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Annual Report : *Rabi* 2019-20

AICRP on Forage Crops & Utilization

वार्षिक प्रतिवेदन
ANNUAL REPORT
(2019-20)
Part-II: *Rabi* 2019-20

अखिल भारतीय समन्वयित अनुसंधान परियोजना
चारा फसलें एवं उपयोगिता
(भारतीय कृषि अनुसंधान परिषद)
भा.कृ.अनु.प.–भा.च.चा.अनु.सं., झाँसी–284 003 (उ.प्र.)

भाकृअनुप
ICAR

All India Coordinated Research Project on Forage Crops & Utilization
(Indian Council of Agricultural Research)
ICAR-IGFRI, Jhansi-284 003 (U.P.)

September, 2020

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September, 2020

PREFACE

The Annual Report (2019-20), Part II–*Rabi* 2019-20 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* 2019-20. 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 nutrient management in different cropping system, weed management, bio fortification, carbon sequestration 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 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 gratefullyacknowledged.

My Scientific colleagues at Project Coordinating unit Dr. R. K. Agrawal,Dr. Nitish R. Bhardwaj, Dr. Subhash Chand and technical officers, Shri R. S. Patel and Shri H. K. Agarwal provided support in allocatingseed/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. Vijay K. Yadav, 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. T. Mohapatra, Secretary DARE & DG, ICAR; Dr. T. R. Sharma, DDG (CS); Dr. Y. P. Singh, ADG (FFC) and Dr. D. K.Yadava, ADG (seed)are gratefully acknowledged. Eachand 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, tribal sub-plan activities of the different forage crops during Rabi 2019-20 at different centers in the country. Weather data at different centers are also reported to correlate the growth and yield of forage crops 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. were also provided.

A. Forage Crop Improvement

In Rabi 2019-20, forage crop improvement trials were conducted across the country to identify the suitable entries for different zones and at national level. Various parameters were considered including green forage yield (GFY), dry matter yield (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 22 trials under annual and 2 perennial trials. The annual crops include Berseem, Oat (single cut, multicut, dual purpose), Lucerne, multicut summer bajra and Lathyrus whereas under the perennial system, Red clover and White clover were evaluated. A total of 249 trials were allocated out of which data were received from 238 trials making a success rate of 95.5%. A total of 118 entries including 93 annual and 25 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:

In IVTB - Berseem, four entries along with one national check and respective zonal checks were evaluated at 20 centres located in four different zones. For GFY, entry HFB-16-10 (5.0%) in NW zone; entries HFB-16-1 (52.7%), JB-07-15 (51.4%), BM-14 (41.3%), HFB-16-10 (26.6%) in NE zone; entry JB-07-15 (3.6%) in central zone and entries HFB-16-1 (36.6%), BM-14 (34.9%), JB-07-15 (34.1%), and HFB-16-10 (32.4%) at all India level showed superiority of over the best check. For DMY, entry BM-14 (10.1%) in hill zone; entries HFB-16-10 (8.5%), BM-14 (8.1%) in NW zone; entries JB-07-15 (44.6%), HFB-16-1 (42%), BM-14 (34.3%), HFB-16-10 (17.1%) in NE zone; entry JB-07-15 (7.3%) in central zone; and entries JB-07-15 (36.6%), BM-14 (36.3%), HFB-16-1 (35.7%), HFB-16-10 (28.7%) was superior over the best check. For crude protein yield, JB-07-15 (13.1 q/ha) was best performer followed by HFB-16-1 (12.2 q/ha). For CP %, national check Wardan (17.3%) ranked first. For ADF and NDF, entry JB-07-15 (33.2% and 55.8% respectively) ranked first.

In AVTB-1-Berseem, five entries along with one national check and respective zonal checks were evaluated at 15 centres located in three zones. For GFY, entry JHB-18-1 (6.3%) in central zone; entries JHB-18-1(27.1%), BM-12 (26.3%), JHB-18-2 (26.2%), JB-06-11 (25.6%), and HFB-15-5 (20.5%) at combined three zones were superior over the best check. For DMY, entries HFB-15-5 (22.4%), JHB-18-1(10.9%), BM-12 (7.1%), JB-06-11 (5.6%), JHB-18-2 (4.9%) in hill

zone; entry JB-06-11 (5.8%) in NW zone; entries JHB-18-1(7.9%), JHB-18-2 (5.1%), JB-06-11 (4.8%) in central zone; entries JB-06-11 (27.1%), BM-12 (21%), JHB-18-1(20.4%), JHB-18-2 (20.3%), and HFB-15-5 (19.2%) at combined three zones level were superior over the best check. Entry JB-06-11 (18.5q/ha) ranked first for crude protein yield while JHB-18-1 (19.6%) ranked first for crude protein content (%). Entry HFB-15-5 ranked first for IVDMD %.

In **AVTB-2- Berseem**, three entries along with one national check and respective zonal checks were evaluated at 12 centres in two zones. For GFY, entry JHB-17-2 (6.9%) in NW zone; entries JHB-17-2 (27.3%), PC-91 (21.6%), JHB-17-1 (16.6%) in NE zone; entries JHB-17-2 (43.7%), JHB-17-1 (32.2%), PC-91 (30.1%) at combined both zones were superior over the best check. For DMY, entries JHB-17-2 (18.4%), PC-91 (14.2%) in NE zone; entries JHB-17-2 (39.8%), PC-91 (38.9%), JHB-17-1 (24.6%) at combined two zones were superior over the best check. For CPY, JHB-17-2 ranked first, while PC-91 ranked first for IVDMD.

In AVTB-2 (Seed)-Berseem, three entries along with one national and respective zonal checks were evaluated at 6 centres in two zones. For seed yield, entry PC-91 and national check-Wardan were similar in productivity in NW zone; entries JHB-17-1 14 (14.2%), JHB-17-2 (6.3%), in NE zone; entries JHB-17-1 (21.5%), PC-91 (17.5%), and JHB-17-2 (17.0%) at all India level was superior over the best check.

In **IVTO (SC), Oat (single cut),** eleven entries along with two national checks (OS-6 and Kent) and zonal checks for respective zones were evaluated at 29 locations across the five zones. For GFY, entries HFO-904 (3.9%), OL-1960 (3.8%) in south zone; entries HFO-906 (5.7%), HFO-904 (4.6%), and JO-07-28 (4.2%) at all India level were superior over the best check. For DMY, entries HFO-904 (11.7%), OL-1960 (8.4%) in south zone; entries HFO-906 (5.4%), HFO-904 (4.7%) at all India level were superior over the best check. For CPY, entry HFO-904 was ranked first followed by JO-07-28. For crude protein, entry SKO-243 ranked first with 9.3% value. National check OS-6 (61.0%) ranked first for IVDMD.

In **AVTO (SC)-1, Oat (single cut),** ten entries were evaluated against two national checks (OS-6 and Kent) and respective zonal checks at 15 locations in three zones. For GFY, entries OL-1876-1 (12.2%), HFO-806 (9.5%), SKO-241 (8.9%), RO-11-1-2 (8.5%), OL-1874-1 (7.3%), and JO-06-23 (6.1%) at all India level were superior over the best check. For DMY, entries HFO-806 (14.6%), OL-1876-1 (13.9%), JO-06-23 (11.1%), SKO-241(10.4%), OL-1874-1 (8.7%), RO-11-1-3 (5.7%), and RO-11-1-2 (5.6%) at all India level were superior over the best check. For CPY, HFO-806 (7.8 q/ha) ranked first followed by RO-11-1-3 (7.7q/ha). Entry HFO-806 (57.9%) ranked first for IVDMD%.

In **AVTO (SC) -2 oat (single cut),** five entries along with two national checks (OS-6 and Kent) and respective zonal checks were evaluated at 17 locations across the three zones. For GFY, entries HFO-529 (9.1%), JO-05-09 (8.9%) in central zone; entries JO-05-09 (9.8%), HFO-718 (8.9%), HFO-529 (7.6%) at combined three zones were superior over the best check. For DMY, entry HFO-529 (5.9%) in hill zone; entry HFO-718 (4.7%) in central zone; entries HFO-718 (13.5%), and JO-05-09 (9.7%) at all India level were superior over the best check. For crude protein yield, entry HFO-718 (8.9 q/ha) ranked first. For crude protein content, entry OL-1896 (9.1%) ranked first. For IVDMD, entry OL-1896 was top ranked.

In AVTO (SC)-2 seed - oat (single cut) seed, five entries along with two national checks (OS-6 and Kent) and respective zonal checks were evaluated at 11 locations across the three zones. For seed yield, zonal checks were superior over the tested entries in all tested zones.

In **IVTO-MC-Oat (Multicut),** seven entries were evaluated against two national checks (RO-19 and UPO-212) at 18 locations in four zones. For GFY, entries JO-07-310 (6.0%) and OL-1924 (4.1%) in central zone were superior over the best check. For DMY, entries HFO-921 (4.4%), HFO-918 (4.1%) in hill zone; entries OL-1919 (4.6%), OL-1924 (4.4%) in central zone were superior over the best check. Entry PLP-24 (10.5 q/ha) ranked first followed by OL-1924 (10.2 q/ha) for CPY. Entry PLP-24 (10.0%) ranked first for CP (%). For IVDMD, entry HFO-921 ranked first.

In **AVTO-1 (MC) Oat (Multicut),** three entries were evaluated against two national checks (RO-19 and UPO-212) at 9 locations in two zones. For GFY, entry HFO-707 (3.8%) in NW zone showed superiority over the best check. For DMY, entry HFO-707 (6.6%) in NW zone showed superiority over the best check. For quality parameters, entry OL-1882 ranked first for CPY and CP per cent.

In **AVTO-2 (MC) Oat (Multicut),** two entries were evaluated against two national checks (RO-19 and UPO-212) at 9 locations in two zones. For DMY, entry JO-05-304 (4.4%) in central zone was marginally superior over the best check. For quality parameters, entry OL-1874 ranked first for CPY and IVDMD.

In **AVTO-2 (MC- seed) -Oat (Multicut) seed,** two entries were evaluated against two national (RO-19 and UPO-212) checks at 8 locations in two zones. For seed yield, national check UPO-212 was superior over the tested entries in both zones and also at all India level.

An **IVTO (DUAL) Oat (Dual) trial** comprising of nine entries along with two national checks (UPO-212 and JHO-822) was conducted at 15 centres located at three zones. For GFY, entry RO-11-1-13 (5.8%) in NW zone; entries JO-12-509 (16.0%), and HFO-902 (4.3%) in NE zone; entry JO-12-509 (8.4%) in central zone; and entry JO-12-509 (9.9%) at all India level showed superiority over the best check. For DMY, entry RO-11-1-13 (8.3%) in NW zone; entries JO-12-509 (22.2%) and HFO-902 (4.7%) in NE zone; entry JO-12-509 (11.5%) in central zone; and entry JO-12-509 (13.1%) at all India level showed superiority over the best check. For crude protein yield, entry JO-12-509 ranked first and entry RO-11-1-13 ranked first for CP per cent and IVDMD.

In **AVTO-1 (D) - Oat (Dual),** seven entries along with two national checks (UPO-212 and JHO-822) were evaluated at 14 centres located in NW, NE and Central zone. For GFY, entries RO-11-2-6 (10.2%) in NW zone; entry RO-11-2-6 (12.3%) in NE zone; entries RO-11-2-6 (21.6%), JO-11-507 (10.0%), OL-1766-2 (9.9%), JHO-18-3 (6.9%) in central zone were superior over the best check. At all India level, entries RO-11-2-6 (20.6%), JO-11-507 (6.0%) and JHO-18-3 (4.2%) showed superiority over the best check. For DMY, entries RO-11-2-6 (7.3%) and JO-11-507 (6.0%) in NW zone; entry RO-11-2-6 (11.8%) in NE zone; entries RO-11-2-6 (17.9%), JO-11-507 (14.9%), OL-1766-2 (11.1%), JHO-18-3 (9.2%) in central zone were superior over the best check.

At all India level, entries RO-11-2-6 (16.0%), JO-11-507 (8.1%) and JHO-18-3 (5.1%) showed superiority over the best check. National check JHO-822 ranked first for CP (%). Entry RO-11-2-2 ranked first for IVDMD. For seed yield, national check JHO-822 was superior over the all tested entries.

In **AVTO-2 (D) - Oat (Dual),** five entries along with two national checks (UPO-212 and JHO-822) were evaluated at 14 centres located in NW, NE and Central zone. For GFY, entries OL-1876-2 (10.7%), JO-10-506 (9.6%), JHO-17-4 (9.2%), OL-1906 (7.1%), in NE zone; entries OL-1876-2 (11.4%), JHO-17-4 (10.0%) in central zone were superior over the best check. At all India level, entries OL-1876-2 (8.3%), JHO-17-4 (4.5%) showed superiority over the best check. For DMY, entries JHO-17-4 (9.1%), OL-1876-2 (8.3%), OL-1906 (5.9%) in NE zone; entries JHO-17-4 (15.4%), OL-1876-2 (13.2%) in central zone were superior over the best check. At all India level, entries OL-1876-2 (7.4%) and JHO-17-4 (5.2%) showed superiority over the best check. Entry JHO-17-4 (4.7 q/ha) ranked first for CPY; entry HFO-611 ranked first for CP and IVDMD. For seed yield, entry JO-10-506 (22.5 q/ha) ranked first followed by national check UPO-212 (21.9 q/ha).

In **AVTO-2 (D, seed) - Oat (Dual) seed,** five entries along with two national checks (UPO-212 and JHO-822) were evaluated at 9 centres located in NW, NE and central zone. For seed yield, entry JO-10-506 showed 4.1% and 10.2% superiority in NW and NE zones respectively over the best check.

In **IVT Lucerne (Annual),** five entries along with two national checks were evaluated at 11 centres located in three zones. For GFY, entry LLC-6 (7.7%) in NW zone; entry AL-66 (8.7%) in south zone; and AL-66 (6.4%) at all India level showed superiority over the best check. For DMY, entry AL-66 (10.6%) in south zone was superior over the best check. For quality parameters, entry AL-66 top ranked for CPY (q/ha). For crude protein, entry LLC-6 (20.2%) ranked first followed by AL-66 (19.9%).

In **IVT Fodder Bajra (Multicut) in summer,** five entries were evaluated along with 3 checks at seven locations in central and south zone. For GFY, entries SBH-101 (4.5%), 16-ADVO111 (4.3%) in central zone; and entry SBH-101 (4.1%) at all India level showed superiorly over the best check. For DMY, entries SBH-101 (13.5%), 16-ADVO111 (11.7%) in central zone; entries SBH-101 (11.7%), 16-ADVO111 (6.7%) at all India level showed superiority over the best check. For quality parameters, entry SBH-101 top ranked for CPY (q/ha). For crude protein, national check Giant Bajra (8.6%) top ranked.

In **AVT-1 Fodder Bajra (Multicut) in summer,** three entries were evaluated along with 3 checks at four locations in central zone. For GFY, national check was superior over the tested entries. For DMY, entry TSFB-18-1 (13.8%) was superior over the best check. For quality parameters, entry BAIF Bajra- 6 top ranked for CPY (q/ha). For crude protein, both BAIF Bajra-6 and national check Moti bajra were jointly ranked first with the value of 8.4%.

In **AVT-2 Fodder Bajra (Multicut) in summer,** three entries were evaluated along with 3 checks at seven locations in central and south zone. For GFY and DMY, entry ADV 0061 (4.3% and 5.7% respectively) was superior over the best check in central zone. At all India level, tested entries were either marginally superior or inferior over the best check. For quality parameters, entry HTBH-4902 top ranked for CPY (q/ha). For crude protein, national check Moti bajra was ranked first with the value of 8.7%.

In **AVT-2 (seed) Fodder Bajra (Multicut) in summer,** three entries were evaluated along with three checks at seven locations in central and south zone. For seed yield, entries ADV 0061 (4.3%), AFB-37 (4.4%) in central zone was superior over the best check.

In **IVT Lathyrus**, five entries were evaluated along with three national checks at seven locations. For GFY and DMY, entry KL-5 (10.2% and 18.5%) showed superiority over the best check. For quality parameters, entry KL-5 top ranked for CPY (q/ha).

In **VT Red Clover 2016- (Perennial) -4th Year,** six entries were evaluated along with one national check at four locations in Hill zone. For both GFY and DMY, national check (PRC-3) was far better than tested entries. For CPY, entry IGFRI RC -2016-4 ranked first followed by IGFRI RC -2016-6. For CP, national check was ranked first.

In **VT White Clover 2016: (Perennial) -4th Year,** five entries were evaluated along with one national check at four locations in Hill zone. For GFY and DMY, entry PWC-25 (3.5% and 4.3% respectively) showed superiority over the best check. For CPY, entries JHWC-16-2, and JHWC-16-3 ranked first. For CP, entry JHWC-16-1 ranked first.

B. Forage Crop Production

The forage crop production programme was executed at 24 locations. In total 17 experiments were conducted, out of which 13 were in network (8 coordinated and 5 AVT based) and 4 were in location specific mode. The main emphasis was to increase the system productivity and resource use optimization in forage crops and cropping system in relation to planting geometry of crops, silvipastoral system, rice stubble management, cutting management, nutrient management with emphasis on use of organics, the results of Cuscuta management in Lucerne crop has also been presented in this chapter.

The chapter also includes results of advanced varietal trials on response of promising entries of different forage species to nutrients. The salient research achievements of forage crop production trials during Rabi 2019-2020 are as follows:

PS-14-AST-4: **Studies on planting geometry of tall fescue grass and seed rates of white clover in wet temperate conditions:** The trial was started in Rabi 2014-15 at Palampur and Srinagar with the objective to evaluate the productivity, quality and compatibility of tall fescue grass + white clover mixture and estimate soil NPK and soil organic carbon (SOC) storage under different treatments.

K-15-AST-12 C: Studies on the productivity and carbon sequestration of silvipastoral systems in hills of north western Himalayas: The trial was initiated at Palampur and Srinagar with the objective to study the system productivity and organic matter input to soil through silvipastoral system. On the locational mean basis, Setaria grass recorded higher green fodder, dry fodder and crude protein yields in the degraded grasslands of Palampur and Srinagar.

R-19 AST 1: Effect of cutting and splitting of nitrogen doses on growth, yield and quality of fodder oat cultivars: The field experiment was initiated during Rabi 2019-20 at four locations *i.e.,* Raipur, Ranchi, Ayodhya and Pantnagar with objective to study the effect of splitting of nitrogen dose and cutting management on fodder yield and quality of oat varieties, to study the interaction effect on oat varieties and splitting of nitrogen, cutting management on fodder oat and to work out the economics of different treatments. In terms of green fodder yield, dry fodder yield, green and dry fodder per day productivity and crude protein oat cultivar RO-19 and two cuts with 50% Basal+50% at 1st cut application proved best on locational mean basis.

R-19 AST 4: Screening of herbicides for control of *Cuscuta* in Lucerne crop: The experiment was initiated in Rabi season of 2019-20 at Bikaner, Jhansi and Mandya with objectives to screen effective herbicide for control of cuscuta in lucerne crop, to find out effect of herbicides on crops and to see the effect of herbicides on other weeds. *Cuscuta* was better controlled by hand weeding (weed free) followed by Paraquat 100g ha^{-1}, Imazethapyr + pendimethalin (both), Pendimethalin 0.75 kg ha^{-1}. Paraquat 100 g ha^{-1} was proved economically better as compared to hand weeding and some other herbicides.

K-19-AST-1: Studies on organic source of nutrients on forage yield and quality of Fodder cowpea-Maize system under irrigated situation: The experiment was initiated at Mandya, TNAU Coimbatore, KAU, Vellayani with the objectives to **s**tudy the effect of organic nutrient sources on green forage yield and quality, Study the physico-chemical and biological properties of soil and to compare the economics of organic with inorganic sources. Application of 100% RDN through inorganic fertilizer (T_1) recorded higher green fodder, dry matter and crude protein yields of both fodder cowpea and fodder maize. The same treatment recorded higher system productivity of green fodder, dry matter and crude protein yields.

K-19-AST-2: Studies on organic source of nutrients on forage yield and quality of rice bean-oat system under irrigated situation: A field experiment was started in *Kharif* 2019 at Jorhat, Imphal, Kalyani, Ranchi, Pusa wit the objectives to compare the effect of nutrient sources on yield, quality and economics of fodder production system and to assess the changes in physico-chemical and biological properties of soil under different nutrient sources. Application of 50% RDN through FYM + 50% RDN through vermin-compost recorded higher green fodder yield and dry fodder yield at Jorhat, Imphal, Kalyani and Pusa. At Ranchi, Application of Recommended dose of fertilizer produced higher green fodder, dry fodder and crude protein yields.

R-18-AST-4: Nutrient management for productivity enhancement in dual purpose oats: The trial was initiated at Kalyani, Jorhat, Imphal, Ayodhya, Jabalpur and Anand with the objectives To find out the effect of nutrient management on green forage quality and grain yield in dual purpose oats, to study the effect of nutrient management on physic-chemical properties of soil after harvesting and to study the production economics of dual purpose oats. Among the nine treatments, T_8- 75% of T_2 + Vermi-compost @ 2t/ha + PSB application to soil @ 1.5 kg + seed treatment with *Azotobactor* @ 10 g/kg seed + $ZnSO_4$ @ 20 kg/ha (soil application as basal) + foliar spray of $ZnSO_4$ (0.5%) just before flowering recorded maximum GFY, DMY, crude protein content and yield as well as highest test weight and seed yield.

K-16-AST-6: Organic nutrient management in sorghum-berseem cropping sequence for sustainable fodder production: The experiment was conducted at Hisar with objectives to study the effect of organic sources of fertilizers on yield and quality of fodder in sorghum-berseem cropping system, to study the influence of organic sources of nutrients on soil fertility and to work out the economics. Application of 7.5 t Vermi-compost/ha (5t in sorghum + 2.5t in berseem) + biofertilizer with Green manuring produced higher green fodder yield, dry fodder yield, crude protein yield and IVDMD in both Kharif and Rabi seasons. Application of 20 t FYM/ha (15t in sorghum + 5t in berseem) + biofertilizer with green manuring economically proved best.

K16-AST-8: Resource management in rice-oat cropping system under sodic soils: The field experiment was initiated during *Kharif* 2016 at Ayodhya centre to study the resource management in rice-oat cropping system under sodic soils. Total green forage yield and gross return were observed higher with 75% RDF+25% N through *dhaincha*. Application of recommended dose of fertilizer proved best in term of net return and benefit cost ratio noticed.

R-18-AST-7: Effect of intercropping on seed setting and seed yield in Lucerne: The experiment was initiated in Rabi season of 2019-20 at Bikaner with the objectives to find out suitable intercrop for improving seed setting and yield in lucerne by improving micro-climate and pollinators. The maximum seed yield was found in combination of fennel intercrop at (1: 15) *i.e.* 74.15 kg seed /ha. Highest net returns and B: C ratio was obtained from dill intercrop at (1:5).

R-16-AST-4: Effect of stubble management and planting density on establishment and productivity of forage oat under zero tillage conditions in rice fallows: The field experiment was initiated during Rabi 2018-19, to study the effect of different height of rice stubble and planting density on establishment and productivity of forage oat under zero tillage condition in rice fallow. Seed rate of 120 kg ha^{-1} recorded significantly higher green fodder yield, dry matter and crude protein yields. Bending of rice stubble (without cutting) proved best in green fodder yield, dry matter yield and crude protein yield.

R-19-AST-7 – Effect of N levels on forage yield of promising entries of single cut oat (AVT-2 SC): AVT trial on oat was conducted in three zones of the country to study the response of nitrogen fertilizer on yield and quality of promising entries of oat under single cut system.

In the trial, five single cut entries (SKO-240, OL-1896, HFO- 529, HFO-718 and JO-05-09 along with two national checks namely; OS-6 and Kent and three zonal checks *viz.*, SKO-90 (HZ), RO-11-1 (NWZ), JHO-2009-1 (CZ), were evaluated at eight locations in the country. The four nitrogen levels (30, 60, 90 and 120 kg N /ha) were imposed on entries to see the response. In Hill zone, Kent (NC) recorded highest GFY, which was on par with JO-05-09. But in case of dry matter yield, NC Kent and zonal check SKO-96recorded highest value which was at par with (HFO 529 & JO-05-09. In North West zone, HFO-718recorded highest GFY and dry matter yield,over best check RO-11-1. In central zone, HFO-529recorded highest GFY and dry matter yield, over best check JHO- 2009-1. On overall mean basis, HFO-718 proved highest yielder in term of GFY followed by HFO-529. HFO-529 recorded higher DMY as well as CP yield but was at par with HFO-718.

R-19-AST-6: Effect of P levels on forage yield of promising entries of Berseem (AVTB-2-MC): AVT trial on berseem was conducted in two zones of the country to study the effect of phosphorus fertilizer on yield and quality of promising entries of berseem under multicut cut system. In the trial three entries (JHB-17-1, JHB-17-2, andPC-91) along with one national check (Wardan -NC)and two zonal checks *viz.*, BB-2 (NWZ), BB-3 (NEZ), were evaluated at six locations in the country. The threephosphorus levels (60, 80 and 100 Kg /ha) were imposed on entries to see the response.In North East Zone, JHB-17-1recorded significantly higher GFY and DMY and CP yields than national check- Wardan. On overall mean basis, PC-91 and JHB-17-1proved superior to other entries and checks but on par with each other.

R-19-AST-8: Effect of N levels on forage yield of promising entries of multi cut oat (AVT-2 MC): AVT trial on multicut was conducted at five locations spread over two zones of the country to study the response of nitrogen fertilizer on yield and quality of promising entries of oat under multicut system. In the trial, two multicut entries (OL-1874 and JO-05-304) along with two national checks namely; UPO-212 and RO-19 were evaluated for their responsiveness to nitrogen fertilizer. The four nitrogen levels (35, 70,105, and 140 kg N /ha) were imposed on entries to see the response. In North West zone, national check RO-19 recorded highest green fodder yield which was closely followed by JO-05-304. In terms of dry matter yields entry JO-05-304 proved superior and it was closely followed by national check RO-19. In Central Zone, national check RO-19 recorded highest green fodder, dry matter and crude protein yields. It was followed by entry OL-1874. On overall mean basis, national check RO-19 recorded highest green fodder, dry matter and crude protein yields and was followed by entry JO-05-304 in terms of GFY and DFY. The respective improvement over dose of 105 kg N/ ha was to the tune of 7.5, 9.5 and 17.4 percent.

R-19 AST 9: Effect of N levels on forage yield of promising entries of dual cut Oat (AVT-2 Dual cut)

AVT trial on dual purpose oat was conducted at three locations spread over two zones 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, five multicut entries (OL-1876-2, OL-1906, HFO-611, JHO-17-4 and JO-10-506) along with two national checks namely; UPO-212 and JHO-822 were evaluated for their responsiveness to nitrogen fertilizer. The four nitrogen levels (35, 70,105, and 140 kg N /ha) were imposed on entries to see the response. In North East zone, entry JHO-17-4 recorded highest green fodder and dry matter yield and was closely followed by national check JHO-822. Entry JHO-17-4 also recorded highest CP yields. In Central Zone, entry JO-10-506 recorded highest green fodder, dry matter and crude protein yield and was closely followed by entry OL-1876-2. On overall mean basis, entry JO-10-506 recorded highest green fodder, dry matter and crude protein yield. It was closely followed by entry OL-1876-2.

R-19-AST-10: Second Advanced Varietal Trial in Forage Pearl millet (Agronomy): AVT trial on Forage Pearl millet was conducted at four locations spread over two zones of the country to study the response of 4 levels of nitrogen fertilizer (0, 40, 80 and 120 kg/ha N /ha) on fodder yield and quality of three promising entries (HTBH-4902, ADV0061 and AFB-37) along with three national checks Giant Bajra, Moti Bajra, Raj Bajra. In Central Zone, Southern Zone as well as on overall mean basis, no entry could surpass the national checks in terms of green fodder, dry matter or CP yields. Moti Bajra proved superior to all entries.

C. FORAGE CROP PROTECTION

During rabi 2019-20, total eight trial were conducted across five locations. Forage crops evaluated were Berseem, Oat, Lucerne, White clover and Red clover. 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 and (c) Development of location and region specific crop protection technologies.

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 end of March with maximum disease incidence of 65.3 percent. Leaf blight in oat appeared in the 1st week of January. Disease development was fast upto end of March with highest disease severity of 52.4 percent. Downy mildew of Lucerne was observed in the first fortnight of January. Highest disease severity was 40.1 percent. The population of *H. armigera* appeared on berseem crop in April with its highest peak during last week of April and first week of May. *Spodoptera exigua* larvae were also recorded in Berseem crop during April, with peak incidence in the second fortnight of April. Lucerne was infested with weevil in March and April. **At Rahuri,** pea aphid was noticed on Lucerne during 4th week of December (7.68 aphids/tiller) and its intensity increased steadily and reached peak level during the 4th week of February (52.30 aphids/tiller). Cowpea aphid was observed on Lucerne during 4th week of December (11.00 aphids/tiller) and reached at its peak during last week of February with 32.58 aphids/tiller. Oat aphid was recorded from 1st week of January to 4th week of February in the range of 3.23 to 56.18 aphids/tiller. Pea aphid was noticed on Berseem during 3rd week of December (1.02 aphids/tiller) and increased steadily at its peak level up to the 2nd week of February (9.65 aphids/tiller).

At Palampur, Oat was severely affected by powdery mildew (45 % severity), followed by leaf blight (25 %), loose smut (1 %) and sucking pest (12 %). In Berseem, low incidence of root rot (4 %), moderate intensity of leaf spot (10 %) and defoliating beetles (3%) was observed. Defoliating beetles (8 %) and leaf spot (8 %) were observed on Lucerne.

At Bhubaneswar, in oat, leaf blight severity recorded was 51.2 % and root rot incidence was 26.6 %. Maximum leaf defoliators were recorded up to 6.8/10 plants. The maximum Berseem leaf spot and blight severity recorded was 36.4 % during 1st week of February, whereas maximum root rot incidence was 35.0 % during last week of January. Maximum defoliator population recorded was 5.4/10 plants in last week of January.

At Jhansi, in Berseem, incidence of stem rot started from 3rd week of January with small lesions indicative of early infection and continued to increase up to last week of February with a maximum disease incidence of 26.4 %. In Oat, leaf blight was the major disease and it appeared during first week of February and maximum severity of 41.5 % was observed during last week of March.

Field screening of *rabi*-breeding materials for resistance to diseases and insect- pests

In IVT Berseem, all the six entries including checks showed resistant disease reaction to stem rot. At Rahuri, all the entries had low incidence of aphids. At Palampur, all the entries were resistant to moderately resistant to root rot. At Bhubaneswar, Bundel Berseem-3, JB-07-15, BM-14 and HFB-16-1 were found resistant whereas HFB-16-10 expressed moderate resistance and Wardan showed moderately susceptible reaction. **In AVT-1 Berseem,** At Ludhiana, all the seven entries including checks showed resistant disease reaction to stem rot. At Rahuri, all the entries had low incidence of aphids. At Palampur, all the entries were resistant to root rot. **In AVT-2 Berseem,** At Ludhiana, all the five entries including checks entries were found resistant to stem rot. **At Bhubaneswar,** JHB-17-2, PC-91 and JHB-17-1 show resistant reactions to leaf spot and blight in Berseem whereas others expressed moderate resistance.

Oat – IVTO SC: At Ludhiana, among the fourteen entries, all showed resistant disease reaction to leaf blight except HFO-904 and SKO-243 which were moderately resistant. At Rahuri, entries RO-11-1-12, Kent, OL-1963, HFO-906, RO-11-1-8, NDO-1807, OL-1960 and UPO-19-1 were moderately resistant to aphids and other entries were susceptible. At Palampur, all entries were susceptible to Powdery mildew except OS-6, RO-11-1-12, OL-1963, UPO-19-1, HFO-904 and JO-07-28 which were moderately resistant. At Bhubaneswar, OS-403, RO-11-1-12, Kent, OL-1963, HFO-906, RO-11-1-8, NDO-1807 and OL-1960 showed resistant reaction to leaf spot and blight, *Sclerotium* root rot and infestation by leaf defoliator. At Jhansi, all the entries were resistant to moderately resistant to leaf light.

Oat-IVTO MC: At Ludhiana, among nine entries, eight showed moderately resistant disease reaction, while OL-1924 showed resistant reaction to leaf blight At Rahuri, all the entries were moderately resistant to aphids except JO-07-310, RO-11-1-13 which were susceptible. At Palampur, all entries were susceptible to Powdery mildew except JO-07-310, OL-1919 and HFO-918 which were moderately resistant. At Bhubaneswar, all the nine entries were resistant to moderately resistant to leaf blight, *Sclerotium* root rot and infestation by leaf defoliators. At Jhansi, all the nine entries were resistant to moderately resistant to leaf light.

Oat– IVTO Dual: At Ludhiana, all the eleven entries were resistant to moderately resistant to leaf blight. At Rahuri, all the eleven entries were resistant to moderately resistant to aphids. At Bhubaneswar, all the entries were resistant to moderately resistant to leaf blight, *Sclerotium* root rot and infestation by leaf defoliators except OL-1954 and JHO-19-2 which were moderately susceptible to both disease and insect infestation. At Jhansi, all the eleven entries were resistant to leaf light.

Oat-AVTO SC-1: At Rahuri, nine entries were resistant to moderately resistant to aphids, while Kent, OL-1874-1, HFO-818 and SKO-241 were susceptible to aphids At Palampur, entries RO-11-1-2, OL-1876-1, Kent, HFO-818, JO-06-23, UPO-18-1 and NDO-1802 were moderately resistant to powdery mildew and rests were susceptible. At Jhansi, all the thirteen entries were in moderately resistant to low resistant category to leaf light.

Oat-AVTO SC-2: At Ludhiana, all the eight entries were moderately resistant to leaf blight. At Rahuri, all the entries were moderately resistant to aphids except HFO-718 and SKO-240 which were susceptible. At Palampur, all entries were susceptible to powdery mildew except OL-1896, HFO-718, HFO-529 and Kent which were moderately resistant. At Jhansi, OL-1896 was in low susceptible category, entries HFO-718 and SKO-240 were in low resistant and resistant category respectively to leaf blight. Rests of the entries were moderately resistant.

Oat-AVTO SC-2 (Seed): At Ludhiana, all the eight entries showed resistant disease reaction to leaf blight. At Rahuri, all the entries were moderately resistant to aphids except SKO-240 which was susceptible. At Palampur, all entries were susceptible to powdery mildew except OL-1896, HFO-718, Kent and JO-05-09 which were moderately resistant. At Jhansi, HFO-718, JHO-2009-1 and HFO-529 were in low resistant category and OL-1896 was moderately resistant. Rests of the entries were resistant to leaf blight.

Oat-AVTO-1 (Dual): At Ludhiana, among nine entries, seven entries were resistant to leaf blight, while JHO-18-3 and OL-1874-2 showed moderately resistant disease reaction n. At Rahuri, all the nine entries were moderately resistant to aphids. At Bhubaneswar, all the entries were resistant to moderately resistant to both disease and insect infestation. At Jhansi, RO-11-2-2, UPO-212 and HFO-816 were resistant; JHO-822 and JHO-18-3 were moderately resistant and rests of the entries were in low resistant category to leaf blight.

Oat-AVTO-2 (Dual): At Ludhiana, all the seven entries including checks were resistant to leaf blight. At Rahuri, all the entries were moderately resistant to aphids. At Bhubaneswar, all the entries were resistant to moderately resistant to leaf spot and blight, Sclerotium root rot and damage by leaf defoliators. At Jhansi, OL-1906 and OL-1876-2 were in mesothetic category, while HFO-611 and JHO-17-4 were in low resistant category to leaf blight. Rests of entries were resistant to moderately resistant to leaf blight.

Oat-AVTO-1 (Multicut): At Ludhiana, all the five entries including check showed resistant disease reaction to leaf blight. At Rahuri, all the entries were moderately resistant to aphids. At Jhansi, all the entries were resistant to moderately resistant to leaf blight to leaf light.

Oat-AVTO-2 (Multicut): At Ludhiana, OL-1874 and UPO-212 showed resistant disease reaction to leaf blight and JO-05-304, RO-19 showed moderately resistant disease reaction. At Rahuri, all the entries were moderately resistant to aphids. At Jhansi, most of the entries were in low resistant to moderately resistant category to leaf blight.

In IVT Lucerne, all the seven entries showed resistant disease reaction to downy mildew. At Rahuri, all the entries were moderately resistant to aphids.

White clover (VTWC): At Palampur, all the six entries were susceptible to powdery mildew.

Red clover (VTRC): At Palampur, all the seven entries were susceptible to powdery mildew.

To study the pathogenic variability of *Blumeria graminis* f. sp. *avenae* on oat : At Palampur, pure culture of 24 isolates of *Blumeria graminis* f. sp. *avenae*, collected from six districts of Himachal Pradesh during 2016-2019 was maintained under controlled conditions. For development of differential set, 142 lines from field screened set of 303 lines was selected and evaluated under greenhouse conditions with 5 pure culture isolates of *Blumeria graminis f*. sp. *avenae.* From these, 44 lines which exhibited varied reaction to specific isolate were selected and further screened against 9 pure culture isolates of powdery mildew. It was found that 20 lines were exhibiting differential reaction to the isolates and now these 20 lines will be evaluated with 24 isolates and lines (about 10 lines) showing differential reaction to the isolates will be identified and final differential set will be selected. To study the inheritance of powdery mildew resistance, three resistant lines (OL-1847, OG-77 and OL-1689) were selected and crossed with HJ-8 (Susceptible check) at Palampur and Kukumseri (Lahul and Spiti) and F_1 seeds were harvested. The F_1 seeds were sown in polyhouse and F_2 seeds were harvested,which will be evaluated under field conditions or in green house with different isolates of powdery mildew.

Biological management of oat aphid *Rhopalosiphum padi* on oats: At Rahuri, at 7 DAS the least incidence of aphids was observed in treatment foliar application of *L. lecanii* @ 7.5g/lit. (9.93), *M. anisopilae* @ 7.5g/lit (12.28), *L. lecanii* @ 5g/lit. (12.36) and *M. anisopilae* @ 5g/lit (14.55). At Ludhiana, At 7 DAS, the least incidence of aphids was observed in treatment foliar application of *L. Lecanii* @ 7.5 g/lit (4.66) followed by foliar application of *M. anisopliae* @ 7.5 g/lit (5.33). Green fodder yield was highest in commercial neem spray.

Biological management of powdery mildew of oats caused by *Blumeria graminis* f. sp. *avenae*: At Palampur, chemical check (three foliar spray of hexaconazole @ 0.1%) gave best control of powdery mildew (5.7 % disease severity and 83.0% disease control) with maximum increase (8.9 %) in the seed yield over the check. Among the biological management treatments, three foliar spray of *Trichoderma viride* @ 0.5% or three foliar spray of *Trichoderma harzianum* @ 0.5% were found effective.

Eco-friendly pest management techniques in berseem ecosystem: At Ludhiana, treatment T4 (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 (19.80 %) with 57.39 percent disease control as compared to control (46.47 %) and 15.59 percent increase in green fodder yield.

The number of *H. armigera* larvae per metre row length were minimum in T7 (Farmers practice) followed by T6 (T2+ Sunflower as trap crop on border row + Bird perches) and T4 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + Chickpea as trap crop on border row + Bird perches). At Rahuri, *H. armigera* or other lepidopteran larvae were not observed throughout the crop growth period and hence treatments were not imposed.

Validation of best treatment of trial entitled "Management of soil borne and powdery mildew diseases in red clover seed crop": At Palampur, it was observed that integrated management i.e. seed treatment with carbendazim @ 2 g/kg seed followed by three foliar spray of hexaconazole @ 0.1 % gave best management of powdery mildew having 6.0 per cent disease severity and 85.7 per cent disease control of powdery mildew and 3.3 % disease incidence with 66.7 % disease control of soil borne disease with 21.7 per cent increase in yield over control.

Integrated disease management in Berseem: At Jhansi, for stem rot management, best treatment was T7 (Seed treatment with *Trichoderma* @ 0.5 % + foliar spray of Chitosan @ 0.05 %) followed by T6 (Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%) with 8.7 % and 11.7 % incidence. At Ludhiana, for stem rot management, best treatment was T6 (Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%) followed by T8 (Seed treatment with carbendazim @ 0.2 % + foliar spray of Chitosan @ 0.05%) with 20.23 % and 22.73 % incidence. At Palampur, for root rot management, best treatment was T9 (Seed treatment with carbendazim @ 0.2 % + Seed treatment with carbendazim @ 0.1 %) with 1 % incidence followed by T8, T5 and T3 (1.3 % incidence). For leaf blight management, best treatment was T9 (3 % severity) followed by T8 (3.3 % severity) and T6 (4 % severity). At Bhubaneswar, for root rot management, best treatment was T9 (Seed treatment with carbendazim @ 0.2 % + Seed treatment with carbendazim @ 0.1 %) with 7.63 % incidence followed by T5 (Seed treatment with Chitosan @ 0.05 % + carbendazim @ 0.1%) having 4.63 % incidence. For leaf blight management, best treatment was T9 (9.30 % severity) followed by T8 (13.37 % severity).

D. Breeder Seed Production

The indent for Breeder Seed Production for Indent year Rabi 2020-21 and Production year Rabi 2019-20 was received from DAC, GOI for 39 varieties in three forage crops *viz.*, Oat (24), Berseem (10) and Lucerne (5). The total quantity allocated was 444.58q comprising of Oat (409.15 q), Berseem (29.23 q) and Lucerne (4.2 q). The overall production was 491.91 q which is 47.33 q (10.65%) higher than the indented target.

In Oat, the production was 468.58q against the allocation of 409.15q - a surplus of 59.43q. There was surplus production in 15 varieties indented. In nine varieties viz., OL-1802, RO-11-1, UPO-6-01, JHO-2015-1, BJ-20122, JHO-2009-1, JHO-2000-4, JHO-99-2, and JO-04-315 the production was less than the indent. In Berseem, the production was 18.97q against the indent of 29.23q for 10 varieties making a deficit of 10.26q. In four varieties *viz.*, BL-22, BB-3, UPB-110, and JB-05-09 the production was less than the indent. In other 06 varieties there was surplus or equal production. In Lucerne, the total production was 4.36 q which was 0.16 q or 3.8% higher than the indent of 4.20q. Out of 5 varieties, there was deficit production in RBB 07-01 variety. In other cases either indent was met or surplus 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.	Palampur, CSKHPKV Srinagar, SKUAS&T-K	1970 2010	Himachal Pradesh Jammu & Kashmir	1. 2. 3.	Almora, ICAR-VPKAS* Rajouri, SKUAST-J Bajoura (Kullu), CSKHPKV RRS	Uttarakhand J & K H P
II. North West States = 5 Locations = 14	3. 4. 5. 6.	Ludhiana, PAU Hisar, CCS HAU Pantnagar, GBPUAT Bikaner, SKRAU	1989 1970 1995 1995	Punjab Haryana Uttarakhand Rajasthan	4. 5. 6. 7. 8. 9. 10. 11. 12. 13.	Meerut, SVBPUA&T Ballowal Sankhari, PAU,RRS Avikanagar, IGFRI-RRS* Jodhpur, ICAR-CAZRI* Bhilwara Arjia/DFRS,MPUAT Udaipur, MPUAT Pali-Marwar, ICAR-CAZRI-RRS* Jaisalmer, ICAR-CAZRI-RRS* Fatehpur Shekhawati/ARS SKNAU Jalore, SKRAU ARS	Uttar Pradesh Punjab Rajasthan Rajasthan Rajasthan Rajasthan Rajasthan Rajasthan Rajasthan Rajasthan
III. East/North States = 9 Locations = 11	7. 8. 9. 10. 11. 12. 13.	Ayodhya, ANDUAT Ranchi, BAU Kalyani, BCKV Bhubaneswar,OUAT Jorhat, AAU Imphal, CAU Pusa, RPCAU	1982 1970 1972 1987 1970 2010 2017	Uttar Pradesh Jharkhand West Bengal Orissa Assam Manipur Bihar	14. 15. 16. 17.	Umiam (Barapani), ICAR Res. Complex for NEH Region* Visva Bharti, Shantiniketan Medziphema, Nagaland University Sabour, BAU	Meghalaya West Bengal Nagaland Bihar

Zone	Coordinated Centers				Testing Locations		
	S.N.	Location	Establishment Year	State / UT	S.N.	Location	State/Union Territory
IV. Central States = 5 Locations = 11	14.	Anand, AAU	1970	Gujarat	18.	Kanpur, CSAU&T	Uttar Pradesh
	15.	Jabalpur, JNKVV	1970	Madhya Pradesh	19.	Jhansi, ICAR-IGFRI*	Uttar Pradesh
	16.	Rahuri, MPKV	1971	Maharashtra	20.	Dhari, JAU	Gujarat
	17.	Urulikanchan, BAIF	1982	Maharashtra	21.	Karjat, RARS, BSKKV	Maharashtra
	18.	Raipur, IGKV	2010	Chhattisgarh	22.	Akola, PDKVV	Maharashtra
					23.	Dapoli, COA	Maharashtra
					24.	Palghar, ARS,DBSKKV	Maharashtra
V. South States/UT = 6 Locations = 9	19.	Mandya, UAS (B)	1986	Karnataka	25.	Dharwad, ICAR-IGFRI-RRS*	Karnataka
	20.	Coimbatore, TNAU	1976	Tamil Nadu	26.	Karaikal, PJLNCA & RI,	Pudducherry
	21.	Vellayani, KAU	1971	Kerala	27.	Tirupati/Guntur, ANGRAU	Andhra Pradesh
	22.	Hyderabad, PJTSAU	1970	Telangana	28. 29.	Raichur, UAS, Mattupetty, KLDB	Karnataka Kerala

Summary: Zone = 5, States/UT = 27, Coordinating Centers = 22, Testing Locations = 29

*ICAR Institute

Entries Code for Rabi 2019-20

1. IVTB:

S. N.	Contributor	Entry name	Code name
1.	ZC HZ	BL-22	IVT B - 1
2.	ZC CZ & NWZ	Bundel Berseem 2	IVT B - 1
3.	ZC NEZ	Bundel Berseem 3	IVT B - 1
4.	CCS HAU, Hisar	HFB-16-10	IVT B - 2
5.	JNKVV, Jabalpur	JB-07-15	IVT B - 3
6.	PAU, Ludhiana	BM 14	IVT B - 4
7.	CCS HAU, Hisar	HFB-16-1	IVT B - 5
8.	NC	Wardan	IVT B - 6

2. AVTB-1:

S. N.	Contributor	Entry name	Code name
1.	IGFRI, Jhansi	JHB-18-2	AVTB -1 -1
2.	NC	Wardan	AVTB -1 -2
3.	ZC HZ	BL-22	AVTB -1 -3
4.	ZC NWZ,CZ	BB-2	AVTB -1 -3
5.	IGFRI, Jhansi	JHB 18-1	AVTB -1 -4
6.	PAU, Ludhiana	BM-12	AVTB -1 -5
7.	CCS HAU, Hisar	HFB-15-5	AVTB -1 -6
8.	JNKVV, Jabalpur	JB-06-11	AVTB -1 -7

3. AVTB-2:

S. N.	Contributor	Entry name	Code name
1.	IGFRI, Jhansi	JHB-17-2	AVT- B- 2- 1
2.	ZC NWZ	BB-2	AVT- B- 2- 2
3.	ZC NEZ	BB-3	AVT- B- 2- 2
4.	PAU, Ludhiana	PC-91	AVT- B- 2- 3
5.	NC	Wardan	AVT- B- 2- 4
6.	IGFRI, Jhansi	JHB-17-1	AVT- B- 2- 5

4. AVTB-2 (Seed):

S. N.	Contributor	Entry name	Code name
1.	IGFRI, Jhansi	JHB-17-2	AVT-B- S-1
2.	ZC NWZ	BB-2	AVT-B- S-2
3.	ZC NEZ	BB-3	AVT-B- S-2
4.	PAU, Ludhiana	PC-91	AVT-B- S-3
5.	NC	Wardan	AVT-B- S-4
6.	IGFRI, Jhansi	JHB-17-1	AVT-B- S- 5

5. IVTO (SC):

S. N.	Contributor	Entry name	Code name
1.	NC	OS-6	IVTO – SC -1
2.	ZC NWZ, NEZ, SZ	OS-403	IVTO – SC -2
3.	ZC HZ	SKO-96	IVTO – SC - 2
4.	ZC CZ	RO-11-1	IVTO – SC -2
5.	IGFRI, Jhansi	JHO-19-1	IVTO – SC -3
6.	MPKV, Rahuri	RO-11-1-12	IVTO – SC -4
7.	NC	Kent	IVTO – SC -5
8.	PAU, Ludhiana	OL-1963	IVTO – SC -6
9.	CCS HAU, Hisar	HFO-906	IVTO – SC -7
10.	MPKV, Rahuri	RO-11-1-8	IVTO – SC -8
11.	NDUAT, Faizabad	NDO-1807	IVTO – SC -9
12.	PAU, Ludhiana	OL-1960	IVTO – SC–10
13.	GBPUAT, Pant	UPO-19-1	IVTO – SC -11
14.	CCS HAU, Hisar	HFO-904	IVTO – SC -12
15.	JNKVV, Jabalpur	JO-07-28	IVTO – SC -13
16.	SKUAST K, Srinagar	SKO-243	IVTO- SC -14

6. AVTO-1:

S. N.	Contributor	Entry name	Code name
1.	MPKV, Rahuri	RO-11-1-2	AVTO-1 –SC-1
2.	PAU, Ludhiana	OL-1876-1	AVTO-1 –SC-2
3.	ZC SZ	OS-403	AVTO-1 –SC-3
4.	ZC HZ	SKO-96	AVTO-1 –SC-3
5.	ZC CZ	RO-11-1	AVTO-1 –SC-3
6.	NC	Kent	AVTO-1 –SC-4
7.	PAU, Ludhiana	OL-1874-1	AVTO-1 –SC-5
8.	CCS HAU, Hisar	HFO-818	AVTO-1 –SC-6
9.	MPKV, Rahuri	RO-11-1-3	AVTO-1 –SC-7
10.	CCS HAU, Hisar	HFO-806	AVTO-1 –SC-8
11.	JNKVV,Jabalpur	JO-06-23	AVTO-1 –SC-9
12.	GBPUAT, Pantn	UPO-18-1	AVTO-1 –SC- 10
13.	NDUAT, Faizabad	NDO-1802	AVTO-1 –SC-11
14.	NC	OS-6	AVTO-1 –SC-12
15.	SKUAST, Srinagar	SKO-241	AVTO-1 –SC- 13

7. AVTO-2 Forage Oat (SC):

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	OL-1896	AVTO-2-SC –1
2.	CCS HAU, Hisar	HFO-718	AVTO-2-SC -2
3.	ZC HZ	SKO-96	AVTO-2-SC -3
4.	ZC CZ	JHO-2009-1	AVTO-2-SC -3
5.	ZC NWZ	RO-11-1	AVTO-2-SC -3
6.	CCS HAU, Hisar	HFO-529	AVTO-2-SC -4
7.	NC	Kent	AVTO-2-SC -5
8.	NC	OS-6	AVTO-2-SC -6
9.	JNKVV, Jabalpur	JO-05-09	AVTO-2-SC -7
10.	SKUAST, Srinagar	SKO-240	AVTO-2-SC -8

8. AVTO-2 (Seed):

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	OL-1896	AVTO-2-SC-S -1
2.	CCS HAU, Hisar	HFO-718	AVTO-2-SC-S -2
3.	ZC HZ	SKO-96	AVTO-2-SC-S -3
4.	ZC CZ	JHO-2009-1	AVTO-2-SC-S-3
5.	ZC NWZ	RO-11-1	AVTO-2-SC-S-3
6.	CCS HAU, Hisar	HFO-529	AVTO-2-SC-S-4
7.	NC	Kent	AVTO-2-SC-S-5
8.	NC	OS-6	AVTO-2-SC-S-6
9.	JNKVV, Jabalpur	JO-05-09	AVTO-2-SC-S-7
10.	SKUAST, Srinagar	SKO-240	AVTO-2-SC-S-8

9. IVTO (Multi cut):

S. N.	Contributor	Entry name	Code name
1	JNKVV, Jabalpur	JO-07-310	IVTO – MC -1
2	NC	UPO-212	IVTO – MC -2
3	NC	RO-19	IVTO – MC -3
4	PAU, Ludhiana	OL-1919	IVTO – MC– 4
5	CCS HAU, Hisar	HFO-921	IVTO – MC -5
6	CCS HAU, Hisar	HFO-918	IVTO – MC -6
7	CSK HPKV, Pala	PLP-24	IVTO – MC -7
8	PAU, Ludhiana	OL-1924	IVTO – MC -8
9	MPKV, Rahuri	RO-11-1-13	IVTO – MC -9

10. AVTO-1 (Multi cut):

S. N.	Contributor	Entry name	Code name
1	PAU, Ludhiana	OL-1882	AVTO-1 –MC -1
2	NC	UPO-212	AVTO-1 –MC -2
3	CCS HAU, Hisar	HFO-707	AVTO-1 –MC–3
4	CCS HAU, Hisar	HFO-716	AVTO-1 –MC -4
5	NC	RO-19	AVTO-1 –MC -5

11. AVTO-2 (Multi cut):

S. N.	Contributor	Entry name	Code name
1	PAU, Ludhiana	OL-1874	AVTO-2-MC-1
2	NC	UPO-212	AVTO-2-MC-2
3	JNKVV, Jabalpur	JO-05-304	AVTO-2-MC-3
4	NC	RO-19	AVTO-2-MC-4

12. AVTO-2 (Multi cut) (Seed):

S. N.	Contributor	Entry name	Code name
1	PAU, Ludhiana	OL-1874	AVTO-2-MC- S -1
2	NC	UPO-212	AVTO-2-MC- S -2
3	JNKVV, Jabalpur	JO-05-304	AVTO-2-MC- S -3
4	NC	RO-19	AVTO-2-MC- S -4

13. IVTO (Dual):

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	OL-1934	IVTO-D-1
2.	PAU, Ludhiana	OL-1954	IVTO-D-2
3.	GBPUAT, Pantnagar	UPO-19-2	IVTO-D-3
4.	MPKV, Rahuri	RO-11-2-8	IVTO-D-4
4.	NC	UPO-212	IVTO-D-5
5.	NC	JHO-822	IVTO-D-6
6.	JNKVV, Jabalpur	JO-12-509	IVTO-D-7
7.	IGFRI, Jhansi	JHO-19-2	IVTO-D-8
8.	CCS HAU, Hisar	HFO-902	IVTO-D-9
9.	CCS HAU, Hisar	HFO-901	IVTO-D-10
10.	MPKV, Rahuri	RO-11-1-13	IVTO-D-11

14. AVTO-1 (Dual):

S. N.	Contributor	Entry name	Code name
1.	MPKV, Rahuri	RO-11-2-6	AVTO-1 - D-1
2.	NC	JHO-822	AVTO-1 - D-2
3.	IGFRI, Jhansi	JHO-18-3	AVTO-1 - D-3
4.	PAU, Ludhiana	OL-1766-2	AVTO-1 - D-4
5.	JNKVV, Jabalpur	JO-11-507	AVTO-1 - D-5
6.	PAU, Ludhiana	OL-1874-2	AVTO-1 - D-6
7.	MPKV, Rahuri	RO-11-2-2	AVTO-1 - D-7
8.	NC	UPO-212	AVTO-1 - D-8
9.	CCS HAU, Hisar	HFO-816	AVTO-1 - D-9

15. AVTO-2 (Dual): Forage Oat:

S. N.	Contributor	Entry name	Code name
1.	JNKVV, Jabalpur	JO-10-506	AVTO-2-D-1
2.	NC	UPO-212	AVTO-2-D-2
3.	NC	JHO-822	AVTO-2-D-3
4.	CCS HAU, Hisar	HFO-611	AVTO-2-D-4
5.	PAU, Ludhiana	OL-1906	AVTO-2-D-5
6.	IGFRI, Jhansi	JHO-17-4	AVTO-2-D-6
7.	PAU, Ludhiana	OL-1876-2	AVTO-2-D- 7

16. AVTO-2 (Dual) (Seed):

S. N.	Contributor	Entry name	Code name
1.	JNKVV, Jabalpur	JO-10-506	AVTO-2-D- S-1
2.	NC	UPO-212	AVTO-2-D- S-2
3.	NC	JHO-822	AVTO-2-D- S-3
4.	CCS HAU, Hisar	HFO-611	AVTO-2-D- S-4
5.	PAU, Ludhiana	OL-1906	AVTO-2-D- S-5
6.	IGFRI, Jhansi	JHO-17-4	AVTO-2-D- S-6
7.	PAU, Ludhiana	OL-1876-2	AVTO-2-D- S-7

17. IVT Lucerne (Annual):

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	LLC-6	IVT LU-1
2.	Alamdar Seed	Alamdar-1	IVT LU-2
3.	AAU, Anand	AL-62	IVT LU-3
4.	AAU, Anand	Al-66	IVT LU-4
5.	NC	RL-88	IVT LU-5
6.	Alamdar Seed	Alamdar-21	IVT LU-6
7.	NC	Anand-2	IVT LU-7

18. IVT Summer Bajra:

S. N.	Contributor	Entry name	Code name
1.	PAU, Ludhiana	FBL-4	IVTSMB – 1
2.	NC	BAIF Bajra -1	IVTSMB – 2
3.	Advanta UPL	16 ADVO111	IVTSMB – 3
4.	NC	Moti Bajra	IVTSMB – 4
5.	NC	Giant Bajra	IVTSMB – 5
6.	SIRA seed	SBH-101	IVTSMB – 6
7.	PJTSAU, Hyderabad	TSFMB-18-14	IVTSMB – 7
8.	SIRA seed	SBH-102	IVTSMB – 8

19. AVT-1 Summer Bajra: CZ:

S. N.	Contributor	Entry name	Code name
1.	PJTSAU, Hyderabad	TSFB-18-1	AVT-1 SMB – 1
2.	NC	Moti Bajra	AVT-1 SMB – 2
3.	BAIF, Uralikanchan	BAIF Bajra -6	AVT-1 SMB – 3
4.	NC	Giant Bajra	AVT-1 SMB – 4
5.	BAIF, Uralikanchan	BAIF Bajra -5	AVT-1 SMB – 5
6.	NC	BAIF Bajra -1	AVT-1 SMB – 6

20. AVT-2: Summer Bajra (CZ and SZ):

S. N.	Contributor	Entry name	Code name
1.	NC	Raj Bajra -1	AVT-2 SMB – 1
2.	Hytech India Seed Pvt Ltd	HTBH-4902	AVT-2 SMB – 2
3.	NC	Moti Bajra	AVT-2 SMB – 3
4.	Advanta UPL	ADV 0061	AVT-2 SMB – 4
5.	AAU, Anand	AFB-37	AVT-2 SMB – 5
6.	NC	Giant Bajra	AVT-2 SMB – 6

21. AVT-2 (Seed): Summer Bajra (CZ and SZ):

S. N.	Contributor	Entry name	Code name
1.	NC	Raj Bajra -1	AVT-2 SMBS – 1
2.	Hytech India Seed Pvt Ltd	HTBH-4902	AVT-2 SMBS – 2
3.	NC	Moti Bajra	AVT-2 SMBS – 3
4.	Advanta UPL	ADV 0061	AVT-2 SMBS – 4
5.	AAU, Anand	AFB-37	AVT-2 SMBS – 5
6.	NC	Giant Bajra	AVT-2 SMBS – 6

22. IVT Lathyrus:			
S. N.	**Contributor**	**Entry name**	**Code name**
1.	BCKV, Kalyani	KL-5	IVT LATH –1
2.	NC	Mahateora	IVT LATH -2
3.	NC	Prateek	IVT LATH -3
4.	AAU, Jorhat	JCL 19-3	IVT LATH -4
5.	NC	Ratan	IVT LATH -5
6.	AAU, Jorhat	JCL-19-2	IVT LATH -6
7.	AAU, Jorhat	JCL-19-4	IVT LATH -7
8.	AAU, Jorhat	JCL-19-1	IVT LATH -8
23. VT Red clover:			
S. N.	**Contributor**	**Entry name**	**Code name**
1.	IGFRI, Jhansi	IGFRI RC -2016-1	VTRC – 1
2.	IGFRI, Jhansi	IGFRI RC -2016-4	VTRC - 2
3.	NC	PRC-3	VTRC - 3
4.	IGFRI, Jhansi	IGFRI RC -2016-6	VTRC - 4
5.	IGFRI, Jhansi	IGFRI RC -2016-5	VTRC - 5
6.	IGFRI, Jhansi	IGFRI RC -2016-2	VTRC – 6
7.	IGFRI, Jhansi	IGFRI RC -2016-3	VTRC – 7
24. VT White clover:			
S. N.	**Contributor**	**Entry name**	**Code name**
1.	Palampur	PWC-25	VTWC – 1
2.	Palampur	PWC-26	VTWC - 2
3.	IGFRI, Jhansi	JHWC-16-1	VTWC – 3
4.	IGFRI, Jhansi	JHWC-16-3	VTWC – 4
5.	NC	Palampur composite	VTWC - 5
6.	IGFRI, Jhansi	JHWC-16-2	VTWC – 6
Entries Code Agronomy (Rabi 2019-20)			
R-19-AST-6 (AVTB-2) (MC)			
S. N.	**Contributor**	**Entry name**	**Code name**
1.	IGFRI, Jhansi	JHB-17-2	AVTB-2- Agron -1
2.	ZC NWZ	BB-2	AVTB-2- Agron -2
3.	ZC NEZ	BB-3	AVTB-2- Agron -2
4.	PAU, Ludhiana	PC-91	AVTB-2- Agron -3
5.	NC	Wardan	AVTB-2- Agron -4
6.	IGFRI, Jhansi	JHB-17-1	AVTB-2- Agron -5

R-19-AST-7: AVT-2 Oat SC):			
S. N.	**Contributor**	**Entry name**	**Code name**
1.	PAU, Ludhiana	OL-1896	AVTO-2-SC – AGRON -1
2.	CCS HAU, Hisar	HFO-718	AVTO-2-SC – AGRON -2
3.	ZC HZ	SKO-96	AVTO-2-SC – AGRON -3
4.	ZC NWZ	RO-11-1	AVTO-2-SC – AGRON -3
5.	ZC CZ	JHO -2009-1	AVTO-2-SC – AGRON -3
6.	CCS HAU, Hisar	HFO-529	AVTO-2-SC – AGRON -4
7.	NC	Kent	AVTO-2-SC – AGRON -5
8.	NC	OS-6	AVTO-2-SC – AGRON -6
9.	JNKVV, Jabalpur	JO-05-09	AVTO-2-SC – AGRON -7
10.	SKUAST, Srinagar	SKO-240	AVTO-2-SC – AGRON -8
R-19-AST-8: AVT-2 Oat (Multi Cut):			
S. N.	**Contributor**	**Entry name**	**Code name**
1.	PAU, Ludhiana	OL-1874	AVTO-2-MC – AGRON -1
2.	NC	UPO-212	AVTO-2-MC – AGRON -2
3.	JNKVV, Jabalpur	JO-05-304	AVTO-2-MC – AGRON–3
4.	NC	RO-19	AVTO-2-MC – AGRON -4
R-19-AST-9: AVT-2 Oat (Dual):			
S. N.	**Contributor**	**Entry name**	**Code name**
1.	JNKVV, Jabalpur	JO-10-506	AVTO-2-D – AGRON -1
2.	NC	UPO-212	AVTO-2-D – AGRON -2
3.	NC	JHO-822	AVTO-2-D – AGRON -3
4.	CCS HAU, Hisar	HFO-611	AVTO-2-D – AGRON -4
5.	PAU, Ludhiana	OL-1906	AVTO-2-D – AGRON -5
6.	IGFRI, Jhansi	JHO-17-4	AVTO-2-D – AGRON -6
7.	PAU, Ludhiana	OL-1876-2	AVTO-2-D – AGRON -7
R-19-AST-10: AVTPM-2-1			
S. N.	**Contributor**	**Entry name**	**Code name**
1.	NC	Raj Bajra -1	AVT-2 SMB - Ag – 1
2.	Hytech India Seed Pvt Ltd	HTBH-4902	AVT-2 SMB - Ag – 2
3.	NC	Moti Bajra	AVT-2 SMB - Ag – 3
4.	Advanta UPL	ADV 0061	AVT-2 SMB - Ag – 4
5.	AAU, Anand	AFB-37	AVT-2 SMB - Ag – 5
6.	NC	Giant Bajra	AVT-2 SMB - Ag – 6

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 four entries along with one national check (Wardan) and three zonal checks in respective zones [BL-22 (HZ), Bundel Berseem-2 (NWZ, CZ) and Bundel Berseem-3 (NEZ)] was conducted at 20 centres located in four different zones (HZ, NWZ, NEZ, CZ) of the country.

For green forage yield (q/ha), entry HFB-16-10 (5.0%) showed superiority over the best check (BB-2) in NW zone. In NE zone, entries HFB-16-1 (52.7%), JB-07-15 (51.4%), BM-14 (41.3%), and HFB-16-10 (26.6%) showed superiority over the best check (Wardan). In central zone, only one entry JB-07-15 (3.6%) was marginally superior over the best check (BB-2). At all India level, entries HFB-16-1 (36.6%), BM-14 (34.9%), JB-07-15 (34.1%), and HFB-16-10 (32.4%) showed superiority over the national check Wardan. All other entries were below or at par or marginally superior in comparison to best check.

For dry matter yield (q/ha), entry BM-14 was superior over the best check by a margin of 10.1% in hill zone. In NW zone, two entries HFB-16-10, BM-14 were superior over the best check by margin of 8.5% and 8.1% respectively. In NE zone, entries JB-07-15, HFB-16-1, BM-14, and HFB-16-10 were superior over the best check by margin of 44.6%, 42%, 34.3% and 17.1% respectively. In central zone, JB-07-15 was superior over the best check by margin of 7.3%. At all India level, entries JB-07-15 (36.6%), BM-14 (36.3%), HFB-16-1 (35.7%), and HFB-16-10 (28.7%) showed superiority over the national check Wardan. All other entries were below or at par or marginally superior in comparison to best check.

For per day productivity, entry HFB-16-1 ranked first for GFY (q/ha/day) while entryJB-07-15 ranked first for DMY (q/ha/day).Entry JB-07-15 ranked firstfollowed by HFB-16-1 for the character plant height. For the character leafiness, entryHFB-16-10 ranked first followed by HFB-16-1.

In quality parameters, for crude protein yield (q/ha), JB-07-15 (13.1 q/ha) was best performer followed by HFB-16-1 (12.2 q/ha). For crude protein percentage, national check Wardan (17.3%) ranked first. For other quality parameters, entry JB-07-15 ranked first for ADF % and NDF %.

Table1.1 IVT Berseem: Initial Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	Hill Zone							North West Zone								
	Palam-pur	Sri-nagar	Rajo-uri	Alm-ora	Aver-age	Ra-nk	Super-iority	His-ar	Ludh-iana	Pant-nagar	Mee-rut	Udai-pur	**Bika-ner	Aver-age	Ra-nk	Super-iority
HFB-16-10	223.8	264.5	500.9	154.7	286.0	4		581.4	982.7	705.8	805.5	1619.3	235.6	938.9	1	5.0
JB-07-15	229.7	254.8	462.9	171.5	279.7	5		602.5	969.6	563.9	771.2	1506.8	289.9	882.8	5	
BM-14	279.7	270.2	531.6	183.0	316.1	1	2.9	557.5	1061.6	690.2	706.4	1551.2	339.9	913.4	3	2.1
HFB-16-1	271.4	296.3	438.4	178.4	296.1	3		559.5	995.7	666.7	730.4	1621.2	324.0	914.7	2	2.3
Wardan (NC)	96.4	351.2	395.2	80.7	230.9	6		578.4	648.8	511.1	689.4	905.5	213.9	666.6	6	
BL-22 (ZC-HZ)	244.4	312.4	488.6	184.0	307.4	2										
Bundel Berseem 2 (ZC-NWZ)								517.5	918.5	696.7	849.8	1489.9	286.1	894.5	4	
Mean	**224.2**	**291.6**	**469.6**	**158.7**	**286.0**			**566.1**	**929.5**	**639.1**	**758.8**	**1449.0**	**281.6**	**868.5**		
CD at 5%	**26.5**	**17.0**		**25.1**				**44.0**	**15.1**	**44.9**		**99.7**	**30.8**			
CV%	**7.8**	**3.2**		**10.4**				**5.1**	**1.1**	**11.2**		**4.6**				

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

Table1.1 IVT Berseem: Initial Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	North East Zone							
	Kalyani	Ranchi	Ayodhya	Pusa	**Bhubaneswar	Average	Rank	Superiority
HFB-16-10	364.5	283.0	275.7	546.0	125.7	367.3	4	26.6
JB-07-15	437.9	302.4	397.2	619.5	131.3	439.3	2	51.4
BM-14	422.1	318.1	316.8	583.0	160.6	410.0	3	41.3
HFB-16-1	380.8	327.1	375.5	688.5	143.8	443.0	1	52.7
Wardan (NC)	362.1	252.8	214.7	331.0	120.2	290.2	5	
Bundel Berseem 3 (ZC-NEZ)	361.7	266.0	214.9	285.5	136.1	282.0	6	
Mean	**388.2**	**291.6**	**299.1**	**508.9**	**136.3**	**371.9**		
CD at 5%	**16.2**	**30.0**	**32.3**	**33.9**	**10.1**			
CV%	**8.5**	**6.8**	**7.2**	**4.4**	**4.9**			

Table1.1 IVT Berseem: Initial Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Rah-uri	Jabal-pur	Rai pur	**Urulikan-chan	Aver-age	Ra-nk	Super-iority (%)	Aver-age	Ra-nk	Superi-ority (%)
HFB-16-10	813.3	401.7	1018.7	383.7	281.2	654.3	5		583.8	4	32.4
JB-07-15	722.3	420.6	1224.2	389.6	265.8	689.2	1	3.6	591.0	3	34.1
BM-14	833.3	377.4	1054.8	369.1	240.8	658.6	4		594.5	2	34.9
HFB-16-1	808.0	382.3	1135.3	379.9	250.4	676.4	2	1.7	602.1	1	36.6
Wardan (NC)	627.3	182.0	1059.0	208.0	66.3	519.1	6		440.8	5	
Bundel Berseem 2 (ZC-CZ)	793.5	416.2	1081.2	369.1	231.5	665.0	3				
Mean	**766.3**	**363.4**	**1095.5**	**349.9**	**222.7**	**643.8**			**562.4**		
CD at 5%	**66.3**	**56.9**	**13.6**	**27.7**	**48.9**						
CV%	**3.8**	**10.4**	**11.7**	**5.2**	**14.5**						

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	Sri-nagar	Rajo-uri	Alm-ora	Aver-age	Ra-nk	Superi-ority	His-ar	Ludh-iana	Pant-nagar	**Bika-ner	Aver-age	Ra-nk	Super-iority
HFB-16-10	38.7	44.7	85.0	27.8	49.1	4		82.8	149.8	108.6	35.7	113.7	1	8.5
JB-07-15	38.5	44.9	79.5	24.0	46.7	5		85.9	146.6	83.8	43.5	105.4	4	0.6
BM-14	47.4	47.2	96.8	36.6	57.0	1	10.1	79.5	157.9	102.7	42.2	113.4	2	8.1
HFB-16-1	47.1	50.5	73.8	32.1	50.9	3		76.9	151.8	96.1	39.7	108.3	3	3.2
Wardan (NC)	15.9	60.1	67.4	14.5	39.5	6		82.5	94.1	74.2	28.7	83.6	6	
BL-22 (ZC-HZ)	44.1	52.2	81.3	29.4	51.8	2								
Bundel Berseem 2 (ZC-NWZ)								73.8	135.4	105.3	42.8	104.8	5	
Mean	**38.6**	**50.0**	**80.6**	**27.4**	**49.2**			**80.2**	**139.3**	**95.1**	**38.8**	**104.9**		
CD at 5%	**5.4**	**5.0**		**4.5**				**6.7**	**3.5**	**6.1**	**4.4**			
CV%	**9.3**	**5.5**		**10.8**				**5.6**	**1.7**	**6.8**				

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

Entries	North East Zone							
	Kal-yani	Ran-chi	Ayod-hya	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk	Superi-ority (%)
HFB-16-10	68.8	47.1	56.4	28.5	102.6	60.7	4	17.1
JB-07-15	86.9	52.5	89.3	30.7	115.4	75.0	1	44.6
BM-14	83.3	51.8	68.1	37.2	107.9	69.6	3	34.3
HFB-16-1	74.2	54.4	82.6	34.6	122.4	73.6	2	42.0
Wardan (NC)	70.3	29.3	40.8	28.3	77.1	49.2	6	
Bundel Berseem 3 (ZC-NEZ)	70.2	44.7	45.0	31.5	67.7	51.8	5	
Mean	**75.6**	**46.6**	**63.7**	**31.8**	**98.9**	**63.3**		
CD at 5%	**9.6**	**1.8**	**7.1**	**2.7**	**23.3**			
CV%	**6.8**	**4.5**	**7.4**	**5.6**	**5.0**			

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

Entries	Central Zone								All India		
	Jha-nsi	Rah-uri	Jabal-pur	Rai-pur	**Urulikan-chan	Aver-age	Ra-nk	Superi-ority(%)	Aver-age	Ra-nk	Superi-ority(%)
HFB-16-10	136.4	76.7	150.4	63.8	45.6	106.8	4		79.3	4	28.7
JB-07-15	127.5	88.7	183.9	68.2	39.6	117.1	1	7.3	84.1	1	36.6
BM-14	136.2	72.8	159.2	59.2	36.6	106.8	4		84.0	2	36.3
HFB-16-1	136.9	73.5	170.3	60.0	33.2	110.2	2	1.0	83.6	3	35.7
Wardan (NC)	109.0	32.7	157.2	32.3	10.9	82.8	5		61.6	5	
Bundel Berseem 2 (ZC-CZ)	132.9	81.8	161.5	60.3	26.9	109.1	3				
Mean	**129.8**	**71.0**	**163.8**	**57.3**	**32.1**	**105.5**			**78.5**		
CD at 5%	**19.1**	**11.1**	**1.4**	**7.2**	**7.3**						
CV%	**6.4**	**10.4**	**7.9**	**8.4**	**14.9**						

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

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Kal-yani	Ayo-dhya	Bhuban-eswar	Pu-sa	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
HFB-16-10	1.38	1.39	3.63	5.09	4.71	2.37	2.29	2.12	4.01	3.65	2.44	3.88	3.08	4
JB-07-15	1.42	1.72	3.77	5.02	3.76	2.84	3.31	2.08	4.60	3.82	2.31	3.94	3.22	3
BM-14	1.72	2.01	3.48	5.50	4.60	2.74	2.64	2.75	4.23	3.43	2.09	3.73	3.24	2
HFB-16-1	1.67	1.92	3.50	5.16	4.44	2.47	3.12	2.44	5.02	3.48	2.18	3.84	3.27	1
Wardan (NC)	0.59	1.27	3.61	3.36	3.40	2.35	1.77	1.99	2.47	1.65	0.58	2.10	2.10	5
BL-22 (ZC-HZ)	1.50													
Bundel Berseem 2 (ZC-NWZ)		1.69	3.24	4.76	4.64									
Bundel Berseem 3 (ZC-NEZ)						2.35	1.79	2.18	2.12					
Bundel Berseem 2 (ZC-CZ)										3.78	2.01	3.73		
Mean	**1.38**	**1.67**	**3.54**	**4.82**	**4.26**	**2.52**	**2.49**	**2.26**	**3.74**	**3.30**	**1.94**	**3.54**	**2.98**	

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Kal-yani	Ran-chi	Ayod-hya	Bhuban-eswar	Pu-sa	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
HFB-16-10	0.24	0.21	0.52	0.78	0.72	0.45	0.40	0.44	0.48	0.33	0.70	0.40	0.64	0.49	3
JB-07-15	0.24	0.26	0.54	0.76	0.56	0.56	0.48	0.69	0.49	0.39	0.81	0.34	0.69	0.52	1
BM-14	0.29	0.25	0.50	0.82	0.68	0.54	0.41	0.53	0.64	0.38	0.66	0.32	0.60	0.51	2
HFB-16-1	0.29	0.24	0.48	0.79	0.64	0.48	0.39	0.64	0.59	0.49	0.67	0.29	0.61	0.51	2
Wardan (NC)	0.10	0.17	0.52	0.49	0.49	0.46	0.40	0.31	0.47	0.20	0.30	0.09	0.33	0.33	4
BL-22 (ZC-HZ)	0.27														
Bundel Berseem 2 (ZC-NWZ)		0.25	0.46	0.70	0.70										
Bundel Berseem 3 (ZC-NEZ)						0.46	0.49	0.35	0.50	0.17					
Bundel Berseem 2 (ZC-CZ)											0.74	0.23	0.61		
Mean	**0.24**	**0.23**	**0.50**	**0.72**	**0.63**	**0.49**	**0.43**	**0.49**	**0.53**	**0.33**	**0.65**	**0.28**	**0.58**	**0.47**	

Table1.5 IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein Yield (q/ha)

Entries	Palam-pur	Bika-ner	Ludh-iana	His-ar	Kal-yani	Ran-chi	Ayod-hya	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Aver-age	Ra-nk
HFB-16-10	7.2	6.9	26.7	15.6	9.7	4.9	9.4	4.1	13.8	21.5	9.6	11.8	4
JB-07-15	7.4	6.0	29.2	16.4	10.1	5.0	15.6	4.3	15.5	25.5	8.7	13.1	1
BM-14	9.3	7.5	26.5	15.3	9.9	4.1	11.6	5.2	13.1	22.7	7.7	12.1	3
HFB-16-1	9.5	5.6	27.3	14.7	10.3	5.2	14.2	4.9	12.0	24.2	6.1	12.2	2
Wardan (NC)	3.0	4.9	17.1	15.2	11.2	5.1	6.7	3.9	6.1	22.3	2.1	8.9	5
BL-22 (ZC-HZ)	8.6												
Bundel Berseem 2 (ZC-NWZ)		6.8	22.7	13.9									
Bundel Berseem 3 (ZC-NEZ)					8.8	4.4	7.6	4.4					
Bundel Berseem 2 (ZC-CZ)									12.6	22.7	5.8		
Mean	**7.5**	**6.3**	**24.9**	**15.2**	**10.0**	**4.8**	**10.9**	**4.5**	**12.2**	**23.2**	**6.7**	**11.6**	

Table1.6 IVT Berseem: Initial Varietal Trial in Berseem: Crude Protein (%)

Entries	Palam-pur	Bika-ner	Ludh-iana	His-ar	Kal-yani	Ran-chi	Ayod-hya	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Aver-age	Ra-nk
HFB-16-10	18.6	17.3	17.8	18.9	14.1	18.2	16.7	14.4	17.9	14.3	21.1	17.2	2
JB-07-15	19.3	13.8	19.9	19.1	11.6	16.5	17.5	13.9	17.5	13.9	21.9	16.8	3
BM-14	19.7	17.9	16.8	19.2	11.9	14.5	17.0	14.1	18.0	14.3	21.1	16.8	3
HFB-16-1	20.1	14.0	18.0	19.1	13.9	17.7	17.2	14.1	16.3	14.2	18.4	16.6	4
Wardan (NC)	18.6	17.2	18.2	18.4	15.9	19.0	16.5	13.9	18.6	14.2	19.5	17.3	1
BL-22 (ZC-HZ)	19.5												
Bundel Berseem 2 (ZC-NWZ)		15.9	16.8	18.9									
Bundel Berseem 3 (ZC-NEZ)					12.5	17.3	16.9	14.1					
Bundel Berseem 2 (ZC-CZ)									15.5	14.1	21.5		
Mean	**19.3**	**16.0**	**17.9**	**18.9**	**13.3**	**17.2**	**17.0**	**14.1**	**17.3**	**14.1**	**20.6**	**16.9**	

Table1.7 IVT Berseem: Initial Varietal Trial in Berseem: Plant Height (CM)

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Kal-yani	Ran-chi	Ayod-hya	Bhuban-eswar	Pu-sa	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
HFB-16-10	56.3	51.9	41.5	60.1	57.4	62.6	63.8	65.4	48.1	47.6	68.5	75.8	62.0	42.1	54.5	44.4	56.4	4
JB-07-15	65.5	44.9	54.0	61.2	62.6	66.6	64.9	74.7	51.8	54.3	69.8	84.9	64.4	53.1	52.3	51.9	61.1	1
BM-14	64.0	58.5	50.0	57.4	62.1	70.8	62.8	71.9	45.3	45.0	73.5	77.1	59.9	39.1	46.5	44.3	58.0	3
HFB-16-1	61.3	59.2	53.3	60.9	57.3	64.9	64.6	70.4	55.7	47.9	71.5	77.2	60.3	51.3	49.3	44.0	59.3	2
Wardan (NC)	59.0	53.7	35.5	59.9	57.4	62.5	57.9	62.4	57.7	50.2	67.3	69.4	60.3	50.3	45.2	40.1	55.5	5
BL-22 (ZC-HZ)	70.5	57.5																
Bundel Berseem 2 (ZC-NWZ)			51.5	57.7	62.5	67.2	64.1											
Bundel Berseem 3 (ZC-NEZ)								68.2	44.8	47.9	72.3	82.0						
Bundel Berseem 2 (ZC-CZ)													62.9	48.0	45.3	47.3		
Mean	**62.8**	**54.3**	**47.6**	**59.5**	**59.9**	**65.8**	**63.0**	**68.8**	**50.6**	**48.8**	**70.5**	**77.7**	**61.6**	**47.3**	**48.8**	**45.3**	**58.1**	

Table1.8 IVT Berseem: Initial Varietal Trial in Berseem: Leaf Stem Ratio

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Kal-yani	Ran-chi	Ayod-hya	Pu-sa	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
HFB-16-10	0.45	0.85	1.13	1.39	1.29	0.88	0.92	0.72	0.69	0.60	0.92	0.66	0.75	0.75	0.52	0.83	1
JB-07-15	0.34	0.75	0.82	1.08	0.98	0.80	0.90	0.68	0.63	0.72	0.97	0.47	0.92	0.75	0.49	0.75	4
BM-14	0.41	0.79	0.93	1.06	0.96	0.98	0.89	0.69	0.68	0.64	1.18	0.62	0.80	0.70	0.57	0.79	3
HFB-16-1	0.43	0.70	0.76	1.01	1.11	0.89	0.91	0.84	0.82	0.76	1.14	0.58	0.87	0.81	0.52	0.81	2
Wardan (NC)	0.44	0.88	0.94	1.18	1.10	0.84	0.93	0.75	0.66	0.58	0.87	0.66	0.81	0.67	0.57	0.79	3
BL-22 (ZC-HZ)	0.45	0.79															
Bundel Berseem 2 (ZC-NWZ)			0.85	1.39	1.09	0.86											
Bundel Berseem 3 (ZC-NEZ)							0.93	0.73	0.65	0.62	1.09						
Bundel Berseem 2 (ZC-CZ)												0.54	0.79	0.67	0.48		
Mean	**0.42**	**0.79**	**0.91**	**1.19**	**1.09**	**0.88**	**0.91**	**0.73**	**0.69**	**0.65**	**1.03**	**0.59**	**0.82**	**0.73**	**0.53**	**0.80**	

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

Entries	ADF (%)		NDF (%)		IVDMD (%)			
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Hisar	Average	Rank
HFB-16-10	36.4	4	58.4	5	65.4	54.7	60.1	3
JB-07-15	33.2	1	55.8	1	60.4	59.6	60.0	4
BM-14	36.4	4	58.0	4	63.7	57.2	60.5	2
HFB-16-1	34.5	2	56.8	3	59.4	58.2	58.8	6
Wadan (NC)	34.9	3	56.0	2	58.7	60.2	59.5	5
Bundel Berseem 2 (ZC-NWZ-CZ)	37.1	5	60.2	6	65.1	61.9	63.5	1
Mean	**35.4**		**57.5**		**62.1**	**58.6**	**60.4**	

2. AVTB-1: FIRST ADVANCED VARIETAL TRIAL IN BERSEEM (Reference tables 2.1 to 2.9)

A FirstAdvanced Varietal Trial in Berseem comprising of five entries along with one national check (Wardan) and three zonal checks [BL-22 (HZ), BB-2 (NWZ, CZ)] was conducted at 15 centres located in three zones (Hill, North West and Central zone). There were 3 locations in Hill, 7 locations in NW and 5 in NE zone.
For green forage yield (q/ha), entry JHB-18-1 (6.3%) was superior over the best check (BB-2) in central zone. At all India level, entries JHB-18-1(27.1%), BM-12 (26.3%), JHB-18-2 (26.2%), JB-06-11 (25.6%), and HFB-15-5 (20.5%) showed superiority over the national check Wardan.

For dry matter yield (q/ha), entries HFB-15-5 (22.4%), JHB-18-1 (10.9%), BM-12 (7.1%), JB-06-11 (5.6%), and JHB-18-2 (4.9%) were superior over the best check in hill zone. In NW zone, JB-06-11 was superior by margin of 5.8% over the best check. In central zone, entries JHB-18-1(7.9%), JHB-18-2 (5.1%), JB-06-11 (4.8%) were superior over the best check. At all India level, entries JB-06-11 (27.1%), BM-12 (21%), JHB-18-1 (20.4%), JHB-18-2 (20.3%), and HFB-15-5 (19.2%) were superior over the national check Wardan. All other entries were below or at par or marginally superior in comparison to best check.

In green and dry forage production potential (q/ha/day), entry JB-06-11 ranked first. Entry JHB-18-1 ranked first for the character plant height. For leafiness, entry BM-12 ranked first.

In quality parameters, for crude protein yield (q/ha), JB-06-11 (18.5q/ha) was best performer followed by JHB-18-1 (18.1 q/ha). For crude protein percentage, entry JHB-18-1 (19.6%) ranked first. For other quality parameters, entry HFB-15-5 ranked first for IVDMD %.

Table 2.1 AVT-1: First Advanced Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	Hill Zone						North West Zone									
	Palam-pur	Sri-nagar	Rajo-uri	Aver-age	Ra-nk	Super-iority%	Pant-nagar	His-ar	Ludh-iana	Udai-pur	Mee-rut	**Bika-ner	**Jal-ore	Aver-age	Ra-nk	Superi-ority%
JHB-18-2	288.2	285.0	379.9	317.7	4		630.3	634.4	967.7	1678.5	791.3	306.4	38.1	940.4	4	
JHB-18-1	290.1	311.2	409.9	337.1	1	3.2	652.1	602.6	900.8	1653.5	815.4	263.1	67.5	924.9	5	
BM-12	264.7	294.1	327.4	295.4	7		641.7	627.9	1047.9	1654.9	804.1	345.5	50.3	955.3	1	0.2
HFB-15-5	313.4	324.1	363.0	333.5	2	2.2	625.6	597.2	1031.8	1461.9	676.1	302.2	45.3	878.5	6	
JB-06-11	288.8	274.9	349.9	304.5	5		702.3	685.3	1046.5	1506.3	766.9	289.4	48.3	941.5	3	
Wardan (NC)	175.8	341.6	389.8	302.4	6		695.8	588.2	696.1	924.6	689.7	110.5	31.1	718.9	7	
BL-22 (ZC-HZ)	264.7	264.9	449.8	326.5	3											
BB-2 (ZC-NWZ)							665.4	626.9	1042.6	1638.2	795.7	272.1	57.2	953.8	2	
Mean	**269.4**	**299.4**	**381.4**	**316.7**			**659.0**	**623.2**	**961.9**	**1502.6**	**762.7**	**269.9**	**48.3**	**901.9**		
CD at 5%	**31.2**	**20.5**					**56.8**	**56.9**	**21.1**	**161.4**		**42.5**	**6.2**			
CV%	**6.5**	**3.9**					**11.3**	**5.1**	**1.2**	**6.0**			**7.1**			

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

Table 2.1 AVT-1: First Advanced Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	Central Zone								All India		
	Jhansi	Rahuri	Jabalpur	Raipur	**Urulikanchan	Average	Rank	Superiority%	Average	Rank	Superiority%
JHB-18-2	800.0	430.1	854.6	352.8	181.7	609.4	3	3.1	674.4	3	26.2
JHB-18-1	748.1	455.2	996.2	312.5	211.6	628.0	1	6.3	679.0	1	27.1
BM-12	745.3	439.9	932.7	320.8	258.3	609.7	2	3.2	675.1	2	26.3
HFB-15-5	731.1	396.2	875.4	330.6	183.5	583.3	6		643.9	5	20.5
JB-06-11	698.0	479.4	916.0	338.9	158.4	608.1	4	2.9	671.1	4	25.6
Wardan (NC)	591.2	173.2	916.0	230.0	100.4	477.6	7		534.3	6	
BB-2 (ZC-CZ)	676.2	419.7	923.3	344.4	198.9	590.9	5				
Mean	**712.9**	**399.1**	**916.3**	**318.6**	**184.7**	**586.7**			**646.3**		
CD at 5%	**156.0**	**63.6**	**205.2**	**62.1**	**37.6**						
CV%	**7.6**	**9.0**	**12.6**	**11.0**	**11.3**						

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

Table 2.2: AVT-1: First Advanced Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	Hill Zone					North West Zone							
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority%	Pant-nagar	His-ar	Ludh-iana	**Bika-ner	**Jal-ore	Aver-age	Ra-nk	Super-iority%
JHB-18-2	45.3	48.7	47.0	5	4.9	103.6	89.9	146.8	54.4	10.0	113.4	4	
JHB-18-1	47.8	51.6	49.7	2	10.9	115.2	80.4	129.1	35.8	16.9	108.2	6	
BM-12	46.0	50.0	48.0	3	7.1	116.4	84.6	158.9	49.4	13.2	120.0	3	
HFB-15-5	54.7	54.9	54.8	1	22.4	104.8	73.6	158.2	48.0	11.8	112.2	5	
JB-06-11	49.8	44.9	47.3	4	5.6	132.2	97.0	158.7	47.6	12.5	129.3	1	5.8
Wardan (NC)	29.3	57.5	43.4	7		121.5	80.5	98.6	20.1	8.7	100.2	7	
BL-22 (ZC-HZ)	45.1	44.5	44.8	6									
BB-2 (ZC-NWZ)						118.3	88.6	159.9	43.8	14.8	122.3	2	
Mean	**45.4**	**50.3**	**47.9**			**116.0**	**84.9**	**144.3**	**42.7**	**12.6**	**115.1**		
CD at 5%	**4.5**	**5.1**				**12.9**	**11.9**	**4.5**	**6.8**	**1.7**			
CV%	**5.6**	**5.7**				**13.2**	**7.8**	**1.8**		**7.5**			

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

Table 2.2: AVT-1: First Advanced Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	Central Zone								All India		
	Jha-nsi	Rah-uri	Jabal-pur	Rai-pur	**Urulikan-chan	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
JHB-18-2	142.8	83.6	122.4	59.4	36.3	102.0	2	5.1	93.6	4	20.3
JHB-18-1	130.5	91.0	145.0	52.3	38.6	104.7	1	7.9	93.7	3	20.4
BM-12	122.0	82.9	133.4	53.0	46.3	97.8	4	0.7	94.1	2	21.0
HFB-15-5	126.2	79.2	126.0	56.7	30.6	97.0	6		92.7	5	19.2
JB-06-11	113.5	103.8	129.5	60.4	25.9	101.8	3	4.8	98.9	1	27.1
Wardan (NC)	102.9	33.6	133.6	42.5	15.3	78.2	7		77.8	6	
BB-2 (ZC--CZ)	109.5	82.2	132.9	63.8	35.3	97.1	5				
Mean	**121.0**	**79.5**	**131.8**	**55.4**	**32.6**	**96.9**			**91.8**		
CD at 5%	**28.2**	**12.4**	**29.4**	**5.7**	**8.2**						
CV%	**8.1**	**8.8**	**12.5**	**10.4**	**11.9**						

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

Table 2.3 AVT-1: First Advanced Varietal Trial in Berseem: Green Forage Yield (q/ha/day)

Entries	Palampur	Pantnagar	Hisar	Ludhiana	Rahuri	Raipur	**Urulikanchan	**Bikaner	Average	Rank
JHB-18-2	1.78	4.20	3.97	5.01	3.91	3.43	1.58	2.17	3.72	2
JHB-18-1	1.79	4.35	3.77	4.67	4.14	3.03	1.84	1.87	3.62	4
BM-12	1.63	4.23	3.93	5.43	4.00	3.11	2.24	2.13	3.72	2
HFB-15-5	1.94	4.17	3.73	5.35	3.60	3.21	1.59	1.87	3.67	3
JB-06-11	1.78	4.68	4.28	5.42	4.36	3.29	1.38	2.05	3.97	1
Wardan (NC)	1.08	4.64	3.68	3.61	1.57	2.23	0.87	0.78	2.80	5
BL-22 (ZC-HZ)	1.63									
BB-2 (ZC-NWZ)		4.44	3.92	5.40				1.93		
BB-2 (ZC-CZ)					3.82	3.34	1.73			
Mean	**1.66**	**4.39**	**3.90**	**4.98**	**3.63**	**3.09**	**1.60**	**1.83**	**3.58**	

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

Table 2.4 AVT-1: First Advanced Varietal Trial in Berseem: Dry Matter Yield (q/ha/day)

Entries	Palampur	Pantnagar	Hisar	Ludhiana	Rahuri	Raipur	**Urulikanchan	**Bikaner	Average	Rank
JHB-18-2	0.28	0.69	0.56	0.76	0.76	0.58	0.32	0.40	0.60	3
JHB-18-1	0.29	0.77	0.50	0.67	0.83	0.51	0.33	0.25	0.59	4
BM-12	0.28	0.78	0.53	0.82	0.75	0.51	0.40	0.31	0.61	2
HFB-15-5	0.34	0.70	0.46	0.82	0.72	0.55	0.27	0.30	0.60	3
JB-06-11	0.31	0.88	0.61	0.82	0.94	0.59	0.23	0.34	0.69	1
Wardan (NC)	0.18	0.81	0.50	0.51	0.31	0.41	0.13	0.14	0.45	5
BL-22 (ZC-HZ)	0.28									
BB-2 (ZC-NWZ)		0.79	0.55	0.83				0.31		
BB-2 (ZC-CZ)					0.75	0.62	0.31			
Mean	**0.28**	**0.77**	**0.53**	**0.75**	**0.72**	**0.54**	**0.28**	**0.29**	**0.59**	

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

Table 2.5 AVT-1: First Advanced Varietal Trial in Berseem: Crude Protein Yield (q/ha)

Entries	Palampur	Ludhiana	Hisar	Rahuri	Jabalpur	**Bikaner	**Urulikanchan	Average	Rank
JHB-18-2	8.6	27.9	18.0	15.2	17.4	12.1	7.3	17.4	4
JHB-18-1	9.7	24.1	16.7	19.4	20.7	7.6	8.1	18.1	2
BM-12	9.1	27.5	17.6	16.4	19.2	11.8	9.6	18.0	3
HFB-15-5	10.4	30.7	14.5	11.9	17.7	11.1	6.2	17.0	5
JB-06-11	9.4	29.0	19.6	15.1	19.4	9.4	5.5	18.5	1
Wardan (NC)	5.7	17.7	17.9	6.6	18.7	4.2	3.3	13.3	6
BL-22 (ZC-HZ)	8.8								
BB-2 (ZC-NWZ)		29.3	20.1			9.2			
BB-2 (ZC-CZ)				13.5	18.8		7.5		
Mean	**8.8**	**26.6**	**17.8**	**14.0**	**18.8**	**9.3**	**6.8**	**17.1**	

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

Table 2.6 AVT-1: First Advanced Varietal Trial in Berseem: Crude Protein (%)

Entries	Palampur	Bikaner	Ludhiana	Hisar	Rahuri	Jabalpur	Urulikanchan	Average	Rank
JHB-18-2	19.0	21.4	19.0	20.0	18.2	14.2	20.2	18.9	4
JHB-18-1	20.4	21.2	18.7	20.7	21.3	14.3	20.9	19.6	1
BM-12	19.8	23.8	17.3	20.8	19.8	14.4	20.8	19.5	2
HFB-15-5	19.0	23.1	19.4	19.7	15.1	14.0	20.2	18.6	5
JB-06-11	19.0	19.8	18.3	20.2	14.6	15.0	21.4	18.3	6
Wardan (NC)	19.3	21.0	18.0	22.3	19.7	14.0	21.7	19.4	3
BL-22 (ZC-HZ)	19.5								
BB-2 (ZC-NWZ)		21.0	18.3	22.7					
BB-2 (ZC-CZ)					16.4	14.1	21.3		
Mean	**19.4**	**21.6**	**18.4**	**20.9**	**17.9**	**14.3**	**20.9**	**19.1**	

Table 2.7 AVT-1: First Advanced Varietal Trial in Berseem: Plant Height (cm)

Entries	Palam-pur	Sri-nagar	Pant-nagar	Bika-ner	His-ar	Ludh-iana	Udai-pur	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
JHB-18-2	64.3	58.8	74.3	25.4	66.0	53.7	66.4	63.8	41.6	59.0	61.1	57.7	4
JHB-18-1	65.0	77.6	69.9	29.4	91.0	57.4	69.0	63.1	55.3	57.8	59.2	63.2	1
BM-12	61.7	62.8	70.6	37.6	85.7	58.8	65.5	64.4	50.6	56.1	54.5	60.8	3
HFB-15-5	67.0	71.8	72.3	43.6	72.0	56.4	67.4	63.8	4.3	56.0	56.2	57.3	5
JB-06-11	61.7	64.2	79.8	39.0	73.7	61.4	70.5	64.8	47.5	55.1	53.2	61.0	2
Wardan (NC)	64.7	73.2	68.6	18.6	74.3	55.5	60.4	60.5	45.4	56.8	50.5	57.1	6
BL-22 (ZC-HZ)	69.0	52.6											
BB-2 (ZC-NWZ)			70.3	25.8	84.7	56.4	67.0						
BB-2 (ZC-CZ)								65.9	48.4	60.6	58.3		
Mean	**64.8**	**65.8**	**72.3**	**31.3**	**78.2**	**57.1**	**66.6**	**63.8**	**41.9**	**57.3**	**56.1**	**59.5**	

Table 2.8 AVT-1: First Advanced Varietal Trial in Berseem: Leaf Stem Ratio

Entries	Palam-pur	Sri-nagar	Pant-nagar	His-ar	Ludh-iana	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	**Bika-ner	Aver-age	Ra-nk
JHB-18-2	0.41	0.68	1.07	0.69	0.98	0.54	0.72	0.73	0.60	1.33	0.71	4
JHB-18-1	0.50	0.81	0.72	0.71	1.01	0.46	0.89	0.73	0.49	2.00	0.70	5
BM-12	0.59	0.86	0.74	0.71	1.05	0.59	0.84	0.76	0.77	1.46	0.77	1
HFB-15-5	0.61	0.75	0.77	0.77	1.04	0.66	0.77	0.75	0.56	1.74	0.74	3
JB-06-11	0.55	0.72	0.93	0.68	1.19	0.53	0.80	0.75	0.69	1.19	0.76	2
Wardan (NC)	0.46	0.90	1.26	0.76	0.94	0.54	0.77	0.74	0.49	5.42	0.76	2
BL-22 (ZC-HZ)	0.51	0.77										
BB-2 (ZC-NWZ)			0.89	0.85	1.21					3.05		
BB-2 (ZC-CZ)						0.48	0.81	0.75	0.54			
Mean	**0.52**	**0.78**	**0.91**	**0.74**	**1.06**	**0.55**	**0.80**	**0.74**	**0.59**	**2.31**	**0.74**	

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

Table 2.9 AVT-1: First Advanced Varietal Trial in Berseem: ADF (%), NDF (%) & IVDMD (%)

Entries	NDF (%)					ADF (%)					IVDMD (%)				
	Rah-uri	Palam-pur	Ludh-iana	Aver-age	Ra-nk	Rah-uri	Palam-pur	Ludh-iana	Aver-age	Ra-nk	Ludh-iana	His-ar	Rah-uri	Aver-age	Ra-nk
JHB-18-2	48.5	61.4	60.4	56.8	5	41.2	56.0	37.4	44.9	6	57.2	56.1	56.8	56.7	5
JHB-18-1	44.3	61.0	62.8	56.0	3	35.9	56.6	37.9	43.5	5	55.2	59.5	60.9	58.5	4
BM-12	39.2	63.4	64.2	55.6	2	32.2	56.0	40.6	42.9	3	58.9	50.0	63.8	57.6	6
HFB-15-5	42.5	61.8	63.9	56.1	4	35.4	55.8	36.8	42.7	2	58.2	68.3	61.3	62.6	1
JB-06-11	47.1	62.6	63.4	57.7	6	38.3	53.8	36.8	43.0	4	56.4	61.0	59.0	58.8	3
Wardan (NC)	39.5	62.2	61.5	54.4	1	32.4	55.4	37.9	41.9	1	56.9	60.4	63.6	60.3	2
BL-22 (ZC-HZ)		62.4					55.0								
BB-2 (ZC-NWZ)			61.5					38.4			56.7	53.7			
BB-2 (ZC-CZ)	45.1					38.7							58.7		
Mean	**43.7**	**62.1**	**62.5**	**56.1**		**36.3**	**55.5**	**38.0**	**43.1**	**3.5**	**57.1**	**58.4**	**60.6**	**59.1**	

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

(Reference tables 3.1 to 3.9)

A Second Advanced Varietal Trial in Berseem comprising of three entries along with one national check (Wardan) and two zonal checks [BB-2 (NWZ), BB-3 (NEZ)] was conducted at 12 centres located in two zones (North West and North East zone). There were 7 locations in NW and 5 in NE zone.

For green forage yield (q/ha), entry JHB-17-2 was superior over the best check (BB-2) by margin of 6.9% in NW zone. In NE zone, entries JHB-17-2, PC-91, JHB-17-1 were superior over the best check by margin of 27.3%, 21.6%, and 16.6% respectively. At all India level, entries JHB-17-2 (43.7%), JHB-17-1 (32.2%), PC-91 (30.1%) were superior over the national check Wardan.

For dry matter yield (q/ha), entries JHB-17-2 (18.4%), PC-91 (14.2%) were superior over the best check (BB-3) by margin of 18.4% and 14.2% respectively in NE zone. At all India level, entries JHB-17-2 (39.8%), PC-91 (38.9%), and JHB-17-1 (24.6%) were superior over the national check Wardan.

In green and dry forage production potential (q/ha/day), entry JHB-17-2 ranked first followed by PC-91. Entry JHB-17-2 ranked first for the character plant height. For leafiness, national check Wardan ranked first.

In quality parameters, for crude protein yield (q/ha), JHB-17-2 (13.8q/ha) was best performer followed by PC-91 (13.1 q/ha). For crude protein percentage, national check Wardan (17.9%) ranked first. For other quality parameters, entry PC-91 ranked first for IVDMD %.

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

(Reference tables 4.1)

A Second Advanced Varietal Trial for Seed in Berseem comprising of three entries along with one national check (Wardan) and two zonal checks [BB-2 (NWZ), BB-3 (NEZ)] was conducted at 6 centres located in two zones (North West and North East zone). There were 3 locations in NW and 3 in NE zone.

For seed yield (q/ha), entry PC-91 has same productivity as zonal check BB-2 (4.1q/ha) in NW zone. In NE zone, entriesJHB-17-1 and JHB-17-2 were superiorby margin of 14.2% and 6.3% respectively over the best check Wardan. At all India level, entries JHB-17-1 (21.5%), PC-91 (17.5%), and JHB-17-2 (17.0%) were superior over the national check Wardan.

Table 3.1 AVT-2: Second Advanced Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	North West Zone								
	Pantnagar	Hisar	Ludhiana	Udaipur	Meerut	**Bikaner	Average	Rank	Superiority%
JHB-17-2	736.6	685.2	1003.6	1662.9	976.1	335.5	1012.9	1	6.9
PC-91	785.5	591.1	1039.2	1405.7	676.5	377.4	899.6	4	
JHB-17-1	712.5	623.4	839.2	1667.0	823.2	335.6	933.1	3	
Wardan (NC)	509.8	547.4	717.4	997.5	732.1	205.7	700.8	5	
BB-2 (ZC-NWZ)	720.0	667.8	1024.6	1468.2	857.1	361.2	947.5	2	
Mean	**692.9**	**623.0**	**924.8**	**1440.3**	**813.0**	**323.1**	**898.8**		
CD at 5%	**38.7**	**55.2**	**15.9**	**93.9**		**60.8**			
CV%	**7.5**	**5.7**	**1.1**	**4.2**					

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

Table 3.1 AVT-2: Second Advanced Varietal Trial in Berseem: Green Forage Yield (q/ha)

Entries	North East Zone								All India		
	Kalyani	Ranchi	Ayodhya	Pusa	**Bhubaneswar	Average	Rank	Superiority%	Average	Rank	Superiority%
JHB-17-2	327.9	305.5	502.3	584.0	171.9	429.9	1	27.3	753.8	1	43.7
PC-91	338.6	316.7	387.4	600.5	156.8	410.8	2	21.6	682.4	3	30.1
JHB-17-1	341.3	301.8	381.3	551.5	146.9	394.0	3	16.6	693.5	2	32.2
Wardan (NC)	279.8	289.3	326.2	322.5	143.3	304.4	5		524.7	4	
BB-3 (ZC-NEZ)	261.1	278.9	399.1	412.0	137.0	337.8	4				
Mean	**309.7**	**298.4**	**399.2**	**494.1**	**151.2**	**375.4**			**663.6**		
CD at 5%	**11.4**	**23.1**	**49.1**	**55.7**	**23.1**						
CV%	**9.3**	**5.0**	**8.0**	**7.3**	**9.9**						

Table 3.2 AVT-2: Second Advanced Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	North West Zone						
	Pantnagar	Hisar	Ludhiana	**Bikaner	Average	Rank	Superiority%
JHB-17-2	125.1	99.2	153.0	42.9	125.8	2	1.1
PC-91	138.6	85.7	161.1	49.8	128.5	1	3.2
JHB-17-1	119.9	96.2	126.9	43.6	114.3	4	
Wardan (NC)	83.3	79.1	101.3	26.5	87.9	5	
BB-2 (ZC-NWZ)	126.2	93.4	153.7	45.1	124.4	3	
Mean	**127.9**	**93.7**	**147.0**	**45.4**	**122.9**		
CD at 5%	**7.3**	**6.6**	**5.7**	**7.8**			
CV%	**9.5**	**4.6**	**2.7**				

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

Table 3.2 AVT-2: Second Advanced Varietal Trial in Berseem: Dry Matter Yield (q/ha)

Entries	North East Zone								All India		
	Kal-yani	Ran-chi	Ayod-hya	Pu-sa	**Bhuban-eswar	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
JHB-17-2	65.1	69.6	107.9	107.8	40.0	87.6	1	18.4	104.0	1	39.8
PC-91	67.5	73.3	79.4	117.8	33.9	84.5	2	14.2	103.3	2	38.9
JHB-17-1	67.9	67.7	72.4	97.5	37.0	76.4	3	3.2	92.6	3	24.6
Wardan (NC)	54.8	66.3	63.5	72.3	33.6	64.2	5		74.4	4	
BB-3 (ZC-NEZ)	51.4	63.3	83.6	97.7	32.8	74.0	4				
Mean	**66.8**	**68.1**	**86.6**	**107.7**	**37.0**	**82.8**			**100.0**		
CD at 5%	**5.4**	**NS**	**10.1**	**15.7**	**4.1**						
CV%	**7.3**	**5.8**	**8.1**	**7.3**	**7.4**						

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

Table 3.3 AVT-2: Second Advanced Varietal Trial in Berseem: Green Forage Yield (q/ha/day)

Entries	Pantnagar	Bikaner	Hisar	Ludhiana	Kalyani	Ayodhya	Bhubaneswar	Pusa	Average	Rank
JHB-17-2	4.91	2.21	4.28	5.20	2.78	4.22	2.69	4.11	3.80	1
PC-91	5.24	2.48	3.69	5.38	2.35	3.25	2.85	4.23	3.68	2
JHB-17-1	4.75	2.21	3.90	4.35	2.37	3.20	2.33	3.88	3.37	3
Wardan (NC)	3.40	1.41	3.42	3.72	1.94	2.74	2.39	2.27	2.66	4
BB-2 (ZC-NWZ)	4.80	2.47	4.18	5.31						
BB-3 (ZC-NEZ)					1.81	3.34	2.32	2.90		
Mean	**4.62**	**2.16**	**3.89**	**4.79**	**2.25**	**3.35**	**2.52**	**3.48**	**3.38**	

Table 3.4 AVT-2: Second Advanced Varietal Trial in Berseem: Dry Matter Yield (q/ha/day)

Entries	Pantnagar	Bikaner	Hisar	Ludhiana	Kalyani	Ranchi	Ayodhya	Bhubaneswar	Pusa	Average	Rank
JHB-17-2	0.83	0.28	0.62	0.79	0.45	0.48	0.84	0.63	0.48	0.60	1
PC-91	0.92	0.33	0.54	0.83	0.47	0.42	0.62	0.62	0.48	0.58	2
JHB-17-1	0.80	0.29	0.60	0.66	0.47	0.41	0.56	0.59	0.36	0.53	3
Wardan (NC)	0.56	0.18	0.49	0.53	0.38	0.44	0.49	0.56	0.23	0.43	4
BB-2 (ZC-NWZ)	0.84	0.31	0.58	0.80							
BB-3 (ZC-NEZ)					0.36	0.39	0.65	0.56	0.27		
Mean	**0.79**	**0.28**	**0.57**	**0.72**	**0.43**	**0.43**	**0.63**	**0.59**	**0.36**	**0.53**	

Table 3.5 AVT-2: Second Advanced Varietal Trial in Berseem: Crude Protein Yield (q/ha)

Entries	Bikaner	Ludhiana	Hisar	Kalyani	Ranchi	Ayodhya	Bhubaneswar	Average	Rank
JHB-17-2	6.2	29.1	21.4	9.1	6.1	18.6	5.8	13.8	1
PC-91	8.9	28.7	17.9	9.4	6.7	14.4	5.9	13.1	2
JHB-17-1	8.2	20.4	19.6	8.8	6.0	12.0	5.7	11.5	3
Wardan (NC)	5.7	18.9	16.9	8.6	5.9	10.7	5.3	10.3	4
BB-2 (ZC-NWZ)	7.6	28.4	19.8						
BB-3 (ZC-NEZ)				7.4	5.4	14.2	5.7		
Mean	**7.3**	**25.1**	**19.1**	**8.7**	**6.0**	**14.0**	**5.7**	**12.2**	

Table 3.6 AVT-2: Second Advanced Varietal Trial in Berseem: Crude Protein (%)

Entries	Bikaner	Ludhiana	Hisar	Kalyani	Ranchi	Ayodhya	Bhubaneswar	Average	Rank
JHB-17-2	14.4	19.0	21.6	14.0	15.2	17.2	14.6	16.6	3
PC-91	17.9	17.8	20.9	13.9	15.6	16.9	17.3	17.2	2
JHB-17-1	18.7	16.1	20.4	13.0	15.4	16.6	15.5	16.5	4
Wardan (NC)	21.5	18.7	21.4	15.7	15.2	16.8	15.8	17.9	1
BB-2 (ZC-NWZ)	16.8	18.5	21.2						
BB-3 (ZC-NEZ)				14.4	14.9	17.0	17.4		
Mean	**17.9**	**18.0**	**21.1**	**14.2**	**15.3**	**16.9**	**16.1**	**17.0**	

Table 3.7 AVT-2: Second Advanced Varietal Trial in Berseem: Plant Height (cm)

Entries	Pantnagar	Bikaner	Hisar	Ludhiana	Udaipur	Kalyani	Ranchi	Ayodhya	Bhubaneswar	Pusa	Average	Rank
JHB-17-2	62.6	37.4	66.0	59.7	65.0	71.8	54.2	61.9	76.3	76.9	63.2	1
PC-91	66.9	42.4	70.5	56.9	61.5	68.7	46.7	56.4	74.3	77.5	62.2	2
JHB-17-1	60.0	43.4	66.6	57.1	62.6	64.4	50.8	49.8	73.8	75.9	60.4	3
Wardan (NC)	68.4	38.4	64.5	57.0	58.3	65.2	47.4	56.0	72.2	70.3	59.8	4
BB-2 (ZC-NWZ)	63.3	49.6	69.1	58.5	65.3							
BB-3 (ZC-NEZ)						60.6	47.1	58.7	70.6	74.8		
Mean	**64.2**	**42.2**	**67.3**	**57.8**	**62.5**	**66.1**	**49.2**	**56.6**	**73.4**	**75.1**	**61.4**	

Table 3.8 AVT-2: Second Advanced Varietal Trial in Berseem: Leaf Stem Ratio

Entries	Pantnagar	Bikaner	Hisar	Ludhiana	Kalyani	Ranchi	Ayodhya	Bhubaneswar	Pusa	Average	Rank
JHB-17-2	0.82	0.87	0.79	0.95	0.93	0.86	0.68	1.11	0.69	0.86	3
PC-91	0.88	0.92	0.85	1.01	0.90	0.79	0.66	1.08	0.75	0.87	2
JHB-17-1	0.81	1.01	0.75	1.01	0.92	0.84	0.65	0.97	0.70	0.85	4
Wardan (NC)	0.96	1.37	0.73	1.08	0.88	0.79	0.70	0.91	0.57	0.89	1
BB-2 (ZC-NWZ)	0.80	0.74	0.70	0.98							
BB-3 (ZC-NEZ)					0.90	0.79	0.69	0.85	0.58		
Mean	**0.85**	**0.98**	**0.76**	**1.01**	**0.91**	**0.82**	**0.68**	**0.98**	**0.66**	**0.87**	

Table 3.9 AVT-2: Second Advanced Varietal Trial in Berseem: ADF (%), NDF (%) & IVDMD (%)

Entries	NDF (%)				ADF (%)				IVDMD (%)				
	Ran-chi	Ludh-iana	Aver-age	Ra-nk	Ran-chi	Ludh-iana	Aver-age	Ra-nk	Ludh-iana	His-ar	Ran-chi	Aver-age	Ra-nk
JHB-17-2	42.0	59.1	50.6	4	31.3	36.4	33.9	2	61.2	59.3	64.5	61.7	3
PC-91	37.6	54.6	46.1	1	27.0	38.5	32.8	1	56.7	66.8	67.8	63.8	1
JHB-17-1	43.4	55.4	49.4	3	37.0	39.4	38.2	4	56.1	55.7	60.0	57.3	4
Wardan (NC)	40.1	57.4	48.8	2	31.8	38.4	35.1	3	58.7	65.1	64.1	62.6	2
BB-2 (ZC-NWZ)		58.7				37.4			59.8	57.9			
BB-3 (ZC-NEZ)	41.1				31.1						64.6		
Mean	**40.8**	**57.0**	**48.7**		**31.6**	**38.0**	**35.0**		**58.5**	**61.0**	**64.2**	**61.3**	

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

Entries	Seed Yield (q/ha)												
	North West Zone					North East Zone						All India		
	Pant-nagar	Ludh-iana	His-ar	Aver-age	Ra-nk	Kal-yani	Ran-chi	Bhuban-eswar	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
JHB-17-2	4.3	5.1	2.7	4.1	2	1.1	2.1	2.1	1.8	2	6.3	2.9	2	17.0
PC-91	4.5	5.3	3.1	4.3	1	1.2	1.5	1.9	1.6	4		2.9	2	17.5
JHB-17-1	4.2	5.0	3.3	4.1	2	1.2	2.6	1.8	1.9	1	14.2	3.0	1	21.5
Wardan (NC)	3.7	3.5	2.7	3.3	3	1.0	2.3	1.6	1.7	3		2.5	3	
BB-2 (ZC-NWZ)	3.9	4.5	4.5	4.3	1									
BB-3 (ZC-NEZ)						0.9	2.2	1.7	1.6	4				
Mean	**4.1**	**4.7**	**3.3**	**4.0**		**1.1**	**2.2**	**1.8**	**1.7**			**2.8**		
CD at 5%	**0.2**	**0.1**	**0.3**			**8.4**	**0.4**	**0.1**						
CV%	**7.6**	**1.8**	**6.7**			**10.4**	**12.5**	**4.6**						

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),** eleven entries along with two national checks (OS-6 and Kent) and three zonal checks for respective zones *viz.*, SKO-96 (HZ), RO-11-1 (CZ), OS-403 (NEZ, NWZ, SZ) were evaluated at 29 locations across the five zones.

For GFY (q/ha), entries HFO-904 (3.9%) and OL-1960 (3.8%) were marginally superior over the best check (OS-403)in south zone. At all India level, entries HFO-906 (5.7%), HFO-904 (4.6%), and JO-07-28 (4.2%) were superior over the beast national check (OS-6).

For DMY (q/ha), entries HFO-904, OL-1960 were superior by margin of 11.7% and 8.4% respectively over the best check in south zone. At all India level, entries HFO-906 (5.4%) and HFO-904 (4.7%) were superior over the best national check.

For fodder production potential (q/ha/day), national check OS-6 and HFO-906 ranked first for green and dry matter, respectively. Entry OL-1960 ranked first for plant height. Entry JO-07-28 ranked first for leafiness.
For quality parameters, entry HFO-904 (8.4q/ha) was ranked first for crude protein yield. For crude protein content, SKO-243 was best with 9.3% and followed by HFO-906 (8.9%). National check OS-6 (61.0%) ranked first for IVDMD %.

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,** ten entries promoted from IVT were evaluated against two national checks (OS-6 and Kent) and three zonal checks [SKO-96 (HZ), RO-11-1 (CZ), and OS-403 (SZ)] in respective zones at 15 locations in three different zones.

For GFY (q/ha), in hill, central and south zone, all tested entries were either marginally at par or inferior against the best check. At all India level, entries OL-1876-1 (12.2%), HFO-806 (9.5%), SKO-241 (8.9%), RO-11-1-2 (8.5%), OL-1874-1 (7.3%), and JO-06-23 (6.1%)were superior over the best national check Kent.

For DMY (q/ha), in hill, central and south zone, all tested entries were either marginally at par or inferior against the best check. At all India level, entries HFO-806 (14.6%), OL-1876-1 (13.9%), JO-06-23 (11.1%), SKO-241(10.4%), OL-1874-1 (8.7%), RO-11-1-3 (5.7%), and RO-11-1-2 (5.6%) were superior over the best national check OS-6.

For fodder production potential (q/ha/day), RO-11-1-2 ranked first followed by OL-1876-1 for both green and dry matter. Entry JO-06-23 ranked first for plant height. Entry SKO-241ranked first followed by OL-1874-1for leafiness.

For quality parameters, entry HFO-806 (7.8 q/ha) was ranked first followed by RO-11-1-3 (7.7 q/ha) for crude protein yield. For crude protein content, national check OS-6 was best with 8.9%. Entry HFO-806 ranked first for IVDMD%.

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

Entries	Hill Zone					North West Zone								
	Palam-pur	Sri-nagar	Rajo-uri	Aver-age	Ra-nk	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Aver-age	Ra-nk	Superi-ority%
JHO-19-1	321.9	382.6	181.1	295.2	6	511.6	774.1	651.9	459.3	612.9	657.1	611.2	12	
RO-11-1-12	335.8	378.3	226.6	313.6	2	541.2	762.9	677.8	411.1	764.7	737.8	649.2	6	
OL-1963	326.9	376.6	217.8	307.1	3	429.8	650.7	688.9	429.6	655.5	739.9	599.1	13	
HFO-906	317.5	382.0	208.9	302.8	4	563.0	837.0	751.9	537.0	837.0	887.1	735.5	1	1.9
RO-11-1-8	256.5	375.0	156.7	262.7	13	441.5	722.2	648.1	477.7	533.3	889.2	618.7	11	
NDO-18-07	307.9	378.3	146.7	277.6	10	429.8	733.3	663.0	484.1	651.8	610.0	595.3	14	
OL-1960	274.9	367.3	167.8	270.0	11	553.0	722.2	725.9	451.8	742.5	622.5	636.3	8	
UPO-19-1	251.4	413.6	193.3	286.1	8	508.3	711.1	696.3	502.9	666.6	789.9	645.8	7	
HFO-904	281.2	350.6	138.9	256.9	14	604.9	674.1	677.8	451.9	831.4	770.4	668.4	4	
JO-07-28	289.5	435.6	170.0	298.4	5	546.6	751.9	677.8	477.8	781.4	855.7	681.9	3	
SKO-243	293.9	405.1	179.4	292.8	7	329.6	777.8	800.0	474.0	655.5	765.7	633.8	9	
OS-6 (NC)	276.8	400.3	175.5	284.2	9	493.5	840.7	638.5	529.6	714.7	754.8	662.0	5	
Kent (NC)	252.6	378.0	161.1	263.9	12	510.1	692.6	603.7	488.9	724.0	737.6	626.1	10	
SKO-96 (ZC-HZ)	346.6	412.6	187.8	315.7	1									
OS-403(ZC-NWZ,NEZ,SZ)						656.2	703.7	756.7	488.9	896.2	829.0	721.8	2	
Mean	**295.2**	**388.3**	**179.4**	**287.6**		**508.5**	**739.6**	**689.9**	**476.0**	**719.1**	**760.5**	**648.9**		
CD at 5%	**49.0**	**26.5**	**2.1**			**99.3**	**77.5**	**74.2**	**38.9**	**103.6**				
CV%	**9.9**	**5.6**	**7.8**				**6.2**	**10.4**	**11.2**	**8.6**				

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

Entries	North East Zone								
	Jorhat	**Kalyani**	**Bhubaneswar**	**Ranchi**	**Pusa**	**Ayodhya**	**Imphal**	**Average**	**Rank**
JHO-19-1	236.4	458.8	246.6	231.1	420.0	437.3	577.0	372.5	12
RO-11-1-12	228.1	457.7	366.6	240.0	555.3	320.0	517.0	383.5	10
OL-1963	237.2	531.3	417.9	275.5	590.0	312.0	504.0	409.7	5
HFO-906	206.6	455.6	287.3	364.0	562.0	410.6	457.0	391.9	8
RO-11-1-8	233.6	456.2	349.3	257.8	482.7	293.3	555.0	375.4	11
NDO-18-07	220.3	455.2	323.9	286.7	534.7	413.3	603.0	405.3	7
OL-1960	335.2	513.9	295.9	304.4	572.7	317.3	515.3	407.8	6
UPO-19-1	204.2	494.9	262.6	336.4	624.7	376.0	573.7	410.4	4
HFO-904	263.4	538.3	277.3	278.7	581.3	368.0	589.7	413.8	3
JO-07-28	289.3	476.8	231.9	330.2	566.0	605.3	490.3	427.1	2
SKO-243	310.9	450.1	226.6	274.2		322.7	418.7	333.9	14
OS-6 (NC)	219.1	497.4	247.9	271.1	523.3	330.7	516.0	372.2	13
Kent (NC)	244.2	435.8	396.6	277.8	562.0	344.0	475.7	390.9	9
OS-403(ZC-NWZ,NEZ,SZ)	273.6	571.6	429.2	342.2	533.3	512.0	688.3	478.6	1
Mean	**250.2**	**485.3**	**311.4**	**290.7**	**546.8**	**383.0**	**534.3**	**398.1**	
CD at 5%	**7.2**	**19.2**	**26.7**	**55.3**	**41.8**	**78.1**	**16.3**		
CV%	**7.2**	**10.3**	**5.1**	**11.3**	**4.5**	**12.1**	**2.6**		

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

Central Zone										
Entries	**Jhansi**	**Rahuri**	**Urulikanchan**	**Palghar**	**Anand**	**Jabalpur**	**Raipur**	**Dhari**	**Average**	**Rank**
JHO-19-1	461.3	390.1	554.5	273.5	735.9	621.1	376.5	457.0	483.7	7
RO-11-1-12	415.9	367.4	457.9	239.9	829.6	565.2	363.0	559.9	474.9	9
OL-1963	465.0	351.8	640.1	242.8	751.9	499.8	329.6	544.6	478.2	8
HFO-906	503.4	437.5	565.6	250.4	851.9	687.8	349.4	517.8	520.5	2
RO-11-1-8	506.2	413.7	423.6	269.3	659.3	573.2	317.3	576.6	467.4	12
NDO-18-07	474.9	352.5	367.1	282.1	784.1	579.8	384.0	531.3	469.5	11
OL-1960	414.1	396.2	448.2	235.9	672.6	643.8	313.6	575.5	462.5	14
UPO-19-1	453.0	386.6	395.5	243.5	722.2	621.1	354.3	584.6	470.1	10
HFO-904	453.9	493.0	550.3	248.2	744.4	618.5	361.7	602.7	509.1	3
JO-07-28	483.9	434.8	439.7	259.3	850.0	650.5	367.9	553.7	505.0	4
SKO-243	521.9	421.1		263.4	915.2	591.8	208.0		486.9	6
OS-6 (NC)	490.4	431.1	418.1	257.8	829.6	598.8	377.8	521.6	490.7	5
Kent (NC)	533.5	399.6	435.8	274.6	627.8	555.8	404.9	495.7	466.0	13
RO-11-1 (ZC-CZ)	549.2	528.5	457.5	245.2	1272.2	581.2	516.1	465.0	576.9	1
Mean	**480.5**	**414.6**	**473.4**	**256.1**	**803.3**	**599.2**	**358.9**	**537.4**	**490.1**	
CD at 5%	**18.2**	**62.2**	**125.9**	**17.9**	**175.7**	**131.3**	**43.5**			
CV%	**10.9**	**9.0**	**15.7**		**13.0**	**12.1**	**7.2**			

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

Entries	South Zone								All India		
	Hyderabad	Mandya	Coimbatore	Mattupetty	**Tirupati	Average	Rank	Superiority%	Average	Rank	Superiority%
JHO-19-1	318.5	233.3	250.0	259.0	51.0	265.2	14		431.8	12	
RO-11-1-12	440.7	243.6	342.6	259.0	90.4	321.5	7		450.2	6	
OL-1963	262.9	219.4	353.7	274.0	92.4	277.5	12		440.0	9	
HFO-906	274.0	272.1	296.3	337.0	87.9	294.9	9		478.8	1	5.7
RO-11-1-8	451.8	242.8	364.8	252.0	74.5	327.8	6		434.9	10	
NDO-18-07	451.8	263.3	359.3	282.0	129.7	339.1	4		441.2	8	
OL-1960	377.7	245.8	366.7	530.0	90.4	380.0	2	3.8	453.7	4	0.1
UPO-19-1	240.7	212.9	281.5	363.0	87.6	274.5	13		445.2	7	
HFO-904	407.4	245.7	368.5	500.0	85.8	380.4	1	3.9	474.0	2	4.6
JO-07-28	277.8	243.4	329.6	348.0	97.9	299.7	8		472.0	3	4.2
SKO-243	225.9	197.1	357.4	378.0	94.0	289.6	10		430.6	13	
OS-6 (NC)	485.1	246.2	348.1	252.0	89.1	332.9	5		453.1	5	
Kent (NC)	377.7	250.4	288.9	233.0	91.3	287.5	11		434.4	11	
OS-403(ZC-NWZ,NEZ,SZ)	537.0	214.2	379.6	333.0	123.4	366.0	3				
Mean	**366.4**	**237.9**	**334.8**	**328.6**	**91.8**	**316.9**			**449.2**		
CD at 5%	**61.9**	**29.0**	**8.8**	**9.2**							
CV%	**10.0**	**10.6**	**1.4**	**1.7**	**12.0**						

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				North West Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Superi-ority%
JHO-19-1	76.0	90.9	83.4	2	77.3	152.1	136.2	138.7	126.1	9	
RO-11-1-12	78.1	88.3	83.2	3	105.7	152.8	138.3	108.3	126.3	8	
OL-1963	78.1	71.6	74.8	10	77.1	128.0	146.0	111.8	115.7	14	
HFO-906	75.9	81.0	78.4	6	92.2	167.4	151.9	162.5	143.5	1	3.4
RO-11-1-8	58.2	100.1	79.2	4	68.2	142.2	130.9	123.9	116.3	13	
NDO-18-07	71.7	81.3	76.5	8	102.7	144.0	132.6	129.2	127.1	7	
OL-1960	66.3	83.0	74.7	11	77.0	144.4	149.5	121.2	123.0	11	
UPO-19-1	59.7	69.0	64.3	14	89.4	141.8	140.7	150.6	130.6	3	
HFO-904	65.9	84.7	75.3	9	103.1	132.5	135.6	118.5	122.4	12	
JO-07-28	67.8	81.1	74.5	12	102.3	147.8	136.9	132.5	129.9	4	
SKO-243	69.0	86.8	77.9	7	63.7	150.6	163.2	121.8	124.8	10	
OS-6 (NC)	63.3	93.8	78.5	5	103.6	165.4	132.8	153.3	138.8	2	
Kent (NC)	58.4	82.5	70.5	13	122.8	136.3	121.9	128.9	127.5	6	
SKO-96 (ZC-HZ)	82.0	99.9	91.0	1							
OS-403(ZC-NWZ,NEZ,SZ)					85.9	140.5	154.4	134.0	128.7	5	
Mean	**69.3**	**85.3**	**77.3**		**90.8**	**146.1**	**140.8**	**131.1**	**127.2**		
CD at 5%	**12.1**	**6.7**			**19.4**	**17.4**	**48.2**	**8.8**			
CV%	**10.4**	**4.7**				**7.1**	**8.3**	**9.6**			

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**	**Bhuba-neswar**	**Ran-chi**	**Pu-sa**	**Ayod-hya**	**Imp-hal**	**Aver-age**	**Ra -nk**
JHO-19-1	44.1	80.9	58.8	37.7	77.0	100.5	132.5	75.9	12
RO-11-1-12	42.1	81.2	88.0	54.8	107.1	71.9	98.2	77.6	10
OL-1963	43.4	94.9	98.9	55.1	117.2	73.3	107.7	84.3	4
HFO-906	36.4	79.7	67.6	80.7	109.7	98.6	98.5	81.6	6
RO-11-1-8	40.2	82.6	79.2	59.7	89.0	73.3	108.4	76.1	11
NDO-18-07	44.3	80.6	76.5	54.5	102.1	90.9	119.5	81.2	7
OL-1960	64.0	88.8	70.2	49.7	112.9	68.2	108.4	80.3	9
UPO-19-1	39.8	83.4	63.3	61.7	126.6	88.3	134.1	85.3	3
HFO-904	51.5	98.0	68.5	57.6	115.2	82.7	106.2	82.8	5
JO-07-28	53.6	84.3	55.5	69.9	111.5	145.3	89.4	87.1	2
SKO-243	60.7	80.1	55.0	62.6		74.2	81.2	69.0	14
OS-6 (NC)	43.9	88.8	56.8	69.1	96.7	74.3	100.2	75.7	13
Kent (NC)	45.1	78.6	99.8	60.6	109.9	84.2	86.8	80.7	8
OS-403(ZC-NWZ,NEZ,SZ)	55.5	101.7	101.6	63.9	98.9	122.9	130.3	96.4	1
Mean	**47.5**	**86.0**	**74.3**	**59.8**	**105.7**	**89.2**	**107.2**	**81.0**	
CD at 5%	**3.5**	**14.4**	6.8	**5.4**	8.0	**18.1**	**14.8**		
CV%	**8.0**	**12.1**	5.4	**7.8**	4.7	**12.1**	**11.6**		

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

Entries	Central Zone									
	Jha-nsi	**Rah-uri**	**Urulikan-chan**	**Pal-ghar**	**Ana-nd**	**Jabal-pur**	**Rai-pur**	**Dha-ri**	**Aver-age**	**Ra-nk**
JHO-19-1	75.1	65.6	127.3	52.5	88.3	143.3	84.1	83.2	89.9	12
RO-11-1-12	81.2	70.0	123.6	44.9	112.0	127.3	65.2	108.1	91.5	10
OL-1963	103.4	64.5	174.4	43.5	105.8	103.1	68.9	102.7	95.8	6
HFO-906	87.3	89.9	150.4	42.3	130.7	162.6	79.9	113.2	107.1	2
RO-11-1-8	98.2	72.9	130.7	46.3	102.7	130.0	58.8	105.6	93.2	9
NDO-18-07	77.6	74.2	93.9	53.6	103.5	131.3	69.9	113.8	89.7	13
OL-1960	78.2	74.6	102.6	44.1	80.9	149.1	75.6	118.2	90.4	11
UPO-19-1	73.7	71.0	119.9	45.5	113.4	143.0	76.9	114.0	94.7	7
HFO-904	90.7	94.6	165.9	40.4	108.2	142.5	83.8	125.0	106.4	3
JO-07-28	82.7	86.3	134.6	50.1	126.2	151.3	84.8	126.3	105.3	4
SKO-243	92.7	78.6		46.1	165.3	134.3	48.4		94.2	8
OS-6 (NC)	104.9	91.2	100.9	42.7	121.1	135.7	70.3	110.0	97.1	5
Kent (NC)	56.7	77.4	110.6	48.3	93.7	124.9	70.3	107.2	86.1	14
RO-11-1 (ZC-CZ)	141.4	89.8	93.4	47.7	218.1	132.3	118.9	130.9	121.6	1
Mean	**88.8**	**78.6**	**125.2**	**46.3**	**119.3**	**136.5**	**75.4**	**112.2**	**97.4**	
CD at 5%	**12.7**	**11.9**	**33.6**	**6.6**	**33.6**	**29.6**	**15.4**			
CV%	**7.6**	**9.1**	**15.8**		**16.8**	**12.0**	**12.1**			

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	Mattupetty	**Tirupati	Average	Rank	Superiority%	Average	Rank	Superiority%
JHO-19-1	47.5	47.1	52.1	65.0	11.6	52.9	14		85.3	13	
RO-11-1-12	89.6	50.9	72.0	65.0	24.1	69.4	7		89.0	8	
OL-1963	48.9	45.5	74.6	69.0	26.4	59.5	12		88.3	9	
HFO-906	57.1	66.6	61.7	83.0	25.4	67.1	8		97.1	1	5.4
RO-11-1-8	90.6	45.2	79.6	63.0	17.7	69.6	6		87.2	10	
NDO-18-07	86.3	55.8	75.1	70.0	30.6	71.8	4		89.4	7	
OL-1960	69.9	49.0	77.6	132.0	22.8	82.1	2	8.4	90.2	5	
UPO-19-1	40.4	45.5	60.6	91.0	19.8	59.4	13		89.7	6	
HFO-904	83.4	48.5	81.7	125.0	18.9	84.7	1	11.7	96.4	2	4.7
JO-07-28	58.1	46.9	70.3	87.0	22.0	65.6	9		95.3	3	3.5
SKO-243	48.3	42.4	75.4	95.0	21.6	65.3	10		86.1	11	
OS-6 (NC)	96.8	51.4	71.7	63.0	24.1	70.7	5		92.1	4	
Kent (NC)	75.9	50.4	59.7	58.0	24.5	61.0	11		86.0	12	
OS-403(ZC-NWZ,NEZ,SZ)	101.1	42.5	76.5	83.0	31.5	75.8	3				
Mean	**71.0**	**49.1**	**70.6**	**82.1**	**22.9**	**68.2**			**90.2**		
CD at 5%	**13.8**	**7.7**	**2.8**	**7.3**							
CV%	**11.5**	**13.6**	**2.3**	**5.3**	**12.0**						

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

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

Entries	Palampur	Bikaner	Hisar	Ludhiana	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Ayodhya
JHO-19-1	2.55	5.22	6.00	5.30	4.10	2.51	4.99	3.43	2.62	5.00	3.87
RO-11-1-12	2.92	5.52	5.91	5.50	3.80	2.62	4.97	5.09	2.87	6.61	3.24
OL-1963	2.60	4.39	5.05	5.60	3.90	2.55	5.78	5.65	3.31	7.02	3.00
HFO-906	2.76	5.75	6.49	6.10	4.90	2.22	4.95	4.42	4.20	6.69	3.98
RO-11-1-8	2.24	4.51	5.60	5.30	4.40	2.51	4.96	5.06	3.04	5.75	2.87
NDO-18-07	2.62	4.39	5.69	5.40	4.50	2.53	4.95	4.76	3.61	6.37	4.13
OL-1960	2.19	5.64	5.60	5.90	4.10	3.60	5.59	4.29	3.32	6.82	3.05
UPO-19-1	2.01	5.19	5.51	5.70	4.50	2.20	5.38	3.92	3.77	7.44	3.54
HFO-904	2.28	6.17	5.23	5.50	4.10	2.83	5.85	3.85	3.25	6.92	3.57
JO-07-28	2.27	5.58	5.83	5.50	4.30	3.11	5.18	3.41	3.87	6.74	5.93
SKO-243	2.49	2.39	6.03	6.50	4.20	3.31	4.89	3.19	2.96		3.19
OS-6 (NC)	2.36	5.04	6.52	5.20	4.90	2.36	5.41	3.65	3.28	6.23	3.27
Kent (NC)	2.13	5.21	5.37	4.90	4.50	2.81	4.74	5.59	3.37	6.69	3.54
SKO-96 (ZC-HZ)	2.36										
OS-403(ZC-NWZ,NEZ,SZ)		6.70	5.46	6.20	4.40	2.91	6.21	6.13	3.79	6.35	5.01
Mean	**2.41**	**5.12**	**5.74**	**5.61**	**4.33**	**2.72**	**5.28**	**4.46**	**3.38**	**6.51**	**3.73**

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	Pal-ghar	Ana-nd	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
JHO-19-1	3.69	4.54	5.84	4.21	9.43	4.05	5.80	4.36	3.67	3.25	2.88	4.70	11
RO-11-1-12	3.46	4.56	4.67	3.69	9.76	4.71	7.40	6.78	3.45	4.23	2.88	5.05	5
OL-1963	3.94	4.27	6.67	3.74	8.95	3.54	6.87	4.05	2.98	4.31	3.04	4.76	8
HFO-906	4.23	5.27	5.95	3.85	9.57	3.76	6.33	3.88	3.61	3.57	3.74	4.89	7
RO-11-1-8	4.28	5.11	4.55	4.14	7.76	4.12	7.43	6.36	3.41	4.29	2.80	4.93	6
NDO-18-07	4.04	4.35	3.75	4.34	10.05	4.41	7.73	6.36	4.45	4.49	3.13	5.19	3
OL-1960	3.36	4.59	4.67	3.63	8.62	4.07	7.37	5.32	3.85	4.42	5.88	5.07	4
UPO-19-1	3.65	4.41	4.25	3.75	7.30	3.81	7.13	3.39	3.06	3.35	4.03	4.38	12
HFO-904	3.74	5.92	5.50	3.82	8.76	3.89	7.23	6.07	3.45	4.39	5.56	5.30	2
JO-07-28	4.03	5.22	4.31	3.99	8.59	3.96	6.60	3.91	3.32	3.97	3.87	4.71	10
SKO-243	4.44	4.01		4.05	8.80	2.24		2.63	2.65	4.16	4.20	4.13	13
OS-6 (NC)	4.17	5.43	4.40	3.97	9.88	4.34	7.37	7.02	3.87	4.25	3.68	5.31	1
Kent (NC)	4.50	5.00	4.45	4.22	7.47	4.65	6.63	5.32	3.59	3.66	2.59	4.73	9
RO-11-1 (ZC-CZ)	4.37	6.15	4.82	3.77	13.68	5.55	5.50						
OS-403(ZC-NWZ,NEZ,SZ)								7.56	2.92	4.52	3.70		
Mean	**3.99**	**4.92**	**4.91**	**3.94**	**9.19**	**4.08**	**6.88**	**5.22**	**3.45**	**4.06**	**3.71**	**4.86**	

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

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa
JHO-19-1	0.79	1.18	1.10	1.20	0.47	0.88	0.82	0.43	0.92
RO-11-1-12	1.08	1.18	1.10	1.00	0.48	0.88	1.22	0.65	1.27
OL-1963	0.79	0.99	1.20	1.00	0.47	1.03	1.34	0.66	1.40
HFO-906	0.94	1.29	1.20	1.50	0.39	0.87	1.04	0.93	1.31
RO-11-1-8	0.70	1.03	1.10	1.10	0.43	0.90	1.15	0.71	1.06
NDO-18-07	1.05	1.12	1.10	1.20	0.51	0.88	1.13	0.69	1.22
OL-1960	0.79	1.12	1.20	1.10	0.69	0.97	1.02	0.54	1.34
UPO-19-1	0.91	1.10	1.10	1.30	0.43	0.91	0.95	0.69	1.51
HFO-904	1.05	1.03	1.10	1.10	0.55	1.07	0.95	0.67	1.37
JO-07-28	1.04	1.15	1.10	1.20	0.58	0.92	0.82	0.82	1.33
SKO-243	0.46	1.17	1.30	1.10	0.65	0.88	0.78	0.68	
OS-6 (NC)	1.06	1.28	1.10	1.40	0.47	0.97	0.84	0.84	1.15
Kent (NC)	1.25	1.05	1.00	1.20	0.52	0.85	1.41	0.74	1.31
OS-403(ZC-NWZ,NEZ,SZ)	0.88	1.09	1.30	1.20	0.59	1.11	1.45	0.71	1.18
Mean	**0.91**	**1.13**	**1.14**	**1.19**	**0.52**	**0.94**	**1.06**	**0.70**	**1.26**

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

Entries	Ayod-hya	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
JHO-19-1	0.90	0.60	0.76	1.34	0.81	1.13	0.90	1.07	0.65	0.74	0.68	0.87	9
RO-11-1-12	0.64	0.68	0.87	1.26	0.69	1.32	0.85	1.47	1.38	0.72	0.89	0.98	4
OL-1963	0.66	0.88	0.78	1.82	0.67	1.26	0.74	1.30	0.75	0.62	0.91	0.96	5
HFO-906	0.88	0.73	1.08	1.58	0.65	1.47	0.86	1.40	0.81	0.89	0.74	1.03	1
RO-11-1-8	0.66	0.83	0.90	1.41	0.71	1.21	0.76	1.40	1.28	0.63	0.94	0.95	6
NDO-18-07	0.81	0.66	0.92	0.96	0.82	1.33	0.80	1.67	1.22	0.95	0.94	1.00	3
OL-1960	0.61	0.63	0.86	1.07	0.68	1.04	0.98	1.50	0.98	0.77	0.94	0.94	7
UPO-19-1	0.79	0.59	0.81	1.29	0.70	1.15	0.83	1.40	0.57	0.65	0.72	0.92	8
HFO-904	0.74	0.75	1.14	1.66	0.62	1.27	0.90	1.50	1.24	0.71	0.97	1.02	2
JO-07-28	1.30	0.69	1.04	1.32	0.77	1.27	0.91	1.50	0.82	0.63	0.85	1.00	3
SKO-243	0.66	0.79	0.75		0.71	1.59	0.52		0.56	0.57	0.88	0.83	10
OS-6 (NC)	0.66	0.89	1.15	1.06	0.66	1.44	0.81	1.57	1.40	0.81	0.87	1.02	2
Kent (NC)	0.75	0.48	0.97	1.13	0.74	1.12	0.81	1.43	1.07	0.69	0.76	0.96	5
RO-11-1 (ZC-CZ)		1.13	1.04	0.98	0.73	2.35	1.28	1.57					
OS-403(ZC-NWZ,NEZ,SZ)	1.10								1.42	0.58	0.91		
Mean	**0.80**	**0.74**	**0.93**	**1.30**	**0.71**	**1.35**	**0.85**	**1.44**	**1.01**	**0.71**	**0.86**	**0.96**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	Ludh-iana	His-ar	Jor-hat	Kal-yani	Bhubane-swar	Ran-chi	Ayod-hya	Imp-hal
JHO-19-1	6.7	8.1	13.4	11.6	13.1	4.5	9.1	4.9	2.0	7.8	9.0
RO-11-1-12	8.4	6.7	17.0	9.7	11.5	4.2	11.5	7.3	3.4	5.5	7.6
OL-1963	7.1	7.3	11.9	12.4	9.5	4.4	9.8	8.4	2.6	5.8	7.3
HFO-906	7.3	3.5	14.7	10.5	12.6	3.7	8.7	5.7	5.2	7.9	7.8
RO-11-1-8	4.9	8.4	6.8	7.9	9.4	4.3	11.9	7.0	3.5	6.4	7.3
NDO-18-07	6.5	8.6	12.5	8.0	11.7	5.0	9.0	6.5	4.1	6.7	8.0
OL-1960	6.4	8.2	12.7	10.8	10.0	6.7	10.9	5.9	3.5	4.9	7.6
UPO-19-1	6.3	6.4	12.5	9.4	9.8	4.0	7.2	5.3	5.1	6.9	10.0
HFO-904	6.7	8.7	17.1	8.4	10.9	5.5	10.4	5.4	3.1	6.4	7.1
JO-07-28	6.9	7.2	16.9	8.2	11.1	5.5	10.5	4.6	2.4	11.9	6.5
SKO-243	6.2		10.3	12.9	12.0	6.1	12.4	4.5	5.8	5.8	5.8
OS-6 (NC)	6.1	9.2	16.9	9.6	13.9	4.3	11.8	5.0	3.8	5.6	7.2
Kent (NC)	5.8	8.6	15.8	9.9	10.1	4.7	7.7	7.9	3.4	7.1	6.0
SKO-96 (ZC-HZ)	7.4	7.9									
OS-403(ZC-NWZ,NEZ,SZ)			12.6	12.8	11.5	5.2	10.0	8.6	3.2	9.7	9.6
Mean	**6.6**	**7.6**	**13.6**	**10.2**	**11.2**	**4.9**	**10.1**	**6.2**	**3.6**	**7.0**	**7.6**

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

Entries	Rahuri	Urulikanchan	Jabalpur	Raipur	Coimbatore	Hyderabad	Mandya	**Anand	Average	Rank
JHO-19-1	3.9	10.6	11.4	7.2	5.9	13.1	2.4	17.6	8.0	4
RO-11-1-12	3.7	7.8	10.2	5.2	8.5	11.5	3.1	17.9	7.9	5
OL-1963	3.4	9.4	8.1	5.6	9.5	9.5	2.0	17.4	7.4	9
HFO-906	6.4	11.3	13.3	6.4	8.4	12.6	4.1	21.6	8.3	2
RO-11-1-8	5.8	10.5	10.4	4.7	9.4	9.4	2.4	15.2	7.2	10
NDO-18-07	3.7	7.7	10.5	5.7	7.9	11.7	4.2	16.5	7.7	7
OL-1960	3.8	8.1	12.2	6.1	9.2	10.0	4.0	14.2	7.8	6
UPO-19-1	3.7	10.8	11.6	6.4	5.3	9.8	3.4	16.9	7.4	9
HFO-904	5.2	11.6	11.6	6.8	11.8	10.9	3.4	17.6	8.4	1
JO-07-28	5.0	10.5	12.4	7.0	7.7	11.1	3.5	20.8	8.3	2
SKO-243	5.2		10.9	4.0	10.6	12.0	2.2	24.8	7.9	5
OS-6 (NC)	4.8	6.3	10.8	5.6	8.2	13.9	3.2	19.3	8.1	3
Kent (NC)	6.2	9.5	10.1	5.7	4.2	10.1	2.4	13.5	7.5	8
RO-11-1 (ZC-CZ)	4.6	9.2	10.6	11.6				29.6		
OS-403(ZC-NWZ,NEZ,SZ)					5.7	11.5	2.5			
Mean	**4.7**	**9.5**	**11.0**	**6.3**	**8.0**	**11.2**	**3.0**	**18.8**	**7.9**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	Ludh-iana	His-ar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Ayod-hya	Imp-hal
JHO-19-1	8.8	8.9	17.3	8.5	8.6	10.3	11.3	8.4	5.3	7.8	6.8
RO-11-1-12	10.8	8.3	16.0	7.0	7.5	10.2	14.2	8.3	6.2	7.7	7.8
OL-1963	9.0	10.2	15.4	8.5	7.4	10.2	10.3	8.4	4.7	7.9	6.7
HFO-906	9.6	9.3	16.0	6.9	7.5	10.3	10.9	8.5	6.4	8.0	7.9
RO-11-1-8	8.5	8.4	9.9	6.0	6.6	11.0	14.4	8.8	5.8	8.7	6.7
NDO-18-07	9.0	10.6	12.1	6.0	8.1	11.3	11.2	8.5	7.5	7.4	6.7
OL-1960	9.6	9.8	16.5	7.2	6.9	10.5	12.3	8.4	7.0	7.2	7.0
UPO-19-1	10.5	9.2	14.0	6.7	6.9	10.2	8.7	8.3	8.3	7.8	7.4
HFO-904	10.2	10.0	16.6	6.2	8.2	10.9	10.6	7.8	5.5	7.7	6.6
JO-07-28	10.2	8.9	16.6	6.0	7.5	10.4	12.4	8.3	3.4	8.2	7.2
SKO-243	9.0		16.1	7.9	8.0	10.1	15.4	8.3	9.2	7.8	7.1
OS-6 (NC)	9.6	9.8	16.3	7.2	8.4	9.9	13.3	8.7	5.5	7.6	7.2
Kent (NC)	9.9	10.4	12.8	8.1	7.4	10.4	9.8	7.9	5.6	8.4	6.9
SKO-96 (ZC-HZ)	9.0	7.9									
OS-403(ZC-NWZ,NEZ,SZ)			14.6	8.3	8.2	9.5	9.8	8.4	5.1	7.9	7.4
Mean	**9.6**	**9.4**	**15.0**	**7.2**	**7.7**	**10.4**	**11.8**	**8.4**	**6.1**	**7.9**	**7.1**

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

Entries	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Coimb-atore	Hydera-bad	Man-dya	**Ana-nd	Aver-age	Ra-nk
JHO-19-1	6.0	8.4	8.1	8.5	11.4	8.6	5.1	19.9	8.8	3
RO-11-1-12	5.3	6.3	8.2	8.0	11.8	7.5	6.1	16.0	8.7	4
OL-1963	5.3	5.4	8.0	8.2	12.7	7.4	4.4	16.4	8.3	7
HFO-906	7.1	7.5	8.3	8.1	13.6	7.5	6.1	16.9	8.9	2
RO-11-1-8	8.0	8.0	8.1	8.0	11.8	6.6	5.3	14.9	8.4	6
NDO-18-07	5.0	8.2	8.1	8.2	10.5	8.1	7.5	16.0	8.6	5
OL-1960	5.1	7.9	8.2	8.1	11.8	6.9	8.1	17.7	8.8	3
UPO-19-1	5.2	9.0	8.1	8.3	8.8	6.9	7.5	15.0	8.4	6
HFO-904	5.5	7.0	8.2	8.2	14.4	8.2	7.0	16.3	8.8	3
JO-07-28	5.8	7.8	8.2	8.3	10.9	7.5	7.5	16.5	8.6	5
SKO-243	6.6		8.2	8.2	14.0	8.0	5.1	15.2	9.3	1
OS-6 (NC)	5.3	6.2	8.2	8.0	11.4	8.4	6.1	16.0	8.7	4
Kent (NC)	8.0	8.6	8.2	8.1	7.0	7.4	4.8	14.3	8.3	7
RO-11-1 (ZC-CZ)	5.1	9.8	8.2	9.7				13.6		
OS-403(ZC-NWZ,NEZ,SZ)					7.4	8.2	5.8			
Mean	**5.9**	**7.7**	**8.2**	**8.3**	**11.3**	**7.7**	**6.2**	**16.0**	**8.7**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Pu-sa	Ayod-hya
JHO-19-1	134.7	94.0	117.8	159.7	128.7	137.1	122.1	180.0	152.7	127.2	136.5	80.5	139.3	102.5
RO-11-1-12	109.3	94.0	135.4	165.3	132.4	131.3	141.8	190.0	146.9	142.0	157.3	88.0	134.3	114.9
OL-1963	145.0	91.0	140.2	168.3	135.6	140.5	148.5	178.0	160.3	174.5	160.2	114.0	143.0	107.7
HFO-906	117.0	100.3	161.3	167.7	156.7	140.2	154.8	180.0	143.5	165.2	145.7	101.7	140.7	121.8
RO-11-1-8	108.7	105.8	120.8	173.0	132.2	130.7	136.4	170.0	152.6	161.3	154.7	108.1	116.7	115.7
NDO-18-07	116.0	108.6	144.4	172.7	141.4	151.8	148.8	190.0	145.6	160.8	152.4	102.7	125.3	141.0
OL-1960	135.3	105.0	144.8	178.3	140.2	140.0	154.0	210.0	167.5	171.8	149.2	97.8	144.3	104.8
UPO-19-1	134.3	105.9	134.6	127.7	132.2	153.1	140.7	200.0	142.5	164.6	142.4	100.5	151.3	108.7
HFO-904	147.0	105.9	149.4	155.7	128.3	138.2	154.5	170.0	156.9	173.4	143.6	107.2	145.0	129.3
JO-07-28	142.0	105.1	130.0	158.7	131.2	138.1	149.6	180.0	155.7	161.4	127.3	101.8	146.3	124.2
SKO-243	126.0	113.9	134.6	121.7	158.9	144.0	106.8	170.0		108.4	123.5	99.4		119.2
OS-6 (NC)	104.7	107.8	146.6	173.3	125.8	142.6	144.9	210.0	144.9	160.9	139.7	100.2	122.3	127.3
Kent (NC)	103.7	100.5	137.2	169.7	122.2	132.2	136.3	150.0	156.1	122.8	158.3	100.5	129.0	108.4
SKO-96 (ZC-HZ)	146.3	105.8												
OS-403(ZC-NWZ,NEZ,SZ)			142.2	132.3	145.8	151.3	159.2	190.0	159.0	175.1	163.3	105.8	137.0	119.4
Mean	**126.4**	**103.1**	**138.5**	**158.9**	**136.5**	**140.8**	**142.7**	**183.4**	**152.6**	**155.0**	**146.7**	**100.6**	**136.5**	**117.5**

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

Entries	Imp-hal	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Hydera-bad	Tiru pati	Man-dya	Coimb-atore	Mattu-petty	Aver age	Ra-nk
JHO-19-1	141.2	130.4	121.8	94.5	108.5	136.6	122.2	121.8	132.5	93.7	64.0	59.2	105.4	83.0	118.8	12
RO-11-1-12	138.3	136.8	118.8	87.6	111.0	145.2	115.5	127.3	144.5	83.0	64.2	82.8	114.3	93.0	123.0	10
OL-1963	152.0	157.3	131.2	91.5	125.3	147.3	105.1	167.6	163.2	96.0	60.6	81.7	120.4	87.0	131.9	2
HFO-906	157.2	162.2	124.6	87.8	115.4	141.9	145.1	151.4	142.5	89.7	62.2	74.9	112.7	109.0	131.2	4
RO-11-1-8	152.8	155.1	123.3	102.1	118.6	142.3	111.7	122.3	144.4	84.2	58.3	69.4	122.3	81.0	124.1	9
NDO-18-07	159.6	150.9	133.3	98.1	120.8	145.2	116.3	124.6	173.3	86.9	71.0	92.9	128.5	82.0	131.6	3
OL-1960	156.7	150.2	133.1	97.7	113.2	144.5	139.4	133.1	167.8	68.1	66.3	91.1	126.3	92.0	132.9	1
UPO-19-1	155.7	142.1	130.2	87.3	116.7	141.1	135.2	140.4	151.1	94.7	60.1	65.7	110.5	91.0	127.2	7
HFO-904	161.7	132.0	127.4	91.0	119.2	143.5	130.0	158.2	150.7	84.1	58.8	73.2	129.2	96.0	130.7	5
JO-07-28	149.6	146.7	135.3	90.4	105.8	144.9	142.5	153.2	143.8	86.4	66.1	52.8	122.0	85.0	127.7	6
SKO-243	139.0	139.3	108.8		121.3	144.5	118.7	127.4		58.0	60.4	44.0	100.2	77.0	115.2	13
OS-6 (NC)	145.3	141.1	123.5	66.4	110.5	142.1	126.4	125.5	151.0	93.5	66.4	97.3	112.5	85.0	126.3	8
Kent (NC)	141.8	151.9	121.2	95.4	120.4	140.0	115.4	117.9	141.6	88.0	58.0	84.4	108.5	102.0	121.9	11
OS-403(ZC-NWZ,NEZ,SZ)	162.8									99.3	68.4	73.5	122.4	99.0		
RO-11-1 (ZC-CZ)		166.9	129.6	80.7	119.5	143.7	122.9	167.9	143.1							
Mean	**151.0**	**147.4**	**125.9**	**90.0**	**116.1**	**143.1**	**124.7**	**138.5**	**150.0**	**86.1**	**63.2**	**74.5**	**116.8**	**90.1**	**126.4**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi
JHO-19-1	0.37	0.40	0.95	0.58	0.75	1.23	0.61	0.95	1.06	0.44
RO-11-1-12	0.37	0.31	1.03	0.49	0.66	1.07	0.66	0.85	1.32	0.28
OL-1963	0.37	0.40	1.47	0.44	0.82	1.04	0.82	0.94	1.39	0.29
HFO-906	0.42	0.35	1.19	0.38	0.90	1.33	0.62	0.94	1.19	0.34
RO-11-1-8	0.32	0.38	1.16	0.47	0.72	1.54	0.70	0.89	1.29	0.30
NDO-18-07	0.33	0.38	0.69	0.52	0.82	1.57	0.61	0.92	1.25	0.41
OL-1960	0.52	0.41	0.63	0.46	0.78	1.49	0.69	0.91	1.21	0.44
UPO-19-1	0.53	0.35	1.57	0.49	0.88	1.28	0.60	0.87	1.14	0.31
HFO-904	0.52	0.33	0.81	0.51	0.75	1.55	0.51	0.96	1.17	0.32
JO-07-28	0.45	0.34	0.91	0.55	0.80	1.50	0.70	0.89	1.00	0.41
SKO-243	0.68	0.39	0.88	0.55	0.90	1.46	0.73	0.93	0.95	0.34
OS-6 (NC)	0.38	0.37	0.99	0.56	0.72	1.05	0.65	0.88	1.09	0.33
Kent (NC)	0.30	0.36	0.73	0.44	0.72	1.08	0.70	0.88	1.36	0.25
SKO-96 (ZC-HZ)	0.52	0.35								
OS-403(ZC-NWZ,NEZ,SZ)			1.00	0.44	0.70	1.27	0.79	0.92	1.41	0.37
Mean	**0.43**	**0.37**	**1.00**	**0.49**	**0.78**	**1.32**	**0.67**	**0.91**	**1.20**	**0.34**

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

Entries	Pu-sa	Ayod-hya	Imp-hal	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Hydera-bad	Man-dya	Coimb-atore	Mattup-etty	Aver-age	Ra-nk
JHO-19-1	0.29	0.72	0.26	0.38	0.65	0.63	0.82	0.62	0.25	0.28	0.45	0.58	0.32	0.70	0.60	7
RO-11-1-12	0.41	0.78	0.32	0.47	0.64	0.71	1.06	0.63	0.40	0.26	0.48	0.31	0.30	0.57	0.60	7
OL-1963	0.46	0.83	0.31	0.60	0.67	0.75	1.02	0.56	0.26	0.28	0.46	0.60	0.35	0.50	0.65	3
HFO-906	0.45	0.79	0.29	0.51	0.68	0.79	1.05	0.82.	0.29	0.29	0.44	0.76	0.33	0.73	0.66	2
RO-11-1-8	0.39	0.71	0.19	0.32	0.68	0.84	1.19	0.61	0.38	0.29	0.55	0.54	0.34	0.73	0.65	3
NDO-18-07	0.38	0.68	0.50	0.40	0.73	0.68	0.97	0.69	0.43	0.29	0.33	0.34	0.32	0.73	0.62	5
OL-1960	0.44	0.82	0.33	0.45	0.73	0.78	1.06	0.76	0.46	0.27	0.62	0.64	0.33	0.50	0.66	2
UPO-19-1	0.48	0.88	0.33	0.45	0.75	0.64	1.25	0.72	0.27	0.30	0.50	0.44	0.31	0.50	0.66	2
HFO-904	0.46	0.81	0.31	0.45	0.70	0.79	1.25	0.70	0.30	0.28	0.42	0.57	0.35	0.63	0.64	4
JO-07-28	0.39	0.80	0.41	0.33	0.59	0.73	1.82	0.79	0.25	0.28	0.44	0.57	0.33	0.73	0.67	1
SKO-243		0.68	0.26	0.67		0.80	0.99	0.69	0.23		0.43	0.44	0.32	0.57	0.66	2
OS-6 (NC)	0.32	0.75	0.38	0.32	0.64	0.62	1.07	0.66	0.46	0.31	0.45	0.32	0.30	0.90	0.61	6
Kent (NC)	0.43	0.69	0.28	0.39	0.61	0.59	1.17	0.65	0.38	0.28	0.53	0.49	0.32	0.63	0.59	8
OS-403(ZC-NWZ,NEZ,SZ)	0.42	0.80	0.41								0.58	0.69	0.32	0.80		
RO-11-1 (ZC-CZ)				0.36	0.65	0.57	1.19	0.62	0.22	0.25						
Mean	**0.41**	**0.77**	**0.33**	**0.44**	**0.67**	**0.71**	**1.14**	**0.67**	**0.33**	**0.28**	**0.48**	**0.52**	**0.32**	**0.66**	**0.64**	

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

Entries	NDF (%)					ADF (%)					IVDMD (%)			
	Ludh-iana	Ana-nd	Bika-ner	Aver-age	Ra-nk	Ludh-iana	Ana-nd	Bika-ner	Aver-age	Ra-nk	Ludh-iana	His-ar	Aver-age	Ra-nk
JHO-19-1	63.9	66.5	71.8	67.4	3	41.8	35.3	42.2	39.8	1	55.3	58.7	57.0	13
RO-11-1-12	64.9	68.2	71.8	68.3	6	47.0	38.9	43.1	43.0	5	52.3	65.1	58.7	9
OL-1963	62.3	67.9	71.7	67.3	2	42.3	38.3	43.1	41.3	2	55.0	66.2	60.6	2
HFO-906	66.3	68.4	72.0	68.9	8	47.8	42.5	46.5	45.6	12	51.9	68.5	60.2	4
RO-11-1-8	65.9	68.4	76.2	70.2	10	46.0	39.7	51.6	45.8	13	51.0	66.8	58.9	8
NDO-18-07	66.8	69.0	74.7	70.2	10	46.9	39.5	48.4	44.9	11	51.3	65.3	58.3	10
OL-1960	67.1	67.5	71.9	68.8	7	45.0	37.6	48.9	43.8	8	51.9	63.3	57.6	11
UPO-19-1	66.9	68.2	72.0	69.0	9	46.8	38.2	43.2	42.7	4	52.4	67.2	59.8	5
HFO-904	65.4	68.4	71.0	68.3	6	47.0	39.7	45.9	44.2	9	52.0	66.2	59.1	7
JO-07-28	64.9	68.3	70.4	67.9	5	47.0	42.0	44.9	44.6	10	50.7	64.3	57.5	12
SKO-243	63.1	69.3	69.9	67.4	3	47.0	37.7	42.5	42.4	3	53.4	65.7	59.6	6
OS-6 (NC)	60.7	68.1	71.6	66.8	1	46.0	40.0	43.5	43.2	6	53.0	68.9	61.0	1
Kent (NC)	60.4	68.9	73.6	67.7	4	43.1	42.0	45.6	43.5	7	54.9	65.9	60.4	3
OS-403(ZC-NWZ,NEZ,SZ)	61.9		71.0			43.9		41.9			54.1	66.3		
RO-11-1 (ZC-CZ)		70.1					41.0							
Mean	**64.3**	**68.4**	**72.1**	**68.3**		**45.5**	**39.5**	**45.1**	**43.4**		**52.8**	**65.6**	**59.1**	

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

Entries	Hill Zone					Central Zone									
	Palam-pur	Sri-nagar	Rajo-uri	Aver-age	Ra-nk	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Supe-riority%
RO-11-1-2	315.3	377.4	189.1	293.9	13	375.0	624.7	494.0	245.8	729.2	432.0	326.4	461.0	4	
OL-1876-1	362.0	386.2	214.9	321.0	4	341.7	458.5	511.4	264.2	895.8	499.0	272.2	463.3	2	0.3
OL-1874-1	328.7	414.5	150.8	298.0	11	289.2	515.4	364.2	258.7	847.2	599.0	347.2	460.1	4	
HFO-818	377.3	399.2	178.3	318.3	5	244.5	495.8	312.0	249.2	556.7	528.0	327.8	387.7	12	
RO-11-1-3	380.7	416.6	145.8	314.4	8	276.0	526.2	425.7	276.8	691.7	523.0	236.1	422.2	8	
HFO-806	420.0	409.1	162.4	330.5	2	384.0	623.8	457.9	278.2	483.3	509.0	308.3	434.9	6	
JO-06-23	327.3	457.2	159.9	314.8	7	279.0	458.9	505.1	284.1	571.4	638.0	327.8	437.8	5	
UPO-18-1	375.3	395.0	183.3	317.9	6	350.1	643.0	408.7	274.6	566.7	536.0	234.7	430.5	7	
NDO-1802	326.7	400.6	154.9	294.1	12	360.3	485.0	393.5	260.2	531.9	530.0	280.6	405.9	11	
SKO-241	340.0	407.7	169.1	305.6	9	403.5	519.5	371.1	293.4	651.4	621.0	394.4	464.9	1	0.6
Kent (NC)	365.3	434.3	175.8	325.1	3	318.9	487.1	385.7	268.5	497.2	680.0	280.6	416.9	10	
OS-6 (NC)	295.3	407.6	203.3	302.1	10	306.0	468.2	477.5	289.5	510.3	575.0	316.7	420.5	9	
SKO-96 (ZC-HZ)	390.0	420.6	201.6	337.4	1										
RO-11-1 (ZC-CZ)						300.0	438.3	381.4	282.4	941.7	540.0	350.0	462.0	3	
Mean	**354.2**	**409.7**	**176.1**	**313.3**		**325.2**	**518.8**	**422.2**	**271.2**	**651.9**	**554.6**	**307.9**	**436.0**		
CD at 5%	**52.1**	**26.5**	**3.2**			17.5	**67.9**	**78.7**	**35.7**	**177.7**	116.7	37.9			
CV%	**8.7**	**3.8**	**9.0**			10.4	**7.8**	**11.0**		**16.2**	12.5	7.3			

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

Entries	South Zone							All India		
	Hyderabad	Mandya	Coimbatore	Mattupetty	**Tirupati	Average	Rank	Average	Rank	Superiority%
RO-11-1-2	347.1	318.2	336.1	467.0	74.8	367.1	4	398.4	4	8.5
OL-1876-1	286.0	308.8	286.1	681.0	72.5	390.5	3	412.0	1	12.2
OL-1874-1	269.3	259.4	355.6	517.0	54.6	350.3	8	394.0	5	7.3
HFO-818	266.6	242.7	363.9	450.0	50.7	330.8	10	356.6	12	
RO-11-1-3	263.8	263.3	334.7	481.0	61.4	335.7	9	374.4	7	1.9
HFO-806	280.4	237.4	354.2	722.0	74.5	398.5	2	402.1	2	9.5
JO-06-23	294.3	255.8	356.9	542.0	64.4	362.3	5	389.8	6	6.1
UPO-18-1	305.4	272.8	269.4	350.0	64.8	299.4	12	368.9	8	0.4
NDO-1802	280.4	297.0	252.8	583.0	75.2	353.3	7	366.9	10	
SKO-241	283.2	327.5	291.7	525.0	50.0	356.9	6	399.9	3	8.9
Kent (NC)	288.8	323.8	333.3	303.0	60.1	312.2	11	367.3	9	
OS-6 (NC)	291.6	239.6	343.1	305.0	77.2	294.8	13	359.2	11	
OS-403 (ZC-SZ)	233.2	275.4	258.3	870.0	81.8	409.2	1			
Mean	**283.9**	**278.6**	**318.2**	**522.8**	**66.3**	**350.8**		**382.5**		
CD at 5%	**46.9**	**50.4**	**5.7**	**11.7**	**1860.0**					
CV%	**9.7**	**10.7**	**1.1**	**1.3**	**16.0**					

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

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

Entries	Hill Zone					Central Zone									
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Super-iority%	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Superi-ority%
RO-11-1-2	72.4	90.4	81.4	13		81.5	119.9	119.2	38.4	112.5	93.4	66.3	90.2	7	
OL-1876-1	84.0	91.9	88.0	10		78.8	106.4	156.6	40.4	122.4	110.7	56.4	96.0	1	2.4
OL-1874-1	75.6	100.6	88.1	9		59.4	122.3	100.6	42.2	128.3	136.3	75.3	94.9	3	1.3
HFO-818	89.5	98.6	94.1	5		65.9	96.9	79.3	39.1	112.5	118.9	52.3	80.7	13	
RO-11-1-3	88.5	97.9	93.2	6		58.1	101.8	131.2	45.7	108.1	117.5	56.1	88.4	8	
HFO-806	98.3	101.8	100.0	1	2.6	82.2	122.4	135.2	41.5	78.8	113.8	69.5	91.9	6	
JO-06-23	75.0	98.7	86.9	11		66.4	81.9	156.3	48.2	98.9	145.9	53.6	93.0	5	
UPO-18-1	87.3	109.9	98.6	2	1.1	77.5	83.1	102.1	44.5	88.9	119.1	53.8	81.3	12	
NDO-1802	76.6	90.7	83.7	12		78.8	105.3	104.4	39.3	87.4	117.7	38.7	81.6	11	
SKO-241	79.4	98.1	88.7	7		84.7	95.1	115.9	49.9	82.1	141.6	96.6	95.1	2	1.5
Kent (NC)	83.2	105.6	94.4	4		67.7	97.4	69.5	41.8	89.9	156.7	54.8	82.5	10	
OS-6 (NC)	67.8	108.7	88.2	8		61.0	143.5	93.5	46.3	90.0	130.6	45.2	87.2	9	
SKO-96 (ZC-HZ)	92.6	102.5	97.5	3											
RO-11-1 (ZC-CZ)						77.4	94.9	90.6	52.5	139.6	122.1	78.7	93.7	4	
Mean	**82.3**	**99.6**	**91.0**			**72.3**	**105.5**	**111.9**	**43.8**	**103.0**	**124.9**	**61.3**	**89.0**		
CD at 5%	**13.2**	**9.7**				**5.0**	**12.7**	**22.3**	**5.9**	**26.1**	26.5	16.3			
CV%	**9.5**	**5.8**				**3.0**	**7.1**	**11.7**		**15.0**	12.6	15.8			

Table 6.2 AVT Oat (SC-1): First 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	**Tiru-pati	Aver-age	Ra-nk	Aver-age	Ra-nk	Superi-ority%
RO-11-1-2	69.3	52.3	73.1	117.0	20.0	77.9	7	85.0	7	5.6
OL-1876-1	58.1	57.9	58.7	170.0	19.4	86.2	3	91.7	2	13.9
OL-1874-1	50.7	39.6	78.0	129.0	13.5	74.3	9	87.5	5	8.7
HFO-818	48.6	34.2	81.3	113.0	13.6	69.3	10	79.2	11	
RO-11-1-3	54.8	60.8	69.2	117.0	16.3	75.4	8	85.1	6	5.7
HFO-806	55.1	44.5	75.0	181.0	18.9	88.9	2	92.2	1	14.6
JO-06-23	64.6	58.2	77.8	137.0	15.5	84.4	4	89.4	3	11.1
UPO-18-1	62.9	42.6	59.1	88.0	17.4	63.2	13	78.4	12	
NDO-1802	57.0	61.5	52.4	146.0	19.3	79.2	5	81.2	8	0.9
SKO-241	56.7	61.9	62.3	131.0	12.2	78.0	6	88.9	4	10.4
Kent (NC)	63.0	56.3	73.3	76.0	14.2	67.2	11	79.6	10	
OS-6 (NC)	59.9	49.8	74.3	76.0	20.7	65.0	12	80.5	9	
OS-403 (ZC-SZ)	47.6	38.2	54.9	217.0	22.2	89.4	1			
Mean	**57.6**	**50.6**	**68.4**	**130.6**	**17.2**	**76.8**		**84.9**		
CD at 5%	**12.5**	**11.0**	**2.1**	**11.5**	**481.0**					
CV%	**12.8**	**12.9**	**1.8**	**5.2**	**16.0**					

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

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

Entries	Palam-pur	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
RO-11-1-2	2.51	3.15	6.94	5.20	3.78	8.19	4.08	4.82	5.11	4.10	5.19	4.82	1
OL-1876-1	2.81	2.76	4.68	5.68	4.06	10.07	2.87	3.85	4.66	3.72	7.57	4.79	2
OL-1874-1	2.63	2.42	5.33	3.83	3.98	9.11	3.65	3.33	3.51	4.34	5.74	4.35	6
HFO-818	2.64	2.04	4.86	3.28	3.83	5.62	3.45	2.93	3.10	4.33	5.00	3.74	11
RO-11-1-3	2.76	2.25	5.83	4.26	4.26	8.23	3.11	3.66	4.23	3.94	5.34	4.35	6
HFO-806	3.27	3.14	7.02	4.82	4.28	5.82	3.25	3.77	3.17	4.22	8.03	4.62	3
JO-06-23	2.61	2.26	4.68	5.32	4.37	5.95	3.45	3.70	3.40	4.15	6.02	4.17	8
UPO-18-1	3.00	2.89	7.17	4.54	4.22	6.37	2.47	4.24	5.22	3.17	3.89	4.29	7
NDO-1802	2.54	3.02	5.75	4.37	4.00	7.09	3.69	4.45	4.98	3.16	6.48	4.50	4
SKO-241	2.70	3.27	5.39	3.79	4.51	7.00	4.15	3.68	5.24	3.74	5.84	4.48	5
Kent (NC)	2.90	2.58	5.78	3.94	4.13	5.99	3.69	3.94	5.01	4.02	3.37	4.12	10
OS-6 (NC)	2.39	2.49	5.55	4.87	4.45	6.07	4.06	4.35	3.87	4.18	3.39	4.15	9
SKO-96 (ZC-HZ)	2.66												
RO-11-1 (ZC-CZ)		3.45	4.46	3.89	4.34	10.46	3.68						
OS-403 (ZC-SZ)								2.84	3.79	3.31	9.67		
Mean	**2.72**	**2.75**	**5.65**	**4.45**	**4.17**	**7.38**	**3.51**	**3.81**	**4.25**	**3.87**	**5.81**	**4.37**	

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

Entries	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Raipur	Hyderabad	Mandya	Coimbatore	Average	Rank
RO-11-1-2	0.68	1.33	1.25	0.59	1.26	0.83	0.96	0.84	0.89	0.96	1
OL-1876-1	0.64	1.09	1.74	0.62	1.37	0.59	0.78	0.87	0.76	0.94	2
OL-1874-1	0.50	1.27	1.06	0.65	1.38	0.79	0.63	0.54	0.95	0.86	8
HFO-818	0.55	0.95	0.83	0.60	1.14	0.55	0.53	0.44	0.97	0.73	11
RO-11-1-3	0.47	1.13	1.31	0.70	1.29	0.74	0.76	0.98	0.81	0.91	3
HFO-806	0.67	1.38	1.42	0.64	0.95	0.73	0.74	0.60	0.89	0.89	5
JO-06-23	0.54	0.84	1.65	0.74	1.03	0.56	0.81	0.77	0.90	0.87	7
UPO-18-1	0.64	0.93	1.13	0.68	1.00	0.57	0.87	0.82	0.70	0.81	10
NDO-1802	0.66	1.25	1.16	0.60	1.16	0.51	0.91	1.03	0.66	0.88	6
SKO-241	0.69	0.99	1.18	0.77	0.88	1.02	0.73	0.99	0.80	0.89	5
Kent (NC)	0.55	1.16	0.71	0.64	1.08	0.72	0.86	0.87	0.88	0.83	9
OS-6 (NC)	0.50	1.70	0.95	0.71	1.07	0.58	0.89	0.80	0.91	0.90	4
RO-11-1 (ZC-CZ)	0.89	0.97	0.92	0.81	1.55	0.83					
OS-403 (ZC-SZ)							0.58	0.52	0.70		
Mean	**0.61**	**1.15**	**1.18**	**0.67**	**1.17**	**0.69**	**0.77**	**0.77**	**0.83**	**0.87**	

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

Entries	Palam-pur	Sri-nagar	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Coimb-atore	Hydera-bad	Man-dya	**Ana-nd	Aver-age	Ra-nk
RO-11-1-2	7.4	8.9	10.2	7.4	7.5	5.5	7.7	4.3	3.5	19.1	6.9	6
OL-1876-1	8.3	8.9	6.4	13.0	8.9	4.8	6.8	3.9	3.8	22.3	7.2	5
OL-1874-1	7.9	10.5	8.0	8.4	11.0	6.6	10.2	3.5	2.2	20.2	7.6	3
HFO-818	9.9	9.1	6.1	7.0	9.7	4.2	7.8	2.8	1.8	18.5	6.5	8
RO-11-1-3	9.0	10.4	8.5	10.9	9.3	4.7	8.8	3.8	4.0	19.1	7.7	2
HFO-806	9.5	10.4	11.1	10.0	9.1	6.9	8.1	2.9	2.7	13.4	7.8	1
JO-06-23	7.0	8.4	5.0	15.5	1.2	5.3	9.9	3.4	3.3	16.3	6.6	7
UPO-18-1	7.9	10.2	6.1	8.6	9.6	3.2	6.0	3.1	3.9	16.8	6.5	8
NDO-1802	7.3	8.1	8.1	8.4	9.6	3.5	6.6	3.4	3.8	15.7	6.5	8
SKO-241	7.0	9.2	6.7	8.7	11.5	10.0	7.4	3.5	4.3	17.1	7.6	3
Kent (NC)	8.5	8.4	6.2	4.6	12.9	4.4	5.7	4.3	4.0	14.3	6.5	8
OS-6 (NC)	6.3	10.3	10.8	6.9	10.6	4.6	11.4	3.3	3.3	15.2	7.5	4
SKO-96 (ZC-HZ)	8.1	11.1										
RO-11-1 (ZC-CZ)			6.0	6.7	9.8	6.3				22.7		
OS-403 (ZC-SZ)							6.3	2.9	2.5			
Mean	**8.0**	**9.5**	**7.6**	**8.9**	**9.3**	**5.4**	**7.9**	**3.5**	**3.3**	**17.7**	**7.1**	

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

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

Entries	Palam-pur	Sri-nagar	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Coimb-atore	Hydera-bad	Man-dya	**Ana-nd	Aver-age	Ra-nk
RO-11-1-2	10.2	9.8	8.5	6.2	8.1	8.3	10.5	5.3	6.7	16.9	8.2	5
OL-1876-1	9.9	9.7	6.1	8.3	8.1	8.5	11.6	7.2	6.5	18.4	8.4	4
OL-1874-1	10.5	10.5	6.6	8.4	8.2	8.8	13.1	6.4	5.7	16.1	8.7	2
HFO-818	11.1	9.2	6.3	8.8	8.2	8.1	9.6	6.6	5.3	16.4	8.1	6
RO-11-1-3	10.2	10.6	8.3	8.3	8.2	8.4	12.7	7	6.6	17.9	8.9	1
HFO-806	9.6	10.2	9.0	7.4	8.1	9.9	10.8	5.2	6.1	17.0	8.5	3
JO-06-23	9.3	8.5	6.1	9.9	8.2	9.9	12.7	5.1	5.7	16.5	8.4	4
UPO-18-1	9.0	9.3	7.3	8.4	8.2	6.1	10.1	5	9.2	18.8	8.1	6
NDO-1802	9.6	8.9	7.7	8.0	8.2	9.1	12.5	6.3	6.1	18.1	8.5	3
SKO-241	8.8	9.4	7.1	7.5	8.2	10.3	11.8	5.4	7.0	20.7	8.4	4
Kent (NC)	10.2	7.9	6.3	6.6	8.2	8.0	7.8	6.3	7.1	16.0	7.6	7
OS-6 (NC)	9.3	9.5	7.5	7.4	8.2	10.2	15.3	5.8	6.6	17.2	8.9	1
SKO-96 (ZC-HZ)	8.8	10.8										
RO-11-1 (ZC-CZ)			6.3	7.4	8.1	8.1				16.2		
OS-403 (ZC-SZ)							11.4	5.5	6.7			
Mean	**9.7**	**9.6**	**7.2**	**7.9**	**8.1**	**8.7**	**11.5**	**5.9**	**6.6**	**17.4**	**8.4**	

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

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

Entries	Palam-pur	Sri-nagar	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Tiru-pati	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
RO-11-1-2	131.3	97.1	125.7	131.7	102.7	117.5	139.9	109.7	133.2	95.9	64.3	80.1	110.5	94.0	109.5	10
OL-1876-1	122.0	109.6	127.9	127.1	101.3	123.4	131.7	118.7	167.2	103.2	65.4	81.5	108.5	129.0	115.5	5
OL-1874-1	142.7	102.1	149.9	126.8	83.8	126.5	140.3	133.5	169.4	102.5	65.3	80.9	120.5	112.0	118.3	3
HFO-818	135.7	111.4	131.0	124.8	85.4	131.2	132.9	115.0	149.9	93.2	52.0	53.6	125.0	85.0	109.0	11
RO-11-1-3	139.0	119.0	113.0	126.4	94.4	112.5	135.1	118.3	137.9	96.7	62.7	72.5	125.2	118.0	112.2	9
HFO-806	140.7	102.7	144.8	128.7	94.5	111.7	136.5	129.6	151.5	96.6	60.6	64.8	128.0	116.0	114.8	7
JO-06-23	136.7	115.0	133.3	137.3	102.7	118.5	146.1	142.7	152.0	106.6	58.0	63.0	129.7	120.0	118.7	1
UPO-18-1	133.3	103.7	139.2	128.6	101.3	119.5	138.7	130.7	166.1	98.4	57.4	67.1	120.8	100.0	114.6	8
NDO-1802	140.0	93.2	150.9	131.9	101.0	117.8	141.2	128.3	133.1	98.0	67.0	78.9	124.6	116.0	115.9	4
SKO-241	144.0	108.0	147.9	138.4	91.6	123.0	140.9	136.6	172.0	115.4	57.3	64.6	115.4	103.0	118.4	2
Kent (NC)	127.7	101.2	126.4	125.8	90.1	117.5	125.1	146.2	129.4	94.8	60.0	71.2	112.5	105.0	109.5	10
OS-6 (NC)	132.3	101.6	125.0	132.2	90.5	120.5	134.1	128.8	143.0	102.4	73.2	90.1	128.6	113.0	115.4	6
SKO-96 (ZC-HZ)	119.0	103.9														
RO-11-1 (ZC-CZ)			140.1	131.8	90.8	119.5	139.5	123.9	165.2							
OS-403 (ZC-SZ)										104.4	77.3	75.9	110.0	114.0		
Mean	**134.2**	**105.3**	**135.0**	**130.1**	**94.6**	**119.9**	**137.1**	**127.8**	**151.5**	**100.6**	**63.1**	**72.6**	**119.9**	**109.6**	**114.3**	

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

Entries	Palam-pur	Sri-nagar	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Mattu-petty	Aver-age	Ra-nk
RO-11-1-2	0.37	0.38	0.47	0.66	0.71	1.15	0.54	0.52	0.43	0.61	0.32	0.83	0.58	5
OL-1876-1	0.55	0.33	0.47	0.63	0.58	1.37	0.59	0.23	0.44	0.59	0.33	0.57	0.56	7
OL-1874-1	0.46	0.34	0.54	0.64	0.84	1.54	0.56	0.21	0.43	0.74	0.34	0.73	0.61	2
HFO-818	0.61	0.40	0.34	0.66	0.78	1.28	0.60	0.47	0.40	0.72	0.34	0.63	0.60	3
RO-11-1-3	0.59	0.35	0.43	0.64	0.75	1.08	0.72	0.57	0.42	0.77	0.32	0.57	0.60	3
HFO-806	0.87	0.36	0.39	0.66	0.59	1.23	0.67	0.25	0.40	0.43	0.35	0.57	0.56	7
JO-06-23	0.45	0.37	0.35	0.68	0.68	1.28	0.72	0.34	0.63	0.55	0.34	0.70	0.59	4
UPO-18-1	0.34	0.41	0.37	0.68	0.72	1.20	0.68	0.34	0.48	0.68	0.35	0.63	0.57	6
NDO-1802	0.31	0.33	0.39	0.65	0.63	1.04	0.72	0.49	0.70	0.49	0.34	0.57	0.56	7
SKO-241	0.38	0.34	0.73	0.68	0.67	2.09	0.75	0.26	0.35	0.44	0.32	0.73	0.65	1
Kent (NC)	0.30	0.31	0.38	0.66	0.75	1.15	0.78	0.36	0.39	0.42	0.34	0.67	0.54	8
OS-6 (NC)	0.40	0.32	0.40	0.63	0.85	0.85	0.70	0.43	0.35	0.34	0.36	0.73	0.53	9
SKO-96 (ZC-HZ)	0.84	0.42												
RO-11-1 (ZC-CZ)			0.48	0.68	0.69	1.75	0.54	0.23						
OS-403 (ZC-SZ)									0.47	0.69	0.30	0.73		
Mean	**0.50**	**0.36**	**0.44**	**0.66**	**0.71**	**1.31**	**0.66**	**0.36**	**0.45**	**0.57**	**0.33**	**0.67**	**0.58**	

Table 6.9 AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): NDF (%), ADF (%) & IVDMD (%)

Entries	NDF (%)					ADF (%)					IVDMD (%)	
	Ana-nd	Palma-pur	Rah-uri	Aver-age	Ra-nk	Palam-pur	Rah-uri	Ana-nd	Aver-age	Ra-nk	Rah-uri	Ra-nk
RO-11-1-2	67.2	65.4	64.3	65.6	9	56.2	46.5	43.0	48.6	11	52.6	8
OL-1876-1	66.1	63.8	68.4	66.1	11	55.8	46.9	39.4	47.4	8	52.3	9
OL-1874-1	67.3	64.0	60.5	63.9	2	54.8	42.8	40.9	46.2	2	55.5	3
HFO-818	67.7	65.8	61.7	65.1	6	55.8	44.8	41.0	47.2	7	54.0	7
RO-11-1-3	66.4	64.2	63.2	64.6	3	56.2	47.0	36.9	46.7	6	52.2	10
HFO-806	67.0	66.6	61.2	64.9	4	56.6	39.8	40.9	45.8	1	57.9	1
JO-06-23	67.3	63.4	68.0	66.2	12	54.6	49.8	41.1	48.5	10	50.1	12
UPO-18-1	66.4	62.2	62.1	63.6	1	54.6	42.2	42.3	46.4	4	56.0	2
NDO-1802	66.8	64.6	65.2	65.5	8	55.4	43.5	40.0	46.3	3	55.0	4
SKO-241	65.6	63.8	65.6	65.0	5	56.6	43.8	39.4	46.6	5	54.7	5
Kent (NC)	66.9	64.8	63.8	65.2	7	58.0	44.3	39.4	47.2	7	54.3	6
OS-6 (NC)	66.9	66.0	64.4	65.8	10	57.6	46.5	39.9	48.0	9	52.6	8
SKO-96 (ZC-HZ)		62.6				57.2						
RO-11-1 (ZC-CZ)	67.2		67.2				48.7	40.6			50.9	11
Mean	**66.8**	**64.4**	**64.3**	**65.1**		**56.1**	**45.1**	**40.4**	**47.1**		**53.7**	

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 five entries along with two national checks (OS-6 and Kent) and three zonal checks (SKO-96 for HZ, JHO-2009-01 for CZ and RO-11-1 for NWZ) for respective zones were evaluated at 17 locations across the three zones. There were 3 locations in HZ, 6 locations in NWZ and 8 locations in CZ.
For GFY (q/ha), entries HFO-529 (9.1%) and JO-05-09 (8.9%) were superior over the best check Kent in central zone. All India level, entries JO-05-09 (9.8%),HFO-718 (8.9%) and HFO-529 (7.6%) were superior over the best national check Kent.All other entries were below or at par or marginally superior in comparison to best check.
For DMY (q/ha), entry HFO-529 was superior over the best check (Kent) by margin of 5.9% in hill zone. In central zone, entry HFO-718 was superior over the best check (JHO-2009-1) by margin of 4.7%. All India level,entries HFO-718 (13.5%), and JO-05-09 (9.7%) were superior over the best national check (OS-6). All other entries were below or at par or marginally superior in comparison to best check.
For fodder production potential (q/ha/day), HFO-529 ranked first followed by JO-05-09 for green matter while HFO-718 ranked first for dry matter. Entry HFO-718 ranked first for plant height. Entry JO-05-09 ranked first followed by SKO-240 for leafiness.

For quality parameters, entry HFO-718 (8.9 q/ha) was ranked first for crude protein yield. For crude protein content, entry OL-1896 was best with 9.1%. Entry OL-1896 ranked first for 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 in Oat (Single cut) for seed,five entries along with two national checks (OS-6 and Kent) and three zonal checks (SKO-96 for HZ, JHO-2009-01 for CZ and RO-11-1 for NWZ) for respective zones were evaluated at 11 locations across the three zones. There were 2 locations in HZ, 3 locations in NWZ and 6 locations in CZ.
For seed yield (q/ha), at zonal level, zonal checks were superior over the tested entries. At all India level, national check Kent is superior over the tested entries.

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

Entries	Hill Zone					North West Zone							
	Palam-pur	Sri-nagar	Rajo-uri	Aver-age	Ra-nk	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Aver-age	Ra-nk
OL-1896	316.7	376.0	177.4	290.0	7	708.7	705.6	711.9	537.0	734.4	968.6	727.7	4
HFO-718	265.3	384.0	239.1	296.1	6	707.7	669.7	750.4	688.9	874.7	911.8	767.2	2
HFO-529	378.7	431.0	190.8	333.5	1	658.4	603.1	621.5	555.6	917.7	753.8	685.0	5
JO-05-09	288.7	410.0	201.6	300.1	5	628.9	657.5	761.7	592.6	765.0	1001.6	734.5	3
SKO-240	331.3	410.3	203.3	315.0	3	415.2	603.1	735.8	444.4	556.7	952.8	618.0	8
Kent (NC)	363.3	414.0	223.2	333.5	1	567.0	633.6	611.7	533.3	731.7	723.3	633.4	6
OS-6 (NC)	297.3	402.0	210.8	303.4	4	636.0	653.0	626.4	470.0	699.7	664.6	625.0	7
SKO-96 (ZC-HZ)	328.7	418.3	225.7	324.2	2								
RO-11-1 (ZC-NWZ)						751.9	699.2	733.6	711.1	888.5	852.4	772.8	1
Mean	**321.3**	**405.7**	**209.0**	**312.0**		**634.2**	**653.1**	**694.1**	**566.6**	**771.1**	**853.6**	**695.5**	
CD at 5%	**53.8**	**34.0**	**3.3**			**152.8**	**59.5**	**52.5**	**41.6**	**121.8**			
CV%	**9.6**	**4.8**	**7.6**				**5.2**	**8.2**	**9.3**	**9.0**			

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

Entries	Central Zone										All India		
	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Super-iority%
OL-1896	294.3	371.7	436.8	269.5	802.8	369.0	388.9	536.9	433.7	7		512.1	4	4.1
HFO-718	236.0	365.2	474.4	285.6	814.4	697.0	386.1	355.0	451.7	3	1.5	535.6	2	8.9
HFO-529	399.3	371.8	588.4	272.5	716.9	583.0	458.3	492.9	485.4	1	9.1	529.0	3	7.6
JO-05-09	404.9	484.9	490.2	274.8	791.1	617.0	272.2	539.4	484.3	2	8.9	540.1	1	9.8
SKO-240	313.2	441.8	385.6	283.5	749.4	539.0	200.0	468.0	422.6	8		472.5	7	
Kent (NC)	368.8	436.0	460.0	267.6	690.0	485.0	363.9	487.3	444.8	4		491.8	5	
OS-6 (NC)	377.7	497.7	459.8	259.5	635.3	467.0	355.6	451.9	438.1	6		480.3	6	
JHO-2009-1 (ZC-CZ)	332.6	346.2	444.2	249.8	705.6	655.0	386.9	433.5	444.2	5				
Mean	**340.9**	**414.4**	**467.4**	**270.4**	**738.2**	**551.5**	**351.5**	**470.6**	**450.6**			**508.8**		
CD at 5%	**16.0**	**47.7**	**103.7**	**27.5**	**NS**	**110.1**	**41.8**							
CV%	**9.1**	**6.6**	**12.5**		**12.2**	**11.4**	**6.8**							

Table 7.2 AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (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-1896	71.5	88.3	79.9	7		157.5	143.4	146.7	118.6	141.6	4	
HFO-718	61.1	89.7	75.4	8		147.8	127.2	159.8	153.2	147.0	1	0.7
HFO-529	87.8	103.3	95.6	1	5.9	139.5	118.5	129.3	123.5	127.7	6	
JO-05-09	67.4	97.7	82.5	5		154.9	129.0	159.2	132.8	144.0	3	
SKO-240	77.8	96.0	86.9	4		103.0	116.4	157.5	96.5	118.4	8	
Kent (NC)	83.2	97.3	90.3	2		139.7	120.5	121.1	126.2	126.9	7	
OS-6 (NC)	68.3	95.7	82.0	6		156.6	134.7	123.4	98.8	128.4	5	
SKO-96 (ZC-HZ)	75.8	103.0	89.4	3								
RO-11-1 (ZC-NWZ)						132.8	135.3	154.1	161.9	146.0	2	
Mean	**74.1**	**96.4**	**85.2**			**141.5**	**128.1**	**143.9**	**126.4**	**135.0**		
CD at 5%	**12.1**	**7.9**				**28.8**	**17.0**	**32.6**	**9.8**			
CV%	**9.3**	**4.7**					**7.5**	**7.1**	**11.5**			

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

Entries	Central Zone											All India		
	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority%
OL-1896	60.6	79.7	79.7	42.9	133.7	74.5	82.1	108.6	82.7	7		99.1	3	3.0
HFO-718	78.9	78.4	92.7	49.5	147.6	160.6	73.4	110.5	98.9	1	4.7	109.3	1	13.5
HFO-529	128.9	78.4	75.5	48.8	122.6	131.2	82.4	108.3	97.0	2	2.6	105.6	2	
JO-05-09	91.1	94.8	65.0	44.0	114.1	139.7	63.6	125.6	92.2	4		105.6	2	9.7
SKO-240	65.3	84.9	111.5	50.5	132.0	120.0	26.7	124.4	89.4	5		97.3	4	1.1
Kent (NC)	82.0	80.7	55.7	45.0	94.1	107.5	73.4	113.3	81.5	8		95.7	6	
OS-6 (NC)	77.9	91.0	61.5	44.4	101.0	102.9	76.9	114.7	83.8	6		96.3	5	
JHO-2009-1 (ZC-CZ)	73.6	71.8	133.6	40.0	111.3	148.6	83.1	94.4	94.5	3				
Mean	**82.3**	**82.5**	**84.4**	**45.6**	**119.6**	**123.1**	**70.2**	**112.5**	**90.0**			**101.3**		
CD at 5%	**4.5**	**9.2**	**19.5**	**6.2**	**NS**	**24.9**	**13.1**							
CV%	**2.5**	**6.4**	**13.0**		**17.2**	**11.5**	**10.6**							

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Rai-pur	Dha-ri	Aver-age	Ra-nk
OL-1896	2.59	7.16	5.47	5.60	4.89	2.41	3.83	4.01	4.15	9.02	4.05	7.30	5.04	3
HFO-718	2.06	7.15	5.19	5.90	5.29	1.96	3.65	4.35	4.39	9.26	4.02	4.30	4.79	6
HFO-529	3.29	6.65	4.67	4.90	5.19	3.34	3.91	5.94	4.19	8.43	6.03	6.80	5.28	1
JO-05-09	2.30	6.35	5.10	6.00	4.98	3.25	5.45	4.95	4.23	8.89	3.58	6.90	5.17	2
SKO-240	2.26	3.08	4.67	5.80	3.58	2.53	4.19	3.51	4.36	6.19	2.63	5.80	4.05	7
Kent (NC)	3.13	5.73	4.91	4.80	5.03	3.06	4.90	4.65	4.12	8.63	4.79	6.40	5.01	4
OS-6 (NC)	2.44	6.42	5.06	4.90	4.35	3.17	5.70	4.64	3.99	7.84	4.68	6.70	4.99	5
SKO-96 (ZC-HZ)	2.24													
RO-11-1 (ZC-NWZ)		7.59	5.42	5.80	6.03									
JHO-2009-1 (ZC-CZ)						2.73	3.63	4.08	3.84	8.02	4.03	5.50		
Mean	**2.54**	**6.27**	**5.06**	**5.46**	**4.92**	**2.81**	**4.41**	**4.52**	**4.16**	**8.29**	**4.23**	**6.21**	**4.90**	

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

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Rai-pur	Dha-ri	Aver-age	Ra-nk
OL-1896	1.59	1.11	1.20	1.08	0.82	0.73	0.66	1.50	0.86	1.50	1.11	2
HFO-718	1.49	0.98	1.30	1.29	0.78	0.85	0.76	1.68	0.76	1.30	1.12	1
HFO-529	1.41	0.92	1.00	1.15	0.83	0.76	0.75	1.44	1.08	1.50	1.08	3
JO-05-09	1.56	1.00	1.30	1.12	1.06	0.66	0.68	1.28	0.84	1.60	1.11	2
SKO-240	0.76	0.90	1.20	0.78	0.81	1.01	0.78	1.09	0.35	1.60	0.93	5
Kent (NC)	1.41	0.94	1.00	1.19	0.91	0.56	0.69	1.18	0.97	1.50	1.03	4
OS-6 (NC)	1.58	1.04	1.00	0.91	1.04	0.62	0.68	1.25	1.01	1.70	1.08	3
RO-11-1 (ZC-NWZ)	1.34	1.05	1.20	1.37								
JHO-2009-1 (ZC-CZ)					0.75	1.23	0.62	1.26	0.87	1.20		
Mean	**1.39**	**0.99**	**1.15**	**1.11**	**0.88**	**0.80**	**0.70**	**1.34**	**0.84**	**1.49**	**1.07**	

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

Entries	Palam-pur	Sri-nagar	Ludh-iana	His-ar	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	**Bika-ner	**Ana-nd	Aver-age	Ra-nk
OL-1896	6.5	8.7	14.4	13.1	7.3	6.1	5.9	8.3	22.8	22.8	8.8	2
HFO-718	6.6	7.5	13.4	11.8	6.6	6.7	13.2	5.9	20.1	21.5	8.9	1
HFO-529	9.2	9.5	11.1	9.7	6.3	6.3	10.7	7.8	19.5	18.0	8.8	2
JO-05-09	5.7	10.2	11.1	11.1	6.7	5.4	11.5	6.1	25.3	20.1	8.5	3
SKO-240	7.3	8.8	16.5	10.2	6.7	8.9	9.7	2.3	15.4	21.1	8.8	2
Kent (NC)	8.0	9.5	8.0	10.8	6.5	4.4	8.8	6.6	18.9	15.9	7.8	4
OS-6 (NC)	6.4	9.2	7.7	11	5.9	6.2	8.4	6.8	23.0	16.3	7.7	5
SKO-96 (ZC-HZ)	7.0	10.9										
RO-11-1 (ZC-NWZ)			9.4	12.6					16.3			
JHO-2009-1 (ZC-CZ)					4.7	11.3	12.2	7.6		19.1		
Mean	**7.1**	**9.3**	**11.5**	**11.3**	**6.3**	**6.9**	**10.1**	**6.4**	**20.1**	**19.3**	**8.5**	

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

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

Entries	Palam-pur	Sri-nagar	Ludh-iana	His-ar	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	**Bika-ner	**Ana-nd	Aver-age	Ra-nk
OL-1896	9.0	9.8	9.8	9.1	9.1	7.6	8.0	10.1	14.5	17.1	9.1	1
HFO-718	10.8	8.4	8.4	9.3	8.4	7.2	8.3	8.0	13.6	14.9	8.6	3
HFO-529	10.5	9.2	8.6	8.2	8.0	8.3	8.2	9.5	14.0	14.6	8.8	2
JO-05-09	8.5	10.4	7.0	8.6	7.1	8.3	8.3	9.6	16.3	17.7	8.5	4
SKO-240	9.3	9.2	10.5	8.8	7.9	7.9	8.2	8.8	14.9	16.4	8.8	2
Kent (NC)	9.6	10.8	6.6	9.0	8.1	8.0	8.2	9.0	13.5	16.9	8.6	3
OS-6 (NC)	9.3	9.6	6.2	8.2	6.5	10.1	8.2	8.9	14.7	16.4	8.4	5
SKO-96 (ZC-HZ)	9.3	10.6										
RO-11-1 (ZC-NWZ)			6.1	9.3					12.3			
JHO-2009-1 (ZC-CZ)					6.5	8.4	8.3	9.2		17.2		
Mean	**9.6**	**9.8**	**7.9**	**8.8**	**7.7**	**8.2**	**8.2**	**9.1**	**14.2**	**16.4**	**8.7**	

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur
OL-1896	140.0	101.3	161.3	153.3	148.6	151.3	149.4
HFO-718	132.0	116.3	154.0	174.0	152.7	142.6	166.9
HFO-529	99.0	130.3	148.3	168.3	140.2	143.6	153.7
JO-05-09	130.3	130.7	146.3	181.3	155.1	149.3	144.4
SKO-240	129.3	129.0	127.8	167.3	150.6	137.8	90.7
Kent (NC)	96.3	138.7	136.3	174.0	138.6	143.3	126.6
OS-6 (NC)	135.3	140.7	138.8	162.3	141.5	134.6	145.6
SKO-96 (ZC-HZ)	125.0	111.3					
RO-11-1 (ZC-NWZ)			136.5	173.3	149.1	158.4	163.8
Mean	**123.4**	**124.8**	**143.7**	**169.2**	**147.1**	**145.1**	**142.6**

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

Entries	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Dha-ri	**Mee-rut	Aver-age	Ra-nk
OL-1896	161.9	108.7	92.0	130.8	137.3	113.0	174.7	151.4	220.0	138.3	2
HFO-718	167.3	113.2	91.2	119.5	146.5	156.4	171.0	143.1	225.0	143.1	1
HFO-529	164.2	107.6	95.8	123.8	154.7	137.6	154.2	150.7	250.0	138.1	3
JO-05-09	135.0	128.4	99.1	118.5	138.5	141.6	134.3	142.4	240.0	138.3	2
SKO-240	140.6	96.4	100.1	120.4	148.6	127.0	131.3	143.5	197.0	129.4	6
Kent (NC)	152.4	109.6	94.6	132.4	128.0	121.2	132.4	138.3	170.0	130.8	5
OS-6 (NC)	156.3	129.1	93.3	115.5	139.6	117.6	137.0	153.8	200.0	136.1	4
JHO-2009-1 (ZC-CZ)	141.2	101.8	97.3	128.5	127.0	148.0	155.0	129.9	230.0		
Mean	**152.4**	**111.8**	**95.4**	**123.7**	**140.0**	**132.8**	**148.7**	**144.1**	**216.5**	**136.3**	

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

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

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Rah-uri	Urulikan-chan	Pal-ghar	Jabal-pur	Rai-pur	Dha-ri	**Ana-nd	Aver-age	Ra-nk
OL-1896	0.60	0.40	0.78	0.44	0.82	0.46	0.55	0.50	0.79	0.58	0.33	0.30	1.52	0.55	3
HFO-718	0.49	0.33	0.80	0.49	0.80	0.52	0.45	0.48	0.67	0.84	0.39	0.25	1.31	0.54	4
HFO-529	0.52	0.31	0.74	0.54	0.66	0.38	0.42	0.46	0.81	0.75	0.32	0.22	1.29	0.51	5
JO-05-09	0.55	0.35	0.96	0.39	0.90	0.60	0.58	0.45	0.71	0.77	0.47	0.34	1.40	0.59	1
SKO-240	0.63	0.36	0.79	0.44	0.88	0.55	0.59	0.50	0.68	0.66	0.27	0.32	1.53	0.56	2
Kent (NC)	0.33	0.34	0.72	0.36	0.65	0.51	0.60	0.49	0.67	0.66	0.4	0.20	1.07	0.49	6
OS-6 (NC)	0.41	0.40	0.68	0.38	0.80	0.57	0.47	0.51	0.65	0.64	0.35	0.20	1.22	0.51	5
SKO-96 (ZC-HZ)	0.79	0.43													
RO-11-1 (ZC-NWZ)			0.86	0.37	0.76	0.52									
JHO-2009-1 (ZC-CZ)							0.51	0.48	0.59	0.78	0.28	0.24	1.60		
Mean	**0.54**	**0.37**	**0.79**	**0.43**	**0.78**	**0.51**	**0.52**	**0.48**	**0.70**	**0.71**	**0.35**	**0.26**	**1.37**	**0.53**	

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

Entries	NDF (%)							ADF (%)							IVDMD (%)				
	Ludh-iana	Palam-pur	Rah-uri	Bika-ner	Ana-nd	Aver-age	Ra-nk	Ludh-iana	Ana-nd	Palam-pur	Rah-uri	Bika-ner	Aver-age	Ra-nk	Ludh-iana	His-ar	Rah-uri	Aver-age	Ra-nk
OL-1896	61.9	65.4	61.1	72.3	67.2	65.6	2	40.1	39.4	56.2	38.9	45.2	43.9	3	63.6	58.3	58.6	60.2	1
HFO-718	61.4	66.2	64.5	72.7	68.1	66.6	5	40.0	41.2	55.4	42.0	46.1	44.9	4	62.9	51.9	56.1	57.0	3
HFO-529	63.7	65.4	61.8	73.2	68.1	66.4	4	43.2	39.4	58.8	41.6	48.6	46.3	6	62.3	48.3	56.5	55.7	6
JO-05-09	64.2	63.4	66.1	70.9	66.6	66.2	3	42.9	38.0	55.8	41.8	39.8	43.7	2	59.2	52.1	56.3	55.9	5
SKO-240	60.2	64.0	57.6	72.0	67.6	64.3	1	38.7	39.9	55.0	36.8	43.1	42.7	1	64.2	50.7	60.2	58.4	2
Kent (NC)	64.9	66.4	65.5	73.4	67.3	67.5	7	44.8	38.7	57.8	39.2	47.1	45.5	5	61.0	51.4	58.3	56.9	4
OS-6 (NC)	65.9	64.2	63.7	73.0	67.3	66.8	6	45.0	38.9	57.2	45.3	49.2	47.1	7	59.8	46.3	53.6	53.2	7
SKO-96 (ZC-HZ)		63.8								56.6									
RO-11-1 (ZC-NWZ)	65.3			73.5				44.2				45.4			60.0	52.3			
JHO-2009-1 (ZC-CZ)			60.6		66.5				38.6		39.3						58.2		
Mean	**63.4**	**64.9**	**62.6**	**72.6**	**67.3**	**66.2**		**42.4**	**39.3**	**56.6**	**40.6**	**45.6**	**44.9**		**61.6**	**51.4**	**57.2**	**56.7**	

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)								
	Hill Zone				North West Zone				
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk
OL-1896	25.6	17.9	21.8	8	27.2	29.6	24.2	27.0	3
HFO-718	27.2	19.0	23.1	7	20.3	30.1	32.2	27.5	2
HFO-529	31.2	17.1	24.2	4	16.1	31.8	30.6	26.2	4
JO-05-09	27.3	19.8	23.5	6	24.6	29.0	23.1	25.6	5
SKO-240	37.3	17.0	27.2	2	22.7	30.2	21.4	24.8	6
Kent (NC)	30.5	19.4	24.9	3	19.5	29.7	18.9	22.7	8
OS-6 (NC)	28.7	18.7	23.7	5	21.3	30.6	19.7	23.9	7
SKO-96 (ZC-HZ)	38.2	17.6	27.9	1					
RO-11-1 (ZC-NWZ)					26.8	31.2	29.7	29.2	1
Mean	**30.8**	**18.3**	**24.5**		**22.3**	**30.3**	**25.0**	**25.9**	
CD at 5%	**4.5**	**1.4**			**2.4**	**2.6**	**2.1**		
CV%	**8.4**	**4.3**			**6.1**	**5.6**	**9.8**		

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

Entries	Central Zone								All India	
	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Aver-age	Ra-nk
OL-1896	10.5	20.5	14.5	39.8	23.3	9.2	19.6	5	22.0	4
HFO-718	8.1	22.4	13.7	30.1	19.1	6.9	16.7	7	20.8	6
HFO-529	11.2	16.2	18.3	40.6	26.4	4.3	19.5	6	22.2	3
JO-05-09	13.0	22.3	18.3	47.4	39.9	11.1	25.3	3	25.1	2
SKO-240	13.0	16.0	17.5	5.8	17.6	13.2	13.9	8	19.2	7
Kent (NC)	14.8	15.9	18.3	66.3	34.0	17.4	27.8	2	25.9	1
OS-6 (NC)	9.7	15.5	22.1	31.6	31.9	11.1	20.3	4	21.9	5
JHO-2009-1 (ZC-CZ)	7.9	20.9	27.4	58.3	57.3	14.3	31.0	1		
Mean	**11.0**	**18.7**	**18.8**	**40.0**	**31.2**	**10.9**	**21.8**		**22.4**	
CD at 5%	**3.5**	**3.0**	**4.1**	**11.7**	**7.1**	**1.7**				
CV%	**2.0**	**9.2**	**12.3**	**16.7**	**13.3**	**8.9**				

9. IVTO-MC: INITIAL VARIETAL TRIAL IN OAT (MULTI CUT) (Reference tables 9.1 to 9.9)

In **Initial Varietal Trial in Oat (Multicut)** [**IVTO-MC],** seven entries were evaluated against two national checks (RO-19 and UPO-212) at 18 locations in four zones (HZ, NWZ, NEZ, and CZ).

For GFY (q/ha), entries JO-07-310 and OL-1924 were superior over the best check (RO-19) by margin of 6.0% and 4.1% respectively in central zone.All other entries were below or at par or marginally superior in comparison to best check.

For DMY (q/ha), entries HFO-921 (4.4%), and HFO-918 (4.1%) were superior over the best check (UPO-212) in hill zone. In central zone, entriesOL-1919, and OL-1924were superior over the best check (RO-19) by margin of 4.6% and 4.4% respectively. All other entries were below or at par or marginally superior in comparison to best check.

For fodder production potential (q/ha/day), national check RO-19 ranked first for both green and dry matter. National check RO-19 ranked first for plant height. Entry PLP-24 ranked first followed by HFO-921 for leafiness.

For quality parameters, entry PLP-24 (10.5 q/ha) was ranked first followed by OL-1924 (10.2 q/ha) for crude protein yield. For crude protein content, entry PLP-24 (10.0%) ranked first. Entry HFO-921 ranked first for IVDMD%.

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 (Multicut)** [**AVTO-1 (MC)]** three entries were evaluated against two national checks (RO-19 and UPO-212) at 9 locations in two zones (NWZ and CZ). There were 4 locations in NWZ and 5 locations in CZ.

For GFY (q/ha), entry HFO-707 was superior over the best check (RO-19) by margin of 3.8% in NW zone. All other entries were below or at par or marginally superior in comparison to best check.
For DMY (q/ha), entry HFO-707 (6.6%) showed superiority over the best check (RO-19) in NW zone. All other entries were below or at par or marginally superior in comparison to best check.

For fodder production potential (q/ha/day), national check RO-19 ranked first for both green and dry matter. Entry HFO-716 ranked first for plant height. National check UPO-212 ranked first for leafiness.

For quality parameters, entry OL-1882 (14.6q/ha, 11.8% ranked first followed by national check UPO-212(13.8q/ha, 11.4%) for crude protein yield and crude protein content respectively.

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

Entries	Hill Zone						North West Zone					
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Superi-ority%	His-ar	Ludh-iana	Pant-nagar	Jal-ore	Aver-age	Ra-nk
JO-07-310	270.7	275.5	218.9	255.0	7		471.1	770.2	538.9	341.1	530.3	6
OL-1919	252.7	355.1	194.9	267.6	5		487.4	726.3	450.1	363.0	506.7	8
HFO-921	320.7	291.9	225.2	279.3	1	1.5	530.7	808.0	573.7	297.4	552.4	4
HFO-918	278.7	266.3	193.3	246.1	8		525.5	750.6	396.9	374.1	511.8	7
PLP-24	256.0	315.2	223.1	264.7	6		501.5	841.1	557.8	356.7	564.3	3
OL-1924	255.3	340.5	215.4	270.4	4		534.1	832.4	566.7	393.7	581.7	2
RO-11-1-13	324.7	306.9	192.5	274.7	3		494.4	697.4	413.0	353.3	489.5	9
UPO-212 (NC)	307.3	272.0	231.9	270.4	4		565.9	755.2	505.6	319.3	536.5	5
RO-19 (NC)	260.7	342.3	222.4	275.1	2		538.9	788.5	600.8	412.6	585.2	1
Mean	**280.7**	**307.3**	**213.1**	**267.0**			**516.6**	**774.4**	**511.5**	**356.8**	**539.8**	
CD at 5%	**43.8**	**25.2**	**28.4**				**46.7**	**51.2**	**35.6**			
CV%	**9.0**	**5.4**	**7.6**				**5.2**	**10.8**	**9.4**			

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

Entries	North East Zone							
	Ayodhya	Jorhat	Bhubaneswar	Imphal	Pusa	Ranchi	Average	Rank
JO-07-310	522.0	422.2	453.2	576.3	685.3	261.7	486.8	2
OL-1919	578.7	281.8	414.6	595.7	684.0	228.3	463.8	6
HFO-921	426.7	351.2	373.2	628.0	744.7	213.3	456.2	8
HFO-918	501.2	306.5	359.2	734.3	701.4	218.3	470.2	5
PLP-24	613.3	240.3	333.9	578.7	864.7	261.7	482.1	3
OL-1924	421.3	294.4	412.6	641.7	751.3	241.7	460.5	7
RO-11-1-13	320.0	214.0	371.2	642.7	717.3	193.3	409.8	9
UPO-212 (NC)	485.3	389.3	291.9	597.0	854.0	231.7	474.9	4
RO-19 (NC)	538.7	329.3	465.9	660.3	856.7	311.7	527.1	1
Mean	**489.7**	**314.3**	**386.2**	**628.3**	**762.2**	**240.2**	**470.1**	
CD at 5%	**99.4**	**8.3**	**32.1**		**52.4**	**26.2**		
CV%	**11.7**	**9.0**	**4.8**		**9.9**	**6.3**		

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

Entries	Central Zone								All India	
	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk
JO-07-310	482.7	1004.1	747.8	532.4	601.0	673.6	1	6.0	509.7	4
OL-1919	384.0	938.5	695.8	504.5	577.0	620.0	6		484.0	8
HFO-921	424.8	859.3	734.4	444.2	515.2	595.6	8		486.8	7
HFO-918	493.4	917.4	665.1	468.2	621.4	633.1	5		487.3	6
PLP-24	516.8	1091.5	606.5	455.9	563.4	646.8	3	1.8	509.9	3
OL-1924	499.2	1002.6	685.1	436.0	683.7	661.3	2	4.1	511.5	2
RO-11-1-13	353.9	780.0	570.5	415.7	549.2	533.9	9		439.5	9
UPO-212 (NC)	447.4	925.2	687.8	441.9	547.7	610.0	7		492.0	5
RO-19 (NC)	418.0	1003.0	771.8	467.1	517.3	635.4	4		528.1	1
Mean	**446.7**	**946.8**	**685.0**	**462.9**	**575.1**	**623.3**			**494.3**	
CD at 5%	**16.7**	**NS**	**123.7**	**66.0**	**NS**					
CV%	**9.7**	**11.4**	**10.4**	**8.2**	**11.8**					

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

Entries	Hill Zone						North West Zone						
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Superi-ority%	His-ar	Ludh-iana	Pant-nagar	Jal-ore	Aver-age	Ra-nk	Superi-ority%
JO-07-310	61.2	61.7	52.5	58.5	9		89.6	157.1	114.1	72.4	108.3	6	
OL-1919	58.0	85.4	50.7	64.7	4	0.8	102.0	138.7	89.6	79.1	102.3	9	
HFO-921	74.1	68.2	58.6	67.0	1	4.4	111.5	152.7	139.8	65.2	117.3	4	
HFO-918	65.5	88.4	46.4	66.8	2	4.1	108.7	136.6	86.2	78.5	102.5	8	
PLP-24	59.6	72.4	58.0	63.3	6		105.2	173.3	141.2	78.2	124.5	3	
OL-1924	58.9	80.8	47.4	62.3	7		113.7	176.5	141.3	91.9	130.8	1	3.4
RO-11-1-13	74.5	74.1	46.2	64.9	3	1.2	109.0	139.5	89.6	81.5	104.9	7	
UPO-212 (NC)	69.9	62.3	60.3	64.2	5		124.5	155.6	109.6	70.4	115.0	5	
RO-19 (NC)	58.6	71.3	53.4	61.1	8		116.7	153.0	148.9	87.4	126.5	2	
Mean	**64.5**	**73.8**	**52.6**	**63.6**			**109.0**	**153.7**	**117.8**	**78.3**	**114.7**		
CD at 5%	**9.9**	**4.8**	**6.9**				**14.5**	**26.6**	**11.3**				
CV%	**8.8**	**3.8**	**7.5**				**7.6**	**8.6**	**11.6**				

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

Entries	North East Zone							
	Ayodhya	Jorhat	Bhubaneswar	Imphal	Pusa	Ranchi	Average	Rank
JO-07-310	120.2	77.6	100.9	98.8	131.0	50.6	96.5	4
OL-1919	138.2	49.5	95.4	94.7	126.5	46.4	91.8	6
HFO-921	98.1	65.2	84.8	113.6	140.3	38.4	90.1	7
HFO-918	123.4	60.1	82.4	141.6	134.8	44.0	97.7	3
PLP-24	150.2	46.8	75.8	105.8	176.5	51.0	101.0	2
OL-1924	94.8	53.0	92.7	101.9	147.0	50.3	89.9	8
RO-11-1-13	70.4	38.6	86.2	115.8	142.0	39.3	82.1	9
UPO-212 (NC)	109.2	70.8	69.7	101.6	171.8	41.7	94.1	5
RO-19 (NC)	126.5	57.5	107.2	123.5	172.1	70.1	109.5	1
Mean	**114.6**	**57.7**	**88.3**	**110.8**	**149.1**	**48.0**	**94.7**	
CD at 5%	**24.2**	**4.1**	**7.7**		**10.2**	**NS**		
CV%	**12.2**	**10.5**	**5.1**		**7.9**	**9.2**		

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

Entries	Central Zone								All India	
	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk
JO-07-310	76.1	134.2	162.2	91.9	76.2	108.1	3	2.5	96.0	5
OL-1919	67.3	129.0	148.6	113.9	92.9	110.3	1	4.6	94.8	7
HFO-921	66.7	120.5	151.7	92.8	95.0	105.3	5		96.5	4
HFO-918	75.4	123.3	135.8	99.2	76.0	102.0	7		94.8	7
PLP-24	79.2	142.0	128.1	94.3	72.3	103.2	6		100.5	2
OL-1924	78.5	134.4	147.0	92.0	98.8	110.1	2	4.4	100.0	3
RO-11-1-13	64.4	113.9	118.2	82.0	78.9	91.5	9		86.9	8
UPO-212 (NC)	62.9	121.7	148.5	96.6	78.1	101.6	8		95.8	6
RO-19 (NC)	64.8	128.8	171.1	93.7	69.1	105.5	4		104.1	1
Mean	**70.6**	**127.5**	**145.7**	**95.2**	**81.9**	**104.2**			**96.6**	
CD at 5%	**15.1**	**NS**	**26.2**	**13.9**	**18.3**					
CV%	**8.7**	**13.1**	**10.3**	**8.4**	**12.8**					

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

Entries	Palam-pur	His-ar	Ludh-iana	Pant-nagar	Ayo-dhya	Jor-hat	Bhuban-eswar	Pu-sa	Ran-chi	Ana-nd	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
JO-07-310	1.85	3.80	6.30	4.53	4.75	3.91	5.53	8.90	2.44	9.47	4.98	6.33	5.23	3
OL-1919	1.73	3.97	6.00	3.81	5.26	2.76	5.10	8.88	2.27	8.94	4.96	6.07	4.98	6
HFO-921	2.19	4.27	6.60	4.70	3.87	3.44	4.71	9.67	2.05	7.54	4.49	5.42	4.91	7
HFO-918	1.91	4.27	6.20	3.36	4.54	3.01	4.45	9.11	2.15	8.05	4.78	6.54	4.86	8
PLP-24	1.75	4.03	6.90	4.61	5.57	2.27	4.19	11.23	3.18	9.57	4.50	5.93	5.31	2
OL-1924	1.74	4.30	6.80	4.72	3.83	2.78	5.05	9.76	2.98	9.28	4.25	7.20	5.22	4
RO-11-1-13	2.22	4.00	5.70	3.56	2.90	2.25	4.70	9.32	1.88	6.84	4.24	5.78	4.45	9
UPO-212 (NC)	2.10	4.57	6.20	4.17	4.41	3.82	3.60	11.09	2.36	8.49	4.51	5.77	5.09	5
RO-19 (NC)	1.78	4.33	6.50	5.01	4.89	3.11	5.66	11.13	2.93	9.46	4.53	5.45	5.40	1
Mean	**1.92**	**4.17**	**6.36**	**4.27**	**4.45**	**3.04**	**4.78**	**9.90**	**2.47**	**8.63**	**4.58**	**6.05**	**5.05**	

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

Entries	Palam-pur	His-ar	Ludh-iana	Pant-nagar	Ayod-hya	Jor-hat	Bhuban-eswar	Pu-sa	Ran-chi	Ana-nd	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
JO-07-310	0.42	0.73	1.30	0.96	1.06	0.72	1.23	1.70	0.47	1.27	0.86	0.80	0.96	6
OL-1919	0.40	0.83	1.10	0.76	1.22	0.49	1.17	1.64	0.46	1.23	1.12	0.98	0.95	7
HFO-921	0.51	0.87	1.30	1.15	0.86	0.64	1.07	1.82	0.37	1.06	0.94	1.00	0.97	5
HFO-918	0.45	0.87	1.10	0.73	1.20	0.59	1.02	1.75	0.43	1.08	1.01	0.80	0.92	8
PLP-24	0.41	0.87	1.40	1.17	1.32	0.44	0.95	2.29	0.62	1.25	0.93	0.76	1.03	2
OL-1924	0.40	0.90	1.40	1.18	0.83	0.50	1.14	1.91	0.62	1.24	0.90	1.04	1.00	3
RO-11-1-13	0.51	0.87	1.10	0.77	0.62	0.47	1.09	1.84	0.38	1.00	0.84	0.83	0.86	9
UPO-212 (NC)	0.48	0.97	1.30	0.91	0.96	0.69	0.86	2.23	0.42	1.12	0.99	0.82	0.98	4
RO-19 (NC)	0.40	0.93	1.30	1.24	1.11	0.54	1.30	2.24	0.66	1.22	0.91	0.73	1.05	1
Mean	**0.44**	**0.87**	**1.26**	**0.99**	**1.02**	**0.56**	**1.09**	**1.94**	**0.49**	**1.16**	**0.94**	**0.86**	**0.97**	

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

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Ayo-dhya	Jor-hat	Bhuban-eswar	Imp-hal	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
JO-07-310	5.7	6.7	7.2	20.4	9.5	3.3	9.5	9.0	2.7	24.0	13.2	5.4	6.9	9.5	6
OL-1919	6.1	8.4	8.5	19.8	11.2	2.6	9.2	8.9	3.8	24.2	11.7	7.6	7.9	10.0	3
HFO-921	7.1	5.8	9.5	23.8	7.7	3.4	7.6	10.5	2.5	22.8	12.7	6.2	7.0	9.7	5
HFO-918	6.3	7.7	9.4	23.1	8.7	3.0	7.4	11.9	3.6	21.9	10.9	6.9	6.7	9.8	4
PLP-24	5.2	7.1	9.0	30.0	12.3	2.3	7.3	10.4	3.7	27.1	10.1	5.8	6.7	10.5	1
OL-1924	5.7	6.7	7.2	29.5	7.2	2.7	8.3	8.3	3.9	24.6	12.4	6.8	8.9	10.2	2
RO-11-1-13	6.7	6.9	10.3	23.0	5.4	2.1	8.5	9.9	3.2	19.8	9.3	6.4	7.0	9.1	8
UPO-212 (NC)	6.0	6.3	10.7	22.4	8.3	3.7	6.5	9.8	3.4	20.1	11.8	6.2	7.2	9.4	7
RO-19 (NC)	5.3	6.8	10.3	21.3	10.1	2.5	9.4	10.7	4.1	24.4	13.7	5.1	5.7	10.0	3
Mean	**6.0**	**6.9**	**9.1**	**23.7**	**8.9**	**2.8**	**8.2**	**9.9**	**3.4**	**23.2**	**11.8**	**6.3**	**7.1**	**9.8**	

Table 9.6 IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Crude Protein (%)

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Ayo-dhya	Jor-hat	Bhuban-eswar	Imp-hal	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
JO-07-310	9.3	10.8	8.1	13.0	7.9	10.5	9.5	9.3	5.3	16.3	8.1	5.9	9.0	9.5	5
OL-1919	10.5	9.8	8.3	14.3	8.1	10.7	9.6	9.8	8.1	16.6	7.9	6.7	8.5	9.9	2
HFO-921	9.6	8.5	8.5	15.6	7.8	10.6	8.9	9.7	6.6	17.2	8.4	6.7	7.4	9.7	4
HFO-918	9.6	8.7	8.6	16.9	7.7	10.2	9.0	8.8	8.1	17.2	8.0	7.0	8.8	9.9	2
PLP-24	8.8	9.8	8.6	17.3	8.2	10.1	9.6	9.8	7.3	17.8	7.9	6.1	9.2	10.0	1
OL-1924	9.6	8.3	8.1	16.7	7.8	10.1	9.0	8.3	7.7	16.8	8.4	7.4	9.0	9.8	3
RO-11-1-13	9.0	9.2	8.3	16.5	7.6	11.0	9.9	8.5	8.1	16.7	7.9	7.8	8.8	9.9	2
UPO-212 (NC)	8.5	10.2	8.6	14.4	7.6	10.5	9.4	10.0	8.3	15.8	7.9	6.4	9.3	9.8	3
RO-19 (NC)	9.0	9.6	8.8	13.9	8.0	10.3	8.8	8.6	5.8	16.6	8.0	5.5	8.3	9.3	6
Mean	**9.3**	**9.4**	**8.4**	**15.4**	**7.9**	**10.5**	**9.3**	**9.2**	**7.2**	**16.8**	**8.1**	**6.6**	**8.7**	**9.8**	

Table 9.7 IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Pant-nagar	Ayod-hya	Jor-hat	Bhuban-eswar
JO-07-310	50.0	112.7	117.7	118.6	132.4	121.8	149.5	128.5
OL-1919	62.3	115.4	119.0	115.7	147.3	134.1	134.1	124.1
HFO-921	71.7	108.7	113.7	135.7	141.6	132.5	138.2	114.4
HFO-918	57.7	111.0	116.0	118.4	138.6	98.7	130.3	109.2
PLP-24	57.7	117.2	115.3	138.5	145.0	119.4	107.7	106.5
OL-1924	64.3	116.7	119.3	132.4	151.6	115.4	115.7	121.6
RO-11-1-13	55.3	119.6	122.0	113.8	106.3	109.1	108.7	119.7
UPO-212 (NC)	53.0	115.8	118.7	115.7	149.6	118.8	138.3	104.3
RO-19 (NC)	51.7	120.2	122.3	122.1	129.3	125.6	130.9	127.2
Mean	**58.2**	**115.3**	**118.2**	**123.4**	**138.0**	**119.5**	**128.2**	**117.3**

Table 9.7 IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Plant Height (cm)

Entries	Imp-hal	Pu-sa	Ran-chi	Ana-nd	Jabal-pur	Jha-nsi	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
JO-07-310	104.3	138.7	103.0	121.3	104.7	138.2	90.8	69.9	112.6	4
OL-1919	106.8	147.3	111.1	124.6	95.1	128.2	90.3	76.8	114.5	2
HFO-921	108.4	145.7	106.9	115.0	99.3	126.4	82.3	62.3	112.7	3
HFO-918	107.9	140.7	105.7	109.9	82.9	130.8	80.8	66.0	106.5	7
PLP-24	103.5	141.3	86.1	111.0	79.8	141.8	75.3	52.4	106.2	8
OL-1924	116.3	141.0	106.3	123.1	94.1	134.7	75.1	61.4	111.8	5
RO-11-1-13	101.6	120.7	94.5	108.0	74.8	130.6	68.4	62.5	101.0	9
UPO-212 (NC)	108.0	145.7	113.8	115.4	86.0	131.6	84.3	64.4	110.2	6
RO-19 (NC)	108.9	145.0	110.6	126.2	107.5	140.1	88.7	80.4	114.8	1
Mean	**107.3**	**140.7**	**104.2**	**117.2**	**91.6**	**133.6**	**81.8**	**66.2**	**110.0**	

Table 9.8 IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Leaf Stem Ratio

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Pant-nagar	Ayo-dhya	Jor-hat	Bhuban-eswar	Imp-hal	Pu-sa	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
JO-07-310	0.80	0.29	0.60	1.20	1.14	0.68	1.22	1.36	1.59	0.34	0.33	1.02	0.81	0.74	0.66	0.85	4
OL-1919	0.83	0.39	0.47	1.25	1.14	0.65	1.34	1.32	0.99	0.35	0.49	1.12	0.75	0.70	0.61	0.83	6
HFO-921	0.75	0.30	0.42	1.30	1.42	0.77	1.27	1.01	1.52	0.44	0.44	1.22	0.81	1.00	0.74	0.89	2
HFO-918	0.85	0.39	0.50	1.26	1.17	0.76	1.16	1.09	1.22	0.39	0.46	1.17	0.72	0.94	0.72	0.85	4
PLP-24	0.83	0.36	0.47	1.10	1.08	0.78	1.23	1.05	1.98	0.30	0.36	1.40	0.62	1.22	0.72	0.90	1
OL-1924	0.90	0.30	0.56	1.00	1.22	0.75	1.02	1.28	1.14	0.38	0.32	1.29	0.66	0.87	0.72	0.83	6
RO-11-1-13	0.75	0.36	0.60	1.20	1.09	0.80	1.15	1.21	0.92	0.34	0.44	1.02	0.60	0.82	0.71	0.80	7
UPO-212 (NC)	0.81	0.27	0.49	1.40	1.16	0.72	1.24	1.16	1.44	0.30	0.54	1.12	0.72	0.88	0.69	0.86	3
RO-19 (NC)	0.83	0.35	0.42	1.36	1.08	0.78	1.32	1.38	1.00	0.28	0.32	1.16	0.84	0.87	0.64	0.84	5
Mean	**0.82**	**0.33**	**0.50**	**1.23**	**1.17**	**0.74**	**1.22**	**1.21**	**1.31**	**0.35**	**0.41**	**1.17**	**0.73**	**0.89**	**0.69**	**0.85**	

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

Entries	NDF (%)				ADF (%)				IVDMD (%)			
	Ludhiana	Anand	Average	Rank	Ludhiana	Anand	Average	Rank	Ludhiana	Hisar	Average	Rank
JO-07-310	67.3	65.1	66.2	6	39.9	39.6	39.7	9	63.9	60.0	62.0	7
OL-1919	67.6	65.0	66.3	7	38.6	39.5	39.0	6	64.2	63.6	63.9	4
HFO-921	66.3	64.8	65.6	5	39.4	39.1	39.3	7	65.3	66.0	65.7	1
HFO-918	65.8	64.7	65.2	3	37.4	39.9	38.6	5	67.6	57.6	62.6	6
PLP-24	64.6	64.0	64.3	1	36.3	37.8	37.0	1	69.3	58.5	63.9	4
OL-1924	65.4	64.4	64.9	2	36.9	38.3	37.6	2	68.2	58.5	63.4	5
RO-11-1-13	65.9	65.1	65.5	4	37.1	38.8	37.9	3	67.1	51.4	59.3	8
UPO-212 (NC)	67.8	65.1	66.5	8	38.4	40.3	39.4	8	64.9	65.7	65.3	2
RO-19 (NC)	68.9	65.3	67.1	9	37.9	39.1	38.5	4	64.1	66.0	65.1	3
Mean	**66.6**	**64.8**	**65.7**		**38.0**	**39.1**	**38.6**		**66.1**	**60.8**	**63.4**	

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

Entries	North West Zone						
	His-ar	Ludh-iana	Pant-nagar	Jal-ore	Aver-age	Ra-nk	Superi-ority%
OL-1882	512.2	704.4	477.8	310.9	501.3	4	
HFO-707	450.0	715.1	544.4	509.4	554.7	1	3.8
HFO-716	584.7	674.1	421.5	435.6	529.0	3	
UPO-212 (NC)	459.7	709.6	400.8	366.1	484.1	5	
RO-19 (NC)	544.4	607.6	591.4	393.6	534.3	2	
Mean	**510.2**	**682.2**	**487.2**	**403.1**	**520.7**		
CD at 5%	**68.5**	**62.2**	**33.5**				
CV%	**8.6**	**10.2**	**8.4**				

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

Entries	Central Zone								All India		
	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	**Jha-nsi	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
OL-1882	1085.8	581.0	561.7	553.5	256.3	695.5	3		598.4	4	
HFO-707	987.5	640.0	531.0	574.2	285.5	683.2	4		618.9	3	
HFO-716	953.3	712.0	657.6	639.9	282.2	740.7	1	1.6	634.8	1	0.5
UPO-212 (NC)	929.2	606.0	585.1	545.9	250.0	666.6	5		575.3	5	
RO-19 (NC)	987.2	707.0	596.5	625.0	333.3	728.9	2		631.6	2	
Mean	**988.6**	**649.2**	**586.4**	**587.7**	**281.5**	**703.0**			**611.8**		
CD at 5%	**NS**	**97.1**	**73.9**	**72.3**	**16.6**						
CV%	**11.3**	**10.1**	**8.2**	**7.9**	**9.6**						

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

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

Entries	North West Zone						
	Hisar	Jalore	Ludhiana	Pantnagar	Average	Rank	Superiority%
OL-1882	112.6	69.4	138.8	103.8	106.1	4	
HFO-707	99.8	111.0	148.0	118.3	119.3	1	6.6
HFO-716	124.0	96.7	126.1	88.2	108.7	3	
UPO-212 (NC)	100.2	80.3	141.2	82.6	101.1	5	
RO-19 (NC)	116.8	87.1	111.8	131.7	111.8	2	
Mean	**110.7**	**88.9**	**133.2**	**104.9**	**109.4**		
CD at 5%	**7.7**		**18.2**	**8.8**			
CV%	**4.5**		**7.8**	**7.5**			

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

Entries	Central Zone								All India		
	Anand	Jabalpur	Rahuri	Urulikanchan	**Jhansi	Average	Rank	Superiority%	Average	Rank	Superiority%
OL-1882	147.1	128.0	126.6	57.2	29.1	114.7	5		110.4	4	
HFO-707	129.9	148.8	112.1	69.4	31.2	115.1	4		117.2	1	1.2
HFO-716	120.7	161.1	143.2	69.2	25.4	123.6	1	3.3	116.1	2	0.4
UPO-212 (NC)	125.3	135.0	133.4	75.8	26.5	117.4	3		109.2	5	
RO-19 (NC)	123.9	160.0	124.5	70.1	39.2	119.6	2		115.7	3	
Mean	**129.4**	**146.6**	**128.0**	**68.3**	**30.3**	**118.1**			**113.7**		
CD at 5%	**NS**	**20.3**	**16.1**	**7.9**	**7.3**						
CV%	**13.6**	**9.4**	**8.2**	**7.4**	**4.2**						

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

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

Entries	Hisar	Ludhiana	Pantnagar	Anand	Rahuri	Urulikanchan	Average	Rank
OL-1882	4.13	5.60	4.30	9.61	5.16	5.83	5.77	3
HFO-707	3.63	5.70	4.90	8.82	4.94	6.04	5.67	4
HFO-716	4.72	5.40	3.76	8.51	5.92	6.74	5.84	2
UPO-212 (NC)	3.71	5.70	3.71	8.15	5.53	5.75	5.43	5
RO-19 (NC)	4.39	4.90	5.14	8.89	5.49	6.58	5.90	1
Mean	**4.12**	**5.46**	**4.36**	**8.80**	**5.41**	**6.19**	**5.72**	

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

Entries	Hisar	Ludhiana	Pantnagar	Anand	Rahuri	Urulikanchan	Average	Rank
OL-1882	0.91	1.10	0.94	1.30	1.16	0.60	1.00	1
HFO-707	0.81	1.20	1.07	1.16	1.04	0.73	1.00	1
HFO-716	1.00	1.00	0.79	1.08	1.29	0.73	0.98	2
UPO-212 (NC)	0.81	1.10	0.76	1.10	1.26	0.80	0.97	3
RO-19 (NC)	0.94	0.90	1.15	1.12	1.14	0.74	1.00	1
Mean	**0.89**	**1.06**	**0.94**	**1.15**	**1.18**	**0.72**	**0.99**	

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

Entries	Hisar	Ludhiana	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1882	10.0	27.5	24.8	10.3	9.8	5.1	14.6	1
HFO-707	8.0	25.8	22.6	11.7	7.8	5.8	13.6	3
HFO-716	10.9	18.2	19.1	13.1	8.3	5.9	12.6	4
UPO-212 (NC)	8.9	24.3	22.7	10.9	9.0	7.0	13.8	2
RO-19 (NC)	10.4	17.4	22.0	13.1	7.4	5.4	12.6	4
Mean	**9.6**	**22.6**	**22.2**	**11.8**	**8.4**	**5.8**	**13.4**	

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

Entries	Hisar	Ludhiana	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1882	8.9	19.8	17.4	8.0	7.7	9.0	11.8	1
HFO-707	8.0	17.4	17.1	7.9	6.9	8.3	10.9	3
HFO-716	8.8	14.4	16.0	8.1	5.8	8.5	10.3	5
UPO-212 (NC)	8.9	17.2	18.1	8.1	6.8	9.3	11.4	2
RO-19 (NC)	8.9	15.6	17.4	8.2	5.9	7.7	10.6	4
Mean	**8.7**	**16.9**	**17.2**	**8.1**	**6.6**	**8.5**	**11.0**	

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

Entries	Hisar	Ludhiana	Pantnagar	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1882	124.3	120.8	125.3	130.6	117.2	90.6	95.4	81.2	110.7	5
HFO-707	116.0	130.1	137.2	132.2	128.0	106.4	97.0	84.4	116.4	3
HFO-716	125.3	115.2	147.5	140.8	126.9	113.9	102.3	85.7	119.7	1
UPO-212 (NC)	119.0	122.7	133.3	134.8	116.3	97.6	92.7	71.2	110.9	4
RO-19 (NC)	123.8	112.4	138.1	141.6	124.6	109.5	98.6	89.5	117.3	2
Mean	**121.7**	**120.2**	**136.3**	**136.0**	**122.6**	**103.6**	**97.2**	**82.4**	**115.0**	

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

Entries	Hisar	Ludhiana	Pantnagar	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1882	0.56	1.20	0.88	1.17	0.68	0.77	0.67	0.85	3
HFO-707	0.70	1.10	0.85	1.19	0.77	0.75	0.64	0.86	2
HFO-716	0.58	1.14	0.87	1.04	0.84	0.68	0.65	0.83	4
UPO-212 (NC)	0.66	1.16	0.79	1.33	0.71	1.00	0.65	0.90	1
RO-19 (NC)	0.49	0.80	0.81	1.12	0.81	0.70	0.68	0.77	5
Mean	**0.60**	**1.08**	**0.84**	**1.17**	**0.76**	**0.78**	**0.66**	**0.84**	

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

Entries	NDF (%)					ADF (%)					IVDMD (%)				
	Ludh-iana	Ana-nd	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Ana-nd	Rah-uri	Aver-age	Ra-nk	Ludh-iana	His-ar	Rah-uri	Aver-age	Ra-nk
OL-1882	57.3	67.2	64.4	63.0	2	35.3	40.1	41.5	39.0	1	67.9	57.5	56.5	60.6	4
HFO-707	59.3	66.7	61.9	62.6	1	37.2	39.9	42.8	40.0	2	67.4	60.4	55.5	61.6	3
HFO-716	60.3	67.4	61.7	63.1	3	39.4	40.4	40.5	40.1	3	64.8	64.9	57.3	62.3	2
UPO-212 (NC)	58.9	66.8	69.1	64.9	5	36.3	41.4	45.9	41.2	5	67.0	60.4	53.1	60.2	5
RO-19 (NC)	60.2	67.2	64.1	63.8	4	36.9	41.0	44.2	40.7	4	66.0	68.2	54.4	62.9	1
Mean	**59.2**	**67.0**	**64.2**	**63.5**		**37.0**	**40.6**	**43.0**	**40.2**		**66.6**	**62.3**	**55.4**	**61.4**	

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 (Multicut)** [**AVTO-2 (MC)]** two entries were evaluated against two national checks (RO-19 and UPO-212) at 9 locations in two zones (NWZ and CZ). There were 4 locations in NWZ and 5 locations in CZ.

For GFY (q/ha), national check RO-19 was superior over the tested entries in two zones separately and also in combined condition.

For DMY (q/ha), entry JO-05-304 was superior over the best check (RO-19) by margin of 4.4% in central zone.
For fodder production potential (q/ha/day), national check RO-19 ranked first for green matter while entryOL-1874 ranked first for dry matter. National check RO-19 ranked first for both plant height and leafiness.

For quality parameters, entry OL-1874 (12.8q/ha) ranked first followed by both national cheeks (12.2q/ha). National check UPO-212 ranked first for crude protein content with 11.6%. Entry OL-1874 ranked first for IVDMD %.

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 (Multicut)** [**AVTO-2 (MC)] for seed,** two entries were evaluated against two national checks (RO-19 and UPO-212) at 8 locations in two zones (NWZ and CZ). There were 3 locations in NWZ and 5 locations in CZ.

For seed yield (q/ha), national check UPO-212 was superior over the tested entries in both zones separately and also in combined form.

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 15centres located at three zones (NW, NE and central zones). There were 4 locations in NWZ, 5 locations in NEZ and 6 locations in CZ.
For GFY (q/ha), entry RO-11-1-13 was superior over the best check (JHO-822) by margin of 5.8% in NW zone.In NE zone, entries JO-12-509 (16.0%), and HFO-902 (4.3%) were superior over the best check (UPO 212). In central zone, entry JO-12-509 (8.4%) was superior over the best check (JHO-822). At all India level, entry JO-12-509 was superior over the best national check (JHO-822) by margin of 9.9%.All other entries were below or at par or marginally superior in comparison to best check.
For DMY (q/ha), entry RO-11-1-13 was superior over the best national check (JHO-822) by margin of 8.3% in NW zone. In NE zone, entries JO-12-509 (22.2%) and HFO-902 (4.7%) were superior over the best national check. In central zone, entry JO-12-509 (11.5%) was superior over the best check. At all India level, entry JO-12-509 (13.1%) showed superiority over the best national check (JHO-822). All other entries were below or at par or marginally superior in comparison to best check.
For fodder production potential (q/ha/day), entry JO-12-509 ranked first for both green and dry matter. Entry OL-1934 ranked first for plant height. Entry JHO-19-2 ranked first followed by HFO-901 for leafiness.
For quality parameters, entry JO-12-509 (5.6q/ha) ranked first followed by national check JHO-822 (5.1q/ha) for crude protein yield. Entry RO-11-1-13 (11.9%) ranked first followed byJHO-19-2 (11.6%) for crude protein content. Entry RO-11-1-13 ranked first for IVDMD %.

For seed yield, entry JHO-19-2 (22.7 q/ha) ranked first followed by national check JHO-822 (22.4 q/ha).

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

Entries	North West Zone						Central Zone							All India	
	His-ar	Ludh-iana	Pant-nagar	Jal-ore	Aver-age	Ra-nk	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	**Jha-nsi	Aver-age	Ra-nk	Aver-age	Ra-nk
OL-1874	539.5	697.9	556.7	266.3	515.1	2	643.8	749.0	659.9	285.9	235.9	584.7	4	549.9	2
JO-05-304	546.8	482.9	588.2	402.2	505.0	3	778.7	730.0	560.5	299.7	243.3	592.2	2	548.6	3
UPO-212 (NC)	579.3	451.3	481.6	351.0	465.8	4	729.7	717.0	604.7	290.7	275.2	585.5	3	525.7	4
RO-19 (NC)	596.2	559.6	610.5	367.2	533.4	1	606.3	784.0	656.0	380.8	216.6	606.8	1	570.1	1
Mean	**565.5**	**547.9**	**559.3**	**346.7**	**504.8**		**689.6**	**745.0**	**620.3**	**314.3**	**242.8**	**592.3**		**548.6**	
CD at 5%	**32.8**	**72.6**	**36.2**				**84.2**	**7.0**	**81.5**	**40.2**	**17.7**				
CV%	**4.2**	**9.9**	**8.3**				**8.9**	**12.6**	**9.5**	**9.2**	**9.7**				

Note: ** Data is not included in zonal and all India average due to low 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	North West Zone						Central Zone								All India		
	His-ar	Jal-ore	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	**Jha-nsi	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
OL-1874	111.1	56.7	145.2	121.6	108.6	2	92.2	166.9	151.5	40.4	26.2	112.8	1		110.7	1	0.8
JO-05-304	112.8	80.7	90.8	128.9	103.3	3	121.2	161.5	124.9	43.5	26.5	112.8	1	4.4	108.0	3	
UPO-212 (NC)	117.1	71.3	88.9	101.6	94.7	4	115.8	158.5	120.1	36.0	27.4	107.6	3		101.2	4	
RO-19 (NC)	131.3	73.9	108.0	133.2	111.6	1	87.3	178.1	116.9	49.7	25.7	108.0	2		109.8	2	
Mean	**118.1**	**70.6**	**108.2**	**121.3**	**104.6**		**104.1**	**166.3**	**128.3**	**42.4**	**26.5**	**110.3**			**107.4**		
CD at 5%	**14.9**		**16.5**	**10.6**			**15.2**	**1.5**	**17.7**	**5.3**	**5.7**						
CV%	**9.0**		**8.2**	**9.6**			**10.6**	**12.2**	**10.0**	**9.0**	**3.1**						

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

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

Entries	Hisar	Ludhiana	Pantnagar	Anand	Rahuri	Urulikanchan	Average	Rank
OL-1874	4.35	5.60	4.35	5.75	6.10	2.85	4.83	2
JO-05-304	4.41	3.90	4.60	6.89	5.27	3.18	4.71	3
UPO-212 (NC)	4.67	3.60	3.76	6.46	6.04	3.04	4.59	4
RO-19 (NC)	4.81	4.50	4.77	5.32	6.11	4.15	4.94	1
Mean	**4.56**	**4.40**	**4.37**	**6.11**	**5.88**	**3.31**	**4.77**	

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

Entries	Hisar	Ludhiana	Pantnagar	Anand	Rahuri	Urulikanchan	Average	Rank
OL-1874	0.90	1.20	0.95	0.82	1.40	0.43	0.95	1
JO-05-304	0.91	0.70	1.01	1.07	1.17	0.46	0.89	3
UPO-212 (NC)	0.94	0.70	0.79	1.02	1.20	0.38	0.84	4
RO-19 (NC)	1.06	0.90	1.04	0.77	1.09	0.52	0.90	2
Mean	**0.95**	**0.88**	**0.95**	**0.92**	**1.22**	**0.45**	**0.89**	

Table 11.5 AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Crude Protein Yield (q/ha)

Entries	Ludhiana	Hisar	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1874	26.4	9.6	16.5	13.3	7.6	3.6	12.8	1
JO-05-304	15.4	9.6	22.8	13.0	6.6	4.2	11.9	3
UPO-212 (NC)	13.9	10.8	21.8	12.7	10.5	3.3	12.2	2
RO-19 (NC)	17.1	10.2	16.0	14.4	10.7	4.6	12.2	2
Mean	**18.2**	**10.1**	**19.3**	**13.4**	**8.9**	**3.9**	**12.3**	

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

Entries	Ludhiana	Hisar	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1874	18.2	8.6	17.8	8.0	5.0	8.8	11.1	4
JO-05-304	17.0	8.6	18.8	8.0	5.3	9.6	11.2	3
UPO-212 (NC)	15.6	9.2	18.8	8.0	8.8	9.1	11.6	1
RO-19 (NC)	15.8	7.8	17.7	8.1	9.2	9.3	11.3	2
Mean	**16.7**	**8.6**	**18.3**	**8.0**	**7.1**	**9.2**	**11.3**	

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

Entries	Hisar	Ludhiana	Pantnagar	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1874	113.0	131.7	136.8	124.0	118.7	110.1	97.4	83.5	114.4	2
JO-05-304	114.2	108.1	147.6	136.0	115.4	100.6	93.6	87.5	112.9	3
UPO-212 (NC)	116.4	110.6	135.2	138.0	111.7	96.7	91.6	82.9	110.4	4
RO-19 (NC)	121.6	126.8	140.1	127.7	126.1	115.8	97.6	95.2	118.9	1
Mean	**116.3**	**119.3**	**139.9**	**131.4**	**118.0**	**105.8**	**95.0**	**87.3**	**114.1**	

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

Entries	Hisar	Ludhiana	Pantnagar	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
OL-1874	0.70	1.16	0.86	1.18	0.72	0.63	0.69	0.85	3
JO-05-304	0.74	0.90	0.85	1.39	0.65	0.81	0.70	0.86	2
UPO-212 (NC)	0.47	1.00	1.01	1.26	0.62	0.80	0.70	0.84	4
RO-19 (NC)	0.76	1.10	0.89	1.10	0.80	0.67	0.76	0.87	1
Mean	**0.67**	**1.04**	**0.90**	**1.23**	**0.70**	**0.73**	**0.71**	**0.85**	

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

Entries	NDF (%)					ADF (%)					IVDMD (%)				
	Ludh-iana	Ana-nd	Rah-uri	Aver-age	Ra-nk	Ludh-iana	Ana-nd	Rah-uri	Aver-age	Ra-nk	Ludh-iana	His-ar	Rah-uri	Aver-age	Ra-nk
OL-1874	58.2	66.5	56.4	60.4	1	33.4	40.2	37.7	37.1	2	70.0	67.6	59.5	65.7	1
JO-05-304	56.3	66.2	61.5	61.2	2	34.0	37.5	38.6	36.7	1	68.0	64.8	58.8	63.9	2
UPO-212 (NC)	57.4	66.3	64.9	61.9	4	37.9	39.8	43.6	40.4	4	65.9	64.2	54.9	61.7	4
RO-19 (NC)	56.9	66.5	64.5	61.7	3	36.4	38.7	42.8	39.3	3	64.6	68.9	55.5	63.0	3
Mean	**57.2**	**66.3**	**61.8**	**61.3**		**35.4**	**39.0**	**40.7**	**38.4**		**67.1**	**66.4**	**57.2**	**63.6**	

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)												
	North West Zone					Central Zone						All India	
	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Jha-nsi	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Aver-age	Ra-nk
OL-1874	11.0	30.3	15.6	19.0	4	15.1	31.4	18.0	20.6	21.3	2	20.3	3
JO-05-304	18.6	28.4	17.8	21.6	2	11.5	27.7	15.3	24.7	19.8	3	20.6	2
UPO-212 (NC)	22.8	31.1	14.4	22.8	1	13.2	39.7	14.8	24.2	23.0	1	22.9	1
RO-19 (NC)	10.3	28.8	19.4	19.5	3	10.6	19.4	14.7	21.5	16.6	4	17.8	4
Mean	**15.7**	**29.7**	**16.8**	**20.7**		**12.6**	**29.6**	**15.7**	**22.7**	**20.2**		**20.4**	
CD at 5%	**1.5**	**2.0**	**1.6**			**4.3**	**0.2**	**2.0**	**3.2**				
CV%	**7.0**	**11.2**	**14.2**			**2.8**	**11.1**	**9.0**	**10.2**				

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

Entries	North West Zone							North East Zone							
	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Aver-age	Ra-nk	Super-iority%	Jor-hat	Bhuban-eswar	Ayod-hya	Pu-sa	**Ran-chi	Aver-age	Ra-nk	Super-iority%
OL-1934	150.9	113.7	198.4	168.5	157.9	7		204.2	270.6	112.0	282.0	112.9	217.2	8	
OL-1954	118.7	134.2	129.6	177.8	140.1	10		192.1	216.0	122.7	330.7	72.9	215.3	10	
UPO-19-2	160.9	100.0	165.1	185.2	152.8	9		228.9	234.6	120.0	281.3	101.3	216.2	9	
RO-11-2-8	170.7	106.1	289.7	166.7	183.3	4		216.0	231.9	114.6	269.3	111.6	208.0	11	
JO-12-509	155.4	100.9	321.1	198.1	193.9	2	2.4	286.6	327.3	138.7	334.0	96.9	271.6	1	16.0
JHO-19-2	87.2	77.8	82.3	162.9	102.6	11		270.5	200.6	117.3	296.7	46.7	221.3	7	
HFO-902	146.9	119.4	170.1	188.9	156.3	8		214.0	315.9	106.6	340.0	74.7	244.1	2	4.3
HFO-901	136.1	99.1	206.2	192.6	158.5	6		243.4	249.9	128.0	316.0	58.7	234.3	4	0.1
RO-11-1-13	161.7	152.6	304.4	181.9	200.2	1	5.8	263.0	285.9	141.3	272.0	57.3	240.6	3	2.8
UPO-212 (NC)	166.1	112.2	242.3	172.2	173.2	5		229.7	292.6	136.0	278.0	90.2	234.1	5	
JHO-822 (NC)	137.8	109.6	320.7	188.9	189.3	3		274.4	237.9	106.6	301.3	85.3	230.1	6	
Mean	**144.8**	**111.4**	**220.9**	**180.3**	**164.4**			**238.4**	**260.3**	**122.2**	**300.1**	**82.6**	**230.3**		
CD at 5%	**52.5**	**16.5**	**40.8**	**18.8**				**6.2**	**26.1**	**22.8**	**40.2**	**31.7**			
CV%	**11.5**	**8.6**		**12.3**				**7.2**	**5.9**	**10.9**	**7.9**	**5.3**			

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

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

Entries	Central Zone									All India		
	Jha-nsi	Rah-uri	Ana-nd	Jabal-pur	**Rai-pur	**Urulikan-chan	Aver-age	Ra-nk	Super-iority	Aver-age	Ra-nk	Super-iority
OL-1934	162.6	133.3	493.3	175.9	255.6	328.5	241.3	7		205.4	8	
OL-1954	128.1	124.0	503.3	126.6	225.9	294.8	220.5	9		192.0	10	
UPO-19-2	142.2	117.9	472.2	133.3	229.6	337.9	216.4	10		195.1	9	
RO-11-2-8	147.4	128.9	588.5	162.6	214.8	356.4	256.9	3		216.0	5	
JO-12-509	162.6	154.7	772.6	218.6	305.6	404.8	327.1	1	8.4	264.2	1	9.9
JHO-19-2	122.2	54.1	366.7	86.6	166.7	250.7	157.4	11		160.4	11	
HFO-902	196.3	124.8	548.9	115.9	244.4	305.1	246.5	5		215.6	7	
HFO-901	184.1	114.0	593.7	127.9	263.0	322.4	254.9	4		215.9	6	
RO-11-1-13	161.8	103.6	548.1	140.0	257.4	309.5	238.4	8		226.4	3	
UPO-212 (NC)	118.1	131.6	554.4	167.9	251.9	368.4	243.0	6		216.8	4	
JHO-822 (NC)	162.9	138.3	755.6	150.6	248.2	296.5	301.9	2		240.4	2	
Mean	**153.5**	**120.5**	**563.4**	**146.0**	**242.1**	**325.0**	**245.8**			**213.5**		
CD at 5%	**11.1**	**20.7**	**232.7**	**28.5**	**24.8**	**57.7**						
CV%	**6.6**	**10.1**	**15.5**	**11.5**	**6.0**	**10.4**						

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

Entries	North West Zone							North East Zone							
	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Aver-age	Ra-nk	Superi-ority%	Jor-hat	Bhuban-eswar	Ayod-hya	Pu-sa	**Ran-chi	Aver-age	Ra-nk	Superi-ority%
OL-1934	28.1	21.9	16.6	38.6	26.3	9		37.1	61.0	24.0	43.1	26.7	41.3	8	
OL-1954	21.5	25.8	15.0	39.9	25.6	10		37.6	50.3	25.7	55.7	15.1	42.3	7	
UPO-19-2	28.3	20.0	19.2	42.2	27.4	7		39.9	54.1	23.2	42.1	22.0	39.8	9	
RO-11-2-8	32.1	20.4	29.2	36.6	29.6	4		42.4	52.9	22.2	35.8	23.4	38.3	11	
JO-12-509	28.1	20.2	27.1	45.3	30.2	3		55.3	75.0	30.5	56.7	18.7	54.4	1	22.2
JHO-19-2	16.0	15.0	10.1	35.2	19.1	11		44.0	45.7	22.8	46.5	7.6	39.7	10	
HFO-902	26.1	22.4	19.8	42.8	27.8	6		33.3	71.6	22.9	58.5	18.4	46.6	2	4.7
HFO-901	24.5	18.5	21.4	44.3	27.2	8		40.5	56.3	27.5	50.3	11.2	43.6	4	
RO-11-1-13	30.4	33.5	29.5	39.6	33.3	1	8.3	43.4	60.9	31.8	38.0	13.0	43.5	5	
UPO-212 (NC)	28.9	22.8	26.5	37.8	29.0	5		42.7	62.0	29.2	44.1	19.7	44.5	3	
JHO-822 (NC)	24.8	21.9	31.9	44.2	30.7	2		49.3	54.3	21.3	48.0	18.9	43.2	6	
Mean	**26.3**	**22.0**	**22.4**	**40.6**	**27.8**			**42.3**	**58.5**	**25.6**	**47.2**	**17.7**	**43.4**		
CD at 5%	**14.4**	**3.4**	**4.2**	**2.8**				**2.1**	**6.6**	**4.4**	**8.4**	**5.8**			
CV%	**8.4**	**9.0**		**8.5**				**5.8**	**6.6**	**10.2**	**10.4**	**8.0**			

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

Entries	Central Zone									All India		
	Jha-nsi	Rah-uri	Ana-nd	Jabal-pur	Rai-pur	**Urulikan-chan	Aver-age	Ra-nk	Super-iority	Aver-age	Ra-nk	Superi-ority
OL-1934	20.2	25.1	61.7	33.6	48.6	53.4	37.9	6		35.4	8	
OL-1954	15.9	23.5	62.7	23.6	41.8	70.3	33.5	10		33.8	10	
UPO-19-2	15.2	23.3	64.2	25.3	43.4	52.9	34.3	9		33.9	9	
RO-11-2-8	15.6	25.0	79.2	30.9	41.7	55.5	38.5	4		35.7	7	
JO-12-509	20.1	29.8	100.5	41.8	53.3	60.5	49.1	1	11.5	44.9	1	13.1
JHO-19-2	15.9	12.0	43.8	15.0	27.9	37.2	22.9	11		26.9	11	
HFO-902	15.4	25.4	70.9	21.6	42.3	59.9	35.1	8		36.4	5	
HFO-901	22.5	22.7	73.0	24.4	44.0	58.7	37.3	7		36.1	6	
RO-11-1-13	21.1	18.6	72.0	26.6	52.3	55.6	38.1	5		38.3	3	
UPO-212 (NC)	15.1	24.3	74.4	32.2	48.8	54.2	38.9	3		37.6	4	
JHO-822 (NC)	16.8	25.2	99.7	28.8	49.8	38.5	44.0	2		39.7	2	
Mean	**17.6**	**23.2**	**72.9**	**27.6**	**44.9**	**54.2**	**37.2**			**36.2**		
CD at 5%	**2.4**	**3.9**	**33.5**	**5.7**	**6.9**	**9.7**						
CV%	**1.4**	**9.9**	**17.3**	**12.1**	**9.0**	**10.4**						

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

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

Entries	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ayod-hya	Pu-sa	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	**Ran-chi	Aver-age	Ra-nk
OL-1934	2.20	1.63	3.20	2.96	3.00	4.92	2.15	3.40	3.25	2.30	5.97	6.58	4.26	1.26	3.52	8
OL-1954	1.70	1.92	2.09	3.12	2.82	3.93	2.35	3.98	2.56	2.14	5.36	6.71	3.77	0.80	3.27	10
UPO-19-2	2.30	1.43	2.66	1.98	3.37	4.27	2.30	3.39	2.84	2.03	6.14	6.30	3.83	1.16	3.30	9
RO-11-2-8	2.50	1.52	4.67	1.84	3.18	4.22	2.20	3.24	2.95	2.22	6.48	7.85	3.58	1.30	3.57	7
JO-12-509	2.30	1.44	5.18	2.07	4.21	5.95	2.66	4.02	3.25	2.67	7.36	10.30	5.09	1.00	4.35	1
JHO-19-2	1.30	1.11	1.33	1.88	3.98	3.65	2.26	3.57	2.44	0.93	4.56	4.89	2.78	0.47	2.67	11
HFO-902	2.10	1.71	2.74	1.92	3.15	5.74	2.04	4.10	3.93	2.15	5.55	7.32	4.07	0.79	3.58	6
HFO-901	2.00	1.41	3.33	2.23	3.58	4.54	2.46	3.81	3.68	1.97	5.86	7.92	4.38	0.60	3.63	5
RO-11-1-13	2.30	2.18	4.91	1.72	3.87	5.20	2.72	3.28	3.24	1.79	5.63	7.31	4.29	0.62	3.73	3
UPO-212 (NC)	2.40	1.60	3.91	2.09	3.38	5.32	2.61	3.35	2.36	2.27	6.70	7.39	4.20	0.95	3.66	4
JHO-822 (NC)	2.00	1.57	5.17	1.75	4.04	4.33	2.04	3.63	3.26	2.38	5.39	10.07	4.14	0.97	3.83	2
Mean	**2.10**	**1.59**	**3.56**	**2.14**	**3.51**	**4.73**	**2.34**	**3.62**	**3.07**	**2.08**	**5.91**	**7.51**	**4.04**	**0.90**	**3.55**	

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

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

Entries	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ayod-hya	Pu-sa	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	**Ran-chi	Aver-age	Ra-nk
OL-1934	0.40	0.31	0.27	0.68	0.55	1.11	0.46	0.52	0.40	0.43	0.97	0.82	0.81	0.30	0.59	6
OL-1954	0.30	0.37	0.24	0.70	0.55	0.91	0.49	0.67	0.32	0.41	1.28	0.84	0.70	0.17	0.60	5
UPO-19-2	0.40	0.29	0.31	0.74	0.59	0.98	0.45	0.51	0.30	0.40	0.96	0.86	0.72	0.25	0.58	7
RO-11-2-8	0.50	0.29	0.47	0.64	0.62	0.96	0.42	0.43	0.31	0.43	1.01	1.06	0.69	0.27	0.60	5
JO-12-509	0.40	0.29	0.44	0.79	0.81	1.36	0.58	0.68	0.40	0.51	1.10	1.34	0.89	0.19	0.74	1
JHO-19-2	0.20	0.21	0.16	0.62	0.65	0.83	0.43	0.56	0.32	0.21	0.68	0.58	0.47	0.08	0.45	8
HFO-902	0.40	0.32	0.32	0.75	0.49	1.30	0.44	0.71	0.31	0.44	1.09	0.95	0.70	0.20	0.63	4
HFO-901	0.40	0.26	0.35	0.78	0.60	1.02	0.52	0.61	0.45	0.39	1.07	0.97	0.73	0.12	0.63	4
RO-11-1-13	0.40	0.48	0.48	0.69	0.64	1.11	0.61	0.46	0.42	0.32	1.01	0.96	0.87	0.14	0.65	2
UPO-212 (NC)	0.40	0.32	0.43	0.66	0.63	1.13	0.56	0.53	0.30	0.42	0.99	0.99	0.81	0.21	0.63	4
JHO-822 (NC)	0.40	0.31	0.51	0.78	0.73	0.99	0.41	0.58	0.34	0.43	0.70	1.33	0.83	0.22	0.64	3
Mean	**0.38**	**0.31**	**0.36**	**0.71**	**0.62**	**1.06**	**0.49**	**0.57**	**0.35**	**0.40**	**0.99**	**0.97**	**0.75**	**0.19**	**0.61**	

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

Entries	Ludh-iana	His-ar	Bika-ner	Jor-hat	Bhuban-eswar	Ran-chi	Ayod-hya	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
OL-1934	3.5	1.9	3.9	4.0	5.8	5.7	1.9	2.3	4.7	13.1	2.7	3.9	4.4	6
OL-1954	2.7	2.5	2.7	4.2	4.5	6.1	2.1	2.2	6.3	12.5	1.7	3.4	4.2	8
UPO-19-2	3.5	1.9	4.1	4.3	4.9	5.3	1.4	2.2	5.2	13.0	1.9	3.5	4.3	7
RO-11-2-8	3.9	1.9	5.5	4.6	4.6	4.8	1.5	2.5	4.9	15.9	2.4	3.4	4.7	5
JO-12-509	3.9	1.9	5.3	5.6	7.0	5.8	2.3	2.9	5.8	19.2	3.3	4.7	5.6	1
JHO-19-2	2.6	1.4	2.0	4.5	4.3	4.1	1.8	1.3	3.2	9.9	1.1	2.8	3.2	9
HFO-902	4.4	2.0	3.5	3.6	6.8	4.9	1.8	2.7	6.0	15.8	1.6	4.2	4.8	4
HFO-901	3.6	1.7	4.0	4.4	5.3	3.3	2.2	2.2	5.0	14.4	1.9	3.4	4.3	7
RO-11-1-13	5.3	3.3	6.1	4.8	6.2	3.9	2.6	2.0	5.4	14.0	2.0	5.3	5.1	2
UPO-212 (NC)	4.0	2.2	5.1	4.3	6.3	4.9	2.4	2.4	5.5	16.2	2.5	4.1	5.0	3
JHO-822 (NC)	3.2	1.7	6.4	4.9	5.1	5.2	1.6	2.3	3.9	19.6	2.1	4.8	5.1	2
Mean	**3.7**	**2.0**	**4.4**	**4.5**	**5.5**	**4.9**	**2.0**	**2.3**	**5.1**	**14.9**	**2.1**	**4.0**	**4.6**	

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

Entries	Ludh-iana	His-ar	Bika-ner	Jor-hat	Bhuban-eswar	Ran-chi	Ayod-hya	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
OL-1934	12.3	8.6	23.2	11.0	9.5	5.8	7.8	9.2	8.8	21.3	8.0	8.1	11.1	5
OL-1954	12.7	9.6	18.0	11.3	8.9	7.3	8.0	9.5	8.9	20.1	7.7	8.2	10.8	8
UPO-19-2	12.5	8.8	21.5	11.0	9.1	6.6	7.0	9.3	9.9	20.1	7.5	8.1	11.0	6
RO-11-2-8	12.0	9.4	18.9	11.1	8.8	7.0	6.9	9.9	8.8	20.0	8.0	8.0	10.7	9
JO-12-509	13.9	9.2	19.5	10.3	9.3	6.6	7.4	9.9	9.6	19.1	8.1	8.7	11.0	6
JHO-19-2	16.2	9.2	20.2	10.4	9.4	7.7	7.7	10.9	8.6	22.3	7.3	9.9	11.6	2
HFO-902	16.9	9.0	17.5	11.1	9.4	5.8	7.9	10.8	10.1	22.3	7.4	10.0	11.5	3
HFO-901	14.8	9.4	18.8	11.1	9.5	5.8	8.0	9.7	8.5	19.9	7.7	7.8	10.9	7
RO-11-1-13	17.6	9.8	20.8	11.2	10.2	6.6	8.2	11.0	9.7	19.4	7.7	10.2	11.9	1
UPO-212 (NC)	13.7	9.8	19.2	10.1	10.1	5.8	8.1	10.0	10.1	21.8	8.0	8.4	11.3	4
JHO-822 (NC)	12.9	7.8	20.0	9.9	9.4	7.5	7.7	9.0	10.2	19.8	8.0	9.6	11.0	6
Mean	**14.1**	**9.1**	**19.8**	**10.8**	**9.4**	**6.6**	**7.7**	**9.9**	**9.4**	**20.6**	**7.7**	**8.8**	**11.2**	

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

Entries	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Ayod-hya	Pu-sa	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Ra-ipur	Aver-age	Ra-nk
OL-1934	135.7	87.7	78.6	121.3	81.7	116.7	94.7	134.4	131.7	53.6	84.8	112.6	61.6	133.4	102.0	1
OL-1954	100.2	86.0	72.6	132.3	72.0	95.3	93.5	140.8	127.3	52.3	76.8	109.9	50.8	130.6	95.7	6
UPO-19-2	137.9	78.0	64.7	112.8	98.0	110.7	87.3	137.6	113.3	51.4	89.4	104.7	50.4	110.1	96.2	5
RO-11-2-8	136.4	78.3	84.2	105.0	81.3	97.7	86.4	142.7	95.3	53.6	83.2	106.5	52.3	124.8	94.8	8
JO-12-509	128.4	77.0	86.8	118.1	89.1	121.7	97.1	141.0	129.7	54.7	84.4	110.7	63.4	124.6	101.9	2
JHO-19-2	78.4	57.0	37.6	106.9	91.4	94.0	80.6	130.3	89.7	38.6	84.1	97.2	37.1	72.4	78.2	11
HFO-902	101.0	93.7	74.6	109.2	91.9	119.3	97.1	137.6	130.7	54.2	78.8	109.3	42.6	129.0	97.8	4
HFO-901	91.8	77.3	68.6	127.7	93.9	115.0	85.1	134.9	125.3	53.0	81.9	108.8	44.0	118.5	94.7	9
RO-11-1-13	136.8	82.0	82.6	98.3	97.0	118.0	85.0	118.4	93.0	51.8	84.1	103.7	54.3	129.3	95.3	7
UPO-212 (NC)	132.4	81.0	88.4	119.3	95.7	118.7	90.0	136.2	120.7	54.5	84.1	107.2	56.6	129.5	101.0	3
JHO-822 (NC)	90.8	89.7	89.6	99.6	90.0	112.3	83.1	134.1	92.3	54.3	78.9	112.4	57.6	122.5	93.4	10
Mean	**115.4**	**80.7**	**75.3**	**113.7**	**89.3**	**110.8**	**89.1**	**135.3**	**113.5**	**52.0**	**82.8**	**107.5**	**51.9**	**120.4**	**95.6**	

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

Entries	Ludh-iana	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Ayo-dhya	Pu-sa	Rah-uri	Urulikan-chan	Ana-nd	Jaba-lpur	Rai-pur	Aver-age	Ra-nk
OL-1934	1.45	1.18	0.62	1.04	0.30	0.88	0.48	1.14	0.78	1.31	1.21	0.55	0.91	7
OL-1954	1.48	1.30	0.56	0.91	0.33	0.86	0.49	1.04	0.79	1.37	1.10	0.58	0.90	8
UPO-19-2	1.32	1.35	1.18	0.96	0.26	0.78	0.37	1.20	0.78	1.11	1.02	0.65	0.92	6
RO-11-2-8	1.36	1.33	1.07	0.95	0.33	0.76	0.31	0.67	0.84	0.98	1.16	0.44	0.85	9
JO-12-509	1.25	1.46	0.94	1.27	0.33	0.86	0.50	1.08	0.73	0.92	1.33	0.42	0.92	6
JHO-19-2	1.30	1.52	1.26	0.85	0.36	0.80	0.43	1.25	0.77	2.35	1.01	0.84	1.06	1
HFO-902	1.22	1.55	1.56	1.19	0.28	0.82	0.51	1.29	0.80	1.38	1.06	0.50	1.01	3
HFO-901	1.40	1.34	0.64	1.01	0.42	0.88	0.49	1.66	0.79	1.98	1.04	0.64	1.02	2
RO-11-1-13	1.44	1.38	1.59	1.13	0.27	0.84	0.30	0.92	0.75	1.21	1.04	0.42	0.94	4
UPO-212 (NC)	1.48	1.17	1.00	1.24	0.34	0.82	0.35	1.30	0.78	0.87	1.17	0.62	0.93	5
JHO-822 (NC)	1.50	1.45	0.94	1.08	0.23	0.84	0.46	0.98	0.77	1.16	1.13	0.38	0.91	7
Mean	**1.38**	**1.37**	**1.03**	**1.06**	**0.31**	**0.83**	**0.43**	**1.14**	**0.78**	**1.33**	**1.12**	**0.55**	**0.94**	

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

Entries	NDF (%)					ADF (%)					IVDMD (%)			
	Ludh-iana	Ana-nd	Bika-ner	Aver-age	Ra-nk	Ludh-iana	Ana-nd	Bika-ner	Aver-age	Ra-nk	Ludh-iana	His-ar	Aver-age	Ra-nk
OL-1934	60.9	65.6	67.4	64.6	5	35.1	39.1	44.7	39.6	9	65.6	51.9	58.8	5
OL-1954	61.2	66.4	69.3	65.6	8	34.1	37.7	40.2	37.4	3	62.9	72.3	67.6	3
UPO-19-2	63.4	66.2	68.1	65.9	9	33.9	35.8	41.4	37.0	2	65.6	65.3	65.5	5
RO-11-2-8	62.3	66.5	69.5	66.1	10	35.0	39.7	44.8	39.8	8	63.9	60.7	62.3	9
JO-12-509	58.2	66.1	69.3	64.5	4	35.6	37.0	45.6	39.4	7	65.1	64.0	64.6	6
JHO-19-2	56.3	63.9	67.3	62.5	1	33.7	36.3	36.2	35.4	1	69.8	63.5	66.7	4
HFO-902	56.1	65.5	68.8	63.4	2	33.1	39.2	42.8	38.3	4	70.3	66.3	68.3	2
HFO-901	60.1	66.3	68.4	64.9	6	34.3	39.3	42.3	38.6	6	65.9	62.3	64.1	7
RO-11-1-13	55.8	66.7	69.0	63.8	3	32.6	40.6	45.5	39.6	9	71.7	66.5	69.1	1
UPO-212 (NC)	59.1	65.5	75.9	66.8	11	34.8	38.8	41.6	38.4	5	64.9	62.8	63.9	8
JHO-822 (NC)	59.9	66.9	69.0	65.3	7	33.7	41.9	45.2	40.3	10	63.8	63.5	63.7	10
Mean	**59.4**	**65.9**	**69.3**	**64.9**		**34.2**	**38.7**	**42.7**	**38.5**		**66.3**	**63.6**	**64.9**	

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

Entries	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Jor-hat	Bhuban-eswar	Ayod-hya	Pu-sa	Jha-nsi	Rah-uri	Jabal-pur	Ana-nd	**Urulikan-chan	Aver-age	Ra-nk
OL-1934	28.8	20.7	21.7	25.5	14.9	10.3	17.0	17.3	8.5	15.5	33.1	8.9	3.2	18.5	8
OL-1954	29.1	22.6	27.0	18.9	14.4	9.1	21.1	21.7	7.4	21.1	27.1	9.9	2.9	19.1	7
UPO-19-2	27.6	21.1	16.0	31.8	12.6	9.4	20.3	14.8	15.0	21.4	39.2	20.2	6.1	20.8	3
RO-11-2-8	28.4	20.7	20.0	16.9	9.2	8.7	19.4	12.5	12.1	25.1	45.9	10.2	5.9	19.1	7
JO-12-509	27.5	18.5	22.6	27.6	12.4	10.6	20.3	23.3	6.4	14.0	29.0	6.5	2.8	18.2	9
JHO-19-2	30.5	19.9	28.7	19.7	14.6	8.9	20.4	17.7	12.2	19.2	38.3	41.7	8.8	22.7	1
HFO-902	31.2	19.2	25.6	24.3	14.3	10.7	21.9	24.6	12.5	20.9	35.8	7.6	3.2	20.7	4
HFO-901	30.8	15.9	25.5	15.5	14.1	9.7	15.7	20.6	7.7	13.5	40.5	2.2	2.4	17.6	10
RO-11-1-13	31.0	18.5	29.6	16.8	13.4	10.1	23.2	14.8	13.3	23.8	29.9	6.7	3.2	19.3	6
UPO-212 (NC)	29.8	18.4	22.1	29.5	11.0	9.9	21.6	17.6	9.4	22.2	37.4	9.3	2.4	19.9	5
JHO-822 (NC)	30.5	20.6	27.4	24.2	11.9	9.7	21.3	19.7	16.4	22.8	50.9	12.9	4.1	22.4	2
Mean	**29.6**	**19.6**	**24.2**	**22.8**	**13.0**	**9.7**	**20.2**	**18.6**	**11.0**	**19.9**	**37.0**	**12.4**	**4.1**	**19.8**	
CD at 5%	**2.5**	**2.0**	**5.4**	**2.5**	**1.0**	**1.0**	**2.6**	**3.4**	**4.8**	**3.5**	**8.5**	**6.0**	**1.1**		
CV%	**10.2**	**5.8**		**13.3**	**5.0**	**6.1**	**7.6**	**10.7**	**2.9**	**10.2**	**13.4**	**18.2**	**15.4**		

14. AVTO-1 (DUAL): FIRST ADVANCED VARIETAL TRIAL IN OAT (DUAL) (Reference tables 14.1 to 14.10)

An Advanced Varietal Trial -1 in Oat (Dual) comprising of seven entries along with two national checks (UPO-212 and JHO-822) was conducted at 14 centres located in North-West, North East and Central zone. There were 4 locations each in NW and NE and 6 locations in Central zone.

For GFY (q/ha), entryRO-11-2-6 was superior over the best check (JHO-822) by margin of 10.2% in NW zone. In NE zone, entry RO-11-2-6 was superior by margin of 12.3% over the best check (UPO-212). In central zone, entries RO-11-2-6 (21.6%), JO-11-507 (10.0%), OL-1766-2 (9.9%), and JHO-18-3 (6.9%) were superior over the best check (UPO-212). At all India level, entries RO-11-2-6 (20.6%), JO-11-507 (6.0%) and JHO-18-3 (4.2%) showed superiority over the best check (JHO-822).All other entries were below or at par or marginally superior in comparison to best check.

For DMY (q/ha), entries RO-11-2-6 (7.3%) and JO-11-507 (6.0%) were superior by margin of 7.3% and 6.0% respectively over the best check (JHO-822) in NW zone. In NE zone, entry RO-11-2-6 was superior by margin of 11.8% over the best check (UPO-212). In central zone, entries RO-11-2-6 (17.9%), JO-11-507 (14.9%), OL-1766-2 (11.1%), and JHO-18-3 (9.2%) were superior over the best check. At all India level, entries RO-11-2-6 (16.0%), JO-11-507 (8.1%) and JHO-18-3 (5.1%) showed superiority over the best check (UPO-212).All other entries were below or at par or marginally superior in comparison to best check.

For fodder production potential (q/ha/day), entry RO-11-2-6 ranked first for both green and dry matter. Entry RO-11-2-6 ranked first for plant height. Entry HFO-816 ranked first followed by national check UPO-212 for leafiness.

For quality parameters, entry RO-11-2-6 (5.8 q/ha) ranked first followed by JO-11-507 (5.4 q/ha) for crude protein yield. National check JHO-822 (11.8%) ranked first for crude protein content. Entry RO-11-2-2 ranked first for IVDMD %.

For seed yield 9q/ha), national check JHO-822 (23.6 q/ha) was superior over the all tested entries.

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

Entries	North West Zone							North East Zone						
	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Aver-age	Ra-nk	Superi-ority%	Jor-hat	Bhuban-eswar	Ayod-hya	**Ran-chi	Aver-age	Ra-nk	Superi-ority%
RO-11-2-6	168.8	386.1	113.8	110.0	194.7	1	10.2	209.4	331.0	165.6	91.0	235.3	1	12.3
JHO-18-3	128.8	283.0	155.4	77.2	161.1	5		166.6	297.7	148.5	104.0	204.2	4	
OL-1766-2	138.6	219.0	110.6	105.6	143.5	8		193.8	268.0	144.7	130.7	202.1	5	
JO-11-507	170.6	276.0	128.8	96.4	168.0	4		166.0	254.0	169.4	125.0	196.4	6	
OL-1874-2	114.4	211.5	122.1	105.3	138.3	9		211.5	281.2	141.8	69.3	211.5	2	0.9
RO-11-2-2	164.7	336.7	111.4	115.8	182.2	2	3.1	155.8	216.5	184.6	114.0	185.7	8	
HFO-816	132.1	260.3	112.8	115.3	155.1	6		158.4	203.5	150.4	67.7	170.8	9	
JHO-822 (NC)	172.5	319.9	125.8	88.6	176.7	3		176.7	232.0	152.3	123.7	187.0	7	
UPO-212 (NC)	138.1	247.6	105.7	95.6	146.8	7		134.7	326.5	167.5	140.0	209.6	3	
Mean	**147.6**	**282.2**	**120.7**	**101.1**	**162.9**			**174.8**	**267.8**	**158.3**	**107.3**	**200.3**		
CD at 5%	**38.4**	**57.4**	**12.6**	**12.2**				**3.9**	**21.5**	**22.0**	**34.3**			
CV%	**8.4**		**11.3**	**7.1**				**5.7**	**4.6**	**8.0**	**5.9**			

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

Entries	Central Zone									All India		
	Jha-nsi	Rah-uri	Ana-nd	Jabal-pur	Rai-pur	**Urulikan-chan	Aver-age	Ra-nk	Superi-ority(%)	Aver-age	Ra-nk	Superi-ority
RO-11-2-6	147.9	309.9	813.9	132.0	316.7	467.4	344.1	1	21.6	267.1	1	20.6
JHO-18-3	157.1	225.8	717.2	115.0	297.2	366.8	302.5	4	6.9	230.8	3	4.2
OL-1766-2	145.8	295.3	750.8	104.0	259.7	411.1	311.1	3	9.9	228.0	4	2.9
JO-11-507	131.1	286.7	652.5	191.6	294.4	376.2	311.3	2	10.0	234.8	2	6.0
OL-1874-2	135.8	280.1	532.8	122.0	261.1	337.9	266.4	8		210.0	8	
RO-11-2-2	125.0	272.2	534.7	136.0	202.8	375.9	254.1	9		213.0	7	
HFO-816	158.1	218.9	675.3	113.0	181.9	304.8	269.4	7		206.7	9	
JHO-822 (NC)	170.8	221.6	609.4	108.0	280.6	343.8	278.1	6		221.5	5	
UPO-212 (NC)	131.5	257.7	660.3	128.0	237.5	360.8	283.0	5		219.2	6	
Mean	**144.8**	**263.1**	**660.8**	**127.7**	**259.1**	**371.6**	**291.1**			**225.7**		
CD at 5%	**13.3**	**44.5**	**154.2**	**29.1**	**51.7**	**53.7**						
CV%	**7.7**	**9.8**	**13.5**	**13.2**	**11.5**	**8.3**						

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

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

Entries	North West Zone							North East Zone						
	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Aver-age	Ra-nk	Superi-ority%	Jor-hat	Bhuban-eswar	Ayod-hya	**Ran-chi	Aver-age	Ra-nk	Superi-ority%
RO-11-2-6	31.6	36.3	27.0	23.1	29.5	1	7.3	39.2	77.0	39.0	16.2	51.7	1	11.8
JHO-18-3	23.9	31.5	33.6	16.2	26.3	6		31.9	68.2	37.1	18.4	45.7	3	
OL-1766-2	25.0	23.8	26.8	19.7	23.8	8		38.4	61.0	34.7	26.8	44.7	5	
JO-11-507	30.4	33.8	32.9	19.5	29.2	2	6.0	32.0	54.2	41.5	23.5	42.5	6	
OL-1874-2	21.1	29.3	29.3	20.7	25.1	7		37.8	65.7	31.0	12.4	44.8	4	
RO-11-2-2	29.3	34.7	24.9	22.8	27.9	3	1.5	28.4	48.8	35.2	28.1	37.4	8	
HFO-816	24.4	35.9	26.8	22.6	27.4	5		30.3	43.0	35.3	12.2	36.2	9	
JHO-822 (NC)	33.1	30.3	28.9	17.7	27.5	4		33.8	53.6	35.7	28.9	41.0	7	
UPO-212 (NC)	24.9	32.5	23.1	19.7	25.1	7		24.8	73.8	40.2	26.8	46.3	2	
Mean	**27.1**	**32.0**	**28.1**	**20.2**	**26.9**			**33.0**	**60.6**	**36.6**	**21.5**	**43.4**		
CD at 5%	**17.7**	**7.0**	**1.1**	**2.6**				**2.1**	**4.9**	**5.2**	**7.5**			
CV%	**7.2**		**6.8**	**7.2**				**7.0**	**4.7**	**8.0**	**10.9**			

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

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

Entries	Central Zone									All India		
	Jha-nsi	Rah-uri	Ana-nd	Jabal-pur	Rai-pur	**Urulikan-chan	Aver-age	Ra-nk	Superi-ority	Aver-age	Ra-nk	Superi-ority
RO-11-2-6	18.8	63.4	95.9	24.0	47.4	48.6	49.9	1	17.9	43.6	1	16.0
JHO-18-3	18.1	46.3	93.7	20.8	52.2	45.9	46.2	4	9.2	39.5	3	5.1
OL-1766-2	17.8	59.0	91.2	18.0	49.1	52.1	47.0	3	11.1	38.7	4	3.1
JO-11-507	16.7	56.7	88.5	27.6	53.5	54.1	48.6	2	14.9	40.6	2	8.1
OL-1874-2	16.4	51.4	63.9	22.2	39.7	48.8	38.7	9		35.7	8	
RO-11-2-2	16.3	53.3	76.9	24.8	41.0	49.2	42.4	5	0.3	36.4	7	
HFO-816	15.3	45.0	84.5	20.3	30.0	43.9	39.0	8		34.5	9	
JHO-822 (NC)	19.3	44.0	76.2	19.5	46.4	45.7	41.1	7		36.5	6	
UPO-212 (NC)	13.8	49.9	86.2	23.4	38.3	49.1	42.3	6		37.5	5	
Mean	**17.0**	**52.1**	**84.1**	**22.3**	**44.2**	**48.6**	**43.9**			**38.1**		
CD at 5%	**5.8**	**8.8**	**NS**	**5.3**	**11.7**	**NS**						
CV%	**3.3**	**9.8**	**14.3**	**13.7**	**15.3**	**8.1**						

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

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

Entries	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Jor-hat	Bhuban-eswar	Ayod-hya	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	**Ran-chi	Aver-age	Ra-nk
RO-11-2-6	2.40	6.13	2.28	1.53	3.61	6.02	3.31	5.64	8.50	11.80	4.87	0.88	5.10	1
JHO-18-3	1.80	4.49	3.12	1.08	2.87	5.41	2.96	4.10	6.67	10.39	4.57	1.02	4.32	4
OL-1766-2	2.00	3.48	2.12	1.47	3.34	4.87	2.89	5.37	7.47	10.88	4.00	1.29	4.35	2
JO-11-507	2.40	4.38	2.58	1.34	2.86	4.62	3.39	5.21	6.84	9.46	4.53	1.27	4.33	3
OL-1874-2	1.60	3.36	2.44	1.46	3.65	5.11	2.81	5.09	6.14	7.72	4.02	0.66	3.95	8
RO-11-2-2	2.40	5.35	2.23	1.61	2.69	3.94	3.69	4.95	6.84	7.75	3.12	1.21	4.05	7
HFO-816	1.90	4.13	2.23	1.60	2.73	3.70	3.00	3.98	5.54	9.79	2.80	0.64	3.76	9
JHO-822 (NC)	2.50	5.08	2.52	1.23	3.05	4.22	3.04	4.03	6.25	8.83	4.32	1.29	4.10	6
UPO-212 (NC)	2.00	3.93	2.11	1.33	2.32	5.94	3.34	4.68	6.56	9.57	3.65	1.40	4.13	5
Mean	**2.11**	**4.48**	**2.40**	**1.41**	**3.01**	**4.87**	**3.16**	**4.78**	**6.76**	**9.58**	**3.99**	**1.07**	**4.23**	

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

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

Entries	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Jor-hat	Bhuban-eswar	Ayod-hya	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	**Ran-chi	Aver-age	Ra-nk
RO-11-2-6	0.50	0.58	0.54	0.32	0.68	1.40	0.76	1.15	0.88	1.39	0.73	0.16	0.81	1
JHO-18-3	0.30	0.50	0.67	0.23	0.55	1.24	0.74	0.84	0.83	1.36	0.80	0.18	0.73	4
OL-1766-2	0.40	0.38	0.54	0.27	0.66	1.11	0.69	1.07	0.95	1.32	0.76	0.26	0.74	3
JO-11-507	0.40	0.54	0.66	0.27	0.55	0.99	0.82	1.03	0.98	1.28	0.82	0.24	0.76	2
OL-1874-2	0.30	0.47	0.59	0.29	0.65	1.20	0.61	0.93	0.89	0.93	0.61	0.12	0.68	7
RO-11-2-2	0.40	0.55	0.49	0.32	0.49	0.89	0.90	0.97	0.89	1.12	0.63	0.30	0.69	6
HFO-816	0.30	0.57	0.54	0.32	0.52	0.78	0.70	0.82	0.80	1.22	0.46	0.12	0.64	8
JHO-822 (NC)	0.50	0.48	0.58	0.25	0.58	0.97	0.71	0.80	0.83	1.10	0.71	0.30	0.68	7
UPO-212 (NC)	0.40	0.52	0.46	0.28	0.43	1.34	0.80	0.91	0.89	1.25	0.59	0.27	0.72	5
Mean	**0.39**	**0.51**	**0.56**	**0.28**	**0.57**	**1.10**	**0.75**	**0.95**	**0.88**	**1.22**	**0.68**	**0.22**	**0.72**	

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

Entries	Ludh-iana	His-ar	Bika-ner	Jor-hat	Bhuban-eswar	Ayod-hya	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
RO-11-2-6	5.1	2.1	7.8	4.0	6.5	3.0	5.8	4.9	18.2	1.9	4.2	5.8	1
JHO-18-3	4.7	1.5	6.3	3.3	5.7	2.8	4.5	4.7	17.6	1.7	4.6	5.2	4
OL-1766-2	4.7	1.7	4.6	3.9	5.5	2.7	6.0	5.3	17.7	1.5	4.2	5.3	3
JO-11-507	5.1	1.6	6.2	3.3	4.9	3.3	4.6	5.6	17.4	2.2	5.0	5.4	2
OL-1874-2	3.8	1.8	4.0	4.1	5.4	2.3	5.0	4.5	11.5	1.8	4.0	4.4	8
RO-11-2-2	5.4	2.1	6.3	3.2	4.4	3.6	5.7	4.7	14.0	2.0	3.3	5.0	5
HFO-816	4.8	2.0	5.3	3.0	4.0	2.7	4.8	4.2	14.8	1.6	2.4	4.5	7
JHO-822 (NC)	5.9	1.6	6.6	3.5	4.5	2.7	4.3	5.3	15.1	1.6	4.4	5.0	5
UPO-212 (NC)	4.3	1.8	5.2	2.7	6.2	3.1	4.3	5.0	16.0	1.9	3.2	4.9	6
Mean	**4.9**	**1.8**	**5.8**	**3.4**	**5.2**	**2.9**	**5.0**	**4.9**	**15.8**	**1.8**	**3.9**	**5.0**	

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

Entries	Ludh-iana	His-ar	Bika-ner	Jor-hat	Bhuban-eswar	Ran-chi	Ayod-hya	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Raip-ur	Aver-age	Ra-nk
RO-11-2-6	16.3	9.2	21.4	10.2	8.5	7.3	7.6	9.1	10.1	19.1	8.2	8.9	11.3	4
JHO-18-3	19.8	9.2	20.1	10.6	8.3	6.0	7.6	9.8	10.3	18.8	8.2	8.9	11.5	2
OL-1766-2	18.9	8.6	19.4	10.3	8.9	6.4	7.7	10.1	10.3	19.4	8.1	8.5	11.4	3
JO-11-507	16.8	8.0	18.3	10.7	9.0	5.6	8.0	8.1	10.4	19.6	8.3	9.2	11.0	5
OL-1874-2	17.9	8.7	13.6	11.1	8.2	6.0	7.3	9.8	9.2	17.9	8.2	10.1	10.7	7
RO-11-2-2	18.4	9.4	18.0	11.3	9.0	8.1	7.9	10.7	9.6	18.2	8.2	8.1	11.4	3
HFO-816	19.8	9.0	14.7	10.1	9.3	6.0	7.6	10.7	9.6	17.6	8.2	7.9	10.9	6
JHO-822 (NC)	17.7	9.0	21.7	10.4	8.4	8.7	7.5	9.7	11.6	19.9	8.1	9.4	11.8	1
UPO-212 (NC)	17.3	9.2	16.0	11.2	8.5	4.1	7.8	8.5	10.1	18.7	8.2	8.2	10.6	8
Mean	**18.1**	**8.9**	**18.1**	**10.7**	**8.7**	**6.5**	**7.7**	**9.6**	**10.1**	**18.8**	**8.2**	**8.8**	**11.2**	

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

Entries	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Jor-hat	Bhuban-eswar	Ran-chi	Ayo-dhya	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
RO-11-2-6	142.4	100.6	164.8	77.7	97.4	113.3	97.6	149.8	69.7	68.8	124.6	63.8	147.6	109.1	1
JHO-18-3	108.7	79.6	165.9	77.7	81.4	116.6	102.2	144.8	68.1	63.7	112.7	57.2	135.7	101.1	4
OL-1766-2	112.7	81.6	168.2	87.7	75.7	104.3	105.6	159.0	67.4	67.2	127.2	48.3	140.6	103.5	2
JO-11-507	140.7	85.2	151.2	83.3	85.5	100.2	103.4	155.0	67.1	61.9	111.5	65.7	131.6	103.3	3
OL-1874-2	92.4	63.8	148.4	80.3	80.0	107.5	103.0	155.6	73.7	53.5	122.9	56.1	139.8	98.2	8
RO-11-2-2	138.2	91.8	140.6	71.0	75.4	96.5	102.7	139.8	72.7	77.4	104.4	62.6	111.2	98.8	7
HFO-816	112.3	66.8	163.4	76.0	74.7	96.0	94.1	141.4	57.5	47.3	115.3	53.7	114.8	93.3	9
JHO-822 (NC)	146.2	79.4	144.0	83.3	86.8	97.7	99.5	139.8	60.5	60.7	108.0	54.9	128.4	99.2	6
UPO-212 (NC)	110.9	86.0	165.8	84.0	78.9	109.6	104.5	144.0	61.1	59.0	116.6	56.5	134.4	100.9	5
Mean	**122.7**	**81.6**	**156.9**	**80.1**	**81.8**	**104.6**	**101.4**	**147.7**	**66.4**	**62.2**	**115.9**	**57.6**	**131.6**	**100.8**	

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

Entries	Ludh-iana	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Ayod-hya	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
RO-11-2-6	1.35	1.48	0.78	1.30	0.94	0.76	0.91	0.66	1.03	1.11	0.43	0.98	3
JHO-18-3	1.18	1.42	0.91	1.28	0.76	0.71	0.75	0.66	1.23	1.07	0.38	0.94	6
OL-1766-2	1.20	1.60	1.09	1.17	0.67	0.73	1.03	0.63	1.08	1.01	0.36	0.96	4
JO-11-507	1.00	1.39	0.78	1.11	0.75	0.75	1.22	0.67	1.16	1.18	0.42	0.95	5
OL-1874-2	1.12	1.36	0.83	1.21	0.78	0.69	0.87	0.69	1.15	1.04	0.51	0.93	7
RO-11-2-2	1.38	1.41	0.61	0.98	0.63	0.78	0.72	0.63	0.72	1.12	0.29	0.84	9
HFO-816	1.20	1.31	0.85	0.95	0.81	0.88	1.09	0.68	1.39	1.04	0.81	1.00	1
JHO-822 (NC)	1.42	1.56	0.67	1.06	0.63	0.72	0.99	0.64	1.13	1.01	0.33	0.92	8
UPO-212 (NC)	1.25	1.43	0.97	1.25	0.70	0.68	1.18	0.66	1.16	1.08	0.56	0.99	2
Mean	**1.23**	**1.44**	**0.83**	**1.15**	**0.74**	**0.74**	**0.97**	**0.66**	**1.12**	**1.07**	**0.45**	**0.95**	

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

Entries	ADF (%)							NDF (%)							IVDMD (%)					
	Ludh-iana	Ana-nd	Ran-chi	Rah-uri	Bika-ner	Aver-age	Ra-nk	Ludh-iana	Ana-nd	Ran-chi	Rah-uri	Bika-ner	Aver-age	Ra-nk	Ludh-iana	His-ar	Ran-chi	Rah-uri	Aver-age	Ra-nk
RO-11-2-6	35.7	41.6	40.3	37.8	47.0	40.5	6	58.3	65.4	65.8	53.3	66.8	61.9	3	66.4	63.7	57.5	59.4	61.8	5
JHO-18-3	34.8	41.6	44.0	36.1	42.7	39.8	4	56.3	65.4	67.7	52.5	68.8	62.1	4	69.2	65.7	54.6	60.7	62.6	3
OL-1766-2	35.7	44.1	46.2	38.6	43.8	41.7	8	56.9	65.5	69.3	54.7	69.0	63.1	8	66.3	63.7	52.9	58.8	60.4	8
JO-11-507	38.4	42.3	46.6	38.7	42.4	41.7	8	59.8	65.3	69.7	53.8	69.1	63.5	9	64.2	63.0	52.6	58.7	59.6	9
OL-1874-2	37.2	40.6	44.2	33.5	36.8	38.4	2	57.6	65.5	67.6	52.3	70.2	62.6	6	66.2	64.7	54.4	62.8	62.0	4
RO-11-2-2	36.9	44.3	43.1	35.1	44.0	40.7	7	57.8	65.9	64.3	54.0	69.7	62.3	5	68.8	71.0	55.3	61.5	64.2	1
HFO-816	35.9	42.8	41.5	33.1	37.6	38.2	1	55.8	66.8	63.4	50.9	68.9	61.2	1	69.6	65.8	56.5	63.1	63.8	2
JHO-822 (NC)	37.3	41.5	38.8	34.7	45.4	39.5	3	57.4	65.0	64.8	53.2	68.2	61.7	2	64.9	60.5	58.6	61.8	61.5	6
UPO-212 (NC)	34.9	41.5	47.9	34.5	41.4	40.0	5	59.3	66.1	68.2	51.4	69.7	62.9	7	67.3	63.3	51.5	62.0	61.0	7
Mean	**36.3**	**42.3**	**43.6**	**35.8**	**42.3**	**40.1**		**57.7**	**65.6**	**66.8**	**52.9**	**68.9**	**62.4**		**67.0**	**64.6**	**54.9**	**61.0**	**61.9**	

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

Entries	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Bhuban-eswar	Jor-hat	Ayod-hya	Jha-nsi	Rah-uri	Ana-nd	Jabal-pur	Rai-pur	**Urulikan-chan	Aver-age	Ra-nk
RO-11-2-6	30.2	26.7	20.2	19.2	8.4	11.9	18.6	15.8	16.7	8.1	29.3	10.1	3.6	17.9	8
JHO-18-3	31.7	36.2	17.5	22.3	7.7	14.3	20.8	22.4	16.9	9.9	42.3	10.5	3.4	21.0	5
OL-1766-2	30.5	29.6	15.6	21.9	7.4	14.1	19.4	17.9	12.8	8.4	27.1	8.9	1.7	17.8	9
JO-11-507	32.5	36.1	21.3	19.4	7.2	13.4	20.0	26.4	16.0	17.4	40.2	10.8	3.1	21.7	4
OL-1874-2	29.6	31.9	22.5	17.8	7.6	14.9	17.7	14.9	11.9	18.7	25.3	11.1	3.8	18.7	6
RO-11-2-2	31.0	38.9	21.3	26.1	6.8	14.4	20.4	23.6	23.8	7.5	42.6	14.4	3.1	22.6	2
HFO-816	30.3	28.9	19.9	17.2	6.7	9.2	18.6	21.1	13.4	14.2	34.7	8.6	2.7	18.6	7
JHO-822 (NC)	32.4	36.7	30.4	22.0	6.9	14.6	18.9	25.9	22.7	16.8	44.2	11.7	2.3	23.6	1
UPO-212 (NC)	29.1	35.8	33.8	20.0	8.2	12.6	21.3	21.6	17.5	12.8	41.4	8.2	1.9	21.9	3
Mean	**30.8**	**33.4**	**22.5**	**20.7**	**7.4**	**13.3**	**19.5**	**21.1**	**16.9**	**12.7**	**36.3**	**10.5**	**2.8**	**20.4**	
CD at 5%	**2.6**	**6.8**	**1.7**	**2.9**	**0.5**		**1.8**	**7.3**	**3.3**	**4.0**	**7.8**	**0.9**	**0.9**		
CV%	**6.5**		**11.5**	**8.2**	**3.7**		**5.4**	**4.2**	**11.2**	**18.1**	**12.6**	**4.7**	**17.7**		

15. AVTO-2 (DUAL): SECOND ADVANCED VARIETAL TRIAL IN OAT (DUAL)

(Reference tables 15.1 to 15.10)

A Second Advanced Varietal Trial- 2 in Oat (Dual) comprising of five entries along with two national checks (UPO-212 and JHO-822) was conducted at 14 centres located in North-West, North East and Central zone. There were 4 locations each in NW and NE; and 6 locations in Central zone.

For GFY (q/ha), entry JO-10-506 was superior by margin of 9.6% over the best national check (UPO-212) in NW zone. In NE zone, entries OL-1876-2 (10.7%), JHO-17-4 (9.2%), and OL-1906 (7.1%) were superior over the best national check (JHO-822). In central zone, entries OL-1876-2 and JHO-17-4 were superior by margin of 11.4% and 10.0% respectively over the best national check (JHO-822). At all India level, entries OL-1876-2 (8.3%), and JHO-17-4 (4.5%) showed superiority over the best check (JHO-822).

For DMY (q/ha), entries JHO-17-4 (9.1%), OL-1876-2 (8.3%), and OL-1906 (5.9%) were superior over the best check in NE zone. In central zone, entries JHO-17-4 and OL-1876-2 were superior by margin of 15.4% and 13.2% respectively over the best check (JHO-822). At all India level, entries OL-1876-2 (7.4%) and JHO-17-4 (5.2%) showed superiority over the best check (JHO-822).

For fodder production potential (q/ha/day), entry OL-1876-2 ranked first for green matter while OL-1876-2 ranked first for dry matter. Entry JO-10-506 and OL-1876-2 jointly ranked first for plant height. National check UPO-212 ranked first for leafiness.

For quality parameters, entry JHO-17-4 (4.7 q/ha) ranked first followed by OL-1876-2 (4.6 q/ha) for crude protein yield. Entry HFO-611 (11.8%) ranked first followed by OL-1876-2 (11.7%) for crude protein content. Entry HFO-611 ranked first for IVDMD %.

For seed yield, entry JO-10-506 (22.5 q/ha) ranked first followed by national check UPO-212 (21.9 q/ha).

16. AVTO-2 (DUAL) SEED: SECOND ADVANCED VARIETAL TRIAL IN OAT (DUAL) FOR SEED

(Reference tables 16.1)

A Second Advanced varietal trial- 2 in Oat (Dual) for seed comprising of five entries along with two national checks (UPO-212 and JHO-822) was conducted at 9 centres located in North-West, North East zone and Central zone. There were 3 locations each in NW, 2 locations in NE and 4 locations in Central zone.

For seed yield (q/ha), entry JO-10-506 showed 4.1% and 10.2% superiority in NW and NE zones respectively over the best check.At all India level, national check JHO-822 showed superiority over the tested entries.

Table 15.1 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	North West Zone							North East Zone						
	Ludhi-ana	Bika-ner	Pant-nagar	His-ar	Aver-age	Ra-nk	Super-iority%	Jor-hat	Bhuban-eswar	Ayod-hya	**Ran-chi	Aver-age	Ra-nk	Superi-ority%
JO-10-506	185.0	202.2	138.9	115.2	160.3	1	9.6	175.8	254.0	129.4	124.3	186.4	6	
HFO-611	150.6	187.8	151.1	102.2	147.9	2	1.1	141.6	302.0	135.1	114.7	192.9	5	
OL-1906	115.7	156.2	147.0	98.3	129.3	7		160.2	344.5	137.1	91.3	213.9	3	7.1
JHO-17-4	133.9	153.4	151.9	78.3	129.4	6		197.3	324.0	133.2	110.0	218.1	2	9.2
OL-1876-2	146.0	178.0	154.4	101.7	145.0	5		188.3	347.5	127.4	91.0	221.1	1	10.7
UPO-212 (NC)	150.8	160.3	157.8	116.1	146.3	3		134.1	262.0	129.4	104.0	175.2	7	
JHO-822 (NC)	167.9	168.6	168.9	77.8	145.8	4		150.0	287.5	161.8	98.3	199.8	4	
Mean	**150.0**	**172.4**	**152.9**	**98.5**	**143.4**			**163.9**	**303.1**	**136.2**	**104.8**	**201.1**		
CD at 5%	**41.3**	**27.9**	**8.3**	**10.3**				**4.6**	**29.4**	**18.3**	**57.1**			
CV%	**9.7**		**6.6**	**5.8**				**7.6**	**5.5**	**7.5**	**8.7**			

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

Table 15.1 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	Central Zone									All India		
	Jha-nsi	Rah-uri	Ana-nd	Jabal-pur	Rai-pur	**Urulikan-chan	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Super-iority
JO-10-506	157.4	214.7	366.9	208.0	225.0	273.8	234.4	5		197.7	3	0.3
HFO-611	153.3	222.4	405.6	160.0	252.8	257.3	238.8	3	1.0	197.0	4	
OL-1906	154.4	173.7	317.5	166.0	244.4	241.1	211.2	7		184.6	5	
JHO-17-4	150.7	193.3	479.7	140.0	336.1	239.2	260.0	2	10.0	206.0	2	4.5
OL-1876-2	151.5	252.4	433.9	137.0	341.7	243.9	263.3	1	11.4	213.3	1	8.3
UPO-212 (NC)	153.3	188.5	387.5	151.0	197.2	282.6	215.5	6		182.3	6	
JHO-822 (NC)	162.2	181.4	458.6	163.0	216.7	259.4	236.4	4		197.0	4	
Mean	**154.7**	**203.8**	**407.1**	**160.7**	**259.1**	**256.7**	**237.1**			**196.9**		
CD at 5%	**14.1**	**34.1**	**NS**	**35.7**	**38.6**	**NS**						
CV%	**7.9**	**9.4**	**15.2**	**12.5**	**8.4**	**11.3**						

Table 15.2 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	North West Zone							North East Zone						
	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Aver-age	Ra-nk	Superi-ority%	Jor-hat	Bhuban-eswar	Ayo-dhya	**Ran-chi	Aver-age	Ra-nk	Superi-ority%
JO-10-506	34.6	24.8	22.2	20.7	25.6	1	0.7	33.4	57.2	28.2	24.7	39.6	6	
HFO-611	29.5	22.3	26.4	20.4	24.7	3		23.8	70.6	29.7	22.9	41.4	5	
OL-1906	21.8	16.7	23.0	20.0	20.4	7		26.6	78.9	28.8	17.2	44.8	3	5.9
JHO-17-4	23.4	18.4	24.7	17.7	21.1	6		35.7	74.7	27.9	22.6	46.1	1	9.1
OL-1876-2	26.6	22.4	27.6	21.4	24.5	4		31.1	78.4	27.8	15.2	45.7	2	8.3
UPO-212 (NC)	29.0	17.4	26.3	22.1	23.7	5		24.1	59.1	26.5	19.6	36.6	7	
JHO-822 (NC)	32.6	24.2	28.2	16.6	25.4	2		28.5	67.0	31.2	20.7	42.2	4	
Mean	**28.2**	**20.9**	**25.5**	**19.8**	**23.6**			**29.0**	**69.4**	**28.6**	**20.4**	**42.3**		
CD at 5%	**14.8**	**3.3**	**1.6**	**2.4**				**2.1**	**7.3**	**3.7**	**4.6**			
CV%	**5.2**		**8.2**	**6.6**				**8.1**	**5.9**	**7.2**	**6.7**			

Table 15.2 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	Central Zone									All India		
	Jha-nsi	Rah-uri	Ana-nd	Jabal-pur	Rai-pur	**Urulikan-chan	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Super-iority
JO-10-506	20.5	42.7	49.4	31.1	27.5	38.9	34.2	5		32.7	5	
HFO-611	18.7	46.2	53.7	29.4	29.3	39.8	35.5	3	3.0	33.3	4	
OL-1906	18.5	36.5	46.4	30.6	27.5	32.8	31.9	7		31.3	6	
JHO-17-4	16.7	38.8	70.5	25.5	47.1	31.9	39.7	1	15.4	35.1	2	5.2
OL-1876-2	17.6	48.1	61.4	24.6	43.1	35.5	39.0	2	13.2	35.8	1	7.4
UPO-212 (NC)	19.5	39.5	51.8	27.5	24.0	40.6	32.5	6		30.6	7	
JHO-822 (NC)	18.6	37.8	60.3	29.8	25.6	39.4	34.4	4		33.4	3	
Mean	**18.6**	**41.4**	**56.2**	**28.4**	**32.0**	**37.0**	**35.3**			**33.2**		
CD at 5%	**6.2**	**7.1**	**NS**	**6.6**	**5.5**	**NS**						
CV%	**3.5**	**9.6**	**15.7**	**13.0**	**9.7**	**13.1**						

Table 15.3 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Green Forage Yield (q/ha/day)

Entries	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Jor-hat	Bhuban-eswar	Ayod-hya	Rah-uri	Ana-nd	Rai-pur	**Ran-chi	**Urulikan-chan	Aver-age	Ra-nk
JO-10-506	2.60	3.26	2.57	1.60	3.03	4.62	2.53	3.98	5.10	3.36	1.30	4.98	3.26	5
HFO-611	2.10	3.03	2.65	1.42	2.44	5.49	2.64	4.12	5.63	3.77	1.14	4.68	3.33	3
OL-1906	1.60	2.52	2.72	1.36	2.76	6.26	2.68	3.22	4.41	3.65	0.96	4.38	3.12	6
JHO-17-4	1.90	2.47	2.62	1.09	3.40	5.89	2.61	3.58	6.66	5.02	1.11	4.35	3.52	2
OL-1876-2	2.00	2.87	2.81	1.41	3.25	6.32	2.49	4.67	6.03	5.10	0.94	4.43	3.69	1
UPO-212 (NC)	2.10	2.59	2.57	1.61	2.31	4.76	2.53	3.49	5.38	2.94	1.08	5.14	3.03	7
JHO-822 (NC)	2.30	2.72	3.11	1.08	2.59	5.23	3.17	3.36	6.37	3.23	1.04	4.72	3.32	4
Mean	**2.09**	**2.78**	**2.72**	**1.37**	**2.83**	**5.51**	**2.66**	**3.77**	**5.65**	**3.87**	**1.08**	**4.67**	**3.33**	

Table 15.4 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha/day)

Entries	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Jorha t	Bhuba-neswar	Ayod-hya	Rah-uri	Ana-nd	Ra-ipur	**Ran-chi	**Urulikan-chan	Aver-age	Ra-nk
JO-10-506	0.50	0.40	0.41	0.29	0.58	1.04	0.53	0.79	0.69	0.41	0.26	0.71	0.56	5
HFO-611	0.40	0.36	0.46	0.29	0.41	1.28	0.56	0.86	0.75	0.44	0.23	0.72	0.58	4
OL-1906	0.30	0.27	0.43	0.28	0.46	1.44	0.54	0.68	0.64	0.41	0.18	0.60	0.54	6
JHO-17-4	0.30	0.30	0.43	0.25	0.62	1.36	0.52	0.72	0.98	0.70	0.23	0.58	0.62	2
OL-1876-2	0.40	0.36	0.50	0.30	0.54	1.43	0.53	0.89	0.85	0.64	0.16	0.65	0.64	1
UPO-212 (NC)	0.40	0.28	0.47	0.31	0.42	1.07	0.49	0.73	0.72	0.36	0.20	0.74	0.53	7
JHO-822 (NC)	0.50	0.39	0.53	0.23	0.49	1.22	0.58	0.70	0.84	0.38	0.22	0.72	0.59	3
Mean	**0.40**	**0.34**	**0.46**	**0.28**	**0.50**	**1.26**	**0.54**	**0.77**	**0.78**	**0.48**	**0.21**	**0.67**	**0.58**	

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

Table 15.5 AVT-2 Oat (Dual):Second Advanced Varietal Trial in Oat (Dual) : Crude Protein Yield (q/ha)

Entries	Ludh -iana	His -ar	Bika -ner	Jor -hat	Bhuban -eswar	Ran -chi	Ayod -hya	Rah -uri	Ana -nd	Jabal -pur	Rai- pur	**Urulikan -chan	Aver -age	Ra- nk
JO-10-506	5.8	1.9	5.9	3.6	4.9	4.9	2.2	4.2	9.6	2.6	2.1	3.2	4.3	3
HFO-611	5.8	1.9	5.3	2.5	5.8	4.1	2.3	4.7	10.2	2.4	2.8	3.5	4.3	3
OL-1906	3.6	1.8	3.9	2.8	6.6	3.4	2.2	3.1	8.6	2.5	2.8	2.8	3.8	6
JHO-17-4	3.7	1.7	3.9	3.7	6.4	6.3	2.1	3.8	12.7	2.1	5.0	2.8	4.7	1
OL-1876-2	4.7	1.9	5.7	3.2	7.5	3.4	2.1	4.9	11.0	2.0	4.3	3.0	4.6	2
UPO-212 (NC)	4.6	2.1	3.8	2.5	5.5	4.5	2.0	4.0	10.4	2.2	2.1	3.4	4.0	5
JHO-822 (NC)	5.3	1.4	5.8	3.0	5.6	3.4	2.5	2.8	11.3	2.4	2.6	3.3	4.2	4
Mean	**4.8**	**1.8**	**4.9**	**3.0**	**6.0**	**4.3**	**2.2**	**3.9**	**10.5**	**2.3**	**3.1**	**3.1**	**4.3**	

Table 15.6 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Crude Protein (%)

Entries	Ludh- iana	His- ar	Bika- ner	Jor- hat	Bhuban- eswar	Ran- chi	Ayod- hya	Rah- uri	Urulikan- chan	Ana- nd	Jabal- pur	Rai- pur	Aver- age	Ra- nk
JO-10-506	16.9	8.8	23.9	10.8	8.5	6.8	7.7	9.9	8.2	19.2	8.4	7.8	11.4	3
HFO-611	19.8	9.2	23.7	10.6	8.2	6.0	7.9	10.1	8.9	19.0	8.3	9.6	11.8	1
OL-1906	16.5	9.1	23.4	10.8	8.4	5.1	7.8	8.4	8.7	18.6	8.4	10.1	11.3	4
JHO-17-4	15.6	9.4	21.4	10.4	8.5	7.0	7.6	9.8	8.7	18.0	8.2	10.6	11.3	4
OL-1876-2	17.7	9.0	25.6	10.6	9.5	6.0	7.5	10.1	8.4	17.9	8.2	10.0	11.7	2
UPO-212 (NC)	15.9	9.7	21.8	10.7	9.4	5.8	7.4	10.2	8.3	20.1	8.3	8.7	11.4	3
JHO-822 (NC)	16.3	8.5	24.0	10.7	8.3	5.1	8.0	7.4	8.4	18.8	8.4	9.9	11.2	5
Mean	**17.0**	**9.1**	**23.4**	**10.7**	**8.7**	**6.0**	**7.7**	**9.4**	**8.5**	**18.8**	**8.3**	**9.5**	**11.4**	

Table 15.7 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Plant Height (cm)

Entries	Ludh-iana	Bika-ner	Pant-nagar	His-ar	Jor-hat	Ran-chi	Ayo-dhya	Bhuban-eswar	Rah-uri	Urulikan-chan	Ana--nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
JO-10-506	138.5	66.8	83.6	81.0	86.5	103.6	139.1	95.7	69.4	84.2	104.0	55.8	131.6	95.4	1
HFO-611	129.9	73.2	88.6	90.3	79.7	108.1	129.5	107.9	57.8	57.1	104.5	51.6	126.3	92.7	3
OL-1906	112.3	68.7	86.5	78.7	75.3	98.8	155.6	114.1	58.9	74.9	105.7	51.7	139.7	93.9	2
JHO-17-4	105.8	68.3	84.8	80.3	83.6	103.3	146.6	109.3	57.3	62.9	101.9	47.3	135.8	91.3	4
OL-1876-2	129.5	69.0	79.3	73.3	94.6	98.1	152.2	115.3	69.9	82.7	108.2	48.6	119.8	95.4	1
UPO-212 (NC)	141.1	68.8	81.5	82.3	78.1	102.5	133.7	97.3	51.1	80.4	104.0	49.7	116.5	91.3	4
JHO-822 (NC)	139.6	69.0	88.2	74.3	84.1	97.4	126.8	101.3	54.2	68.4	100.2	52.9	129.5	91.2	5
Mean	**128.1**	**69.1**	**84.6**	**80.0**	**83.2**	**101.7**	**140.5**	**105.8**	**59.8**	**73.0**	**104.1**	**51.1**	**128.5**	**93.0**	

Table 15.8 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): Leaf Stem Ratio

Entries	Ludh-iana	Pant-nagar	Jor-hat	Bhuban-eswar	Ran-chi	Ayod-hya	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
JO-10-506	1.40	1.32	1.14	0.95	0.40	0.76	0.93	0.83	1.60	1.08	0.51	0.99	3
HFO-611	1.28	0.96	0.99	1.17	0.41	0.85	1.35	0.78	1.66	1.06	0.53	1.00	2
OL-1906	1.12	1.13	0.84	1.24	0.43	0.88	1.32	1.02	1.21	0.99	0.43	0.96	5
JHO-17-4	1.20	1.08	0.93	1.21	0.43	0.81	1.37	0.83	1.42	1.06	0.54	0.99	3
OL-1876-2	1.35	1.20	0.70	1.32	0.56	0.82	0.96	0.76	1.17	1.05	0.39	0.93	6
UPO-212 (NC)	1.25	1.45	0.87	1.05	0.45	0.86	1.50	0.71	1.44	1.04	0.61	1.02	1
JHO-822 (NC)	1.33	1.12	1.04	1.11	0.37	0.80	1.22	0.89	1.22	1.02	0.55	0.97	4
Mean	**1.28**	**1.18**	**0.93**	**1.15**	**0.44**	**0.83**	**1.24**	**0.83**	**1.39**	**1.04**	**0.51**	**0.98**	

Table 15.9 AVT-2 Oat (Dual): Second Advanced Varietal Trial in Oat (Dual): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)							NDF (%)							IVDMD (%)					
	Ludh-iana	An-and	Ran-chi	Rah-uri	Bika-ner	Aver-age	Ra-nk	Ludh-iana	Ana-nd	Ran-chi	Rah-uri	Bika-ner	Aver-age	Ra-nk	Ludh-iana	His-ar	Ran-chi	Rah-uri	Aver-age	Ra-nk
JO-10-506	38.8	35.5	40.8	31.9	44.8	38.4	4	56.4	64.9	64.2	51.5	65.7	60.5	3	64.2	63.6	57.1	64.0	62.2	5
HFO-611	37.4	38.9	37.5	31	43.2	37.6	2	53.7	65.4	63.9	50.5	66.9	60.1	1	68.3	63.4	59.7	64.7	64.0	1
OL-1906	37.9	36.8	43.5	30.7	44.7	38.7	5	56.4	65.1	65.2	50.1	67.4	60.8	4	63.2	68.0	55.0	65.0	62.8	3
JHO-17-4	39.6	36.3	41.2	32.8	47.5	39.5	7	57.2	65.5	65.1	50.8	66.3	61.0	5	62.6	65.8	56.8	63.3	62.1	6
OL-1876-2	38.2	36.6	42.1	34.4	37.8	37.8	3	55.2	66.0	64.4	50.6	65.0	60.2	2	66.2	64.4	56.1	62.1	62.2	5
UPO-212 (NC)	39.3	39.0	42.1	31.6	44.7	39.4	6	56.9	64.7	65.5	52.1	67.5	61.3	6	62.2	69.2	56.1	64.3	63.0	2
JHO-822 (NC)	39.4	38.0	39.6	32.1	35.4	36.9	1	55.9	65.7	66.5	52.3	66.8	61.4	7	63.6	64.9	58.0	63.9	62.6	4
Mean	**38.7**	**37.3**	**41.0**	**32.1**	**42.6**	**38.3**		**56.0**	**65.3**	**65.0**	**51.1**	**66.5**	**60.8**		**64.3**	**65.6**	**57.0**	**63.9**	**62.7**	

Table 15.10 AVT-2 Oat (Dual): Advanced Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	Ludh-iana	Bika ner	Pant nagar	His ar	Bhuban eswar	Jor hat	Ayo dhya	Jha nsi	Rah uri	Ana nd	Jabal pur	Rai pur	**Urulikan chan	Aver age	Ra-nk
JO-10-506	32.8	36.9	26.7	25.3	7.5	11.9	20.2	24.2	22.5	13.1	35.8	12.9	1.2	22.5	1
HFO-611	31.7	32.5	20.7	23.3	6.5	14.1	19.0	15.4	17.7	12.2	37.9	11.7	1.6	20.2	4
OL-1906	30.5	34.2	15.3	15.8	8.0	13.4	20.8	17.9	23.2	7.3	40.4	14.7	1.5	20.1	5
JHO-17-4	31.4	33.2	20.3	18.0	6.4	14.1	20.0	22.2	19.6	9.6	34.9	12.2	1.2	20.2	4
OL-1876-2	31.2	26.7	19.4	20.4	7.7	14.4	18.6	14.6	17.6	5.7	31.4	14.3	1.7	18.5	6
UPO-212 (NC)	30.7	39.2	22.7	27.1	6.9	14.3	21.2	21.5	21.1	7.7	37.4	13.2	2.3	21.9	2
JHO-822 (NC)	31.0	37.5	18.3	18.1	7.6	14.3	20.0	15.5	29.2	8.1	48.3	11.7	1.4	21.6	3
Mean	**31.3**	**34.3**	**20.5**	**21.1**	**7.2**	**13.8**	**20.0**	**18.8**	**21.6**	**9.1**	**38.0**	**13.0**	**1.6**	**20.7**	
CD at 5%	**1.9**	**6.8**	**1.2**	**3.1**	**0.5**		**2.5**	**9.8**	**4.0**	**2.8**	**7.3**	**1.7**	**0.4**		
CV%	**5.7**		**8.2**	**8.1**	**3.5**		**7.0**	**5.5**	**10.5**	**17.5**	**10.8**	**7.4**	**15.7**		

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

Table 16.1 AVT-2 Oat (Dual) (Seed): Second Advanced Varietal Trial in Oat (Dual) (Seed): Seed Yield (q/ha)

Entries	Seed Yield (q/ha)																	
	North West Zone						North East Zone				Central Zone						All India	
	Ludh-iana	Pant-nagar	His-ar	Aver-age	Ra-nk	Superi-ority%	**Bhuban-eswar	Ran-chi	Ra-nk	Superi-ority%	Jha-nsi	Rah-uri	Urulikan-chan	Jabal-pur	Aver-age	Ra-nk	Aver-age	Ra-nk
JO-10-506	34.5	21.1	28.3	28.0	1	4.1	7.7	39.7	1	10.2	21.3	23.5	13.0	41.9	24.9	4	27.9	2
HFO-611	33.7	18.1	24.9	25.6	4		7.0	34.3	4		20.5	21.5	16.8	46.2	26.2	2	27.0	3
OL-1906	32.3	17.2	18.9	22.8	7		10.5	28.3	7		21.2	21.5	16.8	43.3	25.7	3	24.9	6
JHO-17-4	32.8	19.7	20.1	24.2	5		7.2	29.7	6		23.7	17.6	16.8	41.0	24.8	5	25.2	5
OL-1876-2	33.6	15.8	20.0	23.1	6		9.4	31.3	5		20.4	17.8	19.1	22.6	20.0	7	22.6	7
UPO-212 (NC)	32.3	18.9	29.4	26.9	2		8.5	34.7	3		24.3	13.7	14.5	39.5	23.0	6	25.9	4
JHO-822 (NC)	33.4	20.6	23.7	25.9	3		9.9	36.0	2		20.9	26.5	17.5	47.2	28.0	1	28.2	1
Mean	**33.2**	**18.8**	**23.6**	**25.2**			**8.6**	**33.4**			**21.8**	**20.3**	**16.3**	**40.3**	**24.7**		**26.0**	
CD at 5%	**1.9**	**1.6**	**2.7**				**0.7**	**NS**			**11.4**	**3.8**	**2.5**	**7.8**				
CV%	**7.7**	**12.2**	**6.4**				**4.6**	**19.8**			**6.4**	**10.4**	**8.5**	**10.9**				

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

17. IVT LUCERNE: INITIAL VARIETAL TRIAL IN LUCERNE (ANNUAL) (Reference tables 17.1 to 17.9)

An **Initial Varietal Trial in Lucerne (annual)** comprising of five entries along with two national checks (Anand-2 and RL-88) was conducted at 11 centres located at three zones (NW, central and south zone). There were 4 locations in NWZ, 3 locations in CZ and 4 locations in SZ.

For GFY (q/ha), entryLLC-6 was superior by margin of 7.7% over the best check (Anand-2) in NW zone. In south zone, entry AL-66 was superior by margin of 8.7% over the best check (RL-88). At all India level, entry AL-66 (6.4%) showed superiority over the best check (RL-88). All other entries were below or at par or marginally superior in comparison to best check.

For DMY (q/ha), entry AL-66 was superior by margin of 10.6% over the best check (RL-88) in south zone. All other entries were below or at par or marginally superior in comparison to best check.
For fodder production potential (q/ha/day), entry AL-66 ranked first for both green and dry matter. Entry AL-62 ranked first for plant height. Entry LLC-6 ranked first followed by Alamdar-1 for leafiness.

For quality parameters, entry AL-66 (22.2 q/ha) ranked first followed by national check RL-88 (22.0 q/ha) for crude protein yield. Entry LLC-6 (20.2%) ranked first followed by AL-66 (19.9%) for crude protein content. Entry LLC-6 ranked first for ADF % and NDF%.

18. IVT BAJRA (MULTICUT): INITIAL VARIETAL TRIAL IN FODDER BAJRA (MULTICUT) IN SUMMER (Reference tables 18.1 to 18.7)

In Initial Varietal Trial on Summer Bajra Multicut, five entries were evaluated along with 3 checks (Giant Bajra, Moti Bajra, and BAIF Bajra 1) at seven locations in central and south zone.

For GFY (q/ha), entries SBH-101 and 16-ADVO111 were superior by margin of 4.5% and 4.3% respectively over the best check (BAIF Bajra-1) in central zone. At all India level, only one entry SBH-101 was superior by margin of 4.1% over the best check (BAIF Bjara-1).

For DMY (q/ha), entries SBH-101 (13.5%) and 16-ADVO111 (11.7%) were superior over the best check (Moti Bajra) in central zone. At all India level, entries SBH-101 (11.7%),and 16-ADVO111 (6.7%) showed superiority over the best check (BAIF Bajra-1).

For fodder production potential (q/ha/day), national check BAIF Bajra-1 ranked first for green matter, while entry SBH-101 ranked first for dry matter. National check Giant Bajra ranked first for plant height. Entry SBH-101 ranked first for leafiness.

For quality parameters, entry SBH-101 (15.5 q/ha) ranked first followed by 16-ADVO111 (14.4 q/ha) for crude protein yield.National check Giant bajra (8.6%) top ranked for crude protein content.

Table 17.1 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Green Forage Yield (q/ha)

Entries	North West Zone							Central Zone					
	Ludh-iana	Bika-ner	Udai-pur	**Jal-ore	Aver-age	Ra-nk	Superi-ority%	Rah-uri	Urulikan-chan	Ana-nd	Aver-age	Ra-nk	Superi-ority%
LLC-6	800.8	386.3	844.1	78.3	677.1	1	7.7	578.4	303.6	648.6	510.2	6	
Alamdar-1	627.5	241.0	842.7	85.8	570.4	7		578.4	271.6	645.0	498.3	7	
AL-62	679.2	377.8	763.6	77.2	606.9	5		669.5	280.1	756.3	568.6	5	
AL-66	686.7	407.8	846.3	82.8	646.9	3	2.9	688.3	293.2	760.7	580.7	3	
Alamdar-21	720.0	360.0	867.7	77.5	649.2	2	3.3	645.3	367.8	768.2	593.8	1	1.7
RL-88 (NC)	643.3	382.9	720.0	66.4	582.1	6		725.1	304.2	722.9	584.0	2	
Anand-2 (NC)	710.8	390.9	784.4	80.8	628.7	4		654.2	307.0	762.8	574.7	4	
Mean	**695.5**	**363.8**	**809.8**	**78.4**	**623.0**			**648.4**	**303.9**	**723.5**	**558.6**		
CD at 5%	**15.7**	**69.4**	**60.6**					**105.6**	**NS**	**NS**			
CV%	**2.2**		**4.2**					**9.2**	**10.5**	**11.2**			

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

Table 17.1 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Green Forage Yield (q/ha)

Entries	South Zone							All India		
	Hydera-bad	Coimb-atore	Man-dya	Dhar-wad	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
LLC-6	408.2	529.1	244.1	177.8	339.8	6		492.1	5	
Alamdar-1	416.5	556.1	269.8	277.8	380.0	4		472.6	7	
AL-62	374.9	666.1	276.6	241.7	389.8	3		508.6	4	
AL-66	522.0	765.2	286.9	240.3	453.6	1	8.7	549.7	1	6.4
Alamdar-21	433.2	530.5	249.5	211.1	356.1	5		515.3	3	
RL-88 (NC)	438.7	760.0	295.4	175.0	417.3	2		516.7	2	
Anand-2 (NC)	419.3	417.2	238.5	176.4	312.9	7		486.2	6	
Mean	**430.4**	**603.5**	**265.8**	**214.3**	**378.5**			**505.9**		
CD at 5%	**51.2**	**13.8**	**38.7**	**36.3**						
CV%	**6.6**	**1.3**	**8.2**	**9.5**						

Table 17.2 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Dry Matter Yield (q/ha)

Entries	North West Zone						Central Zone				
	Ludh-iana	Bika-ner	**Jal-ore	Aver-age	Ra-nk	Superi-ority%	Rah-uri	Urulikan-chan	Ana-nd	Aver-age	Ra-nk
LLC-6	152.2	65.3	20.9	108.7	1	2.3	112.9	68.0	131.9	104.3	6
Alamdar-1	100.4	34.9	23.6	67.7	7		114.2	53.2	118.8	95.4	7
AL-62	95.1	60.2	20.1	77.6	6		138.8	62.0	153.9	118.2	5
AL-66	116.7	65.3	22.1	91.0	5		137.1	72.7	157.5	122.4	2
Alamdar-21	122.4	60.7	22.5	91.6	4		130.8	72.9	155.6	119.8	4
RL-88 (NC)	122.2	69.3	18.6	95.8	3		153.0	71.3	157.7	127.3	1
Anand-2 (NC)	142.2	70.3	21.6	106.2	2		132.7	69.1	162.4	121.4	3
Mean	**121.6**	**60.9**	**21.3**	**91.2**			**131.3**	**67.0**	**148.3**	**115.5**	
CD at 5%	**5.4**		**3.6**				**21.2**	**NS**	**NS**		
CV%	**3.2**		**18.9**				**9.1**	**10.8**	**12.9**		

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

Table 17.2 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Dry Matter Yield (q/ha)

Entries	South Zone							All India		
	Hyderabad	Coimbatore	Mandya	Dharwad	Average	Rank	Superiority%	Average	Rank	Superiority%
LLC-6	85.9	121.9	46.4	49.4	75.9	6		92.7	6	
Alamdar-1	93.1	134.2	44.4	75.9	86.9	4		85.4	7	
AL-62	82.5	153.7	54.4	66.8	89.3	3		96.4	3	
AL-66	111.7	184.8	58.0	66.1	105.2	1	10.6	107.8	1	1.7
Alamdar-21	90.0	117.8	49.0	59.0	78.9	5		95.3	4	
RL-88 (NC)	96.5	182.9	60.5	40.5	95.1	2		106.0	2	
Anand-2 (NC)	88.7	96.0	46.9	45.4	69.3	7		94.9	5	
Mean	**92.6**	**141.6**	**51.4**	**57.6**	**85.8**			**96.9**		
CD at 5%	**13.1**	**3.8**	**11.0**	**10.6**						
CV%	**7.8**	**1.5**	**12.0**	**10.3**						

Table 17.3 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Green Forage Yield (q/ha/day)

Entries	Ludhiana	Bikaner	Rahuri	Anand	Dharwad	Average	Rank
LLC-6	3.98	1.91	2.70	3.56	1.98	2.83	6
Alamdar-1	3.12	1.19	2.70	3.54	3.09	2.73	7
AL-62	3.38	1.87	3.13	4.16	2.69	3.05	2
AL-66	3.42	2.02	3.22	4.18	2.67	3.10	1
Alamdar-21	3.58	1.78	3.02	4.22	2.35	2.99	3
RL-88 (NC)	3.20	1.90	3.39	3.97	1.94	2.88	5
Anand-2 (NC)	3.54	1.94	3.06	4.19	1.96	2.94	4
Mean	**3.46**	**1.80**	**3.03**	**3.97**	**2.38**	**2.93**	

Table 17.4 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Bikaner	Rahuri	Anand	Dharwad	Average	Rank
LLC-6	0.76	0.32	0.53	0.73	0.55	0.58	4
Alamdar-1	0.50	0.17	0.53	0.65	0.84	0.54	5
AL-62	0.47	0.30	0.65	0.85	0.74	0.60	3
AL-66	0.58	0.32	0.64	0.87	0.73	0.63	1
Alamdar-21	0.61	0.30	0.61	0.86	0.66	0.61	2
RL-88 (NC)	0.61	0.34	0.71	0.87	0.45	0.60	3
Anand-2 (NC)	0.71	0.35	0.62	0.89	0.50	0.61	2
Mean	**0.61**	**0.30**	**0.61**	**0.81**	**0.64**	**0.59**	

Table 17.5 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Crude Protein Yield (q/ha)

Entries	Ludhiana	Bikaner	Rahuri	Anand	Urulikanchan	Coimbatore	Hyderabad	Mandya	Average	Rank
LLC-6	27.4	18.1	17.3	27.5	12.5	25.6	17.6	9.2	19.4	3
Alamdar-1	15.1	9.6	15.5	25.5	10.1	25.9	18.9	8.8	16.2	7
AL-62	14.9	13.1	16.7	32.7	11.8	32.9	16.2	9.4	18.5	6
AL-66	18.0	17.7	24.3	33.0	13.1	38.1	22.5	11.2	22.2	1
Alamdar-21	18.8	14.1	19.7	34.3	13.4	23.7	18.3	8.3	18.8	5
RL-88 (NC)	19.7	19.5	20.4	35.1	13.2	37.7	19.1	11.0	22.0	2
Anand-2 (NC)	22.9	15.1	21.8	35.5	**12.7**	18.3	17.1	8.5	19.0	4
Mean	**19.5**	**15.3**	**19.4**	**31.9**	**12.4**	**28.9**	**18.5**	**9.5**	**19.4**	

Table 17.6 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Crude Protein (%)

Entries	Ludhiana	Bikaner	Rahuri	Urulikanchan	Anand	Coimbatore	Hyderabad	Mandya	Average	Rank
LLC-6	18.0	27.7	15.3	18.4	20.9	21.0	20.5	19.7	20.2	1
Alamdar-1	15.0	27.5	13.6	19.0	21.6	19.3	20.3	19.8	19.5	4
AL-62	15.7	21.7	12.0	19.0	21.7	21.4	19.6	17.2	18.5	7
AL-66	15.4	27.1	17.7	18.0	20.9	20.6	20.1	19.3	19.9	2
Alamdar-21	15.4	23.3	15.1	18.4	22.2	20.1	20.4	17.1	19.0	5
RL-88 (NC)	16.1	28.2	13.3	18.5	22.2	20.6	19.7	18.3	19.6	3
Anand-2 (NC)	16.1	21.5	16.4	18.4	21.7	19.1	19.3	18.2	18.8	6
Mean	**16.0**	**25.3**	**14.8**	**18.5**	**21.6**	**20.3**	**20.0**	**18.5**	**19.4**	

Table 17.7 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Plant Height (cm)

Entries	Ludhiana	Bikaner	Udaipur	Rahuri	Urulikanchan	Anand	Coimbatore	Mandya	Average	Rank
LLC-6	90.0	27.6	63.6	58.7	75.9	70.0	78.6	37.2	62.7	6
Alamdar-1	95.0	29.6	69.8	65.2	71.9	73.6	80.5	61.2	68.3	2
AL-62	98.0	28.2	66.8	68.2	80.1	78.9	85.4	55.8	70.2	1
AL-66	92.0	24.2	66.6	64.6	76.4	80.5	86.3	51.2	67.7	4
Alamdar-21	85.0	29.0	68.4	64.5	78.0	77.7	78.4	58.9	67.5	5
RL-88 (NC)	98.0	27.4	63.7	63.8	63.1	79.0	82.6	62.6	67.5	5
Anand-2 (NC)	91.0	31.6	65.7	64.2	80.0	81.0	**75.2**	55.5	68.0	3
Mean	**92.7**	**28.2**	**66.4**	**64.2**	**75.1**	**77.2**	**81.0**	**54.6**	**67.4**	

Table 17.8 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): Leaf Stem Ratio

Entries	Ludhiana	Bikaner	Rahuri	Urulikanchan	Coimbatore	Mandya	Average	Rank
LLC-6	1.05	3.47	1.08	0.72	0.45	0.50	1.21	1
Alamdar-1	1.23	2.93	0.95	0.74	0.48	0.53	1.14	2
AL-62	1.29	2.09	0.95	0.69	0.50	0.64	1.03	5
AL-66	1.05	2.03	0.87	0.73	0.51	0.59	0.96	7
Alamdar-21	1.21	2.26	1.06	0.73	0.49	0.61	1.06	3
RL-88 (NC)	1.17	1.94	1.28	0.74	0.51	0.65	1.05	4
Anand-2 (NC)	1.09	2.07	1.16	0.75	0.44	0.55	1.01	6
Mean	**1.16**	**2.40**	**1.05**	**0.73**	**0.48**	**0.58**	**1.07**	

Table 17.9 VT Lucerne Annual: Varietal Trial in Annual Lucerne (New): ADF (%), NDF (%)

Entries	ADF (%)		NDF (%)	
	Ludhiana	Rank	Ludhiana	Rank
LLC-6	44.7	1	58.1	1
Alamdar-1	47.5	7	61.4	4
AL-62	47.1	6	63.4	6
AL-66	46.1	4	62.4	5
Alamdar-21	45.7	3	63.4	6
RL-88 (NC)	46.5	5	60.7	3
Anand-2 (NC)	45.1	2	59.8	2
Mean	**46.1**		**61.3**	

Table 18.1 IVT Bajra (Multi cut): Initial Varietal Trial in Fodder Bajra (Multi cut) in summer: Green Forage Yield (q/ha)

Entries	Central Zone							South Zone					All India		
	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Aver-age	Ra-nk	Super-iority%	Hydera-bad	Man-dya	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority%
FBL-4	1074.8	1392.2	926.9	529.0	980.7	7		458.4	404.1	431.2	6		797.6	7	
16-ADVO111	1138.4	1268.0	1267.1	710.3	1095.9	2	4.3	532.5	619.0	575.7	3		922.5	2	2.1
SBH-101	1243.7	1302.3	1240.7	606.1	1098.2	1	4.5	597.3	652.1	624.7	1	2.8	940.4	1	4.1
TSFMB-18-14	1140.2	1158.5	885.6	522.8	926.8	8		416.7	601.8	509.3	5		787.6	8	
SBH-102	1110.6	1235.3	1260.6	608.2	1053.7	3	0.2	240.8	458.8	349.8	7		819.1	5	
BAIF Bajra-1 (NC)	1381.4	1047.4	1286.1	489.5	1051.1	4		513.9	701.2	607.5	2		903.2	3	
Moti Bajra (NC)	1195.7	1075.2	947.2	769.6	996.9	6		449.1	579.0	514.0	4		836.0	4	
Giant Bajra (NC)	1445.0	1120.9	918.5	531.1	1003.9	5		324.1	538.2	431.2	6		813.0	6	
Mean	**1216.2**	**1200.0**	**1091.6**	**595.8**	**1025.9**			**441.6**	**569.3**	**505.4**			**852.4**		
CD at 5%	**209.0**	**144.6**	**169.3**	**130.6**				**93.3**	**64.3**						
CV%	**9.8**	**6.8**	**8.9**	**12.6**				**11.9**	**11.2**						

Table 18.2 IVT Bajra (Multi cut): Initial Varietal Trial in Fodder Bajra (Multi cut) in summer: Dry Matter Yield (q/ha)

Entries	Central Zone							South Zone				All India		
	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Aver-age	Ra-nk	Superi-ority%	Hydera-bad	Man-dya	Aver-age	Ra-nk	Aver-age	Ra-nk	Superi-ority%
FBL-4	203.5	288.7	155.8	110.4	189.6	6		94.7	98.0	96.4	7	158.5	7	
16-ADVO111	231.3	285.3	217.1	152.6	221.6	2	11.7	110.6	160.9	135.7	3	193.0	2	6.7
SBH-101	291.9	257.1	223.6	128.0	225.1	1	13.5	114.5	196.9	155.7	2	202.0	1	11.7
TSFMB-18-14	243.4	222.9	134.1	117.1	179.4	8		82.7	165.0	123.8	5	160.9	6	
SBH-102	179.4	205.1	227.3	129.1	185.2	7		49.7	135.0	92.4	8	154.3	8	
BAIF Bajra-1 (NC)	243.3	210.1	205.1	103.5	190.5	5		106.0	216.9	161.4	1	180.8	3	
Moti Bajra (NC)	254.3	205.1	169.3	164.9	198.4	3		92.7	165.4	129.1	4	175.3	4	
Giant Bajra (NC)	291.6	233.4	149.8	111.0	196.4	4		63.9	130.1	97.0	6	163.3	5	
Mean	**242.3**	**238.5**	**185.3**	**127.1**	**198.3**			**89.4**	**158.5**	**123.9**		**173.5**		
CD at 5%	**40.9**	**28.6**	**30.1**	**28.0**				**26.4**	**20.5**					
CV%	**9.6**	**6.8**	**9.3**	**12.6**				**16.7**	**12.8**					

Table 18.3 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)				
	Rahuri	Anand	Hyderabad	Average	Rank	Rahuri	Anand	Hyderabad	Average	Rank
FBL-4	7.57	7.41	4.17	6.38	7	1.43	1.25	0.86	1.18	6
16-ADVO111	8.02	10.14	4.84	7.67	3	1.63	1.74	1.01	1.46	2
SBH-101	8.76	9.93	5.43	8.04	2	2.06	1.79	1.04	1.63	1
TSFMB-18-14	8.03	7.09	3.79	6.30	8	1.71	1.07	0.75	1.18	6
SBH-102	7.82	10.09	2.19	6.70	5	1.26	1.82	0.45	1.18	6
BAIF Bajra-1 (NC)	9.73	10.29	4.67	8.23	1	1.71	1.64	0.96	1.44	3
Moti Bajra (NC)	8.42	7.58	4.08	6.69	6	1.79	1.35	0.84	1.33	4
Giant Bajra (NC)	10.18	7.35	2.95	6.83	4	2.05	1.20	0.58	1.28	5
Mean	**8.56**	**8.74**	**4.02**	**7.10**		**1.71**	**1.48**	**0.81**	**1.33**	

Table 18.4 IVT Bajra (Multi cut): Initial Varietal Trial in Fodder Bajra (Multi cut) in summer: Crude Protein Yield (q/ha)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Average	Rank
FBL-4	14.1	19.1	14.4	9.0	7.4	7.3	11.9	8
16-ADVO111	12.3	19.3	18.7	12.3	9.5	14.2	14.4	2
SBH-101	17.2	19.0	19.2	10.0	10.2	17.3	15.5	1
TSFMB-18-14	14.0	15.1	13.7	10.0	7.4	12.3	12.1	7
SBH-102	14.6	14.2	22.7	12.1	4.1	11.8	13.2	5
BAIF Bajra-1 (NC)	12.8	13.1	19.0	7.7	9.6	19.9	13.7	4
Moti Bajra (NC)	17.5	13.8	18.3	13.3	7.3	13.0	13.9	3
Giant Bajra (NC)	17.0	20.4	13.5	9.2	5.7	12.0	13.0	6
Mean	**14.9**	**16.7**	**17.4**	**10.4**	**7.7**	**13.5**	**13.4**	

Table 18.5 IVT Bajra (Multi cut): Initial Varietal Trial in Fodder Bajra (Multi cut) in summer: Crude Protein (%)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Average	Rank
FBL-4	6.9	6.6	11.3	8.2	7.8	7.4	8.0	6
16-ADVO111	5.3	6.8	10.2	8.3	8.6	8.8	8.0	6
SBH-101	5.9	7.4	10.4	8.2	8.9	8.8	8.3	3
TSFMB-18-14	5.8	6.8	10.4	8.1	9.0	7.4	7.9	7
SBH-102	8.1	6.9	11.1	8.2	8.2	8.8	8.5	2
BAIF Bajra-1 (NC)	5.3	6.2	10.4	8.2	9.1	9.2	8.1	5
Moti Bajra (NC)	6.9	6.7	11.7	8.3	7.9	7.9	8.2	4
Giant Bajra (NC)	5.8	8.7	10.6	8.2	9.0	9.2	8.6	1
Mean	**6.3**	**7.0**	**10.8**	**8.2**	**8.6**	**8.4**	**8.2**	

Table 18.6 IVT Bajra (Multi cut): Initial Varietal Trial in Fodder Bajra (Multi cut) in summer: Plant Height (CM)

Entries	Rahuri	Urulikanchan	Jabalpur	Anand	Hyderabad	Mandya	Average	Rank
FBL-4	131.8	121.8	154.7	179.3	110.3	141.8	139.9	7
16-ADVO111	144.8	130.7	162.2	190.5	95.1	156.2	146.6	2
SBH-101	153.5	102.2	144.6	190.9	103.5	177.7	145.4	5
TSFMB-18-14	147.4	126.3	140.0	182.3	103.8	167.2	144.5	6
SBH-102	115.9	114.4	151.3	181.1	76.9	169.4	134.8	8
BAIF Bajra-1 (NC)	141.5	107.1	154.8	185.4	109.5	179.6	146.3	3
Moti Bajra (NC)	139.1	128.9	168.1	190.1	87.2	163.8	146.2	4
Giant Bajra (NC)	157.5	146.7	151.3	187.1	98.4	155.0	149.3	1
Mean	**141.4**	**122.3**	**153.4**	**185.8**	**98.1**	**163.8**	**144.1**	

Table 18.7 IVT Bajra (Multi cut): Initial Varietal Trial in Fodder Bajra (Multi cut) in summer: Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Average	Rank
FBL-4	0.29	0.66	0.57	0.67	0.50	0.20	0.48	5
16-ADVO111	0.32	0.65	0.92	0.73	0.31	0.21	0.52	3
SBH-101	0.24	0.74	0.88	0.65	0.55	0.24	0.55	1
TSFMB-18-14	0.33	0.68	1.08	0.56	0.39	0.18	0.54	2
SBH-102	0.39	0.76	0.70	0.64	0.58	0.19	0.54	2
BAIF Bajra-1 (NC)	0.32	0.59	0.26	0.69	0.76	0.30	0.49	4
Moti Bajra (NC)	0.23	0.64	0.41	0.75	0.28	0.20	0.42	7
Giant Bajra (NC)	0.29	0.71	0.30	0.60	0.52	0.21	0.44	6
Mean	**0.30**	**0.68**	**0.64**	**0.66**	**0.49**	**0.22**	**0.50**	

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

(Reference tables 19.1 to 19.8)

In First Advanced Varietal Trial on Summer Bajra Multicut, three entries were evaluated along with 3 checks (Giant Bajra, Moti Bajra, and BAIF Bajra 1) at four locations in central zone.

For GFY (q/ha), national check BAIF Bajra-1 was superior over the tested entries in central zone.

For DMY (q/ha), entry TSFB-18-1 was superior by margin of 13.8% over the best check (Giant Bajra) in central zone.

For fodder production potential (q/ha/day), entry BAIF Bajra -6 ranked first for green matter, while entry BAIF Bajra-5 ranked first for dry matter. Entry TSFB-18-1 ranked first for plant height. National check Moti bajraranked first for leafiness

For quality parameters, entry BAIF Bajra- 6(15.9 q/ha) ranked first for crude protein yield. Both BAIF Bajra- 6and national check Moti bajra were jointly ranked first with the value of 8.4% for crude protein content. National check Moti bajra ranked first in ADF %, NDF % and IVDMD %.

20. AVT-2 BAJRA (MULTICUT): SECOND ADVANCED VARIETAL TRIAL IN FODDER BAJRA (MULTICUT) IN SUMMER

(Reference tables 20.1 to 20.9)

In Second Advanced Varietal Trial on Summer Bajra Multicut, three entries were evaluated along with 3 checks (Giant Bajra, Moti Bajra, and Raj Bajra-1) at seven locations in Central and South zone.

For GFY (q/ha) and DMY (q/ha), entry ADV 0061 (4.3% and 5.7%, respectively) was superior over the best check (Moti Bajra and Raj Bajra-1, respectively) in central zone. At all India, all tested entries were either marginally superior or inferior over the best check.

For fodder production potential (q/ha/day), entry HTBH-4902 ranked first for both green and dry matter. Entry AFB-37 ranked first for plant height. National check Raj Bajra-1 ranked first for leafiness

For quality parameters, entry HTBH-4902 (13.6 q/ha) ranked first followed by national check Moti Bajra (13.4 q/ha) for crude protein yield. For crude protein, national check Moti bajra was ranked first with the value of 8.7%. National check Raj Bajra-1 ranked first for IVDMD %.

21. AVT-2 (SEED) BAJRA (MULTICUT): SECOND ADVANCED VARIETAL TRIAL IN FODDER BAJRA (MULTICUT) IN SUMMER FOR SEED

(Reference tables 21.1)

In Second Advanced Varietal Trial on Summer Bajra Multicut for seed, three entries were evaluated along with 3 checks (Giant Bajra, Moti Bajra, and Raj Bajra-1) at seven locations in Central and South zone.

For seed yield (q/ha), entries AFB-37 and ADV 0061 were superior by margin of 4.4% and 4.3% respectively over the best national check (Moti Bajra) in central zone.

Table 19.1 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
TSFB-18-1	1161.7	1219.9	1211.5	657.7	1062.7	2
BAIF Bajra -6	1271.2	1180.6	1258.3	522.0	1058.0	3
BAIF Bajra-5	1109.5	1158.6	1319.1	486.5	1018.4	4
Moti Bajra (NC)	1054.0	1120.0	1124.7	572.1	967.7	5
Giant Bajra (NC)	1037.0	1293.4	1000.3	530.3	965.3	6
BAIF Bajra-1 (NC)	1089.6	1330.2	1264.2	643.1	1081.8	1
Mean	**1120.5**	**1217.1**	**1196.4**	**568.6**	**1025.6**	
CD at 5%	**175.2**	**NS**	**204.5**	**51.9**		
CV%	**10.4**	**9.1**	**11.3**	**6.2**		

Table 19.2 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	Superiority%
TSFB-18-1	271.7	291.7	190.2	141.9	223.9	1	13.8
BAIF Bajra -6	255.2	192.2	213.0	110.8	192.8	4	
BAIF Bajra-5	260.4	181.8	212.2	105.2	189.9	5	
Moti Bajra (NC)	236.2	201.3	195.0	122.7	188.8	6	
Giant Bajra (NC)	191.4	303.6	177.8	114.2	196.7	2	
BAIF Bajra-1 (NC)	213.6	221.9	208.4	139.4	195.8	3	
Mean	**238.1**	**232.1**	**199.4**	**122.4**	**198.0**		
CD at 5%	**36.2**	**31.2**	**NS**	**10.8**			
CV%	**10.1**	**9.0**	**10.6**	**6.1**			

Table 19.3 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	Anand	Average	Rank	Rahuri	Anand	Average	Rank
TSFB-18-1	8.18	9.69	8.94	3	1.91	1.52	1.72	2
BAIF Bajra -6	8.95	10.07	9.51	1	1.00	1.70	1.35	6
BAIF Bajra-5	7.81	10.55	9.18	2	1.83	1.70	1.77	1
Moti Bajra (NC)	7.42	9.00	8.21	5	1.66	1.56	1.61	3
Giant Bajra (NC)	7.30	8.00	7.65	6	1.35	1.42	1.38	5
BAIF Bajra-1 (NC)	7.67	10.11	8.89	4	1.50	1.67	1.59	4
Mean	**7.89**	**9.57**	**8.73**		**1.54**	**1.60**	**1.57**	

Table 19.4 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
TSFB-18-1	16.0	19.3	20.8	11.7	9.3	15.4	2
BAIF Bajra -6	17.9	15.3	22.1	8.8	15.7	15.9	1
BAIF Bajra-5	17.9	12.1	20.9	8.1	10.3	13.9	5
Moti Bajra (NC)	20.4	15.3	16.5	10.0	14.9	15.4	2
Giant Bajra (NC)	17.1	18.8	16.2	8.9	13.0	14.8	3
BAIF Bajra-1 (NC)	13.8	15.2	23.2	11.2	8.6	14.4	4
Mean	**17.2**	**16.0**	**19.9**	**9.8**	**12.0**	**15.0**	

Table 19.5 AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder Bajra (Multi cut) in summer: Crude Protein (%)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Mandya	Average	Rank
TSFB-18-1	5.9	6.6	11.7	8.2	9.6	8.4	4
BAIF Bajra -6	7.0	8.0	11.8	8.2	10.5	9.1	1
BAIF Bajra-5	6.9	6.7	11.5	8.1	9.6	8.6	3
Moti Bajra (NC)	8.6	7.6	9.6	8.2	11.4	9.1	1
Giant Bajra (NC)	8.9	6.2	10.8	8.1	9.6	8.7	2
BAIF Bajra-1 (NC)	6.5	6.8	12.1	8.2	7.0	8.1	5
Mean	**7.3**	**7.0**	**11.3**	**8.2**	**9.6**	**8.7**	

Table 19.6 AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder Bajra (Multi cut) in summer: Plant Height (CM)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Average	Rank
TSFB-18-1	142.6	138.4	186.4	170.2	159.4	1
BAIF Bajra -6	139.5	114.3	189.6	159.5	150.7	4
BAIF Bajra-5	137.6	122.1	186.8	150.7	149.3	5
Moti Bajra (NC)	141.9	130.0	185.7	150.7	152.1	3
Giant Bajra (NC)	156.7	139.2	188.4	138.0	155.6	2
BAIF Bajra-1 (NC)	123.2	124.7	181.7	165.1	148.7	6
Mean	**140.2**	**128.1**	**186.4**	**155.7**	**152.6**	

Table 19.7 AVT-1 Bajra (Multi cut): Advanced Varietal Trial-1 in Fodder Bajra (Multi cut) in summer: Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Average	Rank
TSFB-18-1	0.54	0.74	0.59	0.78	0.66	2
BAIF Bajra -6	0.45	0.78	0.59	0.6	0.61	4
BAIF Bajra-5	0.44	0.75	0.47	0.60	0.57	5
Moti Bajra (NC)	0.43	0.72	0.89	0.72	0.69	1
Giant Bajra (NC)	0.36	0.73	0.54	0.65	0.57	5
BAIF Bajra-1 (NC)	0.51	0.78	0.55	0.76	0.65	3
Mean	**0.45**	**0.75**	**0.61**	**0.69**	**0.62**	

Table 19.8 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
TSFB-18-1	39.5	5	68.9	6	58.1	5
BAIF Bajra -6	38.0	2	67.3	2	59.3	2
BAIF Bajra-5	40.4	6	68.1	5	57.4	6
Moti Bajra (NC)	36.7	1	67.0	1	60.3	1
Giant Bajra (NC)	39.0	3	67.5	3	58.5	3
BAIF Bajra-1 (NC)	39.4	4	67.8	4	58.2	4
Mean	**38.8**		**67.8**		**58.6**	

Table 20.1 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder Bajra (Multi cut) in summer: Green Forage Yield (q/ha)

Entries	Central Zone							South Zone					All India		
	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Aver-age	Ra-nk	Superi-ority%	Hydera-bad	Man-dya	**Vella-yani	Aver-age	Ra-nk	Aver-age	Ra-nk	Superi-ority%
HTBH-4902	1064.3	1139.0	1150.3	720.3	1018.5	2	2.1	466.5	707.4	216.8	586.9	2	874.6	2	1.5
ADV 0061	914.8	1324.1	1222.2	699.4	1040.1	1	4.3	385.3	717.4	162.8	551.4	3	877.2	1	1.8
AFB-37	792.9	1205.8	1398.6	505.3	975.7	4		379.0	622.1	183.3	500.5	5	817.3	4	
Raj Bajra-1 (NC)	768.4	1002.9	1049.7	559.5	845.1	6		387.3	557.7	155.8	472.5	6	720.9	6	
Moti Bajra (NC)	976.0	1253.0	1222.2	538.7	997.5	3		441.5	736.4	203.8	588.9	1	861.3	3	
Giant Bajra (NC)	899.5	961.2	1144.8	557.5	890.8	5		414.4	674.0	183.5	544.2	4	775.2	5	
Mean	**902.7**	**1147.6**	**1198.0**	**596.8**	**961.3**			**412.3**	**669.2**	**184.3**	**540.8**		**821.1**		
CD at 5%	**155.6**	**201.7**	**157.9**	**50.8**				**56.4**	**81.9**	**6.9**					
CV%	**11.4**	**11.6**	**8.8**	**5.8**				**9.0**	**8.1**	**2.5**					

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

Table 20.2 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder Bajra (multi cut) in summer: Dry Matter Yield (q/ha)

Entries	Central Zone							South Zone					All India		
	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Aver-age	Rank	Super-iority%	Hydera-bad	Man-dya	**Vella-yani	Aver-age	Rank	Aver-age	Rank	Superi-ority%
HTBH-4902	220.5	213.0	193.2	156.6	195.8	2	3.7	97.7	131.1	54.2	114.4	2	168.7	1	3.1
ADV 0061	189.5	257.5	199.1	152.8	199.7	1	5.7	76.2	134.8	41.1	105.5	3	168.3	2	2.9
AFB-37	173.0	221.1	256.3	108.5	189.7	3	0.5	78.4	107.4	46.3	92.9	5	157.5	4	
Raj Bajra-1 (NC)	172.7	233.2	230.6	119.0	188.9	4		81.4	96.4	39.5	88.9	6	155.5	5	
Moti Bajra (NC)	225.0	211.9	190.9	115.0	185.7	5		90.0	149.1	51.2	119.6	1	163.6	3	
Giant Bajra (NC)	178.9	201.0	171.2	119.2	167.6	6		84.1	122.9	45.9	103.5	4	146.2	6	
Mean	**193.3**	**222.9**	**206.9**	**128.5**	**187.9**			**84.6**	**123.6**	**46.4**	**104.1**		**160.0**		
CD at 5%	**33.0**	**NS**	**28.3**	**11.0**				**11.4**	**23.4**	**4.0**					
CV%	**11.3**	**11.2**	**9.1**	**5.8**				**8.9**	**12.6**	**5.8**					

Table 20.3 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder Bajra (Multi cut) in summer: Green Forage Yield (q/ha/day)

Entries	Rahuri	Anand	Hyderabad	Vellayani	Average	Rank
HTBH-4902	7.44	9.20	4.24	4.81	6.42	1
ADV 0061	6.40	9.78	3.50	3.61	5.82	5
AFB-37	5.55	11.19	3.45	4.07	6.06	3
Raj Bajra-1 (NC)	5.37	8.40	3.52	3.42	5.18	6
Moti Bajra (NC)	6.83	9.78	4.01	4.52	6.28	2
Giant Bajra (NC)	6.29	9.16	3.77	4.08	5.83	4
Mean	**6.31**	**9.59**	**3.75**	**4.09**	**5.93**	

Table 20.4 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder Bajra (Multi cut) in summer: Dry Matter Yield (q/ha/day)

Entries	Rahuri	Anand	Hyderabad	Vellayani	Average	Rank
HTBH-4902	1.54	1.55	0.89	1.20	1.30	1
ADV 0061	1.32	1.59	0.69	0.91	1.13	4
AFB-37	1.21	2.05	0.71	1.03	1.25	2
Raj Bajra-1 (NC)	1.21	1.85	0.74	0.88	1.17	3
Moti Bajra (NC)	1.00	1.53	0.82	1.13	1.12	5
Giant Bajra (NC)	1.25	1.37	0.76	1.01	1.10	6
Mean	**1.26**	**1.66**	**0.77**	**1.03**	**1.18**	

Table 20.5 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder Bajra (Multi cut) in summer: Crude Protein Yield (q/ha)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Average	Rank
HTBH-4902	12.7	14.5	17.6	12.5	9.6	14.9	13.6	1
ADV 0061	10.6	17.5	18.0	12.3	7.0	13.0	13.1	3
AFB-37	9.5	14.6	24.9	8.8	7.0	10.3	12.5	4
Raj Bajra-1 (NC)	10.5	15.8	20.6	9.4	7.2	9.3	12.1	5
Moti Bajra (NC)	13.8	15.1	17.5	9.6	8.8	15.7	13.4	2
Giant Bajra (NC)	10.2	14.1	18.7	9.4	7.1	8.6	11.4	6
Mean	**11.2**	**15.3**	**19.6**	**10.3**	**7.8**	**12.0**	**12.7**	

Table 20.6 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder Bajra (Multi cut) in summer: Crude Protein (%)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Average	Rank
HTBH-4902	5.8	6.8	9.9	8.2	9.8	11.4	8.6	2
ADV 0061	5.6	6.8	10.1	8.2	9.2	9.6	8.3	4
AFB-37	5.5	6.6	10.6	8.1	8.9	9.6	8.2	5
Raj Bajra-1 (NC)	6.1	6.8	11.2	8.2	8.9	9.6	8.5	3
Moti Bajra (NC)	6.1	7.1	10.3	8.2	9.7	10.5	8.7	1
Giant Bajra (NC)	5.7	7.0	12.4	8.1	8.4	7.0	8.1	6
Mean	**5.8**	**6.9**	**10.7**	**8.2**	**9.2**	**9.6**	**8.4**	

Table 20.7 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder FBjra (Multi cut) in summer: Plant Height (CM)

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Vellayani	Average	Rank
HTBH-4902	141.9	148.7	183.5	165.5	109.7	155.3	176.3	154.4	4
ADV 0061	156.7	133.7	185.1	165.1	113.6	166.8	160.8	154.5	3
AFB-37	137.6	165.2	188.1	158.6	128.3	157.7	176.5	158.8	1
Raj Bajra-1 (NC)	142.6	170.6	180.7	139.9	94.9	148.7	116.5	142.0	6
Moti Bajra (NC)	139.5	141.2	183.2	145.8	110.6	169.3	202.0	155.9	2
Giant Bajra (NC)	123.2	162.2	187.5	153.5	97.2	159.8	184.3	152.5	5
Mean	**140.2**	**153.6**	**184.7**	**154.7**	**109.1**	**159.6**	**169.4**	**153.0**	

Table 20.8 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder Bajra (Multi cut) in summer: Leaf Stem Ratio

Entries	Rahuri	Urulikanchan	Anand	Jabalpur	Hyderabad	Mandya	Vellayani	Average	Rank
HTBH-4902	0.43	0.69	0.65	0.76	0.44	0.24	0.33	0.51	2
ADV 0061	0.36	0.66	0.61	0.76	0.48	0.28	0.3	0.49	4
AFB-37	0.44	0.74	0.73	0.68	0.41	0.27	0.28	0.51	2
Raj Bajra-1 (NC)	0.54	0.76	0.77	0.55	0.63	0.24	0.23	0.53	1
Moti Bajra (NC)	0.45	0.74	0.74	0.59	0.45	0.33	0.28	0.51	2
Giant Bajra (NC)	0.51	0.73	0.67	0.62	0.48	0.25	0.23	0.50	3
Mean	**0.45**	**0.72**	**0.70**	**0.66**	**0.48**	**0.27**	**0.28**	**0.51**	

Table 20.9 AVT-2 Bajra (Multi cut): Advanced Varietal Trial-2 in Fodder Bajra (Multi cut) in summer: ADF (%) NDF (%), and IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Rahuri	Rank	Rahuri	Rank	Rahuri	Rank
HTBH-4902	44.1	5	70.5	4	54.5	5
ADV 0061	42.8	4	71.2	5	55.5	4
AFB-37	44.1	5	69.0	3	54.5	5
Raj Bajra-1 (NC)	39.3	1	66.7	1	58.2	1
Moti Bajra (NC)	41.5	3	69.0	3	56.5	3
Giant Bajra (NC)	41.1	2	67.1	2	56.8	2
Mean	**42.2**		**68.9**		**56.0**	

Table 21.1 AVT-2 Bajra (Multi cut) (Seed): Advanced Varietal Trial-2 in Fodder Bajra (Multi cut) (Seed) in summer: Seed Yield (q/ha)

Entries	Seed Yield (q/ha)														
	Central Zone							South Zone					All India		
	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Aver-age	Ra-nk	Superi-ority%	Hydera-bad	Man-dya	**Vella-yani	Aver-age	Ra-nk	Aver-age	Ra-nk	Super-iority%
HTBH-4902	7.7	18.4	38.9	8.6	18.4	4		12.3	7.8	0.1	10.0	2	15.6	4	
ADV 0061	8.4	17.8	46.2	9.3	20.4	1	4.3	13.1	6.7	0.9	9.9	3	16.9	1	0.9
AFB-37	8.9	17.6	44.2	11.0	20.4	1	4.4	11.0	8.0	1.0	9.5	4	16.8	2	0.2
Raj Bajra-1 (NC)	8.7	20.2	34.4	13.5	19.2	3		9.2	7.0	0.1	8.1	5	15.5	5	
Moti Bajra (NC)	11.8	16.9	36.9	12.7	19.6	2		14.6	7.6	0.1	11.1	1	16.7	3	
Giant Bajra (NC)	7.8	15.7	35.3	10.6	17.4	5		6.7	7.5	1.0	7.1	6	14.0	6	
Mean	**8.9**	**17.8**	**39.3**	**11.0**	**19.2**			**11.2**	**7.4**	**0.5**	**9.3**		**15.9**		
CD at 5%	**1.4**	**NS**	**NS**	**3.3**				**3.4**	**0.9**						
CV%	**10.8**	**18.2**	**14.5**	**19.2**				**19.8**	**8.0**						

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

22. IVT LATHYRUS: INITIAL VARIETAL TRIAL IN LATHYRUS

(Reference tables 22.1 to 22.8)

In Initial Varietal Trial on Lathyrus, five entries were evaluated along with 3 national checks (Mahateora, Prateek, and Ratan) at seven locations.

For GFY (q/ha) and DMY (q/ha), entry KL-5 was superior by margin of 10.2% and 18.5% respectively over the best national check (Prateek).

For fodder production potential (q/ha/day), entry JCL-19-1 ranked first for both green and dry matter. Entry KL-5 ranked first for plant height. National check Ratan ranked first for leafiness

For quality parameters, entry KL-5 (5.4 q/ha) ranked first followed by national check Mahateora (4.9 q/ha) for crude protein yield. National check Ratan (15.8%) ranked first for crude protein content

23. VT Red Clover 2016: VARIETAL TRIAL IN RED CLOVER (Perennial) - 2016 – 4TH YEAR

(Reference tables 22.1 to 23.4)

In Perennial Trial on Red Clover, six entries were evaluated along with one national check (PRC-3) at four locations in Hill zone of the country.

For both GFY and DMY, zonal check (PRC-3) was superior to tested entries in hill zone.

For fodder production potential (q/ha/day), entry IGFRI RC-2016-4 ranked first for both green and dry matter. Entry IGFRI RC-2016-3 ranked first for plant height. National check PRC-3 ranked first for leafiness

For quality parameters, entry IGFRI RC-2016-4 (5.3 q/ha) ranked first followed by IGFRI RC-2016-6 (5.2 q/ha) for crude protein yield. National check PRC-3 was ranked first for crude protein content. Entry IGFRI RC-2016-5 ranked first in ADF % and NDF %.

24. VT White Clover 2016: VARIETAL TRIAL IN WHITE CLOVER (Perennial) - 2016 – 4THYEAR

(Reference tables 24.1 to 24.3)

In Perennial Trial on WhiteClover, five entries were evaluated along with one national check (Palampur composite) at four locations in Hill zone of the country.

For GFY and DMY, entry PWC-25 (3.5% and 4.3% respectively) showed superiority over the best check (Palampur composite).

For fodder production potential (q/ha/day), entry JHWC-16-2 ranked first for both green and dry matter. Entry PWC-26 ranked first for both plant height and leafiness

For quality parameters, entries JHWC-16-2, and JHWC-16-3 jointly ranked first with the value of 2.8 q/ha. Entry JHWC-16-1 (21.4%) ranked first followed by PWC-26 (21.0%) for crude protein content. Entry JHWC-16-2 ranked first for both ADF % and NDF %.

Table 22.1 IVT Lathyrus (New): Green Forage Yield (q/ha)

Entries	Jorhat	Kalyani	Ranchi	Pusa	Jabalpur	Average	Rank	Superiority (%)
KL-5	136.4	142.8	68.4	126.7	410.5	177.0	1	10.2
JCL-19-3	149.8	157.8	52.4	49.3	289.2	139.7	6	
JCL-19-2	156.4	140.0	90.7	54.0	237.2	135.7	7	
JCL-19-4	152.5	150.6	51.6	42.0	187.9	116.9	8	
JCL-19-1	159.2	156.8	74.7	97.3	240.0	145.6	5	
Mahateora (NC)	141.9	138.6	80.4	84.7	357.2	160.6	2	
Prateek (NC)	137.6	147.3	60.0	92.0	323.9	152.2	3	
Ratan (NC)	138.8	176.8	56.9	86.0	277.2	147.1	4	
Mean	**146.6**	**151.3**	**66.9**	**79.0**	**290.4**	**146.8**		
CD at 5%	**3.6**	**14.1**	**11.9**	**16.5**	**54.3**			
CV%	**6.0**	**10.5**	**10.2**	**11.8**	**10.7**			

Table 22.2 IVT Lathyrus (New): Dry Matter Yield (q/ha)

Entries	Jorhat	Kalyani	Ranchi	Pusa	Jabalpur	**Raipur	Average	Rank	Superiority (%)
KL-5	26.7	29.3	11.9	32.0	77.8	10.9	35.5	1	18.5
JCL-19-3	28.4	32.3	10.0	11.9	53.1	8.1	27.1	6	
JCL-19-2	31.3	28.7	18.1	8.9	43.1	21.5	26.0	7	
JCL-19-4	30.9	30.8	10.5	10.8	33.8	9.3	23.4	8	
JCL-19-1	31.9	32.1	13.6	17.8	43.5	19.9	27.8	5	
Mahateora (NC)	27.8	28.4	13.4	13.7	66.7	3.2	30.0	2	
Prateek (NC)	24.6	30.2	10.6	20.8	60.0	6.5	29.2	3	
Ratan (NC)	24.9	36.2	8.2	21.2	50.6	5.3	28.2	4	
Mean	**28.3**	**31.0**	**12.0**	**17.1**	**53.6**	**10.6**	**28.4**		
CD at 5%	**1.9**	**2.4**	**3.7**	**3.8**	**10.4**	**1.2**			
CV%	**7.1**	**4.5**	**4.4**	**12.5**	**11.1**	**6.7**			

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

Table 22.3 IVT Lathyrus (New): Green Forage Yield (q/ha/day)

Entries	Jorhat	Kalyani	Ranchi	Pusa	Average	Rank
KL-5	2.18	1.60	0.89	1.18	1.46	4
JCL-19-3	2.69	1.77	0.60	0.46	1.38	6
JCL-19-2	2.86	1.57	1.34	0.50	1.57	2
JCL-19-4	2.76	1.69	0.57	0.39	1.35	7
JCL-19-1	2.97	1.76	0.80	0.91	1.61	1
Mahateora (NC)	2.53	1.55	1.24	0.79	1.53	3
Prateek (NC)	2.24	1.65	0.90	0.86	1.41	5
Ratan (NC)	2.29	1.98	0.78	0.80	1.46	4
Mean	**2.56**	**1.70**	**0.89**	**0.74**	**1.47**	

Table 22.4 IVT Lathyrus (New): Dry Matter Yield (q/ha/day)

Entries	Jorhat	Kalyani	Ranchi	Pusa	**Raipur	Average	Rank
KL-5	0.43	0.32	0.15	0.30	0.08	0.30	3
JCL-19-3	0.51	0.36	0.11	0.11	0.06	0.27	6
JCL-19-2	0.57	0.32	0.27	0.08	0.15	0.31	2
JCL-19-4	0.56	0.34	0.12	0.10	0.06	0.28	5
JCL-19-1	0.59	0.36	0.15	0.17	0.14	0.32	1
Mahateora (NC)	0.50	0.31	0.21	0.13	0.02	0.29	4
Prateek (NC)	0.40	0.33	0.16	0.19	0.04	0.27	6
Ratan (NC)	0.41	0.40	0.11	0.20	0.04	0.28	5
Mean	**0.50**	**0.34**	**0.16**	**0.16**	**0.07**	**0.29**	

Table 22.5 IVT Lathyrus (New): Crude Protein Yield (q/ha)

Entries	Jorhat	Kalyani	Ranchi	Jabalpur	Average	Rank
KL-5	3.3	5.2	1.8	11.2	5.4	1
JCL-19-3	3.7	5.7	1.6	7.6	4.6	4
JCL-19-2	4.0	4.8	2.9	6.2	4.5	5
JCL-19-4	4.2	4.7	1.5	4.6	3.8	6
JCL-19-1	4.2	5.3	2.2	6.2	4.5	5
Mahateora (NC)	3.3	4.6	2.0	9.6	4.9	2
Prateek (NC)	3.1	4.8	1.7	8.6	4.5	5
Ratan (NC)	3.0	7.1	1.4	7.2	4.7	3
Mean	**3.6**	**5.3**	**1.9**	**7.7**	4.6	

Table 22.6 IVT Lathyrus (New): Crude Protein (%)

Entries	Jorhat	Kalyani	Ranchi	Jabalpur	Average	Rank
KL-5	12.7	17.6	15.0	14.5	15.0	5
JCL-19-3	13.1	17.5	16.2	14.5	15.3	2
JCL-19-2	13.2	16.6	16.2	14.5	15.1	4
JCL-19-4	13.8	15.2	14.5	14.2	14.4	7
JCL-19-1	13.5	16.5	16.4	14.5	15.2	3
Mahateora (NC)	12.2	16.2	14.7	14.5	14.4	7
Prateek (NC)	12.8	15.8	16.4	14.5	14.9	6
Ratan (NC)	12.2	19.6	16.9	14.5	15.8	1
Mean	**12.9**	**16.9**	**15.8**	**14.4**	**15.0**	

Table 22.7 IVT Lathyrus (New): Plant Height (cm)

Entries	Jorhat	Kalyani	Ranchi	Pusa	Jabalpur	Average	Rank
KL-5	59.3	75.2	50.8	57.2	64.0	61.3	1
JCL-19-3	66.3	74.3	42.0	43.4	52.7	55.7	7
JCL-19-2	72.2	74.9	46.3	45.0	45.6	56.8	5
JCL-19-4	73.3	70.9	47.3	46.4	45.5	56.7	6
JCL-19-1	70.9	73.9	56.1	46.2	38.1	57.0	3
Mahateora (NC)	52.6	69.1	56.0	50.7	58.5	57.4	2
Prateek (NC)	57.2	77.3	36.5	43.4	56.6	54.2	8
Ratan (NC)	63.7	85.7	33.9	52.9	48.0	56.9	4
Mean	**64.5**	**75.2**	**46.1**	**48.2**	**51.1**	**57.0**	

Table 22.8 IVT Lathyrus (New): Leaf Stem Ratio

Entries	Jorhat	Kalyani	Pusa	Jabalpur	Average	Rank
KL-5	1.23	0.61	0.74	1.26	0.96	4
JCL-19-3	1.46	0.63	0.65	1.03	0.94	5
JCL-19-2	1.56	0.77	0.63	1.00	0.99	3
JCL-19-4	1.18	0.75	0.65	1.08	0.91	6
JCL-19-1	1.39	0.70	0.78	1.12	1.00	2
Mahateora (NC)	1.56	0.68	0.66	1.09	1.00	2
Prateek (NC)	1.20	0.71	0.70	1.04	0.91	6
Ratan (NC)	1.49	0.70	0.72	1.15	1.01	1
Mean	**1.38**	**0.69**	**0.69**	**1.10**	**0.97**	

Table 23.1 VT Red Clover-2016: Varietal Trial in Red Clover (Perennial) -4th Year: GFY & DMY (q/ha)

Entries	GFY (q/ha)					DMY (q/ha)				
	Palampur	Srinagar	Bajaura	Average	Rank	Palampur	Srinagar	Bajaura	Average	Rank
IGFRI RC -2016-1	124.4	167.7	451.6	247.9	4	21.3	27.6	74.8	41.2	3
IGFRI RC -2016-4	158.9	189.4	349.3	232.5	6	26.9	37.4	53.6	39.3	5
IGFRI RC -2016-6	147.0	216.3	366.3	243.2	5	25.9	31.5	58.8	38.7	6
IGFRI RC -2016-5	139.8	177.3	431.9	249.7	3	24.3	26.4	67.9	39.5	4
IGFRI RC -2016-2	122.0	199.3	437.9	253.1	2	20.9	30.9	73.2	41.7	2
IGFRI RC -2016-3	132.1		295.1	213.6	7	22.6		46.7	34.6	7
PRC-3 (NC)	137.5	234.4	439.8	270.5	1	23.5	39.1	74.9	45.8	1
Mean	**137.4**	**197.4**	**396.0**	**244.3**		**23.6**	**32.2**	**64.3**	**40.1**	
CD at 5%	**NS**	**9.5**	**37.7**			**NS**	**4.6**	**7.4**		
CV%	**16.2**	**3.2**	**6.4**			**15.0**	**9.5**	**7.8**		

Table 23.2 VT Red Clover-2016: Varietal Trial in Red Clover (Perennial) -4th Year: GFY (q/ha/day) & DMY (q/ha/day)

Entries	GFY (q/ha/day)		DMY (q/ha/day)	
	Palampur	Rank	Palampur	Rank
IGFRI RC -2016-1	0.77	6	0.13	5
IGFRI RC -2016-4	0.99	1	0.17	1
IGFRI RC -2016-6	0.91	2	0.16	2
IGFRI RC -2016-5	0.87	3	0.15	3
IGFRI RC -2016-2	0.76	7	0.13	5
IGFRI RC -2016-3	0.82	5	0.14	4
PRC-3 (NC)	0.86	4	0.15	3
Mean	**0.85**		**0.15**	

Table 23.2 VT Red Clover-2016: Varietal Trial in Red Clover (Perennial) -4th Year: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)		Crude Protein (%)	
	Palampur	Rank	Palampur	Rank
IGFRI RC -2016-1	4.3	6	20.1	2
IGFRI RC -2016-4	5.3	1	19.7	4
IGFRI RC -2016-6	5.2	2	19.9	3
IGFRI RC -2016-5	4.6	4	19.0	6
IGFRI RC -2016-2	4.0	7	19.3	5
IGFRI RC -2016-3	4.4	5	19.7	4
PRC-3 (NC)	5.0	3	21.3	1
Mean	**4.7**		**19.9**	

Table 23.3 VT Red Clover-2016: Varietal Trial in Red Clover (Perennial) -4thYear: Plant Height (CM) & Leaf Stem Ratio

Entries	Plant Height (CM)					Leaf Stem Ratio			
	Palampur	Srinagar	Bajaura	Average	Rank	Palampur	Srinagar	Average	Rank
IGFRI RC -2016-1	41.5	39.7	51.1	44.1	6	0.63	1.59	1.11	5
IGFRI RC -2016-4	46.0	43.2	45.8	45.0	5	0.76	1.66	1.21	3
IGFRI RC -2016-6	40.8	52.3	50.7	47.9	2	0.74	1.79	1.26	2
IGFRI RC -2016-5	46.0	39.3	52.4	45.9	4	0.82	1.53	1.17	4
IGFRI RC -2016-2	40.5	43.5	47.2	43.7	7	0.78	1.65	1.21	3
IGFRI RC -2016-3	51.0		47.7	49.4	1	0.76		0.76	6
PRC-3 (NC)	47.3	48.9	46.1	47.4	3	0.75	1.84	1.30	1
Mean	**44.7**	**44.5**	**48.7**	**46.2**		**0.7**	**1.7**	**1.1**	

Table 23.4 VT Red Clover-2016: Varietal Trial in Red Clover (Perennial) -4th Year: ADF (%) & NDF (%)

Entries	ADF (%)		NDF (%)	
	Palampur	Rank	Palampur	Rank
IGFRI RC -2016-1	51.2	2	60.4	7
IGFRI RC -2016-4	52.6	4	57.4	2
IGFRI RC -2016-6	51.8	3	57.8	3
IGFRI RC -2016-5	51.0	1	57.2	1
IGFRI RC -2016-2	52.6	4	58.6	5
IGFRI RC -2016-3	52.0	5	59.4	6
PRC-3 (NC)	53.2	6	58.2	4
Mean	**52.1**		**58.4**	

Table 24.1 VT White Clover-2016: Varietal Trial in White Clover (Perennial) -4th Year: GFY & DMY (q/ha)

Entries	GFY (q/ha)						DMY (q/ha)					
	Palam-pur	Sri-nagar	Baja-ura	Aver-age	Ra-nk	Superi-ority (%)	Palam-pur	Sri-nagar	Baja-ura	Aver-age	Ra-nk	Superi-ority (%)
PWC-25	74.2	159.2	369.7	201.0	1	3.5	12.5	25.7	49.3	29.2	1	4.3
PWC-26	67.4	200.2	289.5	185.7	4		11.5	28.0	38.7	26.1	6	
JHWC-16-1	70.2	158.9	310.2	179.8	6		12.0	26.7	44.5	27.7	4	
JHWC-16-3	77.0	167.5	310.7	185.0	5		13.5	25.9	41.7	27.0	5	
JHWC-16-2	82.1	184.3	315.1	193.8	3		14.5	27.4	42.4	28.1	2	0.5
Palampur composite (NC)	68.6	175.9	338.0	194.2	2		12.1	26.4	45.3	27.9	3	
Mean	**73.2**	**174.3**	**322.2**	**189.9**			**12.7**	**26.7**	**43.6**	**27.7**		
CD at 5%	**NS**	**10.6**	**42.5**				**NS**	**N.S**	**5.7**			
CV%	**11.1**	**4.0**	**7.3**				**11.9**	**8.2**	**7.2**			

Table 24.2 VT White Clover-2016: Varietal Trial in White Clover (Perennial) -4th Year: CPY (q/ha), CP (%) Plant Height (CM) & Leaf Stem Ratio

Entries	GFY (q/ha/day		DMY (q/ha/day)		Crude Protein Yield (q/ha)		Crude Protein (%)		Plant Height (CM)					Leaf Stem Ratio	
	Palam-pur	Ra-nk	Palam-pur	Ra-nk	Palam-pur	Ra-nk	Palam-pur	Ra-nk	Palam-pur	Sri-nagar	Baj-aura	Aver-age	Ra-nk	Sri-nagar	Ra-nk
PWC-25	0.56	3	0.09	3	2.6	2	20.4	4	17.8	33.1	36.5	29.1	4	1.53	5
PWC-26	0.50	6	0.09	3	2.4	3	21.0	2	15.0	43.0	33.9	30.6	1	1.62	1
JHWC-16-1	0.53	4	0.09	3	2.6	2	21.4	1	14.5	29.6	33.1	25.7	6	1.58	3
JHWC-16-3	0.57	2	0.10	2	2.8	1	20.6	3	13.8	34.8	35.3	27.9	5	1.57	4
JHWC-16-2	0.61	1	0.11	1	2.8	1	19.3	6	16.8	37.5	33.6	29.3	3	1.59	2
Palampur composite (NC)	0.51	5	0.09	3	2.4	3	20.1	5	15.0	36.9	38.8	30.3	2	1.49	6
Mean	**0.55**		**0.10**		**2.59**		**20.46**		**15.48**	**35.82**	**35.19**	**28.83**		**1.56**	

Table 24.3 VT White Clover-2016: Varietal Trial in White Clover (Perennial) -4th Year: ADF (%) & NDF (%)

Entries	ADF (%)		NDF (%)	
	Palampur	Rank	Palampur	Rank
PWC-25	50.6	1	56.0	4
PWC-26	53.8	5	57.2	5
JHWC-16-1	53.2	3	57.8	6
JHWC-16-3	51.8	2	54.2	2
JHWC-16-2	50.6	1	54.0	1
Palampur composite (NC)	53.6	4	54.6	3
Mean	**52.3**		**55.8**	

CHAPTER-2

FORAGE CROP PRODUCTION

FORAGE CROP PRODUCTION

The forage crop production programme was executed at 62 locations in five zones. In total 18 experiments were conducted, out of which 14 were in network (9 coordinated and 5 AVT based) and 4 were in location specific mode. The main emphasis was to increase the system productivity and resource use optimization in forages and forage based cropping systems.
In addition to above, the results of cutting and nitrogen management in oat cultivars, herbicide screening, studies on organic source of nutrients, carbon sequestration potential of perennial grass based cropping and intercropping for enhancing seed setting in Lucerne has also been covered. The results of studies on planting geometry of tall fescue grass and white clover in wet temperate conditions, feasibility of oat - *Lathyrus* intercropping system, techniques for enhancing seed productivity of fodder oat has also been presented in the chapter. The salient research achievements of the forage crop production trials during Rabi 2019-20 are as follows:

A. COORDINATED TRIALS

PS-14-AST-4: Studies on planting geometry of tall fescue grass and seed rates of white clover in wet temperate conditions [Table Reference: PS-14-AST-4 (a)-(d)]

Locations: Palampur and Srinagar

Preamble
Pastures containing a mixture of grasses and legumes form the basis of low cost animal production systems. Legumes provide nitrogen for the pasture through nitrogen fixation, and also provide forage of high feeding value, reflecting both high nutritive value and intake potential. Tall fescue grass and white clover have been recommended suitable range species for temperate conditions of the country. The ability to sustain a proportion of legume in the pasture is important in pastoral systems. The spatial arrangement of plants and seeding has significant influence on the yield and longevity of perennial range species. The present study was initiated during *rabi*2014-15 at Palampur and Srinagar centres to evaluate the productivity, quality and compatibility of tall fescue grass planted at different spacing with variable seed rates of white clover in wet temperate conditions with the objectives, to evaluate the productivity, quality and compatibility of tall fescue grass + white clover mixture, and to estimate soil NPK and soil organic carbon (SOC) storage under different treatments.

Experimental details
Treatments comprised of all possible combinations of three spacing of fescue grass (20 cm x 30 cm; 30 cm x 30 cm and 40 cm x 40 cm) and three seed rate of white clover (1.0, 2.0 and 3.0 kg/ha) with sole stand of tall fescue grass (30 cm x 30 cm) and white clover (6 kg/ha sown by broadcast). These were evaluated in randomized block design. In treatments of tall fescue grass + white clover, the white clover was over sown by broadcast in tall fescue after transplanting of this grass.

Code	Treatments	Code	Treatments
T_1	TFG 20 cm x30 cm + WC 1.0 kg/ha	T_7	TFG 40 cm x 40 cm + WC 1.0 kg/ha
T_2	TFG 20 cm x30 cm + WC 2.0 kg/ha	T_8	TFG 40 cm x 40 cm + WC 2.0 kg/ha
T_3	TFG 20 cm x30 cm + WC 3.0 kg/ha	T_9	TFG 40cm x 40 cm + WC 3.0 kg/ha
T_4	TFG 30 cm x30 cm + WC 1.0 kg/ha	T_{10}	Sole TFG 30 cm x 30 cm
T_5	TFG 30 cm x30 cm + WC 2.0 kg/ha	T_{11}	Sole WC 6.0 kg/ha
T_6	TFG 30 cm x30 cm + WC 3.0 kg/ha		
TFG- Tall fescue grass		WC- White clover	

Results

Significantly taller plants of tall fescue grass (TFG) and white clover (WC) were observed with the planting of tall fescue grass at 30 cm x30 cm with white clover @ 3 kg/ha (T6) and TFG 40 x 40 cm + WC 1.0 kg/ha (T7), respectively at Palampur. Whereas, TFG 20 cm x 30 cm + WC 3.0 kg/ha (T3) and TFG 30 cm x 30 cm + WC 3.0 kg/ha (T6) produced significantly taller plants of tall fescue grass and white clover, at Srinagar as well as on locational mean basis. Leaf stem ratio of tall fescue grass in TFG 30 cm x30 cm + WC 3.0 Kg/ha (T6) and white clover in TFG 40 cm x 40 cm + WC 2.0 Kg/ha (T8) was better at Palampur. The percent proportion white clover increased significantly with increasing seed rate, which reflected its effect on proportion of tall fescue grass in each treatment.

Tall fescue grass planted at 30 cm x 30 cm spacing with white clover (WC) @ 2 kg/ha (T5) and TFG 20 cm x 30cm + WC 1 kg/ha (T1) being at par with each other produced significantly highest green and dry fodder yields of 341.45 and 80.30 q/ha, respectively at Palampur. Whereas, TFG at 30cm x30cm + WC 3 kg/ha (T6) produced highest green (372.30 q/ha) and dry fodder (96.80 q/ha) yields at Srinagar. The mean data indicated that TFG 30 cm x 30cm + WC 2 kg/ha (T5) recorded highest fodder yields. Significant lowest herbage yields were obtained in sole white clover @ 6 kg/ha at both the locations and on the mean basis. In treatments comprised of TFG+ WC, the crude protein content increased with increasing seed rate of white clover. Mean crude protein yield was significantly higher in TFG 30 cm x 30 cm + WC 2.0 kg/ha (T5) and TFG 30x30 cm + WC 3.0 kg/ha (T6) at Palampur and Srinagar, respectively.

TFG 20 cm x 30 cm + WC 1.0 kg/ha (T1) realized maximum net returns of Rs. 90027, 62084 and 76056andbenefit-cost ratio of 5.70, 4.29 and 5.00 at Palampur, Srinagar and on the mean basis, respectively. A consistent reduction in benefit-cost ratio was observed with increasing seed rate of white clover at each planting system of TFG.

The data on soil properties indicated increase in soil organic carbon, available N, P and K in all the treatments over initial status at both the locations. Highest available nitrogen of 275 and 265 kg ha^{-1} was recorded in sole white clover followed by TFG 40 cm x 40 cm + WC 3.0 kg/ha (273 and 259 kg ha^{-1}) and TFG 30cmx30 cm + WC 3.0 Kg/ha (272 and 252 kg ha^{-1}) at Palampur and Srinagar, respectively, indicating increase in available soil nitrogen with increase in seed rate of white clover in each treatment.

Table PS-14-AST-4 (a): Effect on planting geometry of tall fescue grass and seed rate of white clovers on growth of species (mean over the cut)

Treatments	Plant height (cm) of tall fescue grass			Plant height (cm) of white clover			L:S ratio (Palampur)		Proportion of species (%) (Palampur)	
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	TFG	WC	TFG	WC
T_1	69.8	83.9	76.9	31.8	39.3	35.6	1.64	1.90	62.7	37.3
T_2	70.1	76.3	73.2	33.9	42.4	38.2	1.81	1.84	49.3	50.7
T_3	69.4	89.9	79.7	33.8	48.6	41.2	1.9	1.91	49.4	50.6
T_4	67.4	68.9	68.2	33.7	53.8	43.8	1.65	1.94	59.3	40.7
T_5	67.8	83.7	75.8	34.8	43.9	39.4	1.84	1.91	51.6	48.4
T_6	71.8	81.5	76.7	38.7	56.0	47.4	1.98	1.96	48.7	51.3
T_7	66.7	83.9	75.3	39.4	51.5	45.5	1.69	1.96	53.4	46.6
T_8	66.8	78.4	72.6	35.4	47.2	41.3	1.71	2.01	49.4	50.6
T_9	66.3	75.3	70.8	37.6	55.1	46.4	1.77	1.98	46.8	53.2
T_{10}	62.2	70.5	66.4	-	-	-	1.83	-	100	0
T_{11}	-	-	-	31.8	49.4	40.6	-	1.93	0	100
SE(m) ±	1.6	2.1	1.9	0.7	0.8	0.9	0.03	0.06	4.3	2.6
C.D. (P=0.05)	4.7	6.1	5.6	2.0	2.3	2.5	0.09	NS	12.8	7.3

TFG- Tall fescue grass; WC- White clover

Table PS-14-AST-4 (b): Effect on planting geometry of tall fescue grass and seed rate of white clovers on herbage yields and quality

Treatments	Green fodder yield (q/ha)			Dry fodder yield (q/ha)			Crude protein yield (q/ha)			Mean crude protein content (%)		
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean
T_1	341.2	330.5	335.9	80.30	82.20	81.25	11.16	8.71	9.94	13.9	10.6	12.3
T_2	336.5	343.8	340.1	76.18	79.60	77.89	11.35	9.15	10.25	14.9	11.5	13.2
T_3	331.2	353.3	342.3	69.16	86.60	77.88	11.34	11.08	11.21	16.4	12.8	14.6
T_4	338.5	340.8	339.7	73.66	80.60	77.13	12.01	9.27	10.64	16.3	11.5	13.9
T_5	341.5	360.4	350.9	77.33	90.70	84.02	13.07	11.34	12.21	16.9	12.5	14.7
T_6	316.8	372.3	344.5	68.89	96.80	82.85	11.64	12.87	12.26	16.9	13.3	15.1
T_7	336.8	331.0	333.9	76.26	79.00	77.63	12.89	9.24	11.07	16.9	11.7	14.3
T_8	328.2	335.6	331.9	68.53	82.40	75.47	11.51	11.37	11.44	16.8	13.8	15.3
T_9	312.3	343.0	327.7	59.74	81.10	70.42	10.39	10.38	10.39	17.4	12.8	15.1
T_{10}	295.7	306.2	300.9	66.44	72.80	69.62	6.58	8.15	7.37	9.9	11.2	10.6
T_{11}	294.5	286.3	290.4	53.45	61.10	57.28	10.10	10.63	10.37	18.9	17.4	18.2
SE(m) ±	4.96	5.06	3.89	2.61	1.07	1.62	0.36	0.23	0.26	0.32	0.18	0.21
C.D. (P=0.05)	14.82	14.52	11.65	7.67	3.12	4.62	1.07	0.68	0.67	0.93	0.54	0.61

Table PS-14-AST-4 (c): Effect on planting geometry of tall fescue grass and seed rate of white clovers on economics of production

Treatments	Gross return (Rs./ha)			Net returns (Rs./ha)			B:C Ratio		
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean
T_1	109197	80920	95059	90027	62084	76056	5.70	4.29	5.00
T_2	107664	80479	94072	87485	60632	74059	5.34	4.05	4.70
T_3	105994	80731	93363	85863	60931	73397	5.27	4.07	4.67
T_4	108307	79285	93796	88116	59431	73774	5.36	3.99	4.68
T_5	109264	81747	95506	88602	61405	75004	5.29	4.01	4.65
T_6	101370	79308	90339	80704	58970	69837	4.91	3.89	4.40
T_7	107770	76762	92266	88786	58097	73442	5.68	4.11	4.90
T_8	105037	79005	92021	84883	59186	72035	5.21	3.98	4.60
T_9	99949	78638	89294	79780	58803	69292	4.96	3.96	4.46
T_{10}	94614	63642	79128	77805	47166	62486	5.63	3.86	4.75
T_{11}	94224	66927	80576	77120	50153	63637	5.51	3.98	4.75

Table PS-14-AST-4 (d): Effect on planting geometry of tall fescue grass and seed rate of white clovers on soil properties

Treatments	N (kg/ha)		P (kg/ha)		K (kg/ha)		pH		Total soil organic carbon (tonnes carbon/ha)	
	Palampur	Srinagar	Palampur	Srinagar	Palampur	Srinagar	Palampur	Srinagar	Palampur	Srinagar
T_1	239	234	18	21	272	276	5.6	6.5	7.86	7.52
T_2	249	243	21	18	265	276	5.7	6.4	7.89	7.58
T_3	260	247	19	20	278	273	5.7	6.1	7.69	7.6
T_4	245	237	22	20	268	281	5.6	6.5	7.71	7.68
T_5	258	246	19	18	273	27	5.7	6.8	7.74	7.59
T_6	272	252	22	21	266	279	5.8	6.5	7.66	7.72
T_7	246	241	21	19	267	277	5.6	6.4	7.74	7.7
T_8	271	248	21	19	275	281	5.7	6.3	7.76	7.74
T_9	273	259	21	18	276	278	5.6	6.5	7.72	7.85
T_{10}	220	233	22	21	278	274	5.6	6.6	7.68	7.39
T_{11}	275	265	22	15	274	276	5.5	6.2	7.44	7.34
Initial value	212	232	17	15	242	263	5.7	6.2	7.34	7.23

K-15-AST-12 C:-Studies on the productivity and carbon sequestration of silvi-pastoral system in hills of north western Himalayas

[Table Reference: K-15-AST-12 C(a)-(b)]

Locations: Palampur and Srinagar

Preamble

Hill grasslands are under severe pressure of degradation due to continuous grazing, weed invasion in the absence of management and elimination of desirable species. The productivity of these grasslands can be enhanced with the plating of improved range species. Silvi-pastoral, a traditional land use system has potential to increase the productivity of grassland eco-systems and improve the livelihoods of farming community. There is a large potential of sequestering carbon in soil and vegetation by adopting suitable agro-forestry systems. Establishing and maintaining perennial vegetation to enhance 'C' sequestration is less costly compared to other techniques, and these practices have minimal environmental and health risks. Hence, an experiment was started during *Kharif*2015 at Palampur and Srinagar centre in coordinated mode with the objective to study the system productivity and organic matter input to soil through silvi-pastoral system.

Experimental details

Kharif 2015 was considered as year of establishment. Data for *Kharif* 2019 and rabi 2019-2020 have presented in table K-15-AST-12C-1a to K-15-AST-12C-1b.Two tree species {*Grewia*- (at Palampur) *Salix*- (at Srinagar) and Mulberry} in horizontal plots and five range species (Setaria grass var. PSS-1, tall fescue grass var. Hima-14, white clover var. PLP composite, tall fescue grass+ white clover, local species) in vertical plots were evaluated in strip plot design. The data wererecorded of complete crop year 2019-2020.

Results

Tree species, *viz*., *Grewia* and mulberry did not exhibit significant influence on forage (green and dry) and crude protein yields at Palampur. However, at Srinagar, higher green fodder, dry fodder and crude protein yields were obtained with mulberry plantation than *Salix*tree. On the mean basis, mulberry trees resulted in 5.13, 5.04 and 19.89 percent more green fodder, dry fodder and crude protein yields over *Grewia*/*Salix* trees, respectively. Among different range species, setaria grass recorded significantly highest green fodder (614.34 & 478.83 q/ha), dry fodder (141.94 and 102.85 q/ha) and crude protein yields (14.45 and 13.6 q/ha) in the degraded grasslands of Palampur and Srinagar, respectively. The mean green fodder yield at both the locations showed that setaria grass produced 94.90, 102.45, 200.77 and 232.15 percent more green fodder yield over tall fescue grass, tall fescue grass + white clover, white clover and local species, respectively. On the mean basis, the trend for dry fodder yield was similar to that of mean green fodder yield. The mean performance of data also indicated significantly higher crude protein yield under setaria grass.

Highest net returns (Rs. 68645 & 71530) and benefit-cost ratios (8.72 & 14.2) were noticed from mulberry trees in the grassland of Palampur and Srinagar, respectively. Whereas, the mean data revealed that mulberry trees plantation registered 3.65 and 18.63 percent higher net returns and benefit-cost ratio, respectively over *Grewia*/ *Salix* trees. Among range species, setaria grass realized highest net returns of Rs. 187389/ha& 119620/ha and benefit-cost ratios of 18.55 & 18.70 at Palampur and Srinagar, respectively. On mean basis the magnitude of increase in net returns by setaria grass was 127.30, 173.39, 279.90 & 475.59 percent over tall fescue grass + white clover, tall fescue grass, white clover and local species, respectively.

Planting of both tree species (*Grewia*/*Salix* and mulberry) resulted in almost similar value of total soil organic carbon content at both the locations and on the mean basis.Planting of tall fescue grass helped to accumulate highest total organic carbon content than the treatment consisted of local grasses at both locations. The mean data indicated that tall fescue grass resulted in 6.58, 8.81, 9.42 & 10.51 percent higher total soil organic carbon content over tall fescue grass + white clover, white clover, setaria grass and local species, respectively.

Table K-15-AST-12C (a): Effect of tree and range species on green, dry and crude protein yields (q/ha)

Treatments	Green fodder yield			Dry fodder yield			Crude protein yield		
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean
A. Tree species									
Grewia/*Salix**	232.42	330.60	281.51	53.44	71.63	62.54	6.22	7.76	6.99
Mulberry	235.02	356.87	295.95	53.91	77.46	65.69	6.01	10.75	8.38
S Em±	3.78	4.26	2.13	1.62	0.81	1.12	1.16	0.63	0.96
C D at 5%	NS	12.32	6.16	NS	2.35	3.23	NS	1.82	NS
B. Range species									
Setaria grass	614.34	478.83	546.59	141.94	102.85	122.40	14.45	13.6	14.03
Tall fescue grass	172.73	388.17	280.45	38.71	84.55	61.63	4.56	8.75	6.66
White clover	124.45	239.01	181.73	32.56	51.9	42.23	2.35	9.23	5.79
Tall fescue grass + white clover	195.97	344.00	269.99	42.06	74.93	58.50	6.74	9.88	8.31
Local scecies	61.12	268.12	164.56	13.11	58.47	35.79	2.48	4.85	3.67
SE(m) ±	6.88	9.37	7.24	3.12	1.71	2.13	2.02	2.10	2.89
C.D. (P=0.05)	20.56	27.95	21.60	9.02	5.12	6.18	5.86	6.25	8.36
C. Interaction: Tree x range spp.	NS	NS	NS	NS	NS	NS	NS	NS	NS

*Palampur- *Grewia*; Srinagar- *Salix*

Table K-15-AST-12C (b): Effect of tree and range species on economics and soil organic carbon

Treatments	Net Returns (Rs/ha)			B:C			Total soil organic carbon (tonnes carbon/ha)		
	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean
A. Tree species									
Grewia/ *Salix**	67815	67420	67618	8.52	10.8	9.66	6.44	8.4	7.42
Mulberry	68645	71530	70088	8.72	14.2	11.46	6.45	7.79	7.12
B. Range species									
Setaria grass	187389	119620	153505	18.55	18.7	18.63	6.27	7.94	7.11
Tall fescue grass	46872	65425	56149	5.04	10.4	7.72	7.20	8.36	7.78
White clover	37224	43590	40407	10.64	13.3	11.97	6.51	7.78	7.15
Tall fescue grass + white clover	54309	80760	67535	5.84	11.6	8.72	6.30	8.29	7.30
Local scecies	15357	37980	26669	3.01	8.5	5.76	5.95	8.13	7.04

*Palampur- *Grewia*/, Srinagar- *Salix*

R-18-AST-4: Nutrient management for productivity enhancement in dual purpose oats

[Table Reference: R-18-AST-4 (a)-(m)]

Locations: Kalyani, Jorhat, Imphal, Ayodhya, Jabalpur, Anand

Preamble

Oat is one of the most important cereal fodder crops of Rabi season in North, Central and West Zones of the country. It provides soft and palatable fodder. Oat fodder is rich in nutrients and energy. When harvested at 50 % flowering stage of plants, its green fodder contains 10.0 -11.5 % CP, 55-63 % NDF, 30-32 % ADF, 22.0 -23.5 % cellulose and 17-20 % hemicellulose. Oat is also used as straw, hay or silage. Its grain makes a good feed particularly for horses, sheep and poultry. Since, fodder are harvested for biomass before reaching to maturity, seed production is drastically affected creating seed deficit scenario. Therefore, to tackle the above deficit situation, a study was undertaken to harvest fodder and seed from oat by manipulating the nutrient management.

Experimental details

The trial was initiated to find out the effect of nutrient management on forage and grain yields, forage quality and economics of dual purpose oats in Rabi 2018-19. This is the 2nd year (Rabi 2019-2020) of experimentation. The treatments included $\mathbf{T_1}$ –Control (No nutrients), $\mathbf{T_2}$-N: P_2O_5: K_2O -80:40:40 kg/ha, $\mathbf{T_3}$-75% of $\mathbf{T_2}$ + Vermicompost @ 2t/ha, $\mathbf{T_4}$-T_3 + PSB $_{(Soil)}$ @ 1.5 kg/ha, $\mathbf{T_5}$-T4 + Seed treatment with *Azotobactor* @ 10 g/kg seed, $\mathbf{T_6}$-T_5 + $ZnSO_4$ @ 20 kg/ha (soil application as basal), $\mathbf{T_7}$-T_5 + $ZnSO_4$ @ 15 kg/ha (soil application as basal), at just before flowering, T_8 : T6 + Foliar spray of ZnSO4 @ 0.5% at just before flowering and $\mathbf{T_9}$-T_7 + Foliar spray of $ZnSO_4$ (0.5%) at just before flowering treatments were replicated thrice in Randomized Block Design. The 1st cut was taken after 55 DAS then crop left for seed production. 50% nitrogen was applied at basal + 25% after 40 DAS + 25 % after 1st cut. The crop was sown at 25 cm X 5 cm spacing using 80 kg seed per hectare.

Results

Among the nine treatments,$\mathbf{T_8}$- 75% of $\mathbf{T_2}$ + Vermicompost @ 2t/ha + PSB application to soil @ 1.5 kg + seed treatment with *Azotobactor* @ 10 g/kg seed + $ZnSO_4$ @ 20 kg/ha (soil application as basal) + foliar spray of $ZnSO_4$ (0.5%) just before flowering proved the best. It recorded maximum GFY, DMY, crude protein content and yield as well as highest test weight and seed yield. This was closely followed by T_4, T_5, T_7 and T_9. T_8-75% of RDN + Vermicompost @ 2t + PSB application to soil @ 1.5 kg + seed treatment with *Azotobactor* @ 10 g/kg seed+ $ZnSO_4$ @ 20 kg/ha (soil application as basal) + soliar spray of $ZnSO_4$ (0.5%) just before flowering also recorded Maximum net monetary return (Rs.45955/ha) and B:C (2.18).

Table R-18-AST-4 (a): Effect of Nutrient management on green fodder yield of dual purpose oat

Treatments	Green Fodder Yield (q/ha)						
	Anand	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T_1	321.4	15.6	60.1	163.7	49.4	109.5	119.96
T_2	500.0	50.3	81.6	198.5	98.7	127.3	176.07
T_3	400.0	64.8	89.1	210.9	101.2	126.1	165.36
T_4	500.0	73.5	95.8	217.0	105.6	126.1	186.35
T_5	535.7	77.7	99.1	219.9	109.5	141.6	197.26
T_6	464.3	84.3	105.1	227.9	115.1	155.9	192.11
T_7	478.6	78.9	100.8	223.5	116.3	148.8	191.15
T_8	592.9	92.4	125.8	228.9	131.3	179.7	225.17
T_9	521.4	81.2	101.4	224.7	119.6	160.7	201.50
SE(m) ±	26.23	3.41	1.73	1.14	1.23	10.12	
C.D. (P=0.05)	78.63	10.23	5.20	3.42	2.60	31.57	

Table R-18-AST-4 (b): Effect of Nutrient management on dry matter yield of dual purpose oat

Treatments	Dry Matter Yield (q/ha)						
	Anand	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T_1	52.8	2.94	9.01	32.89	8.72	24.46	21.80
T_2	62.9	9.61	12.2	39.32	9.91	28.45	27.07
T_3	55.0	12.70	13.4	41.63	11.92	28.19	27.14
T_4	57.7	15.28	14.4	42.75	11.18	28.18	28.25
T_5	65.2	16.16	15.0	43.28	11.12	31.64	30.40
T_6	64.3	17.66	15.8	44.76	11.39	34.83	31.46
T_7	62.2	16.47	15.1	43.95	15.25	33.24	31.04
T_8	70.4	19.68	19.0	44.95	16.71	40.15	35.15
T_9	68.7	16.98	15.2	44.17	10.81	35.89	31.96
SE(m) ±	4.02	0.68	0.32	0.18	0.53	2.26	
C.D. (P=0.05)	12.05	2.06	0.96	0.54	1.13	7.05	

Table R-18-AST-4 (c): Effect of Nutrient management on crude protein content of oat fodder

Treatments	Crude Protein (%)						
	Anand	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T_1	12.5	7.51	8.50	6.45	9.51	6.30	8.46
T_2	18.6	9.05	11.5	11.65	12.30	7.31	11.7
T_3	18.4	9.75	12.2	12.45	13.40	7.98	12.4
T_4	18.9	9.94	12.7	13.05	13.60	8.05	12.7
T_5	19.8	10.66	13.4	13.55	14.20	7.92	13.3
T_6	19.3	11.32	13.7	14.55	14.70	8.85	13.7
T_7	19.8	10.91	14.1	13.85	15.10	8.08	13.6
T_8	18.8	11.89	14.5	15.05	15.80	8.89	14.2
T_9	18.1	11.12	14.2	14.05	15.30	8.33	13.5
SE(m) ±	0.92	0.28	0.06	0.07	0.17	0.094	
C.D. (P=0.05)	2.76	0.86	0.18	0.21	0.35	0.29	

Table R-18-AST-4 (d): Effect of Nutrient management on crude protein yield of oat

Treatments	Crude Protein Yield (q/ha)						
	Anand	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T_1	6.6	0.22	0.77	2.77	0.83	1.54	2.12
T_2	11.7	0.87	1.40	4.58	1.22	2.07	3.64
T_3	10.1	1.24	1.63	5.18	1.59	2.25	3.67
T_4	10.8	1.52	1.82	5.57	1.52	2.27	3.92
T_5	12.9	1.72	2.01	5.86	1.58	2.50	4.43
T_6	12.4	1.99	2.16	6.57	1.68	3.08	4.65
T_7	12.3	1.79	2.13	6.08	2.30	2.69	4.55
T_8	13.2	2.34	2.76	6.76	2.64	3.57	5.21
T_9	12.3	1.88	2.15	6.20	1.65	2.99	4.53
SE(m) ±	0.54	0.04	0.08	0.06	0.08	0.16	
C.D. (P=0.05)	1.61	0.13	0.24	0.18	0.17	0.51	

Table R-18-AST-4 (e): Effect of Nutrient management on seed yield of oat

Treatments	Seed Yield (q/ha)						
	Anand	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T_1	9.26	6.33	8.80	14.11	8.19	3.34	8.34
T_2	11.21	13.1	15.2	18.93	11.82	12.66	13.8
T_3	11.79	14.1	16.6	20.03	12.03	14.73	14.9
T_4	12.52	14.9	17.5	20.33	12.23	16.13	15.6
T_5	13.65	15.4	18.3	21.03	12.11	16.84	16.2
T_6	13.91	16.6	18.8	22.93	12.73	17.81	17.1
T_7	14.69	15.9	19.1	21.83	13.82	16.78	17.0
T_8	16.62	17.1	19.5	24.03	17.31	18.39	18.8
T_9	15.48	16.2	19.2	23.13	16.48	17.54	18.0
SE(m) ±	0.46	0.51	0.36	0.32	0.36	0.30	
C.D. (P=0.05)	1.38	1.53	1.08	0.96	0.77	0.95	

Table R-18-AST-4 (f): Effect of Nutrient management on straw yield of oat

Treatments	Straw Yield (q/ha)						
	Anand	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T_1	37.2	29.07	30.5	35.73	34.28	13.74	25.93
T_2	66.8	52.73	58.3	59.03	58.93	33.18	46.47
T_3	59.6	58.95	60.4	64.03	58.91	38.58	49.35
T_4	71.0	61.12	62.3	65.03	59.11	42.26	51.15
T_5	75.5	62.77	64.7	66.53	54.19	44.13	51.53
T_6	68.1	64.98	65.1	70.23	60.09	46.66	53.86
T_7	71.0	62.99	65.8	67.63	60.92	43.95	53.07
T_8	82.9	69.15	66.4	71.93	61.31	48.18	56.35
T_9	77.0	63.35	66.1	70.53	65.21	45.95	55.28
SE(m) ±	8.17	1.92	1.34	1.12	0.71	0.80	
C.D. (P=0.05)	24.49	5.76	4.02	3.36	1.51	2.50	

Table R-18-AST-4 (g): Effect of Nutrient management on plant height of dual purpose oat at harvest

Treatments	Plant Height (cm) at harvest						
	Anand	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T_1	86.0	98.2	125.2	115.6	65.92	56.33	91.2
T_2	90.8	121.5	132.3	121.9	71.42	119.6	109.6
T_3	93.0	123.9	134.4	124.8	73.09	140.3	114.9
T_4	94.1	127.4	137.7	127.6	73.15	150.0	118.3
T_5	93.5	127.9	138.5	127.9	76.38	159.6	120.6
T_6	94.0	131.8	140.6	131.6	86.18	172.6	126.1
T_7	97.0	128.7	140.1	129.3	86.11	167.3	124.8
T_8	126.7	134.6	143.8	134.2	87.42	183.3	135.0
T_9	123.1	130.4	141.7	132.1	89.31	178.3	132.5
SE(m) ±	3.50	4.75	0.72	0.64	1.03	2.61	
C.D. (P=0.05)	10.50	14.25	2.16	1.92	2.18	8.16	

Table R-18-AST-4(h): Effect of Nutrient management on seed yield attributes of dual purpose oat

Treatments	Panicle length (cm)					Panicle weight (g)				
	Ayodhya	Jabalpur	Kalyani	Imphal	Mean	Ayodhya	Jabalpur	Kalyani	Imphal	Mean
T_1	28.1	27.66	27.2	26.19	27.3	4.5	5.06	4.3	5.03	4.72
T_2	32.3	32.26	32.6	26.91	31.0	6.8	7.16	6.7	5.31	6.49
T_3	33.9	33.46	32.8	27.03	31.8	7.5	8.06	7.7	5.62	7.22
T_4	34.5	33.66	33.2	27.18	32.1	8.0	8.56	7.9	5.93	7.60
T_5	34.8	34.06	33.7	27.33	32.5	8.6	9.06	8.4	6.08	8.04
T_6	36.3	34.96	34.5	29.71	33.9	9.2	9.46	8.8	6.11	8.39
T_7	34.9	34.36	33.8	30.18	33.3	8.9	9.26	8.6	6.21	8.24
T_8	37.5	36.26	36.2	33.22	35.8	9.6	10.26	9.7	6.79	9.09
T_9	35.7	34.66	34.7	31.81	34.2	9.0	9.96	9.3	6.28	8.64
SE(m) ±	0.80	0.11	0.12	0.67		0.26	0.05	0.07	0.08	
C.D.(P=0.05)	2.31	0.33	0.36	1.43		0.79	0.15	0.21	0.18	

Table R-18-AST-4 (i): Effect of nutrient management on seed yield attributes of dual purpose oat

Treatments	No. of grains /panicle					1000-seed weight (g)				
	Ayodhya	Jabalpur	Kalyani	Imphal	Mean	Ayodhya	Kalyani	Jabalpur	Imphal	Mean
T_1	42.3	36.06	37.5	35.00	37.72	42.9	45.8	46.06	37.78	43.14
T_2	44.7	42.66	42.7	41.67	42.93	44.2	46.4	46.96	38.11	43.92
T_3	46.9	44.56	44.6	47.00	45.77	46.1	46.8	47.46	38.33	44.67
T_4	48.1	48.56	48.5	50.67	48.96	46.8	47.6	48.16	38.78	45.34
T_5	48.7	49.06	49.8	53.33	50.22	47.2	48.7	48.96	39.11	45.99
T_6	51.8	52.56	53.4	53.67	52.86	48.1	49.6	50.16	39.23	46.77
T_7	49.3	51.06	52.6	54.67	51.91	47.6	48.8	49.56	39.63	46.40
T_8	55.7	56.36	57.8	59.67	57.38	48.6	49.7	50.46	40.91	47.42
T_9	50.9	53.46	54.7	56.33	53.85	47.7	49.6	49.66	39.82	46.70
SE(m) ±	1.43	0.42	0.54	1.19		1.80	1.95	1.72	0.60	
C.D.(P=0.05)	4.28	1.26	1.62	2.53		NS	NS	NS	1.27	

Table R-18-AST-4 (j): Effect of nutrient management on gross return of dual purpose oat

Treatments	Gross return (Rs./ha)					Mean
	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	
T_1	27854	28140	34200	60764	30456	36282
T_2	58645	45555	46250	81798	71412	60732
T_3	66023	49585	49000	83344	79757	65541
T_4	70390	52485	49750	85237	85554	68683
T_5	72930	54700	51500	85151	90821	71020
T_6	77793	56620	56250	89690	96943	75459
T_7	74397	56610	53500	95398	91617	74304
T_8	82135	61190	59000	115870	102909	84220
T_9	75673	56915	56750	109568	96542	79089

Table R-18-AST-4 (k): Effect of nutrient management on net return and B:Cof dual purpose oat

Treatments	Net return(Rs./ha)						B:C					
	Ayodhya	Kalyani	Jorhat	Jabalpur	Imphal	Mean	Ayodhya	Kalyani	Jabalpur	Imphal	Jorhat	Mean
T_1	10679	7640	18306	16044	22364	15006	1.62	1.37	2.31	1.58	1.51	1.69
T_2	37260	17355	49262	20165	36799	32168	2.74	1.62	2.20	1.82	2.22	2.12
T_3	40353	19185	51907	21950	20004	30679	2.57	1.63	2.24	1.32	1.86	1.92
T_4	44520	22285	57494	22475	21852	33725	2.72	1.73	2.25	1.34	2.05	2.02
T_5	46775	24200	62551	23940	21266	35746	2.78	1.80	2.30	1.33	2.21	2.08
T_6	50428	24020	65673	27400	25205	38545	2.84	1.74	2.38	1.39	2.10	2.09
T_7	47342	23910	61097	25240	30463	37610	2.75	1.73	2.32	1.47	2.00	2.05
T_8	54132	27690	67639	29680	50635	45955	2.93	1.83	2.44	1.78	1.92	2.18
T_9	47970	24015	62022	28030	44033	41214	2.73	1.73	2.41	1.67	1.80	2.07

Table R-18-AST-4 (l): Effect of Nutrient management on soil fertility parameters after harvest

Treatments	Ayodhya							Kalyani						
	pH	EC (dsm^{-1})	OC (%)	Available nutrient insoil (kg/ha)				pH	EC (dsm^{-1})	OC (%)	Available nutrient in soil (kg/ha)			
				N	P	K	Zinc (mg kg^{-1})				N	P	K	Zn (mg kg^{-1})
T_1	8.7	0.86	0.23	120.5	15.3	240	0.42	6.84	0.14	0.47	150.8	24.5	148.5	0.23
T_2	8.6	0.85	0.24	126.7	16.2	261	0.44	6.85	0.15	0.52	170.7	32.7	174.2	0.28
T_3	8.5	0.83	0.25	132.4	16.8	267	0.45	6.83	0.14	0.53	182.6	35.4	178.5	0.54
T_4	8.5	0.82	0.26	133.2	17.4	272	0.45	6.84	0.15	0.52	185.4	36.5	182.3	0.60
T_5	8.6	0.83	0.25	134.6	17.5	276	0.46	6.82	0.16	0.53	195.2	37.6	188.7	0.63
T_6	8.5	0.83	0.26	135.7	17.9	278	0.56	6.84	0.14	0.54	198.4	37.5	195.2	2.33
T_7	8.6	0.83	0.25	134.8	17.7	277	0.54	6.83	0.15	0.53	189.8	38.2	198.2	1.85
T_8	8.5	0.82	0.26	136.6	18.1	281	0.56	6.84	0.16	0.54	198.4	39.8	201.3	2.43
T_9	8.6	0.83	0.26	135.1	17.8	278	0.54	6.83	0.14	0.54	193.5	38.6	196.4	1.87
Initial	**8.7**	**0.86**	**0.23**	**121.7**	**15.4**	**240**	**0.43**	**6.85**	**0.15**	**0.51**	**211.5**	**43.7**	**225.7**	**0.32**

Table of R-18-AST-4(m): Effect of Nutrient management on soil fertility parameters after harvest

Treatments	Jabalpur						Imphal				
	pH	EC (dsm^{-1})	OC (%)	Available nutrient insoil (kg/ha)			pH	OC (%)	Available nutrient in soil (kg/ha)		
				N	P	K			N	P	K
T_1	7.72	0.47	0.46	230.6	18.2	328.1	5.24	0.91	240.6	10.6	146.9
T_2	7.76	0.48	0.50	260.3	16.2	351.3	5.26	1.14	258.2	11.3	165.8
T_3	7.75	0.46	0.51	262.1	18.8	365.6	5.20	1.50	260.7	11.8	169.6
T_4	7.72	0.48	0.51	265.3	18.6	367.8	5.24	1.14	267.5	12.1	170.4
T_5	7.63	0.47	0.52	270.6	19.4	368.4	5.21	1.15	286.8	12.3	173.8
T_6	7.7	0.48	0.53	275.8	18.6	374.6	5.24	1.17	298.7	12.6	186.3
T_7	7.66	0.48	0.52	268.4	19.5	368.2	5.24	1.14	268.4	12.8	190.7
T_8	7.7	0.47	0.54	278.3	18.2	352.3	5.24	1.18	298.3	13.4	196.3
T_9	7.64	0.46	0.55	272.1	16.4	376.8	5.20	1.18	283.6	12.9	188.3
Initial							**5.35**	**1.09**	**270.10**	**11.25**	**178.32**

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)-(i)]

Locations: Raipur, Ranchi, Ayodhya and Pantnagar

Preamble

Majority of recommended fodder oat varieties have been released based on their single cut performance, but now the farmers are preferring 2-3 cuts according to their need. Harvest from single cut crop is obtained in bulk, which poses storage issue among the farmer. Therefore, assessment of oat varieties for multi cut system is the need of farmers. Nitrogen plays an important role in increasing all the growth and growth attributing characters which finally leads to increased 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. So that, present study on oat cultivars with cutting and splitting of nitrogen doses was taken in the study**.**

Experimental details

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 splitting of nitrogen doses with the objectives to study the effect of splitting of nitrogen dose and cutting management on fodder yield and quality of oat varieties. To study the interaction effect on oat varieties 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 1^{st} cut, two cut + 50% basal+50% at 1^{st} cut, three cut + 50% basal+25% at 1^{st} cut+25% at 2nd cut and three cut + 40% basal+30% at 1^{st} 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.

Results

First year's results indicated that plant height of different oat varieties differed greatly at different cuts. The L: S ratio was influenced significantly by oat varieties at 1^{st} and 2^{nd} cut and 3^{rd} cut as well as average values. Maximum green fodder yield at Ranchi, Raipur and Ayodhya was obtained with oat cultivar RO-19 i.e. 432, 702 and 689 q/ha respectively. The corresponding dry matter yields per hectare were 89.70, 120.20 and 125.48 q/ha respectively. At Pantnagar green fodder yield was found maximum in JHO-851. Result of cutting and splitting of N- management shows that at Raipur and Ayodhya significantly maximum green fodder yield was recorded with treatment three cut + 40% Basal+30% at 1^{st} cut+30% at 2nd cut. In case of Ranch maximum green fodder yield was obtain with three cut + 50% Basal+25% at 1^{st} cut+25% at 2nd cut. Whereas, at Pantnagar higher green fodder yield was obtain with two cut + 50% basal+50% at 1^{st} cut. Result of three centers mean shows that maximum green fodder yield was produced by RO-19. In case of cutting three cuts gives higher GFY as compared two cuts. Per day productivity of green fodder (q/ ha/day) was maximum in RO-19 at Raipur and Ayodhya (8.88 and 8.76), and it was maximum with UPO-212 at Pantnagar (4.95). Significantly higher crude protein yield (10.21 q/ha) was recorded with oat cultivar RO-19. However, higher total crude protein yield (9.94 q/ha) was recorded with two cut + 50% basal+50% at 1^{st} cut.

Table: R-19-AST-1 (a): Effect of cutting and splitting of nitrogen doses on green fodder yield of fodder oat cultivars

Treatments	Total green fodder yield (q/ha)				
	Ranchi	Raipur	Ayodhya	Pantnagar	Mean
Varieties					
RO-19	432	702	689	596	605
JHO-851	370	602	591	606	542
UPO-212	410	598	591	599	550
SE(m) ±	2.01	6.22	10.92	50.27	-
C.D. (P=0.05)	8.09	25.09	42.88	NS	-
Cutting and splitting of N- management					
Two cut + 60% Basal+40% at 1st cut	397	607	594	635	558
Two cut + 50% Basal+50% at 1st cut	403	613	604	662	570
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	410	649	638	566	566
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	407	667	658	537	567
SE(m) ±	4.05	4.04	9.71	17.09	-
SE(m) ±	NS	12.11	28.83	51.17	-
Interaction(VXN)	NS	S	S	NS	-
SE(m) ±	6.4	8.60	16.81	-	-
C.D. (P=0.05)	NS	30.44	49.94	-	-

Table: R-19-AST-1 (b): Effect of cutting and splitting of nitrogen doses on dry matter yield of fodder oat cultivars

Treatments	DMY Total (q/ha)				
	Ranchi	Raipur	Ayodhya	Pantnagar	Mean
Varieties					
RO-19	89.70	120.20	125.48	84.15	104.88
JHO-851	76.96	103.10	109.48	90.64	95.05
UPO-212	84.60	99.10	105.42	87.48	94.15
SE(m) ±	0.28	1.27	2.57	6.93	--
C.D. (P=0.05)	1.15	5.15	10.1	N/A	--
Cutting and splitting of N- management					
Two cut + 60% Basal+40% at 1st cut	83.05	106.20	113.67	96.22	99.79
Two cut + 50% Basal+50% at 1st cut	83.63	111.70	116.85	98.45	102.66
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	84.76	104.80	109.86	80.76	95.04
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	83.57	107.30	113.46	74.27	94.65
SE(m) ±	0.81	1.85	2.24	2.31	--
C.D. (P=0.05)	NS	NS	NS	6.93	--
Interaction(VXN)					
SE(m) ±	1.25	3.05	--	7.74	--
C.D. (P=0.05)	NS	9.79	NS	29.62	--

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

Treatments	GFY Per day productivity (q/ ha/day)			
	Raipur	Ayodhya	Pantnagar	Mean
Varieties				
RO-19	8.88	8.76	4.73	6.39
JHO-851	7.04	6.82	4.52	5.41
UPO-212	7.62	7.42	4.95	4.34
SE(m) ±	0.042	0.14	0.38	-
C.D. (P=0.05)	0.169	0.54	N/A	-
Cutting and splitting of N- management				
Two cut + 60% Basal+40% at 1st cut	7.33	7.07	5.00	5.80
Two cut + 50% Basal+50% at 1st cut	7.35	7.14	5.22	5.92
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	8.25	8.11	4.47	5.87
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	8.46	8.34	4.24	5.91
SE(m) ±	0.032	0.12	0.13	-
C.D. (P=0.05)	0.096	0.37	0.40	-
Interaction(VXN)	S	S	NS	
SE(m) ±	0.064	0.21	0.43	-
C.D. (P=0.05)	0.22	0.62	-	-

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

Treatments	DFY Per day productivity (q/ ha/day)			
	Raipur	Ayodhya	Pantnagar	Mean
Varieties				
RO-19	1.38	1.44	0.70	1.04
JHO-851	1.13	1.17	0.67	0.89
UPO-212	1.18	1.22	0.69	0.92
SE(m) ±	0.010	0.030	0.052	--
C.D. (P=0.05)	0.040	0.120	N/A	--
Cutting and splitting of N- management				
Two cut + 60% Basal+40% at 1st cut	1.19	1.23	0.75	0.97
Two cut + 50% Basal+50% at 1st cut	1.24	1.25	0.77	1.00
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	1.24	1.20	0.64	0.88
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	1.26	1.33	0.59	0.92
SE(m) ±	0.016	0.028	0.019	-
C.D. (P=0.05)	0.047	0.080	0.056	-
Interaction(VXN)	S	NS	S	-
SE(m) ±	0.080	-	0.059	-
C.D. (P=0.05)	0.025	NS	0.226	-

Table: R-19-AST-1 (e): Total crude protein yield (q ha^{-1}) and crude protein content (%) as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatments	Total crude protein yield (q ha^{-1})				Crude protein content (%)			
	Ranchi	Raipur	Ayodhya	Mean	Ranchi	Raipur	Ayodhya	Mean
Varieties								
RO-19	5.88	11.9	12.84	10.21	5.88	7.4	10.2	7.83
JHO-851	4.55	10.5	11.33	8.79	4.55	7.9	10.5	7.65
UPO-212	4.85	9.1	10.55	8.17	4.85	7.5	10.1	7.48
SE(m) ±	0.04	.052	0.29	--	0.04	.047	-	--
C.D. (P=0.05)	0.16	.211	1.14	--	0.16	.189	NS	--
Cutting and splitting of N- management								
Two cut + 60% Basal+40% at 1st cut	4.21	11.5	12.15	9.29	4.21	11.5	11.4	9.04
Two cut + 50% Basal+50% at 1st cut	5.61	11.9	12.31	9.94	5.61	11.5	11.2	9.44
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	6.42	10.5	10.79	9.24	5.42	7.7	7.5	6.87
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	4.13	10.5	11.04	8.56	5.13	7.6	7.4	6.71
SE(m) ±	0.06	0.220	0.26		0.06	0.075	--	
C.D. (P=0.05)	0.17	0.658	0.78		0.17	0.224	--	
Interaction(VXN)	S	NS	NS		S	NS	NS	
SE(m) ±	.09	--	--		.09	.122	.122	--
C.D. (P=0.05)	.30	--	--		.30	NS	NS	--

Table: R-19-AST-1 (f): Plant height (cm) as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatments	Plant height (cm) 1st cut			Plant height (cm) 2st cut			Plant height (cm) 3st cut		
	Rai-pur	Pant-nagar	Ayo-dhya	Rai-pur	Pant-nagar	Ayo-dhya	Rai-pur	Pant-nagar	Ayo-dhya
Varieties									
RO-19	107.7	66.0	109.0	123.6	122.0	123.1	121.6	42.0	120.2
JHO-851	55.1	33.0	55.7	107.8	124.0	109.1	101.8	28.0	101.2
UPO-212	94.8	66.0	94.5	123.7	119.0	123.4	122.3	39.0	119.6
SE(m) ±	2.1	2.0	1.9	2.8	1.0	2.8	2.4	2.0	3.7
C.D. (P=0.05)	8.5	9.0	7.4	11.2	NS	11.1	9.7	7.0	14.4
Cutting and splitting of N- management									
Two cut + 60% Basal+40% at 1st cut	87.0	55.0	87.1	131.1	141.0	131.2	0.0	0.0	0.0
Two cut + 50% Basal+50% at 1st cut	85.4	55.0	85.7	133.4	143.0	133.6	0.0	0.0	0.0
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	86.1	54.0	87.2	101.4	101.0	102.6	113.9	72.0	112.4
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	85.0	55.0	85.6	107.6	103.0	106.6	116.6	73.0	114.9
SE(m) ±	0.8	1.0	1.7	2.3	2.0	2.5	1.9	1.0	2.3
C.D. (P=0.05)	NS	NS	NS	6.9	5.0	7.6	NS	4.0	NS
Interaction(VXN)	NS	NS	NS	S	NS	NS	NS	S	NS
SE(m) ±	2.41	--	--	4.43	--	--	3.32	--	--
C.D. (P=0.05)	NS	--	--	15.06	--	--	NS	--	--

Table: R-19-AST-1 (g): Leaf stem ratio as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatments	L:S ratio 1st cut			L:S ratio 2st cut			L:S ratio 3st cut		
	Rai-pur	Pant-nagar	Ayo-dhya	Rai-pur	Pant-nagar	Ayo-dhya	Rai-pur	Pant-nagar	Ayo dhya
Varieties									
RO-19	0.88	1.15	0.87	0.53	0.44	0.70	0.61	0.43	0.71
JHO-851	1.47	2.31	1.39	0.63	0.40	0.73	0.64	1.03	0.73
UPO-212	1.22	1.20	1.05	0.38	0.47	0.67	0.49	0.44	0.68
SE(m) ±	.017	0.07	0.02	.022	0.01	0.018	.014	0.4	0.022
C.D. (P=0.05)	.070	0.27	0.09	.087	NS	NS	.035	0.16	NS
Cutting and splitting of N- management									
Two cut + 60% Basal+40% at 1st cut	1.17	1.52	1.11	0.55	0.39	071	0.00	00	0
Two cut + 50% Basal+50% at 1st cut	1.21	1.48	1.10	0.57	0.41	0.72	0.00	00	0
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	1.18	1.57	1.11	0.43	0.47	0.68	0.57	1.24	0.70
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	1.21	1.64	1.09	0.51	0.46	0.69	0.58	1.27	0.71
SE(m) ±	.050	0.07	0.019	.029	0.01	0.017	.008	0.04	0.014
C.D. (P=0.05)	NS	NS	NS	.087	0.04	NS	NS	0.13	NS
Interaction(VXN)	NS	S	NS	NS	S	NS	NS	S	NS

Table: R-19-AST-1 (h): Gross and net monitory return as influenced by cutting management and splitting of nitrogen on oat cultivars

Treatments	Gross monitory return (Rs./ha)					Net monitory return (Rs./ha)				
	Ranchi	Raipur	Ayodhya	Pantnagar	Mean	Ranchi	Raipur	Ayodhya	Pantnagar	Mean
Varieties										
RO-19	64838	105232	103350	173642	111766	39153	75932	74240	139862	82297
JHO-851	55450	90328	88575	181775	104032	29765	61027	59465	147995	74563
UPO-212	61500	89687	88650	183707	105886	35815	60387	59540	149927	76417
SE(m) ±	301	743	1434	17368	--	301	743	998	13368	--
C.D. (P=0.05)	1214	2996	5627	NS	--	1214	2996	3920	NS	--
Cutting and splitting of N- management										
Two cut + 60% Basal+40% at 1st cut	59567	91004	89050	190536	107539	35817	63774	62000	158131	79931
Two cut + 50% Basal+50% at 1st cut	60383	91986	90650	198613	110408	36633	64755	63600	166208	82799
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	61450	97340	95650	180310	108688	33830	65969	64480	136665	75236
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	60983	100000	98750	175100	108708	33363	68629	67580	122718	73073
SE(m) ±	660	590	1259	4921	--	608	590	818	4912	--
C.D. (P=0.05)	NS	1766	5627	14734	--	1819	1766	2430	14734	--
Interaction(VXN)	NS	S	S	NS		NS	S	S	NS	

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

Treatments	B:C					Cost of Cultivation (Rs./ha)			
	Ranchi	Raipur	Ayodhya	Pantnagar	Mean	Raipur	Ayodhya	Pantnagar	Mean
Varieties									
RO-19	2.54	3.60	3.56	5.17	3.72	29300	29110	33780	30730
JHO-851	2.17	3.09	3.04	5.41	3.43	29300	29110	33780	30730
UPO-212	2.41	3.07	3.06	5.46	3.50	29300	29110	33780	30730
SE(m) ±	0.01	.027	0.047	0.40		--	--	--	--
C.D. (P=0.05)	0.05	.017	0.19	NS		--	--	--	--
Cutting and splitting of N- management									
Two cut + 60% Basal+40% at 1st cut	2.51	3.34	3.29	5.88	3.76	27230	27050	32405	28895
Two cut + 50% Basal+50% at 1st cut	2.54	3.38	3.35	6.13	3.85	27230	27050	32405	28895
Three cut + 50% Basal+25% at 1st cut+25% at 2nd cut	2.23	3.10	3.07	4.89	3.32	31370	31170	35155	32565
Three cut + 40% Basal+30% at 1st cut+30% at 2nd cut	2.21	3.19	3.17	4.49	3.27	31370	31170	35155	32565
SE(m) ±	0.02	.020	0.038	0.015		--	--	--	--
C.D. (P=0.05)	0.07	.061	0.11	0.44		--	--	--	--
Interaction(VXN)	NS	S	S	NS					

R-19 AST 3: Fodder productivity of Moringa (*Moringaoleifera*) as influenced by planting geometry, nitrogen nutrition and cutting regimes

Locations: Raipur, Ranchi, Hyderabad, Mandya, Dharwad and Pusa.

The experiment was initiated at six locations to identify ideal planting geometry, nutrient management and cutting frequency of Moringa. Experiment comprised of three planting geometry, two nitrogen levels and three cutting regimes was laid in randomized block design. This was considered as year of establishment and data will be reported from the next year.

R-19 AST 4: Screening of herbicides for control of *Cuscuta* in lucerne crop

[Table Reference: R-19 AST 4 (a)-(b)]

Locations: Bikaner, Jhansi and Mandya

Preamble

Lucerne is very important *Rabi*forage crop in many parts of the country. This crop is infested with various type of weed and causes a significant reduction in herbage yield. *Cuscuta*is one of the most important parasitic weeds of this crop. Therefore, present study was undertaken to screen the effective management of *Cuscuta* in lucerne crop.

Experimental details

The experiment was initiated in *Rabi* season of 2019-20 at Bikaner, Jhansi and Mandya to screen the herbicides for control of *Cuscuta* in lucerne crop.At Jhansi and Mandya*Cuscuta* infestation was not observed even after inoculation. Hence, data of these two centershas not been reported. The treatments,T_1: Pendimethalin 0.75 kg ha^{-1} (Pre-emergence), T_2: Diclosulam 20 g ha^{-1} (Pre-emergence), T_3: Diclosulam 30 g ha^{-1} (Pre-emergence), T_4: Diclosulam 30 g ha^{-1} (Post emergence after each cut), T_5:Fenoxaprop 50g ha^{-1} (Post emergence at 40-45 DAS), T_6: Imazethapyr 50 g ha^{-1} (Post emergence at 25 DAS), T_7: Imazethapyr 100 g ha^{-1} (Post emergence after each cut), T_8: Imazethapyr + pendimethalin (Ready mixer) 0.70 kg ha^{-1} (Pre-emergence),T_9: Imazethapyr + pendimethalin (Ready mixer) 0.90 kg ha^{-1} (Pre-emergence), T_{10}: Imazethapyr + Imazamox75 g ha^{-1} (Post emergence at 40-45 DAS), T_{11}: Paraquat 100 g ha^{-1} (Post emergence After each cut), T_{12}: Weed free and T_{13}: Weedy check were replicated thrice in randomized block design. Sowing was done using recommended seed rates. on November 14, 2019 and harvested on June 10-15, 2020. Fertilizers @ 20 kg N, 40 kg P_2O_5 and 20 kg K_2O as basal were drilled at sowing. Further 10 kg N splits at 30DAS and after each cut as broadcasted.

Results

Cuscuta was better controlled by hand weeding (weed free) followed by Paraquat 100g ha^{-1}, Imazethapyr + pendimethalin (both), Pendimethalin 0.75 kg ha^{-1} and Imazethapyr (both). Diclosulam was phytodoxic for crops as pre emergence and ineffective for control of *Cuscuta* as post emergence. Fenoxaprop 50g ha^{-1} was ineffective and Imazethapyr + Imazamox75 g ha^{-1} (Post emergence at 40-45 DAS) was less effective for *Cuscuta* control in lucerne. In case of other weeds weed free was best as compare to herbicides butPendimethalin 0.75 kg ha^{-1} (Pre-emergence),Imazethapyr + pendimethalin and Paraquat 100 g ha^{-1}were also found effective excluded some broadleaf weeds. Economically, Paraquat 100 g ha^{-1} was better as compared to hand weeding and some other herbicides.

Table: R-19-AST-4 (a): Effect of herbicides on fresh and dry weight of *Cuscuta* in lucerne crop

Treatments	Fresh weight of *Cuscuta* (g/m^2)				Dry weight of *Cuscuta* (g/m^2)			
	40 DAS	80 DAS	120 DAS	Harvest	40 DAS	80 DAS	120 DAS	Harvest
Pendimethalin 0.75 kg ha^{-1} (Pre-emergence)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)
Diclosulam 20 g ha^{-1} (Pre-emergence)	0.71(0.00)	0.71(0.00)	2.02(4.53)	2.68(8.70)	0.71(0.00)	0.71(0.00)	1.27(1.30)	1.63(2.58)
Diclosulam 30 g ha^{-1} (Pre-emergence)	0.71(0.00)	0.71(0.00)	1.58(3.50)	2.13(5.90)	0.71(0.00)	0.71(0.00)	1.10(1.03)	1.35(1.73)
Diclosulam 30 g ha^{-1} (Post emergence After each cut)	1.97(3.40)	3.33(10.64)	9.66(92.97)	17.25(297.00)	1.12(0.76)	1.64(2.20)	5.16(26.13)	9.39(87.79)
Fenoxaprop 50g ha^{-1} (Post emergence at 40-45 DAS)	1.80(2.76)	5.79(33.33)	13.99(195.67)	16.75(280.67)	1.05(0.61)	2.72(6.97)	7.20(51.43)	9.12(83.03)
Imazethapyr 50 g ha^{-1} (Post emergence at 25 DAS)	0.71(0.00)	1.00(0.67)	3.05(8.83)	4.46(19.47)	0.71(0.00)	0.79(0.13)	1.73(2.50)	2.53(5.92)
Imazethapyr 100 g ha^{-1} (Post emergence After each cut)	1.89(3.07)	0.71(0.00)	2.92(8.37)	4.20(17.40)	1.09(0.68)	0.71(0.00)	1.66(2.34)	2.37(5.20)
Imazethapyr + pendimethalin (Ready mixer) 0.70 kg ha^{-1} (Pre-emergence)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)
Imazethapyr + pendimethalin (Ready mixer) 0.90 kg ha^{-1} (Pre-emergence)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)
Imazethapyr + Imazamox75 g ha^{-1} (Post emergence at 40-45 DAS)	1.99(3.47)	0.71(0.00)	2.52(5.90)	4.14(16.83)	1.13(0.77)	0.71(0.00)	1.43(1.55)	2.36(5.10)
Paraquat 100 g ha^{-1} (Post emergence After each cut)	1.89(3.10)	0.71(0.00)	0.71(0.00)	0.71(0.00)	1.09(0.69)	0.71(0.00)	0.71(0.00)	0.71(0.00)
Weed free	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)
Weedy check	1.89(3.07)	6.93(47.69)	18.17(330.67)	20.13(405.67)	1.08(0.68)	3.22(9.92)	9.32(86.87)	10.88(118.28)
SE(m) ±	0.05	0.15	0.42	0.47	0.02	0.06	1.83	0.25
C.D. (P=0.05)	0.15	0.44	1.22	1.38	0.06	0.18	5.35	0.74

Original values are in parentheses, data subjected to $\sqrt{x}=0.5$ transformation

Table: R-19-AST-4 (b): Effect of herbicides on fresh and dry weight of weeds in lucerne crop

Treatments	Fresh weight of Weeds (g/m^2)				Dry weight of Weeds(g/m^2)			
	40 DAS	80 DAS	120 DAS	Harvest	40 DAS	80 DAS	120 DAS	Harvest
Pendimethalin 0.75 kg ha^{-1} (Pre-emergence)	3.54(12.67)	4.33(19.53)	3.62(13.20)	4.55(21.20)	1.70(2.45)	2.05(3.96)	1.86(3.06)	2.54(6.29)
Diclosulam 20 g ha^{-1} (Pre-emergence)	1.65(2.80)	2.93(8.53)	2.41(5.33)	3.13(9.33)	1.00(0.56)	1.40(1.52)	1.31(1.22)	1.82(2.83)
Diclosulam 30 g ha^{-1} (Pre-emergence)	1.01(0.69)	2.60(6.61)	2.31(5.13)	2.87(8.12)	0.78(0.12)	1.31(1.27)	1.29(1.21)	1.69(2.44)
Diclosulam 30 g ha^{-1} (Post emergence After each cut)	6.36(41.13)	6.91(48.00)	6.48(42.00)	7.73(59.33)	2.85(7.80)	3.13(9.46)	3.14(9.55)	4.33(18.22)
Fenoxaprop 50g ha^{-1} (Post emergence at 40-45 DAS)	8.32(68.99)	9.14(83.36)	8.42(70.53)	9.61(92.13)	3.85(14.43)	4.10(16.35)	4.09(16.30)	5.32(27.83)
Imazethapyr 50 g ha^{-1} (Post emergence at 25 DAS)	5.12(26.03)	5.84(35.73)	5.41(29.73)	6.54(43.33)	2.36(5.15)	2.65(7.00)	2.71(7.04)	3.70(13.52)
Imazethapyr 100 g ha^{-1} (Post emergence After each cut)	7.61(57.92)	5.93(35.01)	4.86(23.47)	6.09(37.47)	3.56(12.26)	2.72(6.98)	2.46(5.63)	3.36(10.98)
Imazethapyr + pendimethalin (Ready mixer) 0.70 kg ha^{-1} (Pre-emergence)	3.56(12.36)	3.65(13.27)	3.24(10.33)	4.04(16.20)	1.738(2.52)	1.68(2.41)	1.73(2.55)	2.35(5.22)
Imazethapyr + pendimethalin (Ready mixer) 0.90 kg ha^{-1} (Pre-emergence)	3.53(11.96)	3.89(15.47)	3.11(9.80)	4.41(19.87)	1.73(2.48)	1.81(2.92)	1.65(2.32)	2.51(6.05)
Imazethapyr + Imazamox75 g ha^{-1} (Post emergence at 40-45 DAS)	5.87(34.01)	5.94(35.07)	4.95(24.27)	5.98(35.47)	2.75(7.09)	2.70(6.85)	2.50(5.79)	3.35(10.75)
Paraquat 100 g ha^{-1} (Post emergence After each cut)	7.84(61.17)	6.31(39.40)	4.85(23.33)	5.87(34.29)	3.68(13.11)	2.82(7.45)	2.50(5.77)	3.26(10.23)
Weed free	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)	0.71(0.00)
Weedy check	7.93(62.69)	8.09(65.36)	8.07(65.20)	9.63(93.47)	3.64(12.85)	3.52(12.00)	3.97(15.36)	5.37(28.73)
SE(m) ±	0.39	0.50	0.43	0.51	0.17	0.22	1.69	0.27
C.D. (P=0.05)	1.15	1.46	1.26	1.48	0.50	0.65	4.94	0.78

Original values are in parentheses, data subjected to √x=0.5 transformation

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-2 (a)-(g)]

Locations: 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 chemicals, pesticides, fertilizers, which resulted in deterioration of soil health, pollution of ground water sources and excess 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 can be retained and rejuvenated. Apart from these organically grown products fetches more value than inorganic grown produce. Therefore, organic agriculture is gaining importance in present food & fodder production programmes. 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.

Experimental details

A field experiment was undertaken to study the effect of organic source of nutrients on forage yield, quality and 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 vermicompost, T_4-75% RDN 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% 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 vermicompost + 25% RDN through poultry. The trial was laid out in randomized block design with three replications.

Results

The data revealed that, on location mean basis, application of 100% RDN through inorganic fertilizer (T_1) recorded higher green fodder, dry matter and crude protein yields in fodder cowpea (222.6 q, 42.5 q and 8.3 q/ha, respectively) and fodder maize (339.4 q, 75.6 q and 7.2 q/ha, respectively). The same treatment recorded higher system productivity of green fodder, dry matter and crude protein yields (562.2 q, 118.3 q and 15.5 q/ha, respectively) but it was at par with T_5 and T_6. However, 100% RDN through inorganic fertilizer (T_1) recorded highest gross returns (Rs105203/ha), Net returns (Rs.40676 /ha) and B:Cof 1.6 on location mean basis. AtMandya centre, among organic nutrient sources, application of 50% RDN through FYM + 50% RDN through bio-compost (T_6) recorded higher total green forage (583.6 q/ha), dry matter (131.5 q/ha) and crude protein yields (15.7 q/ha). The same treatment recorded higher net monitory returns (Rs43221 /ha) and B: C (1.7). At Coimbatore centre among organic nutrient sources, application of 50% RDN through FYM + 50% RDN through vermicompost (T_5) recorded higher total green forage (565.3 q/ha), dry matter (105.3 q/ha) and crude protein yields (17.4 q/ha). Same treatment recorded higher net monitory returns (108375 Rs/ha) and B: C (1.2).At Vellayani centre among organic nutrient sources, application of 75% RDN through FYM + 25% RDN through bio-compost (T_4) recorded higher total green forage (577.0 q/ha), dry matter (127.0 q/ha) and crude protein yields (17.7 q/ha). The same treatment recorded higher net monitory returns (Rs59613 /ha) and B: C (1.9). At Hyderabad centre among organic nutrient sources, application of 50% RDN through FYM + 50% RDN through vermicompost (T_5) recorded higher green forage yield (465.5 q/ha), dry matter (87.6 q/ha) and crude protein yield (6.8 q/ha). The higher net monitory returns (Rs24124 /ha) and B: C (1.5) 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					Total yield				
	Mandya	Coimbatore	Vellayani	Hyderabad	Mean	Mandya	Coimbatore	Vellayani	Hyderabad	Mean	Mandya	Coimbatore	Vellayani	Hyderabad	Mean
T_1	250.7	282.0	199.3	158.3	222.6	409.0	359.0	238.0	351.7	339.4	659.7	641.0	438.0	510.0	562.2
T_2	173.3	200.0	199.2	96.2	167.2	351.2	315.0	283.0	255.3	301.1	524.5	515.0	482.7	351.5	468.4
T_3	184.1	245.0	230.0	120.1	194.8	303.8	321.0	311.0	321.3	314.3	487.9	566.0	541.0	441.5	509.1
T_4	177.4	205.0	260.0	118.2	190.2	325.4	293.0	317.0	313.5	312.2	502.8	498.0	577.3	431.7	502.5
T_5	217.3	263.0	237.3	127.1	211.2	348.0	328.0	293.0	338.3	326.8	565.3	591.0	530.3	465.5	538.0
T_6	231.6	220.0	231.7	124.2	201.9	352.0	305.0	294.0	330.5	320.4	583.6	525.0	527.3	454.7	522.7
T_7	152.4	185.0	202.3	92.1	158.0	238.4	267.0	303.0	242.5	262.7	390.8	452.0	505.3	334.6	420.7
T_8	160.7	198.0	163.3	109.0	157.8	253.3	283.0	311.0	285.3	283.2	414.0	481.0	474.3	394.3	440.9
T_9	166.6	178.0	260.0	107.4	178.0	264.9	281.0	247.0	277.5	267.6	431.5	459.0	507.3	385.0	445.7
T_{10}	160.1	215.0	241.3	114.2	182.7	284.8	299.0	278.0	303.6	291.3	444.9	514.0	519.0	417.8	473.9
T_{11}	170.1	195.0	185.7	112.3	165.8	276.1	304.0	228.0	295.4	275.9	446.2	499.0	413.3	407.7	441.6
T_{12}	218.4	225.0	196.7	103.4	185.9	350.4	308.0	297.0	267.6	305.7	568.8	533.0	488.3	371.0	490.3
SE(m) ±	10.4	7.4	6.5	9.0	8.6	16.5	10.3	8.0	3.4	11.0	16.7	18.0	15.2	13.8	16.7
C.D.(P=0.05)	30.7	21.2	19.5	26.7	22.6	48.7	30.2	22.6	9.9	26.2	49.2	52.9	45.3	36.6	40.4

K-19-AST-2(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					Total yield				
	Mandya	Coimbatore	Vellayani	Hyderabad	Mean	Mandya	Coimbatore	Vellayani	Hyderabad	Mean	Mandya	Coimbatore	Vellayani	Hyderabad	Mean
T_1	54.2	47.4	31.9	36.7	42.5	107.7	66.7	65.0	62.9	75.6	161.9	114.1	97.6	99.6	118.3
T_2	32.3	33.7	31.9	14.4	28.0	77.4	58.7	71.1	32.9	60.0	109.6	92.4	103.6	47.3	88.2
T_3	36.7	41.2	39.5	25.5	35.7	69.8	59.8	78.0	53.9	65.4	106.5	101.0	116.2	79.4	100.8
T_4	33.8	34.5	47.7	24.4	35.1	76.4	54.5	79.5	52.3	65.7	110.2	89.0	127.2	76.8	100.8
T_5	42.1	44.3	41.4	28.8	39.1	84.6	61.0	73.5	58.8	69.5	126.7	105.3	114.8	87.6	108.6
T_6	43.9	37.0	39.9	27.3	37.0	87.6	56.7	73.7	55.9	68.5	131.5	93.7	113.6	83.2	105.5
T_7	28.6	31.1	32.6	12.3	26.2	53.3	49.7	92.6	29.7	56.3	81.9	80.8	125.2	42.1	82.5
T_8	27.1	33.4	22.9	20.6	26.0	51.5	52.6	77.8	40.6	55.6	78.7	86.0	100.6	61.2	81.6
T_9	27.9	30.0	47.2	20.3	31.3	54.4	52.3	62.2	39.2	52.0	82.3	82.3	109.4	59.5	83.4
T_{10}	26.6	36.2	42.3	23.0	32.0	70.6	55.7	69.6	46.9	60.7	97.3	91.9	111.9	69.8	92.7
T_{11}	30.2	32.8	28.4	22.3	28.4	61.2	56.5	57.1	42.3	54.3	91.5	89.3	85.6	64.5	82.7
T_{12}	45.0	37.9	31.2	18.5	33.2	84.7	57.2	74.6	37.4	63.5	129.7	95.1	105.7	55.8	96.6
SE(m) ±	2.7	1.1	1.3	1.7	2.0	4.0	1.8	2.2	0.7	2.6	3.7	3.4	4.7	2.0	4.7
C.D.(P=0.05)	8.1	3.7	3.6	5.1	5.1	11.7	5.7	6.3	2.1	6.4	10.9	9.8	13.5	7.3	10.8

K-19-AST-2(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					Total yield				
	Mandya	Coimbatore	Vellayani	Hyderabad	Mean	Mandya	Coimbatore	Vellayani	Hyderabad	Mean	Man-dya	Coimbatore	Vellayani	Hyderabad	Mean
T_1	10.3	10.4	7.0	5.6	8.3	11.6	8.5	5.9	2.8	7.2	21.9	18.9	12.9	8.5	15.5
T_2	5.4	7.4	7.0	1.4	5.3	7.0	7.5	6.4	1.0	5.5	12.4	14.9	13.4	2.4	10.8
T_3	6.3	9.0	8.7	3.4	6.9	6.2	7.6	7.0	2.2	5.8	12.5	16.6	15.8	5.6	12.6
T_4	6.1	7.5	10.5	3.2	6.8	6.6	6.9	7.2	2.1	5.7	12.6	14.4	17.7	5.3	12.5
T_5	6.9	9.7	9.1	4.2	7.5	7.7	7.7	6.6	2.6	6.2	14.6	17.4	15.8	6.8	13.6
T_6	8.1	8.1	8.8	3.8	7.2	7.6	7.2	6.5	2.4	5.9	15.7	15.3	15.4	6.2	13.1
T_7	5.0	6.8	7.2	1.2	5.0	4.7	6.3	8.3	0.9	5.1	9.7	13.1	15.5	2.0	10.1
T_8	4.7	7.3	5.0	2.4	4.9	4.7	6.7	7.0	1.4	4.9	9.4	14.0	11.6	3.9	9.7
T_9	4.9	6.6	10.5	2.0	6.0	5.1	6.6	5.4	1.3	4.6	10.0	13.2	15.8	3.4	10.6
T_{10}	4.7	7.9	9.3	2.8	6.2	6.8	7.1	6.2	1.8	5.5	11.5	15.0	15.6	4.6	11.7
T_{11}	5.3	7.2	6.3	2.6	5.3	5.9	7.2	5.2	1.5	5.0	11.2	14.4	11.5	4.2	10.3
T_{12}	8.2	8.3	6.9	1.8	6.3	8.8	7.3	6.7	1.2	6.0	17.0	15.6	13.6	3.0	12.3
SE(m) ±	0.4	0.2	0.2	0.2	0.3	0.4	0.2	0.4	0.1	0.4	0.5	0.4	0.4	0.1	2.0
C.D.(P=0.05)	1.2	0.7	0.8	0.6	0.9	1.3	0.6	1.2	0.3	0.9	1.4	1.3	1.3	0.3	4.3

K-19-AST-2(d): Economics as influenced by organic source of nutrients in fodder cowpea-maize system

Treatments	Economics														
	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	Hydera-bad	Mean	Man-dya	Coimb-atore	Vella-yani	Hydera-bad	Mean
T_1	117756	117300	97425	88329	105203	59698	42405	40270	20329	40676	2.0	1.6	1.7	1.3	1.6
T_2	91667	92250	106400	60014	87583	24512	12104	35075	783	18118	1.4	1.2	1.5	1.0	1.3
T_3	87000	103275	119700	75281	96314	18725	19248	40090	11919	22495	1.3	1.2	1.5	1.2	1.3
T_4	88730	90075	128400	73676	95220	24327	8823	59613	16638	27350	1.4	1.1	1.9	1.3	1.4
T_5	101087	108375	117933	79368	101691	31672	20566	34028	10435	24175	1.5	1.2	1.4	1.2	1.3
T_6	104914	95250	116800	77532	98624	43221	12989	50550	24124	32721	1.7	1.2	1.8	1.4	1.5
T_7	70046	81675	111183	57099	80001	7231	4218	44408	378	14059	1.1	1.1	1.7	1.0	1.2
T_8	74150	87000	103033	67422	82901	10463	6756	32814	7624	14414	1.2	1.1	1.5	1.1	1.2
T_9	77219	82200	114400	65790	84902	16444	3985	50789	11806	20756	1.3	1.1	1.8	1.2	1.3
T_{10}	78747	93225	115925	71193	89772	14192	10146	40965	8279	18395	1.2	1.1	1.6	1.1	1.3
T_{11}	79686	89475	92015	69612	82697	20955	10453	30297	18323	20007	1.4	1.1	1.5	1.3	1.3
T_{12}	101700	96825	108565	63408	92624	36089	12529	33176	1685	20870	1.6	1.1	1.4	1.0	1.3

K-19-AST-2 (e): Soil properties as influenced by organic source of nutrients in fodder cowpea – maize cropping system

Treatments	Hyderabad						Mandya				
	pH	EC (ds/m)	OC (%)	Soil Available Nutrients (kg/ha)			OC (%)	EC (ds m^{-1})	Soil Available Nutrients (kg/ha)		
				N	P_2O	K_2O			N	P_2O	K_2O
T_1	8.50	0.48	0.43	278	40	296	0.67	0.27	358.26	50.26	217.29
T_2	8.56	0.39	0.33	210	10	222	0.73	0.23	317.95	43.02	184.99
T_3	8.50	0.26	0.4	257	27	270	0.73	0.19	313.51	42.05	193.84
T_4	8.60	0.25	0.4	251	21	267	0.73	0.23	281.49	46.33	182.46
T_5	8.45	0.30	0.42	270	38	279	0.73	0.18	293.53	53.56	189.81
T_6	8.20	0.33	0.42	264	30	273	0.67	0.21	249.14	48.24	155.77
T_7	8.60	0.32	0.3	202	10	222	0.68	0.25	232.04	36.73	133.76
T_8	8.43	0.34	0.37	231	17	240	0.70	0.23	216.73	36.16	127.44
T_9	8.44	0.50	0.36	225	15	234	0.67	0.25	205.11	28.73	115.50
T_{10}	8.33	0.41	0.39	243	20	264	0.70	0.25	205.16	29.93	113.36
T_{11}	8.37	0.42	0.38	238	20	249	0.65	0.24	196.13	28.54	115.07
T_{12}	8.38	0.51	0.35	217	13	228	0.70	0.23	230.24	31.34	137.60
SE(m) ±	0.056	0.016	0.008	3.676	0.765	2.384	0.02	0.01	8.91	1.56	5.98
C.D. (p=0.05)	NS	NS	NS	7.672	NS	NS	NS	0.03	26.14	4.57	17.54
Initial	8.53	0.21	0.38	220	15	230	0.65	0.26	318.5	54.1	238.5

K-19-AST-2 (f): Soil properties as influenced by organic source of nutrients in fodder cowpea – maize cropping system

Treatments	Coimbatore						Vellayani			
	pH	EC (ds/m)	OC (%)	Soil Available Nutrients (kg/ha)			OC (%)	Soil Available Nutrients (kg/ha)		
				N	P_2O	K_2O		N	P_2O	K_2O
T_1	7.8	0.42	0.36	236.1	11.1	496.5	0.84	320.0	110.2	250.4
T_2	7.6	0.38	0.39	258.3	12.1	520.1	0.90	370.2	120.56	284.6
T_3	7.6	0.40	0.38	251.3	11.5	502.1	0.89	362.3	105.78	278.5
T_4	7.5	0.40	0.37	257.2	12.2	507.6	0.90	374.0	122.53	285.6
T_5	7.5	0.39	0.38	249.0	12.0	511.2	0.88	360.5	105.6	275.7
T_6	7.7	0.37	0.39	260.4	12.5	522.3	0.88	355.0	107.13	277.8
T_7	7.8	0.39	0.36	255.3	12.1	509.3	0.89	362.6	106.65	280.6
T_8	7.6	0.41	0.35	252.9	11.8	505.9	0.81	348.6	100.6	260.5
T_9	7.7	0.41	0.36	256.4	11.6	507.9	0.81	360.5	102.54	258.5
T_{10}	7.8	0.40	0.36	250.7	11.3	511.2	0.84	352.3	108.72	262.6
T_{11}	7.7	0.39	0.37	256.4	11.6	508.4	0.81	345.6	102.76	260.6
T_{12}	7.5	0.39	0.39	250.5	12.0	512.7	0.80	345.2	102.66	260.5
SE(m) ±	0.26	0.016	0.013	12.7	0.58	25.7	0.026	11.9	2.3	6.7
C.D.(p=0.05)	NS	NS	NS	NS	NS	NS	NS	36.9	9.7	24.7
Initial	7.6	0.41	0.37	268.8	11.5	507	0.85	350.7	93.6	265.4

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)-(g)]

Locations: Jorhat, Imphal, Kalyani, Pusa and Ranchi

Preamble

Organic sources of nutrients play a major role in determining productivity of crops and cropping systems. For organic forage production in cropping system mode, there is need to evaluate different sources of organic nutrients along with its combination. As in any cropping system, legume-non legume combination is an important criterion for selection of component crops. This experiment is proposed with rice been-oat dropping system and intended to see the effect of different organic sources on productivity of the cropping system as a whole.

Experimental details

A field experiment was started in *Kharif* 2019 at five 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 are 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 days after sowing (DAS).The treatments were replicated thrice in randomized block design (RBD). The rice bean was sown during *Kharif*, 2019 in 25 cm apart lines using 30 kg seed /ha. Succeeding crop of oat was sown during Rabi 2019-2020.

Results

The results indicated that all the treatments improved the green forage yield (GFY) and dry matter yield (DMY) significantly over control. The highest GFY was recorded in T_5 - 50% RDN through FYM + 50% RDN through vermicompost followed by T_6- 50% RDN through FYM + 50% RDN through bio-compost at all the centres except Ranchi where application of RDF recorded the highest GFY followed by T_5. In respect of dry matter yield the highest DMY were recorded in T_5 at Jorhat, Kalyani and Pusa. However, at Imphal the highest DMY was recorded in T_6 followed by T_5 and at Ranchi T_1 recorded the highest DMY followed by T_5. In respect of crude protein yield (CPY), the highest total CPY was recorded in T_5 followed by T_6 at Jorhat and Pusa, however, atImphal and Kalyani the highest total CPY was recorded in $T_6$and followed by T_5.On the other hand at Ranchi the highest total CPY was recorded in T_1 followed by T_5.

Economic analysis of the experiment indicated that at Jorhat, Imphal, Kalyani and Pusa, the highest gross income was obtained in T_5 followed by T_6. On the other hand the highest gross income at Ranchi was recorded in T_1 followed by T_2. The highest net income was recorded in T_6 at Jorhat but at Imphal and Kalyani T_5 recorded the highest net income. At Pusa and Ranchi the highest net income was recorded in T_1. Benefit cost ratio (B: C) of different treatments revealed that at Jorhat T_6 recorded the highest B: C but at Imphal and Kalyani the highest B: C ratio was recorded in T_7 and T_3, respectively. Again T_1 recorded the highest B: C ratio at Pusa and Ranchi.

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 microbial biomass carbon (MBC) at Pusa and the highest being observed in T_5 (158 mg/kg) as compared to initial value of MBC (124 mg/kg)

Table K-19-AST- 2(a): Effect of organic source of nutrients on green forage yield (q/ha) of rice bean-oat system

Treatment	Jorhat			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	Rice bean	Oat	Total
T_1	325	317	642	308	279	587	316	288	605	271	387	659	376	401	777	319	334	654
T_2	312	279	591	301	271	573	306	273	579	260	332	593	287	408	695	293	313	606
T_3	295	298	593	343	316	659	353	308	661	306	354	660	314	399	713	322	335	657
T_4	348	328	677	324	305	629	331	300	631	284	345	629	313	403	716	320	336	656
T_5	380	333	713	360	348	708	387	353	741	340	376	717	336	441	777	361	370	731
T_6	370	313	684	341	327	669	362	320	682	324	365	689	308	378	686	341	341	682
T_7	292	248	540	262	203	466	266	208	475	209	286	495	215	283	498	249	246	495
T_8	338	299	637	240	239	480	280	228	508	228	307	536	243	282	525	266	271	537
T_9	325	250	575	289	181	507	275	212	487	216	302	519	234	276	511	268	244	520
T_{10}	322	307	629	297	241	538	298	253	552	245	319	565	252	311	563	283	286	569
T_{11}	304	301	604	248	236	485	288	240	528	236	311	547	231	287	518	261	275	536
T_{12}	346	319	665	281	271	553	302	262	564	282	364	646	338	315	653	310	306	616
SE(m) ±	15.60	14.39	23.84	6.53	2.14	7.59	2.38	3.24	5.62	7.00	9.10	0.88	5.35	7.29	10.5			
C.D.(P=0.05)	48.69	44.90	74.39	19.16	6.28	22.25	7.14	9.72	16.90	20.50	26.70	2.61	15.78	21.52	30.98			

Table K-19-AST- 2(b): Effect of organic source of nutrients on dry matter yield (q/ha) of rice bean-oat system

Treatment	Jorhat			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	Rice bean	Oat	Total
T_1	65	66	131	48	52	100	54	41	95	47	64	111	63	91	176	56	63	123
T_2	62	59	120	49	49	98	62	36	99	47	55	102	48	76	140	54	55	112
T_3	59	63	121	50	50	100	73	42	115	58	59	117	53	75	146	58	58	120
T_4	70	69	138	47	47	93	68	44	112	52	57	110	53	73	144	58	58	119
T_5	76	70	146	53	53	107	99	53	152	70	64	134	57	82	158	71	64	139
T_6	74	66	140	57	57	113	83	52	135	64	62	125	52	71	141	66	62	131
T_7	58	52	110	46	46	92	43	30	73	34	46	80	36	54	102	43	46	91
T_8	68	63	130	39	39	78	47	34	81	38	50	89	42	54	110	47	48	98
T_9	65	52	117	46	46	93	45	28	74	35	49	84	39	53	105	46	46	94
T_{10}	64	65	129	45	45	91	58	36	93	44	53	97	42	59	115	51	52	105
T_{11}	61	63	123	40	40	79	55	33	88	40	51	91	38	55	106	47	48	97
T_{12}	69	67	136	48	48	96	60	43	103	53	62	115	56	60	135	57	56	117
SE(m) ±	15.60	14.39	23.84	6.53	2.14	7.59	2.38	3.24	5.62	7.00	9.10	0.88	5.35	7.29	10.5			
C.D.(P=0.05)	48.69	44.90	74.39	19.16	6.28	22.25	7.14	9.72	16.90	20.50	26.70	2.61	15.78	21.52	30.98			

Table K-19-AST- 2(c): Effect of organic source of nutrients on CPY (q/ha) of rice bean-oat system

Treatments	Jorhat			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	Rice bean	Oat	Total
T_1	8.54	4.12	12.66	6.53	4.43	10.96	7.10	41.00	3.90	6.43	7.90	14.33	5.45	7.39	12.84	6.81	12.97	10.94
T_2	8.77	3.81	12.58	7.07	5.50	12.57	9.70	36.30	4.21	6.19	5.63	11.82	3.54	3.15	6.68	7.05	10.88	9.57
T_3	7.85	3.95	11.80	7.04	5.39	12.43	11.40	41.90	4.23	8.42	6.44	14.86	4.09	3.60	7.69	7.76	12.26	10.20
T_4	9.72	5.01	14.72	6.30	4.53	10.83	10.60	44.10	3.61	7.52	6.11	13.63	3.48	2.73	6.20	7.52	12.50	9.80
T_5	10.75	5.58	16.33	7.20	5.54	12.74	16.10	53.00	5.93	10.72	7.42	18.14	3.60	4.14	7.75	9.67	15.14	12.18
T_6	10.53	5.32	15.85	7.73	6.19	13.92	13.10	52.20	6.10	9.48	7.10	16.58	3.13	2.96	6.08	8.79	14.75	11.71
T_7	8.39	4.12	12.51	6.15	5.42	11.57	5.40	29.60	3.55	4.23	4.11	8.35	2.70	3.90	6.60	5.37	9.43	8.52
T_8	9.77	5.57	15.34	5.19	3.46	8.65	6.20	34.10	3.10	5.07	4.60	9.67	2.88	2.46	5.34	5.82	10.04	8.42
T_9	9.27	4.23	13.50	6.28	4.73	11.01	5.80	28.40	2.90	4.60	4.46	9.06	2.63	2.42	5.05	5.72	8.85	8.30
T_{10}	9.47	5.75	15.22	6.05	4.02	10.07	8.10	35.80	3.04	5.98	4.98	10.96	3.25	2.59	5.85	6.57	10.63	9.03
T_{11}	8.90	5.25	14.15	5.28	4.31	9.59	7.40	32.90	3.65	5.40	4.76	10.16	2.39	2.15	4.54	5.87	9.87	8.42
T_{12}	9.72	4.97	14.69	6.24	4.70	10.94	8.80	43.00	4.56	7.38	7.00	14.39	3.77	2.63	6.40	7.18	12.46	10.20
SE(m) ±	15.60	14.39	23.84	6.53	2.14	7.59	2.38	3.24	5.62	7.00	9.10	0.88	5.35	7.29	10.5			
C.D.(P=0.05)	48.69	44.90	74.39	19.16	6.28	22.25	7.14	9.72	16.90	20.50	26.70	2.61	15.78	21.52	30.98			

Table K-19-AST- 2(d): Effect of organic source of nutrients on gross return (Rs/ha), net return (Rs/ha) and B:C of rice bean-oat system

Treatments	Jorhat			Imphal			Kalyani			Pusa			Ranchi			Mean		
	Gross return	Net return	B:C	Gross return	Net return	B:C	Gross return	Net return	B:C	Gross return	Net return	B:C	Gross return	Net return	B:C	Gross return	Net return	B:C ratio
T_1	96250	62510	2.85	132898	67598	2.04	90765	42415	1.88	118268	55165	1.87	150433	100019	2.98	117723	65541	2.26
T_2	88600	56300	2.74	129697	53997	1.71	100590	46570	1.86	105588	33553	1.47	118717	58505	1.97	108638	49785	1.85
T_3	89000	37372	1.72	149115	70615	1.9	114670	58820	2.05	116855	35930	1.44	122650	51360	1.72	118458	50819	1.75
T_4	101500	61872	2.56	142062	71302	2.01	109720	55740	2.03	111724	37212	1.50	123100	64444	2.1	117621	58114	1.98
T_5	106950	47322	1.79	159780	78540	1.97	128815	65415	2.03	126442	38344	1.44	133350	50984	1.62	131067	56121	1.75
T_6	102550	62922	2.59	150918	69358	1.85	118380	57740	1.95	121787	42373	1.53	118417	61315	2.08	122410	58742	1.92
T_7	81000	43412	2.15	106448	59988	2.29	81670	40045	1.96	88691	28438	1.47	85541	28827	1.51	88670	40142	1.83
T_8	95550	48962	2.05	108048	59728	2.24	87720	43840	2.00	95838	31165	1.48	90970	25948	1.4	95625	41929	1.78
T_9	86250	48662	2.29	115953	64393	2.25	83650	37375	1.81	92980	32410	1.54	88411	32863	1.59	93449	43141	1.86
T_{10}	94400	41812	1.80	122510	59850	1.96	95530	43510	1.84	100747	32132	1.47	97080	23752	1.32	102053	40211	1.65
T_{11}	90650	53062	2.41	109448	56388	2.06	91305	43535	1.91	97760	35099	1.56	89400	36378	1.69	95713	44892	1.88
T_{12}	99700	55400	2.25	124777	58437	1.88	97815	43799	1.81	115268	40981	1.55	114950	54252	1.9	110502	50574	1.84

Table K-19-AST- 2(e): Effect of organic source of nutrients on plant height (cm) of rice bean and oat crops

Treatments	Jorhat		Imphal		Kalyani		Pusa		Ranchi		Mean	
	Rice bean	Oat	Rice bean	Oat	Rice bean	Oat	Rice bean	Oat	Rice bean	Oat	Rice bean	Oat
T_1	166	118	199	118	104	116	113	129	156	119	148	120
T_2	163	108	210	109	107	115	110	124	121	106	142	112
T_3	169	111	181	124	111	121	115	125	145	102	144	117
T_4	176	118	184	120	109	118	113	125	142	100	145	116
T_5	166	123	199	131	112	129	117	127	150	107	149	123
T_6	163	107	192	128	111	126	116	126	139	98	144	117
T_7	165	110	200	196	99	106	102	117	119	83	137	122
T_8	168	113	135	107	104	110	104	119	134	81	129	106
T_9	159	112	164	107	103	112	104	119	139	79	134	106
T_{10}	166	109	188	108	105	113	106	121	124	85	138	107
T_{11}	168	104	174	104	105	112	105	121	122	78	135	104
T_{12}	166	108	153	109	104	116	114	126	141	88.33	136	109
SE(m) ±	4.69	0.21	2.43	2.00	0.42	1.32	2.12	2.32	3.16	1.31		
C.D. (P=0.05)	14.44	0.67	7.14	4.00	1.26	3.96	6.23	7.42	9.31	3.87		

Table- K-19-AST- 2(f): Effect of organic source of nutrient on soil fertility parameters after *Rabi* 2019-20 harvest

Treatments	Jorhat					Imphal				
	pH	OC (%)	Available nutrient (kg/ha)			pH	OC (%)	Available nutrient (kg/ha)		
			N	P	K			N	P	K
T_1	5.74	0.74	261.42	19.76	169.66	5.36	0.84	268.12	11.15	162.08
T_2	5.77	0.89	271.00	22.33	162.98	5.39	1.09	273.00	12.06	152.70
T_3	5.77	0.85	273.06	18.82	171.68	5.39	1.45	271.09	14.12	168.18
T_4	5.75	0.83	270.34	21.33	174.45	5.57	1.03	273.12	12.51	172.31
T_5	5.73	0.82	278.76	18.98	178.11	5.35	1.12	282.10	14.71	176.43
T_6	5.74	0.80	271.18	20.87	169.45	5.36	1.10	269.18	12.62	164.23
T_7	5.73	0.88	269.29	21.71	172.52	5.35	1.08	267.21	11.79	167.52
T_8	5.72	0.85	270.47	21.58	17544	5.34	1.05	268.17	11.38	173.72
T_9	5.74	0.86	273.19	22.22	173.67	5.36	1.06	272.27	12.42	172.61
T_{10}	5.72	0.84	275.23	21.34	171.67	5.32	1.04	271.41	11.81	168.31
T_{11}	5.71	0.84	274.36	22.45	171.71	5.53	1.04	276.31	12.22	169.71
T_{12}	5.72	0.81	271.43	22.36	174.65	5.34	1.01	268.15	12.72	172.34
Initial	5.70	0.72	272.34	19.77	172.12	5.32	0.83	271.00	11.20	179.10

Table- K-19-AST- 2(g): Effect of organic source of nutrient on soil fertility parameters after *Rabi* 2019-20 harvest

Treatments	Kalyani							Pusa						
	pH	OC (%)	EC (dsm^{-1})	Available nutrient (kg/ha)			Zn Content (mg Kg^{-1})	pH	OC (%)	EC (dsm^{-1})	Available nutrient (kg/ha)			MBC (mg/kg)
				N	P	K					N	P	K	
T_1	6.84	0.45	0.15	134.1	28.5	137.6	0.31	8.30	0.56	0.45	285.7	17.9	133.2	129
T_2	6.85	0.48	0.17	152.6	35.8	147.2	0.30	8.27	0.61	0.47	295.3	19.2	136.8	156
T_3	6.86	0.47	0.16	156.7	34.2	156.1	0.32	8.28	0.58	0.46	296.1	19.5	137.9	148
T_4	6.85	0.48	0.14	159.4	32.7	157.3	0.33	8.28	0.58	0.45	295.1	19.0	139.5	149
T_5	6.83	0.50	0.15	164.5	35.2	143.4	0.31	8.27	0.62	0.46	302.6	22.6	141.7	158
T_6	6.84	0.49	0.17	153.3	34.3	151.7	0.30	8.28	0.60	0.47	299.6	21.8	139.4	152
T_7	6.84	0.47	0.15	144.7	32.4	145.1	0.33	8.28	0.58	0.46	291.0	18.9	136.5	150
T_8	6.85	0.48	0.16	136.4	34.1	151.3	0.32	8.28	0.57	0.45	292.9	18.9	137.4	142
T_9	6.86	0.47	0.15	143.2	33.3	144.7	0.31	8.29	0.58	0.46	292.4	19.0	136.9	145
T_{10}	6.85	0.49	0.14	152.6	30.7	142.8	0.30	8.29	0.58	0.45	292.4	19.1	138.1	146
T_{11}	6.86	0.48	0.16	137.4	31.4	146.2	0.32	8.29	0.58	0.46	291.1	19.0	136.8	148
T_{12}	6.84	0.49	0.15	152.6	32.6	144.2	0.32	8.28	0.60	0.45	294.0	20.0	138.9	155
Initial	6.84	0.51	0.16	178.7	39.3	198.5	0.33	8.31	0.55	0.45	290.0	18.35	135.5	124

B. Location Specific Trials

K-16-AST-6 : Organic nutrient management in sorghum-berseem cropping sequence for sustainable fodder production [Table Reference: K-16-AST-6 (a)-(b)]

Location: Hisar

Preamble

Imbalanced use of chemical fertilizers and second generation problems of green revolution in agriculture has weakened the ecological base in addition to degradation of soil, water resources, fodder quality, productivity and farm profitability. Livestock health hazards and environmental degradation associated with input intensive cropping system has renewed the interest in the organic cultivation of fodder crops. The organic sources are eco-friendly, economically viable, ecologically sound and also plays a significant role in the improvement of soil physio-chemical and biological properties of soil with potential to reduce greenhouse gas emissions. The current scenario firmly emphasizes the need to adopt eco-friendly agricultural practices for sustainable fodder production. Therefore, this study was initiated in *Kharif* 2016 to study the feasibility of organic nutrient management in sorghum-berseem cropping sequence for sustainable fodder production.

Experimental details

The treatments included T_1: Recommended dose of fertilizers through inorganic source (75 kg N + 15 kg P_2O_5/ha; N in two splits i.e. 50 kg at sowing an 25 kg after one month, full dose of phosphorus as basal dose, Berseem : 25 kg N + 70 kg P2O5/ha both at the time of sowing; T_2: 20 t FYM/ha (15 t in sorghum and 5 t/ha in berseem); T_3: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + biofertilizer; T_4: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + Green manuring; T_5: 20 t FYM/ha (15 t in sorghum + 5 t in berseem) + biofertilizer + Green manuring; T_6: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem); T_7: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + biofertilizer; T_8: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + Green manuring and T_9: 7.5 t vermicompost/ha (5 t in sorghum + 2.5 t in berseem) + bio fertilizer + Green manuring. The treatments were replicated thrice in Randomised Block Design. For single-cut forage sorghum, HJ-541 variety was used during Kharif season. Berseem crop (HB-1) was sown during Rabi season.

Results

Data presented in following tables revealed that during *kharif* 2019, highest green fodder and dry matter yields of sorghum were recorded in T_9 (561.9 q/ha and 142.9 q/ha, respectively) which were significantly higher than T_1, T_2 and T_6. During *Rabi* 2019-20, highest green fodder and dry matter yields of berseem (total of five cuts) were recorded in T_9 (721.0 q/ha and 97.98 q/ha, respectively) which were significantly higher than T_1, T_2, and T_6 in respect of GFY and T_1,T_2, T_3 and T_6 in respect of DMY. Maximum total green fodder yield of the cropping sequence was recorded in T_9 (1282.9 q/ha) and followed by T_5 and T_8. Highest crude protein content and IVDMD (%) of sorghum was recorded with T_9 (10.72 and 56.20 %, respectively) which were significantly higher than all other treatments except w.r.t. to IVDMD content in T_5. Similarly, highest crude protein content and IVDMD (%) of berseem was also recorded with T_9 (21.13 % and 59.18 %, respectively) which were significantly higher than all other treatments except w.r.t. crude protein content in T_5. Economic analysis of sorghum-berseem cropping sequence represented in Table 3 revealed that maximum net returns and B: C ratio was fetched in T_5 and followed by T_4 and T_3.

Table K-16-AST-6 (a): Effect of organic nutrient management on productivity of sorghum-berseem cropping sequence

Treatments	Sorghum					Berseem (Total five cuts)					Leaf stem ratio
	No. of tillers/m row length	Plant height (cm)	Yield (q/ha)		Leaf: stem ratio	No. of shoots/m^2	Plant height (cm)	Yield (q/ha)		Total GFY (sorghum + berseem)	
			Green fodder	Dry matter				Green fodder	Dry matter		
T_1	9.5	234.0	493.8	126.2	0.16	46.5	51.0	584.0	68.1	1077.8	0.76
T_2	8.9	222.9	458.0	119.7	0.15	45.9	49.0	576.9	62.1	1035.0	0.74
T_3	10.0	238.4	501.6	129.8	0.17	51.5	54.2	674.0	83.0	1175.6	0.79
T_4	10.6	248.0	543.1	134.0	0.19	53.8	56.4	707.4	90.9	1250.5	0.81
T_5	11.4	258.7	555.4	140.9	0.20	55.3	58.5	715.5	95.6	1270.9	0.82
T_6	9.2	231.9	473.6	123.2	0.16	46.0	50.2	579.2	64.5	1052.8	0.75
T_7	10.4	245.7	509.4	132.2	0.18	53.0	55.6	684.4	86.3	1193.9	0.80
T_8	11.0	252.2	550.2	138.2	0.20	54.6	57.5	712.0	93.7	1262.2	0.79
T_9	11.5	259.6	561.9	142.9	0.21	56.5	59.8	721.0	98.0	1282.9	0.82
SE(m) ±	0.33	7.2	22.0	4.6	0.01	1.6	1.0	25.2	3.9	-	0.04
C.D. (P=0.05)	1.01	21.9	66.6	14.0	NS	4.8	3.1	76.3	11.7	-	NS

Table K-16-AST-6 (b): Effect of organic nutrient management on quality of sorghum-berseem cropping sequence

Treatments	Crude protein content (%)		IVDMD (%)	
	Sorghum	Berseem	Sorghum	Berseem
T_1	9.28	20.74	54.80	57.86
T_2	8.18	20.43	48.40	53.94
T_3	8.36	20.56	50.20	55.46
T_4	9.24	20.69	51.80	56.98
T_5	9.28	20.78	55.20	57.98
T_6	8.40	20.52	49.40	55.06
T_7	8.83	20.65	51.00	55.86
T_8	9.26	20.74	53.00	57.46
T_9	9.72	21.13	56.20	59.18
SE(m) ±	0.09	0.12	0.35	0.39
C.D. (P=0.05)	0.28	0.37	1.05	1.19

Table K-16-AST-6 (c): Economic analysis of sorghum-berseem cropping sequence

Treatments	Cost of cultivation (Rs./ha)	Gross returns (Rs./ha)	Net returns (Rs./ha)	B: C ratio
T_1	116125	190868	74743	1.64
T_2	127100	184089	56989	1.45
T_3	127200	210052	82852	1.65
T_4	132800	222941	90141	1.68
T_5	132900	226418	93518	1.70
T_6	141100	186889	45789	1.32
T_7	141200	213302	72102	1.51
T_8	146800	224937	78137	1.53
T_9	146900	228488	81588	1.56

K-16-AST-8: Resource management in rice-oat cropping system under sodic soils

[Table Reference: K-16-AST-8 (a)-(c)]

Location: Ayodhya

Preamble:

In India, the area under salt affected is about 6.73 million ha. Sodic soils have excess exchangeable sodium percentage (>15) and high pH (>8.5) which adversely affects the growth and development in most of the crop plants. Crop responses to organic and biological sources of nutrients are not visible as to fertilizers, but the supplementary and complementary of these resources enhance the use efficiency of applied fertilizers besides improving soil physico-chemical properties. Paddy and oat are two tolerant food and forage crops may be grown under sodic soils with suitable nutrient management practices to sustain the productivity and improve the physico-chemical properties of the soil. The information on nutrient management in rice-oat cropping system under sodic soils is meager. Therefore, the present study was planned.

Experimental details

The field experiment was initiated during *Kharif* 2016 at Ayodhya centre to study the resource management in rice-oat cropping system under sodic soils. The experiment comprised of eight treatments *viz*.; control, RDF (120N:60P_2O_5:40K_2O kg/ha), combination of 75% RDF and 50% RDF with 25% N and 50% N substitution through pressmud,*Dhaincha* and crop residue, respectively was conducted in Randomized Block Design and replicated thrice. Being low in nitrogen, 25% extra dose (30kg N/ha) was added to 120 kg to compensate the dose. The soil of experimental field was sodic and poor in fertility (pH – 9.1, E.C.- 0.97dsm^{-1}, ESP-32.7%,Organic Carbon-0.23%, Available. N- 115.4 kg, P –15.6 kg and K-240.0 kg/ha), silty loam in texture and saline in reaction.The crop paddy var.Sarjoo-52 was transplanted on July 16, 2019 and fertilized as per treatment while fodder oat was sown on November 12,2019 after harvesting of paddy during Rabi 2019-20 was fertilized with recommended dose of fertilizers.

Results

The grain and straw yields of paddy were significantly higher with RDF and being *at par* with 75% RDF+25% N through *dhaincha*. The integrated nutrient applied to paddy crop did not affected the GFY, DMY& CPY of the preceding fodder oat under rice-oat cropping system during first, second, third and fourth years of experimentation. Total green forage yield and gross return were observed higher with 75% RDF+25% N through *dhaincha* while net return and benefit cost ratio noticed more(3.20) with RDF followed by 75% RDF+25% N through *dhaincha*(3.14) under rice – oat cropping system during fourth years (2019-20). Observations recorded on physico- chemical properties of soil after harvest of the fodder oat during fourth years of experimentation showed consistent increase in available nitrogen and phosphorous with 75% RDF+25% N or 50% RDF+50% N through *dhaincha* over control. Considerable reduction in pH, EC and ESP and improvement organic carbon content was observed through organic substitution over initial values.

Table K-16-AST-8 (a): Herbage yield as influenced by integrated nutrient management under rice-oat cropping system

Treatments	Rice yield (q/ha)		Oat forage equivalent Yield	Harvest index (%)	Oat yield (q/ha)			Total oat forage equivalent yield
	Grain yield	Straw yield			GFY	DMY	CPY	
Control	18.22	27.43	199.65	39.91	470.52	105.86	8.57	670.17
RDF(120N:60P_2O_5: 40K_2O kg/ha)	42.34	55.87	454.11	43.11	510.12	118.35	9.83	964.23
75% RDF+25% N through pressmud	34.15	45.81	367.17	42.71	490.66	110.89	8.98	857.83
75% RDF+25% N through *dhaincha*	42.22	55.83	452.93	43.06	512.45	118.89	9.88	965.38
75% RDF+25% N through crop residue	32.20	45.35	348.93	41.52	486.50	108.97	8.82	835.43
50% RDF+50% N through pressmud	33.62	47.84	364.91	41.27	488.77	109.97	9.01	853.68
50% RDF+50% N through *dhaincha*	36.46	51.12	394.76	41.63	497.35	114.88	9.54	892.11
50% RDF+50% N through crop residue	31.16	45.15	338.32	40.83	485.11	108.66	8.75	823.43
SE(m) ±	2.78	2.65	19.55	2.60	24.33	6.67	0.61	42.08
C.D. (P=0.05)	5.96	5.68	41.94	NS	NS	NS	NS	90.26

Table K-16-AST-8 (b): Monetary return as influenced by integrated nutrient management under rice-oat cropping system

Treatments	Total green Forage yield (q/ha)	Cost of cultivation			Gross returns (Rs./ha)	Net Returns (Rs./ha)	B C ratio
		Rice	Oat	Total			
Control	670.17	33877	19950	53827	134034	80207	2.49
RDF(120N:60P_2O_5:40K_2O kg/ha)	964.23	40355	19950	60305	193046	132741	3.20
75% RDF+25% N through pressmud	857.83	44200	19550	64150	171566	107416	2.67
75% RDF+25% N through *dhaincha*	965.38	41585	19550	61535	193076	131541	3.14
75% RDF+25% N through crop residue	835.43	43835	19550	63785	167086	103301	2.62
50% RDF+50% N through pressmud	853.68	48107	19950	68057	170736	102679	2.51
50% RDF+50% N through *dhaincha*	892.11	42815	19950	62765	178422	115657	2.84
50% RDF+50% N through crop residue	823.43	47315	19550	67265	164686	97421	2.45
SE(m) ±	31.08	-	-	-		-	-
C.D. (P=0.05)	90.26	-	-	-		-	-

Table K-16-AST-8 (c): Effect of integrated nutrient management on physico-chemical properties of soil after harvest of fodder oat under rice-oat cropping system

Treatments	Available nutrients(kg/ha)			pH value	EC dSm^{-1}	Exchangeable sodium (%)	O.C. (%)
	N	P	K				
Control	115.9	15.8	243	9.1	0.96	32.6	0.23
RDF(120N:60P_2O_5:40K_2O kg/ha)	126.8	16.6	260	9.0	0.91	30.0	0.24
75% RDF+25% N through pressmud	132.6	17.5	267	8.6	0.88	27.5	0.32
75% RDF+25% N through *dhaincha*	140.2	18.3	274	8.2	0.82	24.4	0.37
75% RDF+25% N through crop residue	128.3	16.7	262	8.6	0.89	28.1	0.28
50% RDF+50% N through pressmud	133.9	17.6	269	8.4	0.86	24.6	0.34
50% RDF+50% N through *dhaincha*	141.5	18.5	277	8.0	0.79	21.6	0.42
50% RDF+50% N through crop residue	129.4	16.8	263	8.5	0.88	26.6	0.30
Initial value	115.4	15.6	240	9.1	0.97	32.7	0.23

R-16-AST-4: Effect of stubble management and planting density on establishment and productivity of forage oat under zero tillage conditions in rice fallows

[Table Reference: R-16-AST-4 (a)]

Location: Imphal

Preamble: Zero tillage practices protect the soil from erosion, conserve water, air and nutrients, promote soil biological activity and contribute to integrated pest management (IPM), diversification of crops in associations, sequences and rotations to enhance system resilience and controlled traffic, while optimizing yields. Thus, Zero tillage/No tillage avoids straw burning, improves soil organic carbon (SOC) content, enhances input-use efficiency, and has the potential to reduce greenhouse gas emissions.

Experimental details

The trial was initially initiated in Rabi 2016-17but it was suggested to change the *lathyrus* crop with oat crop as heavy winter rainfall during the early cropping period adversely affected the growth and development of *lathyrus* in the region (Proc Rabi 2018-19, HAU, and Hisar)*. Hence, the field experiment was initiated during Rabi 2018-19, to study the effect of different height of rice stubble and planting density on establishment and productivity of forage oat under zero tillage condition in rice fallow. The experiment consisted of three seed rates (80, 100 and 120 kg ha^{-1}) and four different rice stubble height (10 cm, 25 cm, 40 cm and bending of rice stubble) was laid out in randomized block design with three replications.

Results

Seed rate of 120 kg ha^{-1} recorded significantly higher green fodder yield (181.96 q ha^{-1}) However, with regard to dry matter and crude protein yields, seed rate of 120 kg per hectare remained at par with 100kgper hectare. Among stubble management, bending of rice stubble (without cutting) resulted in significantly higher green fodder yield (238.50q ha^{-1}), dry matter yield (51.91 q ha^{-1}) and crude protein yield (4.04 q ha^{-1}). From, economic point of view treatment bending of rice stubble gave the highest net return of Rs. 22425 and BC ratio of 0.89. The interaction effect remained non-significant for growth and yield parameters.

Table R-16-AST-4 (a): Effect of stubble management and planting density on yield, quality and economics of oat

Treatments	Green forage yield (q/ha)	Dry matter yield (q/ha)	Crude protein yield (q/ha)	Crude protein content (%)	Plant height (cm)	No. of tillers/m^2	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
A. Rice Stubble Management (cm)									
T_1- 10 cm	116.7	24.08	1.83	7.59	108.6	164.0	23342	-1934	0.92
T_2- 25 cm	147.6	33.45	2.52	7.56	116.6	175.2	29525	4249	1.17
T_3- 40 cm	183.2	43.60	3.37	7.73	123.4	179.2	36632	11356	1.45
T_4- bending of rice stubble	238.5	51.91	4.04	7.78	129.0	181.2	47701	22425	1.89
SE(m) ±	2.02	2.32	0.18	0.25	2.22	1.74	404	404	0.02
C.D. (P=0.05)	6.99	8.03	0.62	NS	7.7	6.01	1398	1398	0.07
B. Seed rate (kg ha^{-1})									
S_1- 80 kg	163.4	34.58	2.67	7.7	117.4	168.2	32682	8606	1.36
S_2- 100 kg	169.1	40.95	3.06	7.46	119.3	176.3	33827	8551	1.34
S_3- 120 kg	182.0	39.24	3.09	7.84	121.5	180.3	36391	9915	1.37
SE(m) ±	2.28	1.7	0.15	0.16	1.69	2.29	456	456	0.01
C.D. (P=0.05)	6.84	5.1	NS	NS	NS	6.88	1367	NS	NS
C. Interaction									
Rice Stubble Management at Seed rate level									
SEm(±)	4.24	3.62	0.3	0.36	3.54	4.13	847	284	0.03
CD 5%	NS	NS	NS	NS	NS	NS	NS	895	0.09
Seed rate at Rice Stubble Management									
SE(m) ±	4.56	3.41	0.29	0.31	3.38	4.59	912	912	0.03
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	0.08

R-18-AST-7: Effect of intercropping on seed setting and seed yield in Lucerne

[Table Reference: R-18-AST-7 (a)]

Location: Bikaner

Preamble:

Lucerne is an important legume fodder crops and its demand is increasing day by day. Proper seed setting is a matter of concern in lucerne in western Rajasthan because of reduced pollination due to low beneficial insect (careers), high temperature, fertility status, agronomical practices etc. Intercropping of Dill and fennel which have same flowering time may create a favourable environment for efficient pollination by attracting of bees and other insects. The present study has been initiated to study the above.

Experimental details

The experiment was initiated in *Rabi* season of 2019-20 at Agricultural Research Station, SKRAU, Bikaner to study theeffect of intercropping on seed setting and seed yield in lucerne on sandy soil with the objectives-(i) to find out suitable intercrop for improving seed setting and yield in lucerne by improving microclimateand pollinators. The treatments included T_1: sole lucerne (without intercrop); T_2: Fennel intercrop at (1:5); T_3 :Fennelintercrop at (1: 10); T_4 : Fennelintercrop at (1:15); T_5 :Dill intercrop at (1:5); T_6 :Dillintercrop at (1: 10); T_7 :Dillintercrop at (1:15); T_8 : Mustard intercrop at (1:5); T_9 : Mustardintercrop at (1: 10) and T_{10} :Mustardintercrop at (1:15). Treatments were replicated thrice in randomized block design. Sowing using recommended seed rates was done on November 14-15, 2019 and harvested on May, 10-15, 2020. Fertilizers @ 20 kg N, 40 kg P_2O_5 and 20 kg K_2O as basal were drilled at sowing.

Results

Seed setting improved by intercropping of fennel as well as dill intercrop with lucerneas compared to other combinations. The maximum seed yield was found in combination of fennel intercrop at (1: 15) i.e. 74.15 kg seed /ha, which was at par with Dill intercrop at (1:15),(1: 10) and Fennel intercrop at (1: 10) but superior to other treatments. Highest net returns (Rs. 67178 /ha) and B:C ratio (3.78) was obtained from dill intercrop at (1:5).

Table R-18-AST-7 (a): Effect of intercropping on yield attribute, yield and economics of lucerne

Treatments	No. of branches per plant	No. of pods per plant	No. of seeds per pod	1000 seed weight (g)	Seed yield (kg/ha)	Economics			
						Cost of Cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C Ratio
Control (Sole lucerne)	5.87	41.27	3.73	2.68	49.21	20000	40035	20035	2.00
Fennel intercrop at (1:5)	5.67	44.27	5.07	3.39	65.99	24600	85371	60771	3.47
Fennelintercrop at (1: 10)	5.60	42.67	4.20	3.37	73.47	23100	74454	51354	3.22
Fennelintercrop at (1:15)	5.33	43.13	3.87	3.37	74.15	21650	67774	46124	3.13
Dill intercrop at (1:5)	5.40	43.60	4.33	3.36	64.40	24150	91328	67178	3.78
Dillintercrop at (1: 10)	5.67	42.13	4.07	3.35	70.52	22575	84120	61545	3.73
Dillintercrop at (1:15)	5.67	42.73	3.93	3.36	69.84	21540	69502	47962	3.23
Mustard intercrop at (1:5)	5.00	42.67	4.07	2.87	42.63	22560	71557	48997	3.17
Mustardintercrop at (1: 10)	5.33	41.87	3.80	2.79	45.35	21730	67045	45315	3.09
Mustardintercrop at (1:15)	5.60	42.00	3.80	2.78	44.67	21010	56375	35365	2.68
SE(m) ±	0.26	1.96	0.23	0.05	2.84	-	3332	3332	0.15
C.D. (P=0.05)	0.77	5.82	0.67	0.16	8.44	-	9900	9900	0.44

C.AVT-2 trials

R-19-AST-6: Effect of P levels on forage yield of promising entries of Berseem (AVTB-2-MC) [Table Reference: R-19-AST-6 (a)-(i)]

Locations: (6)
NWZ: Pantnagar, Hisar, Ludhiana
NEZ: Ranchi, Ayodhya, Pusa

AVT trial on berseem was conducted in two zones of the country to study the effect of phosphorus fertilizer on yield and quality of promising entries of berseem under multicut cut system. In the trial three entries (JHB-17-1, JHB-17-2, andPC-91) along with one national check (Wardan -NC) and two zonal checks *viz.*, BB-2 (NWZ), BB-3 (NEZ), were evaluated at six locations in the country. 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 as basal. The experiment was conducted in split plot design with entries in main plot and replicated thrice. In North West Zone, PC-91 recorded significantly higher GFY and DMY and CP yields (442.0, 72.59 and 12.20q/ha, respectively). It recorded 56.7, 67.9 and 70.2 percent improvement over national check- Wardan.

In North East Zone, JHB-17-1recorded significantly higher GFY and DMY and CP yields (659.7, 97.14 and 19.42 q/ha, respectively). It recorded 80.3, 78.6 and 83.1 percent improvement over national check- Wardan. On overall mean basis, PC-91 and JHB-17-1proved superior to other entries and checks but on par with each other. These entries recorded (542.1 and 525.6, q green fodder /ha, and 79.65 and 76.24 dry matter/ ha, respectively). The entries also remained on par in terms of CP yields ((14.83 and 13.93 q/ha, respectively) but superior to other entries and checks. The interaction effect of entries with nitrogen significant at some centre in terms of GFY, DMY and CP Yields. On overall mean, basis application of 100 kg phosphorus/ha recorded significantly higher yield (471.2 q green, 71.36q dry matter and 13.12 q crude protein per hectare) than lower doses. It recorded 10.8, 16.9 and 18.8 per cent higher green fodder, dry matter and crude protein yields over 60 kg phosphorus/ha and 4.8, 7.0 and 6.5 per cent higher green fodder, dry matter and crude protein yields over 80 kg phosphorus/ha, respectively.

Table -R-19-AST-6 (a): Effect of phosphorus levels on green forage yield of promising entries of Berseem (AVTB-2-MC)

Treatments	Green fodder yield (q/ha)								
	NWZ				NEZ				Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Ranchi	Ayodhya	Pusa	Mean	
Entries									
JHB-17-2	541.4	522.4	717.5	593.8	450.1	339.2	361.2	383.5	488.6
PC-91	755.2	526.8	697.0	659.7	430.9	352.3	382.6	388.6	524.1
JHB-17-1	514.5	582.6	730.6	609.2	485.1	444.2	396.8	442.0	525.6
Wardan (NC)	486.2	527.5	249.1	420.9	300.9	307.6	126.7	245.1	333.0
BB-2 (NWZ)	255.8	513.6	607.1	458.8					
BB-3 (NEZ)					250.2	405.1	143.1	266.1	
S.Em (±)	5.74	9.65	15.30		3.37	12.85	8.00		
C.D. (P=0.05)	19.00	31.96	50.00		11.16	41.88	23.30		
Phosphorus levels (kg /ha)									
60	486.6	502.4	578.0	522.3	359.0	365.1	258.8	327.6	425.0
80	513.8	540.9	591.2	548.6	381.9	383.9	285.7	350.5	449.6
100	531.5	560.4	631.5	574.5	409.5	392.4	301.7	367.8	471.2
S.Em (±)	8.72	7.41	5.00		3.14	8.22	6.20		
C.D. (P=0.05)	25.92	22.0	14.71		9.32	24.25	18.0		
Interaction	NS	NS	NS		NS	NS	NS		

Table -R-19-AST-6 (b): Effect of phosphorus levels on dry matter yield of promising entries of Berseem (AVTB-2-MC)

Treatments	Dry matter yield (q/ha)								
	NWZ				NEZ				Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Ranchi	Ayodhya	Pusa	Mean	
Entries									
JHB-17-2	77.29	69.33	102.70	83.10	68.34	77.94	48.00	64.76	73.93
PC-91	115.43	70.48	105.50	97.14	65.48	69.10	51.90	62.16	79.65
JHB-17-1	74.06	80.49	85.10	79.89	73.79	89.49	54.50	72.59	76.24
Wardan (NC)	68.48	71.94	33.10	57.83	45.80	59.70	16.40	40.63	49.23
BB-2 (NWZ)	35.59	67.33	76.30	59.73					
BB-3 (NEZ)					37.94	81.50	18.40	45.95	
S.Em (±)	0.98	1.95	3.00		1.65	2.17	1.20		
C.D. (P=0.05)	3.24	6.45	9.90		5.46	7.10	3.40		
Phosphorus levels (kg /ha)									
60	70.51	64.21	70.50	68.40	54.55	72.35	34.20	53.70	61.05
80	73.97	73.70	79.80	75.82	58.10	76.31	38.40	57.60	66.71
100	78.03	77.83	91.30	82.38	62.16	77.98	40.90	60.35	71.36
S.Em (±)	1.17	1.41	1.20		0.49	1.31	0.90		
C.D. (P=0.05)	3.46	4.19	3.60		1.45	3.86	2.60		
Interaction	NS	NS	S		NS	NS	NS		

Table -R-19-AST-6 (c): Effect of phosphorus levels on per day productivity of promising entries of Berseem (AVTB-2-MC)

Treatments	Green forage productivity (q/ha/day)								
	NWZ				NEZ				Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Ranchi	Ayodhya	Pusa	Mean	
Entries									
JHB-17-2	3.61	3.46	4.01	3.69	3.69	3.12	3.17	3.33	3.51
PC-91	4.29	3.48	3.89	3.89	3.53	2.8	3.36	3.23	3.56
JHB-17-1	3.43	3.86	4.08	3.79	3.98	3.53	3.48	3.66	3.73
Wardan (NC)	3.24	3.49	1.39	2.71	2.47	2.44	1.11	2.01	2.36
BB-2 (NWZ)	1.71	3.41	3.39	2.84					
BB-3 (NEZ)					2.05	3.21	1.26	2.17	
S.Em (±)	0.04	0.06	0.09		0.03	0.06	0.07		
C.D. (P=0.05)	0.12	0.21	0.28		0.09	0.2	0.2		
Phosphorus levels (kg /ha)									
60	3.09	3.32	3.23	3.21	2.94	2.90	2.27	2.70	2.96
80	3.29	3.59	3.30	3.39	3.13	3.05	2.51	2.90	3.14
100	3.39	3.70	3.53	3.54	3.36	3.11	2.65	3.04	3.29
S.Em (±)	0.06	0.05	0.03		0.03	0.03	0.05		
C.D. (P=0.05)	0.16	0.16	0.08		0.08	0.11	0.16		
Interaction	NS	NS	NS		NS	NS			

Table -R-19-AST-6 (d): Effect of phosphorus levels on per day dry matter productivity of promising entries of Berseem (AVTB-2-MC)

Treatments	Dry matter productivity (q/ha/day)								
	NWZ				NEZ				Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Ranchi	Ayodhya	Pusa	Mean	
Entries									
JHB-17-2	0.52	0.46	0.57	0.52	0.56	0.62	0.42	0.53	0.52
PC-91	0.66	0.47	0.59	0.57	0.54	0.55	0.46	0.52	0.54
JHB-17-1	0.49	0.53	0.48	0.50	0.60	0.71	0.48	0.60	0.55
Wardan (NC)	0.46	0.48	0.18	0.37	0.38	0.48	0.14	0.33	0.35
BB-2 (NWZ)	0.24	0.45	0.43	0.37					
BB-3 (NEZ)					0.31	0.64	0.16	0.37	
S.Em (±)	0.01	0.01	0.02		0.01	0.01	0.01		
C.D. (P=0.05)	0.02	0.04	0.06		0.05	0.03	0.03		
Phosphorus levels (kg /ha)									
60	0.45	0.42	0.39	0.42	0.45	0.58	0.29	0.44	0.43
80	0.47	0.49	0.45	0.47	0.48	0.60	0.34	0.47	0.47
100	0.50	0.52	0.51	0.51	0.51	0.62	0.36	0.50	0.50
S.Em (±)	0.01	0.01	0.01		0.00	0.01	0.01		
C.D. (P=0.05)	0.02	0.03	0.02		0.00	0.02	0.02		
Interaction	NS	NS	NS		NS	NS	NS		

Table -R-19-AST-6 (e): Effect of phosphorus levels on forage yield of promising entries of Berseem (AVTB-2-MC)

Treatments	Crude Protein Yield (q/ha)								
	NWZ				NEZ				Overall mean
	Hisar	Ludhiana	Pantnagar	Mean	Ranchi	Ayodhya	Pusa	Mean	
Entries									
JHB-17-2	14.32	19.00	14.45	15.92	10.34	13.37	8.60	10.77	13.35
PC-91	14.37	22.70	21.19	19.42	9.88	11.71	9.10	10.23	14.83
JHB-17-1	16.72	16.70	13.55	15.66	11.04	15.67	9.90	12.20	13.93
Wardan (NC)	14.50	7.10	12.64	11.41	6.99	10.10	2.90	6.66	9.04
BB-2 (NWZ)	14.01	13.80	6.84	11.55					
BB-3 (NEZ)					5.93	14.04	3.20	7.72	
S.Em (±)	0.72	0.40	0.19		0.24	0.28	0.20		
C.D. (P=0.05)	NS	1.20	0.64		0.79	0.92	0.60		
Phosphorus levels (kg /ha)									
60	12.96	13.80	12.81	13.19	8.25	12.42	6.00	8.89	11.04
80	15.25	16.00	13.87	15.04	8.80	13.11	6.90	9.60	12.32
100	16.14	17.80	14.52	16.15	9.47	13.40	7.40	10.09	13.12
S.Em (±)	0.30	0.30	0.34		0.07	0.21	0.10		
C.D. (P=0.05)	0.89	0.70	0.99		0.28	0.62	0.40		
Interaction	S	S	NS		S	S	S		

Table -R-19-AST-6 (f): Effect of phosphorus levels on forage yield of promising entries of Berseem (AVTB-2-MC)

Treatments	Crude Protein (%)								
	NWZ				NEZ				Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Ranchi	Ayodhya	Pusa	Mean	
Entries									
JHB-17-2	18.66	20.62	18.20	19.16	15.07	17.16	17.94	16.72	17.94
PC-91	18.37	20.36	20.80	19.84	15.10	16.94	17.48	16.51	18.18
JHB-17-1	18.28	20.77	21.30	20.12	15.00	17.52	18.16	16.89	18.50
Wardan (NC)	18.47	20.14	21.20	19.94	15.21	16.93	17.97	16.70	18.32
BB-2 (NWZ)	19.25	20.78	18.00	19.34					
BB-3 (NEZ)					15.61	17.23	17.44	16.76	
S.Em (±)	0.22	0.13	0.30		0.03	0.25	0.18		
C.D. (P=0.05)	NS	0.41	0.9		0.11	NS	0.53		
Phosphorus levels (kg /ha)									
60	18.37	20.18	19.00	19.18	15.18	17.15	17.56	16.63	17.91
80	18.78	20.68	19.80	19.75	15.20	17.16	17.86	16.74	18.25
100	18.66	20.75	21.00	20.14	15.22	17.16	17.97	16.78	18.46
S.Em (±)	0.33	0.08	0.20		0.02	0.16	0.14		
C.D. (P=0.05)	NS	0.24	0.50		NS	NS	NS		
Interaction	NS	NS	S		S	NS	NS		

Table -R-19-AST-6 (g): Effect of phosphorus levels on forage yield of promising entries of Berseem (AVTB-2-MC)

Treatments	Plant population/m row length							
	NWZ			NEZ				Overall mean
	Pantnagar	Hisar	Mean	Ranchi	Ayodhya	Pusa	Mean	
Entries								
JHB-17-2	104.44	98.90	101.67	75.00	100.13	89.30	88.14	94.91
PC-91	108.33	100.27	104.30	73.00	100.26	91.80	88.35	96.33
JHB-17-1	108.67	108.37	108.52	71.00	101.08	94.20	88.76	98.64
Wardan (NC)	94.11	101.09	97.60	40.00	96.97	52.80	63.26	80.43
BB-2 (NWZ)	28.67	94.86	61.77					
BB-3 (NEZ)			101.67	62.00	100.97	55.80	72.92	
S.Em (±)	2.19	1.80		9.38	1.57	0.60		
C.D. (P=0.05)	7.27	5.94		NA	NS	1.80		
Phosphorus levels (kg /ha)								
60	82.87	96.47	89.67	60.00	98.16	73.50	77.22	83.45
80	91.33	101.10	96.22	72.00	100.28	77.20	83.16	89.69
100	92.33	104.52	98.43	60.00	101.21	79.60	80.27	89.35
S.Em (±)	1.99	1.25		7.28	1.08	0.50		
C.D. (P=0.05)	5.90	3.73		NS	NS	1.40		
Interaction	NS	NS		NS	NS	NS		

Table -R-19-AST-6 (h): Effect of phosphorus levels on forage yield of promising entries of berseem (AVTB-2-MC)

Treatments	Plant Height (cm)								
	NWZ				NEZ				Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Ranchi	Ayodhya	Pusa	Mean	
Entries									
JHB-17-2	51.97	55.30	50.70	52.66	45.00	57.78	51.40	51.39	52.02
PC-91	53.66	56.30	46.40	52.12	47.00	56.22	52.70	51.97	52.05
JHB-17-1	53.80	57.40	50.00	53.73	43.00	58.87	53.30	51.72	52.73
Wardan (NC)	54.27	56.40	41.00	50.56	44.00	55.65	48.10	49.25	49.90
BB-2 (NWZ)	47.96	53.40	50.30	50.55					
BB-3 (NEZ)					47.00	57.18	49.10	51.09	
S.Em (±)	1.08	0.90	0.90		0.58	1.26	0.40		
C.D. (P=0.05)	3.56	NS	3.00		1.92	NS	1.10		
Phosphorus levels (kg /ha)									
60	51.66	53.50	43.90	49.69	43.00	54.53	50.00	49.18	49.43
80	52.40	56.20	48.60	52.40	44.00	57.29	51.20	50.83	51.62
100	52.93	57.60	50.60	53.71	48.00	59.00	51.50	52.83	53.27
S.Em (±)	0.63	0.70	0.90		0.97	0.75	0.30		
C.D. (P=0.05)	NS	2.00	2.60		2.87	2.21	0.90		
Interaction	NS	NS	NS		NS	NS	NS		

Table -R-19-AST-6 (i): Effect of phosphorus levels on forage yield of promising entries of Berseem (AVTB-2-MC)

Treatments	Leaf Stem ratio							
	NWZ				NEZ			Overall mean
Entries	**Pantnagar**	**Hisar**	**Ludhiana**	**Mean**	**Ayodhya**	**Pusa**	**Mean**	
JHB-17-2	0.66	0.72	0.69	0.69	0.71	0.71	0.71	0.70
PC-91	0.63	0.74	0.68	0.68	0.70	0.70	0.70	0.69
JHB-17-1	0.69	0.82	0.77	0.76	0.72	0.74	0.73	0.75
Wardan (NC)	0.66	0.75	0.64	0.68	0.69	0.73	0.71	0.69
BB-2 (NWZ)	0.78	0.68	0.63	0.70				
BB-3 (NEZ)					0.71	0.70	0.71	
S.Em (±)	0.01	0.02	0.03		0.01	0.01		
C.D. (P=0.05)	0.03	0.06	0.09		NS	0.02		
Phosphorus levels (kg /ha)								
60	0.69	0.70	0.55	0.65	0.69	0.70	0.70	0.67
80	0.69	0.75	0.74	0.73	0.71	0.72	0.72	0.72
100	0.68	0.78	0.76	0.74	0.71	0.73	0.72	0.73
S.Em (±)	0.01	0.01	0.02		0.01	0.01		
C.D. (P=0.05)	NS	0.04	0.06			0.01		
Interaction	NS	S	NS		NS	NS		

R-19-AST-7: Effect of N levels on forage yield of promising entries of single cut oat (AVT-2 SC) **[Table Reference: R-19-AST-7(a)-(n)]**

Locations: (8)
HZ: Palampur, Srinagar
NWZ: Hisar, Ludhiana, Pantnagar
CZ: Urulikanchan, Anand, Raipur

AVT trial on oat was conducted in three zones of the country to study the response of nitrogen fertilizer on yield and quality of promising entries of oat under single cut system. In the trial, five single cut entries (SKO-240, OL-1896, HFO- 529, HFO-718 andJO-05-09 along with two national checks namely; OS-6 and Kent and three zonal checks *viz.*, SKO-90 (HZ), RO-11-1 (NWZ), JHO-2009-1 (CZ), were evaluated at eight locations in the country. The four nitrogen levels (30, 60, 90 and 120 kg N /ha) were imposed on entries to see the response. The nitrogen was applied in two splits i.e., 60% of nitrogen as basal +40% at 40 DAS as top dressing. The experiment was conducted in split plot design with entries in main plot.

In Hill zone, Kent (NC) recorded highest GFY (353.5 q/ha), which was on par with JO-05-09(350.1q/ha). But in case of dry matter yield, NC Kent (74.0q/ha) and zonal check SKO-96 (77.7q/ha) recorded highest value which was on par with (HFO 529 & JO-05-09. As regards to crude protein, JO-05-09(6.53q/ha) recorded highest yield.
In North West zone, HFO-718 recorded highest GFY and dry matter yield (618.3 and 131.9q/ha), which was 6.7 and 4.7 percent higher over best check RO-11-1 (ZC-NWZ). However, in case of crude protein content and yield HFO- 529 was better, but it was at par with HFO-718.
In central zone, HFO-529(448.3 and 104.9q/ha)recorded highest GFY and dry matter yield, which was 6.0 and 19.2 percent higher over best check JHO- 2009-1 (ZC- CZ). The entry HFO-529(11.43q/ha) also recorded highest crude protein content and yield in the zone.

On overall mean basis, HFO-718 proved highest yielder in term of GFY (467.9 q/ha) followed by HFO-529 (456.7 q/ha). HFO-529 recorded higher DMY as well as CP yield (105.2 and 10.30 q/ha) but was on par with HFO-718. The interaction effect of entries with nitrogen significant at some centres in terms of GFY, DMY and CP Yields. On overall mean, basis application of 120 kg N/ha recorded significantly higher yield (493.79 q green and 110.49q dry matter per hectare) than lower doses. It recorded 30.3, 14.5 and 7.9% higher green fodder and 30.3, 17.1 and 10.5 percent higher dry matter yield over 30,60 and 90 kg N/ha, respectively. The response equation for Hill zone was worked out to be $y = -0.0179x^2 + 4.4027x + 119.3$ (R^2- 0.9974) with Agronomic Maxima of 123 kg N ha^{-1} and Agronomic Optima 119.6.

Table R-19-AST-7 (a): Effect of nitrogen levels on green forage yield of promising entries of single cut Oat (AVTO-2)

Treatments	Green forage yield (q/ha)											
	HZ			NWZ				CZ				Overall mean
	Palampur	Srinagar	Mean	Hisar	Ludhiana	Pantnagar	Mean	Urulikanchan	Anand	Raipur	Mean	
Entries												
OL-1896	299.5	303.3	301.4	544.6	537.9	575.1	552.5	594.5	352.4	353.7	433.5	445.1
HFO-718	328.0	318.0	323.0	609.9	573.5	671.6	618.3	537.8	388.5	315.8	414.0	467.9
HFO- 529	285.5	386.7	336.1	612.2	509.4	514.8	545.5	550.1	467.7	327.3	448.3	456.7
JO-05-09	333.7	366.6	350.1	586.6	525.0	625.8	579.1	562.2	366.8	249.9	392.9	452.1
SKO-240	308.8	347.8	328.3	657.6	449.0	458.3	521.6	533.6	285.8	300.2	373.2	417.6
Kent (NC)	311.0	396.0	353.5	613.8	444.3	475.5	511.2	504.6	421.5	220.1	382.1	423.4
OS-6(NC)	274.8	319.2	297.0	595.9	481.0	491.8	522.9	517.9	371.5	245.7	378.4	412.2
SKO-96 (ZC-HZ)	305.5	375.7	340.6									
RO-11-1 (ZC-NWZ)				549.2	582.1	608.0	579.8					
JHO- 2009-1 (ZC- CZ)								508.2	396.6	254.4	386.4	
S.Em (±)	5.61	5.62		16	15	11.91		9.56	12.3	5.98		
C.D. (P=0.05)	17.00	17.07		49.1	45.6	36.49		29.29	37.31	18.31		
Nitrogen levels (kg N/ha)												
30	175.8	291.9	233.9	535.8	480.0	531.0	515.6	481.1	293.5	240.2	338.3	378.7
60	304.3	342.2	323.2	584.1	502.9	548.0	545.0	529.0	366.1	272.8	389.3	431.2
90	352.3	380.7	366.5	622.7	517.1	552.4	564.1	528.0	406.6	302.0	412.2	457.7
120	391.0	391.8	391.4	642.3	551.1	578.9	590.8	616.3	459.2	318.6	464.7	493.7
S.Em (±)	3.51	4.25		11.2	5.9	4.842		7.68	6.42	3.55		
C.D. (P=0.05)	9.97	12.1		32.0	16.6	13.81		21.9	18.25	10.13		
Interaction	S	S		NS	NS	NS		S	NS	NS		

Table R-19-AST-7 (b): Effect of nitrogen levels on dry matter yield of promising entries of single cut Oat (AVTO-2)

Treatments	Dry matter yield (q/ha)											
	HZ			NWZ				CZ				Overall mean
	Palampur	Srinagar	Mean	Hisar	Ludhiana	Pantnagar	Mean	Urulikanchan	Anand	Raipur	Mean	
Entries												
OL-1896	58.5	72.3	65.4	150.4	124.2	96.9	123.9	122.7	75.1	78.0	91.9	97.3
HFO-718	63.7	76.2	69.9	165.9	111.3	118.3	131.9	110.5	87.6	67.4	88.5	100.1
HFO- 529	54.8	90.1	72.5	167.2	113.8	100.9	127.3	141.0	102.8	70.8	104.9	105.2
JO-05-09	62.2	82.8	72.5	160.6	106	112.1	126.3	143.2	76.7	48.1	89.3	99.0
SKO-240	59.7	80.4	70.1	180.8	94.6	98.5	124.6	99.9	52.3	61.7	71.3	91.0
Kent (NC)	60.4	87.7	74.0	168.6	89.2	101.1	119.6	129.3	84.8	42.6	85.6	95.5
OS-6(NC)	54.1	68.9	61.5	162.6	111.3	106.2	126.7	138.8	77.2	45.7	87.2	95.6
SKO-96 (ZC-HZ)	56.9	98.4	77.7									
RO-11-1 (ZC-NWZ)				151.6	113.5	94.2	119.8					
JHO- 2009-1 (ZC- CZ)								134.6	73.1	56.9	88.2	
S. Em (±)	1.06	3.29		5.30	2.90	3.34		2.24	3.50	2.02		
C.D. (P=0.05)	3.22	10.0		16.3	8.81	10.23		6.87	10.62	6.20		
Nitrogen levels (kg /ha)												
30	33.90	63.66	48.78	141.9	95.5	99.3	112.3	121.59	59.44	49.2	76.74	83.1
60	58.45	80.54	69.50	161.7	104.2	102.7	122.9	122.53	75.25	56.5	84.76	95.2
90	68.06	89.31	78.69	173	108.2	102.5	127.9	120.08	83.15	61.7	88.31	100.8
120	74.76	94.88	84.82	177.3	124.1	109.7	137.0	145.78	96.83	68.2	103.60	111.4
S.Em (±)	0.69	2.18		3.40	1.60	1.20		1.91	2.53	1.03		
C.D. (P=0.05)	1.94	6.21		9.70	4.42	3.44		5.46	7.20	2.95		
Interaction	S	NS		NS	NS	S		S	NS	NS		

Table R-19-AST-7 (c): Effect of nitrogen levels on per day green fodder productivity of promising entries of single cut Oat (AVTO-2)

Treatments	Green fodder productivity (q/ha/day)								
	HZ			NWZ				CZ	Overall mean
	Palampur	Srinagar	Mean	Hisar	Ludhiana	Pantnagar	Mean	Raipur	
Entries									
OL-1896	2.29	1.31	1.80	4.47	4.56	5.06	4.70	4.48	3.70
HFO-718	2.49	1.38	1.94	5.00	4.86	5.86	5.24	3.63	3.87
HFO- 529	2.19	1.68	1.94	5.02	4.32	4.57	4.64	4.25	3.67
JO-05-09	2.42	1.59	2.01	4.81	4.45	5.54	4.93	3.16	3.66
SKO-240	2.35	1.65	2.00	5.39	3.81	3.69	4.30	3.37	3.38
Kent (NC)	2.36	1.71	2.04	5.03	3.77	4.22	4.34	2.82	3.32
OS-6(NC)	2.09	1.38	1.74	4.88	4.08	4.37	4.44	3.32	3.35
SKO-96 (ZC-HZ)	2.21	1.65	1.93						
RO-11-1 (ZC-NWZ)				4.50	4.93	5.29	4.91		
JHO- 2009-1 (ZC- CZ)								3.07	
S.Em (±)	0.04	0.26		0.13	0.13	0.13		0.07	
C.D. (P=0.05)	0.13	0.81		0.4	0.39	0.42		0.22	
Nitrogen levels (kg/ha)									
30	1.34	1.26	1.30	4.39	4.07	4.636	4.37	2.97	3.11
60	2.29	1.48	1.89	4.79	4.26	4.782	4.61	3.38	3.50
90	2.65	1.65	2.15	5.1	4.38	4.818	4.77	3.74	3.72
120	2.93	1.70	2.32	5.27	4.67	5.064	5.00	3.95	3.93
S.Em (±)	0.03	0.20		0.09	0.05	0.04		0.04	
C.D. (P=0.05)	0.08	0.57		0.27	0.14	0.12		0.131	
Interaction	S	S		NS	NS	NS		NS	

Table R-19-AST-7 (d): Effect of nitrogen levels on per day dry matter productivity of promising entries of single cut Oat (AVTO-2)

Treatments	Dry matter productivity (q/ha/day)								
	HZ			NWZ				CZ	Overall mean
	Palampur	Srinagar	Mean	Hisar	Ludhiana	Pantnagar	Mean	Raipur	
Entries									
OL-1896	0.45	0.31	0.38	1.23	1.05	0.86	1.05	0.99	0.81
HFO-718	0.49	0.33	0.41	1.36	0.94	1.03	1.11	0.77	0.82
HFO- 529	0.41	0.39	0.40	1.37	0.96	0.90	1.08	0.92	0.82
JO-05-09	0.46	0.36	0.41	1.32	0.9	1.00	1.07	0.61	0.77
SKO-240	0.45	0.34	0.40	1.48	0.8	0.81	1.03	0.69	0.76
Kent (NC)	0.46	0.38	0.42	1.38	0.76	0.91	1.02	0.55	0.74
OS-6(NC)	0.41	0.29	0.35	1.33	0.94	0.94	1.07	0.62	0.76
SKO-96 (ZC-HZ)	0.42	0.43	0.43						
RO-11-1 (ZC-NWZ)				1.24	0.96	0.82	1.01		
JHO- 2009-1 (ZC- CZ)								0.69	
S.Em (±)	0.01	0.15		0.04	0.02	0.02		0.02	
C.D. (P=0.05)	0.03	0.47		0.13	0.07	0.08		0.08	
Nitrogen levels (kg /ha)									
30	0.26	0.27	0.27	1.16	0.81	0.87	0.95	0.61	0.66
60	0.44	0.35	0.40	1.33	0.88	0.89	1.03	0.70	0.77
90	0.51	0.38	0.45	1.42	0.92	0.90	1.08	0.76	0.82
120	0.56	0.41	0.49	1.45	1.05	0.96	1.15	0.84	0.88
S.Em (±)	0.10	0.10	0.10	0.03	0.01	0.01	0.31	0.01	
C.D. (P=0.05)	0.26	0.27	0.27	0.08	0.81	0.08	0.95	0.04	
Interaction	NS	NS		NS	NS	S			

Table R-19-AST-7 (e): Effect of nitrogen levels on crude protein yield of promising entries of single cut Oat (AVTO-2)

Treatments	Crude Protein Yield (q/ha)										
	HZ			NWZ			CZ				Overall mean
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Mean	Urulikanchan	Anand	Raipur	Mean	
Entries											
OL-1896	5.61	6.65	6.13	13.64	10.60	12.12	10.89	11.50	7.10	9.83	9.43
HFO-718	5.79	5.75	5.77	15.43	10.48	12.96	9.38	13.22	5.80	9.47	9.41
HFO- 529	5.29	6.40	5.85	15.25	10.86	13.06	11.44	16.75	6.10	11.43	10.30
JO-05-09	5.80	7.25	6.53	14.36	9.86	12.11	12.67	12.39	4.10	9.72	9.49
SKO-240	5.57	7.32	6.45	16.01	10.59	13.30	8.43	8.41	5.70	7.51	8.86
Kent (NC)	5.56	7.04	6.30	15.46	10.43	12.94	11.59	13.46	3.40	9.48	9.56
OS-6(NC)	5.10	5.90	5.50	14.57	10.95	12.76	12.19	12.17	4.00	9.45	9.27
SKO-96 (ZC-HZ)	5.29	7.35	6.32								
RO-11-1 (ZC-NWZ)				13.88	10.34	12.11					
JHO- 2009-1 (ZC- CZ)							11.61	11.81	5.60	9.67	
S.Em (±)	0.15	0.17		0.54	0.20		0.20	0.62	0.20		
C.D. (P=0.05)	0.45	0.52		NS	0.61		0.61	1.88	0.62		
Nitrogen levels (kg /ha)											
30	2.92	5.82	4.37	12.17	10.08	11.13	10.22	8.40	4.10	7.57	7.67
60	5.18	6.53	5.86	14.44	10.53	12.48	10.70	12.18	4.90	9.26	9.21
90	6.53	7.12	6.83	16.01	10.76	13.39	10.70	13.49	5.50	9.90	10.02
120	7.37	7.37	7.37	16.68	10.69	13.68	12.48	15.78	6.40	11.55	10.97
S.Em (±)	0.09	0.11		0.34	0.12		0.17	0.44	0.10		
C.D. (P=0.05)	0.24	0.33		0.96	0.34		0.47	1.24	0.29		
Interaction	S	NS		NS	NS		S	NS	S		

Table R-19-AST-7 (f): Effect of nitrogen levels on crude protein content of promising entries of single cut Oat (AVTO-2)

Treatments	Crude Protein (%)									
	HZ			NWZ			CZ			Overall mean
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Mean	Anand	Raipur	Mean	
Entries										
OL-1896	9.40	9.32	9.36	9.02	10.60	9.81	15.17	9.10	12.14	10.44
HFO-718	8.90	7.85	8.38	9.28	10.48	9.88	14.93	8.60	11.77	10.01
HFO- 529	9.20	6.97	8.09	9.13	10.86	10.00	16.10	8.60	12.35	10.15
JO-05-09	9.50	8.52	9.01	8.92	9.86	9.39	16.15	8.40	12.28	10.23
SKO-240	9.10	8.26	8.68	8.85	10.59	9.72	16.10	9.20	12.65	10.35
Kent (NC)	9.30	8.01	8.66	9.13	10.43	9.78	15.96	7.90	11.93	10.12
OS-6(NC)	9.20	7.82	8.51	8.93	10.95	9.94	15.62	8.80	12.21	10.22
SKO-96 (ZC-HZ)	9.30	8.01	8.66							
RO-11-1 (ZC-NWZ)				9.13	10.34	9.74				
JHO- 2009-1 (ZC- CZ)							16.02	9.80	12.91	
S.Em (±)	0.17	0.26		0.08	0.20		0.45	0.16		
C.D. (P=0.05)	NS	0.79		0.23	0.6		NS	0.5		
Nitrogen levels (kg /ha)										
30	8.7	6.92		8.58	10.08	9.33	14.06	8.40	11.23	9.61
60	8.9	7.90		8.95	10.53	9.74	16.19	8.70	12.45	10.45
90	9.6	8.44		9.25	10.76	10.01	16.34	8.90	12.62	10.74
120	9.9	9.11		9.41	10.69	10.05	16.43	9.30	12.87	10.99
S.Em (±)	0.13	0.12		0.08	0.12		0.30	0.05		
C.D. (P=0.05)	0.37	0.36		0.22	0.34		0.85	0.14		
Interaction	NS	NS		NS	NS		NS	S		

Table R-19-AST-7 (g): Effect of nitrogen levels on plant height of promising entries of single cut Oat (AVTO-2)

Treatments	Plant height (cm)										
	HZ			NWZ				CZ			Overall mean
	Palampur	Srinagar	Mean	Hisar	Ludhiana	Pantnagar	Mean	Anand	Raipur	Mean	
Entries											
OL-1896	113.8	85.6	99.7	122.9	151.7	162.7	145.8	153.3	142.0	147.6	133.1
HFO-718	117.5	106.1	111.8	134.8	152.2	172.4	153.1	153.4	140.6	147.0	139.6
HFO- 529	116.1	117.4	116.7	135.7	150.3	157.8	147.9	148.2	141.0	144.6	138.1
JO-05-09	83.6	110.1	96.8	129.5	136.0	157.1	140.9	135.3	124.9	130.1	125.2
SKO-240	114.5	99.5	107.0	142.0	116.0	148.5	135.5	132.3	133.2	132.8	126.6
Kent (NC)	115.0	124.0	119.5	136.6	102.3	143.9	127.6	137.8	115.2	126.5	125.0
OS-6(NC)	119.0	96.0	107.5	131.3	104.2	155.5	130.3	138.9	117.3	128.1	123.2
SKO-96 (ZC-HZ)	83.1	114.9	99.0								
RO-11-1 (ZC-NWZ)				124.1	155.3	172.3	150.6				
JHO- 2009-1 (ZC- CZ)								134.3	122.2	128.2	
S.Em (±)	1.68	1.7		2.42	2.1	4.82		2.7	2.19		
C.D. (P=0.05)	5.08	5.18		7.4	6.4	14.77		8.19	6.72		
Nitrogen levels (kg /ha)											
30	84.7	75.5	80.1	124.1	123.7	160.3	136.0	129.6	123.5	126.5	117.3
60	108.7	103.5	106.1	130.0	131.7	160.5	140.7	140.5	130.4	135.5	129.3
90	116.6	116.9	116.7	136.3	136.9	159.5	144.2	143.6	130.4	137.0	134.3
120	121.3	130.8	126.1	138.1	141.7	154.8	144.9	153.0	133.9	143.4	139.1
S.Em (±)	1.19	1.41		1.95	1.00	3.02		1.77	1.06		
C.D. (P=0.05)	3.37	4.03		5.55	2.70	NS		5.03	3.02		
Interaction	**S**	S		NS	NS	NS		NS	NS		

Table R-19-AST-7 (h): Effect of nitrogen levels on leaf stem ratio of promising entries of single cut Oat (AVTO-2)

Treatments	Leaf stem ratio								
	HZ			NWZ				CZ	Overall mean
	Palampur	Srinagar	Mean	Hisar	Ludhiana	Pantnagar	Mean	Raipur	
Entries									
OL-1896	0.67	0.30	0.49	0.43	0.46	0.38	0.42	0.44	0.45
HFO-718	0.66	0.33	0.50	0.50	0.54	0.31	0.45	0.41	0.46
HFO- 529	0.66	0.41	0.54	0.51	0.46	0.32	0.43	0.35	0.45
JO-05-09	1.40	0.38	0.89	0.47	0.49	0.40	0.45	0.34	0.58
SKO-240	0.67	0.31	0.49	0.56	0.56	0.33	0.48	0.40	0.47
Kent (NC)	0.66	0.44	0.55	0.52	0.51	0.27	0.43	0.26	0.44
OS-6(NC)	0.68	0.37	0.53	0.48	0.43	0.27	0.39	0.20	0.41
SKO-96 (ZC-HZ)	1.43	0.45	0.94						
RO-11-1 (ZC-NWZ)				0.44	0.54	0.36			
JHO- 2009-1 (ZC- CZ)							0.45	0.35	
S.Em (±)	0.04	0.02		0.01	0.01	0.01		0.01	
C.D. (P=0.05)	0.12	0.08		0.03	0.03	0.04		0.04	
Nitrogen levels (kg /ha)									
30	0.64	0.25	0.45	0.41	0.37	0.34	0.37	0.29	0.38
60	0.82	0.36	0.59	0.47	0.48	0.31	0.42	0.34	0.46
90	0.94	0.43	0.69	0.52	0.52	0.32	0.45	0.36	0.52
120	1.02	0.47	0.75	0.56	0.62	0.35	0.51	0.39	0.57
S.Em (±)	0.01	0.01		0.01	0.01	0.01		0.01	
C.D. (P=0.05)	0.03	0.03		0.02	0.02	0.02		0.02	
Interaction	S	S		S	S	NS		S	

Table R-19-AST-7 (i): Effect of Nitrogen levels on no. of tillers (sq. m^{-1})

Treatments	No. of tillers (sq. m^{-1})										
	HZ			NWZ				CZ			Overall mean
	Palampur	Srinagar	Mean	Hisar	Ludhiana	Pantnagar	Mean	Anand	Raipur	Mean	
Entries											
OL-1896	79.50	84.74	82.12	52.10	69.50	129.72	83.77	73.08	102.90	87.99	84.51
HFO-718	76.70	84.45	80.58	64.50	71.40	142.67	92.86	75.92	106.00	90.96	88.81
HFO- 529	87.10	94.23	90.67	66.00	73.30	137.03	92.11	64.83	106.70	85.77	89.88
JO-05-09	92.50	95.05	93.78	59.00	63.40	136.63	86.34	74.42	115.50	94.96	90.93
SKO-240	94.00	93.78	93.89	74.10	51.30	122.31	82.57	74.08	112.40	93.24	88.85
Kent (NC)	93.50	98.87	96.19	66.30	67.50	142.73	92.18	79.33	121.00	100.17	95.60
OS-6(NC)	88.00	80.11	84.06	61.10	52.80	151.95	88.62	57.92	118.40	88.16	87.18
SKO-96 (ZC-HZ)	88.30	91.00	89.65								
RO-11-1 (ZC-NWZ)				53.10	65.80	132.73	83.88				
JHO- 2009-1 (ZC- CZ)								67.50	101.00	84.25	
S.Em (±)	1.62	3.04		1.60	1.00	2.35		1.87	1.76		
C.D. (P=0.05)	4.09	9.22		4.90	3.20	7.19		5.67	5.40		
Nitrogen levels (kg /ha)											
30	70.20	78.04	74.12	57.40	61.30	133.57	84.09	61.88	98.20	80.04	80.08
60	87.50	88.45	87.98	61.00	64.50	131.21	85.57	70.88	105.50	88.19	87.01
90	94.00	94.63	94.32	64.30	65.20	138.35	89.28	74.17	116.60	95.39	92.46
120	98.10	100.00	99.05	65.50	66.40	144.76	92.22	76.63	121.60	99.12	96.14
S.Em (±)	0.75	1.64		1.10	0.10	2.34		0.99	0.98		
C.D. (P=0.05)	2.12	4.69		3.20	0.30	6.68		2.81	2.79		
Interaction	NS	NS		NS	S	S		NS	S		

R 19- AST-7(j): Interaction effect of nitrogen levels and promising entries of single cut oat (AVT-2SC) on green and dry fodder yields -Palampur

Treatments	Green fodder yield (q/ha)				
	N levels (kg/ha)				
Entries	**30**	**60**	**90**	**120**	**Mean**
OL-1896	150.00	315.33	348.67	384.00	299.50
HFO-718	190.00	328.67	376.00	417.33	328.00
HFO- 529	154.67	262.00	343.33	382.00	285.50
JO-05-09	181.33	328.00	392.00	433.33	333.67
SKO-240	230.67	298.00	345.33	361.33	308.83
Kent (NC)	210.67	290.00	354.00	389.33	311.00
OS-6(NC)	194.67	271.33	303.33	330.00	274.83
SKO-96 (ZC-HZ)	94.67	340.67	356.00	430.67	305.50
Mean	175.83	304.25	352.33	391.00	
	V	**N**	**VXN**		
S.Em (±)	5.61	3.51	9.92		
C.D. (P=0.05)	17.00	9.97	28.20		
Dry Fodder yield (q/ha)					
OL-1896	28.55	63.17	69.50	72.83	58.51
HFO-718	36.23	64.42	72.77	81.24	63.66
HFO- 529	30.29	50.57	65.81	72.71	54.84
JO-05-09	33.00	60.68	73.30	81.90	62.22
SKO-240	44.90	57.81	66.99	69.21	59.73
Kent (NC)	42.20	57.81	67.14	74.23	60.35
OS-6(NC)	38.15	51.64	60.77	65.78	54.09
SKO-96 (ZC-HZ)	17.89	61.50	68.19	80.19	56.94
Mean	33.90	58.45	68.06	74.76	
	V	**N**	**VXN**		
S.Em (±)	1.06	0.69	1.94		
C.D. (P=0.05)	3.22	1.94	5.50		

R 19- AST-7(k): Interaction effect of nitrogen levels x promising entries of single cut oat (AVT-2SC) on CP yield -Palampur

Entries	Crude protein yield (q/ha)				
	N levels (kg/ha)				
Entries	**30**	**60**	**90**	**120**	**Mean**
OL-1896	2.43	6.06	6.74	7.19	5.61
HFO-718	2.98	5.29	6.99	7.91	5.79
HFO- 529	2.64	4.58	6.52	7.42	5.29
JO-05-09	2.90	5.34	6.85	8.12	5.80
SKO-240	3.93	5.07	6.45	6.86	5.57
Kent (NC)	3.69	4.91	6.45	7.20	5.56
OS-6(NC)	3.22	4.82	5.85	6.50	5.10
SKO-96 (ZC-HZ)	1.61	5.39	6.36	7.77	5.29
Mean	2.92	5.18	6.53	7.37	
	V	**N**	**VXN**		
S. Em (±)	0.15	0.09	0.24		
C.D. (P=0.05)	0.45	0.25	0.71		

Table R 19- AST-7(l): Interaction effect of nitrogen levels and promising varieties on green fodder yield of oat (AVT-2SC) - Anand

Entries	Green fodder yield (q/ha)			
	N levels (kg/ha)			
	30	**60**	**90**	**120**
OL-1896	259.03	333.44	389.00	428.00
HFO-718	280.78	378.67	430.33	464.33
HFO- 529	377.89	419.44	481.67	591.67
JO-05-09	291.67	350.00	416.67	408.67
SKO-240	244.33	283.33	284.67	330.67
Kent (NC)	347.22	394.44	419.44	525.00
OS-6(NC)	280.56	350.00	397.22	458.33
JHO- 2009-1 (ZC- CZ)	266.56	419.67	433.44	466.56
S. Em (±)	18.15			
C.D. (P=0.05)	51.61			

Table R 19- AST-7(m): Interaction effect of nitrogen levels and promising varieties on dry matter yield of oat (AVT-2SC) - Anand

Treatments	Dry matter yield (q/ha)			
	N levels (kg/ha)			
Entries	**30**	**60**	**90**	**120**
OL-1896	59.15	77.34	81.71	82.00
HFO-718	58.54	71.21	104.71	115.77
HFO- 529	76.24	98.96	98.98	
JO-05-09	56.72	62.90	85.12	
SKO-240	49.92	54.64	49.95	
Kent (NC)	72.89	92.35	84.59	
OS-6(NC)	56.27	69.77	77.21	
JHO- 2009-1 (ZC- CZ)	45.81	74.87	82.92	88.62
S.Em (±)	7.17			
C.D. (P=0.05)	20.38			
CV%	15.78			

Table R 19- AST-7(n): Interaction effect of nitrogen levels and promising varieties of on CP yield of oat (AVT-2SC)- Anand

Treatments	Crude protein yield (q/ha)			
	N levels (kg/ha)			
Entries	**30**	**60**	**90**	**120**
OL-1896	7.92	12.37	12.89	12.83
HFO-718	7.90	10.98	15.11	18.88
HFO- 529	11.27	16.47	15.91	23.36
JO-05-09	8.19	11.14	13.83	16.39
SKO-240	6.32	8.77	8.65	9.88
Kent (NC)	10.98	14.05	14.28	14.56
OS-6(NC)	8.10	10.78	12.99	16.81
JHO- 2009-1 (ZC- CZ)	6.56	12.87	14.23	13.58
S.Em (±)	1.24			
C.D. (P=0.05)	3.52			
CV%	17.18			

R-19-AST-8: Effect of N levels on forage yield of promising entries of multi cut oat (AVT-2 MC) [Table Reference: R-19-AST-8 (a)-(i)]

Locations: (5)
NWZ: Pantnagar, Hisar, Ludhiana
CZ: Anand, Rahuri

AVT trial on multicut was conducted at five locations spread over two zones of the country to study the response of nitrogen fertilizer on yield and quality of promising entries of oat under multicut system. In the trial, two multicut entries (OL-1874 and JO-05-304) along with two national checks namely; UPO-212 and RO-19 were evaluated for their responsiveness to nitrogen fertilizer. The four nitrogen levels (35, 70,105, and 140 kg N /ha) were imposed on entries to see the response. The nitrogen was applied in two splits i.e., 50% of nitrogen as basal + 25% at 40 DAS and remaining 25% after first cut as top dressing. The experiment was conducted in split plot design with entries in main plot.

In North West zone, national check RO-19 recorded highest green fodder yield (501.9 q/ha) which was closely followed by JO-05-304 (488.2 q/ha). In terms of dry matter yields entry JO-05-304 proved superior (105.7q/ha) and it was closely followed by national check RO-19(103.6 q/ha). Other entries recorded lower yields in terms of CP yields, OL-1874 and JO-05-304 recorded superior yields over both checks. In Central Zone, national check RO-19 recorded highest green fodder, dry matter and crude protein yields (538.0, 116.8 and 15.01 q/ha, respectively). It was followed by entry OL-1874, which recorded 484.9, 102.9 and 13.32 q green fodder, dry matter and crude protein yields /ha, respectively. On overall mean basis, also national check RO-19 recorded highest green fodder, dry matter and crude protein yields (516.3, 108.91 and 14.79 q/ha, respectively). It was followed by entry JO-05-304 in terms of GFY and DFY, which recorded 481.8, 102.58 q/ha, respectively. The interaction effect of entries with nitrogen significant at some centre in terms of GFY, DMY and CP Yields. On overall mean basis, linear response to nitrogen application was noted. Application of 140 kg N/ha recorded significantly higher yield (544.3 q green and 118.32q dry matter and 17.33q CP yield per hectare) than lower doses. It recorded 26.81, 33.2 and 58.3% higher green fodder, dry matter and CP yields over 35 kg N/ ha respectively. The respective improvement over dose of 105 kg N/ ha was to the tune of 7.5, 9.5 and 17.4 percent. The response equation for North West zone was worked out to be $y=y=-0.0034x^2+1.4756x+386.62$ (R^2- 0.9985) with Agronomic Maxima of 217 kg N ha^{-1} and Agronomic Optima 199 kg N ha^{-1}. The response equation for Central zone was worked out to be $y = 0.0021x^2 + 0.872x + 392.75$ (R^2- 0.9998) with Agronomic Maxima of 208 kg N ha^{-1} and Agronomic Optima 178 kg N ha^{-1}.

Table R-19-AST- 8 (a): Effect of nitrogen levels on green forage yield of promising entries of multi cut Oat (AVT-2 MC)

Treatments	Green fodder Yield (q/ha)							
	NWZ				CZ			Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Anand	Rahuri	Mean	
Entries								
OL-1874	396.4	406.5	604.5	469.1	475.7	494.1	484.9	475.5
JO-05-304	411.3	398.8	654.4	488.2	472.2	472.3	472.3	481.8
UPO-212 (NC)	399.5	428.7	607.2	478.5	448.6	485.7	467.2	473.9
RO-19 (NC)	419.6	408.4	677.6	501.9	527.8	548.3	538.0	516.3
S.Em (±)	11.21	9.67	7.80		4.97	16.04		
C.D. (P=0.05)	NS	NS	27.00		17.20	55.51		
Nitrogen levels (kg /ha)								
35	367.8	375.3	561.0	434.7	415.3	426.8	425.6	429.2
70	410.9	398.9	604.4	471.4	447.9	475.6	465.0	467.5
105	429.6	424.5	663.3	505.8	503.5	511.3	506.9	506.4
140	418.6	443.6	715.1	525.8	557.6	586.8	556.7	544.3
S.Em (±)	7.55	7.10	6.10		2.84	5.79		
C.D. (P=0.05)	22.16	20.70	17.90		8.30	16.89		
Interaction	NS	NS	S		S	NS		

Table R-19-AST-8 (b): Effect of nitrogen levels on dry matter yield of promising entries of multi cut oat (AVT-2 MC)

Treatments	Dry matter Yield (q/ha)							
	NWZ				CZ			Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Anand	Rahuri	Mean	
Entries								
OL-1874	50.55	133.39	123.10	102.35	103.60	102.28	102.94	102.58
JO-05-304	52.28	130.08	134.80	105.73	100.01	93.61	96.81	102.16
UPO-212 (NC)	49.68	140.73	109.20	99.86	94.64	99.88	97.26	98.83
RO-19 (NC)	49.13	134.36	127.40	103.64	109.32	124.32	116.82	108.91
S.Em (±)	1.35	3.45	2.10		3.37	3.47		
C.D. (P=0.05)	NS	NS	7.40		NS	12.01		
Nitrogen levels (kg /ha)								
35	46.31	118.62	103.20	89.37	94.07	81.72	87.90	88.78
70	51.68	129.70	117.90	99.76	91.88	95.47	93.68	97.33
105	53.38	140.66	128.00	107.36	109.12	109.19	109.16	108.07
140	50.28	149.59	145.50	115.13	112.50	133.72	123.11	118.32
S.Em (±)	1.15	3.51	1.30		2.55	1.69		
C.D. (P=0.05)	3.38	10.30	3.90		7.43	4.93		
Interaction	NS	NS	S		NS	S		

Table R-19-AST-8 (c): Effect of nitrogen levels on per day productivity of forage yield of promising entries of multi cut oat (AVT-2 MC)

Treatments	Green forage productivity (q/ha/day)					
	NWZ				CZ	Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Rahuri	
Entries						
OL-1874	2.66	3.36	5.60	3.87	4.94	4.14
JO-05-304	2.76	3.29	6.06	4.04	4.46	4.14
UPO-212 (NC)	2.68	3.54	5.62	3.95	4.67	4.13
RO-19 (NC)	2.82	3.38	6.27	4.16	5.59	4.52
S.Em (±)	0.08	0.08	0.07		0.15	
C.D. (P=0.05)	NS	NS	0.25		NS	
Nitrogen levels (kg /ha)						
35	2.47	3.10	5.19	3.59	4.19	3.74
70	2.76	3.30	5.60	3.89	4.67	4.08
105	2.88	3.51	6.14	4.18	5.03	4.39
140	2.81	3.67	6.62	4.37	5.77	4.72
S.Em (±)	0.05	0.06	0.06		0.06	
C.D. (P=0.05)	0.15	0.17	0.17		0.17	
Interaction	NS	NS	S		NS	

Table R-19-AST-8 (d): Effect of nitrogen levels on per day productivity of forage yield of promising entries of multi cut Oat (AVT-2 MC)

Treatments	Dry matter productivity (q/ha/day)					
	NWZ				CZ	Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Rahuri	
Entries						
OL-1874	0.34	1.10	1.14	0.86	1.02	0.90
JO-05-304	0.35	1.08	1.25	0.89	0.88	0.89
UPO-212 (NC)	0.25	1.16	1.01	0.81	0.96	0.84
RO-19 (NC)	0.34	1.11	1.18	0.88	1.27	0.97
S.Em (±)	0.01	0.03	0.02		0.03	
C.D. (P=0.05)	0.04	NS	0.07		NS	
Nitrogen levels (kg /ha)						
35	0.25	0.98	0.96	0.73	0.80	0.75
70	0.33	1.07	1.09	0.83	0.94	0.86
105	0.33	1.16	1.19	0.89	1.07	0.94
140	0.36	1.24	1.35	0.98	1.32	1.07
S.Em (±)	0.007	0.03	0.01		0.02	
C.D. (P=0.05)	0.02	0.09	0.04		NS	
Interaction	S	NS	S		NS	

Table R-19-AST-8 (e): Effect of nitrogen levels on Crude Protein Yield of promising entries of multi cut Oat (AVT-2 MC)

Treatments	Crude Protein Yield (q/ha)						
	NWZ			CZ			Overall mean
	Hisar	Ludhiana	Mean	Anand	Rahuri	Mean	
Entries							
OL-1874	12.28	18.50	15.39	17.46	9.17	13.32	14.35
JO-05-304	11.62	18.50	15.06	17.03	7.39	12.21	13.64
UPO-212 (NC)	12.56	15.10	13.83	16.25	8.55	12.40	13.12
RO-19 (NC)	11.93	17.20	14.57	17.97	12.04	15.01	14.79
S.Em (±)	0.29	0.50		0.49	0.28		
C.D. (P=0.05)	NS	1.80		NS	0.95		
Nitrogen levels (kg /ha)							
35	9.96	13.00	11.48	14.30	6.53	10.42	10.95
70	11.45	16.40	13.93	15.43	8.13	11.78	12.85
105	12.90	17.90	15.40	18.40	9.84	14.12	14.76
140	14.08	22.00	18.04	20.57	12.65	16.61	17.33
S.Em (±)	0.35	0.30		0.46	0.19		
C.D. (P=0.05)	1.01	0.80		1.34	0.56		
Interaction	NS	S		NS	S		

Table R-19-AST-8 (f): Effect of nitrogen levels on plant height (cm) of promising entries of multi cut Oat (AVT-2 MC)

Treatments	Crude Protein (%)							
	NWZ				CZ			Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Anand	Rahuri	Mean	
Entries								
OL-1874	9.40	9.18	14.90	11.16	16.85	8.84	12.85	11.83
JO-05-304	9.84	8.87	13.70	10.80	16.92	7.81	12.37	11.43
UPO-212 (NC)	10.00	8.90	13.60	10.83	17.08	8.46	12.77	11.61
RO-19 (NC)	9.70	8.82	13.40	10.64	16.44	9.62	13.03	11.60
S.Em (±)	0.31	0.07	0.30		0.25	0.04		
C.D. (P=0.05)	NS	0.24	1.10		NS	0.15		
Nitrogen levels (kg /ha)								
35	9.42	8.40	12.60	10.14	15.18	7.93	11.56	10.71
70	9.40	8.80	13.90	10.70	16.84	8.44	12.64	11.48
105	9.99	9.17	14.00	11.05	16.91	8.96	12.94	11.81
140	10.13	9.41	15.20	11.58	18.35	9.39	13.87	12.50
S.Em (±)	0.29	0.12	0.20		0.21	0.06		
C.D. (P=0.05)	NS	0.36	0.50		0.61	0.18		
Interaction	NS	NS	NS		NS	NS		

Table R-19-AST- (g): Effect of nitrogen levels on plant height (cm) of promising entries of multi cut Oat (AVT-2 MC)

Treatments	Plant height (cm)							
	NWZ				CZ			Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Anand	Rahuri	Mean	
Entries								
OL-1874	90.50	111.40	113.50	105.13	110.45	86.21	98.33	102.41
JO-05-304	86.42	107.70	109.00	101.04	106.27	84.14	95.21	98.71
UPO-212 (NC)	88.18	116.50	100.30	101.66	99.87	84.52	92.20	97.87
RO-19 (NC)	91.29	112.20	103.40	102.30	107.55	88.18	97.87	100.52
S.Em (±)	0.69	2.70	1.40		1.40	1.05		
C.D. (P=0.05)	2.45	NS	5.00		4.83	3.63		
Nitrogen levels (kg /ha)								
35	86.05	103.30	101.40	96.92	97.90	82.88	90.39	94.31
70	88.19	110.00	104.80	101.00	102.90	83.82	93.36	97.94
105	90.67	115.00	108.70	104.79	108.47	86.41	97.44	101.85
140	91.48	119.50	111.30	107.43	114.87	89.94	102.41	105.42
S.Em (±)	0.98	1.60	0.90		1.11	0.76		
C.D. (P=0.05)	2.87	4.80	2.50		3.25	2.23		
Interaction	NS	NS	S		NS	S		

Table R-19-AST-8 (h): Effect of nitrogen levels on leaf stem ratio of promising entries of multi cut Oat (AVT-2 MC)

Treatments	Leaf Stem ratio (q/ha)					
	NWZ				CZ	Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Rahuri	
Entries						
OL-1874	0.77	0.36	0.74	0.62	0.84	0.68
JO-05-304	0.90	0.35	0.37	0.54	0.74	0.59
UPO-212 (NC)	0.85	0.40	0.80	0.68	0.80	0.71
RO-19 (NC)	0.81	0.37	0.57	0.58	0.92	0.67
S.Em (±)	0.03	0.01	0.03	0.02	0.02	
C.D. (P=0.05)	NS	NS	0.09		NS	
Nitrogen levels (kg /ha)						
35	0.80	0.29	0.51	0.53	0.73	0.58
70	0.81	0.35	0.56	0.57	0.80	0.63
105	0.86	0.40	0.66	0.64	0.86	0.69
140	0.85	0.43	0.75	0.68	0.91	0.74
S.Em (±)	0.02	0.01	0.03		0.01	
C.D. (P=0.05)	NS	0.03	0.08		NS	
Interaction	NS	NS	NS		NS	

Table R-19-AST-8 (i): Effect of nitrogen levels on No. of tillers per metre square of promising entries of multi cut Oat (AVT-2 MC)

Treatment	No. of tillers per metre square							
	NWZ				CZ			Overall mean
	Pantnagar	Hisar	Ludhiana	Mean	Anand	Rahuri	Mean	
Entries								
OL-1874	132.67	47.00	56.60	78.76	59.92	42.00	35.21	61.34
JO-05-304	137.17	44.40	57.80	79.79	56.12	41.33	33.23	61.16
UPO-212 (NC)	152.17	54.30	69.50	91.99	60.88	41.33	35.61	69.44
RO-19 (NC)	133.50	48.20	58.70	80.13	53.98	43.00	32.37	61.03
S.Em (±)	4.73	1.90	0.70		1.12	1.13		
C.D. (P=0.05)	NS	NS	2.50		3.89	3.93		
Nitrogen levels (kg /ha)								
35	132.50	42.60	57.90	77.67	53.94	40.33	32.01	59.40
70	136.58	46.80	60.00	81.13	54.72	41.33	32.53	61.69
105	146.00	50.70	61.10	85.93	60.78	42.33	35.68	65.83
140	140.41	53.80	63.50	85.90	61.46	43.67	36.19	66.02
S.Em (±)	4.18	1.20	1.00		0.85	0.82		
C.D. (P=0.05)	NS	3.40	2.90		2.49	2.40		
Interaction	S	NS	NS		NS	S		

R-19 AST 9: Effect of N levels on forage yield of promising entries of dual cut Oat (AVT-2 Dual cut) **Table Reference [(R-19-AST-9 (a to f)]**

Locations: (3)
NEZ: Jorhat
CZ: Anand, Raipur

AVT trial on dual purpose oat was conducted at three locations spread over two zones 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, five multi cut entries (OL-1876-2, OL-1906, HFO-611, JHO-17-4 and JO-10-506) along with two national checks namely; UPO-212 and JHO-822 were evaluated for their responsiveness to nitrogen fertilizer. The four nitrogen levels (35, 70,105, and 140 kg N /ha) were imposed on entries to see the response. The nitrogen was applied in two splits i.e., 50% of nitrogen as basal + 25% at 40 DAS and remaining 25% after first cut as top dressing. The experiment was conducted in split plot design with entries in main plot.

In North East zone, entry JHO-17-4 recorded highest green fodder and dry matter yield (152.80 and 29.03 q/ha) which was closely followed by national check JHO-822 (152.20 and 28.9 q/ha). Entry JHO-17-4 also recorded highest CP yields (2.07 q/ha).In Central Zone, entry JO-10-506 recorded highest green fodder, dry matter and crude protein yield (317.85, 43.25 and 6.17 q/ha, respectively). It was closely followed by entry OL-1876-2 which produced 290.93, 40.64 and 5.80 q green fodder, dry matter and crude protein yield per hectare, respectively

On overall mean basis, entry JO-10-506 recorded highest green fodder, dry matter and crude protein yield (259.47, 37.87 and 4.80 q/ha, respectively). It was closely followed by entry OL-1876-2 which produced 242.53 and 36.32 q green fodder and, dry matter yield per hectare, respectively. On overall mean basis, linear response to nitrogen application was noted up to 105 kg N/ha which produced (261.2 q green, 38.03 q dry matter and 5.29 q CP yield per hectare). Application of higher dose of 140 kg N/ha reduced the yields (248.0 q green, 36.86 q dry matter and 4.83 q CP yield per hectare). Application of 105 kg N/ha recorded 35.8, 33.4 and 56.5% higher green fodder, dry matter and CP yields over 35 kg N/ ha respectively.

The response equation for Central zone was worked out to be $y = -0.0147x^2 + 3.3486x + 116.66$ (R^2-0.9515) with Agronomic Maxima of 114 kg N ha^{-1} and Agronomic Optima 110 kg N ha^{-1}. The response equation for overall mean was worked out to be $y = -0.0097x^2 + 2.2731x + 122.29$ (R^2-0.9574) with Agronomic Maxima of 117 kg N ha^{-1} and Agronomic Optima 111 kg N ha^{-1}.

Table R-19-AST-9 (a): Effect of nitrogen levels on green fodder and dry matter yield of promising entries of dual cut Oat (AVT-2 Dual cut)

Treatment	Green Forage Yield (q/ha)					Dry Matter Yield (q/ha)				
	NEZ	CZ			Overall mean	NEZ		CZ		Overall mean
	Jorhat	Anand	Raipur	Mean		Jorhat	Anand	Raipur	Mean	
Entries										
JO-10-506	142.70	407.70	228.00	317.85	259.47	27.12	51.99	34.50	43.25	37.87
HFO-611	151.30	372.50	199.50	286.00	241.10	28.75	44.95	28.90	36.93	34.20
OL-1906	141.30	361.10	187.20	274.15	229.87	26.85	45.81	27.80	36.81	33.49
JHO-174-4	152.80	254.90	131.50	193.20	179.73	29.03	35.93	19.40	27.67	28.12
OL-1876-2	145.70	364.10	217.80	290.95	242.53	27.69	47.98	33.30	40.64	36.32
UPO-212 (NC)	140.50	366.60	183.80	275.20	230.30	26.70	46.10	29.40	37.75	34.07
JHO-822 (NC)	152.20	361.90	210.00	285.95	241.37	28.92	46.43	30.50	38.47	35.28
S. Em (±)	1.77	12.56	4.76			0.77	1.64	0.88		
C.D. (P=0.05)	5.25	38.70	13.54			2.25	5.07	2.49		
Nitrogen levels (kg /ha)										
35	138.20	267.50	171.40	219.45	192.37	26.25	34.45	24.80	29.63	28.50
70	143.20	344.70	192.10	268.40	226.67	27.20	44.17	28.70	36.44	33.36
105	149.50	439.70	194.50	317.10	261.23	28.41	56.18	29.50	42.84	38.03
140	155.80	370.30	217.90	294.10	248.00	29.60	47.59	33.40	40.50	36.86
S. Em (±)	1.11	7.91	3.00			0.21	1.22	0.66		
C.D. (P=0.05)	3.31	23.48	8.96			0.62	3.5	1.88		
Interaction	NS	NS	NS			NS	NS	NS		

Table R-19-AST-9 (b): Effect of nitrogen levels on productivity and quality of promising entries of dual cut Oat (AVT-2 dual cut)

Treatment	Crude Protein Yield (q/ha)					Crude Protein (%)					Green Forage Yield (q/ha/day)	Dry Matter Yield (q/ha/day)
	NEZ	CZ			Overall mean	NEZ	CZ			Overall mean	CZ	
Entries	**Jorhat**	**Anand**	**Raipur**	**Mean**		**Jorhat**	**Anand**	**Raipur**	**Mean**		**Raipur**	**Raipur**
JO-10-506	2.07	9.33	3.00	6.17	4.80	7.62	17.81	8.80	13.31	11.41	3.50	0.53
HFO-611	2.08	8.96	2.90	5.93	4.65	7.23	19.82	10.10	14.96	12.38	3.10	0.44
OL-1906	2.04	8.66	2.60	5.63	4.43	7.57	18.83	9.30	14.07	11.90	2.90	0.43
JHO-174-4	2.07	7.11	1.80	4.46	3.66	7.12	19.71	9.30	14.51	12.04	2.00	0.30
OL-1876-2	1.95	8.59	3.00	5.80	4.51	7.03	17.85	9.10	13.48	11.33	3.40	0.51
UPO-212 (NC)	2.05	8.97	2.70	5.84	4.57	7.67	19.36	9.20	14.28	12.08	2.80	0.45
JHO-822 (NC)	1.94	8.63	2.80	5.72	4.46	6.71	18.54	9.00	13.77	11.42	3.20	0.47
S.Em (±)	0.02	0.36	0.09			0.03	0.47	0.11			0.08	0.02
C.D. (P=0.05)	NS	1.10	0.25			0.08	1.44	0.31			0.24	0.05
Nitrogen levels (kg /ha)												
35	1.83	6.12	2.20	4.16	3.38	6.99	17.76	8.80	13.28	11.18	2.60	0.38
70	1.94	8.21	2.60	5.41	4.25	7.13	18.66	9.10	13.88	11.63	3.00	0.44
105	2.11	11.06	2.70	6.88	5.29	7.43	19.90	9.30	14.60	12.21	3.00	0.45
140	2.23	9.05	3.20	6.13	4.83	7.56	19.06	9.80	14.43	12.14	3.40	0.51
S.Em (±)	0.01	0.23	0.07			0.02	0.20	0.08			0.06	0.01
C.D. (P=0.05)	0.02	0.66	0.19			0.05	0.57	2.34			0.18	0.04

Table R-19-AST-9 (c): Effect of nitrogen levels on Plant height and Straw Yield of promising entries of dual cut Oat (AVT-2 dual cut)

Treatment	Straw Yield (q/ha)				Seed Yield (q/ha)			Plant height (cm)				
	NEZ	CZ						NEZ	CZ			Overall mean
	Jorhat	Raipur	Anand	Mean	Jorhat	Raipur	Mean	Jorhat	Anand	Raipur	Mean	
Entries												
JO-10-506	43.19	47.20	49.80	48.50	15.25	12.5	13.9	138.0	91.0	116.0	103.5	115.0
HFO-611	50.59	68.50	41.10	54.80	15.09	10.0	12.5	148.4	92.0	111.8	101.9	117.4
OL-1906	48.33	45.40	17.60	31.50	15.60	17.9	16.8	158.3	95.0	109.8	102.4	121.0
JHO-174-4	51.04	54.10	90.10	72.10	15.62	9.9	12.8	154.7	97.0	95.2	96.1	115.6
OL-1876-2	43.19	42.70	31.10	36.90	15.72	10.3	13.0	155.7	94.0	114.0	104.0	121.2
UPO-212 (NC)	42.71	64.70	39.50	52.10	15.69	10.8	13.2	148.5	94.0	109.4	101.7	117.3
JHO-822 (NC)	46.27	40.60	29.80	35.20	14.96	20.2	17.6	148.2	80.0	104.1	92.1	110.8
S. Em (±)	0.47	1.16	3.29		Sem	0.466		0.574	2.22	1.47		
C.D. (P=0.05)	1.39	3.29	10.14		1.838	13.2		1.14	6.83	4.19		
Nitrogen levels (kg /ha)												
35	44.00	49.60	50.40	50.00	14.77	12.3	13.5	145.5	77.0	106.2	91.6	109.6
70	45.41	49.60	45.90	47.75	15.55	12.8	14.2	148.1	95.0	107.5	101.3	116.9
105	47.17	54.10	35.00	44.55	15.92	13.0	14.5	152.7	104.0	109.4	106.7	122.0
140	49.33	54.10	39.60	46.85	15.44	14.2	14.8	154.7	92.0	111.4	101.7	119.4
S.Em (±)	0.22	0.87	2.28		0.362	0.351		0.23	1.33	1.11		
C.D. (P=0.05)	0.71	2.49	6.52		0.362	0.998		0.67	3.81	3.17		
Interaction	NS	NS	S					S	NS	NS		

Table R-19-AST-9 (d): Effect of nitrogen levels on Leaf Stem Ratio and Tillers per meter row length of promising entries of dual cut Oat (AVT-2 dual cut)

Treatments	Leaf Stem Ratio			Tillers per meter row length				Overall mean
	CZ	NEZ	Mean	NEZ	CZ		Mean	
	Raipur	Jorhat		Jorhat	Anand	Raipur		
Entries								
JO-10-506	0.52	0.52	0.52	79.58	72.87	76.60	74.74	76.35
HFO-611	0.81	0.48	0.65	81.67	79.38	106.80	93.09	89.28
OL-1906	0.68	0.67	0.68	72.58	81.23	77.10	79.17	76.97
JHO-174-4	0.82	0.54	0.68	78.25	92.77	98.00	95.39	89.67
OL-1876-2	0.70	1.05	0.88	80.50	72.10	72.00	72.05	74.87
UPO-212 (NC)	0.71	0.74	0.73	76.50	83.27	99.60	91.44	86.46
JHO-822 (NC)	0.69	0.69	0.69	80.33	80.40	106.10	93.25	88.94
S.Em (±)	0.02	0.00		0.67	1.48	1.90		
C.D. (P=0.05)	0.07	NS		1.97	4.55	5.29		
Nitrogen levels (kg /ha)								
35	0.65	0.62	0.64	78.95	73.16	85.70	79.43	79.27
70	0.70	0.67	0.69	76.71	79.99	89.10	84.55	81.93
105	0.71	0.69	0.70	78.43	90.72	92.90	91.81	87.35
140	0.75	0.70	0.73	79.86	77.28	95.80	86.54	84.31
S.Em (±)	0.02	0.00		0.22	1.09	1.14		
C.D. (P=0.05)	0.05	NS		NS	3.11	4.08		
Interaction	NS	NS		NS	NS	NS		

R-19-AST-9 (e): Interaction effect of nitrogen levels on green forage yield of promising entries of Dual cut oat (AVT-2-Dual cut)

Nitrogen levels X Entries	JO-10-506-1	UPO-212 (NC)	JHO-822 (NC)	HFO-61	OL-1906	JHO-17-4	OL-1876-2	Mean
35	277.55	391.27	237.45	243.22	263.17	230.66	250.27	**256.22**
70	362.18	385.55	305.23	318.72	345.66	290.33	324.03	**333.07**
105	422.65	472.45	378.77	386.15	411.67	361.35	391.26	**403.60**
140	436.45	490.35	397.66	405.21	430.12	380.25	410.15	**421.45**
Mean	**374.68**	**409.90**	**330.03**	**338.32**	**362.65**	**315.64**	**343.93**	
SEm ±	**17.41**							
CD at 5%	**48.26**							
CV%	**8.53**							

Table R-19-AST-9 (f): Interaction effect of nitrogen levels on dry matter yield of promising entries of Dual cut oat (AVT-2-Dual cut)

Nitrogen levels X Entries	JO-10-506-1	UPO-212 (NC)	JHO-822 (NC)	HFO-61	OL-1906	JHO-17-4	OL-1876-2	Mean
35	64.42	68.91	51.83	53.77	60.55	50.37	57.09	**58.13**
70	84.44	91.68	67.30	70.88	79.84	63.96	74.27	**76.05**
105	99.08	112.68	84.15	86.08	95.71	79.96	89.95	**92.52**
140	101.95	116.70	88.00	90.36	99.48	84.03	94.13	**96.38**
Mean	**87.47**	**97.49**	**72.82**	**75.27**	**83.89**	**69.58**	**78.86**	
SEm ±	**4.48**							
CD at 5%	**12.42**							
CV%	**9.61**							

R-19-AST-10: Second Advanced Varietal Trial in Forage Pearl millet (Agronomy)

[Table Reference: R-19-AST-10 (a)-d)]

Locations: (4)
CZ: Anand, Urulikanchan
SZ: Hyderabad, Mandya

AVT trial on Forage Pearl millet was conducted at four locations spread over two zones of the country to study the response of nitrogen fertilizer on yield and quality of promising entries of Forage Pearl millet for fodder purpose. In the trial, three entries (HTBH-4902, ADV0061 and AFB-37) along with three national checks namely; Giant Bajra, Moti Bajra, Raj Bajra were evaluated for their responsiveness to nitrogen fertilizer. The four nitrogen levels (0, 40, 80 and 120kg/ha N /ha) were imposed on entries to see the response. The nitrogen was applied in two splits i.e., 50% of nitrogen as basal + 50% at 40 DAS as top dressing. The experiment was conducted in Randomized block design with three replications.

In Central Zone, Southern Zone as well as on overall mean basis, no entry could surpass the national checks in terms of green fodder, dry matter or CP yields. Moti Bajra proved superior to al entrees. On overall mean basis, linear response to nitrogen application was noted up to 120 kg N/ha which produced (873.5 q green, 210.80 q dry matter and 20.45 q CP yield per hectare). The response equation for South zone was worked out to be $y = -0.0134x2 + 4.383x + 197.57$ (R^2-0.9994) with Agronomic Maxima of 164 kg N ha^{-1} and Agronomic Optima 159 kg N ha^{-1}.

Table R-19-AST-10 (a): Effect of nitrogen levels on green fodder yield of promising entries of forage pearl millet

Treatments	Green fodder yield (q/ha)						
	CZ			SZ			Overall mean
	Anand	Urulikanchan	Mean	Hyderabad	Mandya	Mean	
Entries							
HTBH-4902	1077.0	1050.3	1063.6	254.1	566.2	410.2	736.9
ADV 0061	1147.0	1002.8	1074.9	351.0	474.4	412.7	743.8
AFB-37	1041.0	1019.6	1030.3	230.2	510.5	370.4	700.3
Raj Bajra-1(NC)	908.0	889.7	898.9	169.7	539.8	354.8	626.8
Moti Bajra (NC)	1148.0	1004.6	1076.3	188.5	496.7	342.6	709.5
Giant Bajra (NC)	1171.0	1098.4	1134.7	238.5	608.0	423.3	779.0
SEm (±)	2.55	16.07		13.5	22.3		
CD (0.05)	8.04	51.28		4.5	71.2		
Nitrogen levels (Kg/ha)							
0	936.0	821.3	878.6	145.8	251.9	198.9	538.7
40	1043.0	930.8	986.9	226.3	468.6	347.5	667.2
80	1132.0	1073.7	1102.9	264.5	668.6	466.6	784.7
120	1217.0	1217.7	1217.4	318.0	741.1	529.6	873.5
SEm (±)	2.03	6.06		11.0	15.3		
CD (0.05)	5.82	17.44		3.7	44.2		
Interaction	NS	S		S	NS		

Table R-19-AST-10 (b): Effect of nitrogen levels on dry matter yield of promising entries of forage pearl millet

Treatments	Dry matter yield (q/ha)						
	CZ			SZ			Overall mean
	Anand	Urulikanchan	Mean	Hyderabad	Mandya	Mean	
Entries							
HTBH-4902	327.0	229.8	278.4	53.3	106.1	79.7	179.0
ADV 0061	305.0	218.0	261.5	73.7	85.5	79.6	170.6
AFB-37	323.0	220.7	271.9	48.3	91.2	69.8	170.8
Raj Bajra-1(NC)	303.0	209.7	256.3	35.6	102.0	68.8	162.6
Moti Bajra (NC)	320.0	232.0	276.0	39.5	87.3	63.4	169.7
Giant Bajra (NC)	264.0	220.1	242.1	50.0	114.9	82.5	162.3
SEm (±)	3.06	3.49		2.8	3.86		
CD (0.05)	9.66	11.14		0.9	12.32		
Nitrogen levels (Kg/ha)							
0	261.0	182.9	222.0	30.6	40.8	35.7	128.8
40	284.0	196.2	240.1	47.5	85.0	66.3	153.2
80	322.0	234.6	278.3	55.5	122.0	88.8	183.5
120	360.0	273.2	316.6	66.7	143.4	105.1	210.8
SEm (±)	256	1.39		2.3	3.14		
CD (0.05)	285	4.01		07	9.04		
Interaction	NS	S		S	NS		

Table R-19-AST-10 (c): Effect of nitrogen levels on crude protein yield of promising entries of forage pearl millet

Treatments	Crude protein yield (q/ha)				
	CZ			SZ	Overall mean
	Anand	Urulikanchan	Mean	Mandya	
Entries					
HTBH-4902	22	18.73	20.36	9.13	16.62
ADV 0061	23	15.64	19.32	7.17	15.27
AFB-37	22	17.71	19.85	7.20	15.64
Raj Bajra-1(NC)	22	14.71	18.35	8.03	14.91
Moti Bajra (NC)	23	16.04	19.52	7.83	15.62
Giant Bajra (NC)	19	18.77	18.88	8.72	15.50
SEm (±)	0.50	0.29		0.30	
CD (0.05)	1.58	0.92		0.96	
Nitrogen levels (Kg/ha)					
0	16	13.69	14.845	2.96	10.88
40	19	15.52	17.26	6.6	13.71
80	24	18.75	21.375	6.93	16.56
120	29	19.78	24.39	12.57	20.45
SEm (±)	0.62	0.36		0.27	
CD (0.05)	1.83	1.03		0.79	
Interaction	NS	S		NS	

Table R-19-AST-10 (d): Effect of nitrogen levels on growth and quality parameters of promising entries of forage pearl millet

Treatments	Crude Protein (%)		Plant Height (CM)		Leaf Stem Ratio		Plant Population/m^2
	CZ	SZ	CZ	SZ	CZ	SZ	SZ
	Anand	Mandya	Anand	Hyderabad	Anand	Hyderabad	Hyderabad
Entries							
HTBH-4902	6.48	8.4	222	160	0.25	0.22	54.6
ADV 0061	7.48	8.06	217	149	0.37	0.27	59.0
AFB-37	6.70	7.68	223	153	0.32	0.20	41.2
Raj Bajra-1(NC)	7.04	7.69	213	153	0.26	0.22	47.3
Moti Bajra (NC)	7.02	8.70	220	139	0.49	0.21	53.8
Giant Bajra (NC)	7.21	7.46	234	141	0.63	0.18	36.1
SEm (±)	0.12	0.11	0.81	7.9	0.03	0.021	4.1
CD (0.05)	0.38	0.36	2.57	2.6	0.08	0.007	1.3
Nitrogen levels (Kg/ha)							
0	5.95	7.26	210	126	0.41	0.18	36.0
40	6.54	7.76	223	151	0.35	0.22	48.3
80	7.34	8.19	225	160	0.41	0.24	53.5
120	8.12	8.79	228	159	0.37	0.22	56.9
SEm (±)	0.10	0.07	0.71	6.4	0.02	0.017	3.3
CD (0.05)	0.28	0.19	2.03	2.2	NS	0.006	1.1
Interaction	NS	S	NS	NS	NS	S	S

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 pants/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-42. It was first recorded in end of December, 2019. Disease progressed at faster rate till end of March with maximum disease incidence of 65.3 percent. Leaf blight in oat appeared on OL-10 variety in the 1st week of January. Disease development was fast upto end of March with highest disease severity of 52.4 percent. Downy mildew of Lucerne on variety LLC 5 was observed in the first fortnight of January. Disease progressed at faster rate till end of March. Highest disease severity was 40.1 percent (Table Ludhiana PPT1a).

Entomological observations: The population of green semilooper (*T. orichalcea*) started appearing on the Berseem genotypes in the first week of April with its highest peak observed in the mid April. The population of *H. armigera* appeared on Berseem crop in April reaching highest peak during last week of April and first week of May, 2020. *Spodoptera exigua* larvae were also recorded in Berseem crop during April, with peak incidence in the second fortnight of April (Table Ludhiana PPT1b). Lucerne var. LLC-5 was infested with weevil in March and April. *H. armigera* and *S. exigua* incidence was at its peak in Lucerne during last week of April 2020 (Table Ludhiana PPT1c). Moderate incidence of aphids was observed in oat varieties and it appeared in the end of February 2020 (Table Ludhiana PPT1d).

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**	*5.1	10.4	15.4	24.8	30.2	35.8	43.1	50.1	53.8	56.3	59.2	61.1	63.7	64.8	65.3
Oat	**Leaf Blight**		*7.7	9.8	14.8	19.2	25.0	28.8	33.0	37.5	41.9	45.4	48.1	49.8	52.2	52.4
Lucerne	**Downy Mildew**			*3.3	5.6	9.4	12.6	16.4	21.1	26.6	30.2	32.2	34.3	37.5	39.1	40.1

*****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 in different standard meteorological weeks				Mean
	Standard meteorological weeks				
	15	17	19	21	
BL-10	1.00	1.33	0.33	0	0.66
BL-42	1.33	1.00	0.00	0	0.58
	No. of *H. armigera* larvae per m row length				
BL-10	2.33	7.33	6.00	1.00	4.16
BL-42	2.66	6.33	5.66	0.66	3.83
	No. of *Spodoptera exigua* larvae per m row length				
BL-10	0.33	1.66	1.00	0	0.75
BL-42	0.33	1.33	0.66	0	0.58

Table Ludhiana PPT1c: Incidence of insect pests in Shaftal and Lucerne

Var	No. of Lucerne weevils per plant in different standard meteorological weeks						
	Standard meteorological weeks						
	10	**11**	**12**	**15**	**17**	**19**	**Mean**
Lucerne LLC-5	1.00	2.00	2.33	3.00	2.00	0.33	1.94
Shaftal 69	1.33	2.00	2.00	1.33	1.00	0.33	1.33
No. of *H. armigera* larvae per m row length							
LLC- 5	0	0	0.33	1.66	2.66	0.66	0.88
No. of *Spodoptera exigua* larvae per m row length							
LLC-5	0	0	0	0.33	1.83	0.33	0.42
No. of black aphids per plant							
Shaftal 69	6.5	10	3	0	0	0	3.25

Table Ludhiana PPT1d: Incidence of oat aphid in different varieties of oats

Variety	No. of aphids per tiller in different standard meteorological weeks								Mean
	Standard meteorological weeks								
	5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
OL-10	1.33	2.66	5.66	8.33	6.66	5.00	4.33	2.33	4.54
Kent	2.00	3.00	4.66	8.00	5.33	5.00	3.66	2.00	4.21

Rahuri

Lucerne

Aphids: The population of pea aphid (*Acyrthosiphon pisum*) was noticed on Lucerne during 4th week of December (7.68 aphids/tiller) which increased steadily reaching its peak level during the 4th week of February (52.30 aphids/tiller). Thereafter the decreasing trend of pea aphid population was noticed up to 4th week of March (21.40 aphids/tiller). Population of cowpea aphid (*Aphis craccivora*) was observed on Lucerne during 4th week of December (11.00 aphids/tiller) and reached at its peak during last week of February with 32.58 aphids/tiller. Thereafter decreasing trend of aphid population was observed. Simultaneously population of spotted aphid (*Therioaphis maculata*) was observed on Lucerne during 4th week of December (3.60 aphids/tiller) and reached at its peak during last week of February with 20.68 aphids/tiller. During the aphid infestation, population of predatory lady bird beetle was observed at moderate to high level (1.33 to 3.00 grubs/tiller) (Table Rahuri PPT1a).

Lepidopteran pests: The *Spodoptrera litura* became major and regular pests on Lucerne during summer season. Larval population was noticed during 3rd week of March with 1.00 larva/m^2. Thereafter, population increased steadily and reached to its peak population (3.20 larvae/m^2) during 1st week of April. After that the population of *S. litura* declined and recorded minimum population (1.20 during 1st week of May). The population of *H. armigera* was noticed on Lucerne seed crop during 2nd week of April (1.10 larva/m^2) and showed increasing trend up to 3rd week of April with highest population of 1.90 larvae/m^2. After that population declined and was minimum during 4th week of April (0.80 larvae/m^2) (Table Rahuri PPT1a).

Oat

Aphid: Periodic abundance of oat aphid (*Rhopalosiphum padi* L.) was observed during the investigation. Average number of aphids per tiller recorded from 1st week of January to 4th week February was in the range of 3.23 to 56.18 aphids/tiller. Initial population of oat aphid was noticed during 3rd week of December (3.23 /tiller). The population increased at faster rate and reached its peak level (56.17 aphids/tiller) during the 3rd week of February (Table Rahuri PPT1b).

Natural enemies

C. carnea

The population of *Chrysoperla carnea* was observed in the range of 0.50 to 1.80 per tiller throughout the crop period.

Coccinellid predators

The initial population of LBB grub was recorded during 3rd week of December (0.70 grub/tiller). The population of the grubs increased very slowly with its maximum (2.00 grubs/tiller) level during 2nd week of February. Thereafter, the population of the grubs started decreasing and disappeared from last week of February.

Berseem

Aphids

Pea aphid (*Acyrthosiphon pisum*) was noticed on Berseem during 3rd week of December (1.02 aphids/tiller) and increased steadily at its peak level up to the 2nd week of February (9.65 aphids/tiller). Thereafter the decreasing trend of pea aphid population was noticed up to 3rd week of March (2.10 aphids/tiller). Population of cowpea aphid (*Aphis craccivora*) observed on Berseem during 3rd week of December (2.34 aphids/tiller) and reached at its peak during 3rd week of January with 9.24 aphids/tiller. Thereafter decreasing trend of aphid population was observed. Spotted aphid (*Therioaphis maculata*) was observed on Berseem during last week of December (1.10 aphids/tiller) and reached at its peak during 2nd week of February with 7.00 aphids/tiller. During the aphid infestation, population of predatory lady bird beetles was observed at low to moderate level (0.30 to 2.10 grubs/tiller).

Table Rahuri PPT1a: Population dynamics of insect pests associated with *rabi* forages: Incidence of insect pests in Lucerne

Standard meteorological week	No. aphids/tiller				Lady bird beetle grubs/tiller	No. of larvae/m^2	
	Pea aphid	Cowpea aphid	Spotted aphid	Total		*S. litura*	*H. armigera*
51	7.68	11.00	3.60	22.28	0.00	0.00	0.00
52	11.30	15.07	7.06	33.43	0.00	0.00	0.00
1	13.00	20.60	8.50	42.1	0.00	0.00	0.00
2	20.34	25.64	3.00	48.98	1.33	0.00	0.00
3	23.10	18.30	2.00	43.4	1.67	0.00	0.00
4	29.60	20.60	5.00	55.2	2.20	0.00	0.00
5	36.30	21.32	11.00	68.62	2.33	0.00	0.00
6	41.58	23.54	13.52	78.64	2.40	0.00	0.00
7	45.60	27.58	16.14	89.32	2.68	0.00	0.00
8	48.64	30.65	18.47	97.76	3.00	0.00	0.00
9	52.30	32.58	20.68	105.56	2.77	0.00	0.00
10	42.30	30.50	18.30	91.1	2.80	0.00	0.00
11	38.40	22.70	16.20	77.3	2.24	0.00	0.00
12	34.50	20.40	16.00	70.9	2.20	0.00	0.00
13	38.50	21.00	13.20	72.7	2.22	1.00	0.00
14	21.40	12.10	10.20	43.7	1.80	1.30	0.00
15	27.50	16.50	11.80	55.8	1.50	2.20	0.00
16	35.40	17.50	21.22	74.12	3.20	3.20	1.10
17	50.26	15.10	18.30	83.66	3.00	2.10	1.90
18	46.20	14.20	16.20	76.6	2.10	1.80	0.80
19	38.22	13.20	15.10	66.52	2.90	1.64	0.00
20	31.20	10.32	13.40	54.92	1.25	1.20	0.00
21	26.10	8.40	8.30	42.8	1.30	0.00	0.00
22	12.08	6.20	3.20	21.48	1.10	0.00	0.00

Table Rahuri PPT1b: Population dynamics of insect pests associated with *rabi* forages: Incidence of insect pests in Oat

Standard meteorological week	No. aphids/tiller	Natural enemies/tiller		
		C. carnea	Lady Bird Beetle grubs	Syrphid fly larvae
51	3.23	0.00	0.70	0.00
52	8.27	0.00	0.85	0.00
1	13.10	0.50	0.95	0.00
2	20.20	0.60	0.97	0.00
3	23.25	0.89	0.90	0.00
4	33.38	1.06	1.03	0.00
5	48.25	1.27	1.13	0.00
6	51.69	1.60	1.57	0.00
7	54.35	1.80	2.00	0.00
8	56.17	1.00	1.60	0.00
9	22.60	0.00	1.20	0.00
10	0.00	0.00	0.00	0.00

Table Rahuri PPT1c: Population dynamics of insect pests associated with *rabi* forages: Incidence of insect pests in Berseem

Standard meteorological week	No. aphids/tiller				Lady bird beetle grubs/tiller	No. of larvae/m^2	
	Pea aphid	Cowpea aphid	Spotted aphid	Total		*S. litura*	*H. armigera*
51	1.02	2.34	0.00	3.36	0.00	0.00	0.00
52	2.30	4.58	2.12	9.00	0.30	0.00	0.00
1	2.60	5.10	1.60	9.30	0.92	0.00	0.00
2	3.10	7.24	2.64	12.98	1.33	0.00	0.00
3	4.25	9.24	3.25	17.74	1.48	0.00	0.00
4	4.65	8.98	4.52	18.15	1.60	0.00	0.00
5	5.28	4.25	5.62	15.15	1.82	0.00	0.00
6	7.25	6.21	6.37	19.83	1.90	0.00	0.00
7	9.65	8.25	7.00	24.90	2.10	0.00	0.00
8	8.24	7.10	6.24	21.58	1.80	0.00	0.00
9	6.25	5.23	7.32	18.80	1.70	0.00	0.00
10	4.20	3.20	5.20	12.6	1.20	0.00	0.00
11	3.00	2.10	4.10	9.2	0.60	0.00	0.00
12	2.10	0.90	1.80	4.8	0.00	0.00	0.00

Palampur: Oat crop was severely affected by powdery mildew (45 % severity), followed by leaf blights (25 %), loose smut (1 %) and sucking pest (12 %). In beseem, low incidence of root rot (4 %), moderate intensity of leaf spot (10 %) and defoliating beetles (3%) was observed. Defoliating beetles (8 %) and leaf spot (8 %) were observed on Lucerne (Table Palampur PPT-1).

Bhubaneswar: In oat, leaf blight severity recorded was 51.2 % and root rot incidence was 26.6 %. Maximum leaf defoliators were recorded 6.8/10 plants. The maximum berseem leaf spot and blight severity recorded was 36.4 % during 1st week of February, whereas maximum root rot incidence was 35.0 % during last week of January. Maximum defoliator population recorded was 5.4/10 plants in 4th meteorological week (Table Bhubaneswar PPT-1).

Jhansi: In Berseem, incidence of stem rot started from 3rd week of January with small lesions indicative of early infection and continued to increase up to last week of February with a maximum disease incidence of 26.4 %. In Oat, leaf blight was the major disease and it appeared during first week of February and maximum severity of 41.5 % was observed during last 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	16	17	Max
Oats	Powdery mildew	7	10	15	20	40	45	45
	Leaf blight	2	4	6	10	25	25	25
	Loose smut	-	-	-	-	1	1	1
	Aphids & Thrips	5	10	12	9	-	-	12
Berseem	Root rot	2	3	4	-	-	-	4
	Leaf spot	-	5	7	7	10	10	10
	Defoliating beetles	-	-	-	-	3	3	3
Lucerne	Leaf spot	2	3	4	4	7	7	9
	Defoliating beetles	-	-	2	3	8	8	8

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 (% disease severity)	-	-	6.8	14.2	19.8	32.4	37.0	42.2	46.6	51.2
Root rot (%)	-	7.0	9.2	15.0	21.8	24.4	26.6	-	-	-
Leaf defoliators (No./10 Plants)	-	-	2.8	3.6	4.8	5.2	5.4	6.2	6.8	-
Berseem										
Leaf spot & blight (% disease severity)	-	-	5.2	7.8	12.6	14.4	20.6	26.4	32.2	36.4
Root rot (%)	-	-	6.2	10.4	14.8	20.4	23.8	28.4	35.0	-
Leaf defoliators (No./10 Plants)	-	-	2.2	2.6	3.8	4.2	4.8	5.0	5.4	-

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										
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Oat											
Leaf blight (% disease severity)	-	-	-	2.0	5.3	7.3	15.0	20.6	29.3	36.6	41.5
Berseem											
Stem rot (% disease incidence)	2.0	1.3	7.0	13.3	16.0	21.5	26.4	-	-	-	-

PPT-2: Field screening of *rabi*-breeding materials for resistance to diseases and insect- pests

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, Jhansi
Crops: Berseem, Oat, Lucerne, white clover, red clover

Results:
BERSEEM
IVTB: Initial Varietal Trial in Berseem
At Ludhiana, all the six entries including checks showed resistant disease reaction to stem rot. All the six entries including checks showed moderate larval population of *H. armigera*. **At Rahuri,** all the entries had low incidence of aphids. **At Palampur,** incidence of root rot of berseem was low during the season and all the six entries including checks were resistant to moderately resistant to root rot. **At Bhubaneswar,** Bundel Berseem-3, JB-07-15, BM-14 and HFB-16-1 were found resistant whereas HFB-16-10 expressed moderate resistance and Wardan showed moderately susceptible reaction.

AVTB-1: First Advanced Varietal Trial in Berseem
At Ludhiana, all the seven entries including checks showed resistant disease reaction to stem rot. All the entries showed moderate larval population of *H. armigera*. **At Rahuri,** all the seven entries including checks had low incidence of aphids. **At Palampur,** incidence of root rot of berseem was low during the season and all the entries were resistant.

AVTB-2: Second Advanced Varietal Trial in Berseem
At Ludhiana, all the five entries including checks were found resistant to stem rot. **At Bhubaneswar,** JHB-17-2, PC-91 and JHB-17-1 show resistant reactions to leaf spot and blight in berseem whereas others expressed moderate resistance.

AVTB-2 (Seed): Second Advanced Varietal Trial in Berseem (Seed)
At Ludhiana, all the five entries including checks were found resistant to stem rot. **At Bhubaneswar,** JHB-17-2, PC-91 and JHB-17-1 expressed resistant reactions whereas others showed moderate resistant reaction to leaf spot and blight.

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 (incidence level)
BB-2 (ZC-NWZ, CZ)	9.50	R	1.00						10.40	Low
BL-22 (ZC-HZ)				4	R					
BB-3 (ZC-NEZ)						7.67	R	1.86		
HFB-16-10	9.50	R	1.66	7	R	15.87	MR	4.42	17.20	Low
JB-07-15	7.75	R	1.66	6	R	9.54	R	3.33	13.10	Low
BM 14	8.00	R	1.66	7	R	4.62	R	1.74	14.70	Low
HFB-16-1	9.25	R	1.00	9	R	6.33	R	2.54	16.64	Low
Wardan (NC)	14.00	R	1.66	12	MR	31.62	MS	6.67	15.80	Low

Table: Disease –pest tolerance in AVT-1 Berseem trial

	Ludhiana			Palampur		Rahuri	
Entry	Stem rot (% incidence)	Reaction	Larvae of *H. armigera*/ m row length	Root rot (% incidence)	Reaction	Mean No. of aphids/tiller	Reaction (incidence level)
JHB-18-2	9.47	R	1.33	4	R	13.51	Low
Wardan (NC)	15.50	R	1.33	4	R	16.30	Low
BB-2 (ZC-NWZ, CZ)	9.33	R	1.66			10.30	Low
BL-22 (ZC-HZ)				7	R		
JHB 18-1	7.00	R	1.66	6	R	14.60	Low
BM-12	9.00	R	1.66	7	R	15.80	Low
HFB-15-5	6.93	R	1.33	7	R	9.60	Low
JB-06-11	8.67	R	1.66	10	R	16.20	Low

Table: Disease –pest tolerance in AVT-2 Berseem trial

Entries	Ludhiana		Bhubaneswar		
	Stem rot incidence (%)	Reaction	Leaf spot & Blight	Reaction	Leaf defoliators
JHB-17-2	9.625	R	3.67	R	1.74
BB-2 (ZC-NWZ)	8.25	R			
BB-3 (ZC-NEZ)			22.54	MR	3.86
PC-91	7.25	R	5.62	R	2.33
Wardan (NC)	14.00	R	14.67	MR	3.74
JHB-17-1	7.25	R	8.33	R	3.36

Table: Disease –pest tolerance in AVT-2 Berseem (Seed) trial

Entries	Ludhiana		Bhubaneswar		
	Stem rot incidence (%)	Reaction	Leaf spot & Blight	Reaction	Leaf defoliators
JHB-17-2	9.5	R	3.54	R	2.42
BB-2 (ZC-NWZ)	7.5	R			
BB-3 (ZC-NEZ)			16.87	MR	4.67
PC-91	11.75	R	5.67	R	3.34
Wardan (NC)	9.75	R	19.33	MR	4.86
JHB-17-1	6.75	R	8.62	R	3.74

OAT

IVTO (SC): Initial Varietal Trial in Oat (Single Cut)

At Ludhiana, among the fourteen entries, all showed resistant disease reaction to leaf blight except HFO-904 and SKO-243 which were moderately resistant. All the entries showed low number of aphids/tiller. **At Rahuri,** entries RO-11-1-12, Kent, OL-1963, HFO-906, RO-11-1-8, NDO-1807, OL-1960 and UPO-19-1 were moderately resistant to aphids and other entries were susceptible to aphids. **At Palampur,** eight entries were susceptible to Powdery mildew and OS-6, RO-11-1-12, OL-1963, UPO-19-1, HFO-904 and JO-07-28 were moderately resistant. **At Bhubaneswar**, OS-403, RO-11-1-12, Kent, OL-1963, HFO-906, RO-11-1-8, NDO-1807 and OL-1960 showed resistant reaction to leaf spot and blight, *Sclerotium* root rot and infestation by leaf defoliator. The other entries expressed moderately resistant reaction. **At Jhansi,** all the entries were resistant to moderately resistant to leaf light.

IVTO-MC: Initial Varietal Trial in Oat (Multi Cut)

At Ludhiana, among nine entries, eight showed moderately resistant disease reaction, while OL-1924 showed resistant reaction to leaf blight. All the entries showed low number of aphids/tiller. **At Rahuri,** seven entries were moderately resistant to aphids while JO-07-310, RO-11-1-13 were susceptible to aphids. **At Palampur,** six entries were susceptible to Powdery mildew while JO-07-310, OL-1919 and HFO-918 were moderately resistant. **At Bhubaneswar**, all the nine entries were resistant to moderately resistant to leaf blight, *Sclerotium* root rot and infestation by leaf defoliators. **At Jhansi,** all the nine entries were resistant to moderately resistant to leaf light.

IVTO (DUAL): Initial Varietal Trial in Oat (Dual)

At Ludhiana, all the eleven entries were resistant to moderately resistant to leaf blight. All the entries showed low number of aphids/tiller. **At Rahuri,** all the eleven entries were resistant to moderately resistant to aphids. **At Bhubaneswar**, all the entries were resistant to moderately resistant to leaf blight, *Sclerotium* root rot and infestation by leaf defoliators except OL-1954 and JHO-19-2 which were moderately susceptible to both diseases and insect infestation. **At Jhansi,** all the eleven entries including checks were resistant to leaf light.

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 Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
OS-6 (NC)	15.33	MR	7.03	7.13	18.87	R	5.00	25	MR	16.0	R	19.50	S
OS-403 (ZC-NWZ, NEZ)	3.67	R	3.33	1.42	20.00	R	4.33						
RO-11-1 (ZC-CZ)										14.0	R	17.60	S
SKO-96 (ZC-HZ)								30	S				
JHO-19-1	16.26	MR	8.13	7.67	18.00	R	4.33	30	S	7.3	HR	20.00	S
RO-11-1-12	4.54	R	4.87	3.76	17.67	R	4.66	25	MR	16.7	R	7.10	MR
Kent (NC)	4.62	R	4.87	2.87	17.83	R	4.33	30	S	19.3	R	10.50	MR
OL-1963	3.42	R	4.67	2.53	15.73	R	4.66	22	MR	14.0	R	8.40	MR
HFO-906	9.33	R	4.78	4.33	18.00	R	4.00	30	S	15.0	R	10.00	MR
RO-11-1-8	6.67	R	4.42	3.87	15.00	R	4.33	30	S	18.3	R	9.54	MR
NDO-1807	7.54	R	4.33	4.13	18.67	R	4.66	30	S	20.3	MR	9.30	MR
OL-1960	8.87	R	4.87	4.45	18.17	R	4.33	28	S	24.0	MR	9.90	MR
UPO-19-1	13.26	MR	6.67	6.13	14.33	R	4.33	25	MR	17.0	R	8.80	MR
HFO-904	11.55	MR	6.13	5.67	21.50	MR	5.00	22	MR	20.7	MR	19.50	S
JO-07-28	17.90	MR	8.03	8.33	17.67	R	5.00	25	MR	20.0	MR	18.60	S
SKO-243	19.03	MR	8.78	8.67	20	MR	5.33	30	S	13.3	MR	19.50	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 Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
JO-07-310	3.11	R	1.84	1.34	21.87	MR	5.66	25	MR	21.7	MR	20.26	S
UPO-212 (NC)	19.54	MR	8.34	5.67	20.67	MR	5.00	27	S	20.0	R	9.06	MR
RO-19 (NC)	2.87	R	1.67	1.11	26.00	MR	4.33	30	S	23.3	MR	7.36	MR
OL-1919	3.33	R	2.22	2.42	24.23	MR	4.66	25	MR	25.0	MR	10.00	MR
HFO-921	9.42	R	4.87	2.87	21.33	MR	4.66	32	S	20.7	MR	9.94	MR
HFO-918	14.11	MR	7.42	4.13	25.17	MR	4.33	25	MR	16.7	R	8.82	MR
PLP-24	16.67	MR	5.34	5.33	25.67	MR	5.00	33	S	14.3	R	10.36	MR
OL-1924	6.33	R	3.13	2.54	17.00	R	5.33	35	S	20.7	MR	8.42	MR
RO-11-1-13	18.27	R	4.11	3.11	21.33	MR	4.33	30	S	16.7	R	20.22	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 Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
OL-1934	7.87	R	4.87	4.16	20.00	MR	4.66	11.7	R	5.00	R
OL-1954	36.33	MS	11.42	8.13	29.00	MR	4.66	10.0	HR	9.90	MR
UPO-19-2	15.67	MR	7.67	5.87	18.00	R	5.33	15.7	R	4.80	R
RO-11-2-8	18.54	MR	8.26	6.13	20.00	R	4.66	16.7	R	10.00	MR
UPO-212 (NC)	4.23	R	4.24	3.14	22.33	MR	4.33	13.3	R	8.80	MR
JHO-822 (NC)	13.33	MR	6.23	5.12	19.00	R	4.33	14.3	R	7.30	MR
JO-12-509	3.13	R	1.23	1.33	24.50	MR	4.66	14.0	R	8.64	MR
JHO-19-2	32.14	MS	13.13	9.64	23.53	MR	5.00	18.7	R	9.40	MR
HFO-902	3.67	R	3.24	2.67	19.37	R	4.33	20.0	R	10.10	MR
HFO-901	9.15	R	4.87	4.42	24.67	MR	4.66	18.3	R	8.32	MR
RO-11-1-13	6.42	R	4.67	4.06	20.93	MR	5.00	16.3	R	9.22	MR

AVTO (SC)-1: First Advanced Varietal Trial in Oat (Single Cut)

At Rahuri, nine entries were resistant to moderately resistant to aphids, while Kent, OL-1874-1, HFO-818 and SKO-241 were susceptible to aphids. **At Palampur,** entries RO-11-1-2, OL-1876-1, Kent, HFO-818, JO-06-23, UPO-18-1 and NDO-1802 were moderately resistant to powdery mildew and rests were found susceptible. **At Jhansi,** all the thirteen entries were in moderately resistant to low resistant category to leaf light.

AVTO (SC)-2: Second Advanced Varietal Trial in Oat (Single Cut)

At Ludhiana, all the eight entries including checks were moderately resistant to leaf blight. All the entries showed low number of aphids/tiller. **At Rahuri,** all the entries were moderately resistant to aphids except HFO-718 and SKO-240 which were susceptible. **At Palampur,** all entries were susceptible to powdery mildew except OL-1896, HFO-718, HFO-529 and Kent which were moderately resistant. **At Jhansi,** OL-1896 was in low susceptible category, entries HFO-718 and SKO-240 were in low resistant and resistant category respectively to leaf blight. Rest of the entries were moderately resistant.

AVTO (SC)-2 (Seed): Second Advanced Varietal Trial in Oat (Single Cut) for seed

At Ludhiana, all the eight entries including checks showed resistant disease reaction to leaf blight. All the entries showed low number of aphids/tiller. **At Rahuri,** all the entries were moderately resistant to aphids except SKO-240 which was susceptible. **At Palampur,** all entries were susceptible to powdery mildew except OL-1896, HFO-718, Kent and JO-05-09 which were moderately resistant. **At Jhansi,** HFO-718, JHO-2009-1 and HFO-529 were in low resistant category and OL-1896 was moderately resistant. Rest of the entries were resistant to leaf blight.

Table: Disease –pest tolerance in AVT-1 oat (SC) trial

Entries	Palampur		Jhansi		Rahuri	
	Powdery mildew severity (%)	Reaction	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
RO-11-1-2	25	MR	30.0	MR	4.30	R
OL-1876-1	23	MR	38.3	LR	3.90	R
SKO-96 (ZC-HZ)	28	S				
RO-11-1 (ZC-CZ)			30.0	MR	4.80	R
Kent (NC)	22	MR	38.3	LR	19.30	S
OL-1874-1	31	S	25.0	MR	18.70	S
HFO-818	24	MR	23.0	MR	20.10	S
RO-11-1-3	28	S	20.7	MR	9.40	MR
HFO-806	29	S	27.3	MR	8.60	MR
JO-06-23	20	MR	35.0	LR	10.00	MR
UPO-18-1	22	MR	35.0	LR	5.00	R
NDO-1802	20	MR	33.3	LR	9.20	MR
OS-6 (NC)	29	S	30.0	MR	10.00	MR
SKO-241	29	S	31.7	LR	18.80	S

Table: Disease–pest tolerance in AVT-2 oat (SC) trial

Entries	Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
OL-1896	14.33	R	5.00	25	MR	51.7	LS	7.80	MR
HFO-718	18.47	R	4.33	22	MR	40.0	LR	19.80	S
RO-11-1 (ZC-NWZ)	16.50	R	4.33						
JHO-2009-1 (ZC-CZ)						21.7	MR	9.20	MR
SKO-96 (ZC-HZ)				29	S				
HFO-529	14.33	R	4.66	20	MR	28.3	MR	8.20	MR
Kent (NC)	10.57	R	5.00	20	MR	25.0	MR	7.90	MR
OS-6 (NC)	10.87	R	4.33	27	S	23.3	MR	9.92	MR
JO-05-09	15.33	R	4.66	28	S	21.7	MR	9.20	MR
SKO-240	10.00	R	5.00	33	S	20.0	R	20.20	S

Table: Disease –pest tolerance in AVTO (SC)-2 (Seed) trial

Entries	Ludhiana			Palampur		Jhansi		Rahuri	
	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Powdery mildew severity (%)	Reaction	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
OL-1896	19.00	R	5.33	22	MR	30.0	MR	9.36	MR
HFO-718	12.00	R	4.66	22	MR	33.3	LR	7.44	MR
RO-11-1 (ZC-NWZ)	15.00	R	4.33						
JHO-2009-1 (ZC-CZ)						36.7	LR	8.32	MR
SKO-96 (ZC-HZ)				27	S				
HFO-529	14.50	R	4.66	29	S	33.3	LR	10.00	MR
Kent (NC)	12.40	R	5.33	22	MR	18.3	R	9.22	MR
OS-6 (NC)	11.33	R	4.66	30	S	13.3	R	8.98	MR
JO-05-09	17.67	R	4.66	24	MR	13.0	R	9.00	MR
SKO-240	13.80	R	5.00	28	S	14.3	R	19.92	S

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

At Ludhiana, among nine entries, seven entries were resistant to leaf blight, while JHO-18-3 and OL-1874-2 showed moderately resistant disease reaction. All the entries showed low number of aphids/tiller. **At Rahuri,** all the nine entries including checks were moderately resistant to aphids. **At Bhubaneswar**, all the entries were resistant to moderately resistant to both disease and insect infestation. **At Jhansi,** RO-11-2-2, UPO-212 and HFO-816 were resistant; JHO-822 and JHO-18-3 were moderately resistant and rest of the entries were in low resistant category to leaf blight.

AVTO-2 (DUAL): Second Advanced Varietal Trial in Oat (Dual)

At Ludhiana, all the seven entries including checks were resistant to leaf blight. All the entries showed low number of aphids/tiller. **At Rahuri,** all the entries were moderately resistant to aphids. **At Bhubaneswar**, all the seven entries were resistant to moderately resistant to leaf spot and blight, *Sclerotium* root rot and damage by leaf defoliators. **At Jhansi,** OL-1906 and OL-1876-2 were in mesothetic category, while HFO-611 and JHO-17-4 were in low resistant category to leaf blight. Rest of entries were resistant to moderately resistant to leaf blight.

AVTO-2 (DUAL) Seed: Second Advanced Varietal Trial in Oat (Dual) Seed

At Ludhiana, all the seven entries including checks were resistant to leaf blight. All the entries showed low number of aphids/tiller. **At Rahuri,** entries OL-1906 and JHO-17-4 were moderately resistant while rest were susceptible to aphids. **At Bhubaneswar**, all the seven entries showed resistant reaction to leaf blight, *Sclerotium* root rot and defoliator infestation except HFO-611 which showed moderately resistant reaction. **At Jhansi,** OL-1906 and OL-1876-2 were in mesothetic category, while HFO-611 and JHO-17-4 were in low resistant category to leaf blight. Rest of entries were resistant to moderately resistant to leaf blight.

AVTO (MC)-1: First Advanced Varietal Trial in Oat (Multi Cut)

At Ludhiana, all the five entries including checks showed resistant disease reaction to leaf blight. All the entries showed low number of aphids/tiller. **At Rahuri,** all the five entries were moderately resistant to aphids. **At Jhansi,** all the five entries were resistant to moderately resistant to leaf blight to leaf light.

AVTO (MC)-2: Second Advanced Varietal Trial in Oat (Multi Cut)

At Ludhiana, among the four entries, OL-1874 and UPO-212 showed resistant disease reaction to leaf blight and JO-05-304, RO-19 showed moderately resistant disease reaction. All the entries showed low number of aphids/tiller with non-significant differences. **At Rahuri,** all the entries were moderately resistant to aphids. **At Jhansi,** most of the entries were in low resistant to moderately resistant category to leaf blight.

AVTO (MC)-2 Seed: Second Advanced Varietal Trial in Oat (Multi Cut) Seed

At Ludhiana, all the four including checks showed moderately resistant disease reaction to leaf blight. All the entries showed low number of aphids/tiller with non-significant differences. **At Rahuri,** entries OL-1874 and RO-19 were moderately resistant while UPO-212 and JO-05-304 were susceptible to aphids. **At Jhansi,** most of the entries were in low resistant to moderately resistant category to leaf blight.

Table: Disease –pest tolerance in AVTO-1 (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 Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
RO-11-2-6	2.13	R	1.34	1.47	18.00	R	5.33	36.7	LR	9.90	MR
JHO-822 (NC)	15.11	MR	7.13	6.13	18.00	R	5.00	25.0	MR	10.00	MR
JHO-18-3	4.67	R	3.33	3.52	24.00	MR	5.33	26.7	MR	8.70	MR
OL-1766-2	6.33	R	4.13	4.67	19.67	R	6.00	40.0	LR	7.90	MR
JO-11-507	8.54	R	4.76	5.33	18.33	R	5.33	32.3	LR	8.60	MR
OL-1874-2	6.62	R	4.42	4.13	20.00	MR	6.00	32.3	LR	10.20	MR
RO-11-2-2	13.87	MR	8.34	6.67	17.50	R	5.66	18.3	R	9.82	MR
UPO-212 (NC)	3.42	R	2.67	2.54	19.60	R	5.00	16.7	R	7.62	MR
HFO-816	18.67	MR	9.42	6.42	18.00	R	5.66	13.3	R	9.74	MR

Table: Disease –pest tolerance in AVTO-2 (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 Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
JO-10-506	16.15	MR	12.13	6.33	16.67	R	5.00	18.0	R	9.10	MR
UPO-212 (NC)	13.33	MR	11.14	5.87	13.00	R	5.33	21.7	MR	10.22	MR
JHO-822 (NC)	8.67	R	4.87	4.67	11.87	R	5.66	25.0	MR	8.40	MR
HFO-611	6.64	R	4.67	3.23	13.57	R	5.66	33.3	LR	6.80	MR
OL-1906	2.42	R	4.24	2.67	17.77	R	5.66	45.0	M	9.40	MR
JHO-17-4	4.13	R	4.33	3.14	12.33	R	5.33	35.0	LR	8.26	MR
OL-1876-2	3.27	R	3.33	1.33	19.50	R	5.33	44.3	M	9.80	MR

Table: Disease –pest tolerance in AVTO-2 (Dual) seed 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 Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
JO-10-506	5.90	R	4.87	3.87	13.47	R	5.00	19.0	R	20.22	S
UPO-212 (NC)	6.26	R	4.13	2.87	10.33	R	5.33	25.0	MR	19.41	S
JHO-822 (NC)	4.54	R	3.42	2.53	12.50	R	5.66	26.7	MR	17.16	S
HFO-611	13.33	MR	7.55	6.76	11.60	R	5.66	35.0	LR	20.00	S
OL-1906	9.62	R	4.90	4.13	11.83	R	5.66	48.3	M	9.88	MR
JHO-17-4	7.26	R	4.67	3.76	12.83	R	5.33	38.3	LR	8.92	MR
OL-1876-2	3.67	R	3.13	1.42	16.77	R	5.33	46.7	M	18.64	S

Table: Disease –pest tolerance in AVTO-1 (MC) trial

Entries	Ludhiana			Jhansi		Rahuri	
	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
OL-1882	19.00	R	4.66	25.0	MR	9.82	MR
UPO-212 (NC)	12.00	R	5.00	16.7	R	8.94	MR
HFO-707	15.00	R	4.33	26.7	MR	10.20	MR
HFO-716	14.50	R	4.66	23.3	MR	6.54	MR
RO-19 (NC)	12.40	R	4.66	26.7	MR	8.52	MR

Table: Disease –pest tolerance in AVTO-2 (MC) trial

Entries	Ludhiana			Jhansi		Rahuri	
	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
OL-1874	19.60	R	5.66	38.3	LR	7.64	MR
UPO-212 (NC)	19.60	R	5.00	26.7	MR	9.90	MR
JO-05-304	20.40	MR	5.33	31.7	LR	10.22	MR
RO-19 (NC)	20.40	MR	5.00	30.0	MR	8.64	MR

Table: Disease –pest tolerance in AVTO-2 (MC) Seed trial

Entries	Ludhiana			Jhansi		Rahuri	
	Leaf Blight Severity (%)	Reaction	No. of Aphids/tiller	Leaf blight Severity (%)	Reaction	No. of Aphids/ tiller	Reaction
OL-1874	21.20	MR	5.33	35.0	LR	9.90	MR
UPO-212 (NC)	20.40	MR	5.33	28.3	MR	20.00	S
JO-05-304	23.20	MR	5.66	33.3	LR	19.80	S
RO-19 (NC)	22.00	MR	5.00	30.0	MR	7.56	MR

IVT Lucerne: Initial Varietal Trial in Lucerne

At Ludhiana, all the seven entries including checks showed resistant disease reaction to downy mildew. Lucerne weevil and *H. armigera* number was very less and all the entries were at par with each other. **At Rahuri,** all the seven entries were moderately resistant to aphids.

Table: Disease –pest reaction in IVT Lucerne trial

Entry	Ludhiana				Rahuri	
	Downy mildew severity (%)	Disease Reaction	Lucerne weevil/ plant	*H. armigera*/ metre row length	No. of Aphids/ tiller	Reaction
LLC-6	12.93	R	2.00	2.00	12.30	MR
Alamdar-1	12.00	R	2.00	2.33	18.40	MR
AL-62	12.63	R	2.33	2.00	15.90	MR
Al-66	15.33	R	1.83	2.00	17.50	MR
RL-88 (NC)	16.87	R	2.00	1.83	11.88	MR
Alamdar-21	13.00	R	2.33	2.33	12.78	MR
Anand-2 (NC)	13.57	R	2.00	2.00	18.66	MR

White clover (VTWC): At Palampur, in VTWC, all the six entries including check were susceptible to powdery mildew.

Table: Disease –pest tolerance in VT-White Clover trial

Entries	Powdery mildew	
	% Disease severity	Disease Reaction
PWC-25	27	S
PWC-26	35	S
JHWC-16-1	40	S
JHWC-16-3	29	S
Palampur composite (NC)	32	S
JHWC-16-2	39	S

Red clover (VTRC): At Palampur, in VTRC, all the seven entries including check were susceptible to powdery mildew.

Table: Disease –pest tolerance in VT-Red Clover trial

Entries	Powdery mildew	
	% Disease severity	Disease Reaction
IGFRI RC -2016-1	38	S
IGFRI RC -2016-4	42	S
PRC-3 (NC)	45	S
IGFRI RC -2016-6	29	S
IGFRI RC -2016-5	46	S
IGFRI RC -2016-2	39	S
IGFRI RC -2016-3	38	S

PPT-17: To study the pathogenic variability of *Blumeria graminis* f. sp. *avenae* on oat

Location: Palampur

Results:

Collection and maintenance of isolates: Pure culture of 24 isolates of *Blumeria graminis f*. sp. *avenae***,** collected from six districts of Himachal Pradesh during 2016-2019 was maintained under controlled conditions (Green House). The reaction of these isolates on oat genotypes under greenhouse condition using seedling method was studied to find out the pathogenic variability. The reaction on genotypes for these isolates will be recorded as infection types (0-4) under stereo zoom microscope. The above infection types will be employed for studying the pathogenic variability.

Refinement of Differential set: For development of differential set, 142 lines from field screened set of 303 lines was selected and evaluated under greenhouse conditions with 5 pure culture isolates of *Blumeria graminis f*. sp. *avenae*. The aluminium trays were divided into 40 blocks and each block was sown with the germplasm line. The trays were shifted to cages after 7 days of sowing and were dusted uniformly with the inoculum. These trays were surrounded with pots containing infected plants of HJ-8 to create inoculum pressure. The readings were taken 10 days after inoculation using 0-4 scale given by Banyal (1995) by both visual and stereo-microscopic observation. From these 142 lines evaluated with 5 isolates, 44 lines which exhibited varied reaction to specific isolate were selected and further screened against 9 pure culture isolates of powdery mildew. After recording data on infection types, it was found that 20 lines were exhibiting differential reaction to the isolates and now these 20 lines will be evaluated with 24 isolates and lines (about 10 lines) showing differential reaction to the isolates will be identified and final differential set will be selected.

Study of inheritance of Powdery mildew in oat:

To study the inheritance of powdery mildew resistance, three resistant lines (OL-1847, OG-77 and OL-1689) were selected and crossed with HJ-8 (Susceptible check) at Palampur and Kukumseri (Lahul and Spiti) and F_1 seeds were harvested. The F_1 seeds were sown in polyhouse and seeds were harvested in 3 sets i) Separate earheads of 2-3 plants from each cross, ii) Separate plants from each cross and iii) Bulk F_2 seeds of each cross. The F_2 seeds of these crosses will be evaluated under field conditions or in green house with different isolates of powdery mildew for inheritance of resistance.

Studies on components of slow mildewing:

Susceptible genotypes showing slow disease progress as compared to highly susceptible variety HJ-8 in field screening were selected and studied for components of slow mildewing i.e. incubation period, latent period, number of conidiophores bearing conidia and size of mildew colonies under greenhouse conditions and through stereozoom microscope in the laboratory.

Three oat lines, KRR-AK-06, IG-03-203 and JPO-20 showing moderately susceptible reaction to single colony purified powdery mildew inoculum along with susceptible check HJ-8 were selected to carry out experiment on study of slow mildewing components. Among all the lines, the incubation period varied between 3-4 days and the latent period between 4-5 days. Maximum incubation period of 4 days was observed in IG-03-203, JPO-20 and KRR-AK-06 and minimum 3 days in HJ-8. Similarly, higher latent period of 5 days was also observed in these lines as compared to 4 days in susceptible check (HJ-8). After 5 days of inoculation with *B. graminis* f. sp. *avenae* inoculum, minimum conidiophores bearing conidia i.e. 8 were observed in IG-03-203 followed by 16 and 14 in JPO-20 and KRR-AK-06 respectively, whereas conidiophores bearing conidia per colony was maximum (22) in HJ-8. After 6 days of inoculation, conidiophores bearing conidia ranged from 14-35 in selected lines with least *i.e.* 14 in IG-03-203 followed by 26 in JPO-20, 24 in KRR-AK-06 and being maximum (35) in HJ-8. On 8^{th} day after inoculation, number of conidiophores bearing conidia were found to be 30 (IG-03-203), 40 (JPO-20), 35 (KRR-AK-06) and 50 (HJ-8). After 10 days of incubation, except HJ-8 all the lines had countable number of conidia i.e. 49 (IG-03-203), 60 (JPO-20), 55 (KRR-AK-06) and HJ-8 had a greater number of conidia that were unable to count and was designated as countless (C). After 11 days, countless conidiophores bearing conidia were produced on all the selected lines except in IG-03-203 whereas, being very high numbers in susceptible check (HJ-8). The size of powdery mildew colony was recorded after 11 days of inoculation and the data were presented in Table 2. Maximum colony size *i.e.* 3.87 mm was observed in HJ-8 followed by 2.87, 3.37 and 3.30 mm in IG-03-203, JPO-20 and KRR-AK-06, respectively (Table 2). The values of AUDPC on these four lines ranged from 735 to 1775 and maximum value 1775 was found in HJ-8 followed by 1075 in JPO-20, 1050 in KRR-AK-06 and minimum 735 in IG-03-203. Infection rate (r/day) values in the selected 4 lines ranged between 0.071 to 0.144 per day. The maximum infection rate (r/day) 0.144/day was observed in HJ-8 followed by 0.071/day in JPO-20, 0.087/day in KRR-AK-06 and 0.09/day in IG-03-203.

Table (PPT 17): Slow mildewing components on selected oat genotypes

S. No.	Genotypes	Slow Mildewing Components												
		In vitro								Field evaluation				
		Incubation Period (Days)	Latent Period (Days)	Number of Conidiophores bearing Conidia					Colony Size (mm)	AUDPC	r (Infection rate/day)	Relative AUDPC	Relative infection rate	Slow mildewing category
				5th day	6th day	8th day	10th day	11th day						
1	IG-03-203	4	5	8	14	30	49	60	2.87[a]	735[a]	0.090[b]	41.41	60.62	Cat -IV
2	JPO-20	4	5	16	26	40	60	C	3.37[b]	1075[b]	0.071[a]	60.50	49.48	Cat -IV
3	KRR-AK-06	4	5	14	24	35	55	C	3.30[b]	1050[b]	0.087[ab]	59.15	60.18	Cat -IV
4	HJ-8	3	4	22	35	50	C^{+}	C^{++}	3.87[c]	1775[c]	0.144[c]	100.00	100.00	Cat -V
	CD (p=0.05)	-	-	-	-	-	-	-	0.20	158.05	0.017			
	CV								6.18	7.2	-0.83			
	SE (M)±								0.04	70.31	0.057			

- = No conidia

C = Countless: too many to be counted; more than (>) 75, but give individual appearance

C^{+} = Countless: conidiophores and conidial density very high.

C^{++} = Countless: conidiophores and conidial density very high and look like cluster overlapping each other

*Figures within parentheses are arc sine transformed values

PPT-26: Biological management of oat aphid *Rhopalosiphum padi* on oats

Location: Rahuri, Ludhiana
Crop: Oat **Variety:** Kent **Plot size:** 3 x 4 m^2
Replication: 3 **Design:** RBD
Treatments:
T1: Foliar application of *L.lecani* @ $1x10^8$ CFU/g (5 g/lit)
T2: Foliar application of *L. lecani* @ $1x10^8$ CFU/g (7.5 g/lit)
T3: Foliar application of *M. anisopliae* @ $1x10^8$ CFU/g (5 g/lit)
T4: Foliar application of *M. anisopliae* @ $1x10^8$ CFU/g (7.5 g/lit)
T5: Commercial neem product (Azadirachtin – 10000 ppm) @ 2ml/lt
T6: NSE @ 5%
T7: Untreated control

Results: **At Rahuri,** Precount of aphids and coccinellids were observed non significant. At 5 DAS (days after spray), T2 (*L. lecanii* @ 7.5 g/lit) recorded significantly lower number of survived aphids per tiller (35.75). However, it was at par with T1 (*L. lecanii* @ 5g/lit), T4 (*M. anisopilae* @ 7.5 g/lit) and T3 (*M. anisopilae* @ 5 g/lit). Similar trend was also noticed at 7 DAS. Trend of aphid population in promising treatments at 7 DAT were *L. lecanii* @ 7.5g/lit. (9.93), *M. anisopilae* @ 7.5g/lit (12.28), *L. lecanii* @ 5g/lit. (12.36) and *M. anisopilae* @ 5g/lit (14.55). Among the treatments, there was non-significant difference with respect to coccinellid predators. Biopesticides did not affected the activities of coccinellid predators at 5 and 7 days after spray (Table PPT-26a).

At Ludhiana, Pre-count was non- significant. Least incidence of oat aphid at 5 days after treatment was recorded in treatment foliar application of *L. Lecanii* @ $1x10^8$ CFU/g (7.5 g/lit) (10.33) followed by commercial neem spray (10.66 per tiller). At 7 DAS, the least incidence was observed in treatment foliar application of *L. Lecanii* @ $1x10^8$ CFU/g (7.5 g/lit) (4.66) followed by foliar application of *M. anisopliae* @ $1X10^8$ CFU/g (7.5 g/lit) (5.33) and commercial neem spray (5.66 aphids per tiller). Green fodder yield was highest in commercial neem spray. Biopesticides did not affect the activities of natural enemies after spray (Table PPT-26b).

Table PPT-26a: Biological management of oat aphid *Rhopalosiphum padi* on oats at Rahuri

			Rahuri						
Sr. No.	**Treatments**	**Dose (%)**	**Av. No. of aphids/tiller days after 1st spray**			**Av. No. of LBB grubs/tiller**			**GFY (q/ha)**
			Precount	**5 DAS**	**7 DAS**	**Pre count**	**5 DAS**	**7 DAS**	
1	Foliar application of *L.lecanii* @ $1x10^8$ CFU/g	5 gm/lit.	52.83 [a] (7.30)*	39.23 [ab] (6.30)	12.36 [ab] (3.59)	1.33 [a] (1.35)	1.60 [a] (1.45)	1.73 [a] (1.49)	389.49 [ab]
2	Foliar application of *L. Lecanii* @ $1x10^8$ CFU/g	7.5 gm/lit.	54.27 [a] (7.40)	35.75 [a] (6.02)	9.93 [a] (3.23)	1.35 [a] (1.36)	1.58 [a] (1.44)	1.75 [a] (1.50)	395.41 [a]
3	Foliar application of *M. Anisopliae* @ $1x10^8$ CFU/g	5 gm/lit.	55.25 [a] (7.47)	41.88 [ab] (6.51)	14.55 [ab] (3.88)	1.42 [a] (1.38)	1.53 [a] (1.43)	1.67 [a] (1.47)	387.35 [c]
4	Foliar application of *M. Anisopliae* @ $1x10^8$ CFU/g	7.5 gm/lit.	52.51 [a] (7.28)	37.39 [ab] (6.16)	12.28 [ab] (3.58)	1.38 [a] (1.37)	1.64 [a] (1.46)	1.70 [a] (1.48)	391.05 [ab]
5	Commercial neem product (Azadirachtin – 10000 ppm)	2ml /lit	51.11 [a] (7.18)	39.32 [ab] (6.31)	22.21 [cd] (4.77)	1.47 [a] (1.40)	1.58 [a] (1.44)	1.68 [a] (1.48)	359.62 [d]
6	NSKE	5 %	53.99 [a] (7.38)	38.65 [ab] (6.26)	21.09 [c] (4.65)	1.37 [a] (1.37)	1.60 [a] (1.45)	1.77 [a] (1.51)	358.57 [de]
7	Untreated control	--	53.60 [a] (7.36)	57.32 [c] (39.23)	59.26 [e] (7.73)	1.42 [a] (1.38)	1.62 [a] (1.45)	1.67 [a] (1.47)	345.25 [f]
	SE ±	--	0.28	0.29	0.31	0.07	0.06	0.05	2.65
	CD at 5%	--	N.S.	0.89	0.96	N.S.	N.S.	N.S.	7.82
	CV%	--	6.61	7.80	12.10	8.62	6.95	5.91	1.19

*Values in parenthesis are square root transformed **DAS:** Days after spray **LBB:** Lady bird beetle

Table PPT-26b Biological management of oat aphid *Rhopalosiphum padi* on oats at Ludhiana

Ludhiana							
Sr. No.	**Treatment**		**Av. No. of aphids/tiller days after 1st spray**			**Av. No. of LBB grubs/tiller**	**Green fodder yield (q/ha)**
		Dose (%)	**Pre count**	**5 DAS**	**7DAS**		
1	Foliar application of *L.lecanii* @ $1x10^8$ CFU/g	5 gm/lit.	15.33^{a}	12.00^{ab}	7.00^{bc}	2.33^{a}	298^{ab}
2	Foliar application of *L. Lecanii* @ $1x10^8$ CFU/g		16.00^{a}	10.33^{a}	4.66^{a}	3.33^{a}	307^{ab}
3	Foliar application of *M. Anisopliae* @ $1x10^8$ CFU/g	5 gm/lit.	15.33^{a}	13.00^{b}	8.00^{c}	3.33^{a}	294^{ab}
4	Foliar application of *M. Anisopliae* @ $1x10^8$ CFU/g	7.5 gm/lit.	16.33^{a}	11.33^{ab}	5.33^{a}	2.66^{a}	310^{ab}
5	Commercial neem product (Azadirachtin – 10000 ppm) @ 2ml/lt	2ml /lit	15.33^{a}	10.66^{ab}	5.66^{ab}	3.33^{a}	318^{b}
6	NSKE	5 %	15.66^{a}	13.00^{b}	6.00^{ab}	2.33^{a}	302^{ab}
7	Untreated control	--	15.66^{a}	16.00^{c}	15.00^{d}	3.33^{a}	280^{a}
	SE ± (m)		0.78	0.79	0.44	0.36	11.8
	CD (5%)		NS	2.16	2.80	NS	13.8
	CV		12.35	16.45	14.87	15.60	11.5

PPT-30: Biological management of powdery mildew of oats caused by *Blumeria graminis* f. sp. *avenae*

Location: Palampur **Treatments:** 10 **Replications:** 3

Design: RBD **Plot size:** 3x2 m^2

Treatments:

T1: Three foliar spray of *Trichoderma viride* @ 0.5%

T2: Three foliar spray of *Trichoderma harzianum* @ 0.5%

T3: Three foliar spray of *Psuedomonas flourescens* @ 0.5%

T4: Three foliar spray of extract of *Eupatorium adenophorum* @ 10%

T5: Three foliar spray of Azadirachtin 3000 ppm @ 0.3%

T6: Three foliar spray of NSKE @ 5%

T7: Three foliar spray of Eucalyptus @ 10%

T8: Three foliar spray of Vitex @ 0.1%

T9: Three foliar spray of hexaconazole @ 0.1% (Chemical control)

T10: Control

Results: The experiment was conducted to manage the powdery mildew through biological management in oat crop. It was observed that chemical check i.e T9 (three foliar spray of hexaconazole @ 0.1%) gave best control of powdery mildew (5.7 % disease severity and 83.0% disease control) with maximum increase (8.9 %) in the seed yield over the check. However, among the biological management treatments T1 (three foliar spray of *Trichoderma viride* @ 0.5%) or T2 (three foliar spray of *Trichoderma harzianum* @ 0.5%) were found effective giving 51.0 and 50.0 % powdery mildew control with 5.14 and 3.7 % increase in the seed yield respectively over check.

Table PPT-30: Biological management of powdery mildew of oats caused by *Blumeria graminis* f. sp. *avenae*

Treatment	Powdery mildew		Seed Yield	
	% Severity	% reduction over control	(q/ha)	% increase over control
T1	16.7 (24.0*)^{b}	51.0	17.0^{ab}	5.1
T2	19.0 (25.8)^{b}	50.0	16.8^{bc}	3.7
T3	28.3 (32.1)^{d}	14.9	16.4^{bc}	1.4
T4	17.7 (24.8)^{b}	47.0	16.7^{bc}	3.3
T5	23.0 (28.6)^{c}	30.9	16.3^{bc}	0.4
T6	25.3 (30.2)^{cd}	23.9	16.6^{bc}	2.3
T7	18.0 (25.0)^{b}	46.0	16.2^{c}	0.2
T8	16.3 (23.8)^{b}	43.0	16.5^{bc}	1.7
T9	5.7 (13.7)^{a}	83.0	17.6^{a}	8.9
T10	33.3 (35.2)^{e}	-	16.2^{c}	-
CD (5%)	2.57		0.74	
CV	5.70		2.6	
SE ±(m)	0.93		0.25	

*Values in parenthesis are arc sine transformed values

PPT-31: Eco-friendly pest management techniques in berseem ecosystem

Location: Ludhiana and Rahuri

Design: RBD **Replication:** 3 **Plot size:** 5x5 m^2

Treatments:

T1: Seed treatment with *Trichoderma viride* @ 5 g/kg + foliar spray of NSKE @ 5%

T2: Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NKSE @ 5%

T3: T1+ Chickpea as trap crop on border row + Bird perches

T4: T2 + Chickpea as trap crop on border row + Bird perches

T5: T1+ Sunflower as trap crop on border row + Bird perches

T6: T2+ Sunflower as trap crop on border row + Bird perches

T7: Farmer's Practice (Spray of Bavistin on fodder as well as seed crop + Malathion on fodder crop and Chlorantraniliprole 18.5 SC on seed crop)

T8: Control

Results:

Ludhiana: The experiment was conducted for the evaluation of eco-friendly disease and pest management techniques in berseem. The results presented in table PPT 31 showed that T4 (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 (19.80%) with 57.39 percent disease control as compared to control (46.47%) and 15.59 percent increase in green fodder yield. Likewise, treatments T2 and T6 also provided 52.44 and 50.00 percent disease control with more than 12 percent increase in green fodder yield as compared to untreated control. The number of *H. armigera* larvae per metre row length were minimum in T7 (Farmers practice i.e. Spray of Bavistin on fodder as well as seed crop + Malathion on fodder crop and Chlorantraniliprole 18.5 SC on seed crop) followed by T6 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + Sunflower as trap crop on border row + Bird perches) and T4 (Soil application of *Trichoderma viride* @ 1kg/25kg FYM/acre + foliar spray of NSE @ 5% + chickpea as trap crop on border row + Bird perches). More number of *H. armigera* larvae and natural enemies were observed on sunflower plants as compared to chickpea.

Rahuri: *H. armigera* or other lepidopteran larvae were not observed throughout the crop growth period and hence treatments were not imposed. Among different treatments, highest green fodder yield (241.23 q/ha) was obtained in T2 (soil application of *Trichoderma viride* @ 1kg/ 25kg FYM/acre + foliar spray of NSE @ 5%) followed by T1 (seed treatment of *Trichoderma viride* @ 5g/Kg + foliar spray of NSE @ 5%).

Table PPT-31: Evaluation of eco-friendly disease and pest management techniques in berseem

	Ludhiana									Rahuri
Treatment	**Stem rot incidence (%)**	**Disease Control (%)**	***H. armigera* larvae/ m row length in berseem**	***H. armigera* larvae/ plant on trap crop**	**Natural enemies per metre row length on berseem**		**GFY (q/ha)**	**% increase over control**	**Seed Yield (q/ha)**	**GFY (q/ha)**
					Coccinellids	**Spiders**				
T_1	27.67^{d}	40.46	3.33^{cd}	-	2.00^{b}	1.00^{a}	554.0^{cd}	8.48	3.07^{a}	238.74^{ab}
T_2	22.10^{f}	52.44	4.00^{d}	-	2.33^{c}	1.00^{a}	574.0^{b}	12.39	3.24^{a}	241.23^{a}
T_3	31.17^{c}	32.93	3.00^{bc}	1.33^{a}	3.00^{d}	1.33^{a}	548.3^{de}	7.37	2.70^{a}	222.88^{cd}
T_4	19.80^{g}	57.39	2.83^{bc}	1.33^{a}	3.33^{e}	1.33^{a}	590.3^{a}	15.59	3.43^{a}	222.35^{cd}
T_5	35.43^{b}	23.75	3.00^{bc}	1.66^{a}	3.66^{f}	1.33^{a}	535.7^{e}	4.89	2.60^{a}	223.97^{cd}
T_6	23.23^{ef}	50.00	2.33^{b}	1.66^{a}	3.66^{f}	1.33^{a}	565.0^{bc}	10.63	3.08^{a}	224.03^{cd}
T_7	24.23^{ef}	47.85	1.33^{a}	-	1.66^{a}	0.66^{a}	562.0^{bcd}	10.05	2.97^{a}	225.07^{c}
T_8	46.47^{a}	-	6.33^{e}	-	3.00^{d}	1.33^{a}	510.7^{f}	-	2.33^{a}	221.51^{cd}
CD (P=0.05)	1.074		0.82	NS	0.24	NS	9.833		NS	7.00
SE ±(m)	0.351		0.264	0.19	0.30	0.29	3.211		0.252	2.31
CV	2.112		14.00	20.22	18.20	18.86	1.002		14.910	1.76

PPT-32: Validation of best treatment of trial entitled "Management of soil borne and powdery mildew diseases in red clover seed crop"

Location: Palampur
Plot size: 10 x 10 m^2
Replication: 7
Design: Paired plot design
Treatments:
T1: Seed treatment with *Trichoderma viride* @ 5g/kg seed + three foliar spray of *Trichoderma viride* @ 0.5%
T2: Seed treatment with carbendazim @ 2 g/kg seed+ three foliar spray of hexaconazole @ 0.1 %
T3: Control
Results: The experiment was conducted to manage the powdery mildew (*Erysiphe trifolii*) and soil borne (clover rot caused by *Sclerotinia trifoliorum*) disease in the seed crop of red clover. It was observed that integrated management i.e. seed treatment with carbendazim @ 2 g/kg seed followed by three foliar spray of hexaconazole @ 0.1 % gave best management of powdery mildew having 6.0 per cent disease severity and 85.7 per cent disease control of powdery mildew and 3.3 % disease incidence with 66.7 % disease control of soil borne disease with 21.7 per cent increase in yield over control. The non-chemical treatment i.e. *Trichoderma viride* @ 5g/kg seed + Three foliar spray of *Trichoderma viride* @ 0.5% also gave 25.6 per cent disease severity with 55.6 per cent disease control of powdery mildew and 6.3 per cent disease incidence and 36.7 % disease control of soil borne disease with 5.8 per cent increase in yield over control.

Table PPT-32: Validation of best treatment of trial entitled "management of soil borne and powdery mildew diseases in red clover seed crop"

Treatment	% Severity /Incidence				Seed yield		B:C ratio
	Powdery mildew	% control	Clover rot	% control	Q/ha	% increase	
T_1	18.67 (25.6)[b]	55.6	6.3 (14.6)[b]	36.7	1.41[b]	7.60	1: 4.7
T_2	6.00 (14.1)[a]	85.7	3.3 (10.5)[a]	66.7	1.53[a]	12.90	1: 11
T_3	42.00 (40.4)[c]	-	10.0 (18.4)[c]	-	1.36[c]	-	
CD (5%)	3.07	-	1.74	-	0.04		
CV	5.08		5.30		1.09		
SE ±(m)	0.78		0.44		0.03		

PPT-34: Integrated disease management in berseem

Location: Jhansi, Ludhiana, Bhubaneswar, Palampur

Design: RBD **Replication:** 3 **Plot size:** 3x2 m^2

Treatments:

T1: Seed treatment with Chitosan @ 0.05 %
T2: Seed treatment with *Trichoderma* @ 0.5 %
T3: Seed treatment with carbendazim @ 0.2 %
T4: Seed treatment with Chitosan @ 0.05 % + *Trichoderma* @ 0.5%
T5: Seed treatment with Chitosan @ 0.05 % + carbendazim @ 0.1%
T6: T1 + foliar spray of Chitosan @ 0.05%
T7: T2+ foliar spray of Chitosan @ 0.05 %
T8: T3 +foliar spray of Chitosan @ 0.05 %
T9: T3 + foliar spray of carbendazim @ 0.1 %
T10: Control

Results:

At Jhansi, for stem rot management, best treatment was T7 (Seed treatment with *Trichoderma* @ 0.5 %
+ foliar spray of Chitosan @ 0.05 %) followed by T6 (Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%) with 8.7 % and 11.7 % incidence. Highest green fodder and seed yield was obtained in T7 (611.11 q/ha and 4.56 q/ha respectively) (Table PPT-34).

At Ludhiana, for stem rot management, best treatment was T6 (Seed treatment with Chitosan @ 0.05 % + foliar spray of Chitosan @ 0.05%) followed by T8 (Seed treatment with carbendazim @ 0.2 % + foliar spray of Chitosan @ 0.05%) with 20.23 % and 22.73 % incidence. Highest green fodder and seed yield was obtained in T6 (627.8 q/ha and 5.78 q/ha respectively) followed by T8 (618.1 q/ha and 5.45 q/ha respectively) (Table PPT-34).

At Palampur, for root rot management, best treatment was T9 (Seed treatment with carbendazim @ 0.2 % + Seed treatment with carbendazim @ 0.1 %) with 1 % incidence followed by T8, T5 and T3 (1.3 % incidence). For leaf blight management, best treatment was T9 (3 % severity) followed by T8 (3.3 % severity) and T6 (4 % severity). Highest green fodder yield was obtained in T9 (368.7 q/ha) followed by T5 (366.7 q/ha) and T8 (365.3 q/ha) (Table PPT-34).

At Bhubaneswar, for root rot management best treatment was T9 (Seed treatment with carbendazim @ 0.2 % + Seed treatment with carbendazim @ 0.1 %) with 7.63 % incidence followed by T5 (Seed treatment with Chitosan @ 0.05 % + carbendazim @ 0.1%) having 4.63 % incidence. For leaf blight management, best treatment was T9 (9.30 % severity) followed by T8 (13.37 % severity). Highest green fodder yield was obtained in T9 (422.6 q/ha) followed by T8 (405.1 q/ha) (Table PPT-34).

Table PPT-34: Integrated disease management in berseem

Treatments	Jhansi			Ludhiana			Palampur			Bhubaneswar		
	Stem rot Incidence (%)	Green Fodder Yield (q/ha)	Seed Yield (q/ha)	Stem rot Incidence (%)	Green Fodder Yield (q/ha)	Seed Yield (q/ha)	Root rot incidence (%)	Leaf blight severity (%)	Green Fodder Yield (q/ha)	Leaf spot & blight severity (%)	Root rot and wilt (%)	Green Fodder Yield (q/ha)
T_1	21.0^{b}	497.23^{ab}	3.67^{bcd}	32.87^{e}	550.0^{cd}	4.12^{abc}	2.3^{c}	8.3^{ef}	354.3^{de}	36.47^{g}	12.50^{c}	348.5^{ab}
T_2	18.7^{bc}	541.68^{ab}	3.50^{cd}	38.00^{c}	531.3^{e}	3.92^{bc}	4.3^{d}	9.3^{f}	352.7^{e}	39.90^{h}	15.67^{d}	355.3^{ab}
T_3	16.7^{bcd}	527.80^{ab}	3.78^{bc}	39.23^{b}	529.1^{e}	3.83^{bc}	1.3^{b}	7.3^{cd}	362.0^{bc}	33.43^{f}	9.30^{b}	364.8^{bc}
T_4	20.7^{b}	558.35^{ab}	3.89^{bc}	30.97^{f}	560.2^{bc}	4.66^{abc}	2.3^{c}	8.0^{de}	358.3^{cd}	35.00^{fg}	7.87^{b}	384.5^{d}
T_5	16.0^{bcd}	566.66^{ab}	3.62^{bcd}	35.33^{d}	539.1^{de}	4.61^{abc}	1.3^{b}	7.0^{c}	366.7^{ab}	29.87^{e}	4.63^{a}	392.9^{de}
T_6	11.7^{cd}	530.58^{ab}	4.17^{ab}	20.23^{j}	627.8^{a}	5.78^{a}	2.3^{c}	4.0^{b}	359.7^{c}	17.23^{c}	14.50^{d}	378.6^{cd}
T_7	8.7^{d}	611.11^{a}	4.56^{a}	25.93^{h}	615.6^{a}	5.23^{ab}	3.3^{c}	5.0^{c}	361.7^{b}	24.20^{d}	12.40^{c}	375.5^{cd}
T_8	12.3^{cd}	583.33^{ab}	4.28^{ab}	22.73^{i}	618.1^{a}	5.45^{ab}	1.3^{b}	3.3^{ab}	365.3^{ab}	13.37^{b}	9.43^{b}	405.1^{ef}
T_9	15.0^{bcd}	563.91^{ab}	3.72^{bcd}	28.03^{g}	570.6^{b}	4.88^{abc}	1.0^{a}	3.0^{a}	368.7^{a}	9.30^{a}	7.63^{b}	422.6^{f}
T_{10}	38.3^{a}	477.78^{b}	3.06^{d}	47.30^{a}	506.9^{f}	3.29^{c}	5.3^{e}	10.7^{g}	350.3^{e}	41.73^{h}	19.13^{e}	340.7^{a}
CD (P=0.05)	4.74	0.43	0.40	0.98	11.87	1.09	0.72	1.06	5.18	2.49	1.73	17.06
SE ±(m)	1.5	1.27	0.13	0.33	3.97	0.36	0.24	0.35	1.74	0.84	0.58	5.72
CV	15.44	3.2	6.15	1.76	1.22	13.79	4.77	4.24	0.84	5.17	8.87	2.63

CHAPTER-4

BREEDER SEED PRODUCTION

Forage Crops Breeder Seed Production

[Indent year Rabi 2020-21]
[Production year Rabi 2019-20]
(Table Reference: Tables BSP 1, 2)

The indent for Breeder Seed Production was received from DAC, GOI for 41 varieties in four forage crops *viz*., Oat (24), Berseem (11), Lucerne (5) and Teosinte (1). The total quantity allocated was 444.58 q. The production target was assigned to different Breeder Seed producing centres of the SAUs/ NGO/ ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (409.15 q) followed by Berseem (29.23 q) and Lucerne (4.20 q) and Teosinte (2.00 q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centres revealed that in two crops Oat & Lucerne the overall breeder seed production was more than the allocated quantity. The overall breeder seed production was 491.91 q against the indent of 444.58 q (Table BSP 1 & 2) which is 47.33 q surplus.

In Oat, the production was 468.58q against the allocation of 409.15q making a surplus of 59.43q. The total indent was for 24 varieties. In nine varieties viz., OL-1802, RO-11-1, UPO-06-01, JHO-2015-1, BJ-20122, JHO -2009-1, JHO-2000-4, JHO-99-2, JO-04-315 there was deficit in production and in all other cases there was surplus production. The indent was allocated to 10 centers in 08 states / UT and only two institutions viz., GBPUAT, Pantnagar and ICAR-IGFRI, Jhansi could not meet the target. All other centers produced surplus or equal seeds.

In Berseem, the total production was 18.97q against the indent of 29.23q making a deficit of 10.26q. There was indent of 11 varieties and were allocated to 4 centers located in 4 different states. In four varieties *viz.,* BL-42, BB-3,UPB-110, JB-05-09 the production was less than the indent. In other seven varieties there was surplus or equal production. Center wise scenario indicates that IGFRI, Jhansi PAU, Ludhiana; GBPUAT, Pantnagar; JNKVV Jabalpur were net deficit breeder seed producer in Berseem.

In Lucerne, the target of (4.20 q) was allotted to three centers in three states. The total production was 4.36 q which was 0.16q higher than the indent. MPKV Rahuri was net surplus producer whereas AAU, Anand achieved the target. SKRAU, Bikaner failed to meet the target. Out of 5 varieties, the target was met in AL-3, Anand-2 and Anand -3 whereas in RL-88 there was surplus production of 0.26q. IN RBB-07-01 (Krishna, the target was not met and production was reported nil by SKRAU, Bikaner.

In Teosinte, there was indent of 2.0 q seed and it was allocated to PAU, Ludhiana. During the meeting with DAC &FW it was informed that there is no nucleus seed, hence target should not be placed. As such it was not produced.

Table BSP 1: State wise/ Centre wise Breeder Seed Production (q) during *Rabi 2019-20*

[Indent Rabi 2020-21]

[Production year Rabi 2019-20]

Oat

SN	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Surplus/ Deficit	Indenter organization
1.	**Punjab**						
	PAU, Ludhiana	OL-9	3.00	3.00	3.00	-	3.00 (NSAI)
		OL-10	34.50	34.50	34.50	-	10.00 (NDDB),1.00 (PB), 23.50 (NSAI)
		OL-11	0.50	0.50	10.00	(+) 9.50	0.50 (PB)
		OL-12	6.50	6.50	9.50	(+) 3.00	0.50 (PB), 6.00 (NSAI)
		OL-1802	20.50	20.50	9.00	(-) 11.50	2.50 (GJ), 13.00 (NDDB), 5.00 (RJ)
		OL-1769-1	20.00	20.00	30.00	(+) 10.00	20 (UP)
		Total	**85.00**	**85.00**	**96.00**	**11.00**	
2.	**Maharashtra**						
	BAIF, Uralikanchan	Kent	25.00	25.00	32.00	(+) 7.00	25.00 (NSC)
		Total	**25.00**	**25.00**	**32.00**	**(+) 7.00**	
	MPKV, Rahuri	RO-11-1 (P. Surabhi)	10.50	10.50	10.10	(-) 0.40	0.50 (NDDB), 10.0 (NSC)
		RO-19 (Harita)	5.15	5.15	16.80	(+) 11.65	0.15 (NDDB),5.00 (RJ)
		Kent	5.50	5.50	41.40	(+) 35.90	5.00 (HIL), 0.50 (PB)
		Total	**21.15**	**21.15**	**68.30**	**(+) 47.15**	
3.	**Gujarat**						
	AAU, Anand	Kent	35.30	35.30	35.30	-	35.30 (NDDB)
		Total	**35.30**	**35.30**	**35.30**	**-**	
4.	**Uttarakhand**						
	GBPUAT, Pantnagar	UPO-06-01	13.30	13.30	0.00	(-)13.30	13.30 (NDDB)
		UPO-212	85.10	85.10	90.00	(+) 4.90	85.10 (NDDB)
		Total	**98.40**	**98.40**	**90.00**	**(-) 8.40**	
5.	**Uttar Pradesh**						
	IGFRI, Jhansi	Kent	30.00	30.00	30.00	-	30.00 (JK)
		JHO 2015-1	15.50	15.50	0.90	(-) 14.60	0.50 (HP), 15.00 (NSC)
		BJ- 20122	1.00	1.00	0.00	(-) 1.00	1.00 (DADH)
		JHO- 2009-1	20.50	20.50	18.00	(-) 2.50	0.50 (NDDB), 20.00 (UP)
		JHO- 2000-4	5.00	5.00	0.00	(-) 5.00	5.00 (RJ)
		JHO 99-2	5.00	5.00	0.00	(-) 5.00	5.00 (RJ)
		JHO- 822	17.00	17.00	17.00	-	17.00 (NDDB)
		Total	**94.00**	**94.00**	**65.90**	**(-) 28.10**	
	ANDUAT, Aodhya	NDO-22	0.50	0.50	050	-	0.50 (NDDB)
		Total	**0.50**	**0.50**	**050**	**-**	
6.	**Haryana**						
	CCS HAU, Hisar	OS - 403	27.40	27.40	36.10	(+) 8.70	15.00 (DADH), 0.40 (HR), 10.00 (JK), 2.00 (NSC)
		OS- 377	3.40	3.40	17.20	(+)13.80	1.00 (DADH), 0.40 (HR), 2.00 (NSC)
		HJ- 8	4.00	4.00	11.20	(+) 7.20	4.00 (DADH),
		Total	**34.80**	**34.80**	**64.50**	(+) **29.70**	
7.	**Madhya Pradesh**						
	JNKVV, Jabalpur	JO 04-315	4.50	4.50	1.68	(-) 2.82	4.50 (DADH)
		JO 1	-	-	3.40	(+) 3.40	
		Total	**4.50**	**4.50**	**5.08**	(+) **0.58**	
8.	**UT of J&K**						
	SKUAST, Srinagar	SKO- 20	10.50	10.50	11.00	(+)0.50	0.50 (HP), 10.00 (JK)
		Total	**10.50**	**10.50**	**11.00**	(+) **0.50**	
		Grand Total	**409.15**	**409.15**	**468.58**	**59.43**	

Table BSP 1: State wise/ Centre wise Breeder Seed Production (q) during *Rabi 2019-20—Contd...*

Berseem

SN	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Surplus/ Deficit	Indenter organization
1.	**Punjab**						
	PAU, Ludhiana	BL- 43	3.90	3.90	3.90	-	0.50 (HR), 2.00 (NDDB), 0.40 (PB), 1.00 (NSAI)
		BL- 42	10.18	10.18	4.00	-6.18	0.50 (HR), 1.00 (JK), 1.00 (NDDB), 5.00 (NSC), 0.48 (PB), 2.20 (NSAI)
		BL- 180	1.00	1.00	1.00	-	1.00 (NSAI)
		BL-10	1.40	1.40	1.40	-	1.00 (NDDB), 0.40 (PB)
		Total	**16.48**	**16.48**	**10.30**	**-6.18**	
2.	**Uttar Pradesh**						
	IGFRI, Jhansi	JBSC - 1	0.90	0.90	0.90	0.00	0.60 (NDDB), 0.30 (RJ)
		BB- 3	1.50	1.50	1.00	-0.50	0.50 (DADH), 1.00 (NDDB)
		BB- 2	0.70	0.70	0.70	0.00	0.50 (NDDB), 0.20 (RJ)
		Wardan	4.25	4.25	4.25	0.00	4.25 (NDDB)
		Total	**7.35**	**7.35**	**6.85**	**-0.50**	
3.	**Uttarakhand**						
	GBPUAT, Pantnagar	UPB- 110	0.20	0.20	0.02	-0.18	0.20 (NDDB)
		Total	**0.20**	**0.20**	**0.02**	**-0.18**	
4.	**Madhya Pradesh**						
	JNKVV, Jabalpur	JB- 5	0.10	0.10	0.10	0.00	0.10 (NDDB)
		JB 05-09	5.10	5.10	1.70	-3.40	0.10 (RJ), 5.00 (UP)
		Total	**5.20**	**5.20**	**1.80**	**-3.40**	
Grand Total			**29.23**	**29.23**	**18.97**	**-10.26**	

Table BSP 1: State wise/ Centre wise Breeder Seed Production (q) during *Rabi 2019-20—Contd...*

Lucerne

SN	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Surplus/ Deficit	Indenter organization
1.	**Maharashtra**						
	MPKV, Rahuri	RL- 88	0.10	0.10	0.36	(+) 0.26	0.10 (RJ)
		Total	**0.10**	**0.10**	**0.36**	**(+) 0.26**	
2.	**Gujarat**						
	AAU, Anand	AL- 3	1.50	1.50	1.50	-	1.00 (DADH), 0.50 (NDDB)
		Anand -3	0.10	0.10	0.10	-	0.10 (RJ)
		Anand - 2	2.40	2.40	2.40	-	2.40 (NDDB)
		Total	**4.00**	**4.00**	**4.00**	**0.00**	
3.	**Rajasthan**						
	SKRAU, Bikaner	RBB 07-01 (Krishna)	0.10	0.10	0.00	-0.10	0.10 (RJ)
		Total	**0.10**	**0.10**	**0.00**	**-0.10**	
Grand Total			**4.20**	**4.20**	**4.36**	**(+) 0.16**	

Table BSP 1: State wise/ Centre wise Breeder Seed Production (q) during *Rabi 2019-20—Contd...*

Teosinte

SN	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Surplus/ Deficit	Indenter organization
	Punjab						
1.	PAU, Ludhiana	TL- 1	2.00	2.00	0.00	-2.00	2.00 (NDDB)
		Total	**2.00**	**2.00**	**0.00**	**-2.00**	

(Rabi Forages)	**Allocation as per DAC**	**Allocation BSP-I**	**Production**	**Surplus/ Deficit**
Grand Total	**444.58**	**444.58**	**491.91**	**47.33**

Remarks for less production (Explanation given by respective centers)

Institution	Crop	Variety	Reasons for less production
IGFRI, Jhansi	Oat	JHO 2015-1	Production was less due to non-availability of nucleus seed
		BJ - 20122	Nucleus Seed not available
		JHO- 2000-4	Monitoring team rejected BS plots due to complete crop lodging & weed infestation
		JHO 99-2	
	Berseem	BB- 3	Seed yield was reduced due to rains during flowering
MPKV, Rahuri	Oat	RO 11-1 (P. Surabhi)	Includes 4.70q carryover seed
		RO- 19 (Harita)	Includes 8.40q carryover seed
		Kent	41.40q is carryover seed
PAU, Ludhiana	Berseem	BL-42	Less production due to damage In the fields because of lockdown.
GBPUAT, Pantnagar	Oat	UPO-06-01	Notification number was not found Thus, monitoring team rejected BS plots
JNKVV, Jabalpur	Berseem	JB 05-09	Due to lockdown
SKRAU, Bikaner	Lucerne	RBB 07-01 (Krishna)	No seed set at the center

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2019-20

[Indent Rabi 2020-21]
[Production year Rabi 2019-20]

Crop: Forage Oat

S N	Variety	Produced by	Notification on Year	Allocation as per DAC	Allocation BSP-1	Production	Surplus (+) / Deficit (-)
1	OL- 9	PAU, Ludhiana		3.00	3.00	3.00	-
2	OL- 10			34.50	34.50	34.50	-
3	OL- 11			0.50	0.50	10.00	(+) 9.50
4	OL- 12			6.50	6.50	9.50	(+) 3.00
5	OL- 1802			20.50	20.50	9.00	(-)11.50
6	OL- 1769-1			20.00	20.00	30.00	(+) 10.00
7	Kent	BAIF, Uralikanchan	1975	95.80	25.00	32.00	(+) 7.00
		AAU, Anand			35.30	35.30	-
		MPKV, Rahuri			5.50	41.40	(+) 35.90
		IGFRI, Jhansi			30.00	30.00	-
		Total			**95.80**	**138.70**	**(+) 42.90**
8	RO 11-1 (P. Surabhi)	MPKV, Rahuri		10.50	10.50	10.10	(-) 0.40
9	RO- 19 (Harita)	MPKV, Rahuri		5.15	5.15	16.80	(+) 11.65
10	UPO 06-01	GBPUAT, Pantnagar		13.30	13.30	0.00	(-) 13.30
11	UPO- 212	GBPUAT, Pantnagar		85.10	85.10	90.00	(+) 4.90
12	JHO 2015-1	IGFRI, Jhansi		15.50	15.50	0.90	(-) 14.60
13	BJ- 20122	IGFRI, Jhansi		1.00	1.00	0.00	(-) 1.00
14	JHO- 2009-1	IGFRI, Jhansi		20.50	20.50	18.00	(-) 2.50
15	JHO- 2000-4	IGFRI, Jhansi		5.00	5.00	0.00	(-) 5.00
16	JHO 99-2	IGFRI, Jhansi		5.00	5.00	0.00	(-) 5.00
17	JHO- 822	IGFRI, Jhansi		17.00	17.00	17.00	-
18	OS - 403	CCS HAU, Hisar		27.40	27.40	36.10	(+) 8.70
19	OS- 377	CCS HAU, Hisar		3.40	3.40	17.20	(+) 13.80
20	HJ- 8	CCS HAU, Hisar		4.00	4.00	11.20	(+) 7.20
21	NDO-22	ANDUAT, Ayodhya		0.50	0.50	0.50	0.00
22	JO 04-315	JNKVV, Jabalpur		4.50	4.50	1.68	(-)2.82
23	JO 1	JNKVV, Jabalpur		-	-	3.40	(+) 3.40
24	SKO- 20	SKUAST, Srinagar		10.50	10.50	11.00	(+) 0.50
		Grand Total		**409.15**	**409.15**	**468.58**	(+) **59.43**

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2019-20……Contd.

Crop: Berseem

S N	Variety	Produced by	Notification Year	Allocation as per DAC	Allocation BSP-1	Production	Surplus (+) / Deficit (-)
1	BL- 43	PAU, Ludhiana		3.90	3.90	3.90	-
2	BL- 42	PAU, Ludhiana		10.18	10.18	4.00	(-) 6.18
3	BL- 180	PAU, Ludhiana		1.00	1.00	1.00	-
4	BL-10	PAU, Ludhiana		1.40	1.40	1.40	-
5	JBSC - 1	IGFRI, Jhansi		0.90	0.90	0.90	-
6	BB- 3	IGFRI, Jhansi		1.50	1.50	1.00	(-) 0.50
7	BB- 2	IGFRI, Jhansi		0.70	0.70	0.70	-
8	Wardan	IGFRI, Jhansi		4.25	4.25	4.25	-
9	JB- 5	JNKVV, Jabalpur		0.10	0.10	0.10	-
10	JB 05-09	JNKVV, Jabalpur		5.10	5.10	1.70	(-) 3.40
Grand Total				**29.23**	**29.23**	**18.97**	(-) **10.26**

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2018-19……Contd.

Crop: Lucerne

SN	Variety	Produced by	Notification Year	Allocation as per DAC	Allocation BSP-1	Production	Surplus / Deficit
1	RL-88	MPKV, Rahuri	1996	0.10	0.10	0.36	(+) 0.26
2	AL- 3	AAU, Anand		1.50	1.50	1.50	-
3	Anand -3	AAU, Anand		0.10	0.10	0.10	-
4	Anand - 2	AAU, Anand		2.40	2.40	2.40	-
5	RBB 07-01 (Krishna)	SKRAU, Bikaner		0.10	0.10	0.00	(-) 0.10
Total				**4.20**	**4.20**	**4.36**	**(+) 0.16**

FORAGE TECHNOLOGY DEMONSTRATION

To popularize the forage production technologies and make the farmers aware about various new fodder crop varieties. A total of 570 FTD's were allotted to 21 AICRP centres for Rabi crops. It included 90 FTDs to berseem, 60 to lucerne, 250 to oat (Single cut), 65 to oat (Multi cut), 10 to cowpea, 95 to other crops viz., lathyrus, rye grass, guinea grass, bajra napier hybrid etc.

Crop-wise FTDs to be conducted during Rabi 2019-20

SN	Centre	Berseem	Lucerne	Oat (SC)	Oat (MC)	Cow pea	Other crops	Total
1.	AAU, Jorhat				20		Rye grass: 20, Lathyrus: 10	50
2.	OUAT, Bhubaneswar			10			Rye grass: 5	15
3.	BCKV, Kalyani	10		20			Lathyrus: 20	50
4.	BAU, Ranchi	25		25				50
5	NDUAT, Faizabad			10				10
6.	JNKVV, Jabalpur	10		05				15
7.	AAU, Anand		10	10				20
8.	BAIF, Urulikanchan	05		15				20
9.	MPKV, Rahuri	10		10				20
10.	SKRAU, Bikaner		05	05				10
11.	PAU, Ludhiana			50				50
12.	CCS HAU, Hisar	15		10	05			30
13.	GBPUAT, Pantnagar	10			10			20
14.	TNAU, Coimbatore		05			05	Guinea grass: 05	15
15.	PJTSAU, Hyderabad		10	10				20
16.	ZRS, UAS (B), Mandya		30	45				75
17.	CSK HPKV, Palampur				20		Rye grass: 10	30
18.	KAU, Vellayani					05	BNH: 10, Guinea grass: 10	25
19.	IGKV, Raipur	05		05			Lathyrus: 05	15
20.	CAU, Imphal			10	10			10
21.	Pusa, Bihar			10				10
Total		**90**	**60**	**250**	**65**	**10**	**95**	**570**

Forage In-house Breeding Activities RABI 2019-20

AICRP (FC&U), UAS (B) ZARS, Mandya

Fodder Cowpea: DOS: 09-10-2019

- Advancing of F_4 to F_5 generation of the cross EC170578-1-1 x KBC-9
- No. of lines advanced: **63** stable lines identified for fodder quality and yield were selected and advanced. Out of them, the following high yielding 14 stable genotypes were selected and advanced to F_6 generation and for evaluation in SVT and MLT during kharif-2020.

SN	Lines selected	SN	Lines selected	SN	Lines selected
1.	50-3-1	**6.**	50-3-11	**11.**	50-3-30
2.	50-3-2	**7.**	50-3-19	**12.**	50-3-30
3.	50-3-7	**8.**	50-3-19	**13.**	50-3-30
4.	50-3-7	**9.**	50-3-19	**14.**	50-3-31
5.	50-3-11	**10.**	50-3-19		

Fodder Maize: Following lines were multiplied for large scale evaluation in SVT / MLT
DOS: 11-10-19

Elite lines			
1-45-3	2-10-3-2	1-1-1	1-20-2
1-106-6	2-10-2	1-18-3	1-34-2
5-6-1	2-4-6-1	1-17-2	1-23-4
5-3-3-3	2-1-32	1-17-14	1-41-3
5-2-2	1-106-6	1-17-9	1-44-1
5-2-1-2	1-105-3	1-17-19	1-50-7
5-2-3-2	1-104-2-2	1-19-5	1-59-5
4-6-2-2	1-102-2	1-20-1	1-80-3

Evaluation of F_3 and back cross generation of Maize hybrids for fodder traits: After evaluation five lines were selected **DOS: 26-12-19**

1	1-105-6 x CML 451	**3**	1-106-6 x CML 451	**5**	African tall x CML451
2	5-16-14 x CML 451	**4**	1-19-5 x CML 451		

F_3 backcross generations: These crosses with resistant donors will be screened for the TLB & SDM

1.	(African Tall x CAL 1443) x CML 451	**3.**	(P-12 x MAI-8) x African Tall
2.	(P-8 x 1-50-74) x CML 451	**4.**	(P-8 x MAI -8) x African Tall

Seed production of released varieties

	Nucleus seeds	Breeder seed
MFC-09-1	16 kg	50 kg
MFC-08-14	20 kg	10 kg
MFC-09-3	8 kg	-

AICRP (FC&U), TNAU, Coimbatore

Interspecific hybridization in Lucerne

Seeds of two wild species of Lucerne viz., *Medicago falcata* and *M. truncatula* were collected from Leh and Ladakh regions J&K through SKUAST, Srinagar. These two species will be raised in glass house for effecting inter-specific hybridization with *M. sativa*.

New crosses in BN hybrids

A total of 26 fresh crosses were made during *Rabi,* 2019 involving elite bajra parents collected from ICRISAT, Hyderabad with an objective of evolving high yielding and quality BN hybrids. These crosses are under observation from *Kharif*, 2020 onwards.

Fodder Bajra x Napier grass

SN	Cross combination	SN	Cross combination	SN	Cross combination
1.	IP 20594 × FD 452	**10.**	IP 22269 × FD 480	**19.**	IP 20350 × FD 463
2.	IP 20594 × FD 456	**11.**	IP 22269 × FD 432	**20.**	IP 20350 × FD 481
3.	IP 20594 × FD 443	**12.**	IP 6202 × FD 453	**21.**	ICMV 1616 × FD 461
4.	IP 20594 × FD 431	**13.**	IP 20350 × FD 453	**22.**	ICMV 1616 × FD 463
5.	IP 20594 × FD 432	**14.**	IP 18308 × FD 480	**23.**	ICMV 1616 × FD 474
6.	IP 22269 × FD 439	**15.**	IP 18308 × FD 485	**24.**	ICMV 1617 × FD 476
7.	IP 22269 × FD 451	**16.**	IP 18308 × FD 472	**25.**	ICMR 100228 × FD 454
8.	IP 22269 × FD 453/1	**17.**	IP 18308 × FD 457	**26.**	ICMR 100081 × FD 486
9.	IP 22269 × FD 474	**18.**	IP 20840 × FD 453/1		

New crosses in fodder cowpea

A total of 16 fresh crosses were made during *Rabi,* 2019 involving high yielding released varieties as parents with an objective of evolving high yielding and quality types. These crosses are being evaluated from *Kharif*, 2020 onwards.

SN	Cross combination	SN	Cross combination	SN	Cross combination
1.	CO (FC) 8 × EC 240685	**7.**	CO 9 × CP 4	**13.**	CO 5 × VCP 49
2.	CO (FC) 8 × EC 240215	**8.**	CP 113 × TY 1175	**14.**	CO 5 × EC 241027
3.	CO (FC) 8 × EC 241027	**9.**	1081 × EC 240685	**15.**	CO 5 × UPC 952
4.	CO 9 × TY 1175	**10.**	1081 × EC 240685	**16.**	CO 5 × EC 240215
5.	CO 9 × EC 240685	**11.**	1287 × IFC 95103		
6.	CO 9 × EC 241027	**12.**	N 311 × IFC 9201		

Characterization of *Moringa* for fodder yield and quality

An exploration was conducted in major *Moringa* growing districts of Tamil Nadu like Karur, Dindigul, Theni and Madurai during *kharif* 2018. A total of 24 germplasm lines were collected and the pool comprising of annual and perennial types. The pool was planted during June last week in a randomized block design for assessing the forage yield potential. First harvest was done four months after planting.

The health impact of *Moringa* feeding on milch animals in terms of body weight gain and haemoglobin status was analysed. The feeding showed positive impact of milk yield and quality. The result of continuous feeding on long term basis will be ascertained. The nutrient status of germplasm *viz*., N, P, K, Fe, Mg *etc*., was quantified. Discernible variations for nutrient contents were noticed. The yield on repeated harvests is being recorded.

Crop varieties released during 2019-20

Lucerne variety CO 4 has been identified for release in Tamil Nadu, AP, Telangana and Karnataka during NGM-*Rabi* 2019 on 30th August, 2019 for high green fodder and dry matter yield

AICRP (FC&U), BAIF, Urulikanchan

Lucerne: Evaluation of mutant population

A set of 100 seeds of Lucerne (BAL-08-1 accession) were treated with EMS for mutation. Mutated seeds were sown in nursery pots and were developed into M_1 seedlings. Approximately 800 full grown seedlings were transplanted in pots and in field for further evaluation.

B x N hybrid: Evaluation of fresh hybrids

Seven fresh crosses of Bajra & Napier grass namely ICMV-1610 x BRN 01, ICMV-1622 x BRN 01, ICMV-1608-1x BRN 01, ICMV-05777-1 x BRN 01, ICMV-1607 x BRN 01, ICMV- 1607 x FD-444 and ICMV- 1622 x FD- 444 were attempted during *Kharif* -2018. The crossed seeds of these crosses were sown for evaluation during *summer* 2019. After three cuts, based on the phenotypic characters, 14 promising heterotic clumps were identified for further evaluation.

Maize: Evaluation of advanced generation

During *Kharif*-2019, thirty two individual F_1 plants were selected from following twelve crosses of maize. The progenies of 32 IPS were grown for F_2 generation along with their parents to study the performance with respect to growth, forage yield and quality traits. Based on the phenotypic characters, 71 IPS were made from 32 plant families in F_2 for further advancement.

Sr. No.	Cross combination	No. of IPS		Sr. No.	Cross combination	No. of IPS	
		F_1	F_2			F_1	F_2
White grain colour							
1	BAIF- 102 x African Tall	2	3	**5**	BAIF-245 x African Tall	2	6
2	BAIF-303 x African Tall	2	4	**6**	Pratap Makka x African Tall	5	13
3	BAIF-304 x African Tall	2	4	**7**	BAIF- 235 x African Tall	6	11
4	BAIF-313 x African Tall	2	4	**8**	BAI- 242 x African Tall	2	7
Red grain colour							
9	BAIF-150 x BAIF- 295	2	3	**11**	BAIF-224 x BAIF- 295	3	5
10	BAIF-218 x BAIF- 295	2	7	**12**	BAIF-309 x BAIF- 295	2	4

Maize x Teosinte: Evaluation of advanced generation

The progenies of 11 IPS selected from F_4 segregating generation of Maize x Teosinte cross were grown for study in F_5 generation. The objectives are to develop fodder maize variety having tillering ability, high leaf stem ratio and dual cut. From these progenies, eight IPS were selected for further advancement in F_6 generation.

AICRP (FC&U), KAU, CoA Vellayani

Evaluation of fodder cowpea cultures for yield, forage quality & ratooning ability. Genetic analysis of fodder yield and quality in fodder cowpea and evaluation of F_4 progenies to identify superior recombinants. The F4 progenies of four families CO-8 X IT – 37154999-38, MFC -09-1 X IT – 37154999-38, IC – 97767 X IT – 37154999-38 and IC – 97767 X Pant Lobia-2 are in the field under evaluation.

Induced mutagenesis for developing dual purpose genotypes in fodder cowpea- using chemical mutagens to identify superior dual purpose genotypes for seed and fodder from the mutants.

AICRP (FC&U), BAU, Ranchi

Oat

- **Station trial:** Out of thirteen entries tested in single cut station trial, the entry HFO-619 (481 q/ha) were found significantly superior with both the national check i.e UPO-212 and Kent followed by SKO-240 (437 q/ha), BAUO-104 (430 q/ha) and RSO-60 (425 q/ha).
- **oat germplasm Maintenance**: 70 germplasm lines were maintained during rabi 2019-20
- **Segregating generation of Oat**

F_2 : The following seven F_2 population were evaluated:

i. OL-1871 x UPO-212
ii. RSO-60 x RO-19
iii. UPO-212 x OL-1871
iv. HFO-619 x OL-1871
v. (HFO-60 x UPO-212) x Kent
vi. (JHO-13-14 x UPO-212) x RO-19
vii. (HFO-619 x UPO-212) x OL-1871

F_3 : The following four F_3 population were evaluated

i. HFO-619 x UPO-212
ii. RSO-60 x UPO-212
iii. SKO-170 x OL-1871
iv. JHO 13-14 x UPO-212

F_5 : Four F_4 population were evaluated and 70-80 single plant selected from each population

i. JHO-10 x JHO-2000-4
ii. UPO-12-1 x UPO-10-3
iii. RSO-59 x OS-6
iv. OS-377 x JHO-10

F_7: Two populations were grown and selected plant seed were bulked.

i. JHO 13-14 x UPO-212
ii. JHO 99-2 x OS-403

Lathyrus

- **Station Trial of Lathyrus:** Eleven entries were tested, the varietal differences were found at par with national check i.e Maheteora and Nirmal. The entry JLS-09-2 (136.8 q/ha), BL-1 (129.9) and BL-5 (126.4 q/ha) was reported maximum for GFY.
- **Germplasm maintenance:** 25 germplasm lines were maintained during rabi 2019-20.

Maize: 55 germplasm lines were maintained during rabi 2019-20.

Berseem: 15 germplasm lines were maintained during rabi 2019-20.

AICRP (FC&U), JNKVV, Jabalpur

Germplasm holding: Oat -104 ; Berseem - 98

Berseem

- To create variability, poly cross nursery programme has been started taking five diverse parents viz., Wardan, BL42, Mescavi, UPB110, and JB1 .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.
- Variety JB5 has been treated with different doses (five) of gamma rays. Single plant selection and row bulks were done, treatment wise to raise the M_4 generation3
- In Wardan, five 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 to advance generation.
- 53 advanced lines were evaluated for different fodder traits.
- No. of crosses made - 13
- Segregating material advanced/ handled - 38 (F_2 onwards)
- Advance breeding lines - 53

AICRP (FC&U), ANDUAT, Ayodhya

Germplasm collection, evaluation & maintenance

S.N.	Crop/species	New collections during 2019-20	Sources of collection	Total collections
1.	Oat	06	Local collections from Barabanki, Ghazipur, Rae bareli & Sultanpur districts of UP	170
2.	Berseem	04		24

Oat

Twelve new crosses were made during Rabi 2019-20 (Oat)

S.N.	Cross combinations	S.N.	Cross combinations	S.N.	Cross combinations
1	NDO1807 x *Avena sterilis*	5	NDO711 x LC-6	9	NDO 1902 x LC-7
2	NDO1807 x LC-6	6	NDO711 x LC-7	10	NDO1904 x *Avena sterilis*
3	NDO1807 x LC-7	7	NDO 1902 x *Avena sterilis*	11	NDO 1904 x LC-6
4	NDO711 x *Avena sterilis*	8	NDO 1902 x LC-6	12	NDO 1904 x LC-7

Segregating generations

F_1	12	**F_3**	13	**F_5**	07
F_2	14	**F_4**	10	**F_6**	05

Advance lines - 10

One station trial viz., VT Station on Forage oat was conducted. Fourteen genotypes were tested against two checks viz., NDO-1 and NDO-2.

Breeder Seed Production: Rabi 2019-20 DAC indent – BSP (NDO-2=0.50q)
Production - NDO-2=0.40q

New promising entries of fodder oat: NDO-1807, NDO-1802, NDO-1902, NDO-1904, NDO-1908

AICRP (FC&U), MPKV, Rahuri

Development of Dual Purpose Fodder Oat : F_2 progenies of following crosses were sown during *rabi* 2019-20. Eighty six superior individual plants from these progenies were selected and harvest separately. These 86 F_2 progenies will be grown and evaluated as F_3 progenies during *rabi* 2020-21 for green forage yield and seed potential.

S.N.	Name of Cross (F_2)	IPS	S.N.	Name of Cross (F_2)	IPS
1	RO-11-1-3 x P. Surabhi	4	**11**	RO-11-1-6 x Kent	6
2	RO-11-1-4 x P. Surabhi	9	**12**	RO-11-2-2 x RSO-8	5
3	RO-11-1-6 x P. Surabhi	7	**13**	RO-11-2-8 x RSO-8	5
4	RO-11-1-8 x P. Surabhi	4	**14**	RO-11-1-13 x P. Surabhi	3
5	RO-11-1-12 x P. Surabhi	5	**15**	RO-11-2-2 x P. Surabhi	5
6	RO-11-1-3 x P. Harita	4	**16**	RO-11-2-8 x P. Surabhi	2
7	RO-11-1-4 x P. Harita	5	**17**	RO-11-2-11 x P. Surabhi	1
8	RO-11-1-12 x P. Harita	6	**18**	RO-11-1-13 x P. Harita	3
9	RO-11-1-3 x Kent	7	**19**	RO-11-2-2 x P. Harita	2
10	RO-11-1-4 x Kent	3		**Total**	**86**

Germplasm Maintenance

SN	Crop	Nos	SN	Crop	Nos
1	Oat	35	**8**	Napier (*Pennisetum purpureum* L)	33
2	Maize	54	**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 ternatea*)	25	**12**	Dinanath (*Pennisetum pedicellatum*)	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	**325**

AICRP (FC&U), IGKV, Raipur

Maintenance of germplasm lines: Oat - 42; Lathyrus - 34

Generation of F_3 of elite Oat crosses: F_2 seed of OS-409 x RO-19, ROS-8 x OS-6, OL-10 x RO-19 were sown for advancing generation.

Seed Multiplication of promising lines of Cowpea: RCC-48, RCC-65, RCC-46, RCC52

Generation of F_6 from F_5 seed of elite Lathyrus crosses: F_5 seed of Mahateora x RLK-1950, Pusa24 x RLK-1950, Mahateora x PUSA-24, Mahateora x BK-05, Mahateora x Nirmal, Pusa-24 X Prateek, Pusa-24 X BK-05 were sown at 20-12-2019 for advancing generation.

BRNS, BARC, Mumbai (M.H.), Funded Project; Gamma ray mutagenesis for delayed flowering (65-75 days) and increased leaf stem ratio of Lathyrus, (Parteek & Mahateora) with Budget: 21 Lac approx.

AICRP (FC&U), PAU, Ludhiana

Varieties released at Central or State level (in last 5 years): (13)

Year	Crop	Varieties developed	Features
2015-16	Oats	OL 1804/ CVRC	It is a single cut variety of oats recommended for North East Zone comprising of states viz; West Bengal, Odhisha, Jharkhand, Bihar, Eastern Uttar Pradesh, Manipur and Assam. Its average green fodder yield is 155q/acre.
		OL 1802/ CVRC	It is a multicut variety of oats recommended for Central Zone comprising of states viz; Central Uttar Pradesh, Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh. Its average green fodder yield is 225q/acre.
	Bajra Napier Hybrid	PBN 346/ SVRC	It is a Bajra Napier hybrid recommended for irrigated areas of Punjab state. Its plants have long, smooth, non-hairy and broad leaves. The fodder yield and silage quality of this variety is better than PBN 233. It yields 715 quintal of green fodder per acre.
2016-17	Oats	OL 11/ SVRC	It is a single cut variety recommended 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	It is a single cut variety of oats recommended for South Zone comprising of states viz; Tamil Naidu, Telengana, Andhra Pradesh and Karnataka. On an average, it yields about 145 quintals of green fodder per acre. Its fodder quality is better than checks OS 6, Kent.
		OL 1769-1/CVRC	It is a single cut variety of oats recommended for Central Zone comprising of states viz; Uttar Pradesh, Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh. On an average, it yields about 200 quintals of green fodder per acre.
		OL 1802-1/CVRC	It is a single cut variety of oats recommended for North West Zone comprising of states viz; Punjab, Haryana, Rajasthan, Uttarakhand and Western Uttar Pradesh. Its average green fodder yield is 215q/acre.
	Bajra Napier Hybrid	PBN 342/ SVRC, CVRC	It is a Bajra Napier hybrid recommended for NWZ, NEZ and SZ comprising of states viz; Punjab, Haryana, Rajasthan, Odhisha, Assam, Tamil Naidu and Karnataka. The fodder yield quality of this variety is better than national checks viz; PBN 233 and CO 3. Its average GFY is 430q/acre.
2017-18	Oats	OL 12/ SVRC	It is a single cut variety recommended for irrigated areas of 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	It is 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	Bajra Napier Hybrid	PBN 351	It is a Bajra Napier hybrid recommended for Uttar Pradesh, Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh. The fodder yield quality of this variety is better than national checks viz; CO (BN) 5, NB 21 and CO 3. Its average GFU is 520 q/acre.
2019-20	Oats	OL 1861	It is 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	It is 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.

Station 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 1924, OL 1949, OL 1882, OL 1874
2.	MLT in oats —Single Cut	OL 1869-1, OL 1874-1, OL 1861, OL 1876-1
3.	MLT in oats- Dual	OL 1874-2, OL 1934, OL 1876-2, OL 1861
4.	Station trial in Oats –Single Cut/Dual	OL 1876-2, OL 1906
5.	Station trial in Oats –Multi cut	OL 1942, OL 1944, OL 1938, OL 1931, OL 1949
6.	Station trial in Oats-1-Multi cut/ Single Cut	**MC -** OL 1977, OL 1975, OL 1969, OL 1967 **SC -** OL 1977, OL 1976, OL 1964, OL 1974, OL 1967, OL 1969, OL 1971
7.	Station trial in Oats –2- Multi cut/ Single Cut	**MC -** OL 1984, OL 1992, OL 1980, OL 1983, OL 1987 **SC -** OL 1980, OL 1990, OL 1992, OL 1988, OL 1985

Germplasm Collection, Maintenance and Evaluation

- One hundred and twenty new oat accessions were acquired from NBPGR, New Delhi
- A total of 700 germplasm lines were maintained following standard breeding procedures.

Hybridization: A total of One hundred crosses have been attempted involving promising genotypes and exotic germplasm accessions.

Breeding material handled

Generation	Number	Generation	Number	Generation	Number
F_1 crosses	100	F_3 generation	400	F_5 generation	500
F_2 generation	98	F_4 generation	750	F_6 generation	70

Berseem

- A total of two evaluation trials (1 station and 1 multilocation) were conducted.
- A total of 20 polycross progenies were maintained and evaluated against the best check.

Entries contributed by PAU, Ludhiana, during *Rabi* 2018-19 - 16 entries in oat, 3 in Berseem and 1 in Lucerne making a total of 20 entries

Name of entry	Name of Trial	Name of entry	Name of Trial
Oats		**Berseem**	
OL 1960, OL 1963	IVTO SC	PC 91	AVT-2 Berseem
OL 1874-1, OL	AVTO-1-SC	BM 12	AVT-1 Berseem
OL 1896	AVTO-2-SC	BM 14	IVT Berseem
OL 1919, OL 1924	IVTO MC		
OL 1882	AVTO-1-MC	**Lucerne**	
OL 1874	AVTO-2-MC	LLC 6	IVT Lucerne
OL 1934, OL 1954	IVTO-Dual		
OL 1766-2, OL	AVTO-1-Dual		
OL 1876-2, OL 1906	AVTO-2-Dual, AVTO-2-		

AICRP (FC&U), AAU, Jorhat

Collection of germplasm: Fourteen Lathyrus germplasm from Majuli district of Assam and eight ricebean germplasm from Manipur and Arunachal Pradesh are collected.

Lathyrus

- **Evaluation of Grasspea germplasm** : Fourteen newly collected *lathyrus* germplasm were grown and promising lines were selected.
- **Hybridization programme in Grasspea**: A diallel cross was made in *rabi* 2016-17among 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* 2019-20 F_2 entries were evaluated.
- **Mutation breeding programme**: M_5 progenies were evaluated.

Ricebean:

- **Evaluation of Ricebean germplasm for rabi season:** Suitable entries selected for *rabi* season were grown and evaluated for their fodder yield and quality.

AICRP (FC&U), CCS HAU, Hisar

Maintenance of germplasm (Oats): Two hundred eighty germplasm lines were grown and maintained successfully. Eighty one new germplasm lines were procured from NBPGR, Delhi. But none of them germinated.

Maintenance of germplasm (Berseem): 128 germplasm lines were grown and maintained successfully.

Induction of mutations in Berseem: Chemical mutagen: Dry seeds of variety HB 1, HB 2 & Mescavi were treated with chemical mutagen *i.e*. EMS (0.05, 0.1, 0.3 and 0.5%) to raise the M_1 generation.

Selection of superior plant progenies in different generations: Eight superior progenies were selected from M_2 generation of different treatments and 5 from M_3 for evaluation for fodder yield in next year.

Hybridization in oat: Forty nine new crosses were attempted between genetically diverse parents. Promising single plants/progenies were selected from segregating generations of various crosses.

Station varietal trials conducted (10)

Berseem: Three station trials viz. LST, SST and PRT on berseem were conducted.

Name of Trial	Promising genotype
Large Scale Trial	HFB 17-5, HFB 17-2
Small Scale Trial	HFB 18-3, HFB 18-6
Progeny Row trial	HFB 19-3, HFB 19-9, HFB 19-6, HFB 19-12

Oats: A total of seven station trials on oats were conducted to evaluate the performance of promising oat genotypes developed through hybridization and/or selected from germplasm during the previous season. These were: three Large Scale Trials *i.e.* LST (Single Cut), LST (Dual) and LST (Multi cut); two Small Scale Trials *i.e.* SST (SC) and SST (MC); and two Progeny Row Trials *i.e.* PRT (SC) and PRT (MC).

Trial	Promising genotype	Trial	Promising genotype
LST (SC)	HFO 1009, HFO 1013, HFO 910, HFO 903	**LST (Dual)**	HFO 901, HFO 902, HFO 1014
LST (MC)	HFO 915, HFO 1014, HFO 1016	**SST (SC)**	HFO 1106, HFO 1105, HFO 1104
SST (MC)	HFO 1121, HFO 1104, HFO 1108	**PRT (SC)**	PRT 18-20, PRT 18-16, PRT 18-6
PRT (MC)	PRT 18-17, PRT 18-4, PRT 18-3		

AICRP (FC&U), RPCAU, Pusa

- **Germplasm holding:** a total of 275 genotypes of different fodder crops have been collected and are being maintained
- **Oat crossing programme:** extensive crosses were made in Oat and F_1's of following crosses have been generated to be planted in next season.
- Seed production: 4q of oat variety Kent produced.
- Work for development of Fodder Hub cum Pasture in the Dhab area started.
- Two stations trials and one maintenance trials have been conducted on Fodder Oat.

AICRP (FC&U), GBPUAT, Pantnagar

Evaluation and maintenance of oat germplasm

There are 270 germplasm lines of oats were evaluated and maintained having different characters and used for oat improvement.

Crossing block of oat

There are 56 advance lines along with 43 exotic lines were planted for crossing and maintenance.

Evaluation of different filial generation of oat

SN	Generation	No. of lines	SN	Generation	No. of lines
1	F1	4	**5**	F7	123
2	F2	10	**6**	F8	78
3	F5	128	**7**	F9	30
4	F6	152	**8**	F10	11

Multiplication of advance lines/released varieties of oat

a. Advance lines

SN	Advance lines	SN	Advance lines	SN	Advance lines	SN	Advance lines
1	UPO-10-1	**6**	UPO-16-1	**11**	UPO-18-2-2	**16**	UPO-18-4-4
2	UPO-10-2	**7**	UPO-16-1	**12**	UPO-18-3	**17**	UPO-18-5
3	UPO-10-3	**8**	UPO-16-2	**13**	UPO-18-4-1	**18**	UPO-19-1
4	UPO-11-1	**9**	UPO-16-3	**14**	UPO-18-4-2	**19**	UPO-19-2
5	UPO-12-2	**10**	UPO-18-2-1	**15**	UPO-18-4-3	**20**	UPO-19-3

b. Released varieties

c. UPO 10-2 (**Pant Forage Oat-4) (19.05.2020 state workshop)**

Multiplication of Berseem cv. UPB-110

New crosses in oat = 10

The following new crosses have been made in crossing blocks on the basis of foliage character, plant height and disease resistance.

SN	Crosses	SN	Crosses
1	Kota x UPO 10-1	6	Minominee x UPO 16-1
2	Lang x UPO 10-1	7	UPO 253 x UPO 6-2
3	Lang x Minominee	8	(Fugham x No. 2672) x UPO 6-2
4	Kota x Minominee	9	UPO 94 x EC 13
5	UPO 94 x UPO 16-1	10	EC 1 x UPO 94

Breeder seed production

N	Crop	Variety	Target (BSP-I)	Actual production (BSP-IV)
1	Forage oat	UPO-212	85.5q	100 q
2	Berseem	UPB-110	10 kg	50 kg

State varietal trial =01

One State varietal trial of oat was conducted during Rabi 2019-20

AICRP (FC&U), SKUAST-K, SRINAGAR

Fodder Oats

Multi-location testing of advanced breeding lines in fodder oat: 12 Single cut Fodder Oats advanced lines were evaluated in Multilocation trials (Advanced Evaluation Trial) during 2019-20 and two top ranking entries based on green fodder yield and seed yield potential will be contributed for evaluation in AICRP Trials during 2020-21.

Evaluation of selected families: Six families of four crosses were evaluated in station Initial Evaluation Trial and on basis of their performance will be evaluated in Station Preliminary Evaluation Trial. 15 families from Six (6) crosses were put for seed multiplication for putting them in Initial Evaluation Trial.

Evaluation of segregating generation: F_5 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	**9**	SKO-210 X SKO-207
2	SKO-211 X SKO-205	**6**	SKO-212 X SKO-209	**10**	SKO-205 X SKO-204
3	SKO-211 X SKO-204	**7**	SKO-207 X SKO-205	**11**	SKO-207 X SKO-204
4	SKO-211 X SKO-210	**8**	SKO-212 X SKO-204	**12**	SKO-208 X SKO-205

Germplasm Holding

Crop	No. of accessions	Source /Area
Oats	145	USDA, VIR, Japan, Czech Republic, Canada, Romania
Alfalfa	55	USDA, Ladakh region
Barley	25	Italy
Red Clover	6	Institute For Agricultural and Fisheries Research (ILVO),Plant Sciences Unit Belgium
White Clover	4	
Perennial Rye grass	4	

New Germplasm received during 2019-2020.

SN	Crop	No. of Collections	Country of Source
1	**Alfalfa** a. (*Medicago sativa)*	**3**	Pirsa Sardi, AUSTRALIA
	b. Medicago sativa notho subsp.varia	**7**	
2	**Alfalfa** *Medicago sativa*	**2**	University Di Pisa, ITALY
3.	**Alfalfa** *Medicago sativa*	**9**	Agricultural Institute Osijek, CROATIA
Total		**21**	

AICRP (FC&U), OUAT, Bhubaneswar

Ricebean: Evaluation of 11 selected pure lines with Bidhan1 and Bidhan-2 varieties were conducted during Kharif 2019 and Rabi 2019-20 to record yield and yield attributing characters. Accordingly 2 best performing lines will be selected and seeds multiplied during Kharif 2020 for giving entry in Kharif 2021.

Germplasm holding and evaluation

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

- Evaluation of 105 genotypes of oats in two different environmental conditions *viz*. inorganic and organic, revealed that for green and dry matter yields, genotypes K-353, KUE, HFO-872, OL-9, JPO-8, JPO-19, JPO-21, EC-528897 and JPO-40 were promising under inorganic condition, whereas, under organic condition genotypes IG-03-216, HFO-60, OL-9, HFO-872, JPO-4, IG-03-203, KUE, JPO-8 and K-353 were promising..

Oat

- Fourteen different crosses among diverse genotypes involving *Avena sativa* x *A. sativa* and *A. sativa* x *A. sterilis* and *A. sativa* x *A. byzantina* were attempted to create genetic variability.
- Promising 350 breeding lines have been selectedfrom different segregating, backcross and advance generations. Promising entries developed through hybridization programme were evaluated in station trials. Seed of two promising entries have been multiplied.
- Interspecific F_1's developed between cultivated oat and diploid & tetraploid spp. during Rabi 2018-19 were evaluated for various agro-morphological traits. 385 F_1 spikelets were backcrossed and 46 BC_1F_1 seeds were obtained. Fresh wide crosses of cultivated oat with diploid & tetraploid spp. were attempted to introgress desirable alien chromatin. 24 embryos obtained from150 caryopsis were cultured on half strength MS media after 18 days of pollination.
- Highest concentration of beta-glucan (47.18 mg/g) was recorded in HFO-58 (*A. barbata*, 2n=28), followed by HFO-505 (*A. strigosa*, 2n=14) and HFO-498 (*A. longiglumis* 2n=14), with beta-glucan concentration of 41.67 mg/g and 41.54 mg/g, respectively. The concentration of beta-glucan in HJ-8 variety of cultivated oat (*A. sativa,* 2n=42) was found 34.10 mg/g.
- To induce genetic variability for powdery mildew resistance and yield traits, seeds of two oat varieties, HJ-8 and Kent were treated with different doses of Gamma rays (200Gy, 300Gy &400Gy) and EMS concentrations (0.3%, 0.6% &0.9%). M_2 generation was evaluated and mutants for early and late flowering and maturity, dwarfness and tallness, high number of tillers, awnless and awned, anthocyanin pigmentation along with some mutants for powdery mildew resistance were selected. A total of 494 mutants selected in M_2 generation will be further evaluated inM_3 generation during ensuing Rabi season.

Tall Fescue Grass

- Polycross progenies derived from different diverse genotypes *viz*., Hima-4, Sel.-8, Hima-1, Sel.-49, Sel.-85, Sel.-88, EC-178181, Hima-3 and Sel.-48 were evaluated for various drought parameters and other forage attributes so as to identify good general combiners for development of synthetic variety.

White clover

- Restricted Recurrent Phenotypic Selection has been taken up for developing superior populations. Two entries have been contributed in Co-ordinated trials.

Red clover

- Restricted Recurrent Phenotypic Selection has been taken up for developing superior populations.

AICRP (FC&U), PJTSAU, Hyderabad

Fodder Maize

- 15 new germplasm lines of fodder maize were collected for evaluation during Kharif 2020
- A proposal of national crossing programme on "Fodder Maize Improvement for enhanced green fodder, dry fodder productivity and Nutritional quality" was submitted to Project Co-ordinator, IGFRI, Jhansi.

Forage cowpea - Segregating generations

S No	Filial Generation	No. of crosses studied	No. of SPS made	No. of SPS advanced	Promising SPS/ progenies
1	F2	02	20	20	32
2	F3	03	30	22	41
3	F4	01	13	10	8
4	F5	01	10	10	6

Fresh crosses proposed for Rabi 2020-21

SN	Cross combinations	SN	Cross combinations	SN	Cross combinations
1.	CO5 X UPC 5286	3.	CO2 X CS-88	5.	CN 8076 X B.L
2.	CO4 X SK-58	4.	NDFC-6 X B.L	6.	B.L X selection local

Forage Bajra

Forage Bajra (multicut):

- Eighteen newly designated OPVs, received from Project Coordinator were evaluated during summer 2020 to select high biomass and better forage quality genotypes and data were recorded.
- A Hybrid bajra trial consisting twenty hybrids was taken up to identify the high green fodder yield potential genotypes during summer, 2020.
- A thirty seven pollinator lines developed at ICRISAT were also evaluated in summer, 2020 and data has been recorded.
- A proposal of national crossing programme on "Development of Forage Pearl millet cultivars with increased forage yield and better forage quality " was submitted to Project Coordinator, IGFRI, Jhansi

Fodder sorghum

- Out of twenty four red kernel fodder sorghum hybrids developed by using 12 lines and two testers and evaluated for green fodder yield potential during Kharif 2019, The following five hybrids were found to be promising with respect of green fodder yield in single cut. The hybrid seed production of respective hybrids was taken up during Rabi 2019-20.

SN	Hybrid	GFY (t/ ha)	SN	Hybrid	GFY (t/ ha)
1.	ICSA 422 X PC-6	38.8	4.	ICSA 403 X PC-6	31.8
2.	ICSA 474 X PC-6	35.6	5.	ICSA 425 X PC-6	30.88
3.	ICSA 469 X PC-6	31.5			

AICRP (FC&U), AAU, Anand

Lucerne:

- **Contribution of entry in AICRP trial:** 2 entries AL-62, AL-66 in IVT Lucerne - Annual
- **Germplasm maintenance:** 282 Lines
- **New Germplasm collection:** 8
- **Composite programme & Maintenance: 3rd year**
  - **ALC-1 -** Kutchhi-1, TNCO-3, AL-3, TSLU-14-3
  - **ALC-2 -** BAIF-1, Krishna, AL-3, Anand-2

Crossing programme (Lucerne)

SN	Cross combinations	SN	Cross combinations
1.	Anand 2 x Banaras	**7.**	AL 4 x Banaras
2.	Anand 2 x Krishna	**8.**	AL 4 x Krishna
3.	AL 3 x Banaras	**9.**	BAIF x Banaras
4.	AL 3 x Krishna	**10.**	BAIF x Krishna
5.	RL 88 x Banaras	**11.**	Alamdar-51 x Banaras
6.	RL 3 x Krishna	**12.**	Alamdar-51 x Krishna

Segregating materials: (Lucerne)

Generation	RABI 2019-20	
	SOWN	SELECTION (IPS/BULK)
F_1	12	12
F_2 (Polycross)	25 (Poly.)	110 (Poly.)
F_2	11	55
F_4	39	34
F_5	103	61
F_7(Polycross)	59 (Poly.)	28 (Poly.)
F_7	40	16

Forage Bajra - Crossing programme (Forage Bajra) – Summer – Objectives - Higher GFY, Higher tillering, Multi-cut type – 10 new crosses made

Sr. No.	Cross combinations	Sr. No.	Cross combinations
1.	GP-121 x Raj Bajra	**6.**	GP-121 x HC-20
2.	GP-122 x Raj Bajra	**7.**	GP-122 x HC-20
3.	GP-123 x Raj Bajra	**8.**	GP-123 x HC-20
4.	GP-124 x Raj Bajra	**9.**	GP-124 x HC-20
5.	GP-125 x Raj Bajra	**10.**	GP-125 x HC-20

Varieties release/ at state level

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. 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, Average Plant height - 240.1 cm, Tillers/plant - 3.7, Leaves/plant - 29.5, Leaf stem ratio - 0.9, Average DM (%)-20.90, Average CP (%)- 7.66, Average NDF (%)- 80.50, Crude Fibre (%)- 30.82, Green Fodder Yield-581q/ha, Dry Fodder Yield - 120q/ha

SEED PRODUCTION

(a): Rabi 2019-20

Sr. No.	Crop	Nucleus seed	Breeder Seed Production (kg)		
			ICAR	State	Total
1.	Oats *var*. Kent	220-250*	3530	1020	4550
2.	Lucerne *var*. Anand-2	35-40*	240	85	325-350*
3.	Lucerne *var*. Anand-3	10-15*	160	25	185-190*

Note: * indicate the estimated quantity.

Bio-chemical analysis of forage plant samples carried out for quality evaluation *during* RABI 2019-20: A total of 1717 material were evaluated for various nutritive parameters like CP%, NDF& ADF etc.

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 2019-20.

Crop: Lucerne (Anand 2)

Sr. No.	Name of Farmer	Sr. No.	Name of Farmer
1	Prakashbhai P Solanki	6	Pareshkumar R Patel
2	Dagibhai F Bhojani	7	Arvindbhai C Patel
3	Shaileshbhai M Patel	8	Chetanaben D Devmurari
4	Rakesh Kanubhai Patel	9	Rajendra S Patel
5	Patel Naginbhai C	10	Pankajbhai I Parmar

Crop: Oat (Kent)

Sr. No.	Name of Farmer	Sr. No.	Name of Farmer
1	Maheshbhai S Pandya	6	Pravinbhai S Patel
2	Ravjibhai S Patel	7	Rathod Rajendrasinh S
3	Punambhai S Patel	8	Bharwad Madanbhai Rajabhai
4	Jagdishbhai R Patel	9	Bharwad Bharatbhai Kanabhai
5	Ravjibhai S Patel	10	Patel Umeshbhai S

AICRP (FC&U), BCKV, Kalyani

Germplasm maintained: Rice bean – 250; Lathyrus - 8

Lathyrus: Eight (8) 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.

Rice bean: gamma ray induced mutagenesis in Bidhan Rice Bean 1

M 3 generation **Design:** RBD **Replication:** 3

To find out any morphological mutants in regards to forage quality (high protein or fibre), photo insensitivity, early flowering, bushy types (without the trailing habit) *etc.* or any other agro-economic traits. Variants serving dual purpose character (seed + green forage) could be a good finding which may be of two types- (i) Green forage yielder after proper harvesting of seeds: in that case early flowering mutants will be selected; (ii) Green forage yielder before the harvesting of the seeds, here late flowering may be selected.

The selected plants from the M3 generation will be evaluated in the field as large scale trial for confirmed selection of desired mutants and development of promising entries of ricebean. eg. L4P5- dual purpose (higher GFY + seed yield), L6P1 and L13P5 are promising lines for higher GFY and CPY.

Other Activities Rabi 2019-20

AICRP (FC&U), UAS (B) ZARS, Mandya

Awards and Honours

SN	Title of the Awards/ Recognitions/ Fellowships	Awarded by	Date and place of Award/ Recognition
1.	Best Live demonstration of forage crops varieties & technologies during krishimela-2019	UAS, Bengaluru	07/12/2019 ZARS, V C Farm, Mandya
2.	Best Stall Award for Exhibiting forage varieties and technologies in stall during krishimela-2019	UAS, Bengaluru	07/12/2019 ZARS, V C Farm, Mandya
3	Certificate of appreciation for development of forage technology	ICAR-AICRP FC&U Jhansi	NGM, Kharif-2020 dated 01/06/2020

Research articles in journals: 2

Shekara BG, Mahadevu P, Chikkarugi NM and Manasa N. 2019. Response of pearl millet (*Pennisetum glaucum* L.) varieties to nitrogen levels for higher green forage yield and quality in southern dry zone of Karnataka, *Forage Res.* 45 (3):232-234.

Shekara BG, Prakash P, Mahadevu P, Manasa N and Chikkarugi NM. 2019. Agro techniques for enhancing green forage yield and quality in Signal Grass (*Bracharia ruziziensis*) under rainfed ecosystem, *Res. Jr. of Agril. Sci.* 10(1): 18-21.

Abstracts: 5

Shekara BG, Mahadevu P and Chikkarugi NM. 2020. Evaluation of Hedge Lucerne (*Desmanthus virgatus* L. Willd.) genotypes for green forage yield and quality under southern parts of Karnataka, Indian Science Congress, UAS, GKVK, Bengaluru, 3rd to 7th Jan-2020

Shekara BG, Mahadevu P and Chikkarugi NM. 2020. Performance of top feeds under varied planting geometry with and without intercrop in southern Karnataka, Indian Science Congress, UAS, Bengaluru, 3rd to 7th Jan-2020

Shekara BG, Mahadevu P and Chikkarugi NM. 2020. Response of fodder oat varieties to nitrogen levels under Cauvery command areas of Karnataka, Indian Science Congress, GKVK, Bengaluru, 3rd to 7th Jan-2020

Mahadevu P, Shekara BG and Chikkarugi NM, Performance of promising Bajra Napier Hybrid genotypes in southern dry zone of Karnataka, Indian Science Congress, UAS, Bengaluru, 3rd Jan to 7th Jan-2020

Mahadevu P, Shekara BG and Chikkarugi NM. 2020. Performance of promising Hedge lucerne (*Desmanthus virgatus* L. Willd.) genotypes in southern dry zone of Karnataka, Indian Science Congress, UAS, GKVK, Bengaluru, 3rd Jan to 7th Jan-2020

Book Chapters: 3

Water requirement and critical stages for moisture in different crops, 2020, Training manual on role of micro irrigation for enhancing water productivity.

Irrigation methods, 2020, Training manual on role of micro irrigation for enhancing water productivity.

Water management in field crops, 2020, Training manual on role of micro irrigation for enhancing water productivity

Extension Folders: 04 in Kannada

Cereal forage varieties and production technologies
Legume forages varieties and production technologies
Package of Practices for Important forage crops.
Hydroponics fodder production systems

Radio /TV talks

- Fodder varieties and production technologies- TV DD-1 (Chandan) on 04-12-2019
- Perennial fodder production technologies - Radio AIR, Mysore on20-07-2020

As resource person in training programme.

SN	Particulars	Date	Place
1	Krishimela-2019	06-12-19	ZARS, V.C. Farm, Mandya
2	Krishimela-2019	07-12-19	ZARS, V.C. Farm, Mandya
3	Weed Management and cotton cultivation (DAESI)	19-10-19	Myrada Institute, Kamagere
4	Fodder production technologies	26-12-19	ZARS, V.C. Farm, Mandya
5	Fodder preservation and enrichment	26-12-19	ZARS, V.C. Farm, Mandya
6	Forage Production technologies (DAESI)	28-12-19	ZARS, V.C. Farm, Mandya
7	Silage Making(DAESI)	11-01-20	ZARS, V.C. Farm, Mandya
8	Fodder Production technologies	13-07-20	EEU, Naganahalli (Online)

Presentations in Conferences / Symposium: **03**

SN	Title	Venue	Date
1	Performance of promising Hedge Lucerne (*Desmanthus virgatus* L. Wild.) genotypes in southern dry zone of Karnataka	UAS, Bengaluru.	3rd to7th January-2020
2	Performance of promising Bajra Napier Hybrid genotypes in Southern dry zone of Karnataka	UAS, Bengaluru.	3rd to7th January-2020
3	Maize as a chief source of quality feed and fodder for intensified and sustainable livestock husbandry in Karnataka	PAU, Ludhiana.	09th & 10th February-2020
4	Performance of fodder Maize genotypes for higher green forage yield and quality in Southern dry zone of Karnataka	PAU, Ludhiana.	09th & 10th February-2020
5	Digital Field book	UAS, Bengaluru	07/08/2019

Important persons visit

- Vice chancellor. UAS, GKVK, Bengaluru.
- Director of Research, UAS, GKVK, Bengaluru.
- Managing Director CADA, Govt of Karnataka.
- Dr. M. V. Venkatesh , Deputy commissioner, Mandya district
- Boards Members of UAS, GKVK, Bengaluru.
- Director animal husbandry & Veterinary science GOK, Karnataka
- Deputy director animal husbandry & Veterinary science, Mandya
- Joint director (Fodder) animal husbandry & Veterinary science GOK, Karnataka
- Director of Extension, UAS,GKVK, Bangalore
- Zonal coordinator ATARI, Bangalore

Meetings / Workshop attended:

- Attended the *Kharif* National Group Meeting on Forage crops & Utilization, held at on 1st June-2020 (Zoom Online).
- 107th Indian Science Congress held at UAS, GKVK, Bengaluru from 3rd to 7th January-2020.
- Brain storming session on forage Cowpea on 23rd & 24th December 2019 held at NBPGR New Delhi.

Teaching Activities: UG Courses/ PG courses

- AGR-503 (1+1): Principles & Practices of Weed Management
- GPB 511 (2+0) :Breeding of Cereals, Forage and Sugarcane
- GPB 505 (1+0): Individual mutations and Mutation Breeding

Research guidance: M.Sc. in GPB – 2, M.Sc. in Agronomy- 2, Ph.D. in Agronomy- 1

No. of FTDs conducted: 75

Training conducted for farmers: One day training programme organized for farmers on fodder varieties and production technologies on 26-12-2019 at ZARS, V C Farm, Mandya

Details of seed/ planting material sold

SN	Crops	Root Slips Sold (No.)
1	Napier Bajra Hybrid (Co-3)	20000
	Napier Bajra Hybrid (BNH-10)	15000
2	Guinea grass (JHGG-08-1)	26000
3	Rhodes grass (Selection)	12000
4	Signal grass (Selection)	14000

Quality seed production for 2019-20

SN	Crop	Variety	Breeder seed (q)	Nucleus seed
1	Forage Cowpea	MFC-09-1	6.0	14 Kg
2	Forage Cowpea	MFC-08-14	10.0	18 Kg

Externally funded projects: 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)

AICRP (FC&U), PJTSAU, Hyderabad

Book chapter

Shashikala T, Shanti M, Susheela R, Murali B and Shailaja K. 2019. Fodder and Livestock Scenario of Telangana published in Indian Fodder Scenario: Redefining State-Wise Status - book editors AK Roy et al. P. 170-179

Research guidance: 1 as Major adviser, 1 as minor adviser
Guest lecturers: 2
Workshops/ symposia: 3
TV Programmes: 2 phone in live programmes to DD Yadagiri channel

Training programmes attended

- Dr. K Shailaja attended 10 days short course on Innovations in educational technologies from 13 - 22 Nov.2019 at NAARM Hyderabad
- Sri B. Murali Scientist (Agronomy) attended ICAR Summer School (21 days) on "ICT Applications in Agricultural Education and Extension" from Feb 19th to Mar 10th 2020 at NAARM Hyderabad

Significant events

Forage crops Stall was displayed at University Auditorium on the occasion of Hon'ble Governor Visit to University on 13-02-2020 and on 14-02-2020 on the Principal Secretary Agriculture Govt. Of Telangana

- Participated in Confederation of Indian Industry, Hyderabad - Organizing 2nd Edition of Exhibition and Conference on Agri Technology & Innovation on 22-23 March 2020 at University Auditorium
- Participated in video conference with PC & PIs about center wise work done & Technical Program of work for 2020-21 discussions on 10.04.2020, 16.04.2020 and 27.05.2020.

AICRP (FC&U), MPKV, Rahuri

Popular articles

Surana Prasanna, Danawale Niteen and Landge Sandip. 2020. "Management of Forage Crops in Summer Season" *'Shri Sugi Summer-2020'* January, Page No. 40.

Surana Prasanna, Landge Sandip and Shinde Vijay. 2020. "Management of different Forages & grass crops in *Kharif* Season" *Shri Sugi Kharif-2020'* June, Page No.53-54.

Visits of important persons

- Hon. Shri. Chandrakant Kavlekar, Deputy C.M., Goa visited cactus trial plot on 14.10.2019
- Hon. Vishvajeet Mane DG, MCAER, Pune visited cactus trial plot on 24.10.2019
- Dr. Ashok Dalvai, Chairman of Committee on Doubling of Farmers income, Ministry of Agril. and Co-Op. & Famer's Welfare, National Rainfed Authority, New Delhi on 25.10.2019
- Dr. B. G. Shekara, Principal Scientist (GPB), Zonal Agril. Res. Station, VC, Farm, Mandya (Karnataka) monitored the project on 28th Feb, 2020

Visits of farmers and Govt. Staff of Agril. Department of Maharashtra State

- No. of Farmers visited to farm during *Rabi* 2019-20 : 240
- No. of Govt. officers/staff visited to farm during *Rabi* 2019-20 : 12

Research guidance:

- Plant Breeding Dr. P. L. Badhe : 01 M. Sc. (Agri.)
- Agronomy Dr. N. J. Danawale : 01 M.Sc (Agri.)
- Biochemistry Dr. S. V. Damame : 01 M. Sc. (Agri.)

HRD for the AICRP-FC / Training participation of staff

- Dr. SA Landge attended training on "Soft skills for personality development" jointly organized by Department of Extension Education, MPKV, Rahuri and Extension Education Institute, Anand at MPKV, Rahuri during 18-19/11/2019.
- Dr. SA Landge attended training on "Beekeeping for climate smart agriculture and sustainability" jointly organized by Department of Agriculture Entomology & CAAST project, MPKV, Rahuri at MPKV, Rahuri during 22-23/11/2019.
- Dr. NJ Danawale attended training on "Doubling farmers income through Integrated farming system for livelihood security" during 18-27/11/2019
- Dr. S. A. Landge attended 7 days training on "Scientific Beekeeping and Apiary Management" organized by honey day farm, Pvt. Ltd. Bangalore during 23.01.2020 to 29.01.2020.
- *Dr. S.A. Landge attended 8 week (21/04/2020 to 28/06/2020) online training course on 'Integrated Pest Management' conducted by Indian Institute of Technology, Kanpur and Commonwealth of Learning through agMOOCs.*
- Dr. S.V. Damame *attended live webinar series on "Genomics for food, health and nutrition" organized by Centre of Excellence in Genomics & System biology (CEGSB) ICRISAT, Hyderabad during 14th May, 2020.*

TV/Radio talk delivered by AICRP-FC staff/ extension activities:

- Radio talk :02
- Lectures to farmers in training programme: 04

Breeder Seed Production (*Rabi*-19-20)

S.N.	Crop	Variety	Quantity (qt.)			
			Target	Seed Produced (Unprocessed)	Non lifted seed available	Surplus (+)/ Deficit (-)
1	Oat	Phule Surabhi (RO-11-1)	10.50	5.40	--	(-) 5.10
2	Oat	Phule Harita (RO-19)	5.15	8.40	--	(+) 3.25
3.	Oat	Kent	5.50	-	41.50	(+) 36
4	Lucerne	RL-88	0.10	0.36	--	(+) 0.26

Farmer rally/ Shivarferi:

- Live demonstration of newly released varieties and hybrids of forage crops were demonstrated during Kisan Aadhar Sammelan held at MPKV, Rahuri during 24-25/10/2019.
- Demonstration of newly released varieties and hybrids of forage crops were demonstrated during Magova Programme held at MPKV, Rahuri on 11.01.2020.
- Farmers group (53 farmers) of Bhavnagar, Gujarat visited this project

Lectures delivered

- Dr. S. A. Landge on different types of Forage crops and their cultivation to the farmers group KVK, Babhaleshwar on 20/11/2019.
- Dr. S. A. Landge on different types of Forage crops and their cultivation to the farmers group KVK, Babhaleshwar on 20/01/2020.
- Dr. S. A. Landge on management on fall army worm on maize at Jakhangaon Tal. Dist. Ahmednagar on 30/12/2019 organized by Agriculture department, Ahmednagar.

AICRP (FC&U), JNKVV, Jabalpur

Research articles in journals

Gupta Kavita and Mehta AK. 2018 Morphological Characterization of Advanced Mutant Lines of Oat *(Avena sativa* L.) *Int. J. Curr. Microlobiol. App. Sci*. 7(11): 209-212

Basha MH and Mehta AK. 2018 Mutation Frequency and Spectrum of Induced Morphological Mutations in Oat (*Avena sativa* L.*). Int. Journal of Agriculture Sciences.* 10 (7): 5741-5754.

Important Persons visited

- Shri Sachin Yadav, Hon'ble Agriculture Minister
- Shri Lakhan Singh Yadav Hon'ble Minister for Veterinary and Animal husbandry.
- Dr. Mangla Rai, Ex - DG ICAR
- Board Members of Vishwa Vidyalaya.
- Dr. P. M. Gaur International Scientist, ICRESAT Hyderabad.
- Drs. Meenakshi Goyal & Maninder Kaur (PAU, Ludhiana)
- Drs. Shahid Ahmed and D R Palsaniya IGFRI (Jhansi)
- Director, ICAR- Institute of Weed science. Jabalpur

Research guidance: M. Sc. - 1

FTDs conducted: Berseem JB1, JB5 = 10; Oat JO1, JO 5 = 5

TV/Radio talks: Radio talks = 1

TSP activity: 34 demonstration of different fodder crops at tribal block of Dindori (M.P.) and forage crop related literature were distributed to farmers.

AICRP (FC&U), TNAU, Coimbatore

Awards and Honours

- Dr. C. Babu, Professor and Head & Dr. S.D. Sivakumar Associate Professor (Agronomy) 2020 Awarded with '**Best AICRP centre in India-2020'** by DG, ICAR, New Delhi during the online NGM-*Kharif* 2020 meeting held on 01.06.2020.

Research articles in journals: 4

Jolad Rajesh, Sivakumar SD, Babu C and Sritharan N. 2020. Dynamics in nutritive value of fodder crops under hydroponics as influenced by nutrient foliar spray. *International Journal of Chemical Studies* 8(1): 1736-1740.

Jolad Rajesh, Sivakumar SD, Babu C. 2020. Quality of different crops under hydroponics fodder production system. *Journal of Pharmacognosy and Phytochemistry*. 9 (1): 1434-1439.

Sivakumar SD and Vasuki V. 2019. Growth, yield and economics of Bajra Napier hybrid grass CO (BN) 5 as influenced by Drip fertigation. *Madras Agric. J*., 106 (7-9): 508-511.

Sivakumar SD and Babu C. 2019. Effect of agronomic strategies on growth, yield and quality of *Desmanthus* pre-release culture TND 1308. *Madras Agric. J*., 106 (10-12): 582-585.

Popular articles (in Tamil): 4

Research guidance:

- M.Sc. (Agri.) in PBG – 2, M.Sc. (Agri.) in Agronomy -1, Ph.D. in PBG -2

No. of FTDs conducted: 20

Details of seed/ planting material sold (2019-2020)

S. No.	Crop/ variety	Class of seeds	produced	supplied	Expected production (2020-21)	Total quantity
I	**SEEDS (kg)**					
1.	Multicut Fodder sorghum CO (FS) 29	BS	240.00	225.00	235.00	250.00
		TFL	-	-	100.00	100.00
2.	Fodder sorghum CO 31	BS	405.00	405.00	400.00	400.00
		TFL	436.55	424.30	1000.00	1,012.25
3.	Maize African tall	TFL	142.75	140.60	500.00	502.15
4.	Fodder cowpea CO (FC) 8	TFL	8.70	8.40	100.00	100.30
5.	*Desmanthus*CO 1	TFL	1,036.00	218.15	500.00	1,317.85
6.	Agathi	TFL	90.20	88.90	500.00	501.30
7.	Lucerne CO 3	TFL	4.80	1.65	100.00	103.15
Total			**2,364.00**	**1,512.00**	**3,435.00**	**4,287.00**
II	**PLANTING MATERIAL (Nos.)**					
1.	CN hybrid CO (BN) 5 stem cuttings		5,00,000	4,20,890	10,00,000	10,79,110
2.	Guinea grass CO (GG) 3 rooted slips		5,000	4,170	10,000	10,830
3.	*Cenchrus* CO 1 rooted slips		3,000	2,350	5,000	5,650
Total			**5,08,000**	**4,27,410**	**10,15,000**	**10,95,590**

Externally funded project: 3

S. No.	Title of the project	Sponsors	Duration	Outlay (Rs. in lakhs)	PI
1.	Establishment of biotech KISAN hub at TNAU, Coimbatore	DBT, New Delhi	2018-20	86.63	Dr. C. Babu Dr. S.D. Sivakumar
2.	Pelletization of Forage Crops for enhancing livestock productivity	TANII, GoTN	2019-21	210.00	Dr. S.D. Sivakumar Dr. C. Babu
3.	Expansion of Activities of Biotech-KISAN Hub in Two Aspirational Districts (Virudhunagar and Ramanathapuram) of Tamil Nadu	DBT, New Delhi	2020-22	76.00	Dr. C. Babu Dr. S.D. Sivakumar
Total				**372.63**	

AICRP (FC&U), SKRAU, Bikaner

Extension folder

- Godara AS and Bairwa RC. 2020. A folder on topic "Sewan (*Lasiurus sindicus*): A boon for north-west desert region of Rajasthan.

Research guidance:

- Dr. R.C. Bairwa guided one M.Sc. (Ag.) student as Major Advisor.
- Dr. A.S.Godara worked as paper setter for one PG course of Agronomy of AU, Kota.
- Dr. A.S.Godara worked as External examiner in Practical Examination in B.Sc. (Ag) Part III College of Agriculture, SKRAU, Bikaner

FTDs conducted:

- Total 13 fodder demonstrations were conducted under AICRP on Forage Crops and Utilization during Rabi -2019-20, which were 5 of oat, 5 lucerne and 3 NB –hybrid.

Training conducted for farmers/NGO/Govt. Officials

- Farmers were given training of green fodder production during Rabi season.
- Attended one National Seminar National Seminar "Holistic Approach for enhancing Agricultural Growth in changing Scenario" on 14-16 Nov. at SKRAU, Bikaner
- Participated in one District Level Seminar on "Bikaner is a education hub" on 22.02.2020
- Dr. A.S.Godara & DR. R.C. Bairwa attended a Winter school on " Digital Nutrigation for Resource Conservation in Arid Agro Ecosystem" Winter school on "on 6-26 Dec.2019 at SKRAU, Bikaner.

Works in other projects

- Dr. A.S. Godara conducted one station trial.
- Dr. R.C.Bairwa conducted one station trial and one PVT (Product Verification Trial)

Other works:

Dr. A.S.Godara:

- Worked as Farm In-charge.
- Member of physical verification committee, ARS, Bikaner
- Committee member of videography team during PRT visit
- Sell and Purchase committee member of ARS, Bikaner and NSP Bikaner

AICRP (FC&U), BAU, Ranchi

Research articles in journals:

Kumar S, Bhushan S and Prasad Y. 2019. Climate resilient wheat varieties for heat stress : An overview. *International Journal of Genetics* 11(9): 644-645.

Kumar S, Ram S, Chakraborty M, Ahmad A, Verma N, Lal HC, Prasad Y, Kumar K, Bhushan S and Choudhary AK. 2019. Role of genetic variability for seed yield and its attributes in linseed (*Linum usitatissimun* L.) improvement. *Journal of Pharmacognosy and Phytochemistry*, SP2:266-268.

Popular Article

Prasad Yogendra and Kumar Birendra (2019). Fodder & Livestock scenario in Jharkhand. Indian Fodder scenario: Redefining state wise status, PP.73-78.

Abstract/ souvenirs/ symposia

Choudhary Deban Kumar, Kumar Birendra, Karmakar S and Agarwal BK. 2019. Crop arrangement and fertilization through nano phosphorus as a tool for weed management in pulse based intercropping system. In the *Souvenir cum Lead Proceedings Book* of National Conference on DISHA-2019 held on 10-11, Aug., 2019 at BAU, Ranchi. Pp. 251.

Kumar Birendra, Tirkey Nieta, Izhar Tajwar and Manjhi Shushama .2019. Quality fodder production through INM and Oat + Lathyrus Intercropping system under medium land situation of Jharkhand. In the *Souvenir cum Lead Proceedings Book* of National Conference on DISHA-2019 held on 10-11, Aug., 2019 at BAU, Ranchi. Pp. 251-252.

Kumar Kamleshwar, Prasad Yogendra, Kumar Ravi, Mishra SB, Pandey SS, Kumar Sanjay and Kumar Anuj. 2019. Combining ability for grain yield and its traits in green gram (*Vigna radiata* L. Wilczek). In the *Souvenir cum Lead Proceedings Book* of National Conference on DISHA-2019 held on 10-11, Aug., 2019 at BAU, Ranchi. Pp. 286.

Kumar Ravi, Prasad, Yogendra, Kumar, Kamleshwar, Prakash, Surya, Singh DN, Kumar Arun and Mahato CS. 2019. Production technology and enhancement of quality seed to meet the growing population. In the *Souvenir cum Lead Proceedings Book* of National Conference on DISHA-2019 held on 10-11, Aug., 2019 at BAU, Ranchi. Pp. 234.

Manjhi Shushama, Kumar Birendra and Izhar Tajwar. 2019. Long term influence of nutrient management on growth development and yield of maize (*Zea mays*)- wheat (*Triticum aestivum*) cropping system. In the *Souvenir cum Lead Proceedings Book* of National Conference on DISHA-2019 held on 10-11, Aug., 2019 at BAU, Ranchi. Pp. 252.

Prakash Surya, Surin SS, Prasad Yogendra, Kumar, Krishna and Kumar Ravi. 2019. Estimates of Genetic Parameters in Wheat (*Triticum aestivum* L.) under timely sown condition. In the *Souvenir cum Lead Proceedings Book* of National Conference on DISHA-2019 held on 10-11, Aug., 2019 at BAU, Ranchi. Pp. 281.

Prasad Yogendra, Kumar Kamleshwar, Kumar Birendra, Kumar Ravi, Kumar Sanjay, Prakash Surya, Singh DN and Kumar Sunil. 2019. Genetic variability, association and diversity studies in maize (*Zea mays* L.) for green fodder yield and attributing traits. In the *Souvenir cum Lead Proceedings Book* of National Conference on DISHA-2019 held on 10-11, Aug., 2019 at BAU, Ranchi. Pp. 211 and page 263.

Seminar/Symposium Attended

- Participated in National conference on Doubling Farmer Income for Sustainable and Harmonious Agriculture "DISHA-2019" from 10-11th August, 2019 at BAU, Ranchi.

Extension activities

- Participated in Organic farming training on 26th July, at Mander Block in Totambi village.
- Organized one day Farmer's Training Programme on 24th Dec.2019, village-totambi in Mander Block.
- Participated one day Farmer's Training Programme on Green fodder production a security of rural people in village Ullihatu, dist.-Khunti on 2nd March, 2020.
- Participated one day Farmer's Training Programme on Green fodder production a security of rural people village-Khawa toli, Block-Bandra in dist.-Lohardagga on 4th March, 2020.
- Participated one day Farmer's Training Programme production technology of pigeonpea in village-Gegda, Block-Pataratu, dist.-Ramgarh on 6th March, 2020.

AICRP (FC&U), KAU, CoA, Vellayani

Research articles in journals:
Swathy AH and Usha CT 2020. Mechanization in fodder crop production – A review. *Forage Research* 46(1):1-9.

Popular article (Malayalam) -1
Usha CT, Gayathri G and Allan T. 2020. Kalitheetayilumnedamsayamparyapthatha. *Karshakasree* June 2020.

Research guidance: Ph D in Agronomy- 1; M.Sc. in Agronomy-3 ; M.Sc. in PBG-2

Teaching Courses
Dr. Usha C Thomas

- **B Sc (Ag) courses**-Irrigation and water management, Field Crops II,
- **PG Course-** Agronomy of Fodder and Forage Crops

Dr. Gayathri G

- **B.Sc. (Ag) courses-** Fundamentals of Plant Breeding, Intellectual Property Rights
- **PG courses-** Principles of Quantitative Genetics, *In situ* and *ex situ* conservation of germplasm

Externally funded Projects: Dr. Usha C Thomas is the PI

- State plan project on 'Feasibility of low cost fodder production systems in Kerala- A qualitative and quantitative study
- KLDB project on ' Establishment of fodder museum at College of Agriculture, Vellayani
- Revolving Fund scheme on 'Planting material production in fodder crops', funded by KAU

HR**D- Participation in Trainings:** Dr. Usha C Thomas attended the online workshop 'All India Fodder Production Officers- Kharif' From June 23-26, 2020 conducted under NIAFTA at ICAR-IGFRI, Jhansi

Dr. Gayathri G. attended

- Digital Leadership Course Part 1: Online Learning Workshop for Faculty conducted by QASPIR from 15 to 17 April 2020
- Massive Open Online Course on Psychology of Learning conducted by ICAR-NAARM from 1/5/2020 to 15/5/2020
- Faculty Development Programme (Online Short Term) on Teaching Tools to Knockdown the Lockdown organised by College of Agriculture, Balaghat under Jawaharlal Nehru Krishi Vishwa Vidyalaya (JNKVV), Jabalpur from 16/05/2020 to 20/05/2020.

AICRP (FC&U), PAU, Ludhiana

Awards and Honours:

- Awarded appreciation certificate for the development of new Bajra Napier hybrid PBN 351 (CZ) during NGM (Rabi 2019-20) held at CAU, Imphal under the aegis of AICRP on FCU, IGFRI, Jhansi and ICAR, New Delhi.

Research articles in journals: 9

Atri Ashlesha and Tiwana US 2019. Effect of seed treatment and foliar spray on leaf blight of fodder oat in Punjab. Phytoparasitica 1-9, https://doi.org/10.1007/s12600-019-00758-7 (NAAS rating: 7.01)

Dhillon BS, Uppal RS, Goyal M 2020 Forage quality and productivity of barley (*Hordeum vulgare* L.) as influenced by cutting management under staggered sowing in North-West India. *Archives of Agronomy and Soil Science* 66:1244-1258. (NAAS rating-7.68)

Kapoor Rahul and Singh Tarvinder Pal (2020) OL 12: A new high yielding fodder oat variety released for Punjab state, India. *Int. J. Curr. Microbiol. App. Sci.* 9 (4): 3174-3178.

Kapoor Rahul and Sohu RS (2020) Bajra Napier hybrid variety: PBN 351. *Indian J Gen. Plant Breed*. 80(1): 118.(NAAS rating: 6.41)

Kaur Arshpreet, Kapoor Rahul, Vikal Yogesh and Kalia Anu. 2020. Colchicine-induced chromosome doubling in *Pennisetum* interspecific hybrids and its effect on plant morphology. *Indian J Gen. Plant Breed*. 80(1): 58-63. (NAAS rating: 6.41)

Kaur Gagandeep, Kapoor Rahul and Singla Ashlesha 2020. Identification of potential donors for higher β - glucan content in oats *Avena sativa* L. germplasm. *Int. J. Curr. Microbiol. App. Sci.* 9 (5): 3290-3294.

Kaur Maninder, Punia SS, Singh J and Singh S. 2019. Efficacy of pendimethalin against resistant little seed canary grass as affected by soil moisture and formulation. *Journal of Crop and Weed* 15(3): 167-173.

Oberoi Harpreet Kaur and Kaur Maninder. 2019. Nitrogen uptake association with biomass yield and fodder quality attributes in sorghum genotypes. *Forage Research* 46(1): 58-62.

Oberoi Harpreet Kaur and Kaur Maninder. 2019. Yield, growth and proximate analysis of multi-cut fodder sorghum genotypes with different doses of nitrogen. *Forage Research* 45(2): 137-140.

Papers presented in Symposia/Workshops: (2)

Atri Ashlesha and Cheema Harpreet Kaur (2020). Study on antifungal activity of plant extracts, organic inputs and elicitors on berseem stem rot presented in 7th International Conference on "Phytopathology in achieving UN Sustainable Development Goals" from January 16-20, 2020 at IARI, New Delhi.

Kumari A, Goyal M and Kumar R. 2019. Responsive elements in sorghum against shoot fly infestation. *XIV Agricultural Science Congress. Innovations for Agricultural Transformation* held at NASC complex, Pusa, New Delhi on 22-23 Feb 2019.

Book chapters (2)

Kapoor Rahul. 2018. Addressing animal nutrition through wide hybridization in forage crops. In: *Fodder crops Approaches for value addition and enhancing income*. Y Jindal, A K Chhabra, A K Roy (Eds.). Pp. 104-114, Earth Vision Publications, India (ISBN: 978-93-84922-77-1)

Tiwana US, Oberoi HK, Goyal M and Singh J 2019 Management of anti-nutritional components through agronomic manipulations in forage crops. In: Jindal *et al* (Ed.) *Fodder crops-approaches for value addition & enhancing income*. Earth Vision Publication, Hisar, India pp 179-185 (ISBN: 978-93-84922-77-I).

Popular articles/ extension folders: (7)

Kaur Maninder and Oberoi Harpreet Kaur 2019. Harirute postik chare lenlayi buniyadi jankari. *Vigiyanak Pashu Palan* 13(1): 11-12. (September 2019).

Kapoor Rahul, Kaur Maninder and Obeori HK. 2019. OL-12: High yielding single cut variety of oats. *Progressive Farming* 55(10): 11. (October 2019).

Kapoor Rahul, KaurManinder and Obeori HK. 2019. Vadjhad den valijavi di kisam: OL-12. *Changi Kheti* 55(10): 28. (October 2019).

Singh Devinder Pal, Sohu RS and Kaur Maninder 2019. Hari vichmiyari chara kiven paida kariye. *Changi Kheti* 55(10): 21-22. (October 2019).

Kaur Maninder, Oberoi Harpreet Kaur and Sohu RS 2020. Grow early summer fodders for more profit. *Progressive Farming* 56(3): 22-23. (March 2020).

Kaur Maninder, Bhardwaj Ruchika and Singh Devinder Pal 2020. Garmi de agete chare bijoteva dhare labh kamayo. *Changi Kheti* 56(3): 21. (March 2020).

Oberoi Harpreet Kaur and Kaur Maninder 2020. Chariyan di aachar bana ke sambhal. *Vigiyanak Pashu Palan* 13(8): 12-13. April, 2020

Research guidance: M. Sc.: 7; Ph.D.: 3

Lectures delivered - 6

TV/Radio talks: (2) TV: 1; Radio: 1

Details of seed/Planting material sold

	Variety	TL (q)	C/S (q)	F/S (q)	B/S (q)
Berseem	BL 1	-	-	-	1.25
	BL 10	20.30	45.55	-	15.20
	BL 42	10.25	62.54	5.50	8.25
	BL 43	15.50	-	-	-
	BL 180	-	-	-	1.00
Oats	OL 9	-	-	-	1.00
	OL 10	58.60	-	-	32.00
	Kent	3.65	15.40	-	15.00
	OL 11	8.50	32.45	-	3.56
	OL 12	25.00	55.60	-	20.30
Rye grass	PBRG 1	5.60	-	-	0.30
	Total	**147.4**	**211.5**	**5.50**	**96.6**

External funded Projects

Name of the Project/Scheme	Funding Agency	Budget (Rs in lakhs)	PI/Co-PI
Breeding for development of baby corn hybrids	ICAR-IIMR, Ludhiana	109.59	Dr. Meenakshi Goyal
Development of low lignin mutants sugarcane through mutagenesis and genome editing approach	CSIR, New Delhi	33.00	Dr Meenakshi Goyal (Co-PI)

AICRP (FC&U), CCSHAU, Hisar

FTDs conducted: Fifteen FTDs on berseem, twenty on single cut oats variety and five on multi-cut oats variety were conducted at farmers' field.

Crop Monitoring

- Dr. D. S. Phogat and Dr. Naveen Kumar monitored *Rabi* trials (2019-20) at PAU, Ludhiana.
- Dr. Minakshi monitored *Rabi* trials and FTDs (2019-20) at CSK HPKV, Palampur centre.

Workshop/Seminar/Symposia attended/participated

- Dr. Naveen Kumar participated in the one day workshop on " Awareness and Use of Scopus Citation Database" organized by Nehru Library, CCS HAU, Hisar on 2^{9th} November, 2019.
- Dr. Naveen Kumar attended the National Webinar Awareness & Use of CeRA Resources through J-Gate Discovery Platform on 25.06.2020 organized by Nehru Library, CCS HAU, Hisar in collaboration with Consortium for e-Resources in Agriculture (CeRA) – DKMA-ICAR, New Delhi and Informatics Publishing Limited, Bangalore.
- Dr. D. S. Phogat and Dr. Naveen Kumar attended and presented poster in the Golden Jubilee International Conference on New Millennia Agriculture- Novel Trends and Future Scenario" organized by Directorate of Research, CCS HAU, Hisar held from Nov. 6-8, 2019.

Research Guidance: PG students guided/guiding: 3
Teaching: Dr Minakshi (4 courses); Dr Naveen Kumar (2 courses)

Publications

Research articles in journals: 5
Book Chapter: 1
Technical Bulletin: 1
Popular article: 3
Pamphlet: 1

Nucleus and TFL seed produced during *Rabi,* 2019-20

Crop	Variety	Quantity (quintal)		Crop	Variety	Quantity (quintal)	
		Nucleus	TFL			Nucleus	TFL
Oat	HJ 8	5.0	20.0	**Berseem**	HB 1	0.2	0.4
	OS 403	3.0	9.0		HB 2	0.4	1.6
	OS 346	0.25	0.3		Mescavi	0.05	0.1
	OS 377	1.0	1.0				
	OS6	2.0	2.5				

Breeder seed allocated and produced during *Rabi*, 2019-20

Crop	Variety	Quantity allocated (q)	Quantity produced (q)	Surplus/deficit
Oat	HJ 8	4.00	10.50	+6.50
	OS 377	3.40	17.20	+13.80
	OS 403	27.40	35.40	+8.00

AICRP (FC&U), IGKV, Raipur

Award and Honour

- Excellence in research award to Dr S.K.Jha for outstanding contribution in the field of Agronomy on the occasion of International conference "Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2019)" during 20–22 October, 2019 at ICAR-NAARM, Hyderabad.

Research articles in journals:

Shesh Jayesh, Jha SK, Kumar Ritesh and Kunjam Swati. 2020. Effect of de-topping and nitrogen levels on yield and nutrients uptake of maize (*Zea mays* L.) International Journal of Research in Agronomy 3(1): 45-48

Effect of nitrogen levels, cutting management and splitting of nitrogen dose on growth, yield and quality of fodder oat (*Avena sativa* L.) *International Journal of Chemical Studies* 2020, 8(2) : 1488-1490

Porte C, Jha SK and Dwivedi SK. 2019. Effect of different nitrogen levels and planting geometry on yield of fodder maize (*Zea Mays* L.) under Chhattisgarh condition *J.Agril Issues* 23(*1) 91-94, 2018*

Porte Chancal, Jha SK and Dwivedi SK. 2019. Nitrogen use efficiency in African tall fodder maize (*Zea mays* L.) as affected by nitrogen levels and planting geometry *Int J Chemical Studies* 7(2): 1163-1167

Kujur D and Sahu M (2019). Path analysis for seed yield in Cowpea [*Vigna unguiculata (L.) Walp.*]. *Int J Chemical Studies* 7(4): 2474-2476

Jha SK, Pandey N, Choudhary T and Kumar S. 2019. Effec of different seed rates and weed management practices on dehydrogenase activity on direct seeded rice. *J.Agril Issues* 23 (1) 10-13, 2018

Kumar S, Shrivastva GK, Pandey N, Chitale S and Jha SK Comparative studies of different organic sources of nitrogen on economics and energetic of scented rice (*Oryza sativa* L.) *J.Agril Issues* 23(*1) 14-17, 2018*

Book Chapter

Jha SK. 2019. Fodder and livestock scenario in Chhattisgarh. In Indian Fodder Scenario: Redefining Stat Wise Status (eds. A.K.Roy, R.K.Agrawal. N.R. Bhardwaj) ICAR-AICRP on Forage Crops and Utilization, Jhansi, India pp.33-38.

Jha SK. 2019. Suraji "*Suraaji Gaon Yojana" "Narwa, Garuwa, Ghurwa, and Baadi*": New dimension for sustainable rural economy and fodder production in Chhattisgarh published in Souvenir National Group Meet Rabi 2019-20 AICRP-Forage crops & Utilization Central Agricultural University, Imphal**.**

Research Papers presented in conference

Oral presentation in the International conference "Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2019)" held on 20–22 October, 2019 at ICAR-NAARM, Hyderabad, on the topic "Low Cost Hydroponics Fodder Production : Round the year green fodder for small, marginal and landless farmers***"***

Extension Articles

Tiwari A and Sahu M 2019. Praamaanit beej Kishno kai lieya varadaana, *Krishak Samrddhi*, Raipur, Pp 83-85.

Sahu M and Tiwari A 2019. Chara phasalo Ki unnt Kisame. ***kheti***, ICAR August, 2019 Pp 07-11.

Leaflets/Folders

- pkjs okyh Qly eDdk
- pkjs dk jktk cjlhe
- pkjk okyh nyguh Qly yksfc;k
- gkbMªksQksfud pkjk mRiknu rduhd
- gjs pkjs ls gs ,oa lkbyst dSls cuk;s
- ,d ckj yxk;s cktjk usfi;j ladj ?kkl rhu lky rd gjk pkjk ik;s
- lky Hkj gjk pkjk nsus okyh fdLe cgqo'khZ; Tokj
- lfn;ksa dk cf<+;k pkjk tbZ

Externally Funded Projects

SN	Projects	Title	PI	Funding source	Budget (Rs. in lakh)
1	AGRON -4	Demonstration and training on silage production	SK Jha	VV fund	0.75
2.	AGRON -5	Demonstration and training on rounfd year fodder production for KVK's and GUTHAN farmers	SK Jha	VV fund	0.75
3.	Public Private	Efficacy of Carfentrazone ethyl 40DF against sedges and broad leafed weed in DSR	SK Jha	Sponsored	4.0
4.	Adhoc project	Gamma ray mutagenesis for delayed flowering (65-75 days) and increased leaf stem ratio of Lathyrus. (Parteek & Mahateora)	Mayuri Sahu	BRNS, BARC, Mumbai	21.0

Teaching

	Level	COURSES	SUBJECT
Dr SK Jha	PG	AGRON -501	Modern Concept in crop production
	UG	AGRO5121	Agricultural Water Management
Dr Mayuri Sahu	PG	GP-503	Principles of Plant Breeding
	PhD	GP-605	Advances in Plant Breeding systems
	NCC Officer cum Care Taker for; 8th CG Girl's BN, CoA, Raipur		

Research Guidance

Subject	No of student registered
Dr SK Jha	PG: Major advisor- 2, Co-advisor -6 ; Ph. D.: Major advisor- 3
Dr Mayuri Sahu	PG: Major advisor- 2 , Co-advisor -2

Linkage : AICRP (Dry Land), CARS, Jagdalpur, Bastar (Chhattisgarh), AICRP (IFS), KVK's

National Group Meet -Kharif 2019: Conducted National Group Meet -Kharif 2019 of AICRP-Forage Crops during 26-27 February, 2019

TV/ Radio talk delivered by AICRP-FC staff/ extension activities:

- Lecture delivered to farmers and agricultural developmental officers
- Krishi darshan (BC) main Specialist hetu, Recording date 24-01-2019 Broadcast date : 15-02-2019
- C. G. main hara chara ki sambhavanaye" BC Sjeev Phone main Specialist hetu. on 20-02-2019

Extension packages

- Generated and published *package of practices of fodder crops production under Chhattisgarh Condition*
- Published package of practices of fodder crops production in ***Krishi Yug Panchang*** *in 2020*
- Demonstrated the fodder *production technology in* ***Agriculture Museum*** at 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
- State policy draft on round the year fodder production submitted to Chhattisgarh government for *Gothan* Development

Fodder Policy for *GOTHAN Programme* to Chhattisgarh Government

- Draft on round the year fodder production submitted to Chhattisgarh government for *Goathan* Development

Fodder and Seed production through KVK Koriya

- Pasture Land Development for year round green fodder production at village level
- A model pasture land was developed by KVK - Korea, under the ambitious *Suraji Yojana* scheme, Government of Chhattisgarh in an area of 50 acres of community land from 10 village panchayats for year round green fodder production
- A total revenue of Rs. 2.92 lakhs as income was received by sale of two budded stem cuttings, by 10 village Panchayat samitis. The total revenue received will be effectively utilized for management and maintenance of fodder production area.

New Seed production Farm

- New fodder seed production farm imitated at COARS, Bhatapara , KVK Mahasamund and KVK Durg with the help of local administration and RKVY.

Capacity Building

- Dr S.K.Jha participated in training programme on "Extension Strategies for Mainstreaming Women in Agriculture and Allied Fields" organize by NAARM, Hyderabad during 4th to 8th November 2019.

Important visitor:

- Visit of Agriculture Production Commissioner, Chhattisgarh Government ;
- Hon'ble V.C. IGKV, Raipur
- Directors, Deans, PC, SMS and scientist in forage demonstration block.

Rashtriya Kishan Mela Chhattisgarh -2019: AICRP on FC & U participated in **Rashtriya Kishan Mela Chhattisgarh-2019**

Training: Training on round the year fodder production was conducted for GUTHAN management committee on 24/09/2019. Total 50 participants was trained for fodder production

FTD's: Front line technology demonstration conducted in Mainpat and Raipur district of Chhattisgarh. Total 20 demonstrations on fodder Oat, perennial sorghum (COFS-29) and Napier grass was conducted in GUTHAN.

AICRP (FC&U), RPCAU, Pusa

Seed Production:

- 4q seed of fodder oats variety Kent produced
- Under university funded project on "Fodder seed production programme", initiated the work for development of Fodder Hub cum Pasture in the Dhab area with cooperation of IGFRI, Jhansi.

Research Guidance

- Dr. Nilanjaya - one M.Sc. and one Ph.D. student on Forage Cowpea.
- Dr. Gangadhar Nanda - one M. Sc. student on fodder Oat.

Teaching

- Dr. Nilanjaya is having online course load of nearly 20 credit hours per semester.
- Dr. Gangadhar Nanda is having online course load of nearly 12 credit hours per semester.

Other academic responsibilities

- Dr. Nilanjaya - 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.
- Dr. Gangadhar Nanda - additional assignment of Officer-In- Charge, Fodder production at APRI, RPCAU, Pusa.

AICRP (FC&U), BAIF, Urulikanchan

Research articles in journals:

Kale RV and Takawale PS 2019. Seed priming techniques improve germination, forage yield and economics of forage maize. *Forage Res.,*45 (3): 229-231

Important persons visited to AICRPFC centre:

Dr. R.S. Paroda, Former Director General, ICAR, and currently Chairman TAAS, New Delhi
Dr. Pramod Joshi, Ex Director (South Asia) of IFPRI

FTDs conducted:

Fodder Technology Demonstrations of Oat var. Kent (15) and Berseem var. Wardan (5) were arranged at farmer's field in three blocks of Pune district to make them aware about new package of practices.

TSP activities: Activities under the financial support from Tribal Sub Plan were implemented in two villages namely Balamrai and Kalamba in Nandurbar district of Maharashtra. The major objectives being training and capacity of the tribal farmers, promotion of new fodder crops, their advance varieties and management practices, demonstration of benefits of using improved farm implements at village level. It was need based and participatory programme. Two separate meetings were conducted with villagers in Balamrai and Kalamba villages separately to identify the needs of the farmers. Considering the need, following activities were implemented under TSP.

- Identified forty farmers from two villages to undertake the activity.
- A training programme was organized on Nursery raising of Hybrid Napier and its cultivation
- Supplied training material to the trainee farmers.
- Selected three farmers and their field sites for nursery raising, supplied inputs such as planting material of BAIF Napier Hybrid-11, organic and inorganic fertilizers to all the three farmers. Practical demonstration was given in the field on how to plant the cuttings and aftercare.
- An exposure visit of farmers was arranged to KVK, Nandurbar for orienting them about new farm implements and their benefits.
- Procured 40 units of Mogi harrow, Solar operated sprayers, Sara Yantra and Iron plough and three units of Bullock drawn seed drill and supplied to the participating farmers in these two villages.
- Technical support to the farmers through field visits.
- Total farmers benefited out of this programme were 40 distributed in two groups.

Training conducted for farmers/ NGO/ Govt. officials: BAIF has organized six trainings on "Livestock Management and Fodder Development" at Urulikanchan during the period. In all 91 participants from Govt., Dairy Cooperatives and individuals from Maharashtra, Odisha, Tamilnadu and UK attended the training. The information on "Fodder Production and Utilization Technologies" was shared with participants by the Scientists working in AICRP on Forage Crops.

HRD for the AICRP-FC staff: Mr. P. S. Takawale, attended three days training programme on "**Leadership Development Programme (LDP)**". Training was arranged by BAIF Development Research Foundation, Pune and conducted by Cerveausys Strategic Consulting Pvt. Ltd., Pune

Seed/ planting material sold: Supplied 2.55 lakh stem cuttings of BAIF Napier Hybrid-10 (BNH-10) and 38.53 q seed of oat, berseem, bajra and cowpea seed to farmers and different institutions.

Externally funded projects

- Development of high biomass, drought and salinity tolerant mutant lines in Lucerne (*Medicago sativa* L.) funded by BIRAC, New Delhi.

AICRP (FC&U), GBPUAT, Pantnagar

Research articles in journals:

Pal MS. 2019. Pre- and post-emergence herbicidal effect on weeds, fodder yield and quality of berseem in lowland region of Western Himalayas. Indian Journal of Weed *Science* 51 (2): 173-177.

Book/Book chapters

Pal MS 2019. Crop-livestock interaction under conservation agriculture. CAFT Training on 'Tactical Response Farming fro Climate Resilience' from Nov. 20 to Dec. 1, 2019 at Department of Agronomy, Pantnagar**.**

Book published = **01** (Dr B Prasad)

Kumar Amarjeet, Prasad Birendra and Kumar Anil. 2020. Classical and molecular approaches in plant breeding. Narendra Publishing House Delhi. ISBN No. 978-93-89235-25-8 pp. 525

Popular articles=02

Pal MS and Jain SK. 2020. Guniea grass for green fodder. *Kisan Bharti* 51 96): 28-32**.**

Prasad Birendra, Ojha OP and Kumar Amarjeet. 2020. Seed production: a key factor for enhancing productivity of farm. Indian farmer digest. pp.29-32

TSP-Forage Crops: 159 fodder demonstrations on Oat and Berseem in scheduled tribes dominated 6 villages: Lamjala (Nainital dist), Jawahar Nagar, Balkhera, Salmata, Bidori and Loka (US Nagar dist). 600 rooted slips of BxN hybrids, seed, fertilizers, pesticides and relevant literature related to recent production technology were distributed to farmers. Other information related to organic production and dairy farming, mushrrom production were also provided to interested farmers.

FTD conducted : **20** (10 Oat and 10 Berseem)
Farmers' Meetings **: 03 (**124 beneficiaries**)**
Group discussions **: 04**
Radio Talks **: 05 ,** MS Pal -03, B Prasad -2

Participation in Conference/Workshop (Webinars) = 05 national and 01 international

- Dr MS Pal – 2 national, 1 international Dr B Prasad 03 national

Teaching courses=06 Dr MS Pal – 03 ; Dr B Prasad -03

Course Code	Course title	Credit hours	Semester	Degree programme
APA 318	Rainfed Agriculture & Watershed Management	02	II	UG
APA522	Agronomy of Rabi Crops	04	II	PG
APA 622	Agrostology & Agroforestry	03	II	Ph D
AGP 313	Principles of Seed Technology	03	II	UG
AGP 530	Breeding field crop -II	02	II	PG
AST 705	Advances in Seed Science and Technology	01	I ,II	PG

Research guidance: (PG & Ph D) =06 Dr MS Pal – 02; Dr B Prasad -04

Income generated

SN	Crop	Variety	Quantity	Rate of Breeder seed /q	Total Amount (Rs.)
1	Oat	UPO-212	100.0 q	7250	725000
2	Cowpea	UPC-8705, UPC 625, UPC 628	1.62 q	12,900	20898
3	Berseem	UPB 110	50 kg	44,900	22450

Additional Duties

Dr MS Pal - Vice President, Alumni Almamater Advancement Association (4A), Pantnagar,Hostel Warden
Dr B Prasad: Member of UG course curricular on seed technology.

AICRP (FC&U), CSK HPKV Palampur

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*
- **Councilor**- Range Management Society of India, IGFRI Jhansi
- **Councilor**- Haryana Agronomist Association (Haryana J. Agronomy), Hisar
- **Expert lecture: In-** ICAR Sponsored Course on "Conservation agriculture practices for enhancing productivity and resource use efficiency in major cropping systems", Feb. 4-13, 2020 at SKUAST, Jammu
- **Expert lecture: In-** National Training on "Modern Management practices at instructional livestock and poultry farm" Feb. 28,2020 at Bihar Animal Science University, Patna (Bihar)

Dr. D K Banyal

- **Conferred Fellow of Indian Phytopathological Society 2020**
- Professor Academic Affairs Committee COA 2019-20.
- Reviewer Excellence Award **by Indian Phytopathology**
- **Expert lecture:** Delivered lecture on Entrepreneurship options in Plant Pathology under Adri entrepreneurship orientation cum incubator Programme under Him Palam R-ABI Project

Research articles in journals:

Banyal, D. K., Chatak, S., Malannavar, A. B., Thakur, A. and Singh, A. 2020.Evaluation of bioefficacy of pydiflumetofen 7.5% + difenoconazole 12.5% w/v (200 SC) against early blight of potato. *Pl. Dis. Res. 35 (1)*: 67-69

Bindra S, Mittal RK, Sood VK and Chaudhary HK. 2020. Alien introgression studies involving *Vigna mungo* x *Vigna umbellata* hybridization. *International Journal of Current Microbiology and Applied Sciences* 9(2): 268-276.

Chahal Arvind, Sharma GD, Kumar Naveen, and Kumar Ashish 2019. Physio-chemical properties of soil affected by different source of nutrients. *Indian J. of Ecology* 46(4):850-852

Devi R, Sood VK, Chaudhary HK, Kumari A and Sharma A. 2019. Identification of promising and stable genotypes of oat (*Avena sativa* L.) for green fodder yield under varied climatic conditions of North-western Himalayas. *Range Management and Agroforestry* 40(1): 67-76.

Dogra, P. Singh, A. and Banyal D. K. 2020. Survival of *Cercospora sojina* causing frog eye leaf spot of soybean and impact of weather factors on the disease development. *Pl. Dis. Res. 35 (1)*: 14-19

Katoch R. 2019. Tree fodder for mitigating forage requirement in Himalayan region. *Range Management and Agroforestry* 40(1):173-180.

Manoj NV, Chaudhary HK, Sharma P, Singh K and Sood VK. 2020. Revealing allelic expressivity and distribution of genes for hybrid necrosis in North-west Himalayan diverse wheat (*Triticum aestivum* L.) gene pools. *Cereal Research Communications* 48: 25–31.

Shalley, Kumar Rameshwar, Punam, Kumar Naveen and Sharma Raj Paul. 2019. Studies on performance of improved grasses on degraded grassland under mid hill conditions of Himachal Pradesh. *Indian J. Agroforestry* 21(2):76-80

Sharma A, Sood VK, Rana M, Chaudhary HK and Kumari A. 2019. Genetic diversity and structural variation among tall fescue (*Festuca arundinacea*) grass genotypes using morphological and molecular markers. *Range Management and Agroforestry* 40(2): 215-226.

Sharma Amit, Sharma GD, Kumar Naveen, Chahal Arvind and Sankhyan NK. 2019. Studies on the performance of promising varieties of oat (*Avena sativa* L.) under different cutting regimes in mid hill conditions of Himachal Pradesh. *Journal of Pharmacognosy and Phytochemistry* 8(2): 728-731

Sharma S, Mittal RK, Sood VK and Thakur S. 2019. CRISPR- A powerful functional genomic tool in crop improvement. *Himachal Journal of Agricultural Research* 45(1&2) : 96-99.

Sharma S, Mittal RK, Sood VK and Thakur S. 2020. Studies on efficacy of various *in vivo* and *in vitro* techniques on crossability and pod setting percentage in *Vigna mungo* x *V. umbellata* hybridization. *International Journal of Chemical Studies* 8(1): 1189-1192.

Singh A, Mittal RK, Sood VK, Kumar S and Dhillon KS. 2020. Studies on heterosis and *per se* performance in early segregant population of urdbean (*Vigna mungo* L. Hepper). *International journal of Chemical Studies* 8(1): 2102-2105.

Sood A, Tripathi A, Sood VK and Katoch R. 2019. Biochemical composition of stover from different maize genotypes. *Indian Journal of Agricultural Biochemistry* 32(2): 149-153.

Sunil Kumar, Naveen Kumar, Shilpa Kaushal and Vijay Singh (2019). Quality assessment of vegetative barriers and improved forgae species under degraded grassland conditions. *Int. J.Scientific Res. and Review.* 7(4):459-462

Papers in Seminars/Conferences/Symposia/meeting etc.

Banyal DK, Malannavar AB and Singh A. 2020. Presented an oral paper entitled, "Effect of date of sowing and IDM components on the management of root rot and foliar diseases of forage cowpea" by" in 7th International workshop on "Phytopathology in achieving NU sustainable development Goals", on January, 16-20, 2020 at New Delhi.

Kumar Naveen and Kumari Priyanka 2020 Resources Conservation in Forage Farming. In Compendium: ICAR Sponsored Course on "Conservation agriculture practices for enhancing productivity and resource use efficiency in major cropping systems, Feb. 4-13,2020 at SKUAST, Jammu. Pp.18-21

Sharma S, Mittal RK, **Sood VK**, Chaudhary HK and Sood R. 2020. Effects of different growth media on germinability of interspecific hybrids between *Vigna mungo* and *V. radiata* (Abstract published in "International Conference on Pulses as the Climate Smart Crops: Challenges and Opportunities'' (IC Pulse2020) at Bhopal w.e.f. February 10-12, 2020 organized by Indian Society of Pulses Research and Development (ISPRD), ICAR-Indian Institute of Pulses Research (IIPR), Kanpur, India P 313

Singh A, Mittal RK, **Sood VK**, Sharma S and Singh KD. 2020. Genetic analysis for yield and yield attributing traits in half diallel crosses of urdbean [*Vigna mungo* (L.) Hepper] (Abstract published in "International Conference on Pulses as the Climate Smart Crops : Challenges and Opportunities'' (IC Pulse2020) at Bhopal *w.e.f.* February 10-12, 2020 organized by Indian Society of Pulses Research and Development (ISPRD), ICAR-Indian Institute of Pulses Research (IIPR), Kanpur 208 024, Uttar Pradesh, India, In Collaboration with Indian Council of Agricultural Research (ICAR), New Delhi, India P 165

Thakur A, and Banyal DK. 2020. Evaluation of Integrated disease management components on banded leaf and sheath blight (*Rhizoctonia solani* f. sp. *sasakii)* of fodder maize. In 7th International workshop on "Phytopathology in achieving NU sustainable development Goals", on January, 16-20, 2020 at New Delhi

Book Chapters

Kumar Naveen, Sood VK, Banyal DK and Katoch R. 2019. Fodder and livestock scenario in Himachal Pradesh. In: Indian Fodder Scenario: Redefining state wise status. (Eds,: A K Roy, R K Agrawal and N R Bhardwaj) ICAR, AICRP (FC&U). Pp 53-62

Souvenir

Kumar Naveen, Sood VK, Banyal DK and Katoch Rajan. 2019. Fodder production strategies for the hill in Himachal Pradesh. National group meet - Rabi 2019 held at Central Agricultural University, Imphal on 30-31st August, 2018. Souvenir, 86-88 p.

Participation in symposiums and conferences

- Dr D K Banyal attended 7th International workshop on "**Phytopathology in achieving NU sustainable development Goals"**, being organized by IPS on January, 16-20, 2020 at New Delhi and presented an oral paper on 18.01. 2019 in session 7.

- Dr Rajan attended sensitization workshop on NAHEP component-2 at CSKHPKV, Palampur from 7-8.2.2020.
- Dr Rajan attended Training programme on student counseling & capacity building at CSKHPKV, Palampur on 17-18 Feb., 20
- All the scientists attended Agriculture officer's workshop *Rabi* during 31.10.2019 in the Directorate of Extension education, CSKHPKV, Palampur.

Courses Taught

Course No	Course Title	Cr. Hr.
LPM	Livestock production and Management	4+2=3
Agron-510	Agroforestry and Agrostology	2+1=3
GP 244	Commercial Plant Breeding	1+2= 3
GP 691	Doctoral Seminar	1+0= 1
GP 603	Genomics in Crop Improvement	2+1= 3
GP 608	Advances in Breeding of Major Field Crops (Fodder portion)	3+0= 3
Agron 3613	Diseases of Field and Medicinal Crops	2+2 =4
PI Path 511	Chemicals in Plant Disease Management	2+1=3
PI Path 513	Disease Resistance in Plants	2+0=2
Biochem.121	Plant Biochemistry	1+1=2
Biochem.501	Basic Biochemistry	3+1=4
Biochem.602	Advanced Molecular Biology	3+0=3

Research guidance: (as major advisor): MSc. = 8Ph.D. = 10

Other activities

Project Monitoring	:	AICRP (FC) of Rabi 2018-19 at ANGRAU, Hyderabad
Forage technology consultations	:	9
Lectures delivered to farmers and developent officers	:	16
Training programme organised on farmer's field	:	1
Consultancy	:	– Jersey Breeding Farm, Department of Animal Husbandry (HP) Development of 3 ha lantana infested land into productive pasture
Linkage	:	– AICRP (IFS) ; AICRP (Agroforestry)
Association in Adhoc Projects	:	– Scientists are associated in 7*Ad hoc* projects as PI and Co-PIs
Resource generation (Mega Seed Project)	:	– Rs. 7, 66,810/- (FY 2019-2020)

AICRP (FC&U), SKUAST-K, Srinagar

Two new entries of forage oats have sent for evaluation under AICRP Coordinated programme
Two entries 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 2020-21
Forage seed production during 2019-20:

- Breeder Seed = 44.00 q (as State Indent)
- Nucleus Seed = 05.00 q (varieties released at National & State Level)

Two Tribal farmers days were conducted under TSP in March 2020 in collaboration with KVK Anantnag & KVK Bandipora. Seed and other inputs were distributed among 80 participating farmers.

AICRP (FC&U), AAU, Jorhat

New Variety Developed during last 3 years

Rice bean variety Madhuri: developed by pure line selection. Released for Assam state by SVRC in 2016 for high green and dry matter yields , high quality characters and tolerant to insect pest and diseases in rice fallow both as relay and sole crop. Tolerant to drought and cold

Research articles in journals:

Bora SS, Sharma KK, Borah K and Saud RK. 2020. Opportunities and challenges of forage cultivation in Assam-A review. *Forage Res.* 45(4):251-257.

Sarma A, Saud RK, Thakuria K, Sharma KK and Bora SS. 2020.Nitrogen management in Rye grass (*Lolium multiflorum*) . *Forage Res.* 45(4):295-297.

Bora SS, Sharma KK, Borah K and Konwar MJ. 2019. Effect of nitrogen levels and seed rate on growth and yield of Rye grass (*Lolium multiflorum*) in Assam, India. *Int J. Current Microbiology and Applied Science* 8(9): 2110-2114

Das R, Das G, Talukdar P and Neog SB. 2019. Genetic analysis for yield and yield attributing traits in Cowpea (*Vigna unguiculata* L. Walp), *Legume Research,* Print ISSN:0250-5371 / Online ISSN:0976-0571

Keditsu Z, Neog SB and Barua NS. 2019. Correlation and path coefficient analysis of some fodder yield components of ricebean (*Vigna umbellata*) under Rhizobium treatment. *Forage Res.* 45 (3): 240-242

Lyngdoh AA, Neog SB, Sarma A, Das K and Das P. 2019. Heterosis and combining ability studies in a diallel cross of grass pea (*Lathyrus sativus* L.) genotypes for green forage yield and its component traits. *Forage Res.* 45 (3): 183-188

Book Chapter-2

Sharma KK and Neog SB. 2019. Fodder and Livestock Scenario in Assam. Indian Fodder Scenario: Redefining State Wise Status. Edited by A.K.Roy; R.K.Agrawal and N.R. Bharadwaj Published by AICRP on Forage crops and Utilization, IGFRI, Jhansi

Sharma KK, Bora SS and Neog SB. 2019. Rye grass – Suitable Rabi Forage for Productivity and Profitability in Assam. Souvenir, NGM -AICRP on Forage crops and utilization. Edited by R.J.Koireng *et. Al,* AICRP on Forage Crops and Utilization, CAU, Imphal, Manipur

Bulletin

Package of practices for organic Crop Production for Selected crops of Assam. Compiled and Edited by K. K. Sharma *el al* Published by Directorate of Research ,AAU,Jorhat-785013

Important persons visit:

- Dr A. K. Bhattacharya , VC, AAU, Jorhat
- Dr M.Patiri, Jt Director ,Dept of Agriculture, Govt of Assam

Research guidance: M.Sc. (Agri.) in 3 in PBG and in Agronomy-3; Ph. D in Agronomy- 3

No. of FTDs conducted: 40

TSP activities: Adopted 2 villages in TSP district Baksa , Assam in North Bank Plain Zone.

Training conducted for farmers/ NGO/ Govt. officials: 4

TV/ Radio talk: 2

Details of seed/ planting material sold/ supplied (2019-20)

SN	Forage crops	Total quantity (kg)		
		Total Slips(No)	Foundation seed	TFL seed
1.	Hybrid Napier CO-4,CO-5	2.50 lakh		
2.	Setaria Kazungula, PSS-1	1.30 lakh	-	
3.	Rice bean Var. Shyamalima		20.00 kg	
4.	Oat Var. Kent and JHO 822			3.00 q
	Grand Total	**3.80 lakh**	**20.00 Kg**	**3.00 q**

Externally funded projects: Optimization resources for identification of potential sorghum forage hybrids using genomic selection funded by Department of Biotechnology, Govt of India – 2017-20

AICRP (FC&U), ANDUAT, Ayodhya

Research articles in journals:

Kumar AK, Yadav RS, Kumar R, Kumar S and Kumar D. 2019. Effect of spacing and nutrient management on growth, yield, yield attributes, quality characters and economics in *Hirsutum* cotton in central plain zone of UP. *International Journal of Chemical Studies* 7(4):1012-1017

Singh AP, Yadav RS, Singh RP, Singh A and Singh V. 2020. Influence of weed management practice on weeds, weed control efficiency nitrogen uptake by weeds and the crop, quality and yield of fodder oat (*Avena sativa* L.). *Int.J.Curr.Microbiol.App.Sci. (*Special Issues)-10:168-172

Singh A, Yadav RS, Kumar A, Kumar Abhay, Patel VK, Singh AP and Singh RP. 2020. Effect of weed management practices on yield and economics in Indian mustard. *International Journal of Chemical Studies* 8(2):1064-1067

Souvenirs/ book chapters

Pal P, Kumar S, Yadav RS and Singh SP. 2019. Effect of phosphogypsum to various cultivars on soil fertility and fodder yield of Oat (*Avena sativa* L.) in sodic soils. in Souvenir, National Group Meeting Rabi 2019-20 of AICRP on Forage Crops& Utilization held at CAU Imphal during August 30-31, 2019 p. 97-101

Yadav Ramesh Singh. 2019. Fodder and Livestock Scenario in Uttar Pradesh in : 'Indian Fodder Scenario: Redefining State wise Status' ICAR- AICRP on Forage Crops & Utilization, IGFRI, Jhansi 2019 p. 180-183.

Participation in Seminar/Symposia: 2

Linkages: Department of Animal Husbandry & Department of Agroforestry, ANDUAT , Ayodhya.

Courses taught:

- Agron 221(V) -(B.Sc.Ag.)- Crop production technology (Rabi crops)
- Agron 624- (Ph. D.) –Management of saline and alkali soils

Research Guidance

M.Sc.(Ag.) Student: 02; Ph.D. students: 02

FTD conducted: Forage oat-NDO-1 -10; Radio Talks - 2

AICRP (FC&U), CAU, Imphal

Extension Activities

- Farmers' Field Day : 1
- Resource person : 2
- Interaction programme : 3

Lectures delivered on

- "Issues and strategies for development of dairy farmers of Manipur" organized by Manipur Milk Producers' Co-operative Union Ltd and NGOs.

FTDs conducted

Season	Year	Crop (variety)	No. of FTDs conducted	Yield farmers practice (Approx)	Improved yield
Rabi	2019-20	Oat var. JHO-822	10	345q/ha	400q/ha

TSP activity

Number of individuals/families/ villages benefited	Details
180 nos. of families from 8 different villages of Chandel district, Manipur	Fodder rice bean seed, Fodder maize seed, sorghum, Napier hybrid cuttings, plant protection chemicals, etc

M.Sc /Ph.D students guided: 1 Ph. D. (Agri.) as Co-guide

Publications: Research paper – 1; Bulletins - 1

Germplasm maintained

SN	Crop	No. of accessions	Source area
1.	Rice bean	30	Imphal East, Imphal West, Thoubal, Bishnupur, Senapati, Churachandpur
2.	Maize	25	Tamenglong, Ukhrul, Senapati Imphal east and Churachandpur
3.	**Perennial fodder crops**		
	BxN hybrid	4	IGFRI, Jhansi, AAU, Jorhat, TNAU, Coimbatore and BAIF, Pune
	Seteria	1	IGFRI, Jhansi and AAU, Jorhat
	Signal	1	AAU, Jorhat

Inputs supplied

- Fodder maize and rice bean seed, chemical fertilizers etc were supplied to FTDs beneficiaries.
- All type of fodder seed (seasonal, perennial, perennial cutting etc) were made available to farmers /stakeholders 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 Co-PI in the Project "Agricultural Development Action Plan for Schedule Caste Farmers in Selected Villages of Manipur, under DAPSC Programme of CAU, Imphal.
- Assigned as Co-PI in the Project ICAR-IGFRI, NEH Component Project.
- *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

AICRP (FC&U), BCKV, Kalyani

Awards and Honours:

Received **CWSS Young Scientist Award** from Crop and Weed Science Society, BCKV, Mohanpur, Nadia during December, 2019.

Research articles in journals:

Biswas S, Jana K, Agrawal RK and Puste AM. 2019. Effect of integrated nutrient management on growth attributing characters of crops under various oat – lathyrus intercropping system. *The Pharma Innovation Journal* (ISSN: 2349-8242), 8 (9): 368-373.

Jana K, Kundu CK, Mondal R, Mondal K, Banerjee S and De DK. 2019. Productivity enhancement of food-forage cropping system for sustainability and livelihood security of resource poor farming community in West Bengal under changed climate. *Progressive Agricultural Sciences,* 1 (1): 37- 47.

Atta K, Karmakar S, Dutta D, Pal AK and Jana K. 2019. Comparative physiology of salinity, drought and heavy metal stress during seed germination of ricebean [*Vigna umbellate* (Thunb.)]. *Journal of crop and Weed*, 15 (3): 145-149.

Banerjee S, Jana K, Mondal R, Mondal K and Mondal A. 2020. Effect of seed priming on growth and yield of hybrid maize-lathyrus sequence under rainfed situation. *Current Journal Applied Science and Technology* (ISSN: 2457-1024), 39 (1): 126-136.

Jana K, Mondal R and Mallick GK. 2020. Growth, productivity and nutrient uptake of aerobic rice (*Oryza sativa* L.) as influenced by different nutrient management practices. *Oryza* 57 (1): 49- 56.

Popular articles: 2 (in bengali)

Student(s) guided: M. Sc. (Ag.) in Agronomy – 2; Ph. D. in Agronomy- 4

Teaching: Course No. AGR-554, Name of the course: Agronomy of fodder and forage crops and other courses

No. of FTDs conducted: 50 units (*Rabi*, 2019-2020) Berseem (cv. Mescavi) - 10 units, Oat (SC) (cv. Kent) – 20 units and Lathyrus (cv. Prateek) – 20 units, respectively.

TSP activities: 34 tribal farmers of Pingla block (Village: Sangar Batitaki, PO: Raghunath Chak, Sub-division: Kharagpur, 721140) of Paschim Medinipur district of West Bengal (Red & laterite zone i.e. western part) were benefitted by different field activities organized under TSP Programme of AICRP on FC & U, BCKV, Kalyani centre. TSP interventions were implemented at Bankura and Purulia district under red and laterrite zone of West Bengal. Forage Maize (cv. J 1006), *Moringa* seeds, Rice bean (cv. Bidhan Ricebean-1, Bidhan rice bean-2 & Bidhan Rice bean-3), Hybrid maize (cv. Nisha), Coix (cv. Bidhan Coix-1), rice (cv. Ajit & Rajendra Bhagbati), Mustard (cv. Punjab Keshari), forage Blackgram (cv. Sulata), planting materials (cuttings) of Bajra-Napier Hybrid (CO 3, CO 4 & CO 5), Lathyrus (cv. Prateek) and Chickpea (cv. Jaki 9218) along with r*hizobium* culture, insecticides, herbicides, fungicides, Knap sack sprayer, plastic bucket were distributed among tribal farmers.

Seed production:

Variety	Breeder seed	Nucleus Seed	TFL seed
Rice bean (Bidhan Rice bean 1)	62 kg	6.3 kg	32 kg
Rice bean (Bidhan Rice bean 2)	50 kg	5.3 kg	30 kg
Rice bean (Bidhan Rice bean 3)	10 kg	5.2 kg	
Coix (Bidhan Coix 1)	32 kg	4.8 kg	25 kg
Oat (cv. Kent)	-	-	50 kg
Lathyrus (cv. Prateek)	-	-	40 kg

Management of BN hybrid during *rabi*, 2019-2020
BN hybrid (CO-3) : 9500 cuttings (Approx.) [Nos.]
BN hybrid (CO-4) : 8500 cuttings (Approx.) [Nos.]
BN hybrid (CO-5) : 9000 cuttings (Approx.) [Nos.]
Farmers' Meeting: 3 (Three)

Externally Funded Project: 1 (Private Company)

Ad-hoc Project Funded by ATMA, Govt. of West Bengal: Enhancement of Pulses Productivity in drought prone areas of West Bengal (2019-2020)

Participated in seminar/farmers' meeting etc:

- Farmers' Meet on forage production technology with tribal families/farmers at Pingla block (Vill-Sangar Batitaki) of Paschim Medinipur district of West Bengal (western part) under TSP.
- Participated in short course training programme on "Recent Advances in Resource Conservation Technologies (RCTs) under Aberrant Climate Change Scenario" organizing by ICAR-CRIJAF, Barrackpore from 14.11.2019 to 23.11.2019 (10 days).
- Participated as resource person and delivered lecture with PPT on "Modern Agronomic Technology & Management Practices in Crop Production" in Training Programme organized by AINP on Pesticide Residues, BCKV at Directorate of Research, BCKV, Kalyani.
- Participated as resource person and delivered lecture with PPT on Crop Production Technology at Lake Hall (FACC), BCKV, Kalyani and organized by Pulses Ad-hoc project, ATMA, Govt. of WB- BCKV.
- Participated as resource person in 9th *krishi mela* at Ramakrishna Mission, Kamarpukur, Hooghly and delivered a speech with power point presentation (PPT) on "Sustainable Agriculture" on 07.01.2020.

Awareness development on 'seed production' of forage crops: Seed production of lathyrus (cv. Prateek) and Oats (cv. Kent) by farmers for their own uses as seed for the next year.

Transfer of technology:

- Distributed the seeds of berseem (cv. Mescavi) and lathyrus (cv. Prateek) 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 block and Narayangarh block area in Paschim Medinipur district.
- Given trainings to the farmers, Women SHGs of different districts of West Bengal.
- Participated in Agricultural Fair (*Krishi Mela*) conducted by KVK (Nadia) at Gayeshpur under BCKV.
- Distributions of leaflets on forage crops among the farmers for dissemination of forage technology.
- 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 Bankura, Jhargram, Paschim Medinipur, Nadia, North-24 PGS, Hooghly and Burdwan districts etc.
- Provide the seeds of oats, lathyrus and berseem to Department of Agronomy, UBKV, Coochbehar, and College of Agriculture, Agartala, Tripura for research & experimental purposes.
- Provide seeds of lathyrus (cv. Prateek) for research and experimental purpose to different Institutes.
- Distributed hybrid maize seed (cv. Nisha) 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

- Act as external examiner for the subject 'Organic farming' (AGR-405) of UBKV, Coochbehar.
- Participated in the RAWE programme of under graduate students; B. Sc. (Ag.), BCKV.
- Participated in '*Krishi*' programme of Door Darshan (DD Bangla), Kolkata on 'Contingent Crop Planning under uncertain rainfall' and 'GM Crops'.
- Act as reviewer of research papers in SAARC Journal & another in Journal of Crop and Weed, BCKV, Mohanpur, Nadia, West Bengal-741252.
- Monitoring the AICRP on FC & U-BAU, Ranchi Centre, Jharkhand during rabi-2019-2020.
- Multiplication and management of Guinea grass & Plantation of Drum stick plants (*Moringa*)

AICRP (FC&U), OUAT, Bhubaneswar

Research articles in journals:

Sen A, Dhal A and Niranjan C. 2020. Assessment of various nutritional media, temperature and colour on growth behaviour of Blue Oyster mushroom in Odisha, India. *International Journal of Current Microbiology & Applied Science* 9 (3): 842-847

Dhal P, Sahu GS, Mohanty S and Dhal A 2020. Effect of priming on seed characters, disease incidence and yield in French bean (*Phaseolus vulgaris* L.) *Journal of Pharmacogony and Phytochemistry* 9(1): 1028-1032

Dhal P, Sahu GS, Mohanty S, Dash SK, Tripathy P and Dhal A 2020. Effect of priming on growth behaviours of French bean (*Phaseolus vulgaris* L.) *International Journal of Chemical Studies* 8 (1): 1366-1369

Dhal P, Sahu GS, Mohanty S, Dhal A and Dash SK 2020. Efficacy of seed priming on yield and yield attributing characters in French bean (*Phaseolus vulgaris* L.) *International Journal of Current Microbiology & Applied Science* 9 (2): 915-922

Teaching Activities

- Fundamentals of Plant Pathology PPT-121 (2+1) Practical
- Diseases of Field & Horticultural Crops-I PPT-313 (2+1) Theory
- Diseases of Field & Horticultural Crops-II PPT-324 (2+1) Theory
- Seed Certification and Production PPT-605 (1+0), Theory

Research guidance: MSc Ag in Plant Pathology – 3 nos.

Seed Production & Extension Activities

- Rooted slips of 21 fodder species were supplied on to KVK, Deogarh for establishment of Forage Cafeteria inside KVK campus for farmers.
- 4,000 rooted slips of BxN Hybrid were supplied to KVK, Balasore for On-Farm Trials.
- 11,000 rooted slips of BxN Hybrid supplied to Bharateya Go-Sambardhan O Anusandhan Sansthan" Chandaka, Bhubaneswar, a Registered Trust (Goushala) for taking up 0.5 acres of Fodder Plantation in Gaushala. The Organization is a non-profit making trust dedicated for preservation of Indian Cows & conducts integrated research on cow based products for developing sustainable livelihood.
- During 2019-20, 21650 rooted slips of BxN Hybrid supplied to farmers, KVKs

TSP Activities 2019-20

In Odisha out of 314 Blocks, 117 are tribal dominated blocks (TSP areas). These tribal blocks are concentrated mainly in southern parts of the states and partly in northern and western Odisha. The area is predominantly hilly terrain clad by degraded forests because of large scale soil erosion and shifting cultivation in the past. The tribal farmers usually have small patches of land (average land holding size less than 1ha) and they cultivate paddy, maize, ragi, mustard and organic vegetables round the year depending on perennial streams from hills.

Cattle are reared for milk, dung and for draught purpose. Due to small plots, degree of mechanization is marginal and draught animals are the major source of farm power. Almost all tribal household rears small ruminants to supplement income. Dairying is not a supplemental source of income at present.

Initiated the programme in two tribal blocks namely Kashipur and Semiliguda of Rayagada and Koraput district, respectively. In these villages, tribal are totally unaware of forage crops and its benefit for dairy farming. Grazing in hill tops, denude forests is the only feeding source of cattle. Initially, we made extensive group discussions with their village heads, panchayat heads convincing them about benefit of green forage for increase in milk production so as to sell milk and supplement family income. Later on village meetings were conducted in which tribal farmers were made aware of different potential forage crops suitable for the area and were distributed leaflets in local language. Then in each of the programme villages, 5 to six farmers were motivated to spare land for conduct of demonstration on Improved Cultivation practices of Forage Crops, mainly HNB. Required root slips and fertilizers were supplied free of cost for conduct of demonstration. Manpower for taking up plantations and other operations were borne by the farmers.

Field observations indicate that tribal farmers are much interested to take up forage cultivation. But, the major hindrance is use of primitive farm implements and lack of fencing of crop fields. In the absence of fence, crop is damaged regularly by Wild Boar, Pigs and Stray Cattle. Keeping this in view, it is planned to provide improved farm tools and small implements along with Wire Mesh to farmers under TSP Programme.

Activities during COVID 19 Lock Down 2020

- **Supply of green fodder:** supply 240 quintal of green fodder to starved animals of Nandankanan Zoo at the request of Zoo authorities. The process continued every alternate day.
- **Rendering technical advice to Fodder Farmers and extension workers**: Lack of market for disposal of milk, unavailability of feeds, farm inputs like diesel, fertilizers has landed the farmers in a distressed situation. Keeping this in view, contacted 14 small and marginal dairy farmers over telephone to boost their morale and render required technical advice. Similarly, extension officers were contacted to know the problems of farmers and render required advice.
- **Relief to Stray Cattle:** About 479 quintals of green fodder has been fed to stray cattle.

AICRP (FC&U), AAU, Anand

Research articles in journals:

Chaudhary MM, Chaudhari HL, Patel JA, Patel CK and Patel HK. 2019. Precision Nitrogen management in cereal crops. *International Journal of Agriculture Sciences* 11(8): 8317-8321.

Chaudhari Sadhana, Patel RA and Patel H. 2019. Effect of phosphorus, sulphur and biofertilizer on protein content, P and S content and uptake of summer green gram (*Vigna radiata* L. Wilczek). *International Journal of Chemical Studies*, 7(3): 3994-3997.

Rathod AM, Patel PM, Patel HK and Ranva M. 2019. Nitrogen management through organic and inorganic sources in popcorn (*Zea mays everta*). *International Journal of Chemical Studies* 7(4): 1655-1658.

Vasava Rakesh, Shah SN, Patel PB, Patel HK and Purabiya Vikas 2019. Feasibility of organic nutrient management in Fenugreek (*Trigonella Foenum Graecum* L.). *International Journal of Agriculture Sciences* 11 (6): 8106-8108.

Popular articles (Gujarati / English)

Rathod AM, Patel PM, Ranva Monika, Patel HK and Patel VJ. 2019. Effect of nitrogen management through organic and inorganic sources on growth and yield of popcorn (*Everta*), *Green Farming* 10 (4): 479-482.

Ranva Monika, Patel HK, Patel PM, Rathod AM and Patel AP. 2019. Effect of clipping and plant growth regulators on growth and yield of summer sesame (L.) *Green Farming* 10 (4): 474-478.

Gohil DP, Patel Hiren K and Padheriya DR. 2019. *"Fodder Queen: Rajko"* ***Krushi Govidhya*****.** pp. 19-21

Gohil DP, Patel HK and Padheriya DR. 2019. *"Baremash Lilocharo: Hybrid Napier"* ***Krushi Govidhya*****.** pp. 26-29

Book Published: Two

Soni NV, Patel HK, Shah SN and Patel PC. (Eds.). Krushi Margdarshika Gujarati book published by Directorate of Extension Education. AAU Anand

Patel Hiren K. Shah Sanjay N., and Patel Piyush M and Patel Pinakin C. 2019. Kheti pako: Soil health and Agricultural, published by Directorate of Extension Education, Anand Agricultural University, Anand

Book Chapter published: 12 Published in *Krushi margdarshika published by* Directorate of Extension Education, AAU, Anand.

- Patel HK, Gohil DP, Rathod PH and Padheriya DR. Fodder crops pp. 65-68
- Rathod PH, Patel HK and Gohil DP. Fodder crop production through hydroponics pp.51
- Mehshwari TG., Patel AP and Patel HK. Sandriya kheti dwara prayavarn shurakhsa pp. 109-112

- Patel HK., Shah SN and Patel PM. Precision farming pp.113-118
- Patel MV, Patel PM. and Patel HK. Contingency planning pp. 119-122
- Patel HK, Raval CH and Rathod PH Organic and inorganic fertilizer information pp. 173-178
- Shah SN, Patel HK and Patel PM Different organic cake and its uses pp. 182-185
- Patel HK, Patel PM and Chaudhary VD. Prepared compost pp. 186-190
- Patel HK, Shah SN and Patel AP. NADAP compost pp. 191-192
- Parmar JK, Patel HK and Raval CH. Calculate chemical fertilizer pp. 203-207
- Patel HK, Patel MV and Patel PM. Importance of irrigation pp. 217-223
- Patel HK, Patel MV, Patel PM and Shah SN Drip irrigation system pp. 224-228

Group meeting/ Training/Seminar /Conference attended/participated: Four

- Patel HK participated in Short training Programme short course training on "Recent advance in Soil Carbon sequestration and stabilization for soil health improvement and climate change mitigation" from 10th to 19th December-2019 held at Indian Institute of Soil Science, Bhopal.
- Patel HK and Rathod PH participated in One day state level workshop on Natural farming at Gandhinagar organized by Directorate Agriculture, Gujarat state.
- Gohil DP participated in six days training/workshop on "Value Addition & Post Harvest Management of Agricultural & Horticultural Crops" from 2nd to 7th December-2019 held at EEI, AAU, Anand.
- Rathod PH participated in 21-days Centre for Advanced Faculty Training (CAFT) on "Advances in Data Science using R" from 21 Sept to 11 Oct 2019 at ICAR-IASRI New Delhi.
- Gohil DP, Patel HK and Rathod PH attended NGM *Kharif*-2019 held on line during June 01, 2020.

P.G. Teaching during 2019-20

Name of Teacher	Course No.	Title of the course	Credit
Dr. D. P. Gohil	GP 511	Breeding for cereals, forage and sugarcane	2 + 1
Dr. H. K. Patel	AGRON 511	Agronomy of Forage Crops	2 + 1
	PGS-506	Disaster Management	1 + 0
	ABM-519	Fertilizer Technology and management	2 + 0
	e-Course-3	Usefulness of disaster management in Agriculture	1+0

Research guidance:

Name of Teacher	Name of Student	Degree	Present position
Dr. D. P. Gohil	Parmar Sumitkumar Virabhai	M. Sc. (Agri.)	Continue 2nd sem.
Dr. H. K. Patel	Patel Harsh K.	M. Sc. (Agri.)	Continue 2nd sem.
	Vikram Kumar	M. Sc. (Agri.)	Continue 4th sem.

FTD conducted: 20 Lucerne *var*. Anand 2: 10; Oat *var*. Kent: 10

Externally funded project: One - project entitled "Quality Seed Production in Fodder Crops" under Fodder Development Programme funded by Govt. of Gujarat, Gandhinagar.

Extension activities:

- Delivered lectures to farm women on Importance of Fodder crops for better milk production in short term training programme for women organized by the Department of RBRU, AAU, Anand.
- Delivered lectures in short term refreshers training course organized by the EEI, AAU, Anand.
- Deliver lecture in training programme for Recent managemental practices for crops and animals for farmer of Pali Rajasthan, Extension Education Institute, AAU, Anand on October-November 2019 under ATMA project.
- Resolved some FAQ by farmer regarding Forage and Fodder crops

WEATHER REPORT RABI 2019-20

The weather report of the AICRP-FCU Coordinating centers, Voluntary centers and Headquarter across the different zones during *Rabi* 2019-20 have been presented in this section. The weather parameters prevalent during 40th Standard Meteorological Week (SMW) (October 01-07, 2019) to 21st SMW (May 21-27, 2020) were taken into consideration, which covers the *Rabi* season, 2019-20 for all the testing/ experimenting locations of trial conduction (Tables M1 to M13). 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 surveillance of insect-pest and diseases of forage crops.

Temperature

In Hill zone, Srinagar was the coolest location recording -6.3^{0}C during 52nd SMW. Maximum temperature was recorded at Almora (34.1^{0}C) during 21st SMW. The mean T_{Min} over the season was recorded the lowest at Srinagar (2.4^{0}C). Whereas, the highest mean T_{max} was recorded at Almora (22.8^{0}C). In North-East zone, Ranchi centre recorded the lowest minimum temperature (3.5^{0}C) during 2nd SMW. The highest T_{max} was also recorded at Bhubaneswar (37.0^{0}C) during 18th SMW. The higher mean T_{Max} was recorded at Ayodhya (36.8^{0}C) and the lowest mean T_{min} was recorded at Imphal (12.5^{0}C). In North-West zone, Bikaner recorded the lowest minimum temperature (2.3^{0}C) during 52nd SMW, as well as maximum temperature (46.3^{0}C) during 21st SMW. The higher mean T_{max} was noted at Bikaner (29.8^{0}C); whereas, the lowest mean T_{min} was noted at Ludhiana (12.4^{0}C). In Central zone, Jhansi recorded the lowest minimum temperature (4.2) during 52^{ed} SMW, whereas the maximum temperature was recorded at Anand (42.5^{0}C) during 21st SMW. The higher mean T_{max} and lower mean T_{min} was were recorded at Anand and Jabalpur (32.6 and 14.8 ^{0}C, respectively). In South zone, the lowest minimum and maximum temperature was recorded at Hyderabad (14.1^{0}C during 51st SMW and 41.6^{0}C during 21st SMW, respectively). The higher mean T_{max} and lower mean T_{min} was also recorded at Hyderabad (32.3 and 18.4^{0}C, respectively). Least variation in minimum and maximum temperature was recorded at Vellayani.

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 M13).

In Hill zone, Palampur received higher rainfall (823.1 mm) as compared to other centres in the zone. In North-East zone, Jorhat centre received highest rainfall (642.5 mm in 38 rainy days) followed by Kalyani (552.5 mm) and the lowest being at Ranchi (499.2 mm). In North-West zone, Pantnagar received highest rainfall (317.8 mm). Bikaner centre received the lowest rainfall (128.4 mm) in 15 rainy days. In Central zone, maximum rainfall and maximum number of rainy days (372.2 mm, 20 days) was recorded at Raipur followed by Urulikanchan (336.8 mm) and lowest being at Jhansi (81.8 mm). In South zone, Vellayani received maximum rainfall (1296.7 mm) in 87 rainy days followed by Coimbatore (592.0 mm in 39 days).

Relative Humidity

In the tables RH1 and RH2 refers to morning and afternoon RH, respectively.

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 Rajouri (90.0%). In afternoon hours Srinagar centre recorded higher RH2 (65.1%) followed by Palampur. In North-East zone, maximum average RH of 94.9 % during morning hours was recorded at Jorhat followed by Kalyani (96.2%). The average minimum RH during afternoon hours was recorded at Imphal (49.5 %). In North-West zone, higher average RH of the season during morning hours was recorded at Pantnagar (87.9 %) and Ludhiana (87.8 %) and in afternoon, higher RH was recorded at Pantnagar (52.7%). The lowest RH during morning as well as evening hours was recorded at Bikaner (73.7 & 37.3%, respectively). In Central zone, maximum RH in morning hours was recorded at Raipur (83.8%) and Jabalpur (83.6%). The mean afternoon RH varied in limited range of 37.7 to 50% at all the centers in the zone. In South zone, maximum average RH of the season in morning and evening hours (90.3 and 67.6%) was recorded at Vellyani. The lowest average RH (76.6 & 51.5%) in morning and evening hours, respectively, was recorded at Dharwad.

Sunshine hours

In Hill zone, maximum average sunshine hours were recorded at Rajouri (11.6 hours/ day) and Almora (6.9) followed by Palmpur (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 (7.6). The lowest average sunshine hours were recorded at Hisar (5.8) in the zone. In North-East zone, maximum average sunshine hours were recorded at Ranchi (6.9) followed by Imphal (6.7) and the lowest at Jorhat (5.0). In Central zone, maximum average sunshine hours were recorded at Anand (8.6) followed by Rahuri (7.8). In South zone, maximum average sunshine hours were recorded at Hyderabad (7.5) and the lowest at Vellayani (6.6).

Std. Week No.	Period	Std. Week No.	Period
40	01-07 Oct, 2019	05	29-04 Feb, 2020
41	08-14 Oct, 2019	06	05-11 Feb, 2020
42	15-21 Oct, 2019	07	12-18 Feb, 2020
43	22-28 Oct, 2019	08	19-25 Feb, 2020
44	29-04 Nov, 2019	09	26-04 March, 2020
45	05-11 Nov, 2019	10	05-11 March, 2020
46	12-18 Nov, 2019	11	12-18 March, 2020
47	19-25 Nov, 2019	12	19-25 March, 2020
48	26-02 Dec, 2019	13	26-01 April, 2020
49	03-09 Dec, 2019	14	02-08 April, 2020
50	10-16 Dec, 2019	15	09-15 April,2020
51	17-23 Dec, 2019	16	16-22 April,2020
52	24-31 Dec, 2019	17	23-29 April,2020
01	01-06 Jan, 2020	18	30-06 May, 2020
02	07-14 Jan, 2020	19	07-13 May, 2020
03	15-21 Jan, 2020	20	14-20 May, 2020
04	22-28 Jan, 2020	21	21-27 May, 2020

Table M1: Meteorological data in Hill zone during crop growth period of Rabi 2019-20

Std. Week no.	PALAMPUR						ALMORA						
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	No. of Rainy days	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
40	24.4	13.9	79	71	3.1	5.4	27.9	15.1	90	57	10.5	2	5.9
41	24.5	11.9	79	68	17.8	5.2	27.4	11.5	45	45	6.0	1	7.3
42	24.3	11.9	77	66	12.9	7.5	27.4	8.8	55	55	0.0	-	8.3
43	23.6	10.1	74	60	0.8	8.7	26.5	9.0	38	38	0.0	-	7.6
44	23.1	11.0	80	67	35.5	5.0	25.9	10.7	41	41	0.0	-	6.3
45	21.4	9.4	81	63	13.4	7.1	25.6	5.8	41	41	0.0	-	6.9
46	21.0	9.6	69	62	0.0	2.2	25.6	6.1	36	36	0.0	-	7.1
47	19.8	8.4	79	71	1.8	4.5	23.3	4.3	41	41	0.0	-	6.7
48	17.2	5.9	81	63	22.0	4.6	20.1	4.6	46	46	10.5	1	5.0
49	18.9	4.6	79	54	0.0	8.4	21.4	0.1	34	34	0.0	-	7.6
50	13.6	3.7	85	72	104.8	2.9	14.6	2.4	59	59	50 .5	2	4.4
51	15.8	3.7	77	57	1.0	5.7	19.5	2.8	37	37	0.0	-	6.9
52	15.2	1.5	76	51	0.0	8.9	17.8	2.7	27	27	0.0	-	7.5
1	13.6	3.0	79	70	22.0	4.9	13.4	0.5	56	56	16.5	3	3.1
2	13.1	2.8	81	71	86.8	3.0	16.4	2.6	61	61	17.0	2	4.2
3	14.5	3.2	92	69	18.0	5.1	14.3	2.5	55	55	21.3	2	3.4
4	15.3	3.3	75	60	3.6	6.9	17.4	0.9	44	44	14.8	2	5.4
5	13.4	1.6	83	56	48.4	5.6	15.4	0.6	47	47	13.5	1	5.3
6	14.8	1.9	85	54	0.0	7.9	17.5	-1.0	26	26	0.0	-	8.0
7	20.7	7.6	75	50	0.0	8.3	24.8	3.6	29	29	0.0	-	8.3
8	20.9	7.8	85	63	4.0	7.4	18.9	5.2	50	50	48.0	4	5.0
9	18.7	6.8	79	61	13.4	5.6	20.6	7.0	49	49	17.5	1	6.3
10	16.5	6.2	81	70	41.2	5.6	18.4	5.8	62	62	31.5	3	5.1
11	17.7	5.2	78	62	107.8	5.6	20.8	5.6	42	42	51.0	3	7.3
12	21.6	8.5	73	62	18.0	6.6	23.9	7.4	35	35	10.5	2	8.9
13	20.6	8.7	75	54	92.2	5.1	24.8	7.9	42	42	15.0	2	8.3
14	22.7	9.4	65	49	10.8	8.4	26.5	5.9	27	27	0.0	-	10.3
15	26.1	13.2	61	43	0.0	7.6	29.0	8.8	30	30	0.0	-	9.0
16	24.7	12.1	65	43	28.6	5.2	26.4	10.1	41	41	8.5	5	6.6
17	24.9	13.2	64	52	18.4	7.6	24.5	11.5	89	50	19.5	3	6.3
18	25.2	14.6	72	70	30.6	6.4	27.0	13.6	90	46	21.5	4	7.5
19	26.2	13.8	58	56	27.2	8.0	27.6	11.9	89	45	6.3	2	7.2
20	27.1	14.3	53	44	24.0	8.1	31.8	10.9	74	26	0.0	-	11.2
21	31.6	18.6	48	42	15.0	10.9	34.1	13.1	65	24	0.0	-	11.3
Mean/ Total	**20.4**	**8.3**	**74.8**	**59.6**	**823.1**	**6.4**	**22.8**	**6.4**	**49.9**	**42.5**	**339.3**	**45**	**6.9**

Table M2: Meteorological data in Hill zone during crop growth period of Rabi 2019-20

Std. Week No.	SRINAGAR						RAJOURI					
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2		
40	19.6	9.4	87	72	1.9	3.0	27.6	13.4	92	63	0.5	6.4
41	24.4	6.5	87	48	0.0	6.1	28.0	12.6	89	54	0.0	7.7
42	22.1	6.5	80	55	1.9	5.6	26.5	11.8	91	60	1.5	6.0
43	21.4	2.6	85	43	0.0	6.8	26.9	8.9	89	54	0.0	8.2
44	19.8	4.6	88	53	1.6	5.2	25.5	9.0	89	43	0.3	6.0
45	5.9	1.5	92	87	27.9	1.1	20.9	7.2	93	46	16.4	5.4
46	7.1	2.2	92	81	2.4	0.3	22.3	9.0	92	48	0.1	3.9
47	9.6	2.8	91	76	3.7	0.3	19.7	8.9	91	56	0.2	3.1
48	8.6	1.7	92	76	7.4	2.1	19.7	5.5	92	54	5.6	6.1
49	7.8	-2.9	92	69	0.0	0.0	20.0	2.6	91	37	0.0	6.2
50	4.6	-1.7	92	81	7.4	0.6	16.4	2.7	92	52	6.7	4.0
51	6.6	-2.8	91	67	0.6	6.6	17.0	2.0	90	39	0.2	5.5
52	8.5	-6.3	92	56	0.0	3.6	17.2	-1.5	97	35	0.0	7.0
1	5.5	-3.1	92	77	2.1	0.2	14.1	1.3	91	51	2.4	3.0
2	3.7	-3.4	86	79	2.0	0.3	13.3	0.7	96	52	9.1	3.6
3	4.3	-2.9	92	82	11.6	1.8	16.5	2.1	90	52	0.3	5.3
4	7.4	-2.8	88	64	0.3	2.1	15.7	2.6	91	43	1.2	5.3
5	8.2	-3.8	93	54	1.3	4.2	15.2	1.3	90	40	2.5	6.5
6	10.8	-4.0	93	47	0.0	5.5	17.8	0.8	89	35	0.0	7.6
7	12.8	-1.6	94	62	0.2	4.2	22.1	5.3	87	37	0.0	7.4
8	14.4	1.1	89	54	0.1	5.1	19.5	4.4	87	43	0.1	5.7
9	15.4	3.1	82	58	1.1	4.8	21.2	7.2	88	44	2.7	5.7
10	12.4	2.1	89	73	2.6	1.4	17.3	6.9	91	61	11.5	3.4
11	15.9	2.1	81	58	4.7	4.9	20.1	6.1	87	53	6.7	6.1
12	18.1	4.6	72	49	3.0	4.3	23.0	7.8	86	49	3.5	6.0
13	13.6	4.3	84	79	9.8	2.5	21.8	9.3	90	54	7.6	5.0
14	17.8	3.2	78	62	7.6	5.9	25.7	10.5	87	50	0.6	8.3
15	21.3	6.3	73	57	2.6	5.6	28.3	10.9	86	43	0.3	8.9
16	16.7	6.7	86	74	4.2	2.5	25.0	12.7	89	56	2.3	3.3
17	25.1	8.4	74	65	0.3	7.6	28.0	12.3	86	46	1.0	7.3
18	23.1	9.5	74	69	9.2	6.1						
19	25.3	8.7	75	76	0.9	8.6						
20	23.4	8.7	74	69	2.2	4.9						
21	28.9	9.0	70	44	0.0	10.2						
Mean/ Total	**14.4**	**2.4**	**85.3**	**65.1**	**120.7**	**3.9**	**21.1**	**6.5**	**90.0**	**48.3**	**83.4**	**11.6**

Table M3: Meteorological data in North West zone during crop growth period of Rabi 2019-20

Std. Week No.	HISAR							BIKANER						Sunshine hrs
	Temperature (C)		Humidity (%)		No. of Rainy	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	31.8	21.0	92	50	1	2.6	5.5	32.6	20.6	83	55	2	28.8	7.9
41	32.7	17.6	90	39	0	0.0	7.5	35.6	19.1	74	34	0	0.0	9.6
42	34.1	18.4	79	34	0	0.0	7.3	35.2	18.9	67	32	0	0.0	9.5
43	31.9	14.9	79	31	0	0.0	6.5	35.1	15.8	65	36	0	0.0	9.9
44	30.7	16.2	90	40	0	0.0	1.8	31.6	17.6	79	47	1	8.4	4.8
45	28.4	12.7	85	36	0	0.3	6.6	29.7	12.8	86	34	0	1.4	9.3
46	26.8	12.7	86	41	0	0.0	2.5	25.5	13.3	80	59	2	9.6	3.7
47	26.7	10.9	88	42	0	0.0	4.7	28.0	11.9	79	42	0	0.0	6.7
48	22.6	12.1	92	62	2	12.0	2.8	23.0	9.1	91	54	1	7.8	5.8
49	23.1	6.0	88	47	0	0.0	6.2	24.6	6.1	81	32	0	0.0	8.2
50	19.2	8.3	95	74	1	4.5	2.2	19.0	7.5	92	62	2	6.8	4.4
51	13.7	6.1	99	81	0	0.0	1.1	20.6	4.5	86	42	0	0.0	7.1
52	11.9	2.6	97	75	0	0.0	1.7	21.7	2.3	86	43	0	0.0	8.0
1	17.3	5.7	96	60	0	0.0	3.5	20.8	5.9	85	48	0	0.0	5.0
2	17.7	5.7	96	64	1	3.2	3.3	18.3	4.7	82	54	1	9.8	5.4
3	13.4	4.7	100	82	0	0.0	2.1	18.3	3.7	93	50	0	0.0	7.5
4	19.2	5.0	97	56	1	7.2	5.9	22.2	6.3	82	42	1	12.0	8.2
5	18.8	3.9	98	61	0	0.0	6.3	22.4	5.2	85	50	0	0.0	9.0
6	20.1	2.8	93	46	0	0.0	7.2	23.0	5.4	75	31	0	0.0	9.3
7	24.7	4.8	93	37	0	0.0	8.7	29.1	7.1	72	23	0	0.0	10.3
8	23.8	10.5	89	61	1	10.9	6.4	27.4	10.1	82	36	0	0.0	8.9
9	26.0	12.1	95	55	0	0.2	6.7	31.4	12.4	78	26	0	0.0	7.4
10	23.1	11.7	90	66	3	61.8	5.7	26.6	12.7	80	39	2	19.6	6.9
11	23.8	9.8	94	53	1	11.6	6.5	26.9	10.3	71	30	0	0.0	8.3
12	29.2	14.4	90	52	0	1.5	6.3	34.8	18.0	65	24	0	0.0	7.3
13	27.6	15.0	92	55	1	20.6	5.2	30.3	17.2	73	39	0	0.0	7.0
14	31.0	13.4	80	37	0	0.0	7.9	35.5	19.1	53	22	0	0.0	9.8
15	35.1	17.7	73	24	0	0.0	7.4	39.5	22.0	62	37	0	0.0	8.1
16	36.1	18.8	71	25	0	0.8	8.1	36.7	21.1	59	26	1	6.0	9.5
17	34.5	20.2	72	41	0	4.0	7.6	39.3	22.6	55	24	0	0.0	9.6
18	37.5	22.3	70	32	1	18.2	9.1	40.6	23.8	54	34	1	11.6	2.9
19	37.7	23.1	65	28	0	1.1	8.4	42.1	25.1	56	23	1	6.6	
20	38.6	20.8	58	20	1	6.6	9.2	40.9	23.6	45	21	0	0.0	
21	43.2	23.2	47	16	0	0.0	10.0	46.3	27.0	52	19	0	0.0	
Mean/ Total	**26.8**	**12.5**	**85.9**	**47.7**	**14.0**	**167.1**	**5.8**	**29.8**	**13.6**	**73.7**	**37.3**	**15.0**	**128.4**	**7.6**

Table M4: Meteorological data in North West zone during crop growth period of Rabi 2019-20

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	30.2	20.5	90	56	0	0.0	7.2	30.9	21.3	92	57	0	0.0	7.6
41	31.2	19.2	92	47	0	0.0	9.0	31.9	18.8	88	47	0	0.0	8.6
42	30.5	18.5	87	45	0	0.0	5.5	31.0	18.0	86	50	0	0.0	6.0
43	30.5	15.8	88	40	0	0.0	6.3	29.6	16.2	92	47	0	0.0	6.5
44	29.0	16.2	94	46	0	0.0	1.2	29.2	17.1	89	57	0	0.0	1.2
45	27.4	13.6	82	38	0	0.0	4.9	29.2	14.0	85	44	0	0.0	6.0
46	25.1	13.6	93	48	0	0.0	4.1	29.0	13.3	91	44	0	0.0	6.6
47	24.8	11.2	92	42	0	0.0	5.1	25.8	11.5	94	47	0	0.0	4.7
48	22.4	12.0	92	58	2	35.2	5.0	25.6	11.5	92	54	1	29.2	6.3
49	22.4	7.2	94	43	0	0.0	6.2	23.8	8.3	95	47	0	0.0	7.2
50	16.2	9.4	95	69	2	46.8	2.3	27.5	13.1	91	49	2	29.2	5.5
51	13.6	8.1	94	74	0	0.0	0.9	15.4	9.3	95	78	0	0.0	2.1
52	10.3	5.4	89	75	2	46.8	0.9	12.5	5.9	96	75	0	0.0	1.6
1	16.3	5.7	93	63	1	13.4	2.8	20.1	7.5	92	55	2	8.0	5.0
2	15.1	7.1	93	69	1	20.0	4.1	14.5	8.3	95	83	2	28.2	1.2
3	16.1	7.4	93	67	0	0.0	3.8	18.1	9.9	94	76	2	48.1	3.3
4	18.3	6.2	93	55	1	6.4	6.3	17.8	6.8	93	73	1	0.7	4.2
5	17.5	5.7	95	59	0	0.0	7.2	18.0	6.0	95	64	2	29.8	5.3
6	18.9	4.9	94	49	2	71.0	7.9	20.9	4.0	97	45	0	0.0	8.6
7	23.0	7.8	93	45	0	0.0	9.7	22.9	8.4	94	62	0	0.0	6.9
8	23.4	12.0	85	51	1	6.0	6.9	24.2	11.9	93	57	2	23.2	6.0
9	24.8	13.1	93	53	0	0.0	6.2	24.6	11.6	92	61	0	0.0	6.1
10	21.1	10.8	88	61	2	29.4	5.7	24.2	11.3	91	58	3	29.5	6.7
11	23.3	11.8	87	55	2	17.8	8.6	25.7	13.7	84	49	3	15.6	7.7
12	27.5	14.6	87	50	1	3.0	6.8	28.5	12.6	86	44	0	0.0	9.8
13	26.2	15.3	90	53	2	18.8	6.4	29.3	15.1	88	38	1	1.0	8.0
14	29.1	14.4	81	37	0	0.0	10.1	32.4	13.1	80	26	0	0.0	10.2
15	35.5	18.4	71	21	0	0.0	9.6	34.9	15.9	71	25	0	0.0	9.7
16	32.9	18.1	70	37	1	9.8	9.1	35.4	20.1	58	30	0	0.0	6.0
17	35.5	19.7	66	37	1	3.4	9.3	32.0	18.3	64	44	1	70.8	7.2
18	35.3	21.8	68	35	1	16.2	8.5	31.6	20.9	73	48	2	4.5	8.5
Mean/ Total	**24.3**	**12.4**	**87.8**	**50.9**	**22**	**344.0**	**6.1**	**25.7**	**12.7**	**87.9**	**52.7**	**24**	**317.8**	**6.1**

Table M5: Meteorological data in Central zone during crop growth period of Rabi 2019-20

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			Max.	Min.	RH1	RH2		
40	33.4	23.4	79	1	18.6	32.0	22.4	89	66	1	23.4
41	33.2	25.2	80	1	31.4	33.0	19.3	86	55		0.0
42	30.5	24.0	79	1	63.2	32.4	18.7	86	59		0.0
43	29.9	25.8	85	1	117.2	30.7	16.2	80	55		0.0
44	29.4	22.9	82	1	74.0	31.6	16.1	80	57		0.0
45	28.4	19.1	79	1	3.2	31.4	15.2	81	46		0.0
46	30.0	19.9	77	0	0.0	30.9	14.3	84	51		0.0
47	30.0	19.1	76	0	0.0	28.9	12.8	85	48		0.0
48	30.0	19.5	77	0	0.0	27.2	12.4	8.7	59		0.0
49	28.6	20.5	74	0	0.0	24.1	8.8	89	55		0.0
50	29.8	19.2	77	0	0.0	23.1	10.7	88	68	1	6.2
51	28.7	19.1	75	0	0.0	20.5	5.7	91	68		0.0
52	28.5	20.2	76	0	1.0	15.9	4.2	95	76		2.0
1	29.9	18.3	69	0	0.0	18.4	7.5	91	68		0.6
2	29.2	19.7	70	0	0.0	21.1	5.9	86	62		0.4
3	30.4	18.1	62	0	0.0	18.3	7.8	92	73	2	23.6
4	32.1	20.7	56	0	0.0	22.8	7.1	86	52		0.0
5	30.2	17.7	65	0	0.0	23.0	7.8	85	50		0.0
6	29.1	18.0	66	0	0.0	22.0	6.2	86	53		0.0
7	31.6	19.0	63	0	0.0	26.3	9.8	82	42		0.0
8	32.8	19.3	56	0	0.0	26.5	11.8	85	52		0.0
9	31.5	21.2	53	0	0.0	28.1	12.6	83	51		0.0
10	31.1	21.2	64	0	0.0	27.2	13.2	84	46	1	2.6
11	33.0	19.0	52	0	0.0	27.1	12.8	81	48		0.0
12	34.1	20.3	51	0	1.8	31.8	14.6	76	44	1	6.2
13	34.0	22.3	62	1	3.2	32.0	16.8	77	41	0	3.2
14	35.8	21.5	48	0	0.0	34.7	17.7	63	34		0.0
15	36.5	22.9	53	0	0.0	38.0	17.8	67	29		1.2
16	36.7	23.6	55	0	1.2	38.8	19.6	56	28		0.0
17	36.0	23.7	54	0	0.0	36.2	20.1	56	31		0.0
18	36.9	24.7	58	0	1.2	39.1	22.0	64	31	2	6.8
19	37.1	24.0	52	0	0.0	39.7	21.2	68	30	1	5.6
20	34.6	25.0	66	1	20.8	41.0	23.8	54	26		0.0
Mean/ Total	**32.0**	**21.3**	**66.2**	**8.0**	**336.8**	**28.9**	**13.7**	**77.7**	**50.1**	**9.0**	**81.8**

Table M6: Meteorological data in Central zone during crop growth period of Rabi 2019-20

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	32.1	24.9	93	63	60.4	1	6.4	31.1	21.1	77	50	1	7.8	6.1
41	34.6	22.7	87	44	0.0	0	8.9	31.7	24.1	81	68	-	2.8	7.1
42	34.5	22.2	88	44	0.0	0	8.2	28.2	18.6	87	79	3	52.4	5.0
43	31.5	21.7	83	57	0.4	0	4.7	25.7	20.8	84	58	6	141.8	2.4
44	32.5	23.7	90	66	58.6	1	5.3	30.4	21.0	76	46	1	4.0	6.1
45	32.1	22.4	89	61	4.4	1	6.4	31.1	18.4	73	48	1	23.4	9.0
46	32.1	19.7	90	45	0.0	0	8.1	29.7	16.7	74	45	-	0.0	7.5
47	31.4	17.8	91	46	0.0	0	7.3	30.0	15.2	74	45	-	0.0	7.8
48	31.2	19.6	91	54	0.0	0	6.7	30.5	15.9	71	47	-	0.0	7.3
49	28.2	18.1	73	51	0.0	0	5.3	28.5	16.4	74	42	-	0.0	5.4
50	28.2	13.6	87	46	0.0	0	8.7	29.6	16.3	78	47	1	2.8	7.8
51	27.2	15.5	83	56	0.0	0	8.0	28.0	15.8	79	48	-	0.0	5.1
52	22.5	11.2	70	38	0.0	0	6.1	27.1	16.7	77	50	-	1.4	4.4
1	25.5	12.7	89	48	0.0	0	6.7	27.0	12.0	81	49	-	0.0	6.7
2	26.6	13.8	80	44	0.0	0	8.0	25.8	13.8	83	47	-	0.0	6.7
3	24.6	9.7	87	48	0.0	0	8.9	25.3	11.9	83	43	-	0.0	8.0
4	27.8	13.0	84	44	0.0	0	9.0	30.2	15.3	83	33	-	0.0	8.7
5	26.4	11.0	83	37	0.0	0	9.3	27.4	12.9	79	40	-	0.0	8.9
6	27.6	12.1	75	36	0.0	0	10.1	28.1	13.9	81	45	-	0.0	7.6
7	32.3	15.0	79	32	0.0	0	9.4	30.3	16.3	81	34	-	0.0	7.5
8	32.0	15.2	81	32	0.0	0	9.5	33..5	16.9	73	25	-	0.0	9.3
9	33.2	16.5	83	31	0.0	0	9.3	33.6	12.9	80	25	-	0.0	9.4
10	31.2	16.5	80	31	0.0	0	9.5	31.0	14.7	73	28	-	0.0	8.6
11	31.0	15.8	65	20	0.0	0	9.3	32.5	15.9	68	27	-	0.0	8.5
12	35.6	20.3	77	32	0.0	0	9.5	34.4	17.4	71	25	-	0.0	8.8
13	34.7	20.1	75	34	2.0	0	7.2	34.2	20.2	75	32	2	23.4	7.3
14	38.3	20.4	65	23	0.0	0	10.1	37.0	19.0	77	19	-	0.0	9.5
15	39.9	22.4	65	23	0.0	0	10.2	38.1	21.3	67	18	-	0.0	9.7
16	39.2	25.1	68	36	0.0	0	10.1	39.1	21.9	73	20	1	4.0	10.2
17	39.5	24.4	70	31	0.0	0	10.8	38.1	21.8	70	20	-	0.0	10.8
18	41.2	25.6	60	27	0.0	0	11.2	40.1	25.1	61	17	-	0.0	10.6
19	40.4	26.1	74	33	0.0	0	11.4	39.9	25.6	55	20	-	0.0	10.9
20	41.1	28.0	59	28	0.0	0	11.1	38.8	26.9	63	25	-	0.0	7.9
21	42.5	26.6	70	27	0.0	0	11.4	40.6	25.0	64	17	-	0.0	9.1
Mean/ Total	**32.6**	**18.9**	**78.9**	**40.3**	**125.8**	**3.0**	**8.6**	**31.9**	**18.2**	**74.9**	**37.7**	**16.0**	**263.8**	**7.8**

Table M7: Meteorological data in Central zone during crop growth period of Rabi 2019-20

Std. Week No.	JABALPUR						RAIPUR						
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
40	28.5	23.4	93	83	101.4	4.2	32.0	24.3	90	64	0	1.8	7.5
41	31.7	22.7	91	78	53.1	4.5	31.3	23.6	91	64	0	1.2	5.4
42	29.5	22.1	93	78	77.6	2.5	30.9	21.8	92	65	3	51.0	5.7
43	30.1	21.0	90	66	14.3	7.2	28.1	22.2	92	71	1	27.6	2.8
44	30.3	18.0	91	56	0.0	8.4	31.4	22.2	92	51	0	0.0	6.0
45	29.2	18.7	93	63	2.2	5.6	30.6	23.0	91	65	4	81.6	5.5
46	27.1	19.1	92	60	1.0	0.9	29.6	15.5	90	38	0	0.0	8.7
47	30.3	17.7	92	52	0.0	5.3	30.2	15.2	89	38	0	0.0	8.2
48	29.6	14.0	92	52	0.0	6.5	29.7	16.3	90	43	0	0.0	6.3
49	28.7	10.3	92	41	0.0	8.7	28.0	13.3	84	34	0	0.0	7.6
50	28.2	10.5	91	48	0.0	6.8	29.5	15.3	91	48	0	0.0	5.2
51	29.1	11.3	94	49	0.0	6.4	26.7	14.1	88	42	0	0.8	4.9
52	25.8	8.4	90	46	0.0	6.8	26.1	11.9	81	35	0	0.0	5.7
1	24.8	12.1	95	70	12.4	3.6	23.3	12.9	84	55	1	19.4	3.5
2	21.0	6.3	89	55	0.0	5.3	25.1	10.8	90	46	1	3.2	6.2
3	22.1	6.7	87	50	0.0	5.9	28.6	14.1	88	48	0	0.0	5.7
4	23.9	5.3	72	27	6.0	4.9	28.8	13.4	87	39	0	0.0	7.3
5	23.8	7.4	79	40	12.0	4.2	26.1	13.9	76	46	0	0.0	4.3
6	24.4	7.1	79	35	0.0	4.9	21.3	13.6	94	66	2	49.6	2.4
7	26.2	9.9	69	36	0.0	4.6	29.7	11.9	88	27	0	0.0	9.8
8	26.2	10.7	78	47	0.0	5.2	31.4	15.5	87	45	1	35.8	6.6
9	29.9	13.7	77	40	0.0	5.6	30.0	16.3	87	39	0	0.2	7.8
10	26.9	12.6	78	43	0.0	5.3	30.1	19.4	87	52	0	1.8	6.7
11	28.9	11.7	82	36	0.0	5.8	31.2	20.8	89	54	2	37.2	6.5
12	30.9	14.7	77	40	0.0	6.6	33.6	20.0	84	37	0	1.6	8.3
13	32.9	15.6	78	40	0.0	6.7	35.1	21.9	78	36	1	8.4	7.3
14	35.9	16.7	79	35	0.0	6.8	37.5	22.0	76	30	0	1.0	8.5
15	37.0	16.8	78	32	0.0	6.9	39.0	21.9	69	24	0	2.0	8.4
16	37.6	18.5	76	32	0.0	6.9	40.0	24.3	66	24	1	6.2	9.0
17	37.2	18.4	78	31	0.0	6.7	37.2	23.3	73	38	1	4.0	9.0
18	39.0	19.3	76	32	0.0	6.9	40.6	25.3	61	28	0	0.0	10.3
19	40.8	19.9	76	31	0.0	6.9	37.9	23.4	72	36	2	35.6	9.1
20	43.5	20.4	74	30	0.0	6.8	40.0	25.5	69	32	0	2.2	8.1
21	45.7	22.5	72	29	0.0	7.1	43.8	25.7	50	14	0	0.0	8.9
Mean/ Total	**30.5**	**14.8**	**83.6**	**46.6**	**280.0**	**5.8**	**31.2**	**18.5**	**83.8**	**44.2**	**20**	**372.2**	**6.8**

Table M8: Meteorological data in North East zone during crop growth period of Rabi 2019-20

Std. Week No.	JORHAT							RANCHI						
	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	30.8	23.3	98	76	3	90.9	4.4	28.9	21.7	86	69	0	0	6.9
41	30.9	22.3	97	69	2	61.3	5.3	28.3	21.2	86	68	60	3	5.6
42	32.5	21.8	97	65	0	0.9	6.6	29.1	20.7	86	66	31	2	7.4
43	25.8	20.0	98	80	4	98.6	2.8	26.2	17.8	88	70	171	3	3.2
44	30.4	18.5	95	63	0	0.0	8.1	26.3	14.3	87	69	0	0	8.3
45	28.5	19.3	97	74	3	11.5	4.5	27.0	14.5	86	69	0	0	6.2
46	29.0	18.3	98	66	0	0.0	6.1	27.3	12.9	85	64	0	0	8.5
47	27.4	15.7	98	67	0	0.0	6.7	27.3	10.6	87	64	0	0	8.8
48	27.3	14.6	99	65	0	1.3	5.7	26.6	11.3	85	51	0	0	8.0
49	25.2	9.9	98	58	0	0.0	8.2	23.3	6.9	85	58	0	0	9.0
50	24.1	11.2	99	64	0	0.0	4.4	25.9	10.9	85	67	14	1	4.3
51	23.6	11.1	100	69	0	0.0	4.1	22.1	6.5	85	69	0	0	7.6
52	22.4	8.4	100	61	0	0.0	5.2	22.1	4.3	87	67	8	1	6.4
1	20.7	10.4	100	74	1	6.2	2.1	20.8	5.2	84	70	12	2	3.5
2	22.7	8.5	100	60	0	0.0	6.1	19.9	3.5	86	69	4	1	7.2
3	24.7	11.1	99	60	1	2.6	4.8	23.3	6.1	87	69	2	0	7.0
4	22.3	9.2	99	58	0	0.0	5.8	20.7	3.8	85	69	0	0	8.8
5	22.0	9.9	99	63	1	20.7	2.6	22.2	6.6	85	68	0	0	6.3
6	24.6	11.0	98	56	0	2.0	7.0	21.9	6.5	85	68	0	0	4.3
7	26.3	13.8	97	64	1	3.1	2.3	25.9	9.7	85	68	0	0	9.3
8	25.5	12.4	97	58	0	0.4	2.9	27.4	14.5	86	68	1	0	5.8
9	26.7	13.3	94	56	1	7.8	7.5	26.7	14.8	86	69	14	2	7.4
10	25.3	14.4	96	68	0	0.0	4.1	26.2	13.6	86	68	44	3	5.3
11	29.5	16.2	92	59	0	0.4	6.0	27.2	13.9	85	68	29	2	2.7
12	29.5	15.6	91	61	0	0.0	6.1	31.9	17.3	86	67	4	1	8.3
13	31.7	18.3	93	59	1	3.8	6.4	35.1	20.7	84	68	0	0	8.8
14	29.8	16.1	93	63	0	2.6	6.0	36.9	22.4	84	67	0	0	8.2
15	30.6	17.0	92	57	2	20.2	6.4	36.6	22.6	86	66	2	0	8.8
16	28.3	18.7	97	76	5	54.8	2.5	36.5	21.8	85	69	0	0	8.9
17	27.5	18.1	91	70	1	27.9	3.4	32.1	21.4	86.6	69.1	34.8	2	8.39
18	30.6	20.8	89	67	3	42.7	5.8	31.4	20.9	86.0	69.0	47.8	2	7.83
19	31.6	20.1	87	65	2	14.1	6.3	33.5	22.6	83.1	69.1	16.6	2	7.83
20	29.0	21.2	95	75	3	42.5	2.6	36.7	23.9	85.1	70.3	4	1	7.50
21	27.5	21.9	98	86	4	126.2	0.5							
Mean/ Total	**27.2**	**15.7**	**96.2**	**65.6**	**38**	**642.5**	**5.0**	**27.7**	**14.1**	**85.6**	**67.3**	**499.2**	**28.0**	**7.0**

Table M9: Meteorological data in North East zone during crop growth period of Rabi 2019-20

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	28.9	20.3	93	64	41.8	6	4.2	35.3	25.3	91	52	--	0	9.1
41	28.4	20.5	93	68	41.3	4	3.6	30.2	23.5	93	74	2	10.0	5.4
42	29.4	19.1	95	69	10.7	3	6.7	33.6	22.5	94	55	--	0	8.6
43	28.2	18.7	94	65	1.7	2	5.8	32.2	20.8	92	52	--	0	7.6
44	27.5	18.3	94	66	83.8	3	5.4	31.2	16.0	99	65	--	0.0	8.7
45	28.5	16.3	93	55	1.0	1	9.1	28.2	16.1	98	77	4	83.7	3.8
46	25.1	16.7	96	71	37.7	5	4.2	30.1	13.9	97	62	--	0.0	8.7
47	26.6	11.5	93	47	0.0	0	9.6	28.8	13.2	97	57	--	0.0	7.7
48	25.5	10.6	92	50	0.0	0	8.6	29.0	12.4	98	67	--	0.0	7.3
49	24.4	8.7	93	48	0.0	0	8.2	28.3	11.8	98	59	--	0.0	7.3
50	22.8	7.4	94	49	0.0	0	8.3	26.7	11.6	99	67	--	0.0	4.5
51	22.7	6.5	92	50	0.0	0	8.5	21.2	8.2	99	69	--	0.0	4.4
52	22.6	4.6	91	37	0.0	0	8.4	21.6	7.5	97	71	--	0.0	5.0
1	19.7	7.1	95	62	20.0	4	5.2	31.4	22.8	93	83	6	34.5	4.5
2	19.3	9.7	93	66	49.0	4	4.9	33.4	23.2	93	77	2	8.6	2.9
3	22.8	7.0	89	41	0.4	1	9.4	34.6	23.8	92	68	2	5.5	7.8
4	22.8	6.7	90	40	0.0	0	8.1	33.4	22.7	96	70	3	4.2	4.9
5	20.6	5.2	92	40	0.0	0	6.9	28.6	14.5	94	59	5	15.5	6.9
6	21.1	6.4	97	40	10.0	1	7.5	27.0	9.4	93	45	--	0.0	7.5
7	22.4	7.6	91	41	3.7	2	6.6	28.4	9.7	93	43	--	0.0	8.4
8	24.6	8.7	92	39	0.0	0	7.2	30.6	13.2	95	47	4	13.4	7.9
9	24.1	10.4	92	49	9.6	2	4.8	29.2	18.2	93	66	6	142.2	4.5
10	25.9	10.0	87	36	1.3	1	8.2	33.8	22.3	93	74	1	7.2	5.2
11	25.8	11.5	86	47	4.1	4	7.7	35.6	23.5	93	69	3	18.5	6.3
12	28.8	11.7	82	32	0.0	0	6.6	35.7	22.8	91	66	4	10.9	8.3
13	27.6	11.9	86	38	6.7	1	5.8	29.3	19.1	80	57	6	24.7	4.1
14	30.1	13.7	72	29	0.0	0	9.3	32.7	18.5	96	64	5	46.5	6.5
15	30.0	13.6	71	27	7.0	3	8.6	33.5	19.9	99	67	4	45.3	6.2
16	31.3	16.0	67	32	5.0	1	7.9	34.3	18.3	92	54	2	17.3	8.6
17	26.4	16.0	90	59	44.1	7	3.4	35.9	20.7	93	61	3	14.7	9.6
18	25.4	16.6	88	64	40.9	6	1.9	33.5	21.4	95	73	6	59.8	6.0
19	28.4	17.9	86	62	25.3	5	5.5	35.4	24.8	90.6	68.4	3	20.8	6.9
20	30.6	17.3	76	43	7.4	2	7.6	35.5	24.7	91.6	65.7	3	61.6	7.2
21	30.3	20.1	81	53	16.3	5	3.9	34.8	25.7	95.4	67.2	4	65.2	6.2
Mean/Total	**25.8**	**12.5**	**88.6**	**49.5**	**468.8**	**73**	**6.7**	**30.6**	**16.8**	**94.6**	**64.3**	**66**	**552.5**	**6.4**

Table M10: Meteorological data in North East zone during crop growth period of Rabi 2019-20

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	RH2			
40	33.7	24.9	92	68	1	5.2	6.5	30.3	22.4	94	71	2	10.0	4.1
41	32.5	24.4	96	72	5	52.1	6.0	32.5	20.9	89	59	0	0.0	7.8
42	32.4	23.8	93	63	1	2.0	8.0	32.8	21.0	94	62	0	0.0	6.1
43	32.4	24.0	96	81	4	253.3	3.9	29.2	17.4	90	62	0	0.0	4.9
44	31.8	23.4	95	60	0	0.0	6.2	29.2	16.9	93	64	0	0.0	2.0
45	29.6	21.8	93	60	1	5.3	3.6	29.7	15.5	94	54	0	0.0	4.0
46	30.4	19.6	93	53	0	0.0	8.8	29.4	13.1	93	71	0	0.0	6.8
47	30.1	18.1	95	52	0	0.0	6.8	27.2	12.5	92	59	0	0.0	6.2
48	29.7	18.5	96	56	0	0.0	5.0	26.8	14.2	94	62	0	0.0	3.5
49	29.1	16.9	92	53	0	0.0	6.3	24.9	9.7	94	47	0	0.0	6.2
50	30.4	18.1	93	59	0	0.0	7.5	23.1	11.2	92	57	2	22.0	4.1
51	27.3	16.4	93	60	0	0.0	4.2	17.6	18.5	92	74	0	0.0	2.6
52	26.1	13.2	87	51	0	0.0	4.1	14.0	5.3	90	80	0	0.0	0.9
1	24.3	15.4	92	59	3	12.2	4.5	19.3	9.1	89	63	2	7.8	3.8
2	26.9	13.8	92	48	0	0.0	6.0	16.5	8.2	93	77	1	6.6	1.9
3	29.8	16.4	97	46	0	0.0	7.0	18.6	10.2	95	77	2	21.0	1.5
4	29.4	16.5	95	50	0	0.0	6.2	20.5	6.4	90	66	0	0.0	6.5
5	28.7	19.1	92	54	1	0.5	2.8	21.8	7.3	91	57	0	0.0	6.7
6	24.3	15.4	92	59	3	12.2	4.5	22.5	6.2	92	49	0	0.0	8.1
7	26.9	13.8	92	48	0	0.0	6.0	22.8	8.8	86	49	0	0.0	8.4
8	29.8	16.4	97	46	0	0.0	7.0	25.4	12.4	91	62	2	53.0	4.7
9	29.5	16.6	95	49	0	0.0	6.9	26.8	14.0	93	52	0	0.0	7.5
10	28.4	18.8	92	55	2	1.0	2.4	26.2	13.9	89	59	2	68.0	6.4
11	24.0	15.7	94	63	4	24.4	1.6	26.8	14.7	87	57	1	9.0	5.7
12	31.9	15.1	94	34	0	0.0	9.0	29.5	15.7	86	51	1	2.0	8.0
13	31.3	16.8	84	42	2	15.2	7.2	31.9	16.6	76	33	0	0.0	8.9
14	31.2	18.7	96	43	0	0.0	7.2	34.7	16.0	70	22	0	0.0	9.9
15	32.0	21.6	95	58	4	21.6	5.7	36.6	18.7	71	30	0	0.0	9.2
16	34.6	22.6	95	50	0	0.0	8.2	36.8	21.5	77	35	0	1.0	9.3
17	34.4	21.8	97	50	2	32.1	7.7	33.5	22.0	81	48	1	11.0	8.7
18	37.0	23.7	93	46	1	2.8	8.3							
Mean/ Total	**30.0**	**18.8**	**93.5**	**54.5**	**35**	**454.1**	**6.0**	**26.6**	**14.0**	**88.6**	**57.0**	**16**	**211.4**	**5.8**

Table M11: Meteorological data in South zone during crop growth period of Rabi 2019-20

Std. Week No.	HYDERABAD							VELLAYANI						
	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	31.1	15.9	94	73	2	48.4	4.7	31.5	24.6	90	72	1	7.0	5.4
41	31.0	15.6	98	67				31.1	24.4	93	78	5	133.1	5.0
42	28.9	14.8	93	74	2	26.2	4.3	30.9	24.2	94	80	6	125.7	2.6
43	29.0	18.2	88	68	3	20.0	6.0	30.3	23.6	92	79	5	42.8	0.8
44	30.1	20.5	90	60	1	10.0	7.5	28.8	24.0	94	76	4	105.6	6.0
45	31.1	18.8	94	47	0	0.0	7.7	32.5	28.3	90	68	0	0.0	9.0
46	29.6	17.4	88	49	0	0.0	7.5	24.6	25.3	91	67	2	9.0	8.1
47	29.4	16.6	90	49	0	0.0	7.6	24.3	25.3	92	74	4	49.9	5.6
48	28.8	16.9	92	53	0	0.6	7.3	24.5	25.5	94	69	3	31.0	6.2
49	26.8	16.4	93	55	1	8.2	4.8	24.1	25.3	91	70	7	38.1	1.8
50	28.7	14.9	91	45	0	0.0	8.3	23.6	25.3	91	71	7	53.0	0.7
51	28.0	14.1	95	48	0	0.0	7.5	23.9	25.2	93	72	6	41.4	2.4
52	27.6	16.8	88	56	0	0.0	5.5	23.8	25.4	93	69	7	60.5	0.0
1	27.9	18.6	87	59	1	10.6	5.2	32.2	24.1	92	66	0	0.0	8.8
2	27.9	14.7	91	55	0	0.0	6.7	32	22.7	93	66	1	45.0	7.8
3	29.8	16.3	88	43	0	0.0	8.7	32.2	22.5	92	64	1	10.4	8.3
4	30.7	14.4	90	41	0	0.0	9.3	32.7	23	91	64	0	0.0	9.6
5	31.0	17.6	85	49	0	0.0	7.4	32.7	22.3	93	58	0	0.0	9.4
6	31.1	18.4	93	51	1	5.0	6.7	32.7	23.2	91	63	0	0.0	9.1
7	31.1	10.9	88	39	0	0.0	9.2	33.2	23.7	89	60	0	0.0	9.0
8	32.3	15.0	81	31	0	0.0	10.3	33.1	23.2	91	59	0	0.0	9.5
9	32.4	18.1	84	37	0	0.0	8.7	33.2	23.4	90	61	1	37.6	8.8
10	33.4	19.6	86	48	0	0.0	6.8	33.2	24.3	90	63	1	3.0	8.7
11	33.4	20.4	94	56	0	0.0	7.4	33.4	24.6	87	60	0	0.0	9.2
12	35.2	20.5	91	52	2	12.2	8.5	33.7	25.0	88	60	2	11.7	8.9
13	35.7	19.6	84	62	0	0.0	9.0	34.1	25.1	85	59	0	0.0	9.3
14	35.8	23.0	83	70	0	0.0	5.1	34.1	25.0	84	61	1	19.6	9.2
15	36.8	20.1	81	68	0	3.8	7.9	33.9	25.6	85	62	2	2.9	9.3
16	38.2	21.9	87	69	1	19.4	9.0	34.6	25.9	84	62	2	4.8	9.0
17	39.2	24.8	93	75	0	0.0	10.0	34.4	25.9	87	63	4	60.3	7.6
18	38.7	23.4	90	79	0	0.0	8.7	34.2	26.2	84	63	3	43.0	8.3
19	37.4	23.4	90	80	1	14.2	7.4	32.6	25.7	91	79	5	105.2	3.6
20	38.4	23.9	87	76	0	0.0	8.9	31.5	24.9	92	80	4	125.7	3.9
21	41.6	25.4	83	71	0	0.0	9.3	32.1	25.7	92	80	2	123.4	5.6
Mean/ Total	**32.3**	**18.4**	**89**	**57.5**	**15**	**178.6**	**7.5**	**30.9**	**24.7**	**90.3**	**67.6**	**87**	**1296.7**	**6.6**

Table M12: Meteorological data in South zone during crop growth period of Rabi 2019-20

Std. Week No.	COIMBATORE						MANDYA						
	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				Max.	Min.	RH1	RH2			
40	32.2	23.3	86	1	10.0	8.3	31.9	19.0	94	80	5	112.0	12.6
41	32.7	22.7	86	3	22.7	8.3	32.1	18.9	91	69	1	7.4	7.1
42	30.1	22.6	88	6	187.0	4.6	31.7	18.6	94	78	4	164.9	5.3
43	29.2	22.4	85	1	7.8	4.4	30.8	18.8	91	80	3	34.5	5.5
44	28.7	21.8	88	4	42.0	5.9	31.1	18.6	94	79	0	1.8	6.6
45	31.2	21.7	87	3	72.2	6.8	30.9	17.8	92	77	0	0.3	7.1
46	29.7	22.7	87	1	37.8	7.6	31.5	17.9	88	75	0	0.0	8.1
47	29.1	22.5	85	1	5.9	4.8	30.9	18.8	85	72	0	2.0	7.8
48	27.9	22.5	88	4	43.6	3.1	29.0	18.0	91	75	0	0.1	3.9
49	27.6	21.4	84	1	4.4	4.7	27.8	17.9	91	77	0	0.3	6.6
50	28.3	20.5	85	1	10.4	7.5	27.6	17.1	89	74	0	0.0	7.1
51	28.0	21.0	86	0	1.2	2.8	28.1	16.9	91	76	0	0.0	6.8
52	27.7	21.7	87	1	5.0	3.5	27.5	17.0	93	79	0	0.0	5.3
1	30.4	22.6	87	0	0.0	6.9	29.4	18.6	93	58	0	0.0	8.7
2	29.8	19.4	86	0	0.0	7.2	29.6	19.2	91	58	0	0.0	9.0
3	30.5	20.3	86	0	0.5	7.5	30.5	18.4	90	61	0	0.0	9.3
4	31.4	19.5	85	0	0.0	9.3	30.9	19.1	88	68	0	0.0	9.2
5	32.2	20.9	84	0	0.0	9.5	30.3	18.3	86	63	0	0.0	8.4
6	31.9	22.1	84	0	0.0	7.2	30.0	17.4	86	54	0	0.0	7.9
7	32.8	20.5	81	0	0.0	10.1	32.5	17.4	86	55	0	0.0	8.8
8	32.4	21.9	83	2	0.0	8.9	31.9	17.6	80	63	0	0.0	8.1
9	33.5	23.5	79	0	0.0	7.8	31.8	18.4	81	42	0	0.0	6.3
10	34.9	24.4	81	0	0.0	8.3	32.1	18.4	89	36	0	0.0	7.9
11	34.7	23.3	82	1	0.0	9.4	32.6	19.9	85	34	0	0.0	8.1
12	35.4	23.6	84	0	46.0	7.9	34.2	21.6	84	39	0	0.0	9.0
13	35.3	23.2	80	2	0.0	10.4	34.9	21.9	88	34	0	0.0	8.9
14	35.6	24.1	81	1	2.0	9.4	34.1	20.8	91	47	2	15.9	6.4
15	34.4	22.9	83	1	32.0	9.5	32.9	21.2	26	46	0	0.0	6.7
16	35.7	25.4	81	0	0.0	10.1	33.5	21.8	78	48	0	0.0	6.3
17	35.3	24.7	82	2	23.0	6.1	33.6	21.1	93	69	3	18.4	5.9
18	34.4	24.1	86	1	20.5	9.5	34.6	22.1	92	79	2	44.4	7.0
19	35.4	25.6	81	0	0.5	7.2	34.0	21.4	93	65	1	2.6	6.5
20	34.5	24.7	84	1	12.5	5.1	33.7	21.7	92	59	1	76.0	5.6
21	35.6	25.6	82	1	5.0	7.2	32.7	20.1	93	53	3	34.0	6.0
Mean/ Total	**32.0**	**22.6**	**84.2**	**39**	**592.0**	**7.3**	**31.0**	**19.0**	**87**	**63**	**20**	**402.0**	**7.0**

Table M 13: Meteorological data in South zone during crop growth period of Rabi 2019-20

Std. Week No.	DHARWAD					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2		
40	29.5	20.3	92	85	3	59.2
41	29.5	20.3	91	78	2	72.8
42	29.4	21.0	92	81	3	142.8
43	26.6	20.0	90	88	4	48.4
44	29.1	19.5	86	73	0	3.0
45	30.2	19.1	85	69	2	18.0
46	29.5	18.1	78	57	0	0.0
47	29.6	16.7	80	52	0	0.0
48	29.3	18.1	86	57	0	0.0
49	27.2	16.2	90	66	1	7.8
50	28.8	15.9	80	52	0	0.0
51	28.5	15.6	84	55	0	0.0
52	29.7	17.7	83	56	0	0.0
1	29.6	15.4	84	48	0	0.0
2	28.9	15.7	84	51	0	0.0
3	29.9	15.5	74	42	0	0.0
4	30.8	15.2	67	38	0	0.0
5	30.1	15.8	82	46	0	0.0
6	30.3	16.5	76	43	0	0.0
7	32.1	16.7	57	31	0	0.0
8	33.1	16.5	52	25	0	0.0
9	33.0	19.4	62	36	0	0.0
10	31.6	17.6	65	40	0	0.0
11	33.9	19.3	56	37	0	0.0
12	35.3	19.8	59	28	1	10.2
13	35.7	20.3	70	31	1	3.4
14	36.0	21.9	79	43	1	6.6
15	35.9	20.2	69	54	1	3.6
16	35.9	21.4	71	38	2	22.0
17	35.7	21.2	70	39	0	0.0
18	35.8	22.6	81	47	1	12.0
19	36.5	22.8	73	50	1	15.6
20	35.5	22.3	76	61	2	25.0
21	36.2	22.0	81	56	0	3.8
Mean/Total	**31.7**	**18.7**	**76.6**	**51.5**	**25**	**454.2**

APPENDICES

APPENDIX-I: FORAGE CROPS BREEDING TRIALS AT A GLANCE: (RABI-2019-20) Cont..

Rabi-2019-20		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	AVT-2 B (Seed)	IVTO (SC)	AVTO (SC-1)	AVTO (SC-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			
2	Srinagar	DR	DR			DR	DR	DR	DR	DR			
3	Almora	DR								DR			
4	Bajaura												
5	Rajouri	DR	DR			DR	DR	DR					
6 (NWZ)	Bikaner	DR	DR	DR		DR		DR					
7	Jalore		DR	DNR						DR	DR	DR	
8	Hisar	DR	DR	DR	DR	DR		DR	DR	DR	DR	DR	DR
9	Ludhiana	DR	DR	DR	DR	DR		DR	DR	DR	DR	DR	DR
10	Pantnagar	DR	DR	DR	DR	DR		DR	DR	DR	DR	DR	DR
11	Udaipur	DR	DR	DR		DR		DR					
12	Meerut	DR	DR	DR		DR		DR					
13 (NEZ)	Jorhat					DR				DR			
14	Kalyani	DR		DR	DR	DR							
15	Bhubaneswar	DR		DR	DR	DR				DR			
16	Ranchi	DR		DR	DR	DR				DR			
17	Pusa	DR		DR		DR				DR			
18	Ayodhya	DR		DR		DR				DR			
19	CAU Imphal					DR				DR			
20 (CZ)	Jhansi	DR	DR			DR	DR	DR	DR	DR	DR	DR	DR
21	Rahuri	DR	DR			DR	DR	DR	DR	DR	DR	DR	DR
22	Urulikanchan	DR	DR			DR	DR	DR	DR	DR	DR	DR	DR
23	Anand					DR	DR	DR	DR	DR	DR	DR	DNR
24	Jabalpur	DR	DR			DR	DR	DR	DR	DR	DR	DR	DR
25	Raipur	DR	DR			DR	DR	DR	DR				
26	Palghar					DR	DR	DR					
27	Dhari					DR		DR					
28 (SZ)	Hyderabad					DR	DR						
29	Mandya					DR	DR						
30	Coimbatore					DR	DR						
31	Vellayani/Mattupetty					DR	DR						
32	Tirupti/Guntur					DR	DR						
33	Dharwad												
Total Location		20/20	15/15	11/12	6/6	29/29	15/15	17/17	11/11	18/18	9/9	9/9	7/8

APPENDIX-I: FORAGE CROPS BREEDING TRIALS AT A GLANCE: (RABI-2019-20)

Rabi-2019-20		Tr. 13	Tr. 14	Tr. 15	Tr. 16	Tr.-17	Tr.-18	Tr.-19	Tr.-20	Tr.-21	Tr.-22	Tr.-23	Tr.-24	Total
Zone	Location	IVTO (Dual)	AVTO-1 (Dual)	AVTO-2 (Dual)	AVTO-2 (Dual) (Seed)	IVT Lucerne (Annual)	IVT Summer Bajra	AVT-1 Summer Bajra	AVT-2 Summer Bajra	AVT-2 Summer Bajra (Seed)	IVT Lathyrus	VT Red Clover	VT White Clover	
1 (HZ)	Palampur											DR	DR	9/9
2	Srinagar											DR	DR	9/9
3	Almora													2/2
4	Bajaura											DR	DR	2/2
5	Rajouri													5/5
6 (NWZ)	Bikaner	DR	DR	DR		DR								9/9
7	Jalore					DR								5/6
8	Hisar	DR	DR	DR	DR									15/15
9	Ludhiana	DR	DR	DR	DR	DR								16/16
10	Pantnagar	DR	DR	DR	DR									15/15
11	Udaipur					DR								6/6
12	Meerut													5/5
13 (NEZ)	Jorhat	DR	DR	DR							DR			6/6
14	Kalyani										DR			5/5
15	Bhubaneswar	DR	DR	DR	DR									9/9
16	Ranchi	DR	DR	DR	DR						DR			10/10
17	Pusa	DR									DR			6/6
18	Ayodhya	DR	DR	DR										7/7
19	CAU Imphal													2/2
20 (CZ)	Jhansi	DR	DR	DR	DR						TF			14/15
21	Rahuri	DR	DR	DR	DR	DR	DR	DR	DR	DR				19/19
22	Urulikanchan	DR	DR	DR	DR	DR	DR	DR	DR	DR				19/19
23	Anand	DR	DR	DR		DR	DR	DR	DR	DR				1516
24	Jabalpur	DR	DR	DR	DR		DR	DR	DR	DR	DR			19/19
25	Raipur	DR	DR	DR							DR			10/10
26	Palghar													3/3
27	Dhari													2/2
28 (SZ)	Hyderabad					DR	DR		DR	DR				6/6
29	Mandya					DR	DR		DR	DR				6/6
30	Coimbatore					DR								3/3
31	Vellayani /Mattupetty						TF		DR	DR				4/5
32	Tirupti/Guntur													2/2
33	Dharwad					DR								1/1
Total Location		15/15	14/14	14/14	9/9	11/11	6/7	4/4	7/7	7/7	6/7	3/3	3/3	266/270

Abbreviations: DR= Data Reported; DNR= Data not reported; **TF=** Trial Failed**, Success Index (%) =98.5 (%)**

APPENDIX-II: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (RABI-2020-21)

Location																	Total
Hill Zone																	
Palampur																	
Srinagar																	
North West zone																	
Hisar																	
Pantnagar																	
Bikaner																	
Ludhiana																	
Ayodhya																	
Ranchi																	
Kalyani																	
Jorhat																	
Imphal																	
Pusa																	
Central Zone																	
Jabalpur																	
Rahuri																	
Urulikanchan																	
Jhansi																	
Anand																	
Raipur																	
South Zone																	
Hyderabad																	
Coimbatore																	
Mandya																	
Vellayani																	
Dharwad																	
Total (DR & TC)																	

DR- Data reported; **DNR-**Data not reported**; Success Index (%) =** (100) %

APPENDIX –III: FORAGE CROP PROTECTION TRIALS AT A GLANCE (RABI- 2019-20)

Locations/Trials	PPT-1	PPT-2	PPT-17	PPT-26	PPT-30	PPT-31	PPT-32	PPT-34	Total
(HZ)									
Palampur	DR	DR	DR		DR		DR	DR	**6/6**
(NWZ)									
Ludhiana	DR	DR		DR		DR		DR	**5/5**
(NEZ)									
Bhubaneswar	DR	DR						DR	**3/3**
(CZ)									
Rahuri	DR	DR		DR		DR			**4/4**
Jhansi	DR	DR						DR	**3/3**
Total	**5/5**	**5/5**	**1/1**	**2/2**	**1/1**	**2/2**	**1/1**	**4/4**	**21/21**

Abbreviations: DR = Data Reported; **DNR** =Data not reported; **Data Reporting (%)** ;(21/21) = 100 (%)

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