.5	11.5	52.8	8.7	10.5	17.0	4.90	3.66
36	OL-13	7.90	46.1	68.2	7.7	53.2	6.9	12.1	16.8	5.80	3.00
37	OL-14	8.40	43.9	69.8	9.5	53.2	8.5	10.3	17.9	5.40	3.66
38	OL-15	8.60	43.7	66.1	8.0	55.8	7.4	12.1	20.4	4.40	3.44
39	OL-1931	9.20	42.4	71.5	7.9	54.6	7.6	10.2	20.5	5.50	3.07
40	OL-1949	6.90	46.4	68.3	10.8	50.2	8.7	10.7	17.2	5.30	2.60
41	OL-1977	8.80	46.6	62.8	12.1	56.4	7.1	11.0	18.2	5.90	2.91
42	OL-1980	7.80	47.7	71.6	13.8	56.2	8.5	10.7	19.2	4.90	3.82
43	OS-346	7.60	49.4	73.4	10.4	51.0	9.1	10.0	13.0	5.60	2.66
44	OS-377	8.00	46.9	67.7	13.5	54.8	7.2	9.8	27.1	6.70	5.45
45	OS-403	7.10	46.7	62.1	7.9	49.4	7.6	8.9	20.8	4.20	3.76
46	OS-405	8.10	45.4	67.0	9.8	54.2	7.0	8.2	16.2	3.00	1.88
47	OS-424	8.30	45.9	66.9	7.7	56.6	9.5	12.3	20.5	5.70	2.85
48	OS-427	8.00	51.3	70.4	11.3	51.4	7.4	9.5	20.1	5.70	3.10
49	OS-6	6.90	43.3	69.7	8.8	50.6	7.3	9.8	16.0	4.60	5.35
50	OS-7	9.70	42.9	68.8	7.2	54.4	8.2	10.7	15.3	4.00	4.01
51	PLP-1	8.80	41.1	69.6	6.8	54.6	8.6	9.3	12.0	6.40	3.69
52	PLP-10	8.10	43.3	66.0	9.9	50.6	8.1	10.0	12.3	5.70	4.01
53	PLP-11	7.30	50.7	65.8	12.7	51.8	7.4	10.5	12.8	4.70	3.94
54	PLP-12	7.60	47.6	71.9	9.9	51.8	8.0	11.4	17.1	5.70	2.60
55	PLP-13	6.60	45.8	70.5	11.8	50.2	9.4	8.1	21.3	6.30	4.13
56	PLP-14	8.40	43.9	69.8	9.5	53.2	8.5	10.3	17.9	5.40	3.66
57	RO-11-1	7.60	45.5	74.2	11.9	54.8	7.6	8.9	17.1	4.50	3.66
58	RO-19	6.90	47.2	71.4	12.8	50.4	7.8	10.5	21.5	5.40	3.79
59	SKO-108	7.80	45.1	74.0	12.8	54.2	8.2	10.0	17.1	5.40	3.41
60	SKO-20	6.70	45.8	67.4	7.6	49.8	6.5	9.6	18.2	3.60	5.38
61	SKO-225	9.90	46.1	68.8	8.8	56.6	6.9	8.6	20.7	3.60	4.91
62	SKO-90	9.90	42.3	66.2	7.8	55.8	8.6	9.3	13.5	4.60	4.01
63	SKO-96	8.80	40.2	66.7	7.5	51.6	7.2	8.1	25.3	4.70	2.32
64	UPO-06-1	8.50	42.0	60.4	12.0	56.4	9.2	8.6	27.8	5.70	3.69
65	UPO-10-2	8.80	46.2	68.4	7.9	52.4	8.0	10.7	18.3	6.80	4.13
66	UPO-11-1	7.10	43.5	69.4	8.8	55.0	8.3	13.1	27.5	3.60	3.94
67	UPO-16-4	8.80	43.2	65.8	6.8	56.6	6.7	8.4	19.5	4.60	3.10
68	UPO-18-1-1	8.10	43.8	67.3	7.5	53.8	8.3	10.3	21.1	3.60	3.07
69	UPO-18-1-3	9.20	43.4	68.9	13.0	57.8	9.9	8.2	15.1	5.30	3.57
70	UPO-18-4-4	9.20	40.7	69.7	11.1	57.6	8.7	9.1	23.1	4.50	3.38
71	UPO-212	9.40	44.9	67.1	12.5	55.4	8.5	11.0	16.6	5.40	3.00
72	UPO-94	9.90	39.5	66.9	6.8	59.8	8.9	8.6	27.8	6.50	3.69

Crop: Berseem

No. of entries: 35

Crop Grown: Rabi 2021-22 at PAU, Ludhiana

Samples analyzed by: PAU, Ludhiana

Berseem Fodder samples: Quality profiling of Berseem forage at 50% flowering stage

Berseem seed samples: Quality profiling of Berseem seed

		Fodder (percent dry wt. basis)						Seed (percent dry wt. basis)		
S.No	Berseem	CP	ADF	NDF	ADL	IVDMD	Ash	CP	T. Sugar	Crude fibre
1	BL-10	15.7	35.3	61.0	6.7	53.8	10.6	24.7	8.6	22.5
2	HFB-20-5	15.9	37.0	58.4	5.1	58.0	10.2	28.0	9.6	23.3
3	JHB-17-1	15.5	31.7	55.8	5.3	58.2	11.3	23.0	3.6	24.2
4	WARDAN	17.3	36.3	52.1	7.6	55.6	12.3	28.4	7.3	25.4
5	HB-2	15.0	39.5	61.8	7.7	54.0	11.5	22.1	2.0	21.2
6	JHB-18-1	14.8	41.2	62.4	8.3	50.2	10.9	27.2	8.9	18.4
7	HFB-20-1	17.6	36.5	60.1	6.7	55.2	12.0	22.4	6.1	25.6
8	HFB-20-3	18.9	34.7	56.6	6.3	61.0	12.7	25.6	10.3	24.1
9	BL-22	19.2	34.0	54.1	7.9	59.6	12.1	30.6	7.1	26.0
10	BM-16	18.2	33.2	56.4	8.0	55.8	11.6	29.6	9.2	24.0
11	JHB-17-2	19.6	33.7	56.4	7.6	58.0	11.9	28.9	5.9	24.1
12	HB-1	-	-	-	-	-	-	-	-	-
13	BM-3	15.2	38.5	62.3	8.8	54.8	11.9	22.6	7.3	22.8
14	HFB-20-6	16.4	40.5	57.5	8.1	56.9	11.7	21.2	3.0	26.5
15	HFB-20-4	16.1	36.0	55.8	6.9	56.0	12.3	22.6	7.1	30.9
16	BL-22	19.2	34.0	54.1	7.9	59.6	12.1	30.6	7.1	26.0
17	JB-1	15.5	39.8	59.3	9.0	50.4	11.9	29.1	6.2	16.2
18	BM-14	18.9	32.8	50.9	8.2	62.2	13.3	27.7	13.7	23.8
19	BM-12	17.5	34.3	58.3	7.7	58.2	11.2	22.6	5.3	22.5
20	HFB-20-2	15.9	40.2	59.4	7.4	52.4	13.0	27.9	11.4	21.0
21	JBSC-1	15.7	39.4	58.2	9.3	53.4	12.0	29.4	11.5	24.1
22	BL-44	16.8	38.7	59.1	7.7	54.4	11.6	25.2	8.2	26.5
23	BL-42	16.3	34.1	56.3	6.8	56.4	12.0	23.2	6.6	23.8
24	BB-3	16.8	41.6	60.4	8.3	56.6	11.7	28.4	4.9	23.9
25	BM-13	15.2	38.5	59.3	9.8	54.8	11.9	28.6	4.3	25.4
26	JB-05-9	15.4	38.6	60.3	7.8	57.6	11.9	29.1	6.4	28.2
27	PC-115	17.1	39.3	56.4	7.2	55.2	11.7	16.5	4.0	27.2
28	BM-15	19.9	31.9	54.4	7.6	58.2	11.8	29.3	8.2	27.1
29	JB-5	16.2	37.7	59.4	7.3	57.3	11.8	29.6	9.3	26.5
30	BL-1	15.4	40.9	61.4	8.2	53.4	12.0	29.7	7.9	21.2
31	BL-180	15.9	36.4	61.2	7.0	55.8	11.9	21.7	7.8	23.5
32	BB-2	16.6	36.8	55.7	6.4	56.2	11.5	25.6	5.3	25.4
33	MESCAVI	16.1	39.3	58.9	7.1	52.4	12.1	26.6	7.3	22.0
34	PC-128	15.2	41.2	59.3	8.9	52.4	11.8	25.9	10.0	18.5
35	PC-114	15.5	38.4	63.2	7.9	53.4	11.6	29.0	9.6	25.0

HB-1-Not germinated

Crop: Lucerne

No. of entries: 18

Sample Grown: Rabi 2021-22 at Anand Agricultural University, Anand, Gujarat

Samples analysed by: Main Forage Research Station, Anand Agricultural University, Anand, Gujarat

Sample Received: Fodder: February, 2022 **Seed:** April, 2022

Sample Analysis: Fodder: March-April, 2022 **Seed:** May- June, 2022

Lucerne Fodder samples: Quality profiling of Lucerne forage at 50% flowering stage

S. No.	Lucerne entries/ varieties	Parameters					
		Dry Matter (%)	Crude Protein (%)	NDF (%)	ADF (%)	Hemi Cellulose (%)	Ash (%)
1	Anand-2	15.0	28.0	58.0	41.1	16.9	13.2
2	AL-3	15.5	29.4	61.4	43.3	18.1	13.1
3	AL-4	14.4	27.4	63.0	48.1	14.9	8.3
4	Lucerne Co-1	14.9	24.4	64.0	48.6	15.5	13.4
5	Lucerne Co-2	15.7	30.4	63.0	48.9	14.1	13.9
6	Lucerne Co-3	16.3	17.5	62.9	49.5	13.4	12.5
7	Lucerne Co-4	15.7	27.8	61.0	46.3	14.8	12.4
8	Krishna	17.6	25.9	61.0	45.6	15.3	13.2
9	LLC-5	14.2	26.9	65.0	46.6	18.4	14.0
10	RL-88	15.0	26.4	62.0	45.5	16.5	12.7
11	Alamdar-51	16.1	24.8	60.0	41.6	18.4	14.2
12	SS-627	16.4	27.4	62.0	47.6	14.4	12.8
13	AL-4	14.2	25.0	60.0	45.4	14.6	14.1
14	AL-66	14.6	27.6	61.0	47.5	13.5	12.9
15	AL-99	15.2	27.6	59.0	45.6	13.4	13.4
16	AL-111	14.9	25.0	58.0	44.6	13.4	15.3
17	AL-101	15.2	27.6	58.9	43.6	15.4	15.6
18	AL-104	14.8	28.1	61.0	46.6	14.4	14.4

Lucerne Seed samples: Quality profiling of Lucerne seed

Sr. No.	Lucerne entries/ varieties	Parameters		
		Crude Protein (%)	Total Carbohydrate (%)	Crude Fibre (%)
1	Anand-2	33.6	6.5	44.0
2	AL-3	38.2	8.3	43.0
3	AL-4	36.3	10.5	52.0
4	Lucerne Co-1	40.5	13.0	52.5
5	Lucerne Co-2	36.5	14.2	51.0
6	Lucerne Co-3	37.5	14.5	51.0
7	Lucerne Co-4	28.9	13.3	52.5
8	Krishna	-	-	-
9	LLC-5	30.3	23.1	47.5
10	RL-88	36.5	16.2	52.0
11	Alamdar-51	24.5	15.6	50.0
12	SS-627	40.1	23.5	46.0
13	AL-4	33.3	15.4	55.5
14	AL-66	35.6	14.5	50.0
15	AL-99	38.7	13.5	49.0
16	AL-111	38.7	18.3	44.5
17	AL-101	39.1	19.6	47.0
18	AL-104	36.1	12.1	53.0

Crop: Lucerne

No. of entries: 10

Sample Grown and analyzed: Rabi 2021-22 at TNAU, Coimbatore

Lucerne Fodder samples: Quality profiling of Lucerne forage at 50% flowering stage

S. No.	Entry	Nutrient data in Lucerne Green fodder (%)					
		CP (%)	NDF (%)	ADF (%)	Hemicellulose (%)	ADL (%)	Ash (%)
1	Anand -2	21.88	54.0	34.0	29.60	21.8	9.21
2	RL -88	20.56	58.0	31.0	32.40	15.2	9.34
3	LLC -5	23.63	55.0	31.0	30.80	17.0	10.5
4	Krishna	24.50	56.0	30.0	29.00	28.0	10.6
5	CO 1	22.31	54.0	31.0	28.50	26.0	9.37
6	CO 2	23.13	57.0	33.0	31.20	24.8	9.17
7	CO 3	24.50	58.0	30.0	25.60	26.0	9.77
8	CO 4	23.63	56.0	31.0	22.80	20.0	10.0
9	AL - 3	26.25	59.0	27.0	24.00	20.0	9.73
10	AL -4	24.50	55.0	28.0	28.80	23.2	9.41

Lucerne Fodder samples: Nutrient mineral profiling of Lucerne forage at 50% flowering stage

		Macro minerals (ppm)						Micro minerals (ppm)				
		Ca	K	Na	P	S	Mg	Cu	Fe	Mn	Zn	B
1	Anand -2	3996.77	6913.41	401.62	815.30	4200.00	1197.68	3.59	87.09	27.20	4.52	24.89
2	RL -88	3656.13	6931.72	587.00	798.09	3600.00	1247.04	3.68	88.92	29.35	5.63	26.67
3	LLC -5	3142.86	7534.25	325.29	861.01	2800.00	1119.24	3.64	73.81	26.16	6.19	21.90
4	Krishna	3521.04	7212.29	461.59	1004.86	3200.00	1272.91	4.10	73.41	26.32	6.62	21.78
5	CO 1	3669.19	7416.88	503.77	915.63	3600.00	1350.28	3.86	67.73	27.02	5.88	25.08
6	CO 2	4076.70	9218.28	471.09	1328.98	3700.00	1282.42	4.82	84.14	29.07	6.06	25.24
7	CO 3	3946.76	8738.08	616.82	1223.45	3400.00	1444.26	3.63	65.82	29.65	6.45	25.71
8	CO 4	3875.13	9274.90	730.22	1273.20	3600.00	1482.29	3.60	81.96	30.19	6.00	25.41
9	AL - 3	4532.16	8945.23	736.35	1278.92	3500.00	1710.93	4.04	90.08	35.55	5.80	29.26
10	AL -4	4849.65	8834.03	620.73	1309.87	3800.00	1643.71	4.32	92.41	35.23	6.67	29.31

Crop: Lucerne

No. of entries: 10

Sample Grown and analyzed: Rabi 2021-22 at TNAU, Coimbatore

Lucerne Fodder samples: Quality profiling of Lucerne seed

S. No.	Entry	Crude protein (%)	Crude Fibre (%)	Total Carbohydrate (%)
1	Anand -2	25.81	14.50	26.55
2	RL -88	25.93	15.00	25.75
3	LLC -5	25.50	15.00	23.88
4	Krishna	25.50	15.00	22.34
5	CO 1	24.75	15.00	22.25
6	CO 2	25.93	17.50	24.46
7	CO 3	24.56	13.50	18.65
8	CO 4	23.68	12.00	19.93
9	AL - 3	24.12	14.00	19.61
10	AL -4	23.68	14.00	24.79

Crop: Lucerne

No. of entries: 10

Sample Grown and analyzed: Rabi 2021-22 at TNAU, Coimbatore

Lucerne Fodder samples: Nutrient mineral profiling of Lucerne seed

		Macro minerals (ppm)						Micro minerals (ppm)				
		Ca	**K**	**Na**	**P**	**S**	**Mg**	**Cu**	**Fe**	**Mn**	**Zn**	**B**
1	**Anand -2**	1056.05	5722.75	22.42	3951.95	3800.00	1144.12	10.73	20.83	13.09	26.14	6.80
2	**RL -88**	1145.22	5813.09	33.01	3664.06	3000.00	1106.72	9.22	21.81	12.86	27.74	6.89
3	**LLC -5**	1236.16	6315.63	26.05	4277.77	1800.00	1213.34	11.22	22.04	13.89	28.77	7.06
4	**Krishna**	1296.25	6739.01	55.45	4439.48	2200.00	1385.11	11.69	21.90	14.15	28.16	7.68
5	**CO 1**	1222.97	7381.04	38.43	5035.67	4400.00	1461.27	10.85	23.58	14.99	27.71	9.09
6	**CO 2**	1154.14	7964.51	44.72	5303.79	5100.00	1504.73	11.03	26.72	14.38	29.77	8.27
7	**CO 3**	1292.96	7896.81	47.10	5431.23	5800.00	1503.19	10.19	26.53	14.87	27.57	8.20
8	**CO 4**	1229.82	7465.52	66.67	4762.31	3800.00	1460.32	9.38	27.28	14.77	25.34	7.96
9	**AL - 3**	1135.27	7092.94	62.49	4846.08	2100.00	1331.67	9.13	21.02	13.91	24.86	7.69
10	**AL -4**	1137.17	7428.37	33.18	5000.18	2500.00	1354.22	9.35	21.08	13.62	22.12	7.43

Activities under Development Action Plan for Scheduled Caste (DAPSC) earlier Scheduled Caste Sub Plan (SCSP) Programme

AICRP FC&U center, UAS (B) ZARS Mandya

AICRP on Forage Crops and Utilization, ZARS, V. C. Farm, Mandya in collaboration with KVK, Chamarajanagara implemented Scheduled Caste Sub Plan programme at P.G. Pallya, Hannur taluk, Chamarajanagara district. Under the programme 75 scheduled caste families were selected and seeds of different fodder crops *viz.*, fodder maize, multicut fodder Sorghum (CoFS-29) were provided to them along with package of practice and technical knowhow. Small agricultural implements *viz.*, plastic crates and sickles were also distributed among the beneficiaries.

AICRP FC&U center, BCKV, Mohanpur, Kalyani

120 Schedule Cast farmers of Chakdaha, Ranaghat – II & Hanskhali blocks of Nadia district, Canning – I, Bishnupur & Jaynagar – I blocks of South 24 Parganas District and Bagda, Gaighata & Bongaon blocks of North 24 Parganas District of West Bengal were benefitted by different field activities organized under SCSP Programme of AICRP on FC & U, BCKV, Mohanpur centre. SCSP interventions were implemented at Nadia & North 24 Parganas District (new alluvial zone) and South 24 Parganas District (coastal-saline zone) of West Bengal. Agricultural, livestock and fodder & forage cum food related interventions were demonstrated for socio-economic condition uplift of SC farmers/families under adopted villages of SCSP programme. *Moringa* seeds, Forage Maize (cv. J 1006), Rice bean (cv. Bidhan Ricebean-1, Bidhan rice bean-2 & Bidhan Rice bean-3), Hybrid maize (cv. Nisha), Coix (cv. Bidhan Coix-1), BN-Hybrid Cutting (cv. CO-5), Mung bean (cv. Virat), Blackgram (cv. IPU-01-43), Sesame (cv. Sabitri), vegetable seeds (Bhindi, Pumpkin, Brinjal), Chilli (cv. Bullet), Onion (cv. Sukh Sagar), Jute Seeds (cv. JRO-524: Naveen), Red leafy vegetables seeds, Grasspea (cv. Prateek), Lentil (cv. Moitree) along with SAAF (fungicide), Lancer gold (Insecticide), Micro nutrient mixture, Knapsack sprayer, Plastic pots, Bag, Low Cost Seed Storage Bean, Plastic folder, Books, Literatures, Pad & Pen etc. were distributed among selected schedule cast (SC) farmers. It has been introduced at Nadia & North 24 Parganas & South 24 Parganas District of West Bengal. Schedule Cast farmers' meet cum demonstrations on improved cultivation practices of fodder & forage crops in new alluvial zone & coastal-saline zone of West Bengal was conducted successfully under this SCSP programme (2021-22) for socio-economic condition uplift of SC farmers/families.

AICRP FC&U center KAU, Vellayani

Scheduled caste sub plan (SCSP) programme was implemented in collaboration with KVK, Kollam, and Department of Agriculture and Farmers Welfare, Kerala. 25 beneficiaries in Parakkode block in Kollam district were selected and 10,000 vegetative cuttings of fodder crops BN hybrid variety Sushthira were distributed on 15.02.2022.

AICRP FC&U center PJTSAU, Hyderabad

SCSP activities were carried out at two places, village Gorita, Thimmajipet mandal and village Yadireddypalli, Tadoor mandal. 80 farmer families from village Gorita and 70 farmer families from village Yadireddypalli were selected for the programme. Input distribution *viz.*, seeds of green gram variety WGG-2, seeds of Fodder Maize, Multicut Fodder Jowar and cuttings/ rooted slips of BxN hybrids, vegetable seeds were provided to all 150 farmers along with package of practice and technical details. Small farm equipment like Tarpaulins, Improved sickles, Small farm agricultural implements were also provided to all the 150 farmers. One day Skill Development Training Programme on Forage Production technologies was also organised with these 50 farmers.

AICRP FC&U center OUAT, Bhubaneswar

The Scheduled Caste Sub Plan (SCSP) programme was implemented by OUAT Bhubaneswar Center of All India Coordinated Research Project on Forage Crops and Utilization (ICAR) during 2021-22. Three (3) training programme were conducted, with participation of 108 trainee farmers. In the training programme, farmers were introduced to different types of forage crops and its improved cultivation practices. The trained farmers' also executed Fodder Technology Demonstrations in 100 patches with participation of another 240 farmers.

For demonstration purpose, 12,220 numbers of Hybrid Napier Bajra root slips, 3 quintals of Fertilizers, 10 kilograms of Anti termite dust and 250gms of Rootex hormones were distributed to the farmers. In addition, 150 numbers of small garden tools and farm implements were supplied to the farmers so as to create interest among them to take up timely intercultural operations in their field. Extension functionaries of Animal Husbandry department and KVK were associated and helped in execution of the programme.

The Programme was implemented in three villages namely Sargunmunda, Lakarma and Palligaon of Sonepur block of Sonepur district in Odisha.

AICRP FC&U center GBPUAT, Pantnagar

SCSP programme was undertaken in 02 villages (Talla Paya and Bhil Kot) in Garud block, district Bageshwar. On farm demonstrations were conducted of new agri-techniques on a total of 66 farmer's field. These farmers were also supplied with seeds of new varieties and fertilizers. Four training programme were conducted and farmers were informed about new implementable fodder and livestock management techniques. There were total 66 beneficiaries.

AICRP on Forage Crops and Utilization, Jhansi
Development Action Plan for Scheduled Caste (DAPSC/SCSP)

Center: GBPUAT, Pantnagar

Indicators	Unit	Achievements (2021-22)		
		3rd Quarter	**4th Quarter**	**year**
On farm demonstrations of improved varieties	No.	31	35	66
Distribution of quality seed/ inputs/ implements	No.	Seed-1q Fertilizer- 2q	Seed-1.5q Fertilizer- 2q	Seed – 2.5 q Fertilizer – 4q
Employment generation through farm operations	No.	31	35	66
Training programmes	No.	02	02	04

Total number of beneficiaries = 66

02 villages (Talla Paya and Bhil Kot) in Garud block, district Bageshwar (Uttarakhand).

Centre: KAU, VELLAYANI

Indicators	Unit	Achievements (2021-22)		
		3rd Quarter	**4th Quarter**	**year**
On farm demonstrations of improved varieties	No.	-	-	-
Distribution of quality seed/ inputs/implements BN Hybrid cuttings of variety *Susthira*	No.	-	10000 BN Hybrid cuttings	25 beneficiaries
Employment generation through farm operations	No.	-	-	--
Training programmes	No.	-	-	-

Total number of beneficiaries – 25

Parakkode Block, Kollam District, Kerala.

Center: OUAT, Bhubaneswar

Development Action Plan for Scheduled Caste (DAPSC/SCSP)

Indicators	Unit	Achievements (2021-22)		
		3rd Quarter	**4th Quarter**	**year**
On farm demonstrations of improved varieties	No.	30	70	100
Distribution of quality seed/ inputs/implements				
HNB Root slips	No.	3,500	8,720	12,220
Fertilizers	Quintal	1.00	2.00	3.00
Anti termite dust	Kg	2.00	8.00	10.00
Rootex Hormone	gms	50	200	250
Small farm implements	Nos.	20	130	150
Employment generation through farm operations (Man days) (family labour)	Nos.	70	150	220
Training programmes	No.	1 (32nos.)	2 (76 nos.)	3 (108 nos.)

Total number of beneficiaries: 108

Sargunmunda, Lakarma and Palligaon village of Sonepur block of Sonepur district in Odisha

Center: PJTSAU, Hyderabad

Indicators	Unit	Achievements (2021-22)		
		3rd Quarter	4th Quarter	year
On farm demonstrations of improved varieties	No.	50	100	
Distribution of quality seed/ inputs/implements	No.	50	100	
Employment generation through farm operations	No.	-	-	
Training programmes	No.	1	1	

Total number of beneficiaries – 150

Gorita Village, Thimmajipet Mdl and Yadireddy pally village, Tandoor Mdl Nagar Kurnool District

Center: BCKV, Mohanpur

Indicators	Unit	Achievements (2021-22)		
		3rd Quarter	4th Quarter	year
On farm demonstrations of improved varieties	No.	--	9	9
Distribution of quality seed/ inputs/implements	No.	--	16	16
Employment generation through farm operations	No.	--	60	60
Training programmes	No.	--	3	3

Total number of beneficiaries– 120

Village Chakdaha, Ranaghat – II & Hanskhali blocks of Nadia district, Canning – I, Bishnupur & Jaynagar – I blocks of South 24 Parganas district and Bagda, Gaighata & Bongaon blocks of North 24 Parganas district.

Center: UAS (B) ZARS, Mandya

Indicators	Unit	Achievements (2021-22)		
		3rd Quarter	4th Quarter	year
On farm demonstrations of improved varieties	No.	10	-	10
Distribution of quality seed/ inputs/implements	No.	50	20	70
Employment generation through farm operations	No.	-	-	-
Training programmes	No.	1	-	1

Total number of beneficiaries – 70

Village/ block/ district: PG Palya, Hosapalya & Doddahundevadi, Annur & Kollegala, Chamarajanagara

AICRP on Forage Crops and Utilization
Development Action Plan for North Eastern Hill (NEH) Region

Center: AICRP on Forage Crops & Utilization, Assam Agricultural University, Jorhat

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Compiled for year
Evaluation of germplasm & breeding lines	No.	80	80	40	40	240
Testing of entries in multi-location trials	No.	41	41	81	81	122
Identification of varieties by AICRP VIC	No.	-	-	-	-	-
Production of breeder seed	q.		0.15		0.10	0.25
Developing & testing new technologies	No.	1	1	1	1	4
Conducting Frontline demonstration	No.	-	-	-	-	-
Organizing farmers training programs	No.	1	1	1	1	4

Total number of beneficiaries- 40

villages Phalengichuk, Dhekiajuli, Dholi, Parbatia, Bahana, Balama, Teok, Phesual **District:** Jorhat

Center: AICRP on Forage Crops & Utilization, CAU, Imphal

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Compiled for year
Evaluation of germplasm & breeding lines	No.	-	-	-	-	-
Testing of entries in multi-location trials	No.	-	58	-	68	120
Identification of varieties by AICRP VIC	No.	-	-	-	-	-
Production of breeder seed	q.	-	-	-	-	-
Developing & testing new technologies	No.	-	1	-	1	2
Conducting Frontline demonstration	No.	-	22		35	57
Organizing farmers training programs	No.	-	-	-	2	2

Total number of beneficiaries - 177

In **district Imphal East:** villages Chanam Sandrok Makha Leikai, Khurai Laishram Leikai, Yairipok Lourembam, Yumnam Khunou; In **Imphal West:** Keishampat Konjeng Hajari Leikai, Khonghampat mayai Leikai, Lamdeng Khunou , Luker Maning Leikai, Mayang Imphal, Sagolband, Taothong Mamang Leikai, Kwakeithel Konjeng Leikai; In **Kakching:** Kakching Makha Leikai; In **Thoubal:** Kakching Paji Leikai, Nongpok Lourembam, Thoubal Khunou Makha leikai, Wangbal; In **Bishnupur:** Keinou Thongkha Makha Leikai, Lourembam maning Leikai, Ngaikhong Khunou, Ningthoukhong Ward No.4, Oinam, Waheng Khuman

FORAGE TECHNOLOGY DEMONSTRATION

To popularize the forage production technologies and make the farmers aware about various new fodder crop varieties. A total of 540 FTD's were proposed to be allotted to AICRP centres and co-operating centres during Rabi 2021-22 for the crops viz., Berseem, Lucerne, Oat, Lathyrus, Bajra Napier hybrid, Cowpea, summer Bajra, etc. Out of 540 FTD's, 80 were allocated to Berseem, 20 to Lucerne, 195 to Oat (SC), 145 to oat (MC), 25 to cowpea, 20 to BN Hybrid, 25 to Lathyrus and in small numbers to other crops.

Crop-wise FTDs to be conducted during Rabi 2021-22

SN	Centre	Berseem	Lucerne	Oat (SC)	Oat (MC)	Other crops	Total
1.	AAU, Jorhat			10		Lathyrus 5	15
2.	OUAT, Bhubaneswar			10			10
3.	BCKV, Kalyani	5		10		Lathyrus 20	35
4.	BAU, Ranchi	25		25			50
5	NDUAT, Ayodhya			5		BN Hybrid 5	10
6.	JNKVV, Jabalpur	10		5			15
7.	AAU, Anand		10	10			20
8.	BAIF, Urulikanchan	5		10			15
9.	MPKV, Rahuri						0
10.	SKRAU, Bikaner		5	5			10
11.	PAU, Ludhiana			60	40		100
12.	CCS HAU, Hisar	10		20	5		35
13.	GBPUAT, Pantnagar	20		10			30
14.	TNAU, Coimbatore					Cowpea 10 Guinea grass 10	20
15.	PJTSAU, Hyderabad		5	5		Hedge Lucerne 5 Bajra (MC) 5	20
16.	UAS (B), ZARS Mandya			10		Cowpea 10	20
17.	CSKHPKV, Palampur				20	Rye grass 10	30
18.	KAU, Vellayani					BN Hybrid 15 Cowpea 5	20
19.	IGKV, Raipur	5			10		15
20.	CAU, Imphal				30		30
21.	SKUAS&T, Srinagar				30		30
22.	RPCAU, Pusa				10		10
Total		**80**	**20**	**195**	**145**	**100**	**540**

Activities under Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier Tribal Sub Plan (TSP)

AICRP FC&U center CSK HPKV Palampur

TSP activities were undertaken in tribal population dominated areas of district Kangra of Himachal Pradesh. The activities were mainly focused on the supply of inputs to the farmers with a view to increase fodder production and animal productivity. 100 families in Panchayat Harer (Tehsil Baijnath) and 210 families in Panchayat Jia (Tehsil Palampur) were selected for the distribution of inputs under the proposed programme. 250000 root slips of Setaria grass & Bajra x Napier hybrid and 65.5 q of animal feed ration was distributed among selected families housing milch animals.

During the distribution of inputs two training camps, one at each location were also organized to impart technical knowhow to farmers regarding improved forage cultivation and livestock management.

Farmers' feedback in earlier adopted areas under TSP programme indicated an increase of about 60 % in herbage yield particularly with the planting of improved grass species like Setaria grass and Bajra x Napier hybrid. Feedback taken regarding performance of improved grass species and their production technologies on farmers' own lands in earlier adopted locations. Appreciable improvement in forage production per unit area observed. Interventions have resulted in increase in herbage yield to the tune of about 90-100q/ha over the existing system in the year of establishment accompanied by better animal health and productivity as well as improvement in family income. Keeping in view, the performance of improved species, more and more families are now interested and adopting demonstrated technologies.

AICRP FC&U center AAU, Jorhat

Two districts of Assam *viz.* Baksa and Goalpara were selected for undertaking TSP programme. Both the districts fall under Lower Assam Zone. The selected villages of Baksa distrct *viz*. Charaimari, Garamdew, Mushalpur, Nikasi and Dumunibagan are dominated by Bodo-Kachari tribe. On the other hand, the villages in Goalpara district *viz*. Ahopa, Saru-sakadol, Mankar, Dhopdhora and Sildubi are dominated by Rabha tribe. In these villages fodder technology has been popularized and ancillary input for improvement of their livelihood has been distributed along with machinery related to minimization of requirement of human labours. Total numbers of beneficiaries covered under this programme come to about 84 numbers. Both horizontal and vertical spread of improved varieties of perennial fodder crops was possible through the TSP programme. Many farmers earned a lot by selling planting materials not only to dairy farmers but also to Tea Gardens of Assam. Three numbers training have been conducted on the topic "forage production and storage" and "Concept of seed village". A total of 160 FLD is conducted. In Baksa district a custom hiring centre is established. In order to promote quality seeds for improving production and productivity, AAU Jorhat centre is implementing Seed Village Scheme in Baksa district for Development and Strengthening of Seed Infrastructure facilities for production and distribution of quality seeds.

AICRP FC&U center CAU, IMPHAL

Under AICRP-FC&U, CAU, Imphal Centre, during 2021-22 three training cum interaction programme was conducted at Churachandpur, Chandel and Kangpokpi district of Manipur. During the programme 135 tribal farmers were benefitted through different activities organized under TSP Programme of AICRP on FC & U, CAU Imphal centre.

TSP programme was also conducted in 4 tribal district of Manipur and Mizoram covering more than 150 farmers during 2021-22. Under this programme, different village under various districts of Manipur and Mizoram i.e. Churachandpur, Kangpokpi, Mamit and Serchhip were selected and villagers were benefitted. During the programme 135 tribal farmers were benefitted through different activities organized. Forage Maize (cv. J 1006), planting materials (cuttings) of Bajra-Napier Hybrid (CO 4 & CO 5), Oats (cv. Kent, JHO-822) etc were distributed among selected tribal farmers for 41 Fodder Technology Demonstration (FTDs). Preservation of green fodder through silage" was also conducted successfully under this TSP programme during 2021-22.

Extension activities like training, discussion and demonstration on advance agricultural practices, livestock rearing were conducted. The critical inputs like fodder seeds of high yielding varieties of fodder Maize, Sorghum, BxN Hybrid, oats, fertilizers (SSP, Urea), Plant protection chemicals etc. were provided for improving the poor farmer's economy and also to improve the production and protecting the crops from diseases and insect pests.

AICRP FC&U center KAU, Vellayani

Tribal sub plan programme scheme was taken up in the last quarter of 2020-21 in Wayanad district of Kerala. The programme was implemented in collaboration with KVK, Wayanad, for distribution of layer hen to Tribal women in Wayanad district. KAU-KVK, Wayanad in collaboration with Kudumbashree Mission, Government of Kerala, has launched their Tribal Smart Village Adoption Programme 2020-2021, in Tirunelly panchayath of Mananthavady Block. For implementation of TSP programme, we collaborated with KVKs in the above mentioned programme. All the beneficiaries were selected with the help of KVK, Wayanad and state department of Agriculture officials.

The official inauguration of the programme was conducted on 18.06.2021 in online mode. Hon'ble MLA of Mananthavady, Wayanad inaugurated the programme. Hon'ble Vice Chancellor of KAU, Director of Research, Director of Extension and Associate Directors participated in the programme (online). The programme is being implemented through Kudumbashree mission of Government of Kerala. We supplied 420 layer hen to the beneficiaries. The hen were reared in KVK, Wayanad and the breed is best suited for backyard rearing in Kerala.

Cuttings of BN hybrid varieties were distributed to 15 tribal dairy farmers. As a means for livelihood, 12 kid goats of high yielding breed were distributed to selected tribal families. 30 spades and 7 sprayers were distributed to tribal farmers. Total beneficiaries were 49 for demonstrations and input supplied.

Trainings: Two trainings were conducted. Online training was conducted on the topic 'backyard poultry rearing' for the beneficiaries. The second training was on 'Scientific fodder cultivation and preservation' conducted at KVK, Wayanad and nearly 60 dairy farmers participated in the programme.

AICRP FC&U center MPKV, Rahuri

TSP was implemented on 28th January, 2022 in the village at Kharvad post- Mandavi, Tal. Akrani, Dist- Nandurbar (MS) in *rabi* season of the year 2021-22. Total numbers of beneficiaries were 30 tribal farmers. To each farmer, 10 Kg seeds of Oat Variety- Phule Harita released by the MPKV, Rahuri and one cycle hoe (manually operated) were distributed. The 30 beneficiaries were given training along with field level demonstration regarding cultivation practices and plant protection measures for forage crops.

Guidance to the tribal farmers regards forage and allied components of farming had wider impact on awareness of tribal farmers in terms of latest fodder varieties, Forage crops production and protection technology *viz.*, time of sowing, recommended fertilize dose, irrigation management, cutting and insect pest and diseases management in terms of different forage crops, importance of intercultural operation for weeds management, *in-situ* soil and water conservation, involvement and technical knowhow of females in farming and allied business, as tribal farmers benefited by manually operated Cycle hoes which increased their efficiency and reduced cost of cultivation.

Thus, the implementation of Tribal Sub Plan assured sustainable livelihood, occupational security and risk or hazards free health and environment to the tribal farmers by adopting advance fodder production technologies.

AICRP FC&U, BAIF, Uralikanchan

The activities of Tribal Sub Plan were implemented in villages Ozarde, Pimpripada, Ambapur, Wasdhare and Kalamba in Nandurbar district of Maharashtra. The activities were planned as per the need of the area and the participating tribal people and implemented in participatory mode. The activities included training and awareness of farmers, supply of inputs, equipment, field demonstrations of new varieties of forages, nursery of BxN Hybrid, drip irrigation etc.

Training and awareness of participating farmers: Ten one day training programme were organized for the participating farmers in their respective villages to make exposure of the various activities of TSP and build knowledge about the forage crops. Farmers were trained about new technologies of raising of BAIF Napier Hybrid-11 nursery & cultivation of Berseem, use of Bio-prom (Phosphate Rich Organic Manure), preservation of green fodder through silage making, micro irrigation system etc. Fifty farmers were benefited through this programme and relevant training material was provided to all the participants.

Establishment of Bajra Napier hybrid nursery: Fifty nurseries of newly notified B x N hybrid i.e. BAIF Napier Hybrid-11 (BNH-11) were established at fifty farmers field to make available the planting material to surrounding farmers. Inputs such as planting material, organic fertilizers required for the nursery were provided to the farmers through project support.

Establishment of fodder demonstration: Berseem crop was introduced in the area for the first time as potential legume fodder in the winter. Demonstrations plots were established at fifty farmer’s field during *rabi* season and all the required inputs like seeds, fertilizers were supplied to beneficiaries through project support.

Distribution of small tools, farm implements and drip irrigation kit: Selected beneficiaries were supported with small agricultural tool and farm equipment for the easy field operations. Three chaff cutters and one pellet machine were given to the fodder cultivating groups. Twenty one tank & drip irrigation system was installed in BNH-11 nursery plots for judicious use available irrigation water during post rainy season.

AICRP FC&U center SKUAST-K, Srinagar

During FY 2021-22, a total of three tribal farmers field day cum awareness programmes were organized for Tribal farmers of Gurez (Bandipora), and Uri (Baramulla) where a total of 75 tribal families benefitted. In Gurez (Bandipora), field day was organized on 15/09/2021 and 25 farmer families were benefitted. Each family was provided with Oats seed (10 kg), Tall fesque seed (500 gm), Furrow Opener (1 No), Vermi-compost (20 kg).

In Dooru (Anantnag), field day was organized on 01/11/2021. 25 farmer families were benefitted. Each family was provided with Oats seed (10 kg), Furrow Opener (1 No), Vermi-compost (20 kg). In Uri (Baramulla), field day was organized on 30/03/2022. 25 farmer families were benefitted. Each family was provided with Fodder Maize seed (2 kg), 3 pc toolkit (1 kit), Tarpaulin (1 No), Vermi-Compost (20 kg).

AICRP FC&U center PJTSAU, Hyderabad

Tribal sub-plan activities were carried out at two villages Errannabhavithanda and Naryanaikthanda in Block Nagar Kurnool, District Nagar Kurnool in the Telangana state. The activities taken up included Capacity building programme, distribution of small implements, distribution of fodder and vegetable seed, creating awareness among the farmers about the fodder crops. The total beneficiaries were 191 tribal farm families.

The beneficiaries were provided with inputs like seeds of fodder maize, green gram, multi cut fodder Jowar, vegetables and rooted slips/ cuttings of BN hybrid. The small farm implements like Tarpaulins, improved sickles, small farm agricultural implements etc. were also provided. The literature Bahu varshika pasu grasalasaagu (Telugu) and Perennial forage crops (English) were provided which comprised of package of practice in easily understandable form. One day Skill Development Training Programme on Forage Production technologies was organized.

AICRP FC&U center, BCKV, Mohanpur, Kalyani

176 tribal farmers of Pingla, Narayangarh block of Paschim Medinipur district, Hirbandh block of Bankura district of West Bengal and Haripal and Jangi Para block of Hooghly district were benefitted by different field activities organized under TSP Programme. Forage Maize (cv. J 1006), Rice bean (cv. Bidhan Ricebean-1, Bidhan rice bean-2 & Bidhan Rice bean-3), Hybrid maize (cv. Disha), Coix (cv. Bidhan Coix-1), forage Blackgram (cv. Goutam), Mung (Meha), Moringa seeds, vegetable seeds (brinjal, chili, bhindi, onion etc.) planting materials (cuttings) of Bajra-Napier Hybrid (CO 3, CO 4 & CO 5) along with r*hizobium* culture, insecticides (lancer gold), fungicides (SAAF), Knap sack sprayer (general & battery operated), micro-nutrient mixture (nutri gold), literature (Bengali book on cultivation, leaflets on forage crops) and plastic bucket were distributed among selected tribal farmers. It has been introduced at Pingla block of Paschim Medinipur district and Hirbandh block of Bankura district. Seeds of forage mung (cv. Virat), Sesame (cv. Savitri), oats (cv. Kent), Berseem (cv. Mescavi), grass pea (cv. Prateek), planting materials (cuttings) of Bajra-Napier Hybrid (CO 3, CO 4 & CO 5) along with r*hizobium* culture, insecticides (lancer gold), fungicides (SAAF), micro-nutrient mixture (nutri gold), literature (Bengali book on cultivation, leaflets on forage crops) and plastic bucket were distributed among selected tribal farmers of Haripal block of Hooghly district. Tribal farmers' meet cum demonstrations on improved cultivation practices of fodder & forage crops in Red & Laterite Zone and New Alluvial Zone of West Bengal was conducted.

AICRP FC&U center GBPUAT, Pantnagar

Four villages i.e. Tota Baria (Bajpur block), Pchpera Jhankat and Pahseni (Sitarganj Block) in district U S Nagar and 01 village Haldichur (Haldwani Block) in district Nainital were selected.

A total of 480 field demonstration on forage crops were conducted which comprised of 92 demonstrations in 1st quarter (April to June), 65 in 2nd quarter (July to September), 196 in 3rd quarter (Oct to December) and 127 in 4th quarter (Jan to March).

A total of 31 Training/Skill development/Capacity development programme were conducted with 913 beneficiaries. It comprised of 11 trainings in 1st quarter with 99 beneficiaries; 06 trainings in 2nd quarter with 276 beneficiaries; 07 trainings during 3rd quarter with 290 beneficiaries and 07 trainings during 4th quarter with 248 beneficiaries.

A total of 10 Awareness Camps/ Exposure visit were organized with 481 beneficiaries. Input supplied to beneficiaries included forage seed- 7.9 q (Cowpea-50kg, Maize-1.5 q, Soghum-2 q, Berseem- 2.0q, Oat-1.5 q, Forage mustard-22 kg, Makhan grass-18 kg); Fertilizer - 16 q (Urea/NPK/MOP etc.), 6600 rooted slips of BN Hybrid planting material to 26 Beneficiaries.

The leaflets/pamphlets of forage crops like maize, sorghum, berseem, oat etc. were distributed among 225 farming communities for better understanding and adoption of production technologies of forage crops. Besides, the literature on major crops like wheat, rice, mustard, sugarcane were also distributed for better awareness on crop production.

Miscellaneous activities: Several awareness programs were also organized in selected TSP villages for better living standard of local communities. It included Awareness campaign on education, Awareness campaign on Sanitation, Awareness campaign on soil & water conservation, Awareness campaign on Organic farming/ vermi-compost, Awareness campaign on Soil Health Card, Awareness campaign on mushroom production/dairy production.

Benefits of TSP program: TSP program has left great impact on feed and fodder production of local communities. The productivity of green forage production has increased nearly 38-40% and it helped to increase milk production. The selected villagers are very happy with the programs as they get quality forage seed along with modern production technologies.

AICRP FC&U center OUAT, Bhubaneswar

Total 11 training programmes involving 330 trainees during 2021-22 were conducted. Frontline Demonstrations were conducted in 30 patches with participations of 240 beneficiaries. Six awareness camps organized with 240 participating tribal farmers. For Field level activities, 38255 numbers of Hybrid Napier Bajra root slips were supplied to 36 beneficiaries. Fertilizers (12 q), Anti termite dust (140 Kg) and 850 gms of Rootex hormones were distributed. Around 330 small garden tools and farm implements were given to the farmers to create interest among them and motivate to do timely intercultural operations in their field. Different extension functionaries of Animal Husbandry department also associated and helped in execution of the programme.

The Programme was implemented in two tribal districts. The villages were Alginiguda and Charpai in Kalyansighpur block; Beheraguda and Jagannathpur in Rayagada block and Bilamal, Bhitarmuchukuni, Kodipari and Dangasil in Kashipur block of Rayagada district.

In Kondhamal district, programme was implemented in villages Saskuti in Daringbadi block Durgakumpa and Katringia in Phulbani Block.

AICRP FC&U center IGKV, Raipur

For the benefit of tribal farmers of Chhattisgarh, different activities at Kondagaon district were conducted.

Distribution of small farm implements: Small farm implements like hand hoe, improved *Sickle, Kudali, Fawda, Belcha, Gaiti, Ghamela* and spray pump was distributed among the individual tribal farmer to reduce the human drudgery in agriculture. This implement was very like by the tribal people. Total 50 set of improved small farm implement were distributed at Kanker and Kondagon district. Total 57 tribal farmers were benefited through this activity   Improved sickle are used by the tribal woman to cut paddy and fodder crops. *Kudali, Fawda, Belcha, Gaiti and Ghamela* are very useful in backyard farming locally called *Badi* to produce vegetable and tuber crops. Spray pump was distributed among individual farmer and in group for plant protection in field crop and vegetable crops in *Badi.*

Demonstration of fodder production technology: Fodder production technology were demonstrated in Kanker, Kondagaon and Bastar district of Chhattisgarh. For the selection of tribal farmer, respective Krishi Vigyan Kendra and local district administration was approached. Suitable site and farmers were selected considering approach road, location of the site and socio economic of the farmer. For the technology demonstrations individual farmer having livestock or community land was selected. Seeds of new and improved varieties of fodder crop were supplied to the farmer, full packed and practice was adopted to grow the crop. Time to time visit in farmer's field was done by the fodder scientist and necessary suggestion was given to improve the quality of demonstration. Total 22 demonstrations on fodder oat and Berseem in *Rabi* season were conducted in which 22 tribal framers were benefited.

Quail (Bater) Chick for livelihood programme: Quail are fastest growing bird and it takes just 6 weeks from egg to adult. Bater is very much liked by the rural and urban population in Chhattisgarh state. Under livelihood programme with the help of KVK Kondagoan rearing of Bater chicks were implemented to generated extra income of tribal women. For implementation of the programme four self-help group were selected and training was given by veterinary scientist posted at KVK Kondagoan. After training four self- help group *i.e.* Shitla SHG village Chindli, Shitla SHG village Bhandarshivani, Maa Durga SHG village Bhanpuri and Maa Danteshwari SHG of Kondagoan were selected for demonstration of Bater rearing and marketing. Total 4000 chicks were procured from KVK Mahasamund and Kanker, 1000 chicks for each self-help group was given for rearing. Time to time visit by veterinary scientist was done for monitoring, and suggestions were given to SHG regarding feed and diseases. Care and management of chicks were done with locally available material at village level. After 30 days fully grown marketable Batter was produced by the SHG. Self-help groups were linked with market in the supervision of KVK Kondagoan. In market Rs 60/ Bater was sold out and Rs 32/ Bater as net profit was received by growers group.

AICRP FC&U center, UAS (B) ZARS Mandya

AICRP on forage crops and utilization, ZARS, V. C. Farm, Mandya in collaboration with Samatha Peoples Education for Development Society (NGO), Mysore and KVK, Chamarajanagara, implemented TSP programme at Bavikere, Bovi colony, Saragur taluk, Mysore district on 12th August, 2021. Under the programme, 65 tribal families were selected and distributed different seeds of fodder crops *viz.,* fodder maize, multicut fodder Sorghum (CoFS-29), Hedge lucerne (Co-1) and Bajra Napier Hybrid (BNH-10) and also distributed agricultural implements *viz.,* plastic crates and sickles. The follow up programme was undertaken and they opined that, improvement in milk yield, growth of the animals and economic improvement and livelihood security.

AICRP FC&U center BAU, Ranchi

Demonstrations conducted: Total thirty three demonstrations were conducted during Kharif 2021, Out of that 18 fodder demonstrations were conducted at Angara block in Ranchi district, which included Napier and Maize and fifteen fodder demonstration of Maize were conducted at Mander Block, Village-Nagra, Masmano and Sursa. Thirty demonstrations were conducted during Rabi 2021-22 in Chanho block, Village- Lundary in Ranchi district, which included Oat and Berseem. The average yield of Oat recorded 415 q/ha and Berseem 609 q/ha.

Training Programme: Five farmer's training programme was conducted during 2021-22, out of that two in Shahebganj and three in Ranchi district in different fodder crops i.e Maize, Napier, Cowpea, Pearl millet and Sorghum. Total beneficiaries were 148.

AICRP on Forage Crops and Utilization, Jhansi

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Centre: GBPUAT, Pantnagar

Indicators	**Unit**	**Achievements (2021-22)**				
		1st Quarter	**2nd Quarter**	**3rd Quarter**	**4th Quarter**	**Compiled for year**
• Training/ skill development/ programme conducted	No.	11/ 72	06/276	07/290	07/248	31 / 913*
• Demonstrations (FLDs/ OFTs) conducted	No.	92	65	196	127	480
• Awareness camp/ exhibitions/ exposure visits organized	No.	02	02	03	02	09
• Inputs supplied to beneficiaries (Fertilizers – 9.5 q; Rooted slips of BN hybrid – 6600; Seed -9.5q)	No.	Fertilizer-4 q BN Hybrid 1000	Seed -2q Fertilizer-4q BN Hybrid 4000	Seed-4q Fertilizer-4 q	Seed-3.5q Fertilizer-4 q Slips- 1600	Seed - 9.5q 6600 slips Fertilizer-16 q
• Distribution of other items (pamphlets – 286)	No.	Pamphlets-90	-	Pamphlets-196	-	286

***beneficiaries (training attended) Total number of beneficiaries- 480**

05 villages (Tota Baria (Bajpur block), Pachpera-Jhankat, Saronja and Pahseni (Sitarganj Block, US Nagar distt.) and Haldichaur (Haldwani block, Nainital Distt.).

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Center: CSKHPKV, Palampur

Indicators	**Unit**	**Achievements (2021-22)**				
		1st Quarter	**2nd Quarter**	**3rd Quarter**	**4th Quarter**	**Year**
Training/ skill development/ programme conducted	No.	-	-	-	-	-
Demonstrations (FLDs/ OFTs) conducted	No.	-	-	100	210	236
Awareness camp/ exhibitions/ exposure visits organized	No.	1	1	-	-	2/100
Inputs supplied to beneficiaries	No.	-	-	-	-	
Distribution of other items Root slips of improved grasses	No.	150000	-	150000	100000 Milk ration -62.5 q	236

Total number of beneficiaries – Awareness camp = 100 ; Root slips and milk ration = 236;

Village : Boh Drini, Harer (Thesil. Baijnath), Village Jia (Tehsil. Palamur), Distt Kangra (HP)

AICRP on Forage Crops and Utilization, Jhansi
Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Center: BAIF, Urulikanchan

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	year
Training/ skill development/ programme conducted	No.	-	04	03	03	10
Demonstrations (FLDs/ OFTs) conducted	No.	-	50	0	50	100
Awareness camp/ exhibitions/ exposure visits organized	No.	5	4	1	1	11
Inputs supplied to beneficiaries	No.	-	50	50	-	50
Distribution of other items	No.	-	-	-	21	21

Total number of beneficiaries- 50

Villages: Ozarde, Pimpripada, Ambapur, Wasdhare and Kalamba **Block:** Nandurbar **Dist.:** Nandurbar, Maharashtra

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Centre: BAU, Ranchi

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	year
Training/ skill development/ programme conducted	No.	-	-	2	-	108
Demonstrations (FLDs/ OFTs) conducted	No.	-	33	30	-	66
Awareness camp/ exhibitions/ exposure visits organised	No.	-	-	3	1	139
Inputs supplied to beneficiaries	No.			104	35	139
Distribution of other items	No.	-	-	48	-	48

Total number of beneficiaries - 313

Block : Kanke, Ormanjhi, Angara, Dist.-Ranchi ; Block : Mandro, Dist.- Sahibganj ; Block :Baliapur, Dist.-Dhanbad

AICRP on Forage Crops and Utilization, Jhansi
Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Center: KAU, Vellayani

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	year
Training/ skill development/ programme conducted	No.	1	-	1	1	120 trainees
Demonstrations (FLDs/ OFTs) conducted	No.	-	-	-	-	-
Awareness camp/ exhibitions/ exposure visits organized	No.	-	-	-	-	-
Inputs supplied to beneficiaries	No.	420 layer hen	-	1500 fodder cutting 30 spades	7 Sprayers	112 beneficiaries
Distribution of other items	No.	-	-	10 kid goats	Kid goats	17 beneficiaries

Total number of beneficiaries - 129

Sulthan Bathery and Mananthavady blocks in Wayanad district, Kerala.

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Centre: Assam Agricultural University, Jorhat

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	year
Training/ skill development/ programme conducted	No.	-	1	1	1	3
Demonstrations (FLDs/ OFTs) conducted	No.	10	30	60	60	160
Awareness camp/ exhibitions/ exposure visits organized	No.	-	-	-	-	
Inputs supplied to beneficiaries Rooted slips of perennial grass – 60000, Oat seed -4q, Urea = 200kg, SSP= 320kg, MOP=290 kg	No.	Rooted Slips -20000	Rooted slips 40000	Oats seed =4q Urea = 100kg SSP= 150kg MOP=140 kg	Urea = 100kg SSP= 170kg MOP=150 kg	
Distribution of other items: Brush cutter 4 , Chaff cutter: 4, Water can: 10, Khurpi 20, Garden hoe:20	No.	farm implements	farm implements	farm implements	farm implements	

Total number of beneficiaries- 84

Villages: Charamari, Ahopa, Saru sakadol, Mankar, Dhopdhora, Guwabari Sub –districts : Charamari, Ahopa, Dhopdhora Districts : Baksa and Goalpara

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Center: BCKV, Mohanpur

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	year
Training/ skill development/ programme conducted	No.	2	1	2	1	6
Demonstrations (FLDs/ OFTs) conducted	No.	50	40	80	80	250
Awareness camp/ exhibitions/ exposure visits organized	No.	--	--	--	--	--
Inputs supplied to beneficiaries	No.	110	115	50	55	330
Distribution of other items	No.	50	50	50	60	210

Total number of beneficiaries- 170

Name of village/ block/ district where the programme was implemented - Kharagpur- Pingla block, Narayangarh block (Paschim Medinipur district), Khatra- Hirbandh block , Raipur block (Bankura district), Bagmundi, Arsha, Jaipur block (Purulia district), Haripal block, Jangipara block (Hooghly district)

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Center: PJTSAU, Hyderabad

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Compiled for year
Training/ skill development/ programme conducted	No.			1	1	
Demonstrations (FLDs/ OFTs) conducted	No.			50	50	
Awareness camp/ exhibitions/ exposure visits organised	No.			1	1	
Inputs supplied to beneficiaries	No.			100	91	
Distribution of other items	No.			100	91	

Total number of beneficiaries - 191

Yerranna Baavi Thanda, Kollapur Mdl ; Gangaram, Bijinepally Mdl ; Naga Kurnool dist.

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Centre: UAS (B), ZARS Mandya

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	year
Training/ skill development/ programme conducted	No.	-	-	1	-	1
Demonstrations (FLDs/ OFTs) conducted	No.	-	-	10	05	15
Awareness camp/ exhibitions/ exposure visits organised	No.	-	-	-	-	
Inputs supplied to beneficiaries (Fodder seeds)	No.	-	-	65	-	65
Distribution of other items (Sickles, Plastic crates)	No.	-	-	65	-	65

Total number of beneficiaries - 65

Bhavikere Village, Saragur hobli, Mysuru district

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Centre: Mahatma Phule Krishi Vidyapeeth, Rahuri

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	year
Training programme conducted	No.	Nil	Nil	Nil	1	1
Demonstrations (FLDs/ OFTs) conducted	No.	Nil	Nil		30	30
Awareness camp/ exhibitions/ exposure visits	No.	Nil	Nil	Nil	2	2
Inputs supplied to beneficiaries	No.	Nil	Nil	Nil	300 kg Oat seed	
Distribution of other items: • 10 Kg seeds of Oat Variety- Phule Harita and one cycle hoe (manually operated), given training along with field level demonstration	No.	Nil	Nil	Nil	30 Manually operated Cycle hoe Set of 6 forage technology folder 30	

Total number of beneficiaries- 30

Village Kharawad Post- Mandavi Tal- Akrani District:-Nandurbar

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Centre: OUAT, Bhubaneswar

SN	Indicators	Unit	Achievements (2021-22)				
			1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year
1	**Training** programme conducted	Nos.	-	3 (68)	5 (142)	3 (120)	11 (330)
2	**Demonstrations** (FLDs/ OFTs) conducted	Nos.	-	-	15 (120)	15 (120)	30 (240)
3	**Awareness camp**/Exhibitions/Exposure visits organised	Nos.	-	-	3 (120)	3 (120)	6 (240)
4	**Inputs supplied**						
	HNB Root slips:	Nos.	-	8600	14655	15000	38255
	Fertilizer	Kgs	-	200	500	500	1200
	Anti termite Dust	Kgs	-	50	90	-	140
	Rootex Hormone	gms	-	350	-	500	850
5	Other (small tool, farm implements, Azolla Kits)	Nos.	-	-	150	180	330

(Figures in parenthesis indicate No. of participants) **Total number of beneficiaries- 330**

In Rayagada district: Villages Alginiguda, Charpai in Kalyansighpur block; Beheraguda, Jagannathpur in Rayagada block, Bilamal, Bhitarmuchukuni, Kodipari, Dangasil in Kashipur block. In Kondhamal District, villages Saskuti in Daringbadi block; Durgakumpa, Katringia in Phulbani Block.

Development Action Plan for Scheduled Tribe Component (DAPSTC) earlier TSP

Center: CAU, Imphal

Indicators	Unit	Achievements (2021-22)				
		1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Compiled for year
Training/ skill development/ programme conducted	No.	-	-	2	1	3
Demonstrations (FLDs/ OFTs) conducted	No.	-	-	30	-	30
Awareness camp/ exhibitions/ exposure visits organised	No.	-	-	-	-	-
Inputs supplied to beneficiaries	No.			Oat Seed- 1000 kg SSP-20 bags		Oat Seed- 1000 kg SSP- 20 bags
Distribution of other items	No.	-	-	-	-	-

Total number of beneficiaries - 120

State: Manipur District Churachandpur: Villages Hmuia Veng, Rengkai Venglei, Thingkhangphai, Pearsonmun, Molnom, Hmumtha, Rengkai, New Lamka

State: Mizoram villages Saithah, Serchhip, Zawlpui Leilet, Serchhip Dinthar, Bawktlang, Leng, E. Lungdar

Monitoring Details of Rabi 2021-22 of AICRP (FC&U) Trials

S. N.	Centre	Monitoring Team	Monitoring Date
1	AAU, Jorhat	Drs. B. G. Shekara and P. Mahadevu	5th March, 2022
2	BCKV, Kalyani	Drs. B. G. Shekara and P. Mahadevu	15th Feb., 2022
3	BAU, Ranchi	Drs. S. K. Jha and Sunil Verma	15th Feb., 2022
4	NDUAT, Ayodhya	Drs. Nilanjaya and Gangadhar Nanda	24th Feb., 2022
5	JNKVV, Jabalpur	Drs. S. K. Jha and Sunil Verma	17th Feb., 2022
6	AAU, Anand	Drs. Naveen Kumar, D K Banyal and V. K. Sood	18th Jan., 2022
7	BAIF, Urulikanchan	Drs. K. N. Ganesan and Nitish Bhardwaj	11th Feb., 2022
8	MPKV, Rahuri	Drs. K. N. Ganesan and Nitish Bhardwaj	12th Jan., 2022
9	RAU, Bikaner	Drs. Satyawan Arya and H. K. Patel	14th Feb., 2022
10	PAU, Ludhiana	Drs. P. S. Takawale and Rajan Katoch	24th Feb., 2022
11	CCS, HAU, Hisar	Drs. P. S. Takawale and M. S. Pal	3rd March, 2022
12	GBPUA&T, Pantnagar	Drs. Rahul Kapoor and R. K Agrawal	15th Feb., 2022
13	TNAU, Coimbatore	Drs. T. Shashikala and RVT Balazzi	28th Jan., 2022
14	PJTSAU, Hyderabad	Drs. Usha Thomas & Gayathri G	10th Feb., 2022
15	RPCAU, Pusa	Drs. Kalyan Jana and Santanu Sarkar	5th Feb., 2022
16	CSK HPK, Palampur	Drs. N. Saleem Khuroo and R.C. Bairwa	4th April, 2022
17	IGKV, Raipur	Drs. S K Billaiya and Amit Jha	11th Feb., 2022
18	KAU, Vellayani	Drs. Joseph Koering and Yogendra Prashad	11th Feb., 2022
19	UAS (ZARS), Mandya	Drs. T. Shashikala and RVT Balazzi	28th Jan., 2022
20	CAU, Imphal	Drs. S Bora Neog and Kalyan Jana	20th Feb., 2022
21	OUAT, Bhubaneswar	Drs. S Bora Neog and Kalyan Jana	21st Feb., 2022

Forage In-House Breeding Activities Rabi 2021-22

AICRP (FC&U), TNAU, COIMBATORE

Development of high water use efficient BN hybrids

Crosses were made between the selected pearl millet germplasm accessions containing high protein content with WUE Napier accessions (FD 482, FD 474, FD 434, and FD 443). Out of these, fifteen successful cross combinations were obtained.

A total of 15 F_1 Bajra Napier F_1 hybrids along with five checks namely CO 3, CO (CN) 4, CO (BN) 5, CO 6 and advanced culture TNCN 1534 were planted in the rain out shelter on 15.09.2021 to study the water use efficiency of Bajra Napier hybrids. Two water levels namely T1 and T2 were imposed to evaluate the hybrids which were calculated based on the pan evaporation rate which include Irrigation water/ Cumulative Pan Evaporation at 0.8 and 0.6 respectively. The respective control maintained outside the rainout shelter is IW/CPE at 1. The respective plots were irrigated when the CPE reaches 83.3 mm, 62.5 mm and 50 mm for the water level of 06, 0.8 and control respectively.

Details of Bajra Napier F_1 hybrids planted under ROS

SN	Crosses	SN	Crosses	SN	Crosses		Local checks
1.	GP15074 × FD482	**6.**	GP16016 × FD465	**11.**	**GP15958 × FD464**	**1.**	CO 3
2.	GP15074 × FD464	**7.**	**GP15073 × FD482**	**12.**	GP15958 × FD465	**2.**	CO (CN) 4
3.	GP15074 × FD465	**8.**	GP15073 × FD464	**13.**	GP15988 × FD482	**3.**	CO (BN) 5
4.	GP16016 × FD482	**9.**	GP15073 × FD465	**14.**	GP15988 × FD464	**4.**	CO 6
5.	GP16016 × FD464	**10.**	GP15958 × FD482	**15.**	GP15988 × FD465	**5.**	TNCN 1534

Among the hybrids evaluated, the advanced culture TNCN 1534 has registered the highest green fodder yield of 56.58 t/ha over two cuts followed by the hybrid GP15073 × FD 482 recorded the green fodder yield of 46.24t/ha under the treatment T1. Whereas under T2, the check CO (BN) 5 has registered the highest green fodder yield of 60.79 t/ha over two cuts followed by the hybrid GP15958 × FD464 (60.24t/ha). However, under control, the check CO 6 has registered the highest green fodder yield of 117.70t/ha over two cuts which is closely followed by CO (BN) 5 (116.74t/ha)

Development of bajra napier hybrid grass for high green fodder yield

Clonal Nursery Evaluation during 2020-21: A total of 31 F_1 hybrids along with the check hybrids CO (BN) 5 and CO 6 were planted in clonal nursery in RBD design with two replications on 15.10.2020. First green fodder harvest were made on 75 days after planting and the subsequent green fodder harvest were made at 45 days interval. Seven green fodder harvests were made. Among the clones evaluated for green fodder yield , the clone TNCN 2020-23 recorded the highest green fodder yield of 397 t/ha/yr followed by TNCN 2020-05 recorded 361t/ha/yr over seven consecutive cuts. The yield increase over the best check CO (BN) 5 is 16.08 and 5.55 per cent respectively. The promising clones *viz.*, TNCN 2020-23 and TNCN 2020-05 will be forwarded to the yield trial.

Clonal Nursery Evaluation during 2021-22: A total of 29 F_1 Bajra Napier hybrids along with the check CO (BN) 5 and CO 6 were planted in RBD with two replications in the clonal nursery on 04.10.2021. Two harvests were made and the results are furnished below. Among the clones, the clone TNCN 2021-17 recorded the highest green fodder yield of 53.55 t/cut/ha followed by TNCN 2021-24 recorded 47.53t/cut/ha.

Bajra Napier hybrid grass State MLT 2021-22: Bajra Napier hybrid grass MLT was continued for the third year (2021-22) and the MLT results were received from six locations. Among the entries evaluated, the entry i.e. the check hybrid TNCN 1903 [CO (BN) 5] has registered the highest green fodder yield of 27.32 t/cut/ha. The results received from the different locations are furnished below.

S. No.	Location	Green fodder yield (t/ha/cut)		
		TNCN 1901 (TNCN 1534)	TNCN 1902 (TNCN 1536)	TNCN 1903 [CO (BN) 5]
1.	DFC, Coimbatore	50.80	47.40	46.00
2.	NPRC, Vamban*	7.50	8.51	11.04
3.	SRS, Sirugamani	45.27	38.07	60.49
4.	SRS, Melalathur	27.00	24.12	22.55
5.	RRS, Aruppukopttai*	7.08	12.91	19.16
6.	RRS, Paiyur	29.55	31.76	34.87
	Overall mean	**25.44**	**23.56**	**27.32**

Lucerne

- For poly cross breeding in lucerne, eight parents namely Anand-2, Krishna, RL-88, CO 1, BAL 08-1, Anand-3, CO 4 and Kutchi were collected from different AICRP centers was sown in heptagon design on 05.03.2021. The parents were allowed for bee pollination and the crossed seeds were collected.
- A total of 93 polycrossed hybrid progenies along with the check varieties lucerne CO 3 and CO 4 were sown on 06.01.2021 in the field no. E1 of new area farm for evaluation. The crop is at flowering stage and selection of single pants for green fodder is under progress.

Fodder Cowpea

Advanced Yield Trial (AYT): A total of twelve entries along with checks were sown on 07.04.2022 in field number E3 of new area farm for evaluation of green fodder yield under AYT in RBD. The crop is at flowering stage and selection is under progress. The promising fodder cowpea culture TNFC 1905 has been nominated for evaluation under AICRP during *kharif* 2022

Evaluation of segregating generations: A total of 20 F_2 cross combinations along with the check were sown on 24.09.2021 in field no. F(P) of New area farm. Single plants were selected based on plant height (cm), number of branches/plant, leaf length and leaf breadth.

Rabi/Summer 2021-22: A total of 100 single plants from 20 F_3 generations in fodder cowpea were sown on 19. 05.2022. The crop is at late vegetative stage and selection of single plants based on high biomass is under progress.
Under Advanced yield trial in fodder cowpea, a total of twelve entries along with local check fodder cowpea CO 9 and TNFC 0926 were sown on 19.05.2022 in two replications using RBD. The crop is at late vegetative stage and selection is under progress.

Development of high biomass yielding maize hybrids with fodder quality: A total of 62 F_1 maize single cross hybrids were synthesized and hybrid seeds were collected. All the single cross hybrids were raised in the field along with the local check CO HM 8 on 23.09.2021 in RBD with two replications for evaluation of their suitability for fodder. At 50% flowering stage the single cross hybrids were harvested and evaluated for green fodder yield.

Among the hybrids evaluated, the F_1 hybrid TNFMH 2113 has recorded the green fodder yield of 60.71 t/ha which is 26% yield increase over the check COH(M) 8 followed by TNFMH 2143 with green fodder yield of 60.36 t/ha. The details of the important biometric observations were recorded in the single cross maize hybrids evaluated.

***Stylosanthes* spp.**

Studies to break seed dormancy and to enhance seed setting: Seeds of *Stylosanthes hamata* obtained from the Dhoni Farm, Kerala were utilized for the dormancy studies. The seeds were imposed with the following dormancy breaking treatments to enhance seed germination. Untreated seeds served as control. Control and treated seeds were taken from each treatment and assessed for the following seed quality parameters to find out the best dormancy breaking treatment. Observations were recorded for germination (%), root length (cm), shoot length (cm), vigour Index.

Salient findings: Seed scarified with hot water by immersing the seeds for 4 minutes in hot water of 80º C followed by seed soaking in cold water overnight + seed fortification with 0.25% KNO_3 for 3h recorded higher seed germination (42%), root length (3.9cm), shoot length (5.4cm) and vigour index (391) than other treatments.

AICRP (FC&U), PJTSAU, Hyderabad

Fodder Sorghum Improvement Programme

- Developed 40 single crosses in fodder sorghum using five testers and eight CMS lines. Also developed 10 three-way crosses with two F1s and 5 testers during Rabi 2021-22. The hybrids will be evaluated in Kharif 2022.
- Seed multiplication of following promising hybrids has been taken up during *Rabi* 2021-22

S.No	HYBRIDS	GFY-t/ha	S.No.	HYBRIDS	GFY-t/ha
1	ICSA 422 x PC-6	38.85	**4**	ICSA 403 x PC-6	31.67
2	ICSA 474 x PC-6	35.56	**5**	ICSA 425 X PC-6	30.88
3	ICSA 469 x PC-6	31.51			

Fodder Cowpea Improvement Programme

- 200 genetic resources were obtained from NBPGR, New Delhi for evaluation of various fodder parameters.
- 17 germplasm lines collected on exploration in North Eastern region were obtained from MRC, Rajendranagar.
- **Development of elite inbred lines:** 1st cycle of inbreeding completed during Rabi 2021-22 using African tall as source population.

Forage Bajra (multicut) improvement programme

- In summer 2021-22, an evaluation trial was taken up with 30 entries consisting 21 varieties, 8 hybrids and two checks laid out in Alpha lattice design in 2 replications. Data were recorded and data compilation is in progress.

Bajra Napier hybrid genetic improvement programme

- Estimated quality parameters in 15 Napier lines established at the centre.

AICRP (FC&U), MPKV, RAHURI

Development of Dual Purpose Fodder Oat: F_4 progenies of following crosses were sown during *rabi* 2021-22. Superior individual plants from these progenies were selected and harvest separately. These F_4 progenies will be grown and evaluated as F_5 progenies during *rabi* 2022-23 for green forage yield and seed potential.

SN	Name of Cross (F_3)	SN	Name of Cross (F_3)
1	RO- 11 - 1- 3 x P. Surabhi	**11**	RO- 11 - 1- 6 x Kent
2	RO- 11 - 1- 4 x P. Surabhi	**12**	RO- 11 - 2- 2 x RSO-8
3	RO- 11 - 1- 6 x P. Surabhi	**13**	RO- 11 - 2- 8 x RSO-8
4	RO- 11 - 1- 8 x P. Surabhi	**14**	RO- 11 - 1- 13 x P. Surabhi
5	RO- 11 - 1- 12 x P. Surabhi	**15**	RO- 11 - 2- 2 x P. Surabhi
6	RO- 11 - 1- 3 x P. Harita	**16**	RO- 11 - 2- 8 x P. Surabhi
7	RO- 11 - 1- 4 x P. Harita	**17**	RO- 11 - 2- 11 x P. Surabhi
8	RO- 11 - 1- 12 x P. Harita	**18**	RO- 11 - 1- 13 x P. Harita
9	RO- 11 - 1- 3 x Kent	**19**	RO- 11 - 2- 2 x P. Harita
10	RO- 11 - 1- 4 x Kent	**20**	RO- 11 - 2- 8 x P. Harita

Germplasm Maintenance

SN	Crop	Nos	SN	Crop	Nos
1	Oat	122	8	Napier (*Pennisetum purpureum* L)	33
2	Lucerne	16	9	Guinea grass (*Panicum maximum* L)	11
3	Marvel (*Dichanthium spp.)*	48	10	Madras Anjan (*Cenchrus spp.)*	44
4	Dongari *(Chrysopogon fulvus)*	13	11	Rhodes grass (*Chloris gayana*)	7
5	Butterfly pea (*Clitoria ternatae*)	25	12	Dinanath (*Pennisetum pediselatum*)	5
6	Moshi (*Iseilema wighttii*)	3	13	Ber *(Ischaemum aristatum)*	3
7	Stylo (*Stylosanthes* spp.) *S. seabrana* : 35; . *S. scabra:5; S. viscosa-1;* *S.seca:1 ; S. hamata:2*	44			
				Total	**374**

AICRP (FC&U), BAU, Ranchi

Maintenance of oat germplasm line: 150 germplasm lines were sown during rabi 2021-22 for maintenance.

Segregating generation of Oat

- F_1**:** Six crosses were made during Rabi 2021-22
- F_2: Seven F_2 population were maintained
- F_3: Six F_4 population were planted and 100-110 single plant selected
- F_4: 70-80 single plants were selected from each of three F_5 population
- F_6: Three F_7 populations were grown and 25 plant selected and remaining were bulked

Station Trial of Oat (MC): Out of ten entries tested, the entry BAUO-101 (461 q/ha) was found significantly superior with both the national check i.e UPO-212 and Kent. BAUO-103 was reported at par with both the national check.

Lathyrus: 20 germplasm lines were sown during rabi 2021-22 for maintenance.

Station Trial of Lathyrus: Twelve entries were tested, the varietal differences were found significant. The entry BAUL-103 (194.4 q/ha) showed maximum GFY. Entries BAUL-101 and BAUL-105 were significantly superior to second national check Mahateora.

Berseem: 15 germplasm lines were sown during rabi 2021-22 for maintenance.

AICRP (FC&U), SKUAST-K, Srinagar

Oat

- **Multi-location testing of advanced pipeline entries:** Six single cut advanced fodder oats material were evaluated during 2021-22 across locations (advanced evaluation trial) to confirm the fodder yield potential of these entries and will help in identifying entries to be evaluated in AICRP trials (IVT-SC) and OFT programme.
- 10 families were promoted to Station preliminary evaluation trial during *rabi* 2021-22 and best performing entries promoted to multi-location testing.
- 10 F_6 families of three crosses were put for seed multiplication in order to evaluated them in IVT during 2021-22
- Two new entries of forage oats have sent for evaluation under AICRP Coordinated programme
- Two varieties viz SKO-242 & SKO-243 on oats contributed by Srinagar Centre are in various stages of testing at National level in various breeding trials under AICRP-FCU.
- IC number from NBPGR was obtained for six germplasm in oats.

Progeny detail:

- F5 families of below mentioned crosses were evaluated and selections made among families for further evaluation.

SN	Cross Combination	SN	Cross Combination	SN	Cross Combination
1	SKO-208 X SKO-204	**5**	SKO-207 X Sabzar	**8**	SKO-212 X SKO-204
2	SKO-211 X SKO-205	**6**	SKO-212 X SKO-209	**9**	SKO-210 X SKO-207
3	SKO-211 X SKO-204	**7**	SKO-207 X SKO-205	**10**	SKO-205 X SKO-204
4	SKO-211 X SKO-210				

Germplasm holdings

SN	Crop	Germplasm holdings
1.	Oats	145
2.	Alfalfa	55
3.	Barley	25
4.	Red Clover	6
5.	White Clover	4
6.	Perennial Rye grass	4

AICRP (FC&U), RPCAU, Pusa

- Made extensive crosses in Oat breeding programme and F_3's of crosses have been generated to be planted in next season.
- A total of 275 genotypes of different fodder crops have been collected and are being maintained.
- Two stations trials and one maintenance trial have been conducted on Fodder Oat at Pusa centre in the last *Rabi* season.

AICRP (FC&U), PAU, Ludhiana.

Varieties developed in last 5 years

Year	Crop	Varieties developed	Features
2016-17	Oats	OL 11/ SVRC	A single cut variety for irrigated areas of Punjab state. Its fodder quality is superior to OL 9 and Kent. On an average, it yields about 245 quintals of green fodder and 8.5 quintals of seed per acre.
		OL 1760	A single cut variety recommended for Tamil Nadu, Telangana, Andhra Pradesh and Karnataka. On an average, GFY about 145 quintals per acre. Its fodder quality is better than the checks OS 6 and Kent.
		OL 1769-1/CVRC	A single cut variety recommended for Uttar Pradesh, Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh. GFY about 200 quintals per acre.
		OL 1802-1/CVRC	A single cut variety of oats for Punjab, Haryana, Rajasthan, Uttarakhand and Western Uttar Pradesh. Average green fodder yield is 215q/acre.
	Bajra Napier Hybrid	PBN 342/ SVRC, CVRC	Bajra Napier hybrid recommended for NWZ, NEZ and SZ comprising of states Punjab, Haryana, Rajasthan, Odhisha, Assam, Tamil Naidu and Karnataka. The fodder yield quality of this variety is better than national checks PBN 233 and CO 3. Its average green fodder yield is 430q/acre.
2017-18	Oats	OL 12/ SVRC	A single cut variety recommended for Punjab state. Its fodder quality is superior to OL 9, OL 11 and Kent. On an average, it yields about 255 quintals of green fodder and 9.0 quintals of seed per acre.
	Berseem	BL 43/ SVRC	A quick growing and tall variety of Berseem with more number of tillers recommended for irrigated areas of Punjab state. It supplies superior quality green fodder of 390 quintals per acre up to first week of June and gave good seed yield.
2018-19	B XN Hybrid	PBN 351	A Bajra Napier hybrid recommended for Uttar Pradesh, Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh. Average GFY is 520 q/acre.
2019-20	Oats	OL 1861	A single cut variety recommended for All India except HZ. It gave 9.2% and 15.1% more green fodder yield than the national checks Kent and OS 6 respectively at National level. It is also moderately resistant to leaf blight.
		OL 1869-1	A single cut variety recommended for NWZ and CZ. It gave 6.0% and 11.7% more green fodder yield than the national checks Kent and OS 6 respectively at National level. It is also moderately resistant to leaf blight.
2020-21	Oats	OL 13	A single cut variety and its mean GFY is 305.0 q/acre. Its plants are tall with long and broad leaves, high tillering ability.
		OL 14	A multicut variety and its mean GFY is 307.0 q/acre. Its plants are tall with long and broad leaves, high tillering ability.
		OL 1896	A single cut variety, mean GFY 650 q/ha. Plants are tall with long and broad leaves, high tillering ability, moderately resistant to leaf blight, quality better than the national checks. Recommended for NWZ.
		OL 1874	A single cut variety, mean GFY is 640.0 q/ha. Plants are tall with long and broad leaves, high tillering ability, moderately resistant to leaf blight, quality better than the national checks. It is recommended for NWZ.
		OL 1876-2	A dual purpose variety, recommended for NEZ, mean GFY 225 q/acre. It has high tillering ability, moderately resistant to leaf blight, better quality
	Rye grass	PBRG 2	Mean GFY 325 q/acre. better quality than PBRG 1, tolerant to diseases, insect pests
	Maize	J 1007	Mean GFY 280 q/acre. Moderately resistance to *maydis* leaf blight and brown stripe downy mildew diseases. Grains are white
	Bajra	PCB 165	Mean GFY 265 q/acre. Dual purpose composite variety, resistant to downy mildew.
2021-22	Oats	1874-1	A single cut variety, mean GFY is 368.0 q/ha. Its plants are tall with long and broad leaves, high tillering ability, moderately resistant to leaf blight, quality better than the national checks. It is recommended for SZ.

Germplasm maintained/ handled

Crops	Germplasm	Crops	Germplasm
Oats	1010	Berseem	130
Ryegrass	31	Lucerne	40

Oats

Station and Multi location Trials: A total of seven evaluation trials (5 station and 2 multi location) were conducted. The detail of the promising entries identified on yield basis is given below:

SN	Description of the Trial	Promising entries
1.	MLT in oats-multicut	OL 1949, OL 1967, OL 1964, OL 1931-2, OL 1942
2.	MLT in oats - Single Cut	OL 1971, OL 1877, OL 1974, OL 1988, OL 1964
3.	Station trial in Oats – Single Cut/Dual	OL 1980, OL 1967-1, OL 1931
4.	Station trial in Oats – Multi cut	OL 1967, OL 1969, OL 1975
5.	Station trial in Oats-1-Single Cut	OL 1988, OL 1985, OL 1980, OL 1974, OL 1977,

Germplasm Collection, Maintenance and Evaluation - A total of 1010 germplasm lines were maintained following standard breeding procedures.

Hybridization - A total of sixty crosses have been attempted involving promising genotypes and exotic germplasm accessions.

Breeding material handled - Breeding material as per details given below was handled following standard breeding methods and procedures:

Generation	Number	Generation	Number	Generation	Number
F_1 crosses	50	F_2 generation	85	F_3 generation	315
F_4 generation	425	F_5 generation	125	F_6 generation	54

Berseem

- A total of two evaluation trials (1 station and 1 multilocation) comprising of 12 genotypes were conducted.
- Poly-crosses were made involving nine promising genotypes. Promising polycross progenies will be advanced and will be evaluated against the check variety for yield, quality, insect pest and diseases.

Entries contributed in AICRP (FCU) breeding Trials during *Rabi* 2021-22 (18)

Oat

- **IVTO SC -** OL 1988, OL 1931-1, OL 1967
- **AVTO-1-SC-** OL 1977, OL 1980
- **IVTO MC -** OL 1931-2, OL 1969, OL 1975
- **AVTO-1-MC -** OL 1949,
- **IVTO-Dual-** OL 1967-1, OL 1874-2, OL 1982-2
- **AVTO-1-Dual-** OL 1931

Berseem

- **IVT Berseem -** PC 115, BM 13
- **AVT-1 Berseem -** BM 114.
- **AVT-2 Berseem -** BM 14

Lucerne

- **AVT-2 Lucerne -** LLC 6

Nucleus seed production

Crop	Variety	seed (q)	Crop	Variety	seed (q)	Crop	Variety	seed (q)
Oats	Kent	0.10	Oats	OL 1760	0.10	Berseem	BL 10	0.50
	OL 10	2.00		OL 1769-1	0.05		BL 42	0.50
	OL 11	0.15		OL 1802-1	0.10		BL 43	0.50
	OL 12	0.40		OL 1869-1	0.10		BL 1	0.05
	OL 13	0.20		OL 1874-1	0.20		BL 22	0.05
	OL 14	0.70		OL 1876-2	1.00		BL 180	0.10
	OL 1802	0.10		OL 1896	1.50			
	OL 1804	0.05		OL 1977	0.40			

Seed of recommended varieties, advanced lines and selected elite material was also produced in oats, berseem and Lucerne.

AICRP (FC&U), IGKV, Raipur

Germplasm holding: Lathyrus – 34; Oat – 42; Cowpea – 29

Berseem: Induction of polyploidy using colchicine, mutation breeding using mutagenic agents were carried out in three genotypes Wardan, Bundel Berseem-2 and Bundel berseem -3.

Oat: The conventional breeding programme was taken up for higher yield, delayed flowering and broad leaves. Crosses were attempted in following combinations.

Target Trait	Female	Male	Generation advancement
Higher green fodder, Delayed flowering, Broad leaf	OL-10 OL-11 OL-11 OS-346 OS-346 JHO-822 OS-403 OS-405	Kent OL-10 OL-1876 OS-06 OS-07 NDO-2 OS-2 OS-424	F_1=8
Higher green fodder, Delayed flowering, Broad leaf	UPO-212 UPO-94 JHO-822 UPO-212 UPO-94	OS-409 JHO-822 JHO-99-1 OL-10 JHO-99-1	F_2=5
Higher green fodder, Delayed flowering,	OS-409 ROS-8 OL-10	RO-19 OS-6 RO-19	F_5 =35,
Higher green fodder, Delayed flowering,	3 pipeline entry + checks (Kent, OS-6, OL-1896, RO-11-1) Plot Size = 10m x 3m		Seed multiplication for next year Station Trial

Lathyrus: Conventional Breeding activities were carried out with target of higher yield and delayed flowering. Crosses were made in following combinations.

Target Trait	Female	Male	Generation advancement
Higher green fodder, Delayed flowering	Mahateora PUSA-24	RLK-1950 PUSA-24 BK-05 Nirmal Prateek	F_8=360,
Higher green fodder, Delayed flowering	Mahateora PUSA-24 RLK-1950 Nirmal Ratan BK-5	RLK-1950 PUSA-24 BK-05 Nirmal Mahateora Ratan	F_2=27
Higher green fodder, Delayed flowering	Ratan		Evaluation and seed multiplication of confirmed polyploid lines
	Mahateora, Prateek		Induction of polyploidy using colchicine
	7 pipeline entry + 2 checks (Mahateora, Prateek)		Station Trial RBD with 3 replications

AICRP (FC&U), BAIF, Urulikanchan

Among the mandate crops, the breeding work was continued in Lucerne, fodder maize and pearl millet during the season. The work consisted of crossing programme, advancement of progenies, germplasm maintenance and characterization.

Lucerne

Polycross programme: A new cycle of polycross nursery was established with following eight parental lines contributed by five participating centers as per the layout finalized.

Code	Parental line	Contributing center	Code	Parental line	Contributing center
A	Anand -2	AAU, Anand	**E**	BAL-08-01	BAIF, Urulikanchan
B	Krishna	SKRAU, Bikaner	**F**	AL-3	AAU, Anand
C	RL-88	MPKV, Rahuri	**G**	Co-4	TNAU, Coimbatore
D	Co-1	TNAU, Coimbatore	**H**	Kutchhi (selection)	AAU, Anand

After first cut, the mother plants were left for crossing under nets and manual tripping was done daily. Seeds of 40 polycross were collected from 8 parents. The crossed seed of 29 plants obtained from polycross cycle grown during the *rabi* 2020-21 were grown in a single row in augmented block design to evaluate for GFY, DMY, disease and pest resistance.

Mutation breeding: Families of 100 M2 plants were grown in field to evaluate for high biomass. The data on forage yield contributing characters and other morphological characters was collected for selected plant families. The seeds of 40 families of M2 plants having high biomass yield were collected during the season and will be grown in M3 generation.

Germplasm evaluation: Seeds of sixty accessions was grown in six rows under field conditions for characterization and evaluating for GFY, DMY, disease and pest resistance. Data of three cuts was collected for green fodder yield, quality and morphological characters.

Fodder maize:

Advancement programme: F1 progenies of three crosses developed in kharif-2020 were grown for evaluation of different fodder traits and further progeny advancement. The 40 IPS were for further advancement.

Germplasm evaluation: Seeds of 182 germplasm lines was sown in two rows for characterization and evaluation for GFY, DMY and disease pest resistance under field condition. The germplasm was also screened for Fall Armyworm infestation. Five accessions namely BAIF 115, BAIF 280, BAIF 233, BAIF 137-A, BAIF 123 were found to be moderately resistant to Fall Armyworm infestation.

Maize x Teosinte cross

i. Progenies of four IPS in F_7 generation were evaluated for tillering ability, high leaf stem ratio and total of 9 IPS were selected for further advancement.
ii. With an objective to develop seeding ability, backcrossing was done with maize x teosinte and five IPS were selected for further evaluation.

Pearl millet

Germplasm evaluation for multicut ability: Thirty three accessions along with three checks *viz.* Moti bajra, BAIF Bajra-5 and BAIF Bajra-6 were evaluated for green fodder yield, morphological characters and multicut ability. On the basis of two cuts yield data, five promising accessions were identified.

AICRP (FC&U), CSKHPKV, Palampur

Germplasm Holding

Crop	No. of collections
Tall Fescue Grass (*Festuca arundinacea)*	58
Rye Grass (*Lolium perenne)*	8
Red Clover (*Trifolium pratense)*	9
White Clover (*Trifolium repens)*	58
Oat (*Avena* spp.)	337

Oat

Germplasm evaluation

- Evaluation of oat germplasm revealed that genotypes HFO-504, EC-605834, JPO-21, IG 03-250 and JPO-44 for green fodder yield; JPO-30, IG 03-250, ADG-96, HFO-103, EC-605834 and UPO-102 for dry matter yield and JPO-25, JPO-20 H-B-8, IG-01-211 showed superiority for seed yield per plant over the best check.

Generation of breeding material

- Forty-four new cross combinations were developed involving different genotypes.
- In order to develop mapping population for the identification of QTLs for quality traits, crosses between diverse parents IG-03-205 and JPO-18 were attempted.
- Interspecific hybrids of diploid (*A. strigosa*, *A. orientalis* and *A. longiglumis*) and hexaploid wild *Avena* spp. (*A. byzanitna* and *A. sterilis*) with cultivated *A. sativa* cv. HJ-8 were advanced to BC_2F_2 and BC_3F_1 generations.
- To introgress powdery mildew resistance, BC_2F_1 derivatives of cross HJ-8 (S) × JPO-46 (R) and Kent (S) × PLP-1 (R) were screened for powdery mildew resistance under field condition and resistant progenies were subjected to foreground selection using two gene specific SSR markers i.e. AM-102 and AM-87. A total 40 BC_2F_1 derivatives having linked markers are being subjected to background selection.
- Oat material evaluated in segregating generations derived from different crosses and 300 promising progenies have been selected.
- In M_4 generation, treatments 200Gy + 0.9% EMS, 400Gy + 0.9 % and 400Gy were found effective for generating putative mutants for high yield and powdery mildew resistance in variety Kent, whereas in variety HJ-8, combined treatment of 200Gy + 0.3% EMS, 300Gy + 0.3 % and 200Gy+0.9 % proved effective.

Tall fescue

- Polycross progenies derived from different diverse genotypes revealed that Hima-3, EC-178182, EC-178184, Hima-15, Hima-1, Hima-4, Sel-63 and Sel-71 exhibited significant higher values for different physiological, yield and quality traits were good general combiners and can be used for the constitution of new synthetic populations.

White Clover

- Restricted Recurrent Phenotypic Selection has been taken up for developing superior populations.

Red clover

- Restricted Recurrent Phenotypic Selection has been taken up for developing superior populations and populations are under evaluation.

AICRP (FC&U), AAU, ANAND

Contribution of entry in AICRP trial:

- Fodder Bajra entries AFB 45 & AFB 54 were contributed in IVT (MC) Summer Bajra trials

Germplasm maintenance: 290 Lines
New Germplasm collection: - 6

Crossing programme (Lucerne) – Polycross programme

Name of entries and their coding

Contributing center	Name of entry	Code
AAU, Anand	Anand-2	A
SKRAU, Bikaner	Krishna	B
MPKV, Rahuri	RL-88	C
TNAU, Coimbatore	CO-1	D
BAIF, Urulikanchan	BAL 08-1	E
AAU, Anand	Anand-3	F
TNAU, Coimbatore	CO-4	G
AAU, Anand	Kutchi	H

The plot of Krishna discarded in R-V due heavy dodder i.e. Cuscuta in crossing programme i.e. Polycross of lucerne during *Rabi* season 2021-22. Hence, two crosses of B not obtained. Total 38 crosses were harvested, but threshing will be done in two weeks.

Segregating materials: (Lucerne)

Generation	RABI 2021-22	
	Sown	Selection (IPS) / Bulks
F_1	05	02
F_2	24	97
F_3	60	79
F_4 Poly cross	116	90
F_4	51	35
F_6	52	63
F_7	63	24 Bulks
TOTAL	**371**	**366+24(B)**

Varieties released (in last 3 years)

Forage Bajra: Gujarat Anand Forage Bajra 4 (GAFB 4): This variety was recommended by 14th Combined Joint AGRESCO Meeting of SAUs held during April 3-5, 2018 at Junagadh Agricultural University, Junagadh and accepted for the release. Characteristics: Single cut nature, Light green foliage, Tall plant height, a greater number of tillers and leaves per plant, Thin stem and high leaf stem ratio than check varieties; Average Plant height - 240 cm, 3.7 tillers/plant, 29.5 Leaves/plant, Leaf stem ratio (0.9); Average CP (7.66 %), Average NDF (80.50 %), Crude Fiber (30.82 %); Green Fodder Yield: 581 q/ha, Dry Fodder Yield: 120 q/ha

AICRP (FC&U), GBPUAT, Pantnagar

Evaluation and maintenance of oat germplasm - 272 germplasm lines of forage oats were evaluated and maintained having different characters and used for oat varietal improvement.

Crossing block of oat - 56 advance lines along with 41 exotic lines were planted in the crossing block for their maintenance.

Evaluation of different filial generations of oat

SN	Generation	No. of lines	SN	Generation	No. of lines
1	F1	13	**5**	F7	150
2	F3	123	**6**	F8	123
3	F4	94	**7**	F9	27
4	F6	128			

Multiplication of advanced lines/released varieties of oat

a. Advance lines

SN	Advance lines	SN	Advance lines	SN	Advance lines	SN	Advance lines
1	UPO-10-1	**7**	UPO-16-2	**13**	UPO-18-2-2	**19**	UPO-18-5
2	UPO-10-3	**8**	UPO-16-3	**14**	UPO-18-3	**20**	UPO-19-1
3	UPO-11-1	**9**	UPO-18-2-1	**15**	UPO-18-4-1	**21**	UPO-19-2
4	UPO-12-2	**10**	UPO-20-1	**16**	UPO-18-4-2	**22**	UPO-19-3
5	UPO-16-1	**11**	UPO-20-2	**17**	UPO-18-4-3	**23**	UPO-20-4
6	UPO-16-1	**12**	UPO-20-3	**18**	UPO-18-4-4	**24**	UPO-20-5

b. Released/Identified varieties

SN	Released varieties	SN	Released varieties	SN	Released varieties
1	UPO-94	**3**	UPO-10-2	**5**	Kent
2	UPO-212	**4**	UPO-06-1	**6**	UPO-16-4

New crosses in oat = 20 - The following 20 new crosses have been made in crossing blocks based on foliage character and their canopy, plant height, and disease and pest resistance.

SN	Crosses	SN	Crosses
1	(UPO-212 x UPO-04-4) x KENT	11	F-9-48 x UPO-16-4
2	F-8-60 x KENT	12	F-9-47 x UPO-10-2
3	F-8-61x UPO-20-1	13	F-9-46 x UPO-10-2
4	F-8-62 x UPO-20-1	14	F-9-46 x UPO-18-4-3
5	F-8-64x UPO-18-1-3	15	OGP- 32 x UPO-18-1-3
6	F-8-68x UPO-18-1-3	16	OGP- 33 x UPO-18-1-3
7	F-8-69x UPO-18-1-3	17	OGP- 117 x UPO-16-4
8	F-8-70 x UPO-18-1-3	18	OGP- 59 x UPO-20-1
9	F-8-72 x UPO-18-1-3	19	F9-53 x F10-5
10	F-8-73 x UPO-18-1-3	20	F9-48 X UPO-16-3

Male and Female parents used for crossing program with their distinct characteristics:

SN	Parent	Distinct Characteristics
1	UPO-212, KENT, UPO 10-2, UPO 16-4, UPO-6-1, OX-503, OL-1325, OX-117-6	Resistance against pests, insects, and diseases, High GFY
2	OX-503, M-72, UPO-212, OX-117-3	grain yield
3	EC-35199, EC-79813, OX-117-6	DMY
4	OX-503, OX-229-13	Higher leaf: stem
5	EC-131306, EC-6269	Earliness

6	EC-61704, EC-79813, UPO-92/ Rodney-7-3	more tiller per plant
7	M-72, OX-435, UPO-92/ Rodney-6-3, UPO-6-1	plant height
8	EC-131306, EC-131240	dwarfness
9	EC-159606, EC-117406, Bingham	100 seed weight, high CP
10	OX-435, EC-9655	Lower PDF
11	EC-159606, OX-1090	Low ADF

Breeder seed production

SN	Crop	Variety	Target (BSP-I)	Actual production (BSP-IV)
1	Forage oat	UPO-212	82.5 q	20.0 q

- *Due to delayed sowing and harsh environmental conditions*

State varietal trial =01 - One State varietal trial of oat was also conducted during Rabi 2021-22 and data have been submitted accordingly.

One other microbiological trial has been conducted entitled: Influence of bacterial isolates on forage & seed yield and quality of forage oat Cv. UPO-10-2.

AICRP (FC&U), CAU, Imphal

Germplasm collected during 2021-22

Sl. No.	Crop	No. of accessions
1.	Rice bean	4
2.	Cow pea	5

Germplasm maintained

Crops	Number	Crops	Number	Crops	Number
Sorghum	11	Bothriochloa grass	1	Lathyrus	2
Rice bean	5	Maize	6	Hybrid Napier	3
Cowpea	9	Bajra	7	Dinanath grass	2
Hedge lucerne	1	Pearl millet	1	Millet	1
Berseem	10	Oat	56	Rye grass	3

AICRP (FC&U), BCKV, Kalyani

Germplasm maintained: 250 germplasm lines of Rice bean and 11 of Lathyrus are being maintained

Germplasm evaluated: Eleven (11) germplasm lines of lathyrus were evaluated against one check; Prateek as Large Scale Trial (LST) on production of green forage cum seed production as dual purpose.

New lines of grass pea for high biomass production: BCK-19-50 and BCK-19-27

AICRP (FC&U), KAU, Vellayani

Induced mutagenesis for developing dual purpose genotypes in fodder cowpea- Mutation of seeds of forage cowpea (*Vigna unguiculata*) variety Aishwarya using chemical mutagen EMS is undertaken. The final target is to develop a dual purpose cowpea with forage characters as well as good seeding behaviour. The M1 generation is harvested and the segregating M2 population is raised. Seeds from the selected plants in the M2 generation are harvested separately and used to raise M3 generation. The best plants in M3 generation are harvested separately and will be used to raise the M4 generation.

Development of core collection of fodder cowpea genotypes- 139 accessions of forage cowpea *(Vigna unguiculata)* collected from NBPGR, New Delhi were raised in summer 2021 season. Data analysis is being carried out to identify the promising accessions which can be taken forward in future crop improvement programmes. Many of the accessions are showing promising forage characteristics. These are raised in the coming seasons and depending on the genetic distance among the accessions based on D^2 statistics, crosses will be attempted to generate variability.

Identification of *Stylosanthes* species for yield and quality suited for cultivation in Kerala- To identify the best *Stylosanthes* species from among *S. scabra, S. hamata, S. seabrana and S. guianensis* suited for the climatic conditions of Kerala, thirteen accessions are collected from different parts of the country and are raised in the field. They will be evaluated for forage yield and quality for the coming years and the best suited species for the climatic condition of Kerala will be identified. Crop is in the field and yield observations are undertaken.

Construction of population structure in Stylo [*Stylosanthes* sp.] using SSR markers- Genomic DNA of accessions of *Stylosanthes* genotypes from among *S. scabra, S. seabrana, S. hamata* and *S. guianensis* will be isolated from the leaf samples and will be screened using SSR markers. Phenotypic data of same genotypes will be utilized for interpretation of molecular data and construction of population structure of the genotypes will be attempted. Experiment is underway.

Variability studies in fodder bajra (*Pennisetum glaucum* (L.) R. Br.) for yield and quality-Thirty genotypes of Fodder Bajra is raised in Summer 2022 and evaluated for yield and its correlated characteristics along with the nutritional profiling including antioxidant analysis. Data analysis is underway.

Suitability of a potential underutilized legume *Vigna stipulacea* for fodder purpose: Accessions of *Vigna stipulacea* collected from NBPGR, New Delhi is raised in Rabi 2021 and evaluated for fodder and seed yield along with nutritional quality. Data analysis is underway.

AICRP (FC&U), CCS HAU, Hisar

Varieties Developed

Oat variety HFO 529: The fodder oat variety HFO 529 has been released and notified vide **S.O_8 (E) dated 24.12.2021.** It is suitable for single-cut, timely sown, normal fertility and irrigated conditions in **Hill Zone** of the country (Himachal Pradesh, Uttarakhand and Jammu and Kashmir). It gives 274.4 q/ha green fodder and 70.6 q/ha dry matter yield. Its per day productivity of GFY is 14.2% higher over the best national check OS 6 and 18.2% over the zonal check SKO 96 while, 10.8% over the best qualifying variety OL-1896. The variety HFO 529 is superior over the national check OS-6 (4.4%) for per day productivity of DMY. It gives seed yield of 24.2 q/ha. The variety HFO 529 exhibited superiority to the national checks OS-6 (17.5%) and Kent (13.6%) and zonal check SKO-96 (8.1%) and 9.8% over the best qualifying variety JO-05-09 for Crude protein yield (q/ha). The variety is moderately resistant against powdery mildew disease.

Oat variety HFO 611: The fodder oat variety HFO 611 has been released and notified vide **S.O_8 (E) dated 24.12.2021.** It is a dual-purpose oat variety. It is suitable for timely sown, normal fertility and irrigated conditions in **North West Zone.** It gives 160.7 q/ha green fodder yield which is 10.9% and 7.0% more than the national checks UPO-212 (144.9 q/ha) and JHO-822 (150.2 q/ha), respectively. It gives 28.9 q/ha dry matter yield and shows superiority of 18.4 and 7.0% over the national checks UPO 212 (24.4 q/ha) and JHO-822 (27.0 q/ha), respectively. It gives seed yield of 25.2 q/ha after one cut of fodder. It is good in nutritional quality. It had 9.1% higher crude protein content than the best qualifying variety JO-10-506. For the crude protein yield (q/ha) it showed 15.2 and 5.6% gain over the national checks UPO 212 and JHO 822, respectively. *In-vitro* dry matter digestibility (IVDMD) was also higher than the national checks and qualifying varieties. It is moderately resistant against *Helminthosporium* leaf blight.

Oat variety HFO 707: The fodder oat variety HFO 707 has been identified in the online National Group Meet of AICRP on Forage Crops and Utilization, *Rabi* 2021 held on September 20, 2021. It is suitable for multi cut, timely sown, normal fertility and irrigated conditions in the **North West Zone** of India. It gave 696.1 q/ha green fodder and 134.8 q/ha q/ha dry matter yield. Per day productivity of GFY is 9.72% higher over national check UPO 212 while, it gave 4.73% higher per day productivity of GFY over the qualifying variety OL 1882. The proposed variety HFO 707 showed superiority of 4.5% and 9.43% over the national checks RO 19 and UPO 212 for per day productivity of DMY, respectively and a gain of 7.41% over the qualifying variety OL 1882. It gave seed yield of 23.8 q/ha q/ha. HFO 707 exhibited 19.4 q/ha crude protein yield which was superior to national checks UPO 212 (17.8 q/ha) and RO 19 (18.6 q/ha) and the qualifying variety OL 1882 (18.1 q/ha) by 9.0%, 4.3% and 7.2%, respectively. The variety is moderately resistant against *Helminthosporium* leaf spot disease.

Oat variety HFO 806: The fodder oat variety HFO 806 has been identified in the online National Group Meet of AICRP on Forage Crops and Utilization, *Rabi* 2021 held on September 20, 2021. It is a single cut oat variety. It is suitable for timely sown, normal fertility and irrigated conditions in the **South and Hill zone** of the country**.** The variety HFO 806 gave 376.4 q/ha & 295.2 q/ha green fodder yield which was 22.5% & 6.4% more than the national check Kent (307.3 q/ha) & OS 6 (277.5 q/ha) in South Zone and Hill zone respectively. It gave 83.9 q/ha and 71.6 q/ha dry matter yield and showed superiority of 27.3% and 5.4% over the national checks Kent (65.9 q/ha) and OS 6 (67.9 q/ha) in South Zone and Hill zone, respectively.

It gave seed yield of 9.5 q/ha and 23.9 q/ha in South Zone and Hill zone respectively. It is good in nutritional quality. The crude protein yield (q/ha) of HFO 806 was 5.53 q/ha and 7.05 q/ha in South Zone and Hill zone, respectively. HFO 806 showed moderate resistance against powdery mildew disease

Research Activity

Conducted **8 experiments** during *Rabi* 2021-22 consisting of **16 trials on 2 crops** *viz*. Berseem and Oats.

BERSEEM

Collection, maintenance and evaluation of germplasm (State plan): The berseem germplasm contains 225 lines of indigenous sources and 27 of exotic origin. This year half of the germplasm was grown for maintenance purpose.

Evaluation of varietal trials for fodder yield and its components (State plan): Three station trials *viz*., LST, SST and PRT on berseem were conducted.

Large Scale Trial (LST): 8 genotypes were evaluated for fodder yield against four checks *viz*., Wardan, Mescavi, HB 1 and HB 2. The results are being compiled.

Small Scale Trial (SST): 8 genotypes were evaluated for fodder yield against four checks *viz*., Wardan, Mescavi, HB 1 and HB 2. The results are being compiled.

Progeny Row Trial (PRT): In Progeny Row Trial (PRT), 16 genotypes were tested against four checks *viz*., Wardan, Mescavi, HB 1 and HB 2. The results are being compiled.

Mutation breeding in berseem - creation of genetic variability for morphological characters in berseem using chemical mutagen *i.e.* EMS (State plan).

M1 generation: In this experiment, three doses of EMS (0.05%, 0.1%, 0.3% and 0.5%) were given to dry seeds of HB 1, HB 2 and Mescavi. Treated and untreated seeds (100 in each treatment) were sown immediately in the field in three rows of five meter length each to raise the M_1 generation.

Selection of superior plant progenies in different generations: On the basis of their evaluation against checks (on three cut basis) 9 superior progenies were selected from M_2 generation of different treatments which will be grown in M_3 for evaluated for fodder yield in next year.

OATS

Collection, maintenance and evaluation of Oats germplasm (State plan): The oats germplasm contains 580 lines were grown for maintenance and evaluation of yield and some ancillary characters.
Development of breeding material through hybridization in oat (State plan): Fresh crosses were attempted between desirable and diverse parents. Breeding material in different filial generations were advanced and single plants selected. Results are being compiled.

Evaluation of varietal trials for fodder yield and its components (State plan): Following seven trials were conducted during *Rabi* 2021-22

SN	Trial	Entries	SN	Trial	Entries
1	LST (Single Cut)	9+3 checks	**5**	SST (Multi Cut)	12+4 checks
2	LST (Multi Cut)	12+4 checks	**6**	PRT (Single Cut)	18+3 checks
3	LST (Dual)	8+4 checks	**7**	PRT (Multi Cut)	18+3 checks
4	SST (Single Cut)	9+3 checks			

Evaluation of promising Oats genotypes for fodder yield (AICRP-FCU): A total of **seven** trials under AICRP breeding trials on Oats were conducted during *Rabi* 2021-22

SN	Trial	Entries	SN	Trial	Entries
1	IVT Oat (SC)	13+2 NC+1ZC	**5**	AVT Oat (MC)-1	6+2 NC
2	AVT Oat (SC)-1+2	8 + 3+2 NC+1ZC	**6**	IVT Oat (Dual)	11+2 NC
3	AVT Oat (SC)-2 Seed	3 + 2 NC + 1 ZC	**7**	AVT Oat (Dual)-1	5+2 NC
4	IVT Oat (MC)	14+2 NC			

The results are being compiled.

Genotypes contributed/promoted in AICRP (FC) trials during *rabi* 2020-21 and 2021-22

SN	2020-21	2021-22	Trial Name
Oat			
1	HFO 1003, HFO 1009, HFO 1013	HFO 1101 and HFO 1113	IVTO – SC
2	HFO 904, HFO 906	HFO 1003, HFO 1009, HFO 1013	AVTO-SC-1
3	HFO 806	HFO 904, HFO 906	AVTO-SC-2
4	HFO 915, HFO 1016	HFO 1121 and HFO 1123	IVTO – MC
5	HFO 918, HFO 921	HFO 915	AVTO-1-MC
6	HFO 707	-	AVTO-2-MC
7	HFO 917, HFO 1014	HFO 1108 and HFO 1119	IVTO – D
8	-	HFO 917, HFO 1014	AVTO-1-D
9	-	OS 6	NC
10	-	OS 403	ZC (NWZ)
11	-	HFO 427	ZC (SZ)
Berseem			
1	HFB 17-5	HFB 18-3 and HFB 18-9	IVTB
2	HFB16-1, HFB16-10	-	AVTB-1
3	HFB 15-5	-	AVTB-2

Nucleus and TFL Seed Production: Sufficient quantity of all berseem and Oats varieties seed was produced along with nucleus seed of these varieties.

AICRP (FC&U), JNKVV, Jabalpur

Germplasm holding: Oat (120) + Berseem (110)

Berseem

- To create variability, poly cross nursery programme has been started taking five diverse parents viz., Wardan, BL 42, Mescavi, UPB 110, JB 1. Tripping has been done is to ensure cross pollination in all possible combination. Selections shall be made in all for fodder traits in coming generation.
- The variety JB 5 was irradiated with 8 doses of gamma viz. 200 Gy, 250 Gy, 300 Gy and 350 Gy, 500 Gy, 600 Gy, 800 Gy and 1000 Gy**.** Single plant selection and row bulks were done, treatment wise to raise the M2 generation3
- In Wardan, six superior bulks were selected from mutated population.

Oat

- Under National crossing programme crosses have been attempted with Kent and JO1 with *Avena sterilis*. Seeds were grown as fourth filial generation.
- 55 advanced lines were evaluated for different fodder traits.
- No. of crosses made - 21
- Segregating material advanced/ handled - 31 (F2 onwards)
- Advance breeding lines - 61

AICRP (FC&U), UAS (B) ZARS Mandya

Forage Maize

Multiplication of stabilized and elite inbreds derived from 5 cross combinations: Multiplied the selected (sown on 13-01-2022) and promising maize inbreds to obtain sufficient seed for further evaluation. Promising inbreds which showed resistant /tolerant reaction to TLB and SDM diseases in the screening trials conducted in the previous *kharif* -2021, were observed for their uniformity and their cobs were harvested after observing morphological and cob features:

Generation and evaluation of new hybrids with different donors procured from AICRP on Maize, Mandya center: Date of sowing: 13-01-2022 **parents sown:** 44

SN	Donors used	SN	Donors used	SN	Donors used	SN	Donors used
1	V-938-26	**3**	VL-191000	**5**	MAI-105	**7**	MAI-298
2	V-490-7	**4**	MAI-142	**6**	MAI-3	**8**	MAI-224

SN	Recipient Parents	SN	Recipient Parents	SN	Recipient Parents
1	MAI-712	**4**	5-16-2	**6**	MFM-5-4
2	MAI-764	**5**	MFM-366-2	**7**	40203
3	5-12-1				

Totally 36 hybrid combinations were generated and to be evaluated for forage traits in the ensuring kharif season. The following hybrid combinations were found promising with desirable forage traits

SN	Hybrid combination	SN	Hybrid combination
1	VL 19999 X 5-22-1	**8**	1926009 X 5-16-2
2	40283 X 5-22-1	**9**	2-4-1-1 X 5-2-2
3	V938-26 X 5-12-1	**10**	VL 19000 X V-938-26
4	V938-26 X 5-12-1	**11**	MAI 142 X 5-13-1
5	VL 1999 X 5-12-1	**12**	MAI 105 X 5-16-2
6	MAI 764 X 5-12-1	**13**	V 490-7 X 5-12-1
7	V-490-7 X 5-12-1	**14**	40283 X 5-12-1

Forage cowpea

Multiplication of selected and stabilized forage cowpea lines: Date of sowing: 20-1-2022

SN	Genotype	SN	Genotype	SN	Genotype
1	MFC-18-2	**7**	MFC-20-25	**13**	UPC-628 (C)
2	MFC-18-4	**8**	MFC-20-30	**14**	TNFC-0926 (C)
3	MFC-18-6	**9**	MFC-20-35	**15**	KBC-2 (C)
4	MFC-18-10	**10**	MFC-20-40	**16**	MFC-09-1 (C)
5	MFC-18-8	**11**	MFC-18-5	**17**	MFC-08-14 (C)
6	MFC-20-20	**12**	UPC-9202 (C)	**18**	MFC-09-3 (C)

Generation of new crosses with diverse resistant parents: Date of sowing: 14-4-2022

SN	Parents used	SN	Parents used	SN	Parents used	SN	Parents used
1	UPC-9202	**4**	TNFC-0926	**7**	EC-458418	**10**	EC-107120
2	UPC-628	**5**	EC-170584-1-1	**8**	EC-458411	**11**	IC-97767
3	CL-367	**6**	IC-202777	**9**	IC-402104	**12**	KBC-2

Cowpea Germplasm evaluation programme against disease and insect –pests: Seed material of cowpea selected for disease screening are mentioned below in the table:

SN	Entries	SN	Entries	SN	Entries
1.	MFC-8-14	**10.**	MFC-20-7	**19.**	EC-458418
2.	MFC-18-4	**11.**	MFC-20-3	**20.**	EC-458436
3.	MFC-18-5	**12.**	KBC-2	**21.**	EC-458480
4.	MFC-18-8	**13.**	KM-5	**22.**	IC-219489
5.	MFC-16-8	**14.**	MCB-18	**23.**	IC-45061
6.	MFC-18-2	**15.**	NBC-23	**24.**	IC-402096
7.	MFC-9-1	**16.**	NBC-40	**25.**	402154
8.	MFC-9-3	**17.**	NBC-43	**26.**	F-6 1-1-84-2
9.	MFC-18-10	**18.**	EC-107120	**27.**	EC-458417

Forage Dolichos

Evaluation of Dolichos germplasm (GLB) for forage traits: Totally 44 genotypes procured from AICRP on arid legumes UAS, GKVK, Bengaluru have been evaluated for multicut and forage traits (sown on 14-03-2022). Two methods of pruning done cutting branches from 6 inches above the ground and other pruning only branches and leaves and allowed for regeneration. Preliminary data indicated that up to three cuts could be harvested and among the evaluated the following germplasm lines were found promising with high Green forage Yield as compared to the checks.

SN	Genotype	GFY	SN	Genotype	GFY	SN	Genotype	GFY
1	GLB-209	1180.0	**3**	GLB-320	1078.5	**5**	GLB-444	1002.5
2	GLB-291	1071.5	**4**	GLB-313	1166.0	**6**	GLB-474	1162.0

Evaluation of selected Dolichos genotypes (NBPGR) for forage traits

Date of sowing: 9/4/2022 No. of genotype: 25

Totally 25 selected genotypes from field types germplasm from NBPGR New Delhi were evaluated for their Green forage Yield and multicut nature .since all the selected genotypes were photo sensitive only biomass data was collected and the following genotypes were found promising for green forage yield

SN	Genotype	GFY	SN	Genotype	GFY	SN	Genotype	GFY
1	625	1060.5	**3**	1046	1012.5	**5**	489	1148.0
2	940	1064.0	**4**	822	1152.0			

AICRP (FC&U), AAU, Jorhat

Collection of germplasm: The following germplasm were collected in *rabi* 2021-22

- Ricebean: 7 Area: Assam, Nagaland, Mizoram
- Cowpea: 4 Area : Karbi Anglong, Assam
- Lathyrus: 14 Area: Assam

Lathyrus

Evaluation of Lathyrus germplasm: Fourteen lathyrus germplasm, collected from different parts of Assam including checks were evaluated for their earliness, productivity, quality and disease and pests resistance. Seven entries were found superior in respect of GFY, DMY, Plant height, seed yield, earliness and low ODAP content.

Promising Germplasm	Characters
JCL-19-1	GFY, DMY, Earliness (90 days 50% flowering), low ODAP content (0. 082% leaf, 0.109% seed)
JCL-10-4 , JCL-21-M-5	DMY
JCL-21-M-1	GFY, DMY, low ODAP content (leaf=0.071% seed=0.093%), plant height
JCL-21-M-3, JCL-21-M-4	Seed yield
JCL-21-M-4, JCL-10-1	Low ODAP content (0.098%, 0.151%)

Hybridization programme in lathyrus: A diallel cross was made in *rabi* 2016-17 among four selected local germplasm lines and the test entries Nirmal, Prateek, Ratan and Madhuri without reciprocal to develop a forage lathyrus variety with high biomass yield, quality, disease resistance and low BOAA content. In *rabi* 2021-22 progenies of F_5 generation were evaluated.

Female parent	Male parent	Generation advanced
Prateek	Nirmal	F1=25
JCL-1	Madhuri	F2= 20
JCL-2	Prateek	F3= 22
JCL-3	JCL-1	F4= 20
JCL-4	JCL-2	F5= 25
	JCL-3	

Mutation breeding programme: A mutation breeding programme was initiated with the variety Nirmal in 2016 to develop dual type Lathyrus variety with high forage and grain yield, drought resistance, cold resistance and low ODAP content. The seeds of Nirmal were treated with EMS (0.1% to 1% concentration). M_5 generation was evaluated in 2021. The following observations were recorded.

Treatments	Observations
Nirmal (control)	High grain and green forage yield, Low ODAP content
EMS 0.1%	High grain and green forage yield, Low ODAP content
EMS 0.2%	Low ODAP content, high CP%
EMS 0.3%	Low ODAP Content, high GFY, high DMY, high CP%

Other Activities Rabi 2021-22

AICRP (FC&U), TNAU Coimbatore

Awards and Honours

- Scientists of AICRP on FC&U received 'Appreciation Certificate' for conducting the trial on "Studies on the performance of top feeds under varied planting geometry with and without intercrop" during National Group Meet – *kharif* 2022 held at SKUAST-K, Srinagar on 13.06.2022 & 14.06.2022.

Research articles in journals

Shamini K, Ezhilarasi T, Ganesan KN, Sivakumar SD and Geetha S. (2021). Genetic variability studies in indigenous accessions of guinea grass to explore for enhanced green fodder yield. ***Forage Res.*** 47(3): 284-287.

Shamini K, Ganesan KN, Ezhilarasi T and Meena kumari B. (2022). Exploiting natural genetic variability in Guinea grass accessions of diverse origin. ***Forage Res.*** 47(4): 499-503.

Book chapters

Ezhilarasi T, Babu C and Ganesan KN. (2021). Nucleus and breeder seed production of perennial fodder sorghum varieties. In: Manual on Nucleus and Breeder seed production in field crops, Centre for Plant Breeding & Genetics, Tamil Nadu Agricultural University, Coimbatore. P. 189-194. (ISBN: 978-81-95444-50-2)

Ezhilarasi T, Ganesan KN and Geetha S. (2021). Nucleus and breeder seed production of lucerne and hedge lucerne. In: Manual on Nucleus and Breeder seed production in field crops, Centre for Plant Breeding & Genetics, TNAU, Coimbatore. P. 195-202. (ISBN: 978-81-95444-50-2).

Geetha S, Ganesan KN, Kumaresan D and Binodh Asish K. (2021) Breeder seed production programme in Tamil Nadu Agricultural University and its impact on crop productivity. In: Manual on Nucleus and Breeder seed production in field crops, Centre for Plant Breeding & Genetics, TNAU, Coimbatore.P.1-13. (ISBN: 978-81-95444-50-2).

Popular article (in Tamil): 1

Ezhilarasi T, Ganesan KN and Geetha S. (2022). High yielding green fodder varieties in *Ulavarin Valarum Velanmai* – March 2022 Monthly Magazine 09, Pg. No. 39-42

Important persons visit

- Dr HE Shylendra Kumar, Deputy General Manager & Project Officer, Nucleus Jersey and Stud Farm, TCMPF Ltd., and Dr R. Venkatachalam, General Manager, NDCMPU, Ooty on 20.04.2022 to the fodder pellet production unit.

Student(s) guided:

Ph.D. in Plant Breeding and Genetics – 3; M.Sc. (Agri.) in PBG – 1;
M.Sc. (Agri.) in Entomology – 1.

No. of FTDs conducted: 20

Interaction with farmers, NGO and Govt. staff

- A total of 53 students from Kalasilangam School of Agriculture and Horticulture from Srivilliputhur visited the Dept. of Forage Crops. Lecture on improved fodder varieties were delivered on 05.05.2022.
- A total of 40 farmers from Elachipalayam, Namakkal District from Srivilliputhur visited the Dept. of Forage Crops. Lecture on improved fodder varieties were delivered on 19.05.2022.

- Interactive meeting on “Feasibility of manufacturing fodder pellets at Aavin” with Managing Director and General Managers of different districts on 21.03.2022

Details of seed/ planting material produced and supplied (2021-22)

S. No.	Crop/ variety	Class of seeds	Quantity produced	Quantity supplied
I	**SEEDS (kg)**			
1.	Multicut Fodder sorghum CO (FS) 29	NS	5.00	5.00
		TFL	1.50	1.50
2.	Fodder sorghum CO 31	NS	10.00	10.00
		BS	18.00	18.00
		TFL	600.00	509.25
3.	Fodder Cowpea TNFC 0926	BS	150.00	150.00
		TFL	8.60	8.60
5.	*Desmanthus* CO 1	TFL	215.00	210.70
6.	Desmanthus CO 2	TFL	6.00	5.15
7.	Lucerne CO 3	BS	13.00	13.00
		TFL	9.00	8.90
8.	Agathi	TFL	50.00	43.55
Total			**1086.10**	**983.65**
II	**PLANTING MATERIAL (Nos.)**			
1.	BN hybrid CO (CN) 4 Rooted slips		50	50
2.	BN hybrid CO (BN) 5 stem cuttings		3,20,000	3,14,050
3.	Guinea grass CO (GG) 3 rooted slips		2,500	2,160
4.	*Cenchrus* CO 1 – Rooted slips (Nos.)		50	10
5.	*Cenchrus* CO 2 – Rooted slips(Nos.)		200	200
Total			3,22,800	3,12,870

Biochemical Analysis

S. No.	Particulars	Numbers
1.	ICP MS Basic Elements	183
2.	ICPMS Additional Elements	132
3.	Crude Protein (%)	9
4.	Crude Fibre (%)	3
5.	Crude Fat (%)	3
6.	Ash (%)	3
	Total	**333**

Externally funded project: 2

S. No.	Title of the project	Sponsors	Duration	Outlay (Rs. in lakhs)	PI
1.	HATSUN chair Assistant Professor scheme in PB&G for forage Crop research	HATSUN Agro Product. Ltd. (HAPL)	2018-23	64.74	Dr. K.N. Ganesan
2.	Expansion of Activities of Biotech-KISAN Hub in Two Aspirational Districts (Virudhunagar and Ramanathapuram) of Tamil Nadu – Phase II’	DBT	2019-2021	76.00	Dr. S.D. Sivakumar
Total				**140.74**	

AICRP (FC&U), MPKV, Rahuri

Awards and Honors

- On the occasion of 54th foundation day of Mahatma Phule Krishi Vidyapeeth, Rahuri AICRP on Forage Crops was ranked 15th position in out of 35 research schemes/Research stations held at MPKV, Rahuri on 29th March 2022 Under the Chairmanship of Dr. Charudatta Mayee Ex. President ASRB, New Delhi.
- Certificate of Appreciation was awarded to team of scientist of MPKV, Rahuri for development of technology for management of Aphids in Forage Oat during June, 13-14, 2022 of NGM- Kharif-2022 held at SKUAST, Srinagar

Research articles in journals

Gaikwad SA, Kulkarni SR, Landge SA and Wasu RS. (2021) Effectiveness of biopesticides against oat aphid, *Rhopalosiphum padi* L. ***International Journal of Chemical Studies*** 9(1): 2629-2633

Gaikwad SA, Landge SA, Bhute NK and Pathan YK (2021) Seasonal incidence of aphid, (*Rhopalosiphum padi* L.) and its natural enemies on forage oat (*Avena sativa* L.) ***The Pharma Innovation Journal*** 10(11): 241-245

Popular articles

Surana Prasanna, Landge Sandip and Shinde Vijay Kumar. (2022). Cultivation Practices of Forage Crops in Summer Season" '***Shri Sugi*** Summer-2022' January, Page 34-36.

Landge Sandip, Shinde Vijay and Deore Gajanan. (2022). "Crop cultivation practices of Forages & grass crops in *Kharif* Season" '***Shri Sugi*** Kharif-2022' June, Page 42-43.

Visits of important persons to AICRP FC, MPKV, Rahuri centre

- Dr. S. R. Gadakh, Director of Research, Dr. V. L. Amolik, Head, Department of Botany, MPKV, Rahuri on 20.01.2022.
- Dr. C. S. Patil, Head, Dept of Agril. Entomology, MPKV, Rahuri, on 27.01.2022.
- Shri Promod Lavhale, Registrar, MPKV, Rahuri on 19.01.2022

Student Guide

- Entomology Dr. S. A. Landge : 01 M. Sc. (Agri.) student
- Biochemistry Dr. S. V. Damame : 01 M. Sc. (Agri.) student

HRD:

- Tribal Sub Plan (TSP) was implemented on 28.01.2022 at Village Kharvad, Tal-Akrani, Dist- Nandurbar by distributing cycle hoe and Oat seed. Dr SV Damame & Dr SS Nawale delivered lectures on forage crop technology and crop protection technology.
- Lecture delivered by Dr SA Landge on Forage crops and their advanced cultivation practices to the visiting farmers group from Paithan, Aurangabad on 15/03/2022.
- Lecture delivered by Dr SA Landge to farmers in seven days training programme of Beekeeping on 26/03/2022 at Entomology Department, MPKV, Rahuri.
- Mogova programme was organized by MPKV, Rahuri on 04/01/2022 and attended by all staff by online mode.

- All staff of Forage Project participated in 54th foundation day of MPKV, Rahuri and Forage project was ranked 15th position in All AICRP research stations.
- QRT meeting was organized under the chairmanship of Hon'ble Dr Panjab Singh, Ex DG ICAR and Secretary, DARE, New Delhi, and other seven members on 27 and 28 March, 2022 at BAIF, UruliKanchan Pune and Prof. P. P. Surana presented the Forage project work of MPKV, Rahuri Centre.
- Dr K. N. Ganesan, TNAU, Coimbatore and Nitish Bhardwaj, IGFRI, Jhansi monitored online the *Rabi* Forage trial of this project as on 12.01.2022.
- Dr. S. A. Landge delivered lecture on "Management of Insect pests Cotton Pink bollworm, Sugarcane Whitegrub and Fall Army worm on Maize" in Sharad Krishi Mohotsv organized by APMC, Rahuri, on 17th April 2022.
- Dr. S. A. Landge participated in World Honey bee day programme as on 19th May 2022 organized by Department of Agril. Entomology, MPKV, Rahuri.
- Attended meeting on Seed Production Planning at Director of Research Hall, MPKV, Rahuri as on 13/05/2022
- Attended meeting of '*Vanmohotsav'* as on 22/04/2022 by online mode.
- Attended '*Adhava Baithak'* Meeting under the chairmanship of Hon. Vice Chancellor, MPKV, Rahuri as on 28/06/2022

TV Talk:-01

- Dr. S. A. Landge delivered lecture on "Management Fall Army worm on Maize" in Mumbai Doordarshan, on 25th April 2022.

Radio talk: 03

- Dr. S. A. Landge delivered Radio Talk on "Management of Fall Army worm on Maize and Beekeeping for doubling farmers income" on Akashwani Kendra, Ahmednagar, on 27th April 2022.
- Dr. S. V. Damame delivered Radio Talk on "Kharif Hangamatil Chara Pikanchi Lagwad" on Akashwani Kendra, Ahmednagar, on 27th April 2022.

Lectures to farmers in training programme: 05

Visits of farmers and Govt. Staff of Agril. Department of Maharashtra State

- No. of Farmers visited to farm during *Rabi* 2021-22 : 200
- No. of Govt. officers/staff visited to farm during *Rabi* 2021-22: 25

Farmer rally/ Shivarferi:

- *Rabi* day and Farmers shivarferi organized at AICRP on sorghum project, MPKV, Rahuri as on 09.03.2022 where, the farmers were guided and demonstrated on *Rabi* forage crops.
- Forage Demonstration Crops was kept in exhibition on 14 to 18.04.2022 at Sharad Krishi Mahotsav, organized by APMC, Rahuri.
- Dr. S. A. Landge delivered lecture on "White grub Management on Sugarcane" organized by Krishi Vidnyam Kendra, Dahigaon-ne, Shevgaon, on 27th April 2022.

Product Testing of Forage Crops during *Rabi*- 2021-22

Sr. No.	Company	Crop	Particulars	No. of samples
3	UPL Ltd Mumbai	Maize	Efficacy of different insecticides against Fall Army Worm	03

List of MOU approved and signed for sharing breeder/foundation seed 2020 to 2022

SN	Name of seed company	Crop	Variety	Date
1.	Samruddhi Plant Sciences, Dist. Pune	Maize	African Tall	09.06.2020
2.	Sandesh Seeds, Kolhapur	Maize	African Tall	17.06.2020
3.	PGBCrop Agro Producer Com, Ltd., Latur	Maize	African Tall	19.06.2020
4.	Pattern Greenseeds Pvt Ltd.,Dist. Buldhana	Maize	African Tall	23.06.2020
5.	Kalyan Seeds, Aurangabad	Maize	African Tall	24.06.2020
6.	Madhur Seeds Company, B-44, Jalna	Maize	African Tall	26.06.2020
7.	Mahaagri Seeds Pvt Ltd., Uruli Dewachi, Pune	Maize	African Tall	30.06.2020
8.	Indrayani Seeds and Agrotech, Kumbephal, Dist.Beed	Maize	African Tall	30.06.2020
9.	Prayag Seeds Agrotech, Devali, Dist. Aurangabad	Maize	African Tall	03.07.2020
10.	IGL Seeds Pvt Ltd., MIDC Walunj, Aurangabad	Maize	African Tall	06.07.2020
11.	Treedeo Seeds Crop Private Limited, Dist-Buldhana-443 201	Maize	African Tall	10.06.2021
12.	Keshavpushp Agro Industries Pvt. Ltd. Dist- Aurangabad	Maize	African Tall	30.08.2021
13.	Biodens Agrovet India Private Limited, Aurangabad	Maize	African Tall	16.06.2021
14.	Sai Seeds, Jalana	Maize	African Tall	16.06.2021
15.	Shrinivas Seeds, Jalna	Maize	African Tall	18.06.2021
16.	Shree Aaradhya seeds, Dist- Aurangabad	Maize	African Tall	21.06.2021
17.	Pasaidan Farmers Producer company Ltd. dist- Ahmednagar	Maize	African Tall	22.06.2021
18.	Shubh Lakshmi seeds company	Maize	African Tall	23.06.2021
19.	Wayamaker Greenseeds Pvt. Ltd., Dist- Buldhana	Maize	African Tall	23.06.2021
20.	Krushibindu Farmer Producer Company Limited, Tal- Newasa	Maize	African Tall	23.06.2021
21.	Agro Namada seeds Pvt. Ltd ,Pune	Maize	African Tall	23.06.2021
22.	KKCL Farmers Producer Company Limited, Dist- Ahmednagar	Maize	African Tall	24.06.2021
23.	Sahebrao Seeds India Pvt. Ltd. Dist – Ahmednagar	Maize	African Tall	29.06.2021
24.	Trans Agro seeds Pvt. Ltd. Dist-Ahmednagar	Maize	African Tall	02.07.2021
25.	Farm Shine seeds Pvt. Ltd. Dist- Ahmednagar	Maize	African Tall	23.07.2021
26.	Vanita seeds Pvt. Ltd., Pune	Lucerne	RL-88	29/12/2020
27.	Trans Agro seeds Pvt. Ltd., Dist- Ahmednagar	Lucerne	RL-88	22/03/2021
28.	Sava Seeds Ltd., Dist. Pune	Lucerne	RL-88	25/11/2019

AICRP (FC&U), PAU, Ludhiana

Research articles in journals

Atri Ashlesha, Banyal DK, Bhardwaj NR and Roy AK. (2022). Exploring the integrated use of fungicides, bio-control agent and biopesticide for management of foliar diseases (anthracnose, grey leaf spot and zonate leaf spot) of Sorghum. ***International Journal of Pest Management.*** DOI: 10.1080/09670874.2022.2039799

Atri Ashlesha, Bhardwaj NR and Roy AK. (2022). Field efficacy of different eco-friendly disease control agents against maydis leaf blight in forage maize. ***Indian Phytopathology***. https://doi.org/10.1007/s42360-022-00499-4

Bhardwaj Nitish Rattan, Atri Ashlesha, Banyal Devinder Kumar, Dhal Arabinda and Roy Ajoy Kumar (2022). Multi-location evaluation of fungicides for managing blast (*Magnaporthe grisea*) disease of forage pearl millet in India. ***Crop Protection***. 159: 106019. https://doi.org/10.1016/j.cropro.2022.106019

Goyal M, Kaur HD and Kaur AD (2022). Intra-genotypic variability for antioxidant and bioactive potential in oat under dual purpose system. ***Cereal Research Communication*** https://doi.org/10.1007/s42976-022-00256-3

Hilli Harshvardan J, Kapoor Rahul, Amandeep (2021) Hybridization and factors influencing seed set in oat. ***Indian J Agri. Res.*** DOI: 10.18805/IJARe.A-5813.

Jain M, Singh DP and Goyal M 2022 Generation mean analysis for quality traits in fodder cowpea [*Vigna unguiculata* (l.) walp]. ***Forage Res*** 48 (1), 46-49

Kapoor Rahul (2021). Notification of crop varieties and registration of germplasm, Oat Variety-OL 1874. ***Indian J. Genet. Pl. Breed.*** 81 (4): 612.

Kapoor Rahul, Amandeep, Hilli Harshvardan J (2022) OL 15: A high yielding, single cut variety of fodder oat developed for Punjab state. ***Electronic J Plant Breed*** 13(1):125-131.

Kumar P, Longmei N, Jat BS, Choudhary M, Yathish KR, Bhushan B, Goyal M and Rakshit S 2022. Heterotic grouping of Indian Baby Corn lines based on combining ability. ***Indian J. Genet. Pl. Breed.*** 82 (2): 161-166

Extension publications

Singh Devinderpal and Goyal Meenakshi (2022). Sauni de charian di Katai dhukvensamente karo. *Vigyanik Pashu Palan*16 (7): 7-8

Kaur Maninder, Ashlesha and Cheema Harpreet Kaur (April 2022). Practices for successful cultivation of *kharif* fodders. *Progressive Farming* 58(4): 17-18.

Kaur Maninder and Kaur Harpreet (April 2022). Garmiyan de agete chariyan layi dukanwi jankari. *Vigiyanak Pashu Palan* 16(8): 14-15.

Kaur Maninder, Oberoi Harpreet Kaur and Sohu RS (July 2022). Anti-nutritional factors in kharif fodder crops and their management. *Progressive Farming* 58(7): 21.

Students guided: M. Sc.:4 Ph.D.:2

FTDs conducted: 50 (oats variety OL 15 and OL 14)

Lectures delivered –Four lectures delivered to the young farmers on Production technology of *Kharif* and *Rabi* fodders.

TV/Radio talks: TV: 01; Radio: 02

Seed/Planting material sold during Rabi 2021-22:

Crop	Variety	TL (q)	C/S (q)	F/S (q)	B/S (q)
Berseem	BL 1	-	-	-	1.00
	BL 10	22.30	40.55	-	15.20
	BL 42	15.45	68.00	4.50	7.50
	BL 43	15.50	-	-	-
Oats	Kent	3.65	15.40	-	15.00
	OL 10	58.60	-	-	32.00
	OL 11	8.50	32.45	-	3.56
	OL 12	25.00	55.60	-	20.30
	OL 13	15.00	10.00	-	2.50
	OL 14	12.50	25.00	-	8.00
	OL 15	15.00	30.00	-	7.00
Rye grass	PBRG 1	4.00	-	-	0.40
	PBRG 2	2.00	5.60	-	1.00
Total		**197.5**	**282.6**	**4.5**	**112.46**

External funded Projects: (2)

Project/Scheme	Funding Agency	Budget	PI/Co-PI
Breeding for development of baby corn hybrids	ICAR-IIMR, Ludhiana	Rs 109.59 Lakhs	Dr. Meenakshi Goyal
Development of low lignin mutants sugarcane through mutagenesis and genome editing approach	IIMR-CSIR	Rs 33.00 Lakhs	Dr. Meenakshi Goyal

AICRP (FC&U), AAU, Jorhat

Research articles in journals

Balmiki S, Neog SB and Barua NS (2021). Genetic variability In Rice Bean (*Vigna umbellate* Thunb.) For important quantitative characteristics. ***Forage Research*** 47(2): 172-179

Das RR, Das Gautam, Talukdar P and Neog SB (2021). Genetic analysis for yield and yield attributing traits in Cowpea (*Vigna unguiculata* L. Walp). ***Legume Research*** 44: 900-905

Research Guidance: M.Sc. (Agri) – 1 **Course taught:** B.Sc.- 1; M.Sc.- 1

Extension Leaflet: in Assamese

- Ghah xoisyar xongrakhyan
- Banpanir dina tgaru gair jatan
- “ beej gram” ek abhash

Training conducted: 2

Extension activities:

- Participated in two Farmer’s fair
- Took part in “Amar gaon Amar Gaurav” project

Details of seed/ planting material sold

SN	Forage Crop	Variety	Total Slips (No)
1.	Bajra x Napier Hybrid	CO3, CO4, CO5	1 lakh
2.	Setaria	Kazungula, PSS-1	50000
3.	Guinea grass		20000
4.	Congo signal grass		10000
	Grand Total		**1.80 Lakh**

AICRP (FC&U), IGKV, Raipur

Externally Funded Projects

SN	Title	PI	Funding source	Budget (Rs. in lakh)
1.	Demonstration and training on silage production	S. K. Jha	VV fund	0.75
2.	Efficacy of Carfentrazone ethyl 40DF against sedges and broad leafed weed in DSR	S. K. Jha	Sponsored	4.0
3.	bio-efficacy and phytotoxicity of BAS 625 04 H against grassy weed in transplanted rice and its residual effect on succeeding crop”	S. K. Jha	PPP BASF India Ltd	6 .0
4.	Study the effect of improved corn hybrids on the quality of silage” (from Bayer Crop Science Ltd)	S. K. Jha	PPP Bayer Crop Science Ltd	3.0
5.	Accelerated Genetic gain in Rice (AGGRi Alliance) Marginal Environment (ME)	Sunil Verma	IRRI	15.0

Research articles in journals

Shesh Jayesh, Jha SK, Singh Ritesh Kumar and Thakur Supriya (2021) Effect of de-topping and nitrogen doses on economics of maize (*Zea mays* L.) Varieties ***International Journal of Chemical Studies*** 9(1): 2423-2425

Books Chapters

Jha SK, Verma Sunil and Jha Deepti (2021) “Transfer of technology through forage technology demonstrations to accelerate fodder production in Chhattisgarh” Published in 'Glimpses of Forage Technology Demonstration Activities of All India Coordinated Research Project on Forage Crops and Utilization’ published by AICRP-FC&U ISSN 978-81-948917-6-5 pp 22-32

Jha SK, Verma Sunil, Tiwari Nitish and Jha Deepti (2021) “Journey of Forage Research and Extension at IGKV, Raipur” Published in 50 years journey of AICRP on Forage Crop and Utilization published by AICRP-FC&U, Jhansi ISSN 978-81-948917-7-2 pp 201-217

Extension Articles

Jha SK and Verma Sunil (2021). Poshak tatw se bharpur hey and silage, Chhattisgarh kheti, Pp 24-26, ISSN 0973-2756

Jha SK, Sahu Rashtra Prakash and Verma Sunil Kumar (2021). gkbZMªksiksfud rduhd ls pkjk mRiknu] [ksrh] ebZ 2021, ICAR, Jhansi, India. pp 4 to 6 ISSN No 0023-1088.

Jha SK, Verma Sunil, Jha Deepti and Bhatt Jyoti (2021). Gouthan me Varsh bhar pasuo ke liye chara utpada. Chhattisgarh kheti, Pp 5-8, ISSN 0973-2756

Verma Sunil, Jha SK and Jha Deepti (2021). Chare me hanikarak padarth and use bachaw, Chhattisgarh kheti, Pp13-16, ISSN 0973-2756

Research Guidance

Subject	No of student registered
Agronomy (Dr S. K. Jha)	**PG:** Major advisor- 4, Co-advisor -6 **PhD:** Major advisor- 2
Plant Breading (Dr. Sunil Verma)	**PG:** Major advisor- 6 , Co-advisor -9 **PhD:** Major advisor- 1 Co-advisor -6

Linkage with other programmes and institutes

- AICRP (Dry Land), CARS, Jagdalpur, Bastar (Chhattisgarh),
- AICRP (IFS)
- KVK’s of Chhattisgarh

Teaching

	Level	COURSES	SUBJECT	CREDIT
Dr S.K. Jha	PG	AGRON -501	Modern Concept in crop production	3(3+0)
		AGRON - 502	Soil fertility and nutrient management	3(2+1)
Dr. Sunil Verma	UG	ABT-5211	Food Safety and Standards	3(2+1)
		ABT-5121	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
	PG	MBBD-508	Laboratory I: Biochemistry, Physiology, Analytical techniques	3 (0+3)
		MBBD-521	Molecular Breeding	3(3+0)
		MBBD-528	Laboratory III: Molecular breeding, genomics & proteomics	3 (0+3)
	PhD	MBB-601	Advances in Plant Molecular Biology	3(3+0)
		MBB-605	Advances in Functional Genomics and Proteomics	2(2+0)

On line Training: Dr Sunil Verma

S.No.	Title of Programme	Duration	Organised by
1	Gender responsive plant breeding	12 days (17th to 27th May, 2021)	GREAT Project (Makerere and Cornell University)
2	Smart Breeding technology for Next gen Plant Breeding	04 Days (31 Aug-3rd Sep, 2021)	CGIAR-IRRI-IGKV collaboration
3.	Breeding innovation for crop improvement to enhance genetic gains	21 Days (20 Oct-16th Nov, 2021)	ISARC, Varanasi
4.	Attained meeting on Improvement of elite Rice varieties for GI	1 Days (06 Aug, 2021)	DRS, IGKV, Raipur

Extension packages

- Generated *package of practices of fodder crops production under Chhattisgarh Condition* and published for Extension workers in university dairy published by Director Extension Services, IGKV, Raipur
- Published package of practices of fodder crops production in ***Krishi Yug Panchang*** *2021-2022* published by Director Extension Services, IGKV, Raipur
- Demonstrated the fodder *production technology in* ***Agriculture Museum*** at IGKV, Raipur published by Director Extension Services, IGKV, Raipur
- Developed *computer based programme* of fodder production technology for demonstration in museum
- *Training for SMS , PC of KVK's* on fodder production
- Training for *REO, ADO, DDA of C.G. Government Agriculture department* on fodder production
- Stat policy draft on round the year fodder production submitted to Chhattisgarh government for *Gothan* Development

New Seed production Farm

- New fodder seed production farm imitated at CARS, Bhatapara, KVK Mahasamund and KVK Durg with the help of local administration and RKVY.

Important visitor:

- Hon'ble V.C. IGKV, Raipur along with Directors, Deans, PC, SMS and scientist in forage demonstration block.

FTD's

- Front line technology demonstration was conducted in Bemetara and Raipur district of Chhattisgarh on fodder Oat and Berseem

Forage Garden

- Kharif – Cowpea, Maize, Guar, Rice bean, Pearl millet, Sorghum, BN Hybrid, Dinanath grass, Guinea grass, Dhaman grass, Anjan grass
- Rabi –Berseem, Lucerne, Rye grass, Oat and Lathyrus
- Fodder tree and shrub of Munga, Albizia, Leucena, Desmenthus, Clitoria,

AICRP (FC&U), BCKV, Mohanpur

Research articles in journals

Atta K, Pal AK and Jana K (2021). Effects of salinity, drought and heavy metal stress during seed germination stage of ricebean [*Vigna umbellate* (Thunb.) Ohwi and Ohashi]. ***Springer Plant Physiol. Rep*** 26 (1): 109-115.

Khan R, Biswas S, Kundu CK, Jana K**,** Ray R and Bandopadhyay P. (2021). Effect of conservation tillage practices on growth attributes of different fodder crops and soil moisture depletion. ***International Journal of Chemical Studies***, 9 (1): 1846-1852

Sarkar A, Jana K and Mondal R (2021). Growth and yield of hybrid mustard (*Brassica juncea L.)* as influenced by foliar nutrition in Gangetic plains of West Bengal. ***Journal of Crop and Weed***. 12(3): 35-40.

Sarkar A, Jana K, Mondal R, Banerjee S, Murmu K. (2022). Effect of foliar nutrition on growth, oil yield, production economics of hybrid mustard (*Brassica juncea* L.) and soil microbial properties. ***The Pharma Innovation Journal*** 11(6): 1456-1460.

Tripathi K, Sadhukhan R, Das A, Jana K, Semwal DP, Kumar A, Sarker A, Ahlawat SP (2022). Khesari (*Lathyrus sativus L*), an ancient legume for future gain: An expedition collection from parts of West Bengal state of Eastern India. ***Indian Journal of Traditional Knowledge***, 21(2): 395-403.

Book Chapters

Atta K, Adhikary S, Mondal S, Mukherjee S, Pal A, Mondal S, Jana K and Biswas B. (2022). A Review on Stress physiology and Breeding Potential of an Underutilized, Multipurpose Legume: Rice Bean (*Vigna umbellate*). ***Developing Climate Resilient Grain and Forage Legumes, Springer*****:** 235-253

Papers/ Abstracts in conference/seminar/symposia

Jana K, Banerjee S, Mondal R, Mondal K and Sarkar A. (2021), Effect of different techniques of seed priming on green forage yield and quality of Forage Maize under rainfed situation. ***Extended Summaries: 5th International Agronomy Congress, November 23-21, 2021, India***

Popular articles: 2 (in bengali)

Student(s) guided: M. Sc. (Ag.) 2 and Ph. D. – 4 in Agronomy

Teaching in Department of Agronomy:

- Course No. AGR-554, Name of the course: Agronomy of fodder and forage crops
- Course No. 552, Name of the course: Agronomy of Agronomy of Fibre and *Kharif* Oilseeds and other courses

No. of FTDs conducted: 60 units (*Rabi*, 2021-2022): Berseem (cv. Mescavi) - 5 units, Oat (SC) (cv. Kent) – 30 units and Lathyrus (cv. Prateek) – 25 units, respectively.

Seed production

Crop/ variety	Nucleus seed	Breeder seed	TFL seed
Rice bean (Bidhan Rice bean 1)	5 kg	50 kg	20 kg
Rice bean (Bidhan Rice bean 2)	5 kg	50 kg	10 kg
Rice bean (Bidhan Rice bean 3)	5 kg	10 kg	-
Coix (Bidhan Coix 1)	5 kg	15 kg	5 kg
Oat (cv. Kent)	-	-	20 kg
Lathyrus (cv. Prateek)	-	-	20 kg

Management of planting materials

- BN hybrid (CO-3) : 12000 cuttings (Approx.)
- BN hybrid (CO-4) : 10000 cuttings (Approx.)
- BN hybrid (CO-5) : 12000 cuttings (Approx.)
- Guinea grass & Plantation of Drum stick plants (*Moringa*)

Farmers' Meeting: Four

Externally Funded Project: 5 (Private Company)

Management of Golden Jubilee Forage Garden at CRF, BCKV, Gayeshpur, Nadia.

Participated in seminar/farmers' meeting etc:

- Farmers' Meet on forage production technology with tribal families/farmers at Pingla, Narayangarh blocks of Paschim Medinipur district, Baghmundi block of Purulia district and Haripal block of Hooghly district of West Bengal under TSP.
- Farmers' Meet on forage production technology with Schedule Cast farmers at South 24 Parganas, North 24 Parganas and Nadia districs under SCSP.
- Participated as resource person and delivered a lecture on Agronomy of fodder and forage crops at FACC, BCKV for DAESI.
- Participated as resource person and delivered a lecture on 'Improved package and practices and problems on pulse production' for 'World Pulse Day Celebration though virtual mode on 10th Feb., 2022 organized by ICAR-CRIJAF, Barrackpore.

Awareness development on 'seed production' of forage crops: Seed production of lathyrus (cv. Prateek/Ratan) and Oats (cv. Kent) by farmers for their own uses as seed.

Transfer of technology

- Distributed the seeds of berseem (cv. Mescavi) and lathyrus (cv. Prateek/Ratan) to the resource poor farmers for popularizing as an under canopy legume crop in nutrient enrichment and fodder production in the litchi, mango, banana and guava orchards.
- Introduced oats as dual purpose *i.e* green forage cum seed production and grasspea as '*paira'* crop (dual purpose) in Pingla, Narayangarh block area in Paschim Medinipur district and Raipur & Hirbandh block of Bankura district of West Bengal.
- Given trainings to the farmers' club, Women SHGs of different districts (Bankura, Nadia, Purulia, Paschim Medinipur, North-24 Parganas) through online platform.
- Distributions of leaflets on forage crops among the farmers.
- Distributed the planting material (cuttings) of BN hybrid (Variety: CO 3, CO 4 & CO 5) and rooted slips of guinea grasses to the resource poor farmers in different districts like Bankura, Purulia, Jhargram, Paschim Medinipur, Nadia and North-24 PGS etc.
- Provide the seeds of oats, lathyrus and berseem to the scientist of Department of Agronomy, UBKV, Pundibari, Coochbehar, West Bengal and College of Agriculture, Agartala, Tripura for research & experimental purposes.
- Provided seeds of lathyrus (cv. Prateek/Ratan) for research to different Institutes.
- Distributed hybrid maize seed (cv. Disha) to the resource poor tribal farmers for popularizing as baby corn cum green forage/ green cob cum green forage as well as grain cum stover production.

Other activities

- Acted as reviewer of research papers in ORYZA & Journal of Crop and Weed
- Monitoring the AICRP on FC&U, AAU, Jorhat during kharif, 2021 and RPCAU, Pusa Centre, Bihar and CAU, Imphal during rabi-2021-2022 through online platform.

AICRP (FC&U), OUAT, Bhubaneswar

Research articles in journals

Bharadwaj NR, Atri A, Banyal D, Dhal A and Roy AK (2022). Multilocation evaluation of fungicides for managing blast (*Magnaporthe grisea*) disease of forage Pearl Millet in India, ***Crop Protection*** 159: 106019

Teaching Activities

- Fundamentals of Plant Pathology PPT-121 BSc (Ag) 1st Year 2nd Semester (Credit Hours: 2+1) Practical only
- Diseases of Field & Horticultural Crops-I PPT-313 BSc (Ag) 3rd Year 5th Semester (Credit Hours: 2+1) Theory
- Diseases of Field & Horticultural Crops and their management-II PPT-324 BSc (Ag) 3rd Year 6th Semester (Credit Hours: 2+1) Theory

Students Guided: MSc Ag in Plant Pathology – 1nos.

- Study of Blasts in Hybrid Napier Bajra and its Management by Pragyan Tripathy –

Other assignments

- Assistant Warden, Hostel No. 2, OUAT, Bhubaneswar
- Result Tabulator of BSc Forestry (Hons), College of Forestry, Bhubaneswar
- Training Programme on "Disease symptoms & effective management in pulses and oilseed crops, organized by SITE, Government of Odisha on 15.11.2021 and 10.01.2022- By Dr. A. Dhal
- Impart Rabi training programme to FTAs of KCC as resource person on 10.11.2021 organized by Dean, Extension Education, OUAT, Bhubaneswar
- Participated in Farmer Field Visit programme on 12.04.2022 at Niali, Cuttack District
- Participated in Student's Exposure Visit programme of CA, OUAT on 31.03.2022
- Participated in IGFRI-OUAT Collaborative Workshop on State Fodder Resources Development Plan on 09.03.2022
- Participated in 29th Annual Conference of Agricultural Economics Research Association on the topic "Public Policies and Agricultural Transformations in India" on 27-29th October 2021 organized by Department of Agricultural Economics, OUAT, Bhubaneswar

AICRP (FC&U), PJTSAU, Hyderabad

Research articles in journals

Anoohya D, Balazzii Naaiik RVT, Sukruth Kumar T, Shashikala T and Bhanurekha. Effect of Different varieties, nitrogen levels and cutting management on growth and yield of fodder Bajra. ***International Journal of Environment and Climate Change (accepted)***

Himabindu R, Sukruth Kumar T, Balazzii Naaiik RVT, Shashikala T and Anjaiah T. Soil fertility status of Forage growing soils of Suryapet district, Telangana. ***International Journal of Environment and Climate Change (accepted)***

Book Chapters

Shashikala T, Shanthi M, Balazzii Naaiik RVT, Susheela R, Sukruth Kumar T, Anuradha M,Murali B and Shailaja K. (2022) Journey of Forage research and extension at PJTSAU, Hyderabad. In: 50 Years journey of AICRP on Forage crops and Utilization. Golden jubilee publication Series. Pp 63-80

Shanthi M, Shashikala T, Susheela R, Anuradha M, Balazzii Naaiik RVT, Sukruth Kumar T, Agarwal Rajiv and Roy A K (2022) Impact of Forage technology demonstrations on Forage scenario of Telangana. In: Glimpses of forage technology demonstration activities. Golden jubilee publication Series pp 129-135

Popular articles

Shashikala T, Shanthi M, Balazzii Naaiik RVT, Shailaja K and Sukruth Kumar T (2021). Paadi rythula palita varum-Hydroponics paddathilo pashugrasa sagu. ***Vyavasayam:*** 7(11): 42

Sukruth Kumar T, Balazzii Naaiik RVT. Shashikala T (2021) Vesavilo pashugrasa jonna sagu. ***Vyavasayam*** 7(2): 41

Shanthi M, Shashikala T, Sushila R, Balazzii Naaiik RVT and Sukruth Kumar T (2021). Hydroponic paddathilo pashugrasa uthpathi-Nanyatha. ***Vyavasayam*** 7(2): 42

FTDs conducted: Total 115 -

S. No	Crop	No. of FTDs
1	APBN-1	30
2	Cowpea	5
3	Maize	50
4	Bajra	30
Total		115

Conferences attended by All staff members

SN	Date	Title of symposium/ conference	Organizers
1	12-14 July 2021	National Initiative for Accelerating Fodder technology Adoption	ICAR, IGFRI, Jhansi
2	16-19 September 2021	Global conference on innovative approaches for enhancing water productivity in Agriculture including horticulture	ASM Foundation , New Delhi & PJTSAU, Hyderabad
3	25-27, November 2021	Agri Innovations to Combat Food and Nutrition Challenges	Indian Society of Agronomy and PJTSAU

Meetings attended

Scientist	Meeting	Date	Venue
T. Shashikala	ZREAC 2022	23 & 24.04.2022	RARS, STZ, Palem
T. Sukruth Kumar	ZREAC 2022	28 & 29.03.2022	RARS, NTZ, Karimnager
T. Shashikala	ZREAC 2022	16 & 17.03.2022	RARS, CTZ, Warangal
T. Shashikala	National seminar on Seed production – Quality	6^{th} & 7^{th} October 2021	On line organised by TSSDC, Govt of Telangana
All scientists	*rabi* NGM	20.09.2021	On line
RVT Balazzii Naaiik & T. Sukruth Kumar	Pre-ZREAC meeting	03 & 04.03.22	at RARS, Palem in disciplines of Plant Breeding
T. Shashikala	Pre-ZREAC meeting	01 & 02.03.22	

TV Programmes

SN	Scientist	Title of programme	Channel	Date of telecast
1	T. Shashikala	Vesavi pasugrasa pantala sagu	DD Yadagiri, live-in	24.01.2022
2	T. Sukruth Kumar	Silage pramukyatha	T Sat live in	27.09.2021

Important persons visiting the centre

- University Head, Department of Agronomy Dr. Venkata Ramana visited our centre for technical inspection on 20.08.2021.
- Conducted QRT for Three centres (Hyderabad, Coimbatore and Vellayani) from 26-02-2022 to 27-02-2022 at AICRP on FCU, Rajendranager.
- Conducted field trip, laboratory visit and FTDs on 27.02.2022 for the QRT team.

Student Guidance/Teaching

S.No	Major advisor	Minor advisor	Courses taught
Dr. T. Shashikala	2	-	-
Dr. RVT. Balazzii Naaiik	2	1	-
Dr. T. Sukruth Kumar	1	2	1

Guest lectures by Dr. T. Shashikala

SN	Venue and Organizers	Topic of lecture	Date
1	RFC, Pahadisharif, Hyderabad	Enhancement of fodder production for the farmers	12.02.2021
2		Enhancement of fodder production	15.03.2021

AICRP (FC&U), AAU, ANAND

Research articles in journals

Rathod PH, Shah PG, Parmar KD and Kalasariya RL (2022). The fate of fluopyram in the soil-water-plant ecosystem: a review. *Reviews of Environmental Contamination and Toxicology*, 260 (1): 1-19. DOI: 10.1007/s44169-021-00001-7.

Farooq TH, Kumar U, Yan Y Arif MS, Sakoor A, Tayyab M, Rathod PH, Altaf MM and Wu P (2022). Receptiveness of soil bacterial diversity in relation to soil nutrient transformation and canopy growth in Chinese fir monoculture influenced by varying stand density. *Trees-Structure and Function*. DOI: 10.1007/s00468-022-02278-0.

Patel HK, Rathod PH, Gohil DP, Padheriya D and Raiyani AM (2021). Response of nitrogen levels on growth, yield and quality of single cut oat cultivars. *International Journal of Agriculture Sciences*, 13 (4): 10748-10750.

Shiyal Vikram, Patel HK, Rathod PH, Patel PM, Raval CH and Patel AP (2021). Integrated nutrient management on fodder dual purpose oat (*Avena sativa* L.). *Journal of Plant & Soil Science*, 33 (16): 80-86.

Patel HK, Rathod PH and Padheriya DR (2021). Effect of nitrogen levels on forage yield and quality of multi cuts oat cultivars. *Journal of Plant & Soil Science*, 33(21): 9-13.

Sidapara Mayank P, Gohil DP, Patel Oarthik U and Sharma Deepak D (2021). Heterosis studies for yield and yield components in okra [*Abelmoschus esculentus* (L.) Moench]. *Journal of Pharmacognosy and Phytochemistry* 10(1):1268-1275.

Patel HK, Rathod PH, Shroff JC and Patel PM (2021). Green fodder yield and quality of fodder maize as influenced by seed priming. *Green Farming*. 12 (1&2): 46-48.

Shroff JC, Patel HK, Patel PM and Rathod PH (2021). Effect of nitrogen levels on yield and quality of Guinea grass under middle Gujarat condition. *Green Farming*, 12 (1&2): 35-38.

Group Meeting/Training/Seminar/Web Conference Attended/Participated: Nine

- Gohil DP, Patel HK, Rathod PH attended online NGM *Kharif*-2021 held on 1st – 2nd June, 2021.
- Gohil DP, Patel HK and Rathod PH attended online NGM R*abi*-2021-22 held on 20th September, 2021.
- Patel HK participated in national webinar on “Secondary agriculture for agricultural income enhancement” on 19 April 2021.
- Patel HK participated in a webinar on *Madhamakhi palan* during 19-20 June 2021.
- Patel HK participated in online orientation programme on J-Gate and CMIE database during16-17 July 2021.
- Patel HK participated in webinar on “*Polyhouse na pakoma Rog-Jivat vyavsthapan*” on 23 July 2021.
- Patel HK participated in online seminar on “Analysis of pesticide residues in food and agricultural commodities” on 27 August 2021.
- Patel HK participated in online seminar on “Climate resilient agricultural production system through organic management” during 20-21 October 2021.
- Rathod PH participated in online national workshop on “Intellectual property rights and innovations” organized by IPR cell, AAU and Rajiv Gandhi National Institute of Intellectual Property Management, on 27 October 2021.

P.G. Teaching during 2021-22

Teacher	Course No.	Title of the course	Credit
D. P. Gohil	GP 511	Breeding for cereals, forage and sugarcane	2 + 1
Hiren K. Patel	AGRON 511	Agronomy of forage crops	2 + 1
	AGRON 601	Current trends in Agronomy	3+0
	PGS-506	Disaster management	1 + 0
	ABM-519	Fertilizer technology and management	2 + 0
	e-Course-3	Usefulness of disaster management in agriculture, Distance Education at IDEA, AAU, Anand	1 + 0
Paresh H. Rathod	Soils 510	Remote sensing and GIS techniques for soil and crop studies	2 + 1
	Soils 512	System approaches in soil and crop studies	2 + 1
	Soils 516	Introduction to agrochemicals	2 + 1
	NRMH 1.1 (UG, COH)	Fundamentals of soil science	2 + 1
	NRMH 4.7 (UG, COH)	Soil, water and plant analysis	1 + 1

Research guidance

Major Guide	Student	Degree	Status
Dr. D. P. Gohil	Parmar Sumit V.	M. Sc. (Agri.)	Completed
	Borkhatariya Tejas V.	M. Sc. (Agri.)	Completed
	Rathod Parth Kanubhai	M. Sc. (Agri)	Continue… (2^{nd} Sem.)
Dr. Hiren K. Patel	Patel Harsh K.	M. Sc. (Agri)	Completed
	Nagar Kuldeep	M. Sc. (Agri)	Completed
	Badi Aehamadraza	M. Sc. (Agri)	Completed
	Dudhat Dinesh	M. Sc. (Agri).	Continue… (2^{nd} Sem.)
	Nandaniya Bhavna	M. Sc. (Agri).	Continue… (2^{nd} Sem.)
	Padheriya Dhaval	Ph. D. (in-service)	Continue… (2^{nd} Sem.)

FTD conducted: 22 - Lucerne *var*. Anand 2: 10; Oat *var*. Kent: 12

Externally funded project: One

- "Quality Seed Production in Fodder Crops" under Fodder Development Programme funded by Govt. of Gujarat, Gandhinagar. **B.H.18457-28**

Extension activities:

- Delivered Phone in live online programme on "Chomasu Ghaschara Pakoni Kheti" in the Doordarshan Programme, Ahmedabad on 02.06.2021.
- Delivered lectures on "Ghaschara Pakonu Gunvatta Sabhar Beej Utpadan" in the course "Diploma in Agricultural Extension Services for Input Dealers (DAESI)" organized by Institute of Distance Education (IDEA), AAU, Anand on 28.01.2022.
- Delivered lectures on "Ghaschara Pakoma Sanklit Jivat Vyavshthannu Mahatva" to the farmers participated in the training programme organized by Department of Entomology, BACA, AAU, Anand on 20.02.2022.

Event/Workshop/Seminar organized

- Online Workshop on Fodder Resources Development Plan for Gujarat state jointly organized by ICAR-Indian Grassland & Forage Research Institute, Jhansi and Main Forage Research Station, AAU, Anand on 24 Feb 2022.

AGRONOMY

Recommendation:

Title: Performance of dual-purpose barley under different nitrogen levels and cutting management

Year of recommendation: 2022

Applicability/Situation: middle Gujarat agroclimatic zone-III **(State)**

Recommendation: The farmer of middle Gujarat agro-climatic zone growing dual purpose barley are recommended to apply 60 kg N/ha]30 kg N/ha as basal and 30 kg N/ha in two equal split, 15 kg N/ha after cut (6 week after sowing *i.e.*42 days) and remaining 15 kg N/ha at 20 days after first cut[for obtaining higher seed yield and net return.

Recommendation:

Title: Response to nitrogen application by different varieties of marvel grass

Year of recommendation:: 2022

Applicability/Situation: Gujarat State

Recommendation: The farmers of Gujarat state are recommended to plant rooted slips of marvel grass varieties either GMG 1 or GAMG 2 during *kharif* season after receiving first effective rainfall and apply FYM 10 t/ha with 60 kg N/ha (30 kg N/ha at basal and 30 kg N/ha after one month). Further, after each cut apply 30 kg N/ha as side dressing and 30 kg N/ha at one month after side dressing for obtaining higher green fodder yield and net return.

Recommendation:

Title: Weed management in forage maize - **AICRP**

Year of recommendation:: 2021

Applicability/Situation: Madhya Pradesh, Chhattisgarh, Maharashtra and Gujarat-AICRP

Recommendation: In Madhya Pradesh, Chhattisgarh, Maharashtra and Gujarat, application of Topramezone + Atrazine @35g+ 250g a.i. or Tembotrione + Atrazine @120g+ 250g a.i./ha at 20 DAS to forage maize is recommended for weed management in forage Maize. The Topramezone + Atrazine controlled 66.7% weed biomass (73.4% with two hand weeding). The technology yielded 607, 147.5 and 11.1 q/ha green fodder, dry matter and CP yields, respectively and resulted in BC ratio of 3.20. (607.4 q GFY, 146.7 q DMY, 9.8 q CPY and 2.91 B:C ratio with two hand wedding)

Breeder Seed Production: Rabi 2021-22 (q)

Sr. No.	Crop	ICAR		STATE		Total Production
		Indent	Production	Indent	Production	
1.	Oats *var.* Kent	35.00	35.00	8.50	10.00	45.00
2.	Lucerne *var.* Anand-2	1.75	1.75	1.50	3.25	5.00
3.	Lucerne *var.* Anand-3	0.20	0.20	2.20	2.80	3.00

Nucleus Seed Production

Sr. No.	Crop	Quantity (q)
1.	Oats *var.* Kent	3.10
2.	Lucerne *var.* Anand-2	0.45
3.	Lucerne *var.* Anand-3	0.22

Revenue generated

Budget Head	Receipt ICAR share (01.04.2021 to 31.03.2022)
ICAR, B.H. 2012	₹ 52,605 (ICAR-75%) + ₹ 17,535 (State-25%) = **₹ 70,140**

Bio-chemical analysis of forage plant samples carried out for quality evaluation *during* RABI 2021-22 & SUMMER-2022

Discipline	Total No. of Expts.	No. of samples analyzed for			
		DM%	CP%	NDF & ADF	HCN
Plant Breeding	14	1543	1543	1526	0
Agronomy	04	132	132	264	0
Bio Chemistry	02	612	612	1224	0
PG Study	03	300	372	744	0
Bikaner Centre	13	0	103	142	0
TOTAL	**36**	**2587**	**2762**	**3900**	**0**

Transfer of technology: The FTD of newly released varieties of different forage crops have been arranged on farmer's field for wide publicity among the farmers during Rabi 2021-22.

Crop: Lucerne (Anand 2) – 10; Crop: Oat (Kent) - 12

Details of Forage Garden: In forage garden of ***Rabi 2021-22***, there were two types of forage crops in forage garden like seasonal forage crops and perennial forage crops, among these total 10 varieties of lucerne, 15 varieties of berseem, 49 varieties of oat, 01 variety of chicory and 03 varieties of Ray grass were sown as seasonal forage crops. In perennial crops, 04 varieties of marvel grass, 02 varieties of para grass and *cenchrus* spp, 03 varieties of Guinea grass and 07 varieties of hybrid napier.

AICRP (FC&U), BAIF, Urulikanchan

Awards and Honours: Certificate of Appreciation by ICAR, New Delhi to **BAIF, Urulikanchan** center for Contribution towards Development of BAIF Bajra-5 & BAIF Bajra-6 summer multicut varieties.

Book Chapters

Takawale PS, Kale RV and Jade SS (2021): Journey of Forage Research and Extension at BAIF Development Research Foundation, Urulikanchan, Pune. 50 years Journey of AICRP on Forage Crops and Utilization.

Takawale PS, Kale RV, Pokharkar MB, Ghorpade SD, Kulkarni MM (2021). Report on Fodder Technology Demonstration in Pune district of Maharashtra. Glimpses of Forage Technology Demonstrations Activities. AICRP on Forage Crops and Utilization, ICAR-IGFRI, Jhansi, India.

Important persons visit

- Dr. Ashok Kumar, Director ICAR-NBPGR, New Delhi
- Team of Advantis Development and Relief Agency, ADRA
- Praveen Srivastava, PCCF, Member Secretary, Maharashtra State Biodiversity Board
- L. Krishnan, IAS (Retd.) Team leader/FCRA, Ministry of Home Affairs, New Delhi

FTDs conducted: Total 20 Fodder Technology Demonstrations of Oat var. Kent (15) and Berseem var. Wardan (05) were organised at farmer’s field in three villages in Shirur block of Pune district. Demonstrations were organised on farmer’s field to create awareness among the dairy farmers about new package of practices of winter fodder crops. Technical knowledge was given to the participating farmers through several group meetings and time to time monitoring was done by visiting the individual plots. The data on green fodder yield of all the demonstrations was recorded and compiled.

Training and awareness of participating farmers: Ten one day training programme were organized for the participating farmers in their respective villages to make exposure of the various activities of TSP and build knowledge about the forage crops. Farmers were trained about new technologies of raising of BAIF Napier Hybrid-11 nursery & cultivation of Berseem, use of Bio-prom (Phosphate Rich Organic Manure), preservation of green fodder through silage making, micro irrigation system etc. Fifty farmers were benefited through this programme and relevant training material was provided to all the participants.

Establishment of Bajra Napier hybrid nursery: Fifty nurseries of newly notified B x N hybrid i.e. BAIF Bajra Napier Hybrid-11 (BNH-11) were established at fifty farmers field to make available the planting material to surrounding farmers. Inputs such as planting material, organic fertilizers required for the nursery were provided to the farmers through project support.

Establishment of fodder demonstration: Berseem crop was introduced in the area for the first time as potential legume fodder in the winter. Demonstrations plots were established at fifty farmer’s field during *rabi* season and all the required inputs like seeds, fertilizers were supplied to beneficiaries through project support.

Distribution of small tools, farm implements and drip irrigation kit: Selected beneficiaries were supported with small agricultural tool and farm equipment for the easy field operations. Three chaff cutters and one pallet machine were also given to the fodder cultivating groups. Twenty one tank & drip irrigation system was installed in BNH-11 nursery plots for judicious use available irrigation water during post rainy season.

Training conducted for farmers/ NGO/ Govt. officials: Under the training and capacity building programme BAIF has organised seven trainings on "Livestock Management and Fodder Development" at Urulikanchan during the period. In all 103 participants from Govt., Dairy Cooperatives and individuals from Maharashtra, and Chhattisgarh were attended the training. The information on "Fodder Production and Utilisation Technologies" was shared with participants by the Scientists working in AICRP on Forage Crops.

HRD for the AICRP-FC staff: Attended several webinars related on Biodiversity and Agriculture, sustainable agriculture, soil and climate to update the knowledge.

Details of seed/ planting material sold: During the reporting season, BAIF has supplied 1.20 lakh stem cuttings of BAIF Napier Hybrid-10 **(BNH-10)** and BAIF Napier Hybrid-11 **(BNH-11),** about 35 q seed of oat, berseem, bajra and cowpea to farmers and different institutions.

AICRP (FC&U), SKRAU, Bikaner

Teaching: Ph.D. course "AGRON 625- Research and Publication Ethics" by Dr. A. S. Godara

FTDs conducted: Total 9 fodder demonstrations of oat (Kent) were conducted under AICRP on Forage Crops and Utilization during Rabi-2021-22.

Training conducted: Farmers were given training of green fodder production during rabi season at the time of seed distribution of demonstrations under AICRP on FCU.

Breeder seed production: 20 kg seed of Lucerne variety Krishna was produced. Poor seed setting due to unavailability of irrigation water at this critical stage because of canal closure.

Other assignments

Dr. A. S. Godara: Worked as Farm In-charge; Member of physical verification committee, ARS, Bikaner; Sell and Purchase committee member of ARS, Bikaner and NSP Bikaner

Dr. R. C. Bairwa: PG Hostel warden

AICRP (FC&U), UAS (B), ZARS, Mandya

Awards and Honors: 03

- Certificate of appreciation from ICAR-IGFRI, Jhansi for contribution towards development of technology in forage crops **"*Top feeds based forage cropping system*"** and awarded during National Group Meet held at SKUAST, Srinagar on 13th and 14th of June-2022
- Best live field demonstration awards to AICRP on Forage crops and Utilization, ZARS, VC Farm, Mandya during 02nd December-2021, V. C Farm, Krishimela -2021
- Faculty recognition award: Dr. Nagesh Chikkarugi received best technical officer award by University of agricultural Sciences, GKVK, Bangalore during foundation day of university held on 1st October-2021 at UAS, GKVK, Bangalore.

Research articles in journals

Shekara BG, Mahadevu P, Chikkarugi NM and Manasa N. (2022) Green forage yield, nutritional value and economics of fodder oat genotypes as influenced by nitrogen levels. ***Mysore J. Agric. Sci.,*** **56** (2): 339-344

Manoj KN, Shekara BG, Sridhara S, Jha PK, Prasad PVV. (2021) Biomass quantity and quality from different year-round cereal–legume cropping systems as forage or fodder for livestock. ***Sustainability***, **13**(9414): 1-19

Shekara BG, Mahadevu P, Chikkarugi NM and Manasa N. (2021) Performance of fodder pearl millet genotypes to different levels of nitrogen, ***Forage Res.*** **47**(2): 193-196

Naveena H, Shekara BG, Manoj KN and Chikkarugi NM. (2021). Effect of different organic sources of nutrients on green fodder yield, nutrient uptake and economics of fodder maize and succeeding fodder cowpea under Maize-cowpea cropping system, ***Forage Res.*** **47**: 130-134

Presentations in Conferences / Symposium / Seminars / other forum: **02**

Important persons visited to AICRP-FCU center

- Shri. B C Patil, Hon'ble Minister of Agriculture, Govt of Karnataka.
- Boards Members of UAS, GKVK, Bangalore
- Vice chancellor. UAS, GKVK, Bangalore
- Director of Research, UAS, GKVK, Bangalore
- Director of Extension, UAS, GKVK, Bangalore

Meetings / Workshop/Winter School attended:

- Attended the online virtual Rabi National Group Meeting on Forage crops & Utilization organized at ICAR-IGFRI-Jhansi.
- Attended the online *Kharif* National Group Meeting on Forage crops & Utilization, ICAR-IGFRI-Jhansi, June, 1st-2nd 2021.

Externally funded projects: 01

- Accelerating green fodder production through establishment of model demonstration and multiplication units in southern Karnataka with budget outlay of 25 lakhs. (Dept of Animal Husbandry and Veterinary Services, GOK)

Teaching activities

Title of the course	Course No. and Credit hours	Degree
Advances in weed Management	AGR 606 (2+0)	Post graduate
Mutagenesis & Mutation Breeding	(GPB 505) (1+0)	Post graduate
Insect pests of field crops & stored grains and their management	AET-311 (1+1)	Under Graduate

Research Guidance

Scientist	Chairman		Co-Chairman		Total
	M.Sc.	Ph.D.	M.Sc.	Ph.D.	
Dr. B. G. Shekara, Agronomy	2	1	2	-	05
Dr. P. Mahadevu, GPB	1	-	5	2	08
Total	**3**	**1**	**7**	**2**	**13**

FTDs conducted: 30

Training conducted:

Title of the event	Date	Venue	No. of Participants	
			Men	Women
Fodder production technologies and preservation.	12-8-2021	Bavikere, Saraguru taluk, Mysore district	73	22

Seminars/Conferences/ Symposia/ workshops attended

SN	Title	Date	Events held at	Scientist Participated
1	Current Scenario and Path Forward for GM Crops in India	28th January, 2021	UAS, GKVK, Bangalore	BG Shekara & N. Chikkarugi
2	ESI Young Entomologist Award Lectures	9th January, 2021	Entomological Society of India,	N. Chikkarugi
3	Technical Meet of Agronomist	16th to 18th February 2021	UAS, GKVK, Bangalore	BG Shekara
4	Environmental Ethics & Ecological restoration: Issues and Strategies	05/06/2021	MPUAT, Udaipur	Nagesh Chikkarugi
5	Public Private Partnership for Sustainable Irrigation	07/06/2021	DDG- Agricultural Education-ICAR	BG Shekara
6	Increasing farmers Income: Way Forward	18/06/2021	UAS, Bangalore	Nagesh Chikkarugi
7	Business opportunities in exporting of fruits and vegetables- Alumni Association, UAS, Bangalore	20/06/2021	UAS, Bangalore	BG Shekara

TV talk: 01

Details of seed/ planting material sold

S. No.	Crops & varieties	Root Slips Sold (In Lakhs)
1.	Bajra Napier Hybrid (Co-3)	0.50
	Bajra Napier Hybrid (BNH-10)	1.85
2	Guinea grass (JHGG-08-1)	0.65
3	Rhodes grass (Selection)	0.40
4	Signal grass (Selection)	0.02

Quality seed production for the year 2021

SN	Crop	Variety/ Hybrids Parental line	Class of seed	Quantity Produced (q)
1	Forage Cowpea	MFC-09-1	FS	4.25
2	Forage Cowpea	MFC-08-14	FS	4.0
3	Fodder Cowpea	MFC-09-3	FS	2.0
4	Fodder Maize	African Tall	BS	20.0
5	Multi-cut Fodder Sorghum	CoFS-29	FS	12.0
6	Fodder Maize*	African Tall	FS	200.0

*Seed production through Farmers Participatory programme by National Seed Project, UAS, Bangalore

AICRP (FC&U), SKUAST-K, Srinagar

Research articles in journals

Rashid Uzma, Ahmad Sheikh Muzaffar, Malik HA, Rashid Zahida, Maqbool Showket and Bhat Mohammad Anwar (2021). Knowledge level of the farmers using information and communication technology tools in transfer of technology of North Kashmir, J&K State. ***Journal of Pharmacognosy and Phytochemistry*** 10(1):566-568.

Faisaul-Ur-Rasool, Bhat MI, Dar ZA, Lone BA, Sofi LA, Hakeem SA, Rashid Z, Nasseer S, Bashir S, Majid S and Nissa S (2021). Legume-Maize intercropping System: An Alternative Pathway for Sustainable Agriculture. ***International Journal of Plant and Soil Science.*** 33(16): 87-92.

Majid Shabeena, Kumar Amit, Nasseer Sabina, Bashir Sabiya, Mughal M Najeeb, Dar ZA, Amin Asima, Rashid Zahida, Rasool Faisal and Hakeem Shafiq. (2021). Floral Biology of Exotic and Indigenous Almond (*Prunus amygdalus* Batsch.) Genotypes under Temperate Conditions of Kashmir Valley. ***International Journal of Current Microbiology and Applied Sciences*.** 10(1): 2807-13.

Anayat Rakshanda, Mufti Shahnaz, Khan Inayat M, Rashid Zahida, Wani Shehnaz and Irfan Peer (2021). Effect of Microbial inoculants on growth and yield parameters in Brinjal under temperate conditions. ***Indian Journal of Pure and Applied Biosciences***. 9(1): 140-144.

Rashid Zahida, Tanveer A, Bashir Sabiya, Nasseer Sabina, Khuroo NS, Shabeena M, Rakshanda A, Bhat Raies A, Rasool F, Hakeem S and Jan Seerat (2021). Influence of PGR'S and micronutrients on growth, yield and quality of Sorghum under temperate conditions. ***Journal of Experimental Agriculture International.*** 43(9):18-23

Iqbal Badar, Ahmad Mushtaq, Nissar Roman, Bhat Raies A, Badrudurez, Islam Noor ul, Rashid Zahida and Gani G (2021). Knowledge and adoption of commercial vegetable growers in District Budgam. ***Asian J of Agr'l Extension, Economics and sociology*** 36(11):393-398.

Sabiya B, Mughal MN, Zahida R, Shabeena M, Sabeena N, Dar ZA, Hakeem S and Rasool F (2021). Screening of French bean (*Phaseolus vulgaris* L.) genotypes against Alterneria Leaf spot Caused by (*Alterneria Alternata*) under dry land conditions of Kashmir. ***International Journal of Plant and Soil Science.*** 33(23): 25-30.

Badar Iqbal, Mushtaq A, Raies A Bhat, Tanveer A, Beigh MA, Saraf SA, Showkat M, Farida A, Badrudurez, Rashid Zahida, Wani MA, Khan SH, Gani G, Naresh K and Majid R (2021). Problems faced by vegetable growers in District Budgam, J&K. ***Asian Journal of Agricultural Extension, Economics & Sociology*** 39(12):180-184.

Bhat Raies A, Faizan A, Tanveer A Ahnger, Sheikh TA, Rashid Zahida, Raja Waseem, Latief A, Hakeem SA, Kousar Mumtahin Ul, Nissar Roman and Dar ZA (2021). Evaluation of Fodder Maize (*Zea mays* L.) Cv. African Tall and its Response to Different Rates of FYM and Biofertilizers under Cold arid Conditions of Kargil. ***International Journal of Plant & Soil Science.*** 33 (24): 458-465.

Dar Shahid B., Rashid Zahida, Tanveer Ahmad Ahangar, Nasseer Sabina, Jan Seerat. (2020). Review Article On Pusa Hydrogel - More life per drop. ***E- Newsletter Agriculture and Food,*** ID 31583,Vol 2 (9).

Sabina Nasseer, Shabeena M, Sabiya B, Zahida R, Seerat N, Dar ZA, Faisal R, Shahida I, Mehfuza H, Shafiq H, Shahina N and Gul Zaffar. (2020). Inheritance studies of Aroma in Aromatic Rice (*Oryza sativa* L.) of Temperate Areas of Kashmir Valley. ***Research and Reviews: A Journal of Biotechnology***.10 (5-8).

Nissar Roman, Zahida R, Kanth RH, Manzoor Ganai, Shafeeq Raheel, Aashq H, Waseem R, Raies, Tahir Sheikh and Bhat Anwar (2019). Agronomic bio-fortification of major cereals with zinc and iron- A review. ***Agricultural Reviews***.

Shahid B Dar, Zahida Rashid, Tanveer Ahnger, Sabina Nasseer, and Seerat Jan 2020 Agronomic Zinc bio-fortification of food crops for mitigating malnutrition. ***Indian Farmer*** 7(09) 887-890.

Aijaz N, Zahida Rashid, Tanveer A, Kanth R H, Raies A Bhat, Rakshanda A, Sabina N, Shabina M, Sabiya B, Touseef, Suhail F,Khuroo N S and Z A Dar 2021. Precision Weed Management: A Key to Reduce Herbicide Use. ***Agrigate*** AG-14-11

Tanveer Ahmad Ahnger, F A Bahar, Lal Singh, M A Bhat, Purshotam Singh, S S Mehdi, Touseef A Bhat, Zahida Rashid, Bilal A Lone, Waseem Raja, A A Saad and Latief Ahmad 2022. Artificial Intelligence in agriculture, applications, benefits and challenges: A review. ***The Pharma Innovation*** 11(3): 1407-1414.

Books and Book chapters

Shahina AN, Shabina M, Sabina N, Sabiya B, Rashid Zahida, Buhroo ZI, Dar NA, Khan MH, Qureshi AMI, Dar ZA and Nehvi FA (2021). Genetic improvement of Saffron (Crocus sativus L.) through Breeding Principles and Biotechnological Approaches. ***Saffron-The Red Gold***. pp: 82-103.

Ali G, Hamid A, Dar ZA, Dar SA, Lone AA, Alie BA, Khuroo NS, Nasseer S, Bashir S, Nissa S, Rasool F, Wani SH, Lone BA, Habib M, Hakeem SA, Ahmad L, Rashid Z, Majid S, Khan MH, Iqbal AM, Mir GH, Dar NA, Nagoo S and Iqbal S (2021). Clonal Selection: An effective Approach for Saffron Improvement. ***Saffron-The Red Gold***.pp:124-133.

Bashir S, Mughal MN, Majid S, Nasseer S, Rashid Z, Rasool F, Dar ZA, Nagoo S and Hakeem S (2021). Diseases of saffron and their management under agro-climatic conditions of Kashmir. ***Saffron-The Red Gold***.pp: 218-221.

Kanth RH, Wani OA, Rashid Z, Dar ZA, Mir S and Fayaz S (2021). Scenario, Significance and Prospects of Seed spices. ***Technological advancements in Spices***. Pp: 1-7

Sabina N, Qureshi AMI, Niyaz A Dar, Sabiya B, Shahina N, Shabina M, Rashid Zahida, Rasool F, Irfan M, Dar ZA and Nehvi FA (2021). ***Technological advancements in Spices***. Pp:87-95.

Shahina AN, Shabina M, Sabina N, Sabiya B, Zahida Rashid, Z I Buhroo, N A Dar, M H Khan, A M I Qureshi, Z A Dar and F A Nehvi 2021. Genetic improvement of Saffron (*Crocus sativus* L.) through Breeding Principles and Biotechnological Approaches. ***Saffron-The Red Gold***. pp: 82-103.

Teaching

Semester	Course No	Course title	Credit hours	Course leader/ Co instructor
Autumn 2021	Agron-501	Modern concepts in crop production	3+0	Co-Instructor
Autumn 2021	Agron-507	Agronomy of oilseeds, fibre and sugar crops	2+1	Co-Instructor
Autumn 2021	Agron-513	Principles and practices of Organic farming	2+1	Co-Instructor
Spring 2022	Agron-508	Agronomy of medicinal, aromatic and underutilized crops	2+1	Co-Instructor
Spring 2022	GPB-510	Breeding for biotic and abiotic stress resistance	2+1	Instructor

Students Guided During 2021-2022 as major advisor, Co-Advisor and Dean’s nominee

Ms. Uzma Rashid	Ph.D.	Extension	Member of Advisory committee
Mr Ishfaq	M.Sc.	Sericulture	Member of Advisory committee
Ms. Tsering Dolma	M.Sc.	Soil Science	Co-Advisor
Ms. Insha Nazir	M.Sc.	Agronomy	Co-Advisor
Ms Saima Nazir	M.Sc.	Agronomy	Major Advisor
Ms Iram	M.Sc.	Genetics and Plant Breeding	Dean’s Nominee

Lectures Delivered

- Delivered a Lecture in seven days STRY training Programme on Vermi- agro production technology to restore and improve soil fertility for sustainable agriculture production on 29th March, 2022.
- Lecture delivered on agronomic practices of fodder maize in one day training programme conducted by AICRP-FC&U in Uri, Baramulla

AICRP (FC&U), GBPUAT, Pantnagar

FTD conducted : **30** (25 on Berseem and 05 on Oat)

Farmers' Meetings : **14 (538 beneficiaries)**

Group discussions : **11**

Radio Talks: 07 - Dr MS Pal – 04; Dr B Prasad - 03

Participation in Conference/Workshop: Total 05 National and 02 International

- Dr MS Pal: 02 National + 01 International
- Dr B Prasad: 03 National + 01 International

Teaching courses=07 - Dr MS Pal – 02; Dr B Prasad - 05

Guidance of Students (PG & Ph D) – 06 Dr MS Pal- 02; Dr B Prasad - 04

Publications

Item	Dr M S Pal	Dr B Prasad	Total
Research Papers	02	02	04
Popular articles	03	01	04
Research Report	02	-	02
Book Chapter	02	05	07
Total	09	08	17

Other assigned duties

- **Dr MS Pal: -** PG (Family) Hostel Warden
- **Dr B Prasad:** Deputy Coordinator: RAWE (2020-21, 2021-22); Coordinator of JRF tutorial classes in Plant Science (2021); Deputy Coordinator, certificate course on Seed Production Technology for 3 months. (2020, 2021 & 2022)

AICRP (FC&U), JNKVV, Jabalpur

Research articles in journals

Kumhar Bheru Lal, Agrawal KK, Jha AK. (2021). Weed screening in grass based cropping system in Central India. *Journal of Biotechnology and Crop Science* 9 (14): 94-99.

Sahu Muni Pratap, Kewat Mewa Lal, Jha Amit Kumar, Sharma JK and Sondhia Shobha. (2020). Weed dynamics as affected by practices and straw mulches in chickpea. *International Journal of Chemical Studies* 8(4): 1857-1859

Students - M.Sc. 03: Ph.D. 02

TSP : Oat 10, Berseem 10

AICRP (FC&U), CSK HPKV Palampur

Research articles in journals

Kumar N, Anuragi H, Rana M, Priyadarshini P, Singhal R, Chand S, Indu, Sood VK, Singh S and Ahmed S. (2021). Elucidating morpho-anatomical, physio-biochemical and molecular mechanism imparting salinity tolerance in oats (*Avena sativa* L.). ***Plant Breeding*** 140(5): 835-850

Kumari A, Sood VK and Arora A. (2021). Effect of drought stress on physio-biochemical parameters in *Festuca* and *Lolium* genotypes. ***Annals of Phytomedicine*** 10(2): 494-501

Kumari, J, Sood VK, Mishra P, Kumar S, Sanadya SK, Sharma G. (2022). Genetic variability and association analysis for some forage and seed yield related traits in F_4 and F_5 generations of oat (*Avena sativa* L.). ***Biological Forum*** 14(2): 01-09

Priyanka, Sood VK, Rana A and Kumar S. (2021). Genetic divergence among oat (*Avena sativa* L.) genotypes under dual purpose and seed yield related systems. ***Biological Forum*** 13(4): 1163-1169

Rana A, Sood VK, Priyanka and Kumar S. (2021). Heterosis in oat (*Avena sativa* L.) for various agro-morphological, yield and quality traits. ***Biological Forum*** 13(4): 1149-1157

Atri A., Banyal DK, Bhardwaj NS and Roy AK (2021). Exploring the integrated use of fungicides, bio-control agent and biopesticide for management of foliar diseases (anthracnose, grey leaf spot and zonate leaf spot) of sorghum. ***International Journal of Pest Management:*** https://doi.org/10.1080/09670874.2022.2039799

Bhardwaj NR, Banyal DK and Roy AK (2022). Integrated management of crown rot and powdery mildew diseases affecting red clover (*Trifolium pratense* L.) ***Crop Protection*** DOI: https://doi.org/10.1016/j.cropro.2022.105943.

Bhardwaj NR, Atri A, Banyal DK, Dhal A and Roy AK (2022). Multi-location evaluation of fungicides for managing blast (*Magnaporthe grisea*) disease of forage pearl millet in India. ***Crop Protection.*** 159: 106019 https://doi.org/10.1016/j.cropro.2022.106019.

Katoch R, Tripathi A, Hallan V and Raj R (2021). Cloning, characterization, expression analysis and agglutination studies of novel gene encoding β-D-galactose, *N*-acetyl-D-glucosamine and lactose binding lectin from ricebean (*Vigna umbellata*). ***Molecular Biotechnology***. https://doi.org/10.1007/s12033-021-00410-y.

Katoch R, Apoorva, Tripathi A, Manoj NV (2021). Effect of pre-treatments on quality of maize (*zea mays* l.) stover. ***Forage research*** 46(4): 356-362.

Katoch R and Tripathi A (2021). Research advances and prospects of legume lectins. J***ournal of Biosciences*** 46:104 (1-30).

Papers/ Abstracts in conference/seminar/symposia

Sharma A, Sood VK, Chaudhary HK and Kumar S. (2021). Karyotype analysis of different *Avena* species in oat. Abstract In: National Seminar on “Crop Breeding for Wider Adaptation” on December 12-14, 2021 held at BAU, Ranchi. pp: 70-71

Sanadya SK, Kumar S, Sood VK, Chaudhary HK, Swaran Lata and Mittal RK. (2021). Crop genetic resources in Northwestern Himalayan context. Abstract In: 2nd Asian Web Conference, Managing Hill Resources and Diversities for Zero Hunger and Climate Resilience, CAU, Imphal, 12-13 February, 2021

Priyanka, Sood VK, Kumar S, Rana A and Sanadya SK. (2021). Minimum data set to improve seed and fodder yield in oat. Abstract In: 3rd International Conference on Global Initiative in Agricultural, Forestry and Applied Sciences for Food Security, Environmental Safety and Sustainable development. SGRRU, Dehradun.

Kumar S, Sood VK, Sanadya SK, Sharma G and Kaushal R. (2022). Introgression of quality and yield traits from wild *Avena* species to cultivated oat (*Avena sativa* L.) and identification of introgressed alien chromatin using morphological and molecular techniques. 1st International Symposium held at IIWBR, Karnal on January 18-20, 2022. pp: 18-19

Banyal DK and Mallannavara AB (2021). Oat powdery mildew caused by *Blumeria graminis* and its management. In the National Symposium on Strategic Plant Disease Management for Food security organized by INSOPP at CPRI Shimla on 6-7th December, 2021.

Kumar Naveen, Agrawal RK and Sharma Tarun (2021) Productivity and quality of fodder maize genotypes under different nitrogen management under sub-humid & sub-temperate raifed conditions. Extended summary: 5th International Agronomy Congress, November 23-27, 2021. Pp 880

Sharma Tarun, Kumar Naveen, Singh Akashdeep and Chauhan Garima (2022). Production potential of dual-purpose cereals in north-westen hilly regions. 1st International Symposium on "Cereals for food security and climate resilience" January 18-20. Pp. 115

Kumar Naveen, Agarwal RK, Singh Sukhchain and Thakur Deeksha. (2021). Effect of phosphorus levels on performance of promising entries of forage cowpea. 5th International Agronomy Congress, November 23-27, 2021. Pp 861

Kumar Naveen, Agarwal RK and Singh Sukhchain. (2021). Response of oat entries to nitrogen management under sub-temperate conditions of Himachal Pradesh. 5th International Agronomy Congress, November 23-27, 2021. Pp 2183

Popular article

Sood VK, Kumar N, Kumar S, Sanadya SK and Sindhu S. 2022. *Grishamkaleen chaara faslon ka mehtav*. *ICAR-Kheti* 74(10): 31-33

Book Chapters

Kumar N, Sood VK, Banyal DK and Katoch R. 2021. Journey of forage and extension at CSKHPKV, Palampur. In: 50 years of AICRP on Forage Crops and Utilization (Roy A.K. et al., eds). ICAR-IGFRI Jhansi, India. pp 111-127

Banyal DK, Thakur Nisha and Sinha Diksha. 2022. Analysis of diversity at *er* loci for identification of diverse sources of pea powdery mildew resistance. Pages 288-300. Editors; HR Gautum, Narender Bharat, Anil Handa and SK Sharma. Novel strategies in plant stress diagnosis and management Neoti Book Agency Pvt Ltd, New Delhi pp 1-444. ISBN 978-81-952185-5-4

Participation of scientist in different programmes

i. Awareness programme cum workshop on safe use of pesticides and adoption of good agricultural practices for production on Basmati Rice at Dhanotu on 22.10.21.
ii. National Symposium on Strategic Plant Disease Management for Food security organised by INSOPP at CPRI Shimla on 6-7th December, 2021. Acted as Co Chairman in Technical session – II and also presentation oral paper on Oat powdery mildew caused by *Blumeria graminis* and its management.
iii. Annual group meeting – – *Rabi 2021* of All India Co-ordinated Research Project on Forage on 20.09.2021 online
iv. SAC meetings of KVK Mandi at Charkhari on 19.03.22 and KVK Kangra at Jamanabad on 21.03.22.
v. National Symposium on Novel strategies in plant stress diagnosis and management" at UHF Solan on May 6-7, 2022. Acted as Co Chairman in Technical session – IV and also delivered a lead lecture on Analysis of diversity at *er* loci for identification of diverse sources of pea powdery mildew resistance.

vi. Organized a lecture on ‘Plant Biotechnology Approaches for Crop Improvement’ under NAHEP-CAAST, delivered by Dr. R.C. Yadav, Ex-Professor & Head, Department of Molecular Biology, Biotechnology & Bioinformatics, CCS HAU, Hisar at CSK HPKV, Palampur on 20.06.2022

Lead Lectures

Banyal D K, Thakur Nisha and Sinha Diksha.2022. Analysis of diversity at *er* loci for identification of diverse sources of pea powdery mildew resistance in **National Symposium** on “Novel strategies in plant stress diagnosis and management” **at UHF Solan on May 6-7, 2022. Page 16**

Participation of scientists in symposiums and conferences

Courses Taught

Course No.	Course Title	Cr. Hr.
LPM	Livestock production and Management	4+2=6
Agron-510	Agroforestry and agrostology	2+1=3
ORT 111	Orientation	1+0=1
Agron 3613	Agrochemicals	2+1=3
Pl Path 507	Principals of Plant disease management	2+1=3
GP 509	Biotechnology for Crop Improvement	2+1=3
GP 608	Advances in breeding of major field crops	3+0=3
GP 591	Master’s Seminar-I	1+0=1
GP 691	Doctoral Seminar-I	1+0=1
GP 604	Molecular and chromosomal manipulations for crop improvement	2+0=2
Biochem.502	Plant Biochemistry	3+0=3

Recognitions & Awards

Dr. Naveen Kumar

- Reviewer Excellence Award – ARCC Journals
- **Member Editorial Board, Section Editor: Resource Management**: The Society for Advancement of Wheat and Barley Research (SAWBAR), Karnal. *J. of Cereal Research*
- **Councillor**- Indian Society of Agronomy, New Delhi
- **Councillor**- Haryana Agronomist Association (Haryana J. Agronomy), Hisar

Dr. D K Banyal

- Fellow Indian Society of Plant Pathologist 2021
- Award of certificate of reviewing for 2021-22 by Indian Phytopathology
- Best Research Paper Award in National Symposium on “Novel strategies in plant stress diagnosis and management” organized by Himalayan Phytopathological Society at UHF Solan on May 6-7, 2022

Students guidance (as major advisor): M Sc. –4 , Ph. D. 7

Forage technology consultations: 12

Lectures delivered to farmers and development officers:

- Dr V K Sood delivered lecture on fodder crops varieties and production technologies at MAREC, Sangla, Kinnaur on 07.11.2021
- Dr V K Sood delivered lecture on fodder crops varieties and production technologies at Research Sub Station, Lari, Lahaul & Spiti on 09.11.2021

Consultancy: Jersey Breeding Farm, Department of Animal Husbandry (HP) - Development of 3 ha lantana infested land into productive pasture

Linkage with other programme and institutes: AICRP (IFS); AICRP (Agroforestry)

Association in *Adhoc* Projects: Scientists associated in 7 *Ad hoc* projects as PI and Co-PIs

AICRP (FC&U), BAU, Ranchi

Honours and Award

- Appreciation Award receive on 11th Dec. 2021 during 41st Rabi Research Council meeting for active support and contribution in developing crop variety of Maize **(Birsa Baby Corn-1)** on crop improvement aspect.
- **Best Research Award** received on 3rd International Conference (Hybrid Mode) on Food, Agriculture and Innovation (3rd ICFAI), 24th – 26th December 2021 @ Holiday Home, Ranchi, Jharkhand.
- **Outstanding Plant Breeder Award** received on 3rd International Conference (Hybrid Mode) on Food, Agriculture and Innovation (3rd ICFAI), 24th – 26th December 2021 @ Holiday Home, Ranchi, Jharkhand.
- Award received from IGFRI, Jhansi during kharif 2022 to team of BAU, Ranchi (Jharkhand) for Contribution towards Development of **Technology "Variety and Cutting Management for Higher Seed Yield of Berseem"** identified during 2022.

Research articles in journals

Prasad Yogendra, Kumar Sunil, Kumar Ravi, Kumar Kamleshwar and Izhar Tajwar (2021). Genetic diversity studies in forage Maize (*Zea mays* L.) for green fodder yield. *Chemical Engineering*, P.P. 1-5.

Book Chapter

Ahmad Ekhlaque, Kumar Niraj, Prasad Yogendra, Kumar Kamleshwar, Arya Madhuri and Kumar Aloke (2021). *Introduction to Genetics and Breeding*. ISBN: 978-81-928932-6-9.

Popular Article

Prasad Yogendra and Kumar Birendra (2020). Role of forage oats in India. Published in National Group Meet of AICRP on Forage Crops & Utilization SKUAST, Srinagar, Souvenir-PP 33-37.

Participation in Workshop/Seminar/Conference

- Participated in the "3rd INTERNATIONAL CONFERENCE (Hybrid Mode) ON FOOD, AGRICULTURE AND INNOVATIONS 'ICFAI-2021' held at Holiday Home, Ranchi, Jharkhand on 24th to 26th Dec.2021.
- Participated in the QRT meeting (2016-2022), AICRP on Forage Crops held at OUAT, Bhubaneshwar on 11th and 12th April 2022.

TSP Programme: Thirty Demonstrations conducted on Berseem & Oats in Lundari & Bharhe village, Block-Chanho of Ranchi, district and thirty five demonstrations in Mandar Block of Ranchi district during rabi.

FLD's Conducted under ICAR-TSP Programmes

SN	Crops & Variety	Location	Area (ha)	No. of Farmer's
1.	Bajra Napier Hybrid / IGFRI-6	Kumharia/Kanke	1.0	10
2.	Guinea grass/ Makuni	Kumharia/Kanke	1.0	10
3.	Bajra Napier Hybrid / IGFRI-6	Ara keram/ Ormanjhi	1.5	15
4	Guinea grass/Makuni	Ara keram/ Ormanjhi	1.4	14
5.	Bajra Napier Hybrid /CO-3 & CO-4	Simra, Mandro/Sahibganj	5.5	30
6.	Guinea grass/ Makuni	Simra, Mandro/Sahibganj	5.5	30
7.	Bajra Napier Hybrid /CO-3 & CO-4	Baliapur/Dhanbad	3.0	30
8.	Guinea grass/ Makuni	Baliapur/Dhanbad	3.0	30
	Total		**20.9**	**69**

TSP Training Programme

Title of Programme	Date	Venue	No. of Beneficiaries
Awareness creation cum mini Input kit distribution for fodder production	01.09.2021	Kumharia/ Kanke	15
Awareness creation cum mini Input kit distribution for fodder production	06/09/2021	Ara keram/ Ormanjhi	29
Green fodder production for livelihood security of rural people	07 - 08.09.2021	Simra, Mandro/ Sahibganj	60
Awareness creation cum mini Input kit distribution for fodder production	09.09.2021	Baliapur/ Dhanbad	60
Awareness creation cum mini Input kit distribution for fodder production	28.03.2022	Kumharia/ Kanke	35

AICRP (FC&U), RPCAU, Pusa

Establishment of Golden Jubilee Forage Garden: Golden Jubilee Forage Garden (*Rabi*) was established and maintained.

Technical Guidance: Providing technical guidance to NavGanga Food Private Limited, Begusarai for production of Maize silage on commercial scale as per the MoU signed with our University.

Seed Production

- Oat variety Kent seed produced - 4.5 qt.
- Sold propagules of Napier and guinea grass - Rs. 20,000/-

Research Guidance

- Dr. Nilanjaya - three M.Sc. and one Ph.D. student.
- Dr. Gangadhar Nanda - one M. Sc. student.

Teaching

- Dr. Nilanjaya is having course load of nearly 20 credit hours per semester along with additional assignment of Officer-In- Charge (Academic) of Deptt. of Plant Breeding and Genetics as well as Co-ordinator, Academic society, PG College of Agriculture (PGCA).
- Dr. Gangadhar Nanda is having course load of nearly 16 credit hours per semester along with additional assignment of Officer-In- Charge, Fodder production at APRI, RPCAU, Pusa.

AICRP (FC&U), KAU, Vellayani

Research articles in journals

Swathi AH and Thomas Usha C, (2021). Yield and quality of Bajra napier hybrid as influenced by weed management practices. ***Range management and Agroforestry.*** 42(2):294-300

Leaflet

Stylo- a fodder legume (in Malayalam) - released during Kharif 2022 NGM of AICRP on FCU

Papers/ Abstracts in conference/seminar/symposia

Mubeena P, Usha CT and Surendran Deepa. (2022). Anti-nutritional factors and micronutrient content of locally available tree folders and shrubs in Southern Kerala, National Webinar on Sustainable interventions towards resource conservation and natural farming- ANRCM and AAU. pp.321

Thomas Usha C, Divakaran Niveditha K, Gautham Suresh SP and Gayathri G. (2022). Azolla- A potential feed substitute for Livestock. SKUAST-K 2022 Souvenir, National Group Meet (Kharif-2022), All India Coordinated Research Project on Forage Crops and Utilisation (Eds. NS Khuroo, Zahida Rashid, ZA Dar) p.75-80

Thomas Usha C, Deepthi C., Gautham Suresh SP and Gayathri G. (2022). Moisture stress tolerance in fodder crops. SKUAST-K (2022) Souvenir, National Group Meet (Kharif-2022), All India Coordinated Research Project on Forage Crops and Utilisation (Eds. NS Khuroo, Zahida Rashid, ZA Dar) p.119-123

Certificate of Appreciation: ICAR Certificate of appreciation to the centre for the development of the fodder production technology on 'Top feed based cropping system' identified during 2021.

Research guidance

- PhD in Agronomy- 2
- M.Sc. (Agri.) in Agronomy-3 ; M.Sc. –Integrated Biotechnology-1
- M.Sc. (Agri.) in Plant Breeding and Genetics-4

Teaching- Courses

Dr. Usha C Thomas

- Agro1101- Introductory Agro-meteorology & Climate change (1+1)
- Agron 605- Irrigation management(2+1)
- DOF1101- Introductory Agriculture (1+0)

Dr. Gayathri G

- Pbgn3205 – Intellectual Property Rights (1+0)
- GP605- Advanced Plant Breeding Systems (2+0)
- GP506- Population Genetics (1+1)

Externally funded projects

- Revolving Fund scheme on 'Planting material production in fodder crops', funded by KAU – PI Dr. Usha C Thomas
- Kerala State plan project 2020-21 on 'Performance Evaluation of Promising Fodder Varieties in Different AEUs in Kerala' - PI Dr. Usha C Thomas
- Kerala State plan project 2020-21 on ' Identification of *Stylosanthes* species for yield and quality suited for cultivation in Kerala' PI - Dr. Gayathri G

Additional Duty

- Dr. Usha C Thomas as Assistant Warden, UG Ladies Hostel, College of Agriculture
- Dr. Usha C Thomas - member of district level monitoring committee of State Horticulture Mission
- Dr. Gayathri G Assisting Academic Officer (UG) in day-to-academic matters of Undergraduate students and nodal officer for KSHEC Higher Education Survey 2018-19

AICRP (FC&U), CCS HAU, Hisar

Research Articles in journals

Arya RK, Panchta R and Vu NN (2021) Morphological characterization of cowpea genotypes and its utility for DUS testing. ***Range Management & Agroforestry***, 42 (1): 49-58

Gaur Arpit, Jindal Yogesh, Singh Vikram, Tiwari Ratan, Kumar Dinesh, Kaushik Deepak, Singh Jogendra, Narwal Sneh, Jaiswal Sarika, Iquebal Mir Asif, Angadi Ulavapp B., Singh Gyanendra, Rai Anil, Singh Gyanendra Pratap and Sheoran Sonia (2022). GWAS to identify novel QTNs for WSCs accumulation in wheat peduncle under different water regimes. ***Frontiers in Plant Science***. March 2022 Vol 13 Article No. 825687 pp 1-17. doi: 10.3389/fpls.2022.825687

Jindal YK and Tokas J (2021). Evaluation of hybrid napier grass genotypes in different agro-ecological zones across India. ***Forage Res.,*** 47(1): 50-57

Kathwal Rajesh, Thakral SK, Kumar Parveen, Sharma KD, Sharma Manoj Kumar, Jindal Yogesh and Kumar Amit (2022). Effect of plant regulators on growth, yield attributes, yield and economics in wheat under restricted irrigation. ***Annals of Agri-Bio Research*** 27 (1): 17-22.

Kumar N, Satpal and Kharor N (2021). Response of promising entries of single cut fodder oat to different nitrogen levels. ***Forage Res.,*** 46(4): 374-378

Kumar Naveen, Satpal, Kharor Neeraj, Kumar Suresh, Phogat DS and Jindal Y (2021). Genotypic response of berseem (*Trifolium alexandrinum* L.) to different phosphorus levels. ***Forage Res.,*** 47 (3): pp. 329-333

Kumar R, Devi U, Kumar P, Singh C, Satpal, Kumar S and Singh DP (2022). Sewage water and organic manure influence on grain and fodder maize production: A review**. *Forage Res.,*** 47(4): 399-407

Oo, PP, Panchta R, Nimbal S, Singh DP, Kharor N, Arya S and Sonu (2022) Morphological Characterization of leaf, flower, pod and seed traits of Cowpea [*Vigna Unguiculata* (L.) Walp] genotypes. ***Forage Research***, 48(1): 50-56

Panchta R, Arya RK, Vu NN, Behl RK (2021). Genetic Divergence in Cowpea (*Vigna unguiculata* L. Walp) **-** an Overview. ***Ekin Journal of Crop Breeding and Genetics*** 7(1):1-20

Phogat DS, Jindal Y, Jattan M, Kumar Naveen, Singh DP and Tokas J (2021). HFO 607: A new single-cut oat variety for North West Zone of India. ***Forage Research***, 46(4): 393-95

Phogat DS, Jindal Y, Jattan M, Thakral NK, Kumar N, Singh DP and Kharor N (2022). Notification and germplasm registration. ***Indian J. Genet. Plant Breed.,*** 82(1): 125-131

Phogat DS, Jindal Yogesh, Jattan Minakshi, Kumar Naveen, Singh Dalvinder Pal and Kharor Neeraj (2021). HFO 529: A new single-cut oat variety for hill zone of India. ***Forage Res.,*** 47 (3): 379-38

Poonia A, Phogat DS, Versha, Nagar S, Sharma P, Kumar V. (2022) Biochemical assessment of oat genotypes revealed variability in grain quality with nutrition and crop improvement implications. **Food Chemistry.** 377: 131982. https://doi.org/10.1016/j.foodchem.2021.131982

Thant Su Mon, Kumari Pummy, Pahuja SK, Tokas Jayanti, Yashveer Shikha. (2021). Identification of dual types in sorghum genotypes based on correlation and path coefficient studies. ***Forage Res.,*** 46 (4): 302-307

Book

Jindal Y, Sehrawat SK, Chhabra AK, Kumar Neeraj, Kumar Satish, Kumar Suresh, Yadav SS, Dahiya Manju and Niwas Ram (Eds.) (2021). *Varieties of CCSHAU: Continued efforts towards food security*. Published by Dorex Offset Printers, Hisar. ISBN 978-93-90670-30-7. University publication No. CCSHAU/PUB#21-058. pp 152

Book Chapter

Jattan, M, Phogat, DS, Kumar N and Satpal (2021). Impact of Forage Technology Demonstrations on Fodder Production in Haryana. In "Glimpses of Forage Technology Demonstration Activities", Roy AK, Agrawal RK, Bhardwaj NR and Chand S (Eds.). PC, AICRP on FCU, IGFRI, Jhansi. Pp 14-21. ISBN: 978-81-948917-8-5

Extension Activities

- Interacted with farmers and dignitaries during "Krishi Mela" in Sept. 2021
- Interacted with state officials during AO's workshop in *Kharif* 2021 (April 29, 2021) and September 2021.
- Delivered lectures during "Monthly T & V" schedules.
- Delivered **a** lecture in "Online Refresher course on "Research Management" in April 2021 on the topic "Formulation of technical programme" organized by AAREM, DHRM, CCS HAU, Hisar.

Ph.D. /M.Sc. Students being supervised

Sr. No.	Name of Student	Admission No.	Advisor	Research Title
1	Annu	2020A02M	Dr. Satyawan Arya	Principal component analysis for yield and its attributing traits in grain Cowpea (*Vigna unguiculata* L)
2	Anil	2021A19M	Dr. Satpal	Effect of foliar application of nitrogen based formulations on quality and yield of fodder sorghum during summer season under semi-arid condition
3	Sonu	2018A34D	Dr. Yogesh Jindal	Stability and molecular diversity analysis for yield and its components in wheat (*Triticum aestivum* L.)
4	Sanjeev	2021A69M	Dr. Yogesh Jindal	Genetic diversity and path analysis for multicut traits in forage sorghum

AICRP-FC & U, CAU, Imphal

Extension Activities

- Resource person : 5
- Interaction programme : 4

FTDs conducted

Season	Year	Crop (variety)	No. of FTDs conducted
Kharif	2021	Bajra Napier Hybrid var. (Co-4 & Co-5)	5
		Maize (J-1006)	15
		Sorghum	10
Rabi	2021-22	Oat	20
Total			**50**

Publications: One bulletin

Students guided: 1 M.Sc. (Agri.) as Major guide.

Courses taught

SN	Course title	No of topics
1.	Agricultural Heritages	16
2.	Geo-informatics and Nano technology and Precision Farming	7
3.	Cropping system	16
4.	Dryland farming	32
5.	Forage crops production	32

Inputs supplied

- Fodder maize, sorghum Oats seed, Hybrid Napier cutting, supplied to FTDs/ TSP beneficiaries.
- Any type of fodder seed (seasonal, perennial, perennial cutting etc) are made available at the AICRP on Forage Crops & Utilization, CAU, Imphal Centre.

University Assigned Activities

- Assigned as Co-PI in the Project Sustainable Livelihood Development of Farmers under Farmers FIRST Programme component.
- Assigned as PI in the Project ICAR-IGFRI NEH Component Project.
- Assigned as Co-PI in the Project Identification of Climate resilient food crops, traditional rice varieties of Manipur and their production enhancement through Scientific manipulation having least impact to climate Change..
- Scientist and staff of AICRP on Forage crops of CAU Imphal centre are also actively involved in many activities in the CAU Head Quarter and Directorate of Research office of CAU, Imphal

WEATHER REPORT RABI 2021-22

The weather report of the AICRP-FCU Coordinating centers, Voluntary centers across the different zones and Headquarter during *Rabi* 2021-22 have been presented in this section. The weather parameters prevalent during 40^{th} Standard Meteorological Week (SMW) (October 01-07, 2021) to 21^{st} SMW (May 21-27, 2022) were taken into consideration, which covers the *Rabi* season, 2021-22 for all the testing/ experimenting locations of trial conduction (Tables M1 to M12). During the reporting period, weather variations are clearly visible in maximum and minimum temperature, relative humidity, rainfall, rainy days and sunshine hours in different agro-climatic zones, which had varied impact on establishment, growth, yield and quality of different annual and perennial forage crops and their varieties and also having close correlation with the incidence and magnitude of insect-pest and diseases of forage crops.

Temperature

In Hill zone, Srinagar was the coolest location recording -4.3^{0}C during 51^{st} SMW. Maximum temperature was recorded at Almora (34.0^{0}C) during 17^{th} SMW. The mean T_{Min} over the season was recorded the lowest at Srinagar (2.9^{0}C). Whereas, the highest mean T_{max} was recorded at Almora (24.4^{0}C). In North-East zone, Ranchi centre recorded the lowest minimum temperature (3.6^{0}C) during 51^{st} SMW. The highest T_{max} was recorded at Ayodhya (40.7^{0}C) during 16^{th} SMW. The higher mean T_{Max} was recorded at Bhubaneswar (31.4^{0}C) and the lowest mean T_{min} was recorded at Imphal (13.5^{0}C). In North-West zone, Bikaner recorded the lowest minimum temperature (3.1^{0}C) during 51^{st} SMW, as well as maximum temperature (46.3^{0}C) during 19^{th} SMW. The higher mean T_{max} was noted at Bikaner (32.5^{0}C); whereas, the lowest mean T_{min} was noted at Hisar (13.5^{0}C). In Central zone, Jhansi recorded the lowest minimum temperature (5.8) during 3^{rd} SMW, whereas the maximum temperature was recorded at Jhansi (44.6^{0}C) during 20^{th}SMW. The higher mean T_{max} and lower mean T_{min} was were recorded at Raipur and Jhansi (32.6 and 14.2^{0}C, respectively). In South zone, the lowest minimum and maximum temperature was recorded at Hyderabad (9.6^{0}C during 51^{st}SMW and 39.5^{0}C during 18^{th} SMW, respectively). The higher mean T_{max} and lower mean T_{min} was also recorded at Hyderabad and Mandya(32.4 and 18.9^{0}C, respectively).

Rainfall

The average annual rainfall of India is about 1192 mm and 80-90 percent rainfall in the country is mostly contributed through South-West Monsoon. During winter season some of the states received substantial amount of rainfall especially Kerala, Assam and West Bengal as evident from the rainfall data presented in tables (M1 to M12).

In Hill zone, Almora received higher rainfall (528.7 mm) as compared to other centres in the zone. In North-East zone, Imphal centre received highest rainfall (6463 mm in 62 rainy days) followed by Bhubaneswar(360.0 mm) and the lowest being at Kalyani (42.0 mm). In North-West zone, Pantnagar received highest rainfall (612.7 mm). Bikaner centre received the lowest rainfall (43.8 mm) in 7 rainy days. In Central zone, maximum rainfall and maximum number of rainy days (375.1 mm, 15 days) was recorded at Urulikanchan followed by Jhansi (262.6 mm in 10 rainy days) and lowest being at Anand (32.4 mm in 4 rainy days). In South zone, Vellayani received maximum rainfall (1480.7 mm) in 94 rainy days followed by Mandya (679.3mm).

Relative Humidity

In the tables RH1 and RH2 refers to morning and afternoon RH respectively. In Hill zone, higher average RH during morning hours was recorded at Almora (91.2%). In afternoon hours Srinagar centre recorded higher RH2 (59.6%) followed by Palampur. In North-East zone, maximum average RH of 97 % during morning hours was recorded at Jorhat followed by Pusa (92.8%). The average minimum RH during afternoon hours was recorded at Imphal (51.4%). In North-West zone, higher average RH of the season during morning hours was recorded at Hisar (85.5 %) and Pantnagar (84.3 %) and in afternoon, higher RH was recorded at Pantnagar (46.9%). The lowest RH during morning as well as evening hours was recorded at Bikaner (66.2 & 27.5%, respectively). In Central zone, maximum RH in morning hours was recorded at Anand (79.6%) and Raipur (78.6%). The mean afternoon RH varied in limited range of 33.7 to 52.7% at all the centers in the zone. In South zone, maximum average RH of the season in morning and evening hours (91.5 and 83.2%) was recorded at Vellayani. The lowest average RH (85.6 & 48.7%) in morning and evening hours, respectively, was recorded at Hyderabad.

Sunshine hours

In Hill zone, maximum average sunshine hours were recorded at Palampur (7.4 hours/ day) followed by Almora (6.4). This indicates that the weather was fairly clear during the period. In North-West zone, higher average sunshine hours were recorded at Bikaner (8.5). The lowest average sunshine hours were recorded at Hisar (6.5) in the zone. In North-East zone, maximum average sunshine hours were recorded at Ranchi (7.4) followed by Ayodhya (6.6) and the lowest at Bhubaneswar (5.6). In Central zone, maximum average sunshine hours were recorded at Anand (8.4) followed by Rahuri (7.7). In South zone, maximum average sunshine hours were recorded at Hyderabad (7.1) and the lowest at Vellayani (5.8).

Std. Week No.	Period	Std. Week No.	Period
40	01-07 Oct, 2021	05	29-04 Feb, 2022
41	08-14 Oct, 2021	06	05-11 Feb, 2022
42	15-21 Oct, 2021	07	12-18 Feb, 2022
43	22-28 Oct, 2021	08	19-25 Feb, 2022
44	29-04 Nov, 2021	09	26-04 March, 2022
45	05-11 Nov, 2021	10	05-11 March, 2022
46	12-18 Nov, 2021	11	12-18 March, 2022
47	19-25 Nov, 2021	12	19-25 March, 2022
48	26-02 Dec, 2021	13	26-01 April, 2022
49	03-09 Dec, 2021	14	02-08 April, 2022
50	10-16 Dec, 2021	15	09-15 April,2022
51	17-23 Dec, 2021	16	16-22 April,2022
52	24-31 Dec, 2021	17	23-29 April,2022
01	01-06 Jan, 2022	18	30-06 May, 2022
02	07-14 Jan, 2022	19	07-13 May, 2022
03	15-21 Jan, 2022	20	14-20 May, 2022
04	22-28 Jan, 2022	21	21-27 May, 2022

Table M1: Meteorological data in Hill zone during crop growth period of Rabi 2021-22

Std. Week no.	PALAMPUR							ALMORA						
	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	25.9	16.5	89	78	55.0	3	4.9	30.1	15.4	93	70	31.0	1	5.9
41	26.8	14.9	73	55	15.0	1	8.4	30.4	12.6	93	58	0.0	0	7.5
42	25.9	13.9	77	63	4.2	1	7.4	26.1	12.2	96	79	296.0	3	4.2
43	22.1	10.5	74	60	14.4	3	6.5	26.8	8.9	93	56	0.0	0	5.6
44	22.5	9.3	65	53	0.0	0	8.5	24.8	5.4	89	61	0.0	0	7.0
45	22.2	8.8	74	49	0.0	0	9.4	24.6	5.1	88	42	0.0	0	7.5
46	20.8	6.8	81	48	0.0	0	9.4	24.1	4.1	89	42	0.0	0	6.6
47	20.8	6.6	71	43	0.0	0	9.4	24.6	3.9	94	52	0.0	0	6.3
48	18.8	6.3	75	49	0.0	0	7.7	22.2	2.6	98	57	0.0	0	4.6
49	18.0	7.3	80	64	18.8	3	4.5	20.8	4.4	100	47	0.5	1	4.9
50	16.7	3.7	77	48	0.0	0	8.1	19.7	0.4	100	38	0.0	0	5.1
51	14.6	4.7	76	47	0.0	0	7.3	18.1	-2.9	100	35	0.0	0	6.4
52	15.1	3.6	82	49	4.6	0	5.9	16.3	1.1	99	50	2.0	1	4.8
1	14.2	6.1	85	72	87.4	3	3.9	18.2	2.0	97	47	21.0	3	4.4
2	13.9	3.8	85	62	56.8	3	4.5	15.6	5.2	100	73	41.0	3	4.0
3	15.4	5.1	81	65	5.6	1	5.1	17.4	2.2	98	53	2.0	1	5.1
4	10.8	2.4	89	83	67.0	6	2.9	12.6	2.9	99	64	12.0	3	3.4
5	14.5	3.7	83	60	33.8	2	6.3	15.4	0.6	100	57	34.5	2	4.2
6	14.3	3.7	75	47	2.4	1	6.7	16.9	2.6	93	54	8.0	1	6.2
7	17.5	4.0	73	40	0.0	0	9.9	20.7	3.1	95	37	0.0	0	7.7
8	18.2	6.9	71	42	23.6	3	6.9	20.7	2.1	97	37	0.0	0	6.4
9	17.9	5.9	76	50	17.4	3	6.1	20.6	4.2	92	44	12.5	1	5.6
10	21.7	9.1	69	46	0.0	0	7.4	25.1	5.9	88	28	0.0	0	8.0
11	26.7	13.5	64	45	0.0	0	10.1	29.3	11.6	84	43	0.0	0	7.6
12	28.3	14.3	49	29	0.0	0	9.1	29.3	9.2	85	35	0.0	0	9.0
13	28.5	14.3	44	27	0.0	0	10.3	30.1	7.4	93	32	0.0	0	8.9
14	29.3	15.6	47	22	0.0	0	10.5	31.1	7.4	92	35	0.0	0	9.0
15	31.3	16.8	51	31	2.8	1	8.6	32.0	11.6	85	31	0.0	0	8.6
16	30.0	16.6	43	29	8.2	3	8.0	31.1	12.0	82	35	0.0	0	8.2
17	30.2	16.6	40	27	3.6	1	9.5	34.0	12.8	76	39	2.2	1	8.0
18	30.3	17.8	51	33	0.2	0	4.9	32.9	16.6	71	38	0.0	0	7.8
19	29.4	17.9	53	46	55.3	4	6.6	26.1	20.2	77	44	26.0	2	4.5
20	32.8	20.0	40	30	3.0	2	9.6	33.0	17.7	81	53	10.0	3	8.4
21	28.7	16.4	58	47	36.6	3	5.7	28.2	14.3	84	51	30.0	3	6.0
Mean/ Total	**22.2**	**10.1**	**68.3**	**48.2**	**515.7**	**47**	**7.4**	**24.4**	**7.2**	**91.2**	**47.6**	**528.7**	**29**	**6.4**

Table M2: Meteorological data in Hill zone during crop growth period of Rabi 2021-22

Std. Week No.	SRINAGAR					
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2		
40	27.4	10.9	90	56	11.7	7.3
41	23.5	6.7	89	69	13.6	6.7
42	21.2	6.4	88	69	26.2	5.6
43	14.4	3.6	88	81	61.8	4.0
44	18.9	1.2	91	63	0.0	5.8
45	14.1	1.5	92	68	3.0	3.5
46	14.4	-1.6	88	64	0.0	1.6
47	13.1	-2.4	90	65	0.0	0.0
48	12.8	-2.3	90	66	0.0	0.0
49	11.2	-0.6	87	72	28.6	2.4
50	9.6	-3.5	88	72	0.0	3.5
51	9.4	-4.3	86	54	0.0	4.1
52	8.6	-1.6	90	66	2.2	2.1
1	4.7	-0.3	93	81	47.0	0.0
2	4.6	-2.2	92	84	51.5	1.7
3	6.1	-0.2	92	77	4.8	0.8
4	7.5	-0.8	89	73	35.4	2.1
5	8.8	-1.3	88	62	20.0	3.7
6	9.9	-1.1	84	60	3.0	5.3
7	12.9	-1.9	86	50	0.0	4.7
8	9.0	-0.9	88	64	117.2	2.9
9	9.7	1.8	86	68	24.2	1.5
10	15.9	4.1	86	56	10.8	4.2
11	23.6	5.6	74	38	1.0	7.9
12	21.2	6.3	78	40	17.4	6.8
13	25.7	5.0	71	22	0.0	9.2
14	26.4	6.4	68	31	0.0	9.2
15	23.2	7.3	70	54	4.4	4.9
16	21.4	7.6	76	59	23.4	3.9
17	23.7	8.1	75	42	10.0	7.4
18	23.3	10.2	79	57	14.4	5.7
19	28.6	10.2	70	38	16.4	9.1
20	26.3	10.6	69	53	0.0	6.6
21	25.0	10.1	74	51	23.2	7.4
Mean/ Total	**16.4**	**2.9**	**83.7**	**59.6**	**571.2**	**4.5**

Table M3: Meteorological data in North West zone during crop growth period of Rabi 2021-22

Std. Week No.	HISAR							BIKANER						Sunshine hrs
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	33.3	25.3	93	66	1	5.5	6.7	36.1	24.4	82	47	1	3.2	9.0
41	34.8	21.6	86	37	0	0.0	8.2	36.9	20.4	62	29	0	0.0	9.3
42	31.3	18.4	86	50	0	0.0	6.3	34.6	17.2	67	29	1	2.6	8.8
43	29.8	15.9	86	44	0	0.0	7.8	30.5	17.0	79	41	1	6.8	8.8
44	30.4	13.5	83	34	0	0.4	7.0	32.4	13.6	72	24	0	0.0	9.3
45	28.9	11.8	90	37	0	0.0	4.3	32.1	12.4	68	21	0	0.0	8.5
46	27.4	9.1	92	33	0	0.0	4.2	29.5	9.0	63	26	0	0.0	8.7
47	26.6	7.9	89	30	0	0.0	7.1	29.8	9.4	58	26	0	0.0	7.9
48	25.3	9.2	95	48	0	0.0	5.1	28.0	9.2	79	25	0	0.0	7.7
49	23.3	8.5	99	49	0	0.0	5.0	25.4	7.9	85	44	0	0.0	6.9
50	22.2	5.7	95	42	0	0.0	6.5	22.9	4.6	81	27	0	0.0	7.9
51	18.9	3.3	94	45	0	0.0	5.2	24.5	3.1	66	22	0	0.0	8.9
52	20.3	6.4	93	56	0	1.2	4.0	25.6	6.4	83	47	0	0.0	3.2
1	18.5	8.6	96	82	2	16.5	3.7	20.5	8.4	83	55	1	16.4	4.7
2	15.9	8.2	98	72	1	23.5	1.9	18.0	5.9	91	61	1	3.2	6.6
3	14.0	6.6	99	74	0	1.4	0.7	19.6	5.4	87	51	0	0.0	6.5
4	15.5	6.6	96	59	1	22.6	2.6	19.9	5.9	84	50	1	3.0	7.3
5	20.0	6.5	94	46	0	0.0	5.6	26.9	8.1	78	24	0	0.0	9.5
6	21.5	7.7	98	53	1	5.8	6.8	25.0	9.2	84	31	1	7.4	8.8
7	24.8	6.4	100	52	0	0.0	8.6	28.7	9.6	71	21	0	0.0	10.4
8	24.8	9.5	97	43	0	0.0	7.7	30.2	11.5	71	21	0	0.0	9.2
9	24.6	9.4	94	34	0	0.0	7.9	28.1	11.1	81	28	0	0.0	8.2
10	27.1	10.5	91	43	0	0.0	7.3	32.5	13.9	78	25	0	0.0	8.6
11	32.7	14.7	89	40	0	0.0	8.1	40.0	19.1	69	16	0	0.0	9.4
12	35.0	17.2	88	37	0	0.0	7.4	39.0	19.0	61	15	0	0.0	9.0
13	37.5	15.6	75	26	0	0.0	8.3	41.4	18.8	48	7	0	0.0	9.6
14	39.3	15.2	69	18	0	0.0	8.8	43.0	19.9	49	8	0	0.0	9.9
15	41.1	19.8	54	15	0	0.0	7.8	42.6	23.1	43	15	0	0.0	9.0
16	40.2	21.2	67	26	0	1.5	8.2	42.4	24.5	37	12	0	0.0	9.8
17	40.1	20.0	58	23	0	0.0	9.2	43.7	25.4	33	13	0	0.0	10.5
18	41.5	24.3	54	30	0	0.0	8.3	43.1	26.8	36	16	0	0.0	9.7
19	41.7	26.3	66	37	0	0.0	8.6	46.3	26.4	31	16	0	0.0	9.6
20	44.0	26.0	71	44	0	0.0	7.8	45.5	28.6	37	15	0	0.0	10.5
21	36.9	22.4	72	34	2	25.6	7.6	41.2	25.8	55	27	0	1.2	5.6
Mean/ Total	**29.1**	**13.5**	**85.5**	**42.9**	**8**	**104.0**	**6.5**	**32.5**	**14.7**	**66.2**	**27.5**	**7**	**43.8**	**8.5**

Table M4: Meteorological data in North West zone during crop growth period of Rabi 2021-22

Std. Week No.	LUDHIANA							PANTNAGAR						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	32.8	24.4	87	56	1	6.6	8.7	32.9	23.5	91	61	1	7.3	6.2
41	33.7	21.6	85	40	-	0.0	9.4	33.2	20.5	87	50	0	0.0	8.0
42	31.8	19.1	87	39	-	0.0	7.0	30.6	20.6	88	67	3	420.2	5.3
43	27.6	15.6	86	42	2	31.0	8.7	29.7	16.6	89	44	0	0.0	8.5
44	28.7	14.9	81	31	-	0.0	7.1	29.7	14.1	88	37	0	0.0	8.3
45	28.3	11.9	91	29	-	0.0	6.3	28.1	13.0	91	41	0	0.0	7.3
46	26.5	9.6	93	29	-	0.0	6.9	27.4	12.3	92	39	0	0.0	7.3
47	26.0	8.5	92	31	-	0.0	8.2	26.3	11.4	90	38	0	0.0	6.7
48	23.7	9.6	94	43	-	0.0	4.9	25.2	10.8	92	46	0	0.0	5.8
49	24.4	9.8	93	45	-	0.0	6.0	25.0	12.1	93	50	1	3.0	5.2
50	20.8	6.1	96	49	-	0.0	4.5	23.4	7.2	89	42	0	0.0	7.4
51	18.4	5.0	95	48	-	0.0	6.1	19.8	4.3	93	46	0	0.0	5.4
52	19.3	5.1	97	53	-	0.0	4.5	21.6	8.4	90	49	0	2.0	5.6
1	17.6	8.7	93	68	3	51.6	2.6	20.2	9.1	93	56	1	22.2	5.0
2	15.5	9.7	95	83	1	47.8	2.1	19.6	11.0	94	73	3	54.7	3.3
3	13.5	8.3	92	77	-	0.8	0.1	14.1	8.7	91	80	1	2.8	0.6
4	14.5	8.0	96	76	2	13.2	2.5	17.0	9.3	93	71	1	19.2	2.1
5	17.5	7.4	94	62	2	31.0	4.4	16.0	8.6	92	77	1	30.7	1.7
6	19.9	7.8	93	49	-	0.0	8.4	16.1	7.4	94	76	1	17.5	3.1
7	23.4	7.2	94	42	-	0.0	9.0	22.2	6.7	94	48	0	0.0	8.6
8	23.4	10.2	85	41	1	3.4	7.4	23.7	9.8	86	45	0	0.0	8.0
9	22.0	10.4	91	57	1	9.9	7.3	24.7	10.0	93	48	0	2.2	8.0
10	27.2	13.0	91	58	-	0.0	8.4	27.5	11.3	92	48	0	0.0	7.0
11	31.8	17.3	90	45	-	0.0	9.4	30.7	16.6	90	49	0	0.0	7.1
12	33.5	18.9	83	33	-	0.0	9.4	33.9	17.1	84	40	0	0.0	8.8
13	35.6	17.1	79	23	-	0.0	10.5	34.0	15.9	80	31	0	0.0	9.0
14	38.2	17.6	73	13	-	0.0	10.7	37.0	15.5	76	19	0	0.0	9.8
15	39.9	21.5	61	16	-	0.0	7.9	37.1	20.9	65	31	1	2.6	8.3
16	38.2	21.6	49	18	-	0.0	8.8	38.2	19.1	63	19	0	0.0	9.0
17	39.7	21.6	47	13	-	0.0	10.5	38.0	19.0	54	19	0	0.0	10.3
18	38.1	25.7	52	27	-	0.0	5.4	36.1	23.0	63	39	1	**8.4**	8.1
19	40.4	26.8	53	27	-	0.0	8.6	35.2	23.3	67	43	1	**5.0**	8.5
20	43.0	27.4	39	17	-	0.0	7.5	37.8	24.6	63	34	0	**0.0**	8.8
21	36.0	23.3	54	34	1	19.4	9.0	34.5	22.6	67	39	2	**14.9**	7.8
Mean/ Total	**28.0**	**14.4**	**81.8**	**41.6**	**14**	**214.7**	**7.0**	**27.8**	**14.2**	**84.3**	**46.9**	**18**	**612.7**	**6.8**

Table M5: Meteorological data in Central zone during crop growth period of Rabi 2021-22

Std. Week No.	URULIKANCHAN						JHANSI					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2		
40	33.0	21.3	52	55	4	100.4	33.2	22.3	85	52	0	2.0
41	31.5	20.6	49	53	3	36.1	32.7	19.6	86	54	0	0.0
42	31.2	18.5	41	45	0	0.3	32.4	19.4	87	64	2	123.2
43	30.9	15.1	35	37	0	0.0	31.6	16.7	80	53	0	0.0
44	30.9	16.4	44	48	0	0.0	30.5	12.6	82	52	0	0.0
45	29.8	14.6	73	39	0	0.6	30.8	9.9	81	46	0	0.0
46	30.9	15.2	90	43	0	1.8	27.9	10.6	84	50	0	0.0
47	31.8	20.6	95	50	1	3.8	28.1	12.0	85	49	0	0.0
48	26.3	14.8	93	68	2	103.1	27.5	9.3	85	57	0	0.0
49	27.8	15.6	97	51	0	0.2	24.7	11.2	88	56	0	0.0
50	28.2	14.6	96	53	1	2.6	23.4	7.8	89	60	0	0.0
51	28.9	10.9	97	39	0	1.2	22.9	4.4	88	61	0	0.0
52	27.9	12.4	97	54	0	1.4	22.3	8.4	90	65	1	12.0
1	28.7	12.7	75	71	0	1.6	20.9	7.7	91	71	2	18.0
2	26.5	12.3	73	73	0	4.0	19.2	10.4	91	71	1	23.8
3	28.0	11.3	72	65	0	3.6	18.3	5.8	91	72		0.0
4	26.0	10.5	68	66	0	1.8	19.9	7.6	91	71	1	3.6
5	30.8	9.0	60	58	0	2.9	26.4	7.3	89	59		0.0
6	29.5	10.6	64	63	0	4.2	24.0	7.5	88	47		0.0
7	30.1	11.0	58	55	0	10.2	25.8	8.0	87	46		0.0
8	33.2	12.4	53	52	0	5.8	28.0	11.3	84	46		0.0
9	32.9	13.6	48	46	0	3.7	28.5	11.3	84	45		0.0
10	32.4	15.9	54	56	1	10.9	30.0	12.6	81	44		0.4
11	34.7	14.7	51	44	1	7.4	35.2	16.0	80	38		0.0
12	34.8	19.3	50	49	0	1.1	38.0	17.4	79	38		0.0
13	36.5	17.3	46	39	0	1.9	38.8	16.8	76	34		0.0
14	42.0	18.7	51	51	0	4.7	40.4	17.4	60	30		0.0
15	38.8	22.9	51	47	0	0.9	42.7	20.4	53	29		0.0
16	42.3	22.9	46	45	1	28.9	40.5	20.5	52	29		0.0
17	38.6	21.8	52	45	0	1.3	42.3	21.3	49	26		0.0
18	34.9	21.9	50	50	0	2.4	43.2	24.0	54	28	1	4.0
19	34.8	24.1	57	60	0	4.9	42.2	24.2	49	27		0.0
20	35.6	24.4	59	58	0	12.6	44.6	26.7	39	24		0.0
21	33.4	24.3	61	60	1	8.8	40.2	24.1	62	31	2	75.6
Mean/ Total	**32.2**	**16.5**	**63.3**	**52.7**	**15**	**375.1**	**31.1**	**14.2**	**77.6**	**47.8**	**10**	**262.6**

Table M6: Meteorological data in Central zone during crop growth period of Rabi 2021-22

Std. Week No.	ANAND							RAHURI						Sunshine hrs
	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	33.6	25.9	92	63	18.0	2	6.6	31.2	22.7	94	65	4	63.2	7.7
41	35.0	25.8	91	58	0.4	-	6.6	30.8	22.7	92	59	-	25.4	6.1
42	34.7	21.6	83	38	0	-	8.3	32.3	20.7	85	39	-	0.0	8.3
43	33.1	21.2	83	41	0	-	9.3	32.1	18.5	84	32	-	0.0	9.8
44	33.1	16.7	73	23	0	-	9.7	31.3	18.2	79	36	-	0.0	8.6
45	32.8	17.0	67	28	0	-	8.2	30.7	17.4	84	33	-	0.0	7.7
46	31.2	18.0	62	36	0	-	7.2	30.4	19.6	84	50	-	0.0	5.7
47	31.7	20.7	84	50	0	-	6.0	30.8	21.7	91	54	2	50.4	5.4
48	30.6	16.4	83	53	11.2	2	7.0	27.1	16.7	83	53	1	23.2	5.4
49	26.1	17.6	86	62	2.2	-	4.4	26.2	17.4	93	54	1	47.4	4.7
50	28.1	16.5	80	49	0	-	6.5	28.2	15.9	87	46	-	0.0	5.7
51	26.6	11.2	78	38	0	-	8.3	27.8	12.6	91	39	-	0.0	7.3
52	23.3	12.5	81	48	0.6	-	5.6	27.6	13.8	91	46	-	0.0	6.3
1	27.6	16.7	91	58	0	-	5.0	28.3	15.0	91	42	-	0.0	5.7
2	23.9	11.1	87	39	0	-	8.7	25.2	14.6	88	54	-	0.0	5.4
3	26.7	12.9	90	49	0	-	8.7	26.7	14.0	89	44	-	0.0	6.9
4	24.5	10.4	84	42	0	-	7.6	24.7	12.0	92	42	-	0.0	7.5
5	28.8	10.9	88	37	0	-	8.8	28.7	12.1	82	24	-	0.0	10.0
6	29.0	12.4	86	33	0	-	9.0	27.3	13.2	81	33	-	0.0	9.6
7	30.1	13.5	77	32	0	-	9.7	29.2	14.4	80	30	-	0.0	9.5
8	32.2	14.2	83	37	0	-	9.8	33.0	16.1	73	23	-	0.0	9.7
9	33.6	16.8	75	29	0	-	9.6	33.1	18.1	55	21	-	0.0	9.0
10	34.5	18.2	70	30	0	-	8.7	32.3	19.7	73	30	-	0.0	7.0
11	38.2	19.0	70	26	0	-	9.7	35.7	21.1	59	18	-	2.4	9.0
12	37.7	22.2	60	27	0	-	7.1	37.6	22.5	55	16	-	0.0	7.1
13	38.7	20.9	84	29	0	-	9.1	38.2	22.3	55	14	-	0.0	9.0
14	40.1	22.2	84	24	0	-	9.3	39.7	23.4	52	12	-	0.0	9.4
15	39.4	22.7	85	25	0	-	9.4	38.9	24.5	59	17	-	0.0	8.6
16	39.1	24.1	78	25	0	-	9.2	38.8	24.9	52	16	-	0.0	9.2
17	41.0	23.3	60	23	0	-	11.0	39.4	27.5	45	17	-	0.0	8.7
18	39.7	26.0	84	32	0	-	10.5	39.9	26.4	50	17	-	0.0	10.2
19	41.7	26.9	70	27	0	-	10.0	40.9	28.1	50	21	-	0.0	7.0
20	39.0	27.2	82	40	0	-	10.0	39.1	27.0	60	23	-	1.6	7.3
21	38.0	27.9	74	43	0	-	9.6	37.5	27.0	61	25	-	0.0	8.4
Mean/ Total	**33.0**	**18.8**	**79.6**	**38.1**	**32.4**	**4**	**8.4**	**32.4**	**19.5**	**74.7**	**33.7**	**8**	**213.6**	**7.7**

Table M7: Meteorological data in Central zone during crop growth period of Rabi 2021-22

Std. Week No.	JABALPUR							RAIPUR						
	Temperature (C)		Humidity (%)		No. of Rainy	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	32.9	23.7	84	58	0	0.0	8.2	32.7	25.1	90	66	0	0.0	6.1
41	33.3	20.0	84	48	0	0.0	8.6	32.6	23.0	89	47	0	0.4	6.7
42	31.9	19.9	88	48	2	67.0	8.1	32.4	24.3	90	57	2	15.2	7.8
43	30.7	16.0	87	41	0	0.0	8.3	31.4	18.1	87	35	0	0.0	9.3
44	28.7	11.0	84	33	0	0.0	9.0	30.4	19.1	88	50	0	0.0	7.8
45	28.7	10.5	84	34	0	0.0	7.8	30.1	14.8	87	34	0	0.0	7.3
46	27.6	12.8	85	45	0	0.0	4.9	29.1	21.3	93	65	0	0.6	3.1
47	29.1	15.0	87	46	0	1.8	4.3	31.0	20.4	92	53	1	48.0	5.8
48	27.1	8.9	86	33	0	0.0	7.7	29.1	13.6	85	30	0	0.0	7.7
49	26.0	12.3	89	53	0	0.0	3.7	28.7	17.3	85	49	0	0.0	6.2
50	25.4	8.9	86	41	0	0.0	5.4	27.8	13.4	88	39	0	0.0	5.2
51	23.8	4.8	76	31	0	0.0	7.8	25.7	8.4	88	33	0	0.0	5.5
52	23.4	8.9	88	58	2	23.8	5.6	26.4	13.8	91	57	2	82.4	1.9
1	23.2	8.6	85	50	0	0.0	7.0	18.3	15.0	93	46	0	0.0	2.9
2	21.9	12.9	93	69	2	10.4	2.6	24.3	16.6	94	70	2	15.0	2.8
3	20.8	7.0	91	57	0	0.0	5.2	25.3	12.2	91	45	1	0.0	6.1
4	21.6	7.1	88	52	1	5.7	7.0	26.0	12.1	87	39	1	3.0	6.7
5	23.0	3.9	75	33	0	0.0	10.0	27.9	10.7	88	28	0	0.0	8.9
6	24.4	7.4	81	39	1	4.4	7.5	28.5	11.4	87	31	1	7.0	7.5
7	24.7	8.0	82	31	0	0.0	9.5	27.6	12.3	84	32	0	0.0	7.3
8	29.0	11.4	83	30	0	0.2	8.7	31.9	14.2	82	30	0	0.0	6.3
9	29.1	13.4	83	41	1	7.0	8.3	33.1	17.9	83	36	0	0.0	6.2
10	30.3	12.6	81	31	0	0.0	7.7	33.8	16.1	74	22	0	0.0	8.5
11	34.5	14.2	80	25	0	0.0	9.0	36.2	17.9	67	18	0	0.0	8.7
12	36.8	18.2	75	20	0	0.0	7.5	38.5	21.5	72	27	0	0.0	7.9
13	38.4	16.0	68	13	0	0.0	7.7	39.8	19.7	67	15	0	0.0	6.7
14	39.8	16.6	66	15	0	0.0	8.6	40.7	24.0	63	25	0	0.0	7.0
15	40.6	20.4	58	18	0	0.2	7.7	40.6	26.0	58	29	0	0.0	5.4
16	40.7	21.8	46	20	0	0.0	8.4	42.2	25.5	49	24	1	5.6	5.9
17	40.6	20.0	54	18	0	0.0	9.5	41.7	24.9	49	17	0	1.0	8.0
18	41.3	23.5	48	23	0	0.0	9.1	43.0	25.9	52	20	1	17.0	8.2
19	40.0	24.0	59	30	0	0.0	8.0	39.8	27.6	61	28	0	0.0	7.9
20	41.7	27.6	52	28	0	0.0	6.0	41.5	27.8	58	33	0	1.6	7.4
21	38.6	24.1	63	38	1	3.6	4.0	41.0	25.4	60	25	1	18.0	7.8
Mean/ Total	**30.9**	**14.5**	**77.0**	**36.8**	**10**	**124.1**	**7.3**	**32.6**	**18.7**	**78.6**	**36.9**	**13**	**214.8**	**6.6**

Table M8: Meteorological data in North East zone during crop growth period of Rabi 2021-22

Std. Week No.	RANCHI							JORHAT						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	31.9	23.8	86	69	2	49.6	8.0							
41	32.0	22.5	85	69	0	0.0	8.8							
42	31.7	22.1	87	69	2	36.2	5.0							
43	29.8	19.0	86	69	0	0.0	8.0							
44	29.8	19.6	85	70	0	0.0	7.6	30.1	18.1	96	58	14.8	1	8.7
45	28.8	17.4	84	68	0	0.0	8.0	29.6	14.5	96	53	0.0	0	9.8
46	28.7	17.7	86	70	2	24.2	3.7	29.2	14.4	97	55	0.0	0	8.6
47	29.0	19.2	86	68	0	0.0	7.8	26.8	14.4	97	62	8.4	1	5.4
48	26.0	9.3	85	70	0	0.0	7.8	26.9	11.5	96	50	0.0	0	8.1
49	26.8	9.9	85	69	1	8.4	7.7	27.7	13.9	97	58	0.0	0	5.5
50	25.7	7.5	85	69	0	0.0	8.8	26.0	12.4	98	60	0.6	0	6.6
51	22.0	3.6	86	69	0	0.0	8.6	25.7	8.7	98	50	0.0	0	8.4
52	23.3	8.0	87	69	1	14.2	4.9	24.4	8.5	98	52	0.0	0	6.1
1	21.0	5.6	87	69	0	0.0	7.9	24.6	8.2	100	54	0.0	0	6.3
2	25.9	13.2	86	69	1	26.4	3.0	24.2	11.5	99	64	6.1	1	4.0
3	23.4	7.4	86	68	1	4.0	5.6	23.7	9.2	99	54	2.0	0	5.8
4	24.5	10.9	86	70	2	10.2	1.7	21.3	10.2	99	70	10.8	1	2.2
5	23.3	7.1	85	70	1	10.4	8.8	21.2	9.7	98	56	8.6	1	4.1
6	23.8	9.6	85	69	1	14.2	7.8	22.7	9.8	99	58	22.8	2	5.5
7	25.2	8.8	85	70	0	0.0	9.0	24.8	8.2	98	43	0.0	0	8.6
8	26.0	11.6	86	69	1	12.4	8.7	24.1	11.0	97	54	13.6	2	4.7
9	26.7	13.8	85	68	0	0.0	6.8	26.8	12.5	97	47	3.5	1	7.2
10	29.7	13.5	85	69	0	0.0	9.3	31.1	13.7	96	40	0.0	0	8.4
11	32.3	15.0	87	70	0	0.0	9.5	33.2	15.6	97	41	0.0	0	7.5
12	34.9	15.4	85	70	0	0.0	9.3	33.3	18.9	94	48	9.2	1	7.2
13	34.4	15.2	85	70	0	0.0	8.6	27.0	18.7	95	71	33.7	2	1.0
14	36.1	16.3	87	70	0	0.0	9.5	24.0	18.0	98	85	76.7	4	0.2
15	38.1	20.4	85	69	0	0.0	9.6	25.0	19.0	98	83	50.3	4	2.2
16	38.9	23.8	86	69	0	0.0	9.4	29.9	19.6	94	66	38.1	3	5.5
17	39.2	26.4	88	70	0	0.0	9.6	28.3	19.9	95	71	52.0	5	4.5
18	37.3	24.8	87	69	1	6.0	0.0	28.9	19.8	94	71	50.7	3	5.0
19														
20														
21														
Mean/ Total	**29.2**	**14.8**	**85.8**	**69.2**	**16**	**216.2**	**7.4**	**26.7**	**13.7**	**97.0**	**58.3**	**401.9**	**32**	**5.8**

Table M9: Meteorological data in North East zone during crop growth period of Rabi 2021-22

Std. Week No.	IMPHAL							KALYANI						
	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40														
41														
42														
43														
44														
45														
46														
47														
48								27.4	15.7	89	53		0.0	7.0
49								25.0	17.5	94	76	3	20.1	3.7
50								24.8	15.5	93	65	1	0.4	5.6
51								23.7	10.4	92	53		0.0	7.6
52								24.8	12.3	90	57		0.0	3.9
1	23.1	6.0	90	43	0.0	0	8.9	25.6	12.2	92	58		0.0	6.1
2	21.0	9.4	88	58	2.0	3	4.6	22.4	13.5	95	65	3	1.6	4.9
3	21.0	7.5	93	78	13.7	2	5.6	22.7	12.7	92	66	1	0.7	3.0
4	18.5	9.6	95	60	14.7	3	4.6	23.5	11.4	88	52	1	1.4	6.3
5	19.9	8.1	91	44	37.8	4	6.2	24.7	12.7	92	67	1	2.8	6.3
6	20.8	5.6	90	40	0.6	1	8.3	25.2	12.3	91	50		0.0	7.1
7	23.9	5.8	83	25	0.0	0	9.8	28.2	12.9	89	46		0.0	7.5
8	23.5	9.3	88	38	9.5	3	7.0	29.9	16.6	92	58	2	2.3	7.1
9	27.1	9.3	79	30	0.0	0	9.1	31.7	17.2	89	46		0.0	9.0
10	31.6	12.9	78	27	0.0	0	8.7	33.7	17.1	89	37		0.0	9.7
11	31.8	14.4	78	31	0.0	0	8.1	36.7	21.2	91	37		0.0	8.9
12	28.6	15.7	80	48	47.2	4	4.6	36.1	25.2	93	45		0.0	6.2
13	26.7	18.0	85	60	9.8	1	1.8	34.5	26.2	89	58		0.0	6.4
14	28.9	18.1	81	48	0.6	2	5.1	36.2	25.5	89	55		0.0	8.0
15	27.5	17.8	83	60	60.1	7	3.3	37.3	26.4	87	47		0.0	7.1
16	27.3	17.9	83	61	59.5	6	6.1	38.0	26.4	86	45		0.0	6.3
17	30.0	18.7	77	52	46.2	5	7.4	35.0	24.8	88	59	3	3.2	5.7
18	28.8	19.1	86	60	72.3	4	6.1	34.1	23.7	92	69	3	9.4	6.7
19	25.7	20.4	92	81	113.6	7	0.5							
20	26.7	19.4	92	73	141.8	7	2.5							
21	29.4	21.1	83	62	16.9	3	5.7							
Mean/Total	**25.8**	**13.5**	**85.5**	**51.4**	**646.3**	**62**	**5.9**	**29.6**	**17.8**	**90.5**	**54.9**	**18**	**42.0**	**6.5**

Table M10: Meteorological data in North East zone during crop growth period of Rabi 2021-22

Std. Week No.	BHUBANESWAR							AYODHYA					
	Temperature (C)		Humidity (%)		Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)	Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1			
40	34.4	25.4	93	67	1	16.5	7.1	32.4	25.5	82.0	2	18.0	8.1
41	34.6	26.0	93	64	1	15.5	3.5	34.0	24.0	79.5	0	0.0	9.0
42	30.9	25.1	97	73	6	45.2	0.9	31.8	23.6	81.3	3	24.0	6.9
43	33.0	22.2	93	65	0	0.0	7.7	31.1	18.2	68.0	0	0.0	6.5
44	31.1	23.6	86	60	0	0.0	2.0	32.2	21.9	76.5	0	0.0	7.5
45	31.0	21.1	82	60	0	0.0	7.3	29.7	13.7	69.4	0	0.0	7.5
46	28.7	22.6	91	77	3	51.7	1.1	27.6	12.3	72.3	0	0.0	7.0
47	30.9	23.0	88	66	1	30.9	4.5	27.4	13.5	76.0	0	0.0	3.6
48	29.1	18.3	91	84	0	0.0	6.3	28.2	13.0	74.9	0	0.0	5.9
49	26.2	19.8	94	82	3	70.8	2.7	27.5	12.6	74.7	0	0.0	4.7
50	27.5	15.5	86	59	0	1.0	4.3	22.8	7.9	79.4	0	0.0	6.2
51	25.7	10.0	87	64	0	0.0	7.4	21.7	5.8	77.0	0	0.0	5.0
52	27.3	15.4	93	79	0	0.8	4.2	24.6	9.3	78.4	2	15.0	4.8
1	26.4	12.8	92	77	0	0.0	7.3	19.4	9.3	82.5	1	14.2	2.5
2	26.7	15.7	95	39	3	16.5	5.0	20.2	10.6	87.2	1	11.6	2.1
3	25.7	14.6	95	26	0	0.0	6.0	15.9	5.7	86.6	0	0.0	1.9
4	27.5	16.9	95	41	1	12.6	3.9	17.3	8.3	87.4	1	8.8	2.9
5	28.2	14.7	95	68	0	0.0	9.0	19.6	8.8	86.7	0	0.0	4.9
6	28.7	15.8	95	66	0	0.0	7.1	20.8	9.0	84.9	0	0.0	6.0
7	28.9	15.3	95	74	0	1.1	6.6	24.0	9.9	80.4	0	0.0	8.3
8	31.2	19.7	95	70	1	40.0	1.3	25.6	13.5	77.7	0	0.0	8.9
9	33.1	20.0	94	69	0	0.0	4.5	27.1	11.4	79.6	0	0.0	9.0
10	34.7	20.6	93	67	0	0.0	7.3	29.8	12.5	77.3	0	0.0	7.8
11	36.3	22.3	95	69	0	0.0	7.2	32.0	16.2	77.1	0	0.0	8.3
12	36.3	23.0	95	69	0	0.0	7.9	35.3	18.5	72.9	0	0.0	8.6
13	35.4	26.0	93	77	0	0.0	6.4	36.8	16.7	58.9	0	0.0	8.3
14	34.2	25.9	93	78	0	0.0	6.3	36.3	17.2	56.9	0	0.0	9.2
15	35.7	26.3	92	72	0	0.0	7.4	39.2	19.6	54.1	0	0.0	8.3
16	37.0	26.3	94	78	0	0.0	6.5	40.7	22.4	53.1	0	0.0	9.4
17	40.7	27.5	95	74	0	0.0	7.2	38.2	22.2	57.5	0	0.0	9.0
18	37.2	26.1	92	76	2	57.4	6.9						
19													
20													
21													
Mean/ Total	**31.4**	**20.6**	**92.5**	**67.4**	**22**	**360.0**	**5.6**	**28.3**	**14.4**	**75.0**	**10**	**91.6**	**6.6**

Table M11: Meteorological data in North East zone during crop growth period of Rabi 2021-22

Std. Week No.	Pusa						
	Temperature (C)		Humidity (%)		Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			
40	26.9	24.4	95	83	3	225.9	-
41	33.7	24.9	95	69	1	39.8	5.8
42	31.0	24.3	91	78	2	93.4	3.4
43	30.5	20.6	95	65	-	0.0	5.7
44	29.9	16.5	95	51	-	0.0	7.9
45	29.5	15.5	97	51	-	0.0	7.1
46	28.9	13.8	92	55	-	0.0	8.3
47	27.6	13.9	97	60	-	0.0	5.3
48	26.9	12.4	98	60	-	0.0	4.8
49	27.8	13.9	97	59	-	0.0	7.0
50	24.3	9.1	97	56	-	0.0	6.5
51	22.5	7.6	96	56	-	0.0	5.5
52	22.4	11.0	94	66	2	7.7	3.2
1	18.5	10.5	94	80	-	0.0	0.9
2	22.9	12.9	97	69	1	4.6	3.5
3	17.4	8.5	96	70	-	0.0	3.0
4	20.0	11.1	95	66	-	0.0	1.5
5	18.8	9.1	96	74	1	29.6	1.3
6	20.9	10.4	97	66	-	0.0	5.6
7	24.1	9.7	96	54	-	0.0	8.5
8	25.0	12.3	91	56	-	0.0	7.4
9	27.5	12.9	94	55	-	0.0	8.1
10	29.7	14.3	91	49	-	0.0	8.6
11	32.1	16.9	91	55	-	0.0	8.1
12	35.0	20.4	89	51	-	0.0	7.0
13	33.6	20.2	90	55	-	0.0	5.8
14	35.2	22.7	93	55	-	0.0	5.4
15	35.2	22.2	87	57	-	0.0	6.1
16	35.6	21.7	80	52	-	0.0	4.9
17	37.9	21.3	86	39	-	0.0	8.3
18	31.8	21.4	87	62	2	37.4	7
19	34.2	23.8	84	56	1	34.8	8.6
20	34.5	23.8	89	65	2	36.4	7.8
21							
Mean/ Total	**28.2**	**16.2**	**92.8**	**60.5**	**15**	**509.6**	**5.9**

Table M12: Meteorological data in South zone during crop growth period of Rabi 2021-22

Std. Week No.	VELLAYANI							COIMBATORE						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	31.4	22.4	93	90	3	118.6	3.2	30.9	23.5	87	62	4	3.7	5.3
41	31.6	22.2	96	91	7	112.0	2.4	30.9	23.3	83	65	1	11.5	4.0
42	30.8	21.9	92	89	6	94.6	3.5	31.0	23.5	86	66	1	66.5	5.3
43	31.0	22.7	92	91	5	70.8	4.2	30.3	22.7	86	64	3	46.0	4.9
44	30.1	22.5	94	90	6	63.2	2.4	28.1	23.0	87	71	5	104.0	2.1
45	30.6	22.3	94	90	6	77.1	3.8	27.9	22.0	87	73	4	85.2	1.8
46	29.7	22.4	97	91	6	231.2	1.5	29.6	22.6	87	67	1	60.0	3.6
47	31.2	23.0	92	91	4	22.8	4.3	28.9	22.1	86	67	1	32.0	4.2
48	29.8	22.8	96	90	5	97.9	2.0	27.5	22.6	86	69	2	25.8	2.3
49	31.7	24.1	92	86	3	20.1	4.6	29.7	22.5	86	66	3	30.0	4.6
50	32.2	24.6	92	85	3	8.3	4.9	28.1	21.8	85	58	1	19.5	6.9
51	32.4	23.9	91	84	1	0.3	7.7	28.9	19.6	84	53	0	0.0	5.5
52	31.7	21.1	91	82	-	-	8.4	29.2	19.4	84	48	0	0.0	7.7
1	32.4	23.1	90	82	1	9.0	7.6	28.2	21.0	84	57	1	16.6	5.7
2	32.0	23.8	90	84		0.0	6.9	30.4	21.3	85	50	0	0.0	6.7
3	32.4	23.7	90	82		0.0	9.1	30.8	20.6	85	46	0	0.0	8.1
4	32.3	21.6	91	83		0.0	8.4	31.6	19.0	85	43	0	0.0	8.3
5	32.9	20.9	91	74		0.0	9.0	31.1	21.2	84	47	0	0.0	7.3
6	32.8	21.7	90	77		0.0	7.5	32.2	20.7	85	40	0	0.0	7.1
7	31.9	21.5	94	80	5	68.2	6.0	31.2	20.9	83	45	0	0.0	5.1
8	32.2	21.5	91	77	1	5.6	7.2	32.6	21.9	83	39	0	0.0	7.6
9	33.0	22.1	92	75	-	0.0	8.5	32.8	19.4	78	28	0	0.0	8.7
10	32.8	24.1	90	77	1	0.8	7.7	33.4	21.3	77	41	0	0.0	8.7
11	33.4	24.4	89	76	-	0.0	7.7	35.3	21.0	78	30	0	0.0	7.7
12	33.9	25.3	88	76	-	0.0	7.9	34.9	23.4	85	44	0	1.0	6.2
13	33.8	25.2	88	76	1	0.6	8.0	35.1	24.1	87	45	1	8.2	8.4
14	33.5	23.4	89	84	1	40.0	6.5	35.4	24.7	83	40	0	0.0	7.9
15	32.5	21.3	92	89	4	41.2	4.3	32.9	24.0	85	57	2	9.7	3.8
16	32.7	21.6	90	81	3	5.9	6.8	34.8	24.1	85	48	1	30.5	8.4
17	33.4	23.3	87	77	2	26.0	7.0	35.1	25.3	85	46	0	1.0	8.5
18	33.6	23.9	90	75	2	21.3	6.6	35.0	24.5	82	50	0	1.0	7.9
19	33.6	23.8	89	81	4	35.6	5.4	32.9	23.9	80	55	1	6.5	3.7
20	31.0	22.9	97	89	7	235.0	2.1	31.0	23.9	85	62	1	5.5	3.6
21	31.2	23.3	91	86	7	74.6	4.7	32.9	23.7	82	56	1	6.0	7.2
Mean/ Total	**32.1**	**22.9**	**91.5**	**83.2**	**94**	**1480.7**	**5.8**	**31.5**	**22.3**	**84.1**	**52.9**	**34**	**570.2**	**6.0**

Table M12: Meteorological data in South zone during crop growth period of Rabi 2021-22

Std. Week No.	MANDYA							HYDERABAD						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	30.0	19.7	91	59	2	33.0	5.0	31.4	22.5	94	63	1	4.4	7.9
41	29.4	19.7	89	63	2	77.6	5.4	31.4	21.4	91	60	1	87.8	7.6
42	30.1	20.1	85	61	3	37.4	5.2	30.7	21.4	89	62	1	8.6	5.7
43	30.1	19.7	90	63	2	161.4	5.6	31.0	18.0	90	40	0	0.0	8.9
44	29.4	18.3	89	62	0	1.7	4.3	29.5	20.1	85	61	0	0.0	4.8
45	29.0	18.0	90	69	0	1.3	2.9	28.9	17.1	91	48	0	0.0	5.5
46	28.0	17.7	88	72	3	10.4	1.7	29.0	21.4	80	68	0	2.2	3.6
47	28.7	17.6	91	71	3	9.7	2.4	27.8	20.9	97	73	2	16.0	3.0
48	29.2	17.7	90	66	0	0.3	2.2	28.6	17.6	85	50	0	0.0	5.8
49	30.0	18.1	88	63	2	5.4	3.6	29.5	16.5	90	47	0	0.0	7.2
50	28.4	17.7	89	62	0	1.3	4.8	27.8	16.9	91	55	0	0.0	3.8
51	28.3	15.3	90	54	0	0.0	6.5	27.5	9.6	88	32	0	0.0	8.4
52	28.4	14.7	84	52	0	0.0	8.6	29.2	14.1	91	48	0	0.0	7.5
1	28.9	15.9	88	62	0	0.0	6.9	27.9	14.1	91	53	0	0.0	7.1
2	30.0	15.9	87	55	0	0.0	7.9	28.6	18.5	91	56	1	4.6	5.8
3	30.0	15.7	85	54	0	0.0	8.9	28.2	15.4	91	51	0	0.0	7.0
4	29.9	16.9	88	58	0	0.0	9.3	29.2	14.3	81	42	0	0.0	8.5
5	31.3	16.9	89	47	0	0.0	8.9	30.9	12.1	76	25	0	0.0	9.3
6	31.4	16.4	86	41	0	0.0	8.4	30.1	14.7	87	37	0	0.0	8.3
7	31.9	16.7	73	43	0	0.0	8.0	30.1	15.8	86	40	0	0.0	7.4
8	32.1	16.9	77	39	0	0.0	9.1	32.4	14.9	83	38	0	0.0	9.2
9	32.8	18.0	82	36	0	0.0	9.2	33.5	14.8	85	42	0	0.0	10.1
10	32.1	18.6	86	35	0	0.0	8.6	33.4	16.8	82	51	0	0.0	8.6
11	33.9	19.1	81	33	0	0.0	9.4	35	17.8	76	46	0	0.0	7.3
12	33.7	19.9	85	42	1	14.0	6.5	37.4	21.6	87	52	1	3.2	6.9
13	34.6	22.0	87	53	0	0.0	6.6	38.1	21.4	90	53	0	0.0	7.4
14	36.1	22.8	87	52	0	0.0	7.8	38.1	22.6	84	34	0	0.0	7.8
15	34.1	21.1	87	52	1	22.0	6.6	37.6	21.8	81	31	0	0.0	6.9
16	34.3	20.7	84	57	2	19.2	7.9	38.5	25.1	68	34	0	0.0	6.4
17	35.8	21.7	85	65	0	0.0	7.9	38.5	23.2	80	42	1	6.2	7.6
18	34.7	21.5	89	58	3	36.3	8.0	39.5	24.1	74	48	0	0.0	9.0
19	31.1	21.5	88	70	7	102.8	5.0	38.1	25.9	78	56	0	0.2	6.5
20	27.6	21.1	92	77	5	135.5	2.4	37.4	25.7	86	62	0	1.2	6.9
21	29.0	20.4	89	61	1	10.0	6.1	37.2	24.6	86	57	0	0.0	8.1
Mean/ Total	**31.0**	**18.6**	**86.7**	**56.1**	**37**	**679.3**	**6.4**	**32.4**	**18.9**	**85.4**	**48.7**	**8**	**134.4**	**7.1**

APPENDICES

APPENDIX-I: FORAGE CROPS BREEDING TRIALS AT A GLANCE: (RABI-2021-22) Cont...

Rabi 2021-22		Tr.-1	Tr.-2	Tr.-3	Tr.-4	Tr.-5	Tr.-6	Tr.-7	Tr.-8	Tr.-9	Tr.-10	Tr.-11	Tr. -12
Zone	Location	IVTB	AVTB-1	AVTB-2	AVTB-2 (Seed)	IVTO (SC)	AVTO-1	AVTO-2	AVTO (SC-2)(Seed)	IVTO (MC)	AVTO-1 (MC)	AVTO-2 (MC)	AVTO-2 (MC) (Seed)
1 (HZ)	Palampur	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR
2	Srinagar	TF	TF	TF	TF	DR	DR	DR	DR	DR	DR	DR	DR
3	Almora		DR	DR						TF	DR	DR	
4	Rajouri	DR	DR	DR		DR	DR	DR					
9 (NWZ)	Bikaner	DR	DR	DR		DR	DR	DR					
10	Jalore									DR	DR		
11	Hisar	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR		
12	Ludhiana	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR		
13	Pantnagar	DR	DR	DR	DR	DR	DR	DR			DR		
14	Udaipur	DR	DR	DR		TF	TF	TF					
15	Meerut	TF	TF	TF		DR	DR	DR					
16 (NEZ)	Jorhat					DR	DR	DR	DR	DR			
17	Kalyani	DR	DR	DR	DR	DR	DR	DR	DR				
18	Bhubaneswar	DR	DR	DR		DR	DR	DR		DR			
19	Ranchi	DR	DR	DR	DR	DR	DR	DR	DR	DR			
20	Pusa	DR	DR	DR	DR	DR	DR	DR		DR			
21	Ayodhya	DR	DR	DR		DR	DR	DR		DR			
22	CAU Imphal					DR	DR	DR		DR			
23	Sabour	DR											
24 (CZ)	Jhansi	DR	DR	DR	DR	DR	DR	DR	TF	DR		DR	DR
25	Rahuri	DR	DR	DR	DR	DR	DR	DR	DR	DR		DR	DR
26	Urulikanchan	DR	DR	DR		DR	DR	DR	DR	DR		DR	
27	Anand					DR	DR	DR		DR		DR	
28	Jabalpur	DR	DR	DR	DR	DR	DR	DR		DR		DR	DR
29	Raipur	DR	DR	DR	DR	DR	DR	DR					
30	Karjat					DR	DR	DR					
31	Dhari					DR	DR	DR					
32 (SZ)	Hyderabad					DR	DR	DR	DR				
33	Mandya					DR	DR	DR	DR				
34	Coimbatore					DR	DR						
35	Vellayani					DR	DR						
36	Guntur												
37	Dharwad												
Total Location		18/20	18/20	18/20	11/12	27/28	27/28	25/26	11/12	16/17	7/7	8/8	5/5

Rabi 2021-22		Tr. 13	Tr.-14	Tr.-15	Tr.-16	Tr.-17	Tr.-18	Tr.-19	Tr.-20	Tr.-21	Total
Zone	Location	IVTO (Dual)	AVTO-2 (Dual)	VT Lucerne-Pere. 2nd Year	AVT-2 Lucerne (Annual)	AVT-2 Lucere Annual (Seed)	IVT Lathyrus	AVT-1 Lathyrus	IVT Summer Bajra (New)	AVT-1 Summer Bajra	
1 (HZ)	Palampur										12/12
2	Srinagar										8/12
3	Almora										4/5
4	Rajouri										6/6
9 (NWZ)	Bikaner	DR	DR	DR	DR	DR					11/11
10	Jalore			TF							2/3
11	Hisar	DR	DR								12/12
12	Ludhiana	DR	DR	DR	DR	DR					15/15
13	Pantnagar	DR	DR								10/10
14	Udaipur			TF							3/7
15	Meerut										3/6
16 (NEZ)	Jorhat	DR	DR				DR	DR			9/9
17	Kalyani						DR	DR			10/10
18	Bhubaneswar	DR	DR								9/9
19	Ranchi	DR	DR				DR	DR			13/13
20	Pusa	DR	DR				DR	DR			12/12
21	Ayodhya	DR	DR								
22	CAU Imphal										4/4
23	Sabour										1/1
24 (CZ)	Jhansi	DR					DR	DR			13/14
25	Rahuri	DR		DR					DR	DR	14/14
26	Urulikanchan			DR						DR	11/11
27	Anand	DR							DR	DR	8/8
28	Jabalpur	DR					DR	DR	DR	DR	15/15
29	Raipur	DR					DR	DR			10/10
30	Karjat										3/3
31	Dhari										3/3
32 (SZ)	Hyderabad			DR	DR	DR			DR	DR	9/9
33	Mandya			TF	DR				DR	DR	7/8
34	Coimbatore			DR	DR	DR					5/5
35	Vellayani								DR	DR	4/4
36	Guntur			TF							0/1
37	Dharwad			DR	DR						2/2
Total Location		14/14	9/9	7/11	6/6	4/4	7/7	7/7	6/6	7/7	258/274

Abbreviations: DR = Data Reported; **TF**=Trial; **Data Reporting= (%) =** 94.16 (%)

APPENDIX-II: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (RABI-2021-22)

Location	R-19-AST-1	R-19-AST-2	R-19-AST-3	K-19-AST-1	K-19-AST-2	K-20-AST-1c	K-20-AST-6	K-20-AST-4b	K-20-AST-4c	K-20-AST-4d	K-21-AST-1	K-21-AST-2	K-21-AST-2	R-21-AST-3	R-21-AST-4	R-21-AST-5	R-21-AST-6	Total
Hill Zone																		
Palampur								DR						DNR	DR	DR		3/4
Srinagar						DR									DR	DR		3/3
North West zone																		
Hisar						DR								DR				2/2
Pantnagar	DR									DR				DR	DR			4/4
Bikaner																	DR	1/1
Ludhiana														DR	DR		DR	3/3
North East Zone																		
Ayodhya	DR								DR									2/2
Ranchi	DR		DR		DR	DR												4/4
Kalyani					DR									DR				2/2
Imphal					DR										DR			2/2
Pusa					DR	DR								DR	DR			4/4
Central Zone																		
Jabalpur														DR		DR		2/2
Urulikanchan						DR									DR			2/2
Anand		DR														DR		2/2
Raipur	DR					DR								DR	DR			4/4
Rahuri																DR		1/1
South Zone																		
Hyderabad		DR	DR	DR							DR	DR	DR		DR		DR	8/8
Coimbatore				DR											DR		DR	3/3
Mandya			DR	DR			DR								DR		DR	5/5
Vellayani				DR														1/1
Dharwad			DR				DR											2/2
Total (DR & TC)	**4/4**	**2/2**	**4/4**	**4/4**	**4/4**	**6/6**	**2/2**	**1/1**	**1/1**	**1/1**	**1/1**	**1/1**	**1/1**	**7/8**	**11/11**	**5/5**	**5/5**	**60/61**

DR- Data reported; **DNR-**Data not reported**; Success Index (%) =** (98.36) %

APPENDIX –III: FORAGE CROP PROTECTION TRIALS AT A GLANCE (RABI- 2021-22)

Locations/Trials	PPT-1	PPT-2	PPT-31	PPT-34	PPT-35	PPT-36	PPT-3	PPT-5	PPT-4	Total
(HZ)										
Palampur	DR	DR		DR			DR		DR	**5/5**
(NWZ)										
Ludhiana	DR	DR	DR	DR	DR	DR	DR		DR	**8/8**
(NEZ)										
Bhubaneswar	DR	DR		DR			DR		DR	**5/5**
(CZ)										
Rahuri	DR	DR				DR		DR	DR	**5/5**
Jhansi	DR	DR		DR		DR	DR		DR	**6/6**
(SZ)										
Coimbatore		DR						DR	DR	**3/3**
Total	**5/5**	**6/6**	**1/1**	**4/4**	**1/1**	**3/3**	**4/4**	**2/2**	**6/6**	**32/32**

Abbreviations: DR = Data Reported; **DNR** =Data not reported; **Data Reporting (%) =100 %**

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