PREFACE

Annual Report (2015-16), Part II- Rabi 2015-16, embodies the results of various research trials conducted to evaluate the new breeding lines and develop technologies for enhancing the fodder productivity, production and improving the forage resources in the country. The information on breeder seed production against the DAC indent is also provided. Other activities related to research, extension, training, tribal sub-plan etc. being carried out by centers has been included in the report.

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 dual-purpose forage species of annuals and perennials are compiled in Crop Improvement chapter. The trials presented in Crop Production chapter focused on various aspects of forage crops viz., zinc and boron nutrition for enhancing the seed production, different aspects of intercropping of fodder-fodder (lucerne + oats / sarson) food-fodder (oat + pea, oat ï chickpea, oat ï Lathyrus and Pigeon pea with different annual fodders). The studies on productivity maximization of sole crops viz, grasspea, oat, perennial fodder sorghum and bajra napier hybrids yield maximization. The studies were also conducted for utilization of rice fallow and sodic soils for fodder production for horizontal expansion of forage crops. The use of micronutrients for yield maximization has been an important dimension of the research activities. The studies on quality of conserved fodder were undertaken during the year, besides the regular activity of evaluation of promising entries of forage crops for their response to nutrient application. Weather data from coordinating and voluntary centres has also been compiled to correlate the growth and yield of forage crops with weather parameters at different sites during crop period. The chapter on plant protection deals with different aspects of plant protection in selected Rabi forage species, viz., Berseem, oat and lucerne and generation of technologies for pest management. Breeder Seed Production chapter provided variety wise and center wise breeder seed production. Other chapters include details of in-house breeding activities, weather details 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 & Utilization is gratefully acknowledged.

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A. K. Roy
Project Coordinator

CONTENTS

EXECUTIVE SUMMARY

The present report describes compiled and edited results of the various trials conducted at different locations/ centers in the country on crop improvement, crop production and crop production during Rabi 2015-16 as per approved technical programme. Breeder seed production data is also presented in the report. The outreach programme carried out during the season *viz.,* Forage Technology Demonstrations, Tribal sub-plan activities were also included in the report. In house breeding activities, other activities of coordinated centres were also appended to give complete picture of activities in form of human resource development, technology dissemination, publications, breeding material generated etc. Weather data of various centres during the crop growth period is also appended to correlate the production as most of the experiments were in rainfed condition. In the end, directory of scientists and managers involved in forage research is also appended for ready reference and ease of communication.

A. FORAGE CROP IMPROVEMENT

In *rabi* 2015-16, Fifteen breeding trials were conducted on 3 crops viz., Berseem, oat and Lucerne. Entries contributed by different institutions along with national and zonal checks were evaluated in multilocation trials in coded form in five zones of the country. A total of 211 trials at different locations were allocated out of which reports were recived from 192 trials.

BERSEEM

IVTB: In initial varietal trial in Berseem four entries along with two national checks and three zonal checks in respective zones were evaluated at 17 centres in four zones (HZ, NWZ, NEZ, and CZ). For green forage yield (q/ha), PC-82 (20.7%) and HFB-12-4 (9.0%) in HZ; HFB 12-4 (7.2%) in CZ; HFB-12-4 (5.4%) and HFB-12-9 (5.3%) at national level showed superiority over the best national/zonal check. For dry matter yield, entries PC-82 (22.1%), HFB 12-4 (10.9%) in HZ; HFB 12-9 (11.8%) in NWZ; HFB 12-4 in CZ, entries PC-82 (6.5%), HFB 12-4 (6.8%), HFB 12-9 (6.0%) at national level showed better performance than the checks. For per day productivity, entry PC-82 ranked first for both GFY and DMY (q/ha/day). In quality parameters, HFB-12-4 was best followed by HFB 12-9 for CPY (q/ha). For CP (%) entry JB 05-9 ranked joint first with check Mescavi.

AVTB-1: An advanced varietal trial in Berseem comprising of three entries along with two national checks (Wardan and Mescavi) and one zonal check (BB-2) was conducted at eleven centres located in two zones (Central and North West). For green forage yield, entry JB-04-23 ranked best in NWZ (7.0%) and all India (5.5%). For dry matter yield, entries JB-04-23 and JB- 4-21 showed superiority at Central zone and all India. In green forage and dry matter production potential (q/ha/day), entry JB-04-21 ranked first. Entry JB-04-21 and JB-04-23 ranked first for CPY (q/ha) and CP (%) resepctively.

OAT

IVTO (SC): In Oat (single cut), twelve entries along with two national checks and five zonal checks were evaluated in initial varietal trial at 28 locations. For GFY (q/ha), entries JHO-15-1 (12.2%), HFO-427 (8.0%), VOS-15-24 (6.0%), SKO-227 (5.6%), OL 1844 (5.3%) in Hill zone; entries HFO-529 (9.5%), OL-1844 (7.4%), JO -04-22 (6.5%), SKO-227 (5.1%) in NWZ ; entries JO-04-22 (18.3%), OL-1844 (11.5%), HFO-529 (9.1%) in NEZ; entry OL-1844 in SZ exhibited superiority over best national/zonal check. At national level, entries OL-1844 (9.1%), JO-04-22 (7.4%), HFO-529 (5.9%) were superior to checks. For DMY (q/ha), entries JHO 15-1 (12.5%), SKO-227 (8.1%), OL-1844 (6.3%), HFO-427 (6.0%), JO-04-22 (5.1%), VOS-15-24 (4.9%) in Hill zone; HFO-529 (8.8%), OL-1844 (7.4%), JO-04-22 (7.3%), JHO-15-1 (6.2%) in NWZ; JO-04-22 (20.5%), HFO-529 (10.6%), OL-1844 (7.9%) in NEZ; JO-04-22 (9.2%) at national level exhibited superiority over checks. For fodder production potential (q/ha/day), OL-1844 for GFY and JO-04-22 for DMY were best performers. Entry JO-04-22 along with check OS-6 ranked joint first for CPY (q/h), whereas SKO-227 and JHO 15-1 ranked first for CP (%).

AVTO (SC)-1: In Oat (single cut), eight entries were evaluated against two national checks (and three zonal checks at 16 locations in three different zones (HZ, NWZ, CZ). For GFY (q/ha), entries SKO-225 (21.3%), OS-424 (7.9%), OL-1802-1 (5.4%) in HZ; OL-1802-1 (11.3%), JO-04-19 (5.2%) in NWZ, SKO-225 (19.7%), OL-1769-1 (16%), OL 1766-1 (14.2%), OS-424 (10.8%), JO-04-19 (6.6%) in central zone exhibited superiority over the best check. At national level, OS-424, OL-1769-1, OL-1802-1, OL-1766-1, SKO-225, JO-04-19

registered more than 10% superiority for GFY (Q/ha). Similarly for DMY (q/ha), entry SKO-225 (16.2%) in HZ; SKO-225(12.2%), UPO-10-3 (9.1%), OS-432 (6.6%), OL-1802-1 (5.2%) in NWZ; entries OL-1769-1 (17.6%), JO-04-19 (12.7%), OL-1766-1 (8.8%), SKO-225 (6.5%), OS-424 (6.9%) performed better than the best check. At all India level, entries SKO-225 (12.3%), OL-1769-1 (12.1%), JO-04-19 (10.2%), OL-1766-1 (7.2%), UPO-10-3 (5.8%) and OS-424 (5.6%) recorded superiority. In green forage production potential (q/ha/day), entries SKO-225 (4.86) followed by OL-1769-1 (4.54) were far superior to both the checks (3.78). Similarly for dry matter production potential (q/ha/day), all the entries were better than check. SKO-225 (1.26) followed by OS-424 (1.23) were best performers in comparison to Kent (1.06).For quality parameters, for crude protein yield, the top ranking entry was OL-1769-1 (8.0) in comparison to best check Kent (6.7).

AVTO (SC)-2: In Oat (single cut), nine entries were evaluated against two national checks and four respective zonal checks at 23 locations in four zones (NWZ, NEZ, CZ, SZ). For GFY (q/ha), entries RO-11-1 (12.1%) in NWZ; RO-11-1 (12.4%), OS-406 (5.6%), SKO-198 (5.0%) in NEZ, OS-406 (6.6%), OL-1689 (6.2%) in CZ and RO-11-1 (42.3%), OL-1804 (19.8%) in SZ and RO-11-1 (15.4%), OS-406 (7.3%) at all India exhibited superiority over best zonal/national check. For DMY (q/ha), entries RO-11-1 (8.1%), OL-1804 (6.6%) in NWZ; RO-11-1 (15.3%), SKO-198 (11.9%), OS- 406 (8.0%) in NEZ; OL-1689 (11.1%), JO 14-18 (10.6%), OS-406 (8.6%), RSO-8 (6.5%) in CZ; RO-11-1 ()24.2%), OL-1804 (13.2%) in SZ registered superiority over best check. At national level, RO-11-1 (12.5%), OS-406 (5.7%), RSO-8 (4.8%) recorded superiority over best check. For forage production potential (q/ha/day), entry RO-11-1 followed by RSO-8 for green forage and entries RSO-8 and RO-11-1 for dry matter production potential were adjudged superior performers. In quality parameters, entries OS-406 (6.7) followed by JO-04-18 (6.3) for CPY (q/ha) and JO-04-18 (9.3%) for CP(%)recorded superiority.

AVTO (SC)-2 (SEED): Eight entries along with two national checks and respective zonal checks were evaluated at four zones. Entry JO-04-18 performed better in NWZ (13.1%), CZ (7.1%), SZ (12.1%) and all India level (17.9%) over the best check.

AVT OAT (SC-2)-REPEAT 13-14: AVT-2(SC) conducted in 2013-14 was repeated in two locations of NWZ as per comments of Varietal Identification committee. Single entry OS-403 was evaluated along with 2 national checks and one zonal check. Checks performed better than the test entry.

AVTO (SC)-2: REPEAT 14-15: Eight entries were evaluated in AVT-2 repeat trial at 10 locations in five zones. For GFY (q/ha), entries SKO-190 (16.5%), RSO-60 (8.7%), OL-1760 (6.7%) in HZ; JHO-2012-1 (9.3%), OL-1760 (5.4%) in NWZ; RSO-59 (6.2%), OL-1760 (5.2%) in NEZ; RSO-59 (16.9%), JHO-2012-2 (16.6%), JHO-2012-1 (11.6%), OL-1760 (10.7%), OS-405 (9.8%), JO-04-14 (8.8%), RSO-60 (8.4%) in CZ and OS-405 (31%), RSO-60 (22.7%), OL-1760 (13.2%), JHO- 2012-1 (11.9%), RSO-59 (5.1%) in SZ registered superiority over best zonal/national check. At national level, OL-1760 ranked first followed by RSO-60. In DMY (q/ha), entries SKO-190 followed by OL-1760 and RSO-60 in HZ; Entries OL-1760 (9.3%), JHO -2012-1 (7.3%) in NWZ, JHO-2012-1 (19.9%), RSO-59 (18.9%), OS-405 (14.9%), JO-04-14 (14.9%), JHO-2012-1 (14.4%), RSO-60 (11.6%) in CZ; OS-405 (22.1%), RSO-60 (11.9%) in SZ; exhibited their superiority. At national level, RSO-60 ranked first followed by OL-1760. For quality parameters, OS-405 (6.1 q/ha) and JHO-2012-1 (8.8%) ranked first for crude protein yield and crude protein content respectively.

IVTO-MC: In initial varietal trial in oat (multicut), nine entries were evaluated against three national checks at 18 locations in four zones (HZ, NWZ, NEZ, and CZ). For GFY (q/ha), entry JO-04-321 (6.4%) in HZ, OL-1842 (10.7%), OL-1866 (9.9%), HFO-514 (6.1%), HFO-417 (5.1%) in CZ exhibited superiority over the best check. For DMY (q/ha) none of the entries showed significant superiority over the checks on zonal and national basis. Entry OL-1866 for CPY (q/ha) and JO-4-321 for crude protein content (%) ranked first.

AVTO-1 (MC): Three entries along with three national checks were evaluated at three centres in Hill Zone. Entry JO-04-319 exhibited superiority of 2.7% for GFY and 4.4% for DMY. For CPY (q/ha) and CP %, check UPO 212 ranked first.

AVTO-2 (MC): Two entries OL-1802 and JO-04-317 were evaluated against three national checks at 17 locations in four zones. Entry JO-04-317 showed superiority by a margin of 12.2% and 5.2 % in HZ for GFY (q/ha) and DMY (q/ha) respectively. It was also superior over best check by a margin of 5.2% in CZ and 2.2 % at national level. Entry JO-4-317 and OL-1802 ranked first for green forage yield and dry matter yield potential respectively. In quality parameters, national check Kent, entries OL-1802 and JO-4-317 were ranked top for crude protein yield and crude protein content (%).

AVTO-2 (SEED) (MC): Two entries *i.e.* OL-1802 and JO-4-317 along with three national checks were evaluated at twelve locations in four zones. None of the entries could surpass checks in any zone or at national level.

AVTO-2 MC: REPEAT 14-15: The AVT-2 trial in oat multicut of 14-15 was repeated with one entry JO-04-315 along with 3 checks at two locations Anand and Rahuri as per decision of VIC. For GFY (q/ha) national check ranked first whereas for DMY entry JO 04-315 exhibited marginal superiority over best check.

IVTO (DUAL): Eight entries along with three national checks were tested at 17 centres located at four zones. For GFY (q/ha), entries NDO-1101 (7.8%), OL-1760-1 (5.7%) and OL-1802 (5.5%) in NEZ registered superiority over the best check. For DMY, entries NDO-1101 and HFO-525 showed marginal superiority over the best check at central zone, whereas in other zones and national level, none of the entries could surpass checks. For quality parameters, entry OL-1802 for crude protein yield (4.5 q/ha) and entry JHO-15-6 (12%) for crude protein content exhibited superiority. For seed yield (q/ha), entry JHO-15-6 ranked first at national level.

LUCERNE

VT Lucerne: (Perennial) - 2013 – 3rd YEAR: The trial was established in 2013 and in third year data of five entries along with two checks were reported by 6 centres in three zones. For green fodder production (q/ha), entries ALP-1-1 (19.7%), Anand-26 (11.3%) and Anand-25 (5.3%) in NW zone, and entry TNLC-14 in south zone registered superiority over the best check. Similarly for dry matter yield (q/ha), entries ALP-1-1 (16.8%), Anand -26 (12.4%), Anand -25 (3.3%) in NW zone and entry TNLC -14 (30.5%) in south zone registered superiority over the best check. For fodder production potential, ALP-1-1 for green fodder and check RL-88 for dry matter production potential (q/ha/day) were top rankers. For growth parameters, ALP1-1 (73.5 cm) ranked first for plant height while for leaf stem ratio, entry RL-10-2 was superior. For quality parameters, National check RL-88 for CPY (q/ha) and entries Anand-25 and Anand-26 for crude protein (%) ranked first.

B. FORAGE CROP PRODUCTION

The present report contains results of the coordinated trials conducted on Crop Production, during *Rabi* 2015-16 at different locations/ centres in the country placed in five zones *viz*., Hill zone, North-West zone, North-East zone, Central zone and South zone. The trials focussed on various aspects of forage crops viz., zinc and boron nutrition for enhancing the seed production, different aspects of intercropping of fodder-fodder (lucerne + oats / sarson) food-fodder (oat + pea, oat – chickpea, oat – Lathyrus and Pigeon pea with different annual fodders). The studies on productivity maximization of sole crops viz, grasspea, oat, perennial fodder sorghum and bajra napier hybrids yield maximization. The studies were also conducted for utilization of rice fallow and sodic soils for fodder production for horizontal expansion of forage crops. The use of micronutrients for yield maximization has been an important dimension of the research activities. The studies on quality of conserved fodder were undertaken during the year, besides the regular activity of evaluation of promising entries of forage crops for their response to nutrient application.

PS-13-AST-2: Performance of perennial fodder sorghum (*sorghum bicolor* cv. COFS- 29) as influenced by planting geometry and cutting intervals under irrigated conditions

A trial was conducted at three locations to assess the effect of planting geometry and cutting intervals on growth, yield and quality of perennial sorghum under irrigated condition. The green dry and crude protein yield was highest with 45 cm row spacing (1349.1, 330.04 and 26.18 q/ha, respectively). Cutting interval of 45 days exhibited maximum green, dry and crude protein content on location mean basis

CS-13-AST-1: Study on different models for year round green fodder production under irrigated condition

The trial was conducted at four locations to find out suitable models for year round green fodder production. On location mean basis, - Bajra napier hybrid + cowpea - berseem- cowpea recorded highest GFY (984.46 q/ha/yr) whereas, BN hybrid + lucerne recorded significant superiority in terms of DMY (221.90 q/ha/yr) and CPY (24.64 q/ha/yr).

CS-13-AST-2: Evaluation of fodder crops under different rice fallow system

The trial was conducted at three locations (Ranchi, Jabalpur and Bhubaneswar) to evaluate fodder crops under different rice fallow system. On mean basis over the locations, forage crops grown after SRI flat bed method of rice recorded highest yields (347.7q green and 61.26 q dry matter/ha), gross and net monetary returns as well as B:C ratio than. Growing of berseem recorded highest GFY and CP yields (456.4 and 11.39 q/ha, respectively), net monetary returns (Rs 114234/ha) and benefit cost ratio (4.53).

CS-13-AST-3: Evaluation of different varieties of grasspea (*Lathyrus sativus* L.) as forage crop under different sowing methods in rice based cropping system

The trial was conducted at two locations to increase the availability of legume forage through utilization of rice fallow system. Nirmal variety recorded highest green, dry and CP yields (96.62, 21.47 and 3.12 q/ha, respectively) on location mean basis. Zero seed drill with 150 % more seed rate recorded highest GFY (97.65 q/ha) and DMY (21.45 q/ha).

K-14-AST-3: Study of intercropping system of Pigeon pea with different annual fodder crops

The experiment was initiated at two locations to identify the suitable intercropping system higher yields of pigeonpea as well as fodder. The results indicated that, in terms of GFY and DFY, Pigeonpea +Sorghum (2:1), Pigeonpea +Maize (2:1) intercropping system remained at par with each other but significantly superior to other systems on locational mean basis.

R-15-AST-1: **Productivity of oat - lathyrus food fodder intercropping system as influenced by integrated nutrient management.**

A field experiment was initiated at three locations to study the productivity and profitability of food (lathyrus) + forage (oat) intercropping system influenced by INM. Sole oat recorded maximum GFY (241q), DFY (60.49q), and CPY (5.60q). However, with respect to monetary parameters, sole oat and oat + lathyrus (3:2) proved superior. Application of 50% N (RDF) + 50% N (vermicompost) recorded significantly higher GFY, CPY and GFEY.

PS-14-AST-2: Impact of Mg and B on nutrient uptake, quality and yield of bajra napier hybrid

The trial was conducted at Vellayani centre with the objective to assess the influence of Mg and B nutrition on the performance of bajra napier hybrid. Highest GFY and DMY was recorded in open situation+ POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$, 80kg/ha which was on par with Open situation+ POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) +Borax, 10 kg/ha.

CS-14-AST-1: Studies on intensive fodder cropping systems for yield maximization

The perennial based experiment was initiated at Raipur with objective to identify appropriate cropping system for maximum fodder production. BN hybrid + Berseem system recorded significantly maximum green fodder, dry matter, net monetary return and B:C ratio (900, 185.31 q /ha Rs. 67082 /ha and 1.95, respectively)

CS-14-AST-2: Study of intensive annual fodder crop based cropping system

The experiment was initiated at Raipur with the objective to find out appropriate annual cropping system for maximum fodder production. The results indicated that significantly superior green fodder and dry matter yield was recorded under Maize + rice been (2:1)- oat (multi cut) –sorghum (multi cut) + cowpea (2:1) cropping system (1325, 251.74 q/ha respectively). The net, gross and return per rupees invested was maximum in maize based cropping system.

K-15-AST-2 L: Performance of bajra napier hybrids as influenced by nature of vegetative propagules

The experiment was initiated at Dharwad to identify a suitable planting material for propagation of bajra napier hybrid varieties. The results revealed that 2 eyed root slips were high green fodder yielder. 2 eyed root slips recorded the highest establishment as well as number of tillers/hill, plant height and weight of green and dry fodder per meter row length.

R-14-AST-2-: Effect of cutting and nutrient management on growth, yield and quality of oat

This experiment was initiated at Imphal with a view to evaluate oat for different purpose, viz. grain, fodder and both grain and fodder, under different nutrients and cutting management practices. The combined effect of three cut with 50% RDF + 7.5 t FYM/ha and no cut (seed) + 50% RDF + 7.5 t FYM/ha showed superiority in green fodder yield (564.11 q/ha) and seed yield (24.58 q/ha) respectively. In terms of net monetary return, the combined effect of single cut + seed with 50% RDF + 7.5 t FYM/ha recorded highest net return (Rs. 99017/ ha) and benefit cost ratio.

R-14-AST-3: Studies on the effect of additives on silage quality of different grasses

The experiment was conducted at Vellayani to study the effect of additives on silage quality of different grasses. Highest dry matter and fresh silage/pit was recorded in guinea grass silage. The colour of all the silages was in acceptable range. Lowest ash content (6.64) was recorded in the silage prepared from BN hybrid and highest total ash content (10.2) was recorded in guinea grass silage.

R-15-AST-2: Productivity of oat + pea intercropping system as influenced by integrated nutrient management

The experiment was undertaken at Jorhat to study the performance of the cropping system on productivity of both food and forage. The results revealed that highest GFEY and net return of the system as a whole was highest in Pea sole (1870 q/ha).INM with 50% RDF + 50% N through vermicompost recorded the highest GFEY than other treatments.

R-15-AST-2(A): **Productivity of oat - chickpea intercropping system as influenced by integrated nutrient management**

This experiment was conducted at Imphal to study the productivity of oat - chickpea intercropping system as influenced by integrated nutrient management. The results indicated that significantly higher values of Plant height, dry matter yield, green fodder and stover yield of oat and chickpea were recorded with application of 50% nitrogen through inorganic source + 50% through vermicompost. Total productivity of the systems in terms of green forage equivalent yield and gross returns and B: C ratio was higher in intercropping than sole cropping of oat and chickpea.

R-15 AST-3: Response of phosphogypsum to various cultivars of fodder oat in sodic soil.

The experiment was conducted at Faizabad center to assess the effect of phosphogypsum on fodder production of various cultivars of oat under sodic soils. A significant consistent increase in GFY, DMY, CPY and per day productivity was recorded with increase in phosphogypsum levels up to 250 kg (40kg S)/ha. Oat cultivars exhibited non significant effects on plant height, plant populations, leaf stem ratio, days to 50% flowering and content.

R-15-AST-4: Study on lucerne + oats / sarson fodder production system at variable seed rates of mixed crop under irrigated condition

Field study was carried out at Bikaner on sandy soil to find out optimum seed rate of oats/ sarson mixed cropping for long term stable green fodder yields and the economics of different treatments. The result indicated that lucerne + oat seed mixed treatments gave significantly higher GFY and DMY as compared to lucerne + sarson seed mixed treatments. The highest DMY (129.8 qt/ha) was recorded in lucerne+ oat mixed with 30 kg/ha. The highest CP % was noted in sole lucerne. The maximum net return and B:C ratio found in sole oat which was at par in lucerne+ oat mixed @30 kg/ha.

R-15-AST-7: Standardization of Seed Rate of Berseem with Rye Grass under Mixed Cropping System

The field experiment was conducted at NDRI, Karnal to standardize of seed rate of berseem with rye grass under mixed cropping system. The results revealed that the highest green fodder yield and benefit: cost ratio was obtained from 100% ryegrass with 25% Berseem as mixed crop.

R-15-AST-5: Effect of zinc and boron on seed production potentiality of oats under lateritic soil

A field experiment was conducted at Sriniketan, West Bengal to study the effect of zinc and boron on seed production potentiality of oats under lateritic soil. The highest seed yield was recorded in the treatment having $ZnSO_4$ @ 20 kg/ha+ Borax @ 15 kg/ha (3.22 t/ha).

R-14-AST-4: Effect of nitrogen levels on green fodder yield of promising entries of oat (AVTO-2-SC)

A field experiment was conducted at 13 locations over all (five) zones in the country to evaluate nine promising entries of Single cut oat (AVTO-2-SC) for their response to nitrogen application. In North West zone, for GFY and DMY, entry OL-1689 (515.4 and 108.5 q/ha, respectively) was superior. In North East zone, entry Ro-11-1 (419.7q GFY and 79.3 q DFY/ ha) and OL-1804 (415.9 q GFY and 77.1 q DFY/ha) were found superior for GFY and DFY. In Central and South zone, for GFY and DFY, entry Ro-11-1 (615.8q GFY and 120.1 q DFY/ ha) was superior over other entries. On all India mean basis, RO-11-1 produced maximum GFY (467.08 q/ha) and DFY (97.26 q/ha). It was followed by OL-1804 (443.69 q/ha) in terms of GFY and RSO-8 (93.26 q/ha) in terms of DFY. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha

R-14-AST-10: Effect of N levels on forage yield of promising entries of oat (AVT-2 MC)

A field experiment was conducted at nine locations across the four zones in the country to evaluate the two entries (JO-4-317 and OL-1802) of Oat (Multi cut) for their response to nitrogen application. In hill zone, JO-4-317 performed better (257.29q green and 49.5q dry matter/ha). In North West zone, OL-1802 performed better (525.2q green and 90.30q dry matter/ha). In Central zone, OL-1802 performed better (610.3q green and 119.5q dry matter/ha). On all India mean basis, both the entries remained on par with each other on terms of GFY. However in terms of DFY OL_1802 was better and recorded 8.27% higher DFY over JO-4-317. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (483.5 q green and 98.8 q dry matter/ha).

PS-14-AST-4: Studies on the effect of planting geometry of tall fescue grass and seed rates of white clover in wet temperate conditions

The experiment was initiated at two locations with the objectives to see the effect of tall fescue grass and white clover compounding on forage productivity, quality, soil NPK and carbon (SOC). The results revealed tall fescue 30 x 30 cm + white clover 3.0kg/ha produced higher green fodder yield (356.46 q/ha), net returns (Rs.71005/ha), B:C (3.92) and LER (1.76). Higher crude protein was noticed in sole while clover. The tall fescue grass has better plant height at closer spacing of 20 x 30 cm. Leaf stem ratio of tall fescue grass also increased with increasing seed rate of white clover

R-14-AST-1-: Studies on the production potential feasibility of annual rye grass with berseem in hill zone

The experiment was started to study the production potential feasibility of rye grass with berseem in hill zone. ATMA rye grass (pure stand) and ATMA rye grass + berseem with seed rate in 75:25 ratio produced higher green fodder and dry matter yield. Sole stand of ATMA rye grass indicated maximum net returns (Rs.119583/ha) with higher LER of 2.62.

C. FORAGE CROP PROTECTION

Forage crop protection trials were conducted during Rabi 2015-16 on three major aspects *viz.,* (i) occurrence of insect-pest, diseases and nematodes; (ii) evaluation of improved breeding lines/ entries; (iii) devising suitable methodologies for pest management. Two experiments were also conducted to validate the treatment recommended in large plot size.

PPT – 1: Survey of pathogens, insect pests, nematodes associated with Berseem and Oats eosystems.

The experiment was carried out with the objective to record the occurrence and abundance of major diseases and insect-pests in berseem, lucerne and oat and 5 Locations viz., Bhubaneswar, Hyderabad, Ludhiana, Rahuri, Palampur. **At Bhubaneswar,** In oat, leaf blight caused by *Helminthosporium sp.* and root rot caused by *Sclerotium sp.* were observed. Nematode population was found to increase before sowing and after harvest. **At Palampur,** Oat crop was severely affected by powdery mildew (95 % severity), followed by leaf blights (16%), loose smut (4%) and sucking pest (20%). In Berseem low incidence of root rot (12%) and moderate to high intensity of leaf spot (30 %) and defoliating beetles (20 %) was observed. Defoliating beetles was the main pest (45 %) of lucerne, whereas only 15 per cent severity of leaf spot was observed. **At Hyderabad,** Aphid incidence started from 1 std wk and leaf webber damaged plants were seen from 52nd std week in lucerne. Jassids were noticed in Berseem from 51st week while thrips were seen from 2nd std week.

At Ludhiana, Stem rot of Berseem was first observed at end December, 2015, disease progressed slowly and then at faster rate till first week of March, 2016 with maximum disease incidence of 55.6 percent. During this period, 8.6-16.0 mm rainfall with moderate temperature of 10.5-20.6ºC and mean relative humidity of 65-87% was observed which increased the disease incidence. **Leaf blight of oat a**ppeared in the 2nd week of January, 2016. Disease development was slow till first fortnight of February, 2016 and thereafter, it increased at alarming rate upto first week of April, 2016 with favourable temperature between 10.5-27.1ºC, percent relative humidity of 53-87 and 25.9 mm of rainfall which increased the disease severity upto 67.0 percent. **Downy mildew of Lucerne** was first observed in the 2nd fortnight of January, 2016. Disease progressed at faster rate till first week of March, 2016 with disease severity of 49.6 percent. During this period, low temperature range of 9.7-27.1ºC, high relative humidity (85-97%) and high rainfall favoured the disease development. The disease progressed at steady pace upto first week of April, 2016 with maximum downy mildew severity of 61.0 percent. **Rust of Lucerne** appeared in the first week of February, 2016 and progressed slowly till end of February, then progressed at rapid rate upto end of March, 2016 with maximum disease severity of 29.7 percent. 14.8-27.1ºC temperature and 53-75% of relative humidity favoured the disease progress.

At Ludhiana, the population of green semilooper, *T. orichalcea* started appearing on berseem in the first week of April with its highest peak observed in the last week of May. The population of *H. armigera* appeared on berseem crop in 3rd week of April and lasted till the IV week of May, with its highest peak during last week of April 2016. Lucerne var. LLC-5 was heavily infested with lucerne weevil from I week of February till mid March 2016 with highest peak in the 3rd week of march. Maximum population of oat aphid appeared during the last week of February and starting to decrease from month of March onward.

At Rahuri, In berseem crop, there were no insect-pests and diseases were observed throughout crop period. **In Lucerne,**The population of pea aphid (*Acyrthosiphon pisum*) was noticed during 4th week of December and increased steadily at its peak level up to the 1st week of February, 2016 (115.33 aphids/tiller), followed by decrease upto 1st week of March, 2016. The cowpea aphid (*Aphis craccivora*) started build up on Lucerne during 4th week of Dec., 2015 (2.00 /tiller) and found increasing trend up to 4th week of February, 2016 with highest population (75.67 aphids/tiller). The spotted aphid (*Therioaphis maculata*) started appearing on crop during 2nd week of February, 2016 with 25.67 aphids/tiller and it showed increasing trend up to 3rd week of February, 2016 (49.67 aphids/tiller). During the aphid infestation, population of predatory lady bird beetles was observed moderate to high level. (1.00 to 4.00 grubs/tiller). The *Spodoptrera litura* become a major and regular pest on Lucerne during summer season. The population of *H. armigera* was noticed on lucerne seed crop during 3rd week of February, 2016 and showed increasing trend upto 2nd week of April 2016. **In Oat crop,** aphids, *Rhopalosiphum padi* was noticed during 3rd week of Jan., 2016 and reached at maximum level (150.67 aphids/ tiller) during 2nd week of February, 2016. There was no disease incidence recorded on oat crop.

PPT-2A: Field screening of *rabi*-breeding trials for resistance to diseases and insect- pests.

IVTB: At Rahuri, no infestation/incidence of insect-pests and diseases were observed. At Bhubaneswar, For leaf blight and pot diseases, entry JB-05-9 and HFB 12-4 were moderately resistant, At Palampur, Wardan and PC-82 were moderately resistant to root rot, all other entries showed resistant reaction. At Ludhiana, all the entries including check showed susceptible reaction for stem rot.

AVTB-1: At Rahuri. No infestation/incidence of insect-pests and diseases were observed in any of the AVT Berseem entries. At Ludhiana, All the entries including checks showed susceptible reaction

IVTO (SC): Ludhiana: The aphid *Rhopalosiphum padi* population in the test genotypes varied significantly from 1.7-7.3 aphid per tiller being significantly higher population of aphid in SKO-206, (7.3 aphids per tiller) and lowest in VOS-15-23 (1.7). Entries HFO-427, JO-04-22, Check OS-6 were highly susceptible whereas other entries showed susceptible reaction to leaf blight. At **Rahuri,** Resistant entries were VOS-15-23, OL-1847, HFO-427 and SKO-227, **Susceptible entries was** OS-377. At **Hyderabad,** No insects and diseases were observed in the trial **At Bhubaneswar,** for Alternaria leaf blight, entry JO-04-22 and national check Kent were moderately resistant, whereas other entries showed resistant reaction. For Sclerotium root rot, OL-1844 was resistant, whereas, entries NDO-911, VOS 15-23, HFO-529, JO-04-22, SKO-206, SKO 227 were moderately resistant. Entries VOS- 15-24, JHO-15-1 and checks Kent and JHO-99-2 were susceptible. Entries OL-1847, JHO 15-2, HFO-427 and national check OS-6 were highly susceptible for Sclerotium root rot. Minimum incidence of leaf defoliators was observed in HFO-529 and maximum in SKO 227. At **Palampur,** all the entries were found susceptible under artificial as well as under field conditions except OL-1847 which was moderately resistant.

AVTO (SC)-1: At Ludhiana, the **oat aphid, *Rhopalosiphum padi*** population in the test genotypes varied significantly from 1.0-5.0 being highest population of aphid in OL 1802, (5 aphids per tiller) and lowest in OL-1766-1 (1.0). At **Rahuri,** Resistant: OL-1766-1, UPO -10-3,; Highly susceptible: OS-424 and OL-1802-1. At **Ludhiana, for leaf blight,** OL-1766-1 was moderately susceptible whereas all other entries including checks showed susceptible reaction. At **Palampur,** All the entries were susceptible under artificial as well as under field conditions.

AVTO (SC)-2: Ludhiana: The oat aphid, *Rhopalosiphum padi* population in the test genotypes varied non significantly For leaf blight, entry SKO-196 was highly susceptible, whereas Kent was moderately susceptible. Other entries were susceptible. **At Rahuri,** OL-1689 and Kent were resistant to aphids, whereas SKO-198 and RSO-8 were Highly susceptible:. At **Hyderabad,** No insects and diseases were observed in the trial At **Bhubaneswar, f**or Alternaria leaf blight, entries SKO-199, SKO-196, JHO 99-2 were moderately resistant, whereas all other entries showed resistant reaction.

For Sclerotium root rot, entry RSO-8 was resistant, whereas entries OL-1689, JO-04-18, OL-1804, RO-11-1, SKO-199 showed moderately resistant reaction. Entries Kent, OS-6, SKO-198, SKO-196, OS-406, JHO 99-2 were susceptible to highly susceptible. For leaf defoliators, minimum incidence was recorded in JO-14-18 and maximum in JHO 99-2.

AVTO (SC)-2 (SEED): AT Ludhiana, the oat aphid, *Rhopalosiphum padi* population in the test genotypes varied non-significantly from 1.0-3-3.At **Hyderabad,** No insects and diseases were observed in the trial. At **Rahuri,** Minimum incidence of aphids were recorded in entires JO-04-18 and RSO-8, maximum incidence were recorded in SKO-198 and Kent.

AVT OAT (SC-2) - REPEAT 13-14: Ludhiana: All the entries showed susceptible disease reaction to leaf blight. The aphid population in the test genotypes varied non significantly from 5.25-8.0 being highest population of aphid in check OS-6 (8.0 aphids per tiller) and lowest in OS-403 and OL-125 (5.25). There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment.

AVTO (SC)-2: REPEAT 14-15: AT Ludhiana, JHO 2012-2, RSO-59, JHO-2012-1, OL-1760 showed moderately susceptible disease reaction to leaf blight. Rest of entries was susceptible. The aphid population in the test genotypes varied non significantly from 1.0-3-0. At **Rahuri,** Resistant entries were JHO-2012-2, RSO-60, SKO-190 and Highly susceptible were OS-405 and Kent. At **Hyderabad,** No insects and diseases were observed in the trial. At **Bhubaneswar,** For Alternaria leaf blight, entry SKO-190 was highly resistant; entries kent and OL-1760 showed moderately resistant reaction. All other entries were resistant. For Sclerotium root ort, Check JHO-99-2 was resistant, whereas entries JHO 2012-2, SKO-190, JHO-2012-1, Kent were moderately resistant. Other entries were susceptible to highly susceptible. For leaf defoliators, maximum incidence was observed in national check Kent and minimum in OL-1760, OS-405 and JHO-2012-2. At **Palampur, a**ll the entries were found susceptible under artificial as well as under field conditions except RSO-60 and SKO-190 which gave moderately resistant reaction under field conditions

IVTO-MC: AT Ludhiana, HFO-514 was moderately susceptible to leaf blight and other entries were susceptible. The **oat aphid, *Rhopalosiphum padi*** population in the test genotypes varied non significantly from 1.0-3.67. At **Rahuri,** Resistant entreis were JO-04-321, HFO-514 and UPO-212; Moderately resistance were RO-19 and PLP-19 Highly susceptible were HFO-417 and PLP-19. At **Bhubaneswar,** For Alternaria leaf blight, entries HFO-417, OL-1867 were moderately resistant, whereas other entries showed resistant reaction. For Sclerotium root rot, Kent, OL-1866, HFO-417, OL-1867 showed moderately resistant reaction whereas other entries were susceptible to highly susceptible. For leaf defoliators, maximum intensity was recorded in entries OL-1867 and HFO-417. At **Palampur, a**ll the entries were found susceptible under artificial as well as under field conditions except OL-1867 which gave moderately resistant reaction under field conditions.

AVTO-1 (MC): Palampur: All the entries were found susceptible under artificial as well as under field conditions except OL-1867 which gave moderately resistant reaction under field conditions

AVTO-2 (MC): Ludhiana: All entries were susceptible to leaf blight. The **oat aphid, *Rhopalosiphum padi*** population in the test genotypes varied non significantly from 2.50-3.0. At **Rahuri, for aphids,** Resistant: Kent, JO-04-317, OL-1802 Susceptible: RO-19. At **Bhubaneswar,** For Alternaria leaf blight, Check UPO-212 was moderately resistant, whereas all other entries and checks were resistant. For Sclerotium root rot, Kent was moderately resistant whereas all other entries were susceptible. For leaf defoliators, entry JO-04-317 was moderately resistant, UPO-212 was susceptible and rest were resistant. At **Palampur:** All the entries were found susceptible under artificial as well as under field conditions.

AVTO-2 (SEED) (MC): AT Ludhiana, all entries were susceptible to leaf blight. The aphid population varied non significantly from 1.75-3.0. At **Bhubaneswar, f**or Alternaria leaf blight Kent and RO-19 were resistant, whereas UPO-212, OL-1802 and JO-04-317 were moderately resistant. For Sclerotium root rot, Kent was moderately resistant and all toehr entreis showed resistant reaction. For leaf defoliators, minimum incidence was recorded in Kent. At **Palampur, a**ll the entries were found susceptible under artificial as well as under field conditions.

AVTO -2 MC: REPEAT 14-15, at Rahuri, Maximum intensity was observed in National check Kent and test entry JO -04-315 showed less aphid intensity than checks Kent, RO-19.

IVTO (DUAL): Ludhiana: The aphid population in the test genotypes varied non significantly from 1.0-3.00. All entries showed susceptible reaction to leaf blight. At **Rahuri:,** NDO-1101, HFO-523, OL-1760-1, OL-1802JO-09-509 recorded 16.09, 16.70, 17.26, 17.63 and 18.70 aphids per tiller, respectively and were significantly lesser than other entries.

At **Bhubaneswar,** For Alternaria leaf blight, entries JHO15-5 , JO-09-509 were moderately resistant whereas all other entries showed resistant reaction. For Sclerotium root rot, entry OL-1802 was resistant, entries NDO 1101, RO 19, JHO 15-6 were susceptible and all other entries were moderately resistant. For leaf defoliators, not much variation was observed among the entries and checks. At **Palampur,** all the entries were found susceptible under artificial as well as under field conditions.

PPT 17: To study the pathogenic variability of A. *Blumeria graminis* f. sp. *avenae* on oat

At Palampur, **t**he virulence pattern of the 11 isolates (during 2012-13, 2013-14, 2014-15 and 2015-16) of *Blumeria graminis* f. sp. *avenae* on differential set (10 lines) was studied. On the basis of reaction of 10 differentials, the 11 isolates were grouped into 6 different pathotypes . Of the 7 isolates, one isolate was placed in pathotype PMO-1, two in pathotype PMO-2, three in pathotype PMO-3, two in pathotype PMO-4, one in pathotype PMO-5 and two in pathotype PMO-6.

PPT 19: Management of soil borne diseases in clover (Egyptian clover) seed crops

At Ludhiana, experiment was carried out with the o**bjective** to manage the soil borne diseases in clover seed crop mainly stem rot caused by *Sclerotinia trifoliorum*. Spray with Carbendazim @ 1.0 kg/ha exhibited least disease incidence of stem rot that is 13.58% followed by application of neem seed powder @ 50 kg/ha (16.29%) and spray of NSKE @ 5% before disease appearance. Maximum GFY was observed with the application of Carbendazim and neem seed powder Both the treatments also exhibited maximum seed yield (3 q/ha).

PPT-20: Management of soil borne and powdery mildew diseases in red clover seed crop

At Palampur, The experiment was conducted to manage the powdery mildew and soil borne diseases in the seed crop of red clover. 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 3.3 percent disease severity and 95.1 per cent disease control with 83.3 per cent increase in yield as compared to control.

PPT 21: Management of foliar diseases of oat

Experiment was carried out at Ludhiana, with objective to manage the foliar diseases of oat through seed treatment and soil application of fungicides and bioagents. Seed treatment with Carbendazim 50WP @2g/kg seed + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS showed minimum disease severity of leaf blight in oats (28.83%) as compared to check with percent leaf blight severity of 57.17. Increase in fodder and seed yield was also observed. All the treatments were statistically at par with each other.

PPT-22: Studies on biological management of *Spodoptera litura* in relation with different time of application on lucerne under field condition

The experiment was carried out at Rahuri and Hyderabad with the Objectives to find out effectiveness of different entomopathogenic fungi in combination with *SlNPV* against *S. litura* on Lucerne and to study the efficacy of biopesticides against *S. litura* at different time of application. At Rahuri, at 5 DAS, the treatments, mixture of *B. bassiana, N. rileyi* and SlNPV was found significantly superior over all the treatments recording 4.84 larvae/m^2. At 7 DAS, lower survival population of larvae was observed with mixture of *B. bassiana, N. rileyi* and SlNPV recording 2.46 larvae/m^2. Among the time of application, statically lower survival population was observed at 8 pm, recording 2.81 larvae/m^2 . The higher green forage yield (103.94 q/ha) of lucerne was obtained from the treatment combination of *B. basssiana*, *N. rileyi* and SlNPV sprayed during 8 pm on lucerne and it was significantly higher than the other treatments and other time of applications, Maximum ICBR (1:2.83) due to individual treatment of SLNPV alone. Aapplication at 8 PM showed highest (1:4.41) ICBR than the other time of application. At Hyderabad, Incidence of *S.litura* was not observed. Hence treatments were not imposed

PPT-23: Biological control of *Helicoverpa armigera* on Lucerne seed crop

Experiment at Rahuri and Hyderabad was carried out with the objective to find out effectiveness of different entomopathogenic fungi in combination with *HaNPV* against *H. armigera* on Lucerne seed crop and the effect of biopesticides on honey bee activities. At Rahuri, At 5 DAS treatment combinations of *B. bassiana* (1x108 cfu/g), *N. rileyi* (1x108cfu/g) and HaNPV (250 LE/ha) gave excellent control of *H. armigera*. At seven days after treatment, combination of *B. bassina*, *N. rileyi* and HaNPV and combination of *N. rileyi* and HaNPV were statistically at par with each other. There were non significant differences among the treatments in respect of bee visits and average number of bees/plot/min at 2nd days after treatment. The treatment combinations of *B. bassiana, N. rileyi* and HaNPV recorded highest seed yield (2.9 q/ha) of Lucerne. The highest ICBR recorded in individual treatments of *B.bassiana* and *N. releyi* (1:45.67), however, maximum net profit obtained due to treatment combination of *B.bassiana, N. releyi* and HaNPV. At Hyderabad, Incidence of *H.armigera* was not observed. Hence treatments were not imposed

PPT-24: Validation of disease management in white clover

Recommendation:

- At Palampur, on the basis of three years data and one more year validation trial, seed treatment with carbendazim @ 2 g/kg and *Trichoderma viride* @ 5g/kg seed followed by alternate sprays of carbendazim (@ 0.1%) and hexaconazole (@0.05%) is recommended for the management of powdery mildew (*Erysiphe trifolii)* and clover rot (*Sclerotinia trifoliorum*) in the seed crop of clover.

PPT-25: Validation of entnomopathogenic fungi on insect pests of Lucerne

Recommendation: At Rahuri

- On the basis of 3 years results and one more year validation as and when 20 aphids/tiller noticed on Lucerne, mixture of *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) + *M. anisopliae* @ $1X10^8$ CFU/g (5 g/lit) or *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) alone as a foliar application is recommended for the control of aphids on Lucerne as a ecofriendly treatments.
- For the control of *S. litura* and *H. armigera* as an when 2 larvae per square meter /per running meter appeared on Lucerne, foliar application of mixture of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) + *B. bassiana* @ $1X10^8$ CFU/g (5 g/lit) or *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) alone as ecofirendly treatments are recommended.

D. BREEDER SEED PRODUCTION

The indent for Breeder Seed Production, Indent year Rabi 2016-17; Production year Rabi 2015-16 was received from DAC, GOI for 29 varieties in four forage crops. The quantity allocated was 409.13 q and it comprised of Oat (357.75 q) for 14 varieties, Berseem (46.63 q) for 11 varieties, Lucerne (4.60 q) for 3 varieties and Gobhi Sarson (0.15 q) for one variety. The production of 409.13 q was assigned to eleven Breeder Seed producing centres of the different SAUs/ NGO/ ICAR institutes. In Berseem, the production was 50.8 q (4.17 q surplus) against the allocated quantity of 46.63 q. In Oat, the production was 355.63 q (2.12 q deficit) against the allocation of 357.75 q. in Lucerne, there were 0.74 q deficit in production (3.86 q) with respect to 4.60 q allocation. In Gobhi Sarson, the production was 0.20 q against the allocation of 0.15 q (0.05 q surplus). The overall breeder seed production was 410.49 q against the indent of 409.13 q. HAU, Hisar and JNKVV, Jabalpur in Berseem; NDUAT, Faizabad; BAIF, Urulikanchan; MPKV, Rahuri in oat; AAU, Anand in Lucerne were net deficit seed producer

FODDER TECHNOLOGY DEMONSTRATIONS

A total of 550 FTDs were allocated to different centers to be conducted during Rabi 2015-16. It included 100 FTDs in Berseem, 45 in Lucerne, 220 in oat single cut, 75 in oat multicut, 15 in lathyrus, 25 in rye grass, 20 in spring maize, 5 in Guinea grass, 15 in cowpea, 10 in Hedge Lucerne, 5 in Tall fescue, 15 in napier Bajra hybrid. No extra financial support was provided due to paucity of funds. However, most of the centers conducted FTDs out of their own resources. The FTDs were allocated to 21 centres located in different parts of the country.

TRIBAL SUB-PLAN ACTIVITIES

Tribal sub-plan activities were conducted by 09 centres in eight states. Various activities included training of farmers, awareness and sensitization about forage crops; demonstration of improved cultivars and package of practice; distribution of literature, providing inputs like improved seed, fertilizers, minor farm tools, livestock component etc.

OTHER RELEVANT ACTIVITIES

Scientists in the centre also carried out activities related to human resource development like teaching courses in graduate and post graduate levels, guiding M. Sc. and Ph. D. students; training of stakeholders in the field of fodder and livestock; production and distribution of breeder, foundation and certified/ TFL seeds; disseminating technologies in form of radio, TV talks, popular articles, extension publications; presenting findings in research journals, seminar/symposia etc.

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	S. N.	Location	State/Union Territory
I. Hill States = 3 Locations = 3	1.	Palampur, CSKHPKV	1970	Himachal Pradesh	1.	Almora, VPKAS*	Uttarakhand
	2.	Srinagar, SKUAS&T-K	2010	Jammu & Kashmir			
II. North West States = 5 Locations = 13	3.	Ludhiana, PAU	1989	Punjab	2.	Meerut, SVBPUA&T	Uttar Pradesh
	4.	Hisar, CCS HAU	1970	Haryana	3.	Avikanagar, IGFRI-RRS*	Rajasthan
	5.	Pantnagar, GBPUAT	1995	Uttarakhand	4.	Jodhpur, CAZRI-RRS*	Rajasthan
	6.	Bikaner, SKRAU	1995	Rajasthan	5.	Jalore, AU-ARS, Jodhpur	Rajasthan
					6.	Udaipur, MPUAT	Rajasthan
					7.	Pali-Marwar, CAZRI-RRS*	Rajasthan
					8.	Jaisalmer, CAZRI-RRS*	Rajasthan
					9.	Fatehpur Shekhawati/ARS Sikar	Rajasthan
					10.	Bawal, CCSHAU	Haryana
III. North East States = 8 Locations = 9	7.	Faizabad, NDUAT	1982	Uttar Pradesh	11.	Umiam (Barapani), ICAR Res. Complex for NEH Region*	Meghalaya
	8.	Ranchi, BAU	1970	Jharkhand	12.	Visva Bharti, Shantiniketan Sriniketan	West Bengal
	9.	Kalyani, BCKV	1972	West Bengal			
	10.	Bhubaneswar,OUAT	1987	Orissa			
	11.	Jorhat, AAU	1970	Assam			
	12.	Imphal, CAU	2010	Manipur			
	13.	Pusa, RAU	2015 (Approved)	Bihar			

Zone	Coordinated Centers				Testing Locations		
	S. N.	Location	Establishment Year	State	S. N.	Location	State/Union Territory
IV. Central States = 6 Locations = 10	14.	Anand, AAU	1970	Gujarat	13.	Kanpur, CSAU&T	Uttar Pradesh
	15.	Jabalpur, JNKVV	1970	Madhya Pradesh	14.	Jhansi, IGFRI*	Uttar Pradesh
	16.	Rahuri, MPKV	1971	Maharashtra	15.	Dhari,JAU	Gujarat
	17.	Urulikanchan, BAIF	1982	Maharashtra	16.	Akola, PDKVV	Maharashtra
	18.	Raipur, IGKV	2010	Chhattisgarh	17.	Dapoli & Palghar, DBSKKV	Maharashtra
V. South States = 6 Locations = 7	19.	Mandya, UAS (B)	1986	Karnataka	18.	Dharwad, IGFRI-RRS*	Karnataka
	20.	Coimbatore, TNAU	1976	Tamil Nadu	19.	Pudducherry, PJLNCA & RI, Karaikal	Pudducherry
	21.	Vellayani, KAU	1971	Kerala	20.	Hyderabad , ANGRAU	Andhra Pradesh
	22.	Hyderabad, PJTSAU	1970	Telangana	21.	Raichur, UAS, Raichur	Karnataka

Summary: Zone = 5, States = 24, Coordinating Centres = 22, Testing Locations = 21

*ICAR Institute

AICRP in Forage Crops & Utilization
Coding of varieties for Rabi 2015-16

1. IVT Berseem

Location	Entries	Code
Ludhiana	PC-82	IVTB -1
Hisar	HFB-12-4	IVTB -2
(NC)	Wardan	IVTB -3
(ZC-CZ)	Bundel Berseem-2	IVTB -4
(ZC-NEZ)	Bundel Berseem-3	IVTB -5
(ZC-NWZ)	Bundel Berseem-2	IVTB -6
(NC)	Mescavi	IVTB -7
(ZC-HZ)	BL-22	IVTB -8
Jabalpur	JB-05-9	IVTB -9
Hisar	HFB-12-9	IVTB -10

2. AVT-1 Berseem

Location	Entries	Code
Jabalpur	JB-04-23	AVTB-1
Ludhiana	PC-75	AVTB-2
(NC)	Mescavi	AVTB-3
Jabalpur	JB-4-21	AVTB-4
(ZC-CZ)	Bundel Berseem-2	AVTB-5
(ZC-NWZ)	Bundel Berseem-2	AVTB-6
(NC)	Wardan	AVTB-7

3. IVT Oat (SC)

Location	Entries	Code
Ludhiana	OL-1847	IVTO SC-1
(ZC-NWZ)	OL-125	IVTO SC-2
Faizabad	NDO-911	IVTO SC-3
Meerut	VOS-15-23	IVTO SC-4
Meerut	VOS-15-24	IVTO SC-5
Hisar	HFO-427	IVTO SC-6
Hisar	HFO-529	IVTO SC-7
Ludhiana	OL-1844	IVTO SC-8
Jabalpur	JO-04-22	IVTO SC-9
Jhansi	JHO-15-2	IVTO SC-10
Jhansi	JHO-15-1	IVTO SC-11
Srinagar	SKO-227	IVTO SC-12
(NC)	Kent	IVTO SC-13
(NC)	OS-6	IVTO SC-14
(ZC-NEZ)	JHO-99-2	IVTO SC-15

3. IVT OAT (SC)-Contd

Location	Entries	Code
(ZC-HZ)	SKO-90	IVTO SC-16
(ZC-SZ)	JHO-2000-4	IVTO SC-17
(ZC-CZ)	OS-377	IVTO SC-18
Srinagar	SKO-206	IVTO SC-19

4. AVT Oat -1 (SC)

Location	Entries	Code
Hisar	OS-424	AVTO SC-1-1
Ludhiana	OL-1769-1	AVTO SC-1-2
Ludhiana	OL-1802-1	AVTO SC-1-3
Ludhiana	OL-1766-1	AVTO SC-1-4
Srinagar	SKO-225	AVTO SC-1-5
Jabalpur	JO-04-19	AVTO SC-1-6
(ZC-NWZ)	OL-125	AVTO SC-1-7
Pantnagar	UPO-10-3	AVTO SC-1-8
Hisar	OS-432	AVTO SC-1-9
(NC)	OS-6	AVTO SC-1-10
(NC)	Kent	AVTO SC-1-11
(ZC-HZ)	SKO-90	AVTO SC-1-12
(ZC-CZ)	JHO-822	AVTO SC-1-13

5. AVT Oat -2 (SC)

Location	Entries	Code
Ludhiana	OL-1689	AVTOSC-2-1
(NC)	Kent	AVTOSC-2-2
Srinagar	SKO-199	AVTOSC-2-3
(NC)	OS-6	AVTOSC-2-4
Srinagar	SKO-198	AVTOSC-2-5
Rahuri	RSO-8	AVTOSC-2-6
Srinagar	SKO-196	AVTOSC-2-7
Jabalpur	JO-04-18	AVTOSC-2-8
Hisar	OS-406	AVTOSC-2-9
Ludhiana	OL-1804	AVTOSC-2-10
Rahuri	RO-11-1	AVTOSC-2-11
(ZC-NWZ)	OL-125	AVTOSC-2-12
(ZC-NEZ)	JHO-99-2	AVTOSC-2-13
(ZC-CZ)	JHO-822	AVTOSC-2-14
(ZC-SZ)	JHO-2000-4	AVTOSC-2-15

6. AVT Oat-2 (SC) (Seed)		
Location	**Entries**	**Code**
Jabalpur	JO-04-18	AVTO SC -2-1-Seed
Rahuri	RSO-8	AVTO SC -2-2-Seed
Srinagar	SKO-199	AVTO SC -2-3-Seed
Srinagar	SKO-198	AVTO SC -2-4-Seed
Hisar	OS-406	AVTO SC -2-5-Seed
Ludhiana	OL-1804	AVTO SC -2-6-Seed
Rahuri	RO-11-1	AVTO SC -2-7-Seed
(NC)	Kent	AVTO SC -2-8-Seed
Ludhiana	OL-1689	AVTO SC -2-9-Seed
Srinagar	SKO-196	AVTO SC -2-10-Seed
(NC)	OS-6	AVTO SC -2-11-Seed
(ZC-NWZ)	OL-125	AVTO SC -2-12-Seed
(ZC-NEZ)	JHO-99-2	AVTO SC -2-13-Seed
(ZC-CZ)	JHO-822	AVTO SC -2-14-Seed
(ZC-SZ)	JHO-2000-4	AVTO SC -2-15-Seed
7. AVT Oat-2 (SC) Repeat-(13-14)		
Location	**Entries**	**Code**
Hisar	OS-403	R13-14 AVTO SC -1
(NC)	OS-6	R13-14 AVTO SC -2
(NC)	Kent	R13-14 AVTO SC -3
(ZC-NWZ)	OL-125	R13-14 AVTO SC -4
8. AVT Oat-2 (SC) Repeat -14-15		
Location	**Entries**	**Code**
Jhansi	JHO-2012-2	R14-15 AVTO SC -2-1
Rahuri	RSO-59	R14-15 AVTO SC -2-2
Rahuri	RSO-60	R14-15 AVTO SC -2-3
Pantnagar	UPO-12-1	R14-15 AVTO SC -2-4
Hisar	OS-405	R14-15 AVTO SC -2-5
Srinagar	SKO-190	R14-15 AVTO SC -2-6
Jhansi	JHO-2012-1	R14-15 AVTO SC -2-7
(ZC-HZ)	SKO-90	R14-15 AVTO SC -2-8
Ludhiana	OL-1760	R14-15 AVTO SC -2-9
(NC)	OS-6	R14-15 AVTO SC -2-10
Jabalpur	JO-04-14	R14-15 AVTO SC -2-11

8. AVT Oat -2 (SC) - contd		
Location	**Entries**	**Code**
(NC)	Kent	R14-15 AVTO SC -2-12
(ZC-NWZ)	OL-125	R14-15 AVTO SC -2-13
(ZC-NEZ)	JHO-99-2	R14-15 AVTO SC -2-14
(ZC-CZ)	JHO-822	R14-15 AVTO SC -2-15
(ZC-SZ)	JHO-2000-4	R14-15 AVTO SC -2-16
9. IVTO Oat (MC)		
Location	**Entries**	**Code**
(NC)	RO-19	IVTO MC -1
Ludhiana	OL-1842	IVTO MC -2
Ludhiana	OL-1867	IVTO MC -3
Jabalpur	JO-04-321	IVTO MC -4
Hisar	HFO-514	IVTO MC -5
Jhansi	JHO-15-4	IVTO MC -6
Hisar	HFO-417	IVTO MC -7
Jhansi	JHO-15-3	IVTO MC -8
Palampur	PLP-19	IVTO MC -9
(NC)	Kent	IVTO MC -10
(NC)	UPO-212	IVTO MC -11
Ludhiana	OL-1866	IVTO MC -12
10. AVTO -1 Oat (MC)		
Location	**Entries**	**Code**
Ludhiana	OL-1845	AVTO MC-1-1
Jabalpur	JO-04-319	AVTO MC-1-2
(NC)	Kent	AVTO MC-1-3
(NC)	UPO-212	AVTO MC-1-4
(NC)	RO-19	AVTO MC-1-5
Hisar	OS-414	AVTO MC-1-6
11. AVTO-2 oat (MC)		
Location	**Entries**	**Code**
Ludhiana	OL-1802	AVTO MC -2-1
(NC)	RO-19	AVTO MC -2-2
(NC)	UPO-212	AVTO MC -2-3
(NC)	Kent	AVTO MC -2-4
Jabalpur	JO-4-317	AVTO MC -2-5

12. AVTO-2 (Seed) Oat (MC) -seed		
Location	**Entries**	**Code**
(NC)	UPO-212	AVTO MC -2-1 –seed
Ludhiana	OL-1802	AVTO MC -2-2 –seed
(NC)	Kent	AVTO MC -2-3 –seed
Jabalpur	JO-4-317	AVTO MC -2-4 -seed
(NC)	RO-19	AVTO MC -2-5 –seed
13. AVTO-2 Oat (MC) Repeat 14-15		
Location	**Entries**	**Code**
(NC)	Kent	R14-15 AVTO 2 MC -1
Jabalpur	JO-04-315	R14-15 AVTO 2 MC -2
(NC)	RO-19	R14-15 AVTO 2 MC -3
(NC)	UPO-212	R14-15 AVTO 2 MC -4
14. IVT Oat (Dual)		
Location	**Entries**	**Code**
Ludhiana	OL-1802	IVTO D -1
Faizabad	NDO-1101	IVTO D -2
Ludhiana	OL-1760-1	IVTO D -3
(NC)	RO-19	IVTO D -4
Hisar	HFO-525	IVTO D -5
Jhansi	JHO-15-5	IVTO D -6
Jhansi	JHO-15-6	IVTO D -7
Hisar	HFO-523	IVTO D- 8
Jabalpur	JO-09-509	IVTO D -9
(NC)	UPO-212	IVTO D -10
(NC)	JHO-822	IVTO D -11
15. Lucerne VT Lucerne Perennial – 2013		
Location	**Entries**	**Code**
NC	RL -88	VTLu -1
Anand	Anand -25	VTLu -2
Coimbatore	TNLC -14	VTLu -3
Rahuri	RL-10-2	VTLu -4
Anand	Anand -2	VTLu -5
Urulikanchan	ALP-1-1 (Baif Lucerne -3)	VTLu 6
Anand	Anand 26	VTLu -7

Rabi 2015-16 (Agronomy)		
5(A) Agron. AVT Oat (SC-2): Agronomy		
Location	**Entries**	**Code**
Rahuri	RO-11-1	AVTO SC- 1 -Ag
Jabalpur	JO-04-18	AVTO SC- 2 -Ag
Ludhiana	OL-1689	AVTO SC- 3 -Ag
Srinagar	SKO-198	AVTO SC- 4 -Ag
(NC)	Kent	AVTO SC- 5 -Ag
(NEZ)	JHO-99-2	AVTO SC- 6 -Ag
(SZ)	JHO-2000-4	AVTO SC- 7 -Ag
(CZ)	JHO-822	AVTO SC- 8 -Ag
(NC)	OS-6	AVTO SC- 9 -Ag
(NWZ)	OL-125	AVTO SC- 10 -Ag
Srinagar	SKO-199	AVTO SC- 11 -Ag
Srinagar	SKO-196	AVTO SC- 12 -Ag
Rahuri	RSO-8	AVTO SC- 13 -Ag
Ludhiana	OL-1804	AVTO SC- 14 -Ag
Hisar	OS-406	AVTO SC- 15 -Ag
11 (A) Agron. AVTO-2 (MC): Agronomy		
Location	**Entries**	**Code**
Jabalpur	JO-4-317	AVTO MC - 1 -Ag
(NC)	Kent	AVTO MC - 2 -Ag
(NC)	RO-19	AVTO MC - 3 -Ag
(NC)	UPO-212	AVTO MC - 4 -Ag
Ludhiana	OL-1802	AVTO MC - 5 -Ag

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 two national checks (Wardan and Mescavi) and three zonal checks in respective zones [BL-22 (HZ), BB-2 (NWZ, CZ) and BB-3 (NEZ)] was conducted at 17 centres located in four different zones (HZ, NWZ, NEZ, CZ) of the country.

For green forage yield (q/ha), PC-82 (20.7%) and HFB-12-4 (9.0%) in HZ registered their superiority over best zonal/national checks. In CZ, HFB 12-4 showed superiority of 7.2 % over best check. At national level, HFB-12-4 and HFB-12-9 showed superiority by a margin of 5.4% and 5.3% respectively. In NEZ, none of the entries showed better performance than checks. In NWZ, HFB 12-4, JB 05-9, HFB 12-9 and in CZ, PC-82, JB 05-9, HFB 12-9 showed marginal superiority.

For dry matter yield, entries PC-82 (22.1%), HFB 12-4 (10.9%) in HZ; HFB 12-9 (11.8%) in NWZ; entry HFB 12-4 in CZ showed superiority over the best check. At all India level, entries PC -82 (6.5%), HFB 12-4 (6.8%), HFB 12-9 (6.0%) showed better performance than the checks.

For per day productivity, entry PC-82 ranked first for both GFY and DMY (q/ha/day). Entry JB-05-9 ranked first for the character plant height. For the character leafiness, entries PC-82 and HFB 12-9 ranked best. In quality parameters, all the entries were superior than the checks with entry HFB-12-4 ranking first followed by entry HFB 12-9 for crude protein yield (q/ha). For crude protein percentage, entry JB 05-9 ranked joint first with check Mescavi. For other quality parameters, checks ranked first.

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

(Reference tables 2.1 to 2.6)

An advanced varietal trial in Berseem comprising of three entries along with two national checks (Wardan and Mescavi) and one zonal check (BB-2) was conducted at eleven centres located in two zones (Central and North West).

For green forage yield, entry JB-04-23 ranked best in NWZ (7.0%) and all India (5.5%), other entries showed marginal superiority over checks at NWZ and All India. For dry matter yield, none of the entries were better than check in NWZ, whereas entries JB-04-23 and JB-4-21 showed superiority over checks at Central zone and all India.

In green forage and dry matter production potential (q/ha/day), entry JB -4-21 ranked first. Entry JB-04-23 ranked first for the character plant height. For the character leafiness, entry PC-75 performed better.

In quality parameters, entry JB-4-21 ranked first for crude protein yield (q/ha). For crude protein content (%) entry JB -04-23 ranked first along with check Wardan. For other quality parameters, checks were best performers.

Table 1.1: IVT Berseem: Initial Varietal Trial in Berseem: Green Forage 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	Mee-rut	Udai-pur	Aver-age	Ra-nk	Super-iority%
PC-82	334.1	99.2	216.6	1	20.7	295.0	503.7	362.6	524.0	621.4	461.4	5	
HFB-12-4	301.4	90.1	195.7	2	9.0	315.6	493.3	369.1	553.6	686.4	483.6	2	2.1
JB-05-9	198.1	105.2	151.6	7		392.2	543.7	413.3	566.6	498.5	482.9	3	1.9
HFB-12-9	270.3	82.9	176.6	4		408.0	531.1	380.7	587.0	560.3	493.4	1	4.1
Wardan (NC)	207.7	128.3	168.0	5		304.2	440.0	338.0	479.6	532.7	418.9	7	
Mescavi (NC)	241.4	76.2	158.8	6		347.1	603.3	373.3	525.9	519.4	473.8	4	
BL-22 (ZC-HZ)	247.4	111.6	179.5	3									
Bundel Berseem-2 (ZC-NWZ)						308.7	448.9	308.3	525.9	583.8	435.1	6	
Mean	**257.2**	**99.1**	**178.1**			**338.7**	**509.2**	**363.6**	**537.5**	**571.8**	**464.2**		
CD at 5%	49.9	6.2				61.5	94.6	36.5	16.2	80.5			
CV%	10.9	4.5				10.2	10.9	5.6	5.1	7.9			

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

Entries	North East Zone							Central Zone								All India		
	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Super-iority%
PC-82	290.0	263.9	392.9	91.0	212.0	250.0	2	902.3	399.7	893.8	336.4	311.5	568.7	3	2.1	402.0	3	4.4
HFB-12-4	284.4	180.6	327.0	84.7	231.0	221.5	6	850.1	416.0	902.0	547.9	270.4	597.3	1	7.2	406.1	1	5.4
JB-05-9	317.7	176.0	374.3	79.9	251.0	239.8	4	848.4	277.7	846.7	552.6	281.7	561.4	4	0.7	395.5	4	2.6
HFB-12-9	298.8	180.6	332.8	103.0	259.0	234.8	5	865.2	314.6	789.7	614.4	318.6	580.5	2	4.2	405.7	2	5.3
Wardan (NC)	331.1	212.9	311.9	108.4	244.0	241.7	3	855.1	304.4	771.7	369.3	274.6	515.0	7		365.5	6	
Mescavi (NC)	337.7	162.1	238.4	98.2	239.0	215.1	7	934.3	305.2	799.5	471.7	275.5	557.2	5		385.2	5	
Bundel Berseem-3 (ZC-NEZ)	358.8	185.1	393.5	87.5	242.0	253.4	1											
Bundel Berseem-2 (ZC-CZ)								782.8	225.1	866.1	493.6	276.5	528.8	6				
Mean	**316.9**	**194.4**	**338.7**	**93.2**	**239.7**	**236.6**		**862.6**	**320.4**	**838.5**	**483.7**	**287.0**	**558.4**			**393.3**		
CD at 5%	12.5	2.7	81.4	8.3	21.7			NS	61.5	150.3	39.6	31.4						
CV%	10.6	10.5	13.5	5.1	9.4			6.1	10.8	10.1	4.5	6.4						

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

Entries	Hill Zone					North West Zone					
	Palampur	Srinagar	Average	Rank	Superiority%	Pantnagar	Hisar	Ludhiana	Average	Rank	Superiority%
PC-82	67.1	17.9	42.5	1	22.1	33.0	57.4	58.5	49.6	6	
HFB-12-4	61.1	16.2	38.6	2	10.9	33.7	60.1	60.9	51.6	4	
JB-05-9	40.3	18.9	29.6	7		46.2	64.6	60.1	57.0	2	1.9
HFB-12-9	54.4	14.9	34.7	4		48.9	60.8	77.9	62.5	1	11.8
Wardan (NC)	41.0	23.1	32.0	5		37.4	51.6	62.6	50.5	5	
Mescavi (NC)	48.4	13.7	31.1	6		41.1	67.3	59.2	55.9	3	
BL-22 (ZC-HZ)	49.5	20.1	34.8	3							
Bundel Berseem-2 (ZC-NWZ)						35.8	50.4	45.4	43.9	7	
Mean	**51.7**	**17.8**	**34.8**			**39.5**	**58.9**	**60.7**	**53.0**		
CD at 5%	10.6	3.5				10.0	10.8	11.8			
CV%	11.6	3.0				14.2	10.9	10.9			

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

Entries	North East Zone								Central Zone								All India		
	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Pu-sa	Aver-age	Ra-nk	Superi-ority%	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Superi-ority%
PC-82	54.9	42.4	86.3	18.0	38.0	47.9	2		148.4	80.9	130.4	57.2	67.3	96.8	2	4.9	63.8	2	6.5
HFB-12-4	54.3	31.0	76.1	16.8	41.3	43.9	5		133.7	85.0	126.7	96.9	65.6	101.6	1	10.1	64.0	1	6.8
JB-05-9	59.7	27.5	76.4	16.0	44.8	44.9	4		141.5	62.1	119.7	96.1	54.1	94.7	4	2.4	61.9	4	3.3
HFB-12-9	55.3	27.9	67.1	20.5	46.4	43.4	6		120.7	65.6	114.2	107.3	70.2	95.6	3	3.6	63.5	3	6.0
Wardan (NC)	62.7	35.8	71.0	21.8	43.6	47.0	3		133.6	61.7	110.6	63.6	53.9	84.7	7		58.3	6	
Mescavi (NC)	62.6	26.8	55.4	19.5	42.7	41.4	7		153.8	64.0	115.6	78.4	49.9	92.3	5		59.9	5	
Bundel Berseem-3 (ZC-NEZ)	66.5	28.8	87.7	17.4	43.4	48.7	1												
Bundel Berseem-2 (ZC-CZ)									117.0	47.3	123.5	85.2	52.1	85.0	6				
Mean	**59.4**	**31.4**	**74.3**	**18.6**	**42.9**	**45.3**			**135.5**	**66.7**	**120.1**	**83.5**	**59.0**	**93.0**			**61.9**		
CD at 5%	2.7	7.5	15.3	1.9	4.3				16.1	13.1	23.2	6.8	8.1						
CV%	6.1	13.3	11.6	5.9	10.7				6.7	11.1	11.4	4.5	8.1						

Table 1.3: IVT Berseem: Initial Varietal Trial in Berseem: Green Forage Yield (q/ha/day)

Entries	Hisar	Ludhiana	Kalyani	Ranchi	Faizabad	Bhubaneswar	Raipur	Average	Rank
PC-82	4.04	2.27	2.41	2.36	2.58	1.38	2.71	2.54	1
HFB-12-4	4.07	2.31	2.37	1.68	2.15	1.35	2.27	2.31	6
JB-05-9	4.52	2.58	2.64	1.57	2.46	1.29	2.45	2.50	2
HFB-12-9	4.33	2.38	2.49	1.61	2.18	1.59	2.70	2.47	3
Wardan (NC)	3.67	2.11	2.75	1.82	2.05	1.62	2.29	2.33	5
Mescavi (NC)	4.95	2.33	2.81	1.45	1.56	1.51	2.32	2.42	4
Bundel Berseem-2 (ZC-NWZ)	3.74	1.93							
Bundel Berseem-3 (ZC-NEZ)			2.99	1.65	2.58	1.44			
Bundel Berseem-2 (ZC-CZ)							2.30		
Mean	**4.19**	**2.27**	**2.64**	**1.73**	**2.22**	**1.45**	**2.43**	**2.43**	

Table 1.4: IVT Berseem: Initial Varietal Trial in Berseem: Dry Matter Yield (q/ha/day)

Entries	Hisar	Ludhiana	Kalyani	Ranchi	Faizabad	Bhubaneswar	Raipur	Average	Rank
PC-82	0.46	0.37	0.46	0.38	0.56	0.27	0.59	0.44	1
HFB-12-4	0.49	0.38	0.45	0.28	0.50	0.27	0.55	0.42	3
JB-05-9	0.53	0.38	0.49	0.24	0.50	0.26	0.47	0.41	4
HFB-12-9	0.49	0.49	0.46	0.25	0.44	0.32	0.59	0.43	2
Wardan (NC)	0.43	0.39	0.52	0.32	0.46	0.33	0.45	0.41	4
Mescavi (NC)	0.55	0.37	0.52	0.24	0.36	0.30	0.42	0.39	5
Bundel Berseem-2 (ZC-NWZ)	0.42	0.28							
Bundel Berseem-3 (ZC-NEZ)			0.55	0.26	0.57	0.29			
Bundel Berseem-2 (ZC-CZ)							0.43		
Mean	**0.48**	**0.38**	**0.49**	**0.28**	**0.48**	**0.29**	**0.50**	**0.42**	

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

Entries	Palam-pur	Ludh-iana	His-ar	Kal-yani	Faiza-bad	Bhuban-eswar	Ran-chi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
PC-82	12.4	8.2	12.9	7.3	14.7	3.5	8.0	11.2	18.6	11.0	10.4	10.7	3
HFB-12-4	11.9	8.1	12.8	7.9	12.2	3.1	4.3	12.4	20.0	18.5	10.7	11.1	1
JB-05-9	7.3	7.6	13.7	11.8	12.8	3.2	4.3	8.8	17.3	18.5	9.2	10.4	4
HFB-12-9	8.9	10.0	13.3	9.7	11.7	4.0	4.3	9.9	15.8	20.6	11.3	10.9	2
Wardan (NC)	7.3	8.2	11.1	10.3	15.0	4.3	5.3	9.9	15.5	12.1	8.3	9.8	5
Mescavi (NC)	9.3	9.1	14.6	8.7	9.4	3.9	4.8	10.0	16.0	15.0	7.4	9.8	5
BL-22 (ZC-HZ)	9.4												
Bundel Berseem-2 (ZC-NWZ)		7.2	10.9										
Bundel Berseem-3 (ZC-NEZ)				8.9	14.9	3.3	5.4						
Bundel Berseem-2 (ZC-CZ)								7.0	17.6	16.6	8.6		
Mean	**9.5**	**8.3**	**12.7**	**9.2**	**13.0**	**3.6**	**5.2**	**9.9**	**17.3**	**16.0**	**9.4**	**10.4**	

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

Entries	Palam-pur	Ludhi-ana	His-ar	Kal-yani	Faiza-bad	Bhuban-eswar	Ran-chi	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Aver-age	Ra-nk
PC-82	18.5	14.0	22.5	13.2	17.0	19.2	18.8	13.9	19.2	14.3	15.4	16.9	2
HFB-12-4	19.5	13.3	21.4	14.5	17.2	18.5	14.0	14.6	19.1	16.3	16.3	16.8	3
JB-05-9	18.1	12.6	21.6	19.9	16.8	19.8	15.8	14.2	19.3	14.4	16.9	17.2	1
HFB-12-9	16.3	12.8	22.0	17.6	17.5	19.3	15.3	15.2	19.2	13.8	16.1	16.8	3
Wardan (NC)	17.8	13.1	21.9	16.5	17.1	19.7	14.9	16.0	19.1	11.1	15.4	16.6	4
Mescavi (NC)	19.3	15.4	22.2	14.0	16.9	19.8	17.9	15.6	19.1	13.8	14.9	17.2	1
BL-22 (ZC-HZ)	19.0												
Bundel Berseem-2 (ZC-NWZ)		15.9	22.2										
Bundel Berseem-3 (ZC-NEZ)				13.4	17.0	18.8	18.8						
Bundel Berseem-2 (ZC-CZ)								14.9	19.5	14.3	16.4		
Mean	**18.4**	**13.9**	**22.0**	**15.6**	**17.1**	**19.3**	**16.5**	**14.9**	**19.2**	**14.0**	**15.9**	**16.9**	

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

Entries	Palam-pur	Sri-nagar	Pant-nagar	His-ar	Ludh-iana	Udai-pur	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
PC-82	39.4	61.9	48.3	57.7	40.8	45.9	65.3	31.2	53.4	67.4	52.6	50.4	59.9	61.2	52.5	5
HFB-12-4	44.1	56.2	47.1	51.2	41.8	48.0	61.5	48.3	57.8	62.5	53.4	54.8	59.3	62.0	53.4	3
JB-05-9	40.2	65.5	51.5	57.1	58.0	47.7	65.0	42.1	55.4	61.3	57.9	49.3	57.6	62.6	55.1	1
HFB-12-9	40.8	51.7	50.1	58.6	45.6	43.0	57.9	40.8	57.8	70.6	53.4	42.6	58.4	64.0	52.5	4
Wardan (NC)	36.4	80.1	48.9	47.8	37.7	44.8	64.1	48.8	59.5	74.6	54.2	40.9	62.9	62.2	54.5	2
Mescavi (NC)	40.6	47.6	48.5	60.9	39.1	42.0	61.0	42.8	51.8	69.5	55.3	46.2	54.0	66.3	51.8	6
BL-22 (ZC-HZ)	36.9	69.6														
Bundel Berseem-2 (ZC-NWZ)			47.9	48.5	31.4	42.8										
Bundel Berseem-3 (ZC-NEZ)							61.2	51.6	55.7	64.3						
Bundel Berseem-2 (ZC-CZ)											50.0	51.4	56.1	57.1		
Mean	**39.8**	**61.8**	**48.9**	**54.5**	**42.1**	**44.9**	**62.3**	**43.7**	**55.9**	**67.2**	**53.8**	**47.9**	**58.3**	**62.2**	**53.3**	

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

Entries	Palam-pur	Sri-nagar	Hi-sar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad	Bhuba-neswar	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
PC-82	0.63	0.88	1.08	1.15	0.90	0.81	0.72	0.98	0.65	0.67	0.64	0.50	0.80	1
HFB-12-4	0.59	0.78	1.04	1.01	0.80	0.90	0.75	0.87	0.72	0.70	0.85	0.51	0.79	2
JB-05-9	0.49	0.86	0.99	1.00	0.83	0.89	0.72	0.81	0.73	0.51	0.62	0.46	0.74	4
HFB-12-9	0.49	0.95	1.06	0.95	0.87	0.91	0.70	1.05	0.83	0.41	0.79	0.54	0.80	1
Wardan (NC)	0.60	0.87	1.01	1.00	0.90	0.87	0.77	1.08	0.72	0.40	0.60	0.52	0.78	3
Mescavi (NC)	0.58	0.99	0.95	1.15	0.86	0.86	0.68	0.92	0.70	0.47	0.70	0.49	0.78	3
BL-22 (ZC-HZ)	0.53	1.17												
Bundel Berseem-2 (ZC-NWZ)			0.99	1.20										
Bundel Berseem-3 (ZC-NEZ)					0.93	0.83	0.69	0.84						
Bundel Berseem-2 (ZC-CZ)									0.81	0.57	0.75	0.59		
Mean	**0.56**	**0.93**	**1.02**	**1.07**	**0.87**	**0.87**	**0.72**	**0.94**	**0.74**	**0.53**	**0.71**	**0.52**	**0.78**	

Table 1.9: IVT Berseem: Initial Varietal Trial in Berseem: ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries	ADF (%)		NDF (%)		IVDMD (%)				DDM (q/ha)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Hisar	Average	Rank	Hisar	Rank
PC-82	41.5	1	51.6	2	62.0	66.4	64.2	2	39.2	4
HFB-12-4	46.0	4	60.3	5	62.8	63.6	63.2	5	39.1	5
JB-05-9	46.6	6	61.3	6	61.0	64.9	63.0	6	43.1	2
HFB-12-9	46.1	5	61.9	7	61.3	64.2	62.8	7	40.2	3
Wardan (NC)	45.3	3	59.8	4	61.3	66.5	63.9	4	35.2	6
Mescavi (NC)	42.0	2	52.1	3	63.6	64.4	64.0	3	44.6	1
Bundel Berseem-2 (ZC-NWZ)	41.5	1	49.1	1	64.1	64.8	64.4	1	33.9	7

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

Entries	North West Zone									Central Zone								All India		
	Bika-ner	His-ar	Ludh-iana	Udai-pur	Mee-rut	*Jal-ore	Aver-age	Ra-nk	Super-iority%	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
JB-04-23	129.3	563.9	361.1	819.1	583.1	137.3	491.3	1	7.0	895.0	373.5	820.3	641.9	333.2	612.8	1	2.4	552.0	1	5.5
PC-75	136.2	505.0	386.4	809.3	483.1	95.3	464.0	3	1.1	923.6	334.1	884.8	604.5	305.4	610.5	2	1.9	537.2	2	2.7
JB-4-21	113.0	575.0	328.0	870.3	489.4	139.3	475.1	2	3.5	797.4	325.2	898.4	618.0	345.9	597.0	4		536.1	3	2.5
Wardan (NC)	123.7	590.3	315.5	758.7	444.6	117.3	446.6	6		783.5	295.2	890.0	607.3	319.8	579.1	5		512.8	5	
Mescavi (NC)	128.2	561.1	352.9	807.8	388.4	85.8	447.7	5		851.4	333.0	962.9	542.9	303.2	598.7	3		523.2	4	
Bundel Berseem-2 (ZC-NWZ)	120.6	625.0	353.4	737.8	458.2	114.8	459.0	4												
Bundel Berseem-2 (ZC-CZ)										736.7	286.7	751.6	535.9	263.7	514.9	6				
Mean	**125.2**	**570.0**	**349.6**	**800.5**	**474.5**	**114.9**	**463.9**			**831.2**	**324.6**	**868.0**	**591.8**	**311.9**	**585.5**			**532.3**		
CD at 5%	NS	94.3	31.5	93.5	34.9	36.9				119.0	39.4	147.5	39.7	28.3						
CV%	11.8	9.7	6.0	6.7	4.9	27.6				9.5	8.1	11.3	4.4	6.2						

Note: * Not included in zonal and all India average due to CV≥ 20

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

Entries	North West Zone					Central Zone								All India		
	Bika-ner	His-ar	Ludh-iana	Avera-ge	Ra-nk	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Superi-ority%
JB-04-23	31.0	66.6	57.3	51.6	5	165.6	79.9	119.2	107.9	73.5	109.2	1	7.4	87.6	1	4.8
PC-75	29.8	57.5	77.5	54.9	2	151.8	68.3	129.8	99.0	59.8	101.7	3		84.2	3	0.7
JB-4-21	27.9	69.6	62.0	53.2	3	139.9	69.0	131.4	103.1	90.4	106.7	2	4.9	86.7	2	3.7
Wardan (NC)	29.7	67.8	62.6	53.4	4	143.7	61.4	130.3	99.7	73.3	101.7	3		83.6	4	
Mescavi (NC)	29.5	63.8	61.2	51.5	6	147.5	68.5	142.7	90.3	57.5	101.3	4		82.6	5	
Bundel Berseem-2 (ZC-NWZ)	27.6	72.1	71.2	57.0	1											
Bundel Berseem-2 (ZC-CZ)						133.9	56.0	109.6	86.9	66.8	90.6	5				
Mean	**29.2**	**66.2**	**65.3**	**53.6**		**147.1**	**67.2**	**127.2**	**97.8**	**70.2**	**101.9**			**84.9**		
CD at 5%	NS	12.2	7.0			17.5	8.0	21.0	6.5	5.7						
CV%	11.9	10.9	7.1			7.9	7.9	11.0	4.4	6.4						

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

Entries	GFY (q/ha/day)						DMY (q/ha/day)					
	Bika-ner	His-ar	Ludh-iana	Rai-pur	Aver-age	Ra-nk	Bika-ner	His-ar	Ludh-iana	Rai-pur	Aver-age	Ra-nk
JB-04-23	0.86	4.53	2.29	2.58	2.57	2	0.21	0.58	0.36	0.57	0.43	3
PC-75	0.90	4.05	2.45	2.42	2.46	5	0.20	0.50	0.49	0.47	0.42	4
JB-4-21	0.75	4.68	2.08	2.88	2.60	1	0.18	0.60	0.39	0.75	0.48	1
Wardan (NC)	0.82	4.84	2.00	2.40	2.52	4	0.20	0.59	0.40	0.55	0.44	2
Mescavi (NC)	0.85	4.51	2.23	2.55	2.54	3	0.20	0.55	0.39	0.48	0.41	5
Bundel Berseem-2 (ZC-NWZ)	0.80	5.08	2.24				0.18	0.62	0.45			
Bundel Berseem-2 (ZC-CZ)				2.09						0.53		
Mean	**0.83**	**4.62**	**2.22**	**2.49**	**2.53**		**0.20**	**0.57**	**0.41**	**0.56**	**0.43**	

Table 2.4: AVTB-1: First Advanced Varietal Trial in Berseem: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	Crude Protein Yield (q/ha)									Crude Protein (%)								
	Bika-ner	Ludh-iana	His-ar	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Bika-ner	Ludh-iana	His-ar	Rah-uri	Urulikan-chan	Jabal-pur	Rai-pur	Aver-age	Ra-nk
JB-04-23	6.2	8.0	5.8	12.6	17.1	21.5	11.4	11.8	2	20.0	14.0	21.7	15.8	20.0	14.3	15.5	17.3	1
PC-75	5.8	9.8	6.0	10.3	18.6	19.8	8.5	11.3	4	19.5	12.6	21.8	15.1	20.0	14.3	14.3	16.8	4
JB-4-21	5.3	8.6	5.8	10.3	19.0	20.5	13.9	11.9	1	18.9	13.8	21.4	15.0	19.9	14.5	15.4	17.0	3
Wardan (NC)	6.0	9.0	6.3	9.5	18.7	19.8	11.6	11.5	3	20.1	14.3	21.4	15.4	19.9	14.4	15.8	17.3	1
Mescavi (NC)	5.9	7.9	6.5	10.0	20.7	18.0	9.0	11.1	5	20.1	12.9	22.0	14.6	19.9	14.5	15.6	17.1	2
Bundel Berseem-2 (ZC-NWZ)	5.4	9.7	6.5							19.6	13.6	21.3						
Bundel Berseem-2 (ZC-CZ)				8.8	15.6	17.2	11.1						15.6	19.8	14.2	16.6		
Mean	**5.8**	**8.8**	**6.1**	**10.2**	**18.3**	**19.5**	**10.9**	**11.5**		**19.7**	**13.5**	**21.6**	**15.2**	**19.9**	**14.4**	**15.5**	**17.1**	

Table 2.5: AVTB-1: First Advanced Varietal Trial in Berseem: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)										Leaf Stem Ratio									
	Bika-ner	His-ar	Ludh-iana	Udai-pur	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk	Bika-ner	His-ar	Ludh-iana	Rah-uri	Jabal-pur	Urulikan-chan	Rai-pur	Aver-age	Ra-nk
JB-04-23	52.3	60.0	36.5	59.2	59.9	42.9	54.0	61.0	53.2	1	0.70	1.07	1.31	0.70	0.40	0.64	0.66	0.78	5
PC-75	49.0	54.0	45.6	47.7	54.0	47.3	60.5	59.6	52.2	4	1.00	0.97	1.45	0.79	0.50	0.86	0.76	0.90	1
JB-4-21	45.0	58.5	29.6	57.6	60.4	50.0	64.6	57.5	52.9	3	0.99	1.00	1.05	0.85	0.61	0.74	0.61	0.84	2
Wardan (NC)	46.3	57.9	31.5	54.2	57.8	44.1	55.0	61.0	51.0	5	1.23	0.91	0.85	0.81	0.54	0.67	0.53	0.79	4
Mescavi (NC)	55.0	56.8	34.1	46.6	58.5	55.7	53.9	63.3	53.0	2	1.03	1.06	0.95	0.80	0.69	0.62	0.55	0.81	3
Bundel Berseem-2 (ZC-NWZ)	37.7	55.7	34.2	50.3							1.22	0.86	1.25						
Bundel Berseem-2 (ZC-CZ)					58.9	41.0	61.7	65.2						0.78	0.31	0.72	0.51		
Mean	**47.6**	**57.1**	**35.3**	**52.6**	**58.3**	**46.8**	**58.3**	**61.3**	**52.5**		**1.03**	**0.98**	**1.14**	**0.79**	**0.51**	**0.71**	**0.60**	**0.83**	

Table 2.6: AVTB-1: First Advanced Varietal Trial in Berseem: ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries	ADF (%)				NDF (%)				IVDMD (%)					DDM (q/ha)	
	Rah-uri	Ludh-iana	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Aver-age	Ra-nk	Rah-uri	His-ar	Ludh-iana	Aver-age	Ra-nk	His-ar	Ra-nk
JB-04-23	34.2	42.0	38.1	3	53.4	42.1	47.7	5	61.9	62.8	66.4	63.7	4	15.8	5
PC-75	32.8	47.1	39.9	5	58.9	33.0	46.0	2	63.0	65.1	61.2	63.1	5	16.7	4
JB-4-21	29.8	45.6	37.7	2	57.6	36.1	46.8	4	65.3	62.0	64.1	63.8	3	16.7	4
Wardan (NC)	23.3	42.8	33.0	1	50.6	30.3	40.4	1	70.4	63.2	67.1	66.9	1	18.4	3
Mescavi (NC)	30.9	48.1	39.5	4	60.1	33.2	46.6	3	64.5	64.9	63.6	64.3	2	18.6	2
Bundel Berseem-2 (ZC-NWZ)		44.3			56.3					63.8	63.4			19.0	1
Bundel Berseem-2 (ZC-CZ)	30.4					35.4			64.8						
Mean	**30.2**	**45.0**	**37.6**		**56.2**	**35.0**	**45.5**		**65.0**	**63.6**	**64.3**	**64.4**		**17.5**	

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

(Reference tables 3.1 to 3.9)

In Oat (single cut), twelve entries along with two national checks namely OS-6 and Kent and five zonal checks *viz.*, SKO-90 (HZ), OL-125 (NWZ), JHO-99-2 (NEZ), OS-377 (CZ) and JHO-2000-4 (SZ) for respective zones were evaluated in initial varietal trial at 28 locations across the five zones in the country.

For green forage yield (q/ha), entries JHO-15-1 (12.2%), HFO-427 (8.0%), VOS-15-24 (6.0%), SKO-227 (5.6%), OL 1844 (5.3%) in Hill zone; entries HFO-529 (9.5%), OL-1844 (7.4%), JO -04-22 (6.5%), SKO-227 (5.1%) in NWZ ; entries JO-04-22 (18.3%), OL-1844 (11.5%), HFO-529 (9.1%) in NEZ; entry OL-1844 in SZ exhibited superiority over best national/zonal check. In central zone, none of the entries could surpass best zonal check. Other entries were either inferior to or showed marginal superiority over best national/zonal check. At national level, entries OL-1844 (9.1%), JO-04-22 (7.4%), HFO-529 (5.9%) were superior to checks.

For dry matter yield (q/ha), entries JHO 15-1 (12.5%),SKO-227 (8.1%), OL-1844 (6.3%), HFO-427 (6.0%), JO-04-22 (5.1%), VOS-15-24 (4.9%) in Hill zone; HFO-529 (8.8%), OL-1844 (7.4%), JO-04-22 (7.3%), JHO-15-1 (6.2%) in NWZ; JO-04-22 (20.5%), HFO-529 (10.6%), OL-1844 (7.9%) in NEZ exhibited superiority over checks. In SZ and CZ the checks were superior or marginally inferior to a few entries. At national level, JO-04-22 (9.2%) was best performer.

For fodder production potential (q/ha/day), OL-1844 followed by HFO-529 for green forage yield and JO-04-22 followed by HFO-529 for dry matter yield were best performers. For plant height, VOS 15-24 was adjudged best performer. For the character leafiness (L/S ratio), entry JHO-15-1 followed by JO-04-22 performed better.

For quality parameters, entry JO-04-22 along with check OS-6 ranked joint first for crude protein yield (q/h), whereas SKO-227 and JHO 15-1 ranked first for crude protein (%). For other quality parameters, checks showed superiority for ADF, NDF and DDM, whereas for IVDMD (%), SKO-206 followed by JO-04-22 registered superiority over best check.

Table 3.1: 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	Alm-ora	Aver-age	Ra-nk	Superi-ority%	Bika-ner	Jal-ore	His-ar	Ludh-iana	Pant-nagar	Dha-ri	Mee-rut	Aver-age	Ra-nk	Superi-ority%
OL-1847	259.7	411.9	112.4	261.3	6	4.1	218.8	186.1	337.0	434.0	519.6	212.9	407.4	330.8	8	1.4
NDO-911	228.8	423.5	90.4	247.6	11		257.8	189.3	251.9	365.4	437.8	191.3	472.2	309.4	14	
VOS-15-23	230.4	415.1	112.1	252.5	9	0.6	280.9	162.3	425.9	440.6	391.1	173.3	466.6	334.4	7	2.5
VOS-15-24	253.3	452.6	92.8	266.2	4	6.0	288.9	123.7	285.2	359.6	458.2	182.8	474.0	310.3	13	
HFO-427	282.1	424.4	107.7	271.4	2	8.0	334.4	138.0	407.4	448.4	436.3	139.6	459.2	337.6	5	3.5
HFO-529	268.3	418.9	93.3	260.2	7	3.6	407.0	158.7	422.2	417.3	433.0	188.1	474.0	357.2	1	9.5
OL-1844	261.4	436.7	94.8	264.3	5	5.3	403.9	181.7	381.5	401.1	426.3	209.6	448.1	350.3	2	7.4
JO-04-22	266.1	428.9	85.2	260.1	8	3.6	325.0	140.7	363.0	397.2	409.3	352.0	444.4	347.4	3	6.5
JHO-15-2	231.5	405.0	102.5	246.3	13		262.4	125.3	444.4	364.9	430.0	269.0	418.5	330.7	9	1.3
JHO-15-1	277.3	479.0	89.1	281.8	1	12.2	311.6	147.3	455.6	409.7	368.2	184.6	481.4	336.9	6	3.2
SKO-227	228.3	492.7	75.1	265.3	3	5.6	125.2	129.7	185.2	377.2	379.6	143.9	359.2	242.9	4	5.1
SKO-206	236.3	400.2	51.6	229.4	15		164.6	101.7	344.4	55.3	333.3	170.2	336.6	215.2	15	
Kent (NC)	242.1	395.3	70.1	235.9	14		323.8	178.0	318.5	466.7	421.9	182.7	392.6	326.3	10	
OS-6 (NC)	244.3	445.4	63.7	251.1	10		266.3	90.0	448.2	318.2	441.9	169.2	496.2	318.6	12	
SKO-90 ZC(HZ)	262.4	403.7	74.6	246.9	12											
OL-125 ZC(NWZ)							291.8	146.2	318.5	365.9	434.8	204.7	507.4	324.2	11	
Mean	**251.5**	**428.9**	**87.7**	**256.0**			**284.2**	**146.6**	**359.3**	**374.8**	**421.4**	**198.3**	**442.5**	**318.1**		
CD at 5%	NS	26.2	4.4				85.7	5.6	60.3	55.6	138.2	26.9	44.2			
CV%	10.7	6.4	4.7				18.0	9.3	9.9	8.9	19.6	7.9	6.0			

Table 3.1: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	North East Zone										Central Zone								
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Superi-ority%	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
OL-1847	288.1	470.6	201.3	231.1	466.0	416.5	382.1	350.8	5	3.18	434.8	424.4	507.7	294.9	444.4	356.7	298.8	394.5	12
NDO-911	189.3	493.3	218.6	222.3	400.0	254.4	605.4	340.5	7	0.15	394.7	399.9	542.9	273.2	346.7	391.4	285.9	376.4	13
VOS-15-23	274.8	489.4	229.9	222.3	416.0	297.1	540.7	352.9	4	3.8	499.5	379.4	508.8	282.3	433.3	485.8	340.0	418.4	10
VOS-15-24	227.8	438.6	207.3	231.1	433.0	235.2	563.5	333.8	10		440.9	395.7	554.6	244.7	587.8	506.6	289.9	431.5	9
HFO-427	261.1	426.5	222.6	231.1	450.0	250.1	460.7	328.9	13		551.9	402.1	599.4	254.0	605.2	509.4	279.9	457.4	2
HFO-529	333.6	502.1	257.9	235.6	450.0	402.7	415.6	371.1	3	9.1	505.7	384.5	621.3	226.5	419.7	553.8	313.5	432.1	8
OL-1844	252.4	505.3	214.0	240.0	407.0	492.8	541.6	379.0	2	11.5	481.0	491.0	556.2	236.4	468.1	544.1	340.6	445.4	4
JO-04-22	309.7	538.6	227.3	235.6	400.0	406.9	697.7	402.3	1	18.3	567.3	358.3	501.3	217.9	447.4	594.0	380.2	438.1	6
JHO-15-2	215.6	456.0	224.6	257.7	300.0	345.6	507.6	329.6	12		373.1	407.1	500.2	294.8	428.0	521.8	278.8	400.5	11
JHO-15-1	323.8	508.0	220.6	257.7	409.0	313.1	412.3	349.2	6	2.7	431.7	491.7	465.6	240.6	578.0	512.1	412.0	447.4	3
SKO-227	206.6	444.2	211.3	173.3	213.0	280.5	283.7	259.0	15		354.6	271.4	556.8	255.1	491.0	435.8	150.1	359.3	14
SKO-206	169.7	481.3	233.1	164.4	416.0	277.3	419.6	308.8	14		169.6	201.2	177.1	236.7	431.5	272.0	283.7	253.1	15
Kent (NC)	179.5	537.3	200.0	248.9	250.0	319.5	610.6	335.1	9		400.8	456.8	626.6	256.9	552.0	569.1	251.0	444.7	5
OS-6 (NC)	240.3	460.0	217.3	240.0	333.0	322.7	504.0	331.0	11		419.3	397.8	657.6	248.4	481.0	491.3	332.0	432.5	7
JHO-99-2 ZC(NEZ)	296.7	476.0	217.3	222.3	383.0	266.7	518.2	340.0	8										
OS-377 ZC(CZ)											496.4	523.1	606.4	264.0	470.0	576.0	293.5	461.3	1
Mean	**251.3**	**481.8**	**220.2**	**227.6**	**381.7**	**325.4**	**497.6**	**340.8**			**434.8**	**399.0**	**532.2**	**255.1**	**478.9**	**488.0**	**302.0**	**412.8**	
CD at 5%	4.3	17.6	19.7	35.7	41.7	72.8	28.6				15.4	67.3	71.1	12.1	43.1	92.7	31.1		
CV%	4.2	5.6	5.3	9.3	8.9	13.4	4.9				9.2	10.1	8.0	2.7	5.4	11.3	6.0		

Table 3.1: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	South Zone							All India		
	Hyderabad	Mandya	Coimbatore	Mattupetty	Average	Rank	Superiority%	Average	Rank	Superiority%
OL-1847	306.6	258.4	357.4	117.2	259.9	2	1.0	334.2	8	
NDO-911	256.4	257.9	235.2	126.3	219.0	12		314.4	12	
VOS-15-23	275.6	200.2	325.9	158.5	240.0	8		337.8	6	1.0
VOS-15-24	252.0	255.4	313.0	103.3	230.9	10		330.4	10	
HFO-427	245.3	356.0	314.8	95.2	252.8	5		346.2	5	3.5
HFO-529	268.2	363.7	237.0	148.9	254.5	4		354.3	3	5.9
OL-1844	232.2	343.3	417.8	200.0	298.3	1	15.8	364.6	1	9.1
JO-04-22	268.2	265.8	285.2	143.3	240.6	7		359.2	2	7.4
JHO-15-2	221.1	214.5	222.2	133.3	197.8	13		319.8	11	
JHO-15-1	220.4	309.2	242.6	165.9	234.5	9		347.1	4	3.8
SKO-227	166.5	172.6	259.3	128.5	181.7	15		269.7	13	
SKO-206	160.7	270.4	255.6	86.2	193.2	14		246.4	14	
Kent (NC)	238.9	236.6	288.9	145.2	227.4	11		334.3	7	
OS-6 (NC)	215.3	296.2	344.4	137.0	248.2	6		332.9	9	
JHO-2000-4 ZC(SZ)	230.8	271.3	388.9	138.5	257.4	3				
Mean	**237.2**	**271.4**	**299.2**	**135.2**	**235.8**			**327.9**		
CD at 5%	61.6	46.2	54.2	18.6						
CV%	15.8	10.2	10.8	8.8						

Table 3.2: 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	Alm-ora	Aver-age	Ra-nk	Superi-ority%	Bika-ner	His-ar	Ludh-iana	Dha-ri	Pant-nagar	Aver-age	Ra-nk	Superi-ority%
OL-1847	51.1	106.3	18.0	58.5	8	3.1	68.9	69.6	93.3	83.3	58.3	74.7	12	
NDO-911	45.8	108.3	15.3	56.5	11		93.1	54.1	73.0	81.4	59.3	72.2	13	
VOS-15-23	45.8	106.0	20.2	57.3	9	1.1	91.1	82.9	90.3	76.6	48.9	78.0	10	
VOS-15-24	50.4	112.4	15.8	59.5	6	4.9	105.3	63.7	77.3	81.6	49.6	75.5	11	
HFO-427	55.9	107.1	17.2	60.1	4	6.0	117.3	76.4	95.9	65.7	50.9	81.2	7	
HFO-529	52.7	105.5	17.8	58.6	7	3.4	128.5	92.6	89.4	76.5	58.4	89.1	1	8.8
OL-1844	52.5	111.2	17.1	60.3	3	6.3	134.7	76.4	86.9	90.7	51.3	88.0	2	7.4
JO-04-22	53.6	108.1	17.0	59.6	5	5.1	103.9	62.9	84.2	134.1	54.3	87.9	3	7.3
JHO-15-2	45.7	102.8	19.6	56.0	12		83.9	92.0	79.7	111.0	56.3	84.6	5	3.3
JHO-15-1	54.1	122.3	15.2	63.8	1	12.5	98.4	90.8	88.8	111.6	45.5	87.0	4	6.2
SKO-227	44.5	125.9	13.5	61.3	2	8.1	47.6	52.4	79.8	73.1	49.0	60.4	14	
SKO-206	47.3	102.3	9.8	53.1	14		52.4	45.9	11.0	61.3	46.6	43.4	15	
Kent (NC)	47.0	99.9	11.2	52.7	15		109.5	67.9	103.3	72.7	56.2	81.9	6	
OS-6 (NC)	48.5	111.0	10.8	56.7	10		103.0	98.6	67.6	71.3	53.7	78.8	8	
SKO-90 ZC(HZ)	51.8	100.8	13.4	55.3	13									
OL-125 ZC(NWZ)							101.4	70.8	81.1	81.4	58.7	78.7	9	
Mean	**49.8**	**108.6**	**15.5**	**58.0**			**95.9**	**73.1**	**80.1**	**84.8**	**53.1**	**77.4**		
CD at 5%	NS	8.0	2.6				29.8	20.0	15.8	12.2	10.8			
CV%	10.6	4.1	10.0				18.6	16.1	11.8	8.6	12.2			

Table 3.2: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	North East Zone										Central Zone									
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Superi-ority%	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority%
OL-1847	55.7	68.7	42.0	51.1	91.7	96.0	69.5	67.8	5	2.1	83.1	83.8	76.1	86.7	85.7	79.5	69.4	80.6	12	
NDO-911	32.9	70.5	45.4	52.3	78.9	62.4	114.5	65.3	7		67.5	94.5	99.6	75.6	45.8	87.6	61.6	76.0	13	
VOS-15-23	53.1	74.8	47.7	50.5	82.7	73.3	90.8	67.6	4	1.8	85.4	86.1	88.3	81.1	88.4	112.3	115.7	93.9	5	
VOS-15-24	35.2	65.8	43.7	59.2	85.4	57.4	107.4	64.9	9		89.4	75.3	89.1	71.5	104.6	116.9	87.0	90.5	9	
HFO-427	49.3	62.2	46.7	52.0	89.4	68.8	85.7	64.9	9		98.4	94.1	66.3	70.8	115.0	118.1	91.2	93.4	6	
HFO-529	62.6	71.8	53.4	56.5	89.8	97.1	83.6	73.5	2	10.6	95.8	78.1	112.4	66.5	60.8	130.3	68.5	87.5	11	
OL-1844	44.9	70.7	43.7	59.9	80.3	108.3	93.9	71.7	3	7.9	92.1	94.5	99.7	72.8	56.6	120.0	83.3	88.4	10	
JO-04-22	58.8	80.8	48.2	46.5	78.9	105.6	141.1	80.0	1	20.5	104.4	81.1	97.9	66.8	97.1	140.2	114.8	100.3	1	1.1
JHO-15-2	43.0	63.8	45.4	60.9	59.6	61.3	108.0	63.2	10		80.0	90.1	89.0	84.0	104.0	122.5	69.7	91.3	8	
JHO-15-1	61.8	79.2	45.6	55.6	80.4	58.9	75.9	65.3	7		83.5	99.7	80.5	74.2	76.9	119.3	117.7	93.1	7	
SKO-227	37.2	69.3	43.5	44.7	42.0	65.1	39.7	48.8	13		65.7	49.1	67.7	78.2	55.9	97.8	52.3	66.7	14	
SKO-206	32.2	75.1	48.3	32.8	81.9	70.1	82.5	60.4	12		28.5	46.8	29.1	73.5	75.9	60.1	86.3	57.2	15	
Kent (NC)	34.5	76.8	41.4	60.9	49.3	73.1	100.1	62.3	11		83.9	101.2	105.0	78.9	85.6	134.0	97.7	98.0	3	
OS-6 (NC)	46.1	67.1	44.9	59.5	65.4	72.5	109.5	66.4	6		80.2	79.6	122.9	75.4	86.1	113.4	102.4	94.3	4	
JHO-99-2 ZC(NEZ)	55.9	72.8	46.1	44.0	75.3	70.9	89.8	65.0	8											
OS-377 ZC(CZ)											81.1	100.6	105.6	82.1	97.2	136.0	91.8	99.2	2	
Mean	**46.9**	**71.3**	**45.7**	**52.4**	**75.4**	**76.1**	**92.8**	**65.8**			**81.3**	**83.6**	**88.6**	**75.9**	**82.4**	**112.5**	**87.3**	**87.4**		
CD at 5%	2.5	3.4	4.3	11.6	11.4	29.7	9.0				14.7	14.0	10.9	4.4	7.3	22.5	9.1			
CV%	5.7	9.4	5.5	13.2	9.7	11.3	8.2				8.8	10.0	7.3	1.9	5.3	12.9	6.1			

Table 3.2: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	South Zone							All India		
	Hyderabad	Mandya	Coimbatore	Mattupetty	Average	Rank	Superiority%	Average	Rank	Superiority%
OL-1847	60.2	52.5	78.4	24.0	53.8	1	2.5	69.3	11	
NDO-911	47.9	49.1	50.0	30.3	44.3	10		65.3	12	
VOS-15-23	47.3	36.4	63.2	26.2	43.3	12		71.7	8	
VOS-15-24	43.4	45.3	58.4	28.5	43.9	11		70.0	10	
HFO-427	42.7	69.0	57.7	31.7	50.3	4		72.9	6	
HFO-529	50.1	84.7	46.8	30.0	52.9	2	0.8	75.4	2	3.2
OL-1844	42.6	63.5	67.6	24.3	49.5	5		74.6	3	2.2
JO-04-22	51.3	56.9	59.7	23.0	47.7	9		79.7	1	9.2
JHO-15-2	42.6	51.3	39.1	29.3	40.6	13		70.6	9	
JHO-15-1	49.6	65.4	53.2	25.7	48.5	8		74.2	4	1.6
SKO-227	35.0	39.4	62.4	38.7	43.9	11		56.5	13	
SKO-206	35.4	28.2	54.4	25.2	35.8	14		51.6	14	
Kent (NC)	43.6	62.4	62.5	27.2	48.9	6		72.5	7	
OS-6 (NC)	48.1	69.8	64.4	27.7	52.5	3		73.0	5	
JHO-2000-4 ZC(SZ)	42.1	58.8	71.3	22.2	48.6	7				
Mean	**45.5**	**55.5**	**59.3**	**27.6**	**47.0**			**69.8**		
CD at 5%	10.3	12.8	10.8	4.9						
CV%	13.6	13.8	10.9	11.2						

Table 3.3: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Dha-ri	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Jha-nsi	Rah-uri	Pal-ghar	Ana-nd	Rai-pur	Urulikan-chan	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
OL-1847	2.41	2.01	2.81	3.40	2.87	2.72	6.35	2.88	2.31	5.07	3.78	4.94	4.88	4.02	5.29	1.91	6.27	3.31	3.44	4.47	3.76	6
NDO-911	1.99	2.37	2.10	2.90	2.57	1.79	6.66	3.53	2.27	4.30	2.42	4.54	4.54	3.36	5.25	1.75	6.46	2.63	4.16	2.87	3.42	12
VOS-15-23	2.21	2.58	3.55	3.50	2.37	2.72	6.61	3.19	2.38	4.33	2.75	5.74	4.41	3.80	5.16	2.05	6.69	3.36	3.23	4.07	3.74	7
VOS-15-24	2.43	2.65	2.38	2.80	2.49	2.15	5.92	3.19	2.26	4.51	2.17	5.19	4.77	3.15	7.00	1.71	6.93	2.89	4.12	4.01	3.64	10
HFO-427	2.65	3.07	3.40	3.50	1.94	2.46	5.76	3.53	2.24	4.69	2.33	6.27	4.73	3.24	7.20	1.76	7.22	2.87	5.42	4.09	3.92	4
HFO-529	2.49	3.73	3.52	3.30	2.66	3.30	6.78	3.63	2.33	4.74	3.79	5.81	4.32	3.29	6.66	2.07	8.17	2.76	4.85	2.96	4.06	2
OL-1844	2.44	3.71	3.18	3.20	2.61	2.23	6.82	2.89	2.26	4.24	4.69	5.53	5.46	3.32	7.43	2.19	6.87	2.38	4.88	5.09	4.07	1
JO-04-22	2.27	2.98	3.02	3.10	4.63	2.74	7.27	3.67	2.22	4.30	3.70	6.37	3.94	2.93	4.76	2.21	6.27	2.65	3.54	3.48	3.80	5
JHO-15-2	2.18	2.41	3.70	2.90	3.57	2.13	6.16	3.00	2.36	4.22	3.38	4.39	4.73	3.89	4.55	1.81	6.58	2.52	2.69	2.78	3.50	11
JHO-15-1	2.59	2.86	3.80	3.20	3.65	2.87	6.86	3.45	2.47	4.39	3.13	4.96	5.52	3.00	8.76	2.53	5.48	2.25	5.30	2.96	4.00	3
SKO-227	2.17	1.15	1.54	3.00	2.31	1.95	6.00	2.82	1.75	2.32	2.67	4.55	2.89	3.31	7.79	1.08	6.47	2.31	2.78	3.60	3.12	13
SKO-206	2.01	1.51	2.87	0.40	1.85	1.68	6.50	3.38	1.23	4.38	2.71	2.00	1.65	3.11	4.49	2.00	2.33	1.38	3.84	3.01	2.62	14
Kent (NC)	2.30	2.97	2.65	3.70	2.40	1.59	7.26	3.03	2.46	2.72	3.01	4.72	5.19	3.19	6.57	1.47	8.03	2.42	3.61	3.61	3.65	9
OS-6 (NC)	2.37	2.44	3.73	2.50	2.28	2.38	6.21	3.34	2.30	3.51	3.07	4.88	4.85	3.14	5.73	1.93	9.13	2.46	3.95	4.42	3.73	8
SKO-90 ZC(HZ)	2.29																					
OL-125 ZC(NWZ)		2.68	2.65	2.90	2.77																	
JHO-99-2 ZC(NEZ)						2.80	6.43	3.10	2.11	4.16	2.42											
OS-377 ZC(CZ)												5.71	5.81	3.21	5.00	1.83	7.68					
JHO-2000-4 ZC(SZ)																		2.37	3.62	4.86		
Mean	**2.32**	**2.61**	**2.99**	**2.95**	**2.73**	**2.37**	**6.51**	**3.24**	**2.20**	**4.13**	**3.07**	**5.04**	**4.51**	**3.33**	**6.11**	**1.89**	**6.71**	**2.57**	**3.96**	**3.75**	**3.64**	

Table 3.4: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Bika-ner	His-ar	Ludh-iana	Dha-ri	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Pu-sa	Jha-nsi	Rah-uri	Pal-ghar	Ana-nd	Rai-pur	Urulikan-chan	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
OL-1847	0.63	0.58	0.70	1.12	0.53	0.93	0.60	0.51	0.87	0.99	0.94	0.96	1.18	1.02	0.64	0.94	0.65	0.70	0.98	0.81	8
NDO-911	0.85	0.45	0.60	1.09	0.31	0.95	0.73	0.53	0.59	0.85	0.78	1.07	0.93	0.69	0.58	1.19	0.49	0.79	0.61	0.74	11
VOS-15-23	0.84	0.69	0.70	1.05	0.53	1.01	0.66	0.52	0.67	0.86	0.98	1.00	1.09	1.05	1.01	1.16	0.58	0.59	0.79	0.83	6
VOS-15-24	0.97	0.53	0.60	1.11	0.33	0.89	0.67	0.58	0.53	0.89	1.05	0.91	0.92	1.25	0.76	1.11	0.50	0.73	0.75	0.79	10
HFO-427	1.08	0.64	0.80	0.91	0.46	0.84	0.74	0.50	0.64	0.93	1.12	1.11	0.90	1.37	0.87	0.80	0.50	1.06	0.75	0.84	5
HFO-529	1.18	0.77	0.70	1.08	0.62	0.97	0.75	0.56	0.92	0.95	1.10	0.88	0.96	0.97	0.68	1.48	0.52	1.13	0.59	0.88	2
OL-1844	1.24	0.64	0.70	1.13	0.40	0.95	0.59	0.56	0.98	0.84	1.06	1.05	1.02	0.90	0.79	1.23	0.44	0.91	0.82	0.86	4
JO-04-22	0.95	0.52	0.70	1.77	0.52	1.09	0.78	0.44	1.03	0.85	1.17	0.89	0.90	1.03	0.99	1.22	0.51	0.76	0.73	0.89	1
JHO-15-2	0.77	0.77	0.60	1.47	0.43	0.86	0.61	0.56	0.61	0.64	0.94	1.05	1.11	1.11	0.70	1.17	0.49	0.64	0.49	0.79	9
JHO-15-1	0.90	0.76	0.70	1.43	0.55	1.07	0.71	0.53	0.56	0.86	0.96	1.12	0.92	1.17	1.07	0.95	0.51	1.11	0.65	0.87	3
SKO-227	0.44	0.44	0.60	1.18	0.35	0.94	0.58	0.45	0.61	0.46	0.84	0.52	1.01	0.89	0.56	0.79	0.49	0.64	0.87	0.67	12
SKO-206	0.48	0.38	0.10	0.67	0.32	1.01	0.70	0.25	0.68	0.86	0.34	0.38	0.96	0.79	0.91	0.38	0.30	0.39	0.64	0.55	13
Kent (NC)	1.00	0.57	0.80	0.96	0.30	1.04	0.63	0.60	0.68	0.54	0.99	1.15	0.98	1.02	0.89	1.35	0.44	0.93	0.78	0.82	7
OS-6 (NC)	0.94	0.82	0.50	0.96	0.46	0.90	0.69	0.57	0.69	0.69	0.93	0.97	0.95	1.03	0.93	1.71	0.55	0.93	0.83	0.84	5
OL-125 ZC(NWZ)	0.93	0.59	0.60	1.10																	
JHO-99-2 ZC(NEZ)					0.53	0.98	0.66	0.42	0.64	0.82											
OS-377 ZC(CZ)											0.93	1.12	1.00	1.03	0.87	1.34					
JHO-2000-4 ZC(SZ)																	0.43	0.78	0.89		
Mean	**0.88**	**0.61**	**0.63**	**1.13**	**0.44**	**0.96**	**0.67**	**0.51**	**0.71**	**0.80**	**0.94**	**0.95**	**0.99**	**1.02**	**0.82**	**1.12**	**0.49**	**0.81**	**0.74**	**0.80**	

Table 3.5: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	Palam-pur	Bika-ner	Ludh-iana	His-ar	Jor-hat	Kal-yani	Bhuban-eswar	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
OL-1847	4.5	4.4	8.0	9.9	5.2	3.6	3.5	8.3	5.0	7.0	6.5	10.7	6.0	4.5	3.3	3.4	10.0	6.1	6
NDO-911	4.0	8.6	6.1	7.1	3.2	3.8	4.0	5.0	6.5	7.4	7.5	8.0	6.7	4.5	2.6	2.4	6.6	5.5	8
VOS-15-23	4.8	4.9	7.6	10.7	4.5	3.2	4.4	6.0	5.9	6.5	7.2	11.2	8.7	8.8	3.4	1.9	6.6	6.3	5
VOS-15-24	5.7	5.9	6.3	9.5	3.4	2.2	4.0	4.9	7.1	5.9	7.3	12.3	9.2	5.5	2.9	2.0	7.9	6.0	7
HFO-427	4.9	7.2	8.4	11.1	4.9	2.6	4.3	5.9	5.4	6.6	6.4	15.2	9.4	7.3	2.9	3.0	4.5	6.5	4
HFO-529	4.4	9.2	6.1	13.2	6.3	1.3	4.9	8.5	5.1	7.5	9.4	9.9	10.5	4.3	2.8	3.7	5.9	6.7	2
OL-1844	5.5	7.4	6.6	11.1	4.5	1.6	3.8	8.7	5.7	8.3	8.6	9.8	10.4	6.1	2.4	3.4	6.5	6.5	4
JO-04-22	4.5	7.1	7.0	8.5	5.6	4.3	4.8	8.7	9.5	6.4	7.2	11.6	11.5	8.4	2.7	2.7	5.7	6.8	1
JHO-15-2	4.3	4.6	6.9	12.4	4.5	2.4	4.0	5.2	5.8	6.8	7.9	14.8	9.8	4.7	2.5	3.0	3.6	6.1	6
JHO-15-1	5.7	6.0	7.5	12.4	5.8	2.6	4.2	4.7	5.5	7.9	7.2	12.5	9.7	9.8	2.3	2.8	7.6	6.7	2
SKO-227	4.7	3.1	7.4	7.7	3.4	2.0	3.9	5.3	3.0	3.7	6.5	9.0	7.8	3.8	2.3	2.8	8.2	5.0	9
SKO-206	4.1	3.4	1.0	6.5	3.1	4.3	4.4	5.6	5.7	3.7	2.5	11.6	4.4	6.8	1.4	1.9	6.9	4.6	10
Kent (NC)	4.7	6.2	8.9	10.3	3.5	2.5	3.6	6.1	7.1	7.5	9.6	11.2	11.0	6.1	2.4	4.7	6.3	6.6	3
OS-6 (NC)	5.1	6.9	6.4	14.1	4.6	2.9	4.4	6.1	6.6	7.3	10.5	10.3	9.2	7.1	2.5	2.4	9.4	6.8	1
SKO-90 ZC(HZ)	4.7																		
OL-125 ZC(NWZ)		7.7	7.7	9.3															
JHO-99-2 ZC(NEZ)					5.8	3.6	4.1	6.0	5.4										
OS-377 ZC(CZ)										8.4	10.0	10.6	11.1	6.6					
JHO-2000-4 ZC(SZ)															2.4	3.3	9.1		
Mean	**4.8**	**6.2**	**6.8**	**10.2**	**4.6**	**2.9**	**4.2**	**6.3**	**5.9**	**6.7**	**7.6**	**11.2**	**9.0**	**6.3**	**2.6**	**2.9**	**7.0**	**6.1**	

Table 3.6: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): CP (%)

Entries	Palam-pur	Bika-ner	Ludh-iana	His-ar	Jor-hat	Kal-yani	Ran-chi	Bhuban-eswar	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	Jabal-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
OL-1847	8.8	6.4	8.6	14.3	9.4	5.3	8.3	8.4	8.6	7.1	8.3	8.5	12.5	6.4	7.5	7.4	6.6	12.7	8.6	5
NDO-911	8.8	9.3	8.4	13.1	10.0	5.4	9.2	8.7	8.0	5.7	7.9	7.5	17.5	7.3	7.7	7.4	4.8	13.1	8.9	2
VOS-15-23	10.5	5.3	8.4	12.9	8.5	4.4	8.3	9.3	8.2	6.5	7.6	8.1	12.7	7.6	7.9	6.6	5.2	10.5	8.2	9
VOS-15-24	11.4	5.6	8.1	14.9	9.9	3.3	9.2	9.2	8.5	6.6	7.9	8.2	11.7	6.3	7.8	5.3	4.4	13.6	8.4	7
HFO-427	8.8	6.1	8.8	14.5	10.0	4.2	9.2	9.1	8.6	6.3	7.0	9.7	13.2	8.0	8.0	7.9	4.4	7.9	8.4	7
HFO-529	8.3	7.2	6.8	14.3	10.2	1.9	7.4	9.2	8.8	6.1	9.6	8.4	16.3	6.3	8.2	7.0	4.4	12.7	8.5	6
OL-1844	10.5	5.5	7.6	14.5	10.2	2.4	7.0	8.7	8.0	6.1	8.8	8.6	17.2	7.3	8.2	7.9	5.3	9.6	8.5	6
JO-04-22	8.5	6.8	8.3	13.5	9.6	5.4	8.8	10.0	8.2	6.7	7.9	7.4	12.0	7.3	8.2	6.6	4.8	9.6	8.3	8
JHO-15-2	9.3	5.4	8.6	13.5	10.5	3.8	6.6	8.9	8.5	5.4	7.6	8.8	14.2	6.7	8.2	8.7	5.7	9.2	8.3	8
JHO-15-1	10.5	6.1	8.4	13.7	9.5	3.3	7.9	9.2	8.0	7.2	7.9	8.9	16.3	8.4	8.2	9.2	4.4	14.4	9.0	1
SKO-227	10.5	6.5	9.3	14.7	9.2	2.9	7.4	9.0	8.1	7.6	7.4	9.6	16.0	7.3	8.1	8.8	7.0	13.1	9.0	1
SKO-206	8.8	6.4	9.0	14.1	9.8	5.8	8.8	9.2	8.0	6.9	7.9	8.7	15.3	7.9	7.5	5.9	6.6	12.7	8.8	3
Kent (NC)	9.9	5.7	8.6	15.1	10.3	3.3	9.2	8.8	8.3	7.1	7.4	9.2	13.0	6.2	8.2	7.9	7.4	10.1	8.7	4
OS-6 (NC)	10.5	6.7	9.5	14.3	10.1	4.4	7.9	9.7	8.4	6.0	9.2	8.6	12.0	6.9	8.1	7.4	3.5	14.4	8.8	3
SKO-90 ZC(HZ)	9.0																			
OL-125 ZC(NWZ)		7.6	9.5	13.1																
JHO-99-2 ZC(NEZ)					10.4	5.1	7.9	9.0	8.5	6.0										
OS-377 ZC(CZ)											8.3	9.5	10.9	7.2	8.2					
JHO-2000-4 ZC(SZ)																6.6	5.7	12.7		
Mean	**9.6**	**6.4**	**8.5**	**14.0**	**9.8**	**4.0**	**8.2**	**9.1**	**8.3**	**6.5**	**8.0**	**8.6**	**14.1**	**7.1**	**8.0**	**7.4**	**5.3**	**11.8**	**8.6**	

Table 3.7: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Palampur	Srinagar	Bikaner	Hisar	Ludhiana	Pantnagar	Dhari	Jorhat	Kalyani	Bhubaneswar	Ranchi	Faizabad
OL-1847	94.3	113.5	106.0	113.0	95.3	128.4	125.1	143.4	138.9	123.1	116.0	118.2
NDO-911	95.0	119.9	90.0	111.2	121.5	134.1	121.9	138.8	160.1	139.7	117.0	116.0
VOS-15-23	97.7	112.1	109.0	114.9	117.8	136.5	130.2	140.7	156.5	152.3	116.0	128.4
VOS-15-24	91.3	125.0	130.0	124.7	114.6	133.7	140.2	140.3	161.9	126.6	115.0	128.0
HFO-427	102.3	108.3	101.0	98.5	126.7	130.6	121.0	128.3	159.2	147.6	115.0	120.2
HFO-529	100.0	111.3	115.0	113.2	127.4	130.3	129.8	136.4	162.9	155.6	114.0	108.5
OL-1844	111.0	120.5	108.0	105.6	91.2	138.4	120.1	137.2	143.9	130.1	115.0	118.2
JO-04-22	95.0	115.8	91.0	105.3	110.3	126.3	134.7	150.9	158.4	150.6	114.0	115.8
JHO-15-2	105.3	108.9	82.0	99.4	101.2	124.7	141.7	136.2	155.1	148.5	113.0	105.0
JHO-15-1	78.0	145.0	99.0	110.1	129.6	132.5	130.0	125.1	168.4	143.3	115.0	117.2
SKO-227	84.7	132.5	87.0	80.2	60.2	120.5	101.4	88.0	154.7	128.6	112.0	94.4
SKO-206	84.0	112.1	101.0	85.2	38.6	111.3	106.8	76.2	144.1	154.4	90.0	45.3
Kent (NC)	101.3	118.5	94.0	102.0	92.6	120.3	115.8	122.7	157.1	119.8	113.0	99.1
OS-6 (NC)	94.3	125.7	107.0	106.3	88.4	126.5	126.8	120.6	155.8	135.4	111.0	119.0
SKO-90 ZC(HZ)	87.7	105.8										
OL-125 ZC(NWZ)			100.0	115.8	98.4	131.6	132.2					
JHO-99-2 ZC(NEZ)								144.5	111.8	137.5	112.0	102.4
Mean	**94.8**	**118.3**	**101.3**	**105.7**	**100.9**	**128.4**	**125.2**	**128.6**	**152.6**	**139.5**	**112.5**	**109.0**

Table 3.7: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Imphal	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Jabalpur	Raipur	Hyderabad	Mandya	Coimbatore	Mattupetty	Average	Rank
OL-1847	120.7	161.7	111.2	113.0	159.0	115.8	97.3	102.6	80.0	105.0	114.8	74.0	115.4	7
NDO-911	135.2	158.0	120.4	114.2	142.0	95.6	99.2	96.3	81.1	65.9	102.7	59.7	114.0	8
VOS-15-23	153.7	158.3	117.0	115.9	135.2	123.1	105.7	121.8	88.3	73.9	113.9	59.3	119.9	3
VOS-15-24	136.7	167.6	126.2	113.6	121.3	134.3	106.1	123.8	89.0	71.9	123.6	68.7	121.4	1
HFO-427	134.7	157.9	113.8	100.6	127.7	127.5	108.5	119.9	57.9	66.3	125.9	82.0	115.9	6
HFO-529	141.1	161.3	117.2	116.2	116.3	100.9	118.6	111.4	91.6	120.7	118.7	69.3	120.3	2
OL-1844	153.0	149.0	127.3	110.9	118.6	91.7	118.1	103.3	82.3	123.4	107.5	74.3	116.6	5
JO-04-22	161.6	166.8	117.6	122.0	96.0	117.8	125.2	118.7	85.3	112.7	104.0	60.3	119.0	4
JHO-15-2	139.9	142.0	114.4	99.0	132.0	117.9	112.6	93.4	71.7	92.7	113.2	60.7	112.9	9
JHO-15-1	133.0	157.6	116.4	117.3	121.2	113.1	109.9	96.3	71.0	124.6	128.9	73.0	119.0	4
SKO-227	93.6	106.2	106.9	95.9	138.4	91.7	103.2	81.2	51.3	54.5	127.8	77.7	98.9	11
SKO-206	119.8	99.8	89.7	27.1	126.2	81.3	89.9	43.1	73.0	112.3	87.2	65.3	90.2	12
Kent (NC)	141.0	144.8	113.3	99.3	113.3	125.1	120.4	106.9	64.8	104.7	118.4	56.0	111.0	10
OS-6 (NC)	147.8	158.2	119.8	111.6	127.1	136.0	110.0	118.9	82.0	126.5	130.6	69.7	119.0	4
JHO-99-2 ZC(NEZ)	151.4													
OS-377 ZC(CZ)		157.0	111.0	113.1	132.2	123.3	122.4	113.1						
JHO-2000-4 ZC(SZ)									82.1	123.2	116.5	64.3		
Mean	**137.5**	**149.7**	**114.8**	**104.6**	**127.1**	**113.0**	**109.8**	**103.4**	**76.8**	**98.6**	**115.6**	**67.6**	**113.8**	

Table 3.8: 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	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Pal-ghar	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
OL-1847	0.51	0.49	0.52	0.59	1.00	0.59	0.81	0.66	0.91	0.39	0.70	0.35	0.61	0.54	0.91	0.32	0.57	0.66	0.69	0.33	0.61	5
NDO-911	0.51	0.50	0.49	0.43	0.96	0.45	0.68	0.75	0.98	0.34	0.72	0.33	0.56	0.83	0.88	0.38	0.43	0.70	0.81	0.39	0.61	5
VOS-15-23	0.46	0.47	0.48	0.47	0.72	0.52	0.68	0.87	1.27	0.35	0.75	0.27	0.51	0.79	0.86	0.40	0.30	0.66	0.59	0.33	0.59	6
VOS-15-24	0.40	0.52	0.37	0.45	0.67	0.48	0.84	0.77	0.84	0.38	0.75	0.28	0.49	0.45	0.71	0.45	0.40	0.61	0.75	0.43	0.55	8
HFO-427	0.42	0.45	0.51	0.67	0.70	0.59	1.34	0.66	1.11	0.41	0.76	0.29	0.45	0.51	0.89	0.42	0.33	0.69	0.61	0.44	0.61	5
HFO-529	0.36	0.46	0.29	0.59	1.00	0.61	1.45	1.00	1.24	0.39	0.77	0.30	0.58	0.81	0.78	0.51	0.49	0.82	0.44	0.33	0.66	2
OL-1844	0.46	0.50	0.42	0.49	0.96	0.52	1.06	0.87	0.88	0.39	0.70	0.26	0.58	0.65	0.84	0.50	0.49	0.76	0.51	0.56	0.62	4
JO-04-22	0.42	0.48	0.50	0.69	0.92	0.47	1.21	0.66	1.18	0.53	0.76	0.33	0.46	0.81	0.81	0.61	0.51	0.67	0.71	0.54	0.66	2
JHO-15-2	0.38	0.45	0.43	0.72	0.89	0.46	1.01	0.75	1.07	0.36	0.77	0.28	0.46	0.68	0.91	0.48	0.45	0.67	0.61	0.39	0.61	5
JHO-15-1	0.40	0.60	0.33	0.79	0.89	0.45	1.47	1.14	1.04	0.41	0.75	0.32	0.61	0.71	0.89	0.46	0.47	0.81	0.62	0.35	0.68	1
SKO-227	0.36	0.55	0.26	0.52	0.48	0.40	1.42	0.77	0.86	0.35	0.79	0.45	0.54	0.78	0.85	0.36	0.44	0.68	0.58	0.28	0.59	6
SKO-206	0.40	0.47	0.78	0.72	0.70	0.59	0.98	0.77	1.21	0.59	0.76	0.36	0.55	0.76	0.80	0.32	0.77	0.47	0.55	0.55	0.65	3
Kent (NC)	0.42	0.49	0.39	0.61	0.54	0.45	0.84	0.75	0.77	0.37	0.69	0.24	0.58	0.74	0.86	0.59	0.62	0.70	0.53	0.31	0.57	7
OS-6 (NC)	0.40	0.52	0.32	0.52	0.72	0.52	1.03	0.66	0.94	0..34	0.72	0.29	0.78	0.73	0.81	0.45	0.44	0.63	0.37	0.32	0.59	6
SKO-90 ZC(HZ)	0.51	0.44																				
OL-125 ZC(NWZ)			0.60	0.49	0.97	0.51																
JHO-99-2 ZC(NEZ)							1.02	1.00	0.96	0.43	0.75	0.26										
OS-377 ZC(CZ)													0.66	0.78	0.76	0.58	0.44					
JHO-2000-4 ZC(SZ)																		0.92	0.62	0.68		
Mean	**0.43**	**0.49**	**0.45**	**0.58**	**0.81**	**0.51**	**1.06**	**0.81**	**1.02**	**0.41**	**0.74**	**0.31**	**0.56**	**0.70**	**0.84**	**0.46**	**0.48**	**0.70**	**0.60**	**0.42**	**0.61**	

Table 3.9: IVT Oat (SC): Initial Varietal Trial in Oat (Single Cut): ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries	ADF (%)		NDF (%)		IVDMD (%)				DDM (q/ha)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Hisar	Average	Rank	Hisar	Rank
OL-1847	48.9	8	59.1	8	45.2	60.8	53.0	8	42.3	9
NDO-911	50.3	13	60.5	11	44.3	60.6	52.5	10	32.8	13
VOS-15-23	49.9	11	61.3	13	45.2	62.6	53.9	7	51.9	5
VOS-15-24	51.1	14	61.1	12	43.4	65.2	54.3	6	41.5	11
HFO-427	48.4	6	58.3	6	42.6	62.2	52.4	11	47.5	7
HFO-529	52.3	15	62.6	14	41.0	62.8	51.9	13	58.2	2
OL-1844	48.6	7	58.6	7	45.3	65.8	55.6	4	50.3	6
JO-04-22	45.3	3	57.1	3	47.0	66.0	56.5	2	41.5	12
JHO-15-2	49.0	9	58.3	6	43.4	61.6	52.5	10	56.7	3
JHO-15-1	50.0	12	60.3	10	43.0	61.5	52.3	12	55.9	4
SKO-227	46.0	4	57.2	4	50.3	60.4	55.4	5	31.7	14
SKO-206	46.3	5	57.6	5	46.3	67.0	56.7	1	30.7	15
Kent (NC)	49.3	10	59.3	9	44.1	61.6	52.9	9	41.8	10
OS-6 (NC)	45.0	2	56.9	2	47.8	63.8	55.8	3	62.9	1
OL-125 ZC(NWZ)	44.6	1	56.7	1	47.2	60.6	53.9	7	42.9	8
Mean	**48.3**		**59.0**		**45.1**	**62.8**	**54.0**		**45.9**	

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

(Reference tables 4.1 to 4.9)

In Oat (single cut), eight entries promoted from IVT were evaluated against two national checks (Kent and OS-6) and three zonal checks in respective zones [(SKO-90 (HZ), OL-125 (NWZ), JHO-822 (CZ)] at 16 locations in three different zones (HZ, NWZ, CZ) of the country.

For green forage yield (q/ha), entries SKO-225 (21.3%), OS-424 (7.9%), OL-1802-1 (5.4%) in HZ; OL-1802-1 (11.3%), JO-04-19 (5.2%) in NWZ, SKO-225 (19.7%), OL-1769-1 (16%), OL 1766-1 (14.2%), OS-424 (10.8%), JO-04-19 (6.6%) in central zone exhibited superiority over the best check. At national level, all the test entries recorded their superiority over the best national check in which OS-424, OL-1769-1, OL-1802-1, OL-1766-1, SKO-225, JO-04-19 registered more than 10% superiority for GFY (Q/ha). Similarly for dry matter yield (q/ha), entry SKO-225 (16.2%) in HZ; and SKO-225(12.2%), UPO-10-3 (9.1%), OS-432 (6.6%), OL-1802-1 (5.2%) in NWZ; entries OL-1769-1 (17.6%), JO-04-19 (12.7%), OL-1766-1 (8.8%), SKO-225 (6.5%), OS-424 (6.9%) performed better than the best check. At all India level, all the entries performed better than the checks. Entries SKO-225 (12.3%), OL-1769-1 (12.1%), JO-04-19 (10.2%), OL-1766-1 (7.2%), UPO-10-3 (5.8%) and OS-424 (5.6%) recorded superiority of more than 5% over the best national check.

In green forage production potential (q/ha/day), all the entries were superior over the checks. Entries SKO-225 (4.86) followed by OL-1769-1 (4.54) were far superior to both the checks (3.78). Similarly for dry matter production potential (q/ha/day), all the entries were better than check. SKO-225 (1.26 followed by OS-424 (1.23) were best performers in comparison to Kent (1.06). For plant height (cm), entry OL-1769-1 (132.3 cm) ranked first, whereas for the character leafiness, OS-424 (0.68) was adjudged best performer.

For quality parameters, for crude protein yield, all the entries were better performer than the checks. The top ranking entry was OL-1769-1 (8.0) followed by OL-1766-1 (7.5) in comparison to best check Kent (6.7). For crude protein content, OS-432 (8.9%) followed by OL-1769-1 and SKO-225 (8.8%) each were best performer in comparison to best check Kent (8.6%). For other quality parameters, entry OS-424 ranked first for ADF and IVDMD, whereas entry JO-04-19 ranked first for NDF, SKO-225 ranked first for DDM (q/ha).

Table 4.1: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	Hill Zone						North West Zone								
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Superi-ority%	Bika-ner	Jal-ore	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Aver-age	Ra-nk	Superi-ority%
OS-424	239.5	425.3	125.0	263.2	2	8.0	349.8	270.6	350.0	704.7	354.2	549.8	429.8	4	0.3
OL-1769-1	194.1	436.9	100.7	243.9	8	0.1	281.4	278.0	311.1	785.2	333.3	555.3	424.1	6	
OL-1802-1	249.6	412.9	108.5	257.0	3	5.4	360.6	260.3	372.2	803.0	284.8	780.2	476.9	1	11.3
Ol-1766-1	198.9	404.0	132.1	245.0	7	0.5	365.9	275.0	388.9	655.2	270.0	580.3	422.5	7	
SKO-225	264.5	511.6	111.3	295.8	1	21.3	291.5	190.0	450.0	855.6	276.7	469.3	422.2	8	
JO-04-19	182.4	464.1	110.9	252.5	5	3.6	361.4	243.3	336.1	795.2	263.3	705.3	450.8	2	5.2
UPO-10-3	210.1	452.8	87.0	250.0	6	2.5	372.6	269.3	369.4	794.8	276.7	566.4	441.5	3	3.0
OS-432	216.5	445.6	100.1	254.1	4	4.2	312.8	206.3	330.6	677.6	291.1	530.3	391.4	10	
OS-6 (NC)	200.5	451.9	79.0	243.8	9		372.6	215.6	336.1	573.5	237.5	510.9	374.4	11	
Kent (NC)	180.8	412.4	103.7	232.3	11		285.3	236.7	350.0	698.1	256.4	572.0	399.7	9	
SKO-90 (ZC-HZ)	231.5	412.5	82.6	242.2	10										
OL-125 (ZC-NWZ)							343.2	202.0	338.9	729.6	266.7	691.4	428.6	5	
Mean	**215.3**	**439.1**	**103.7**	**252.7**			**336.1**	**240.6**	**357.6**	**733.9**	**282.8**	**591.9**	**423.8**		
CD at 5%	26.4	24.6	17.1				NS	10.1	78.2	54.0	65.4	140.4			
CV%	7.2	6.3	9.7				13.3	16.5	12.9	4.3	14.7	13.9			

Table 4.1: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha)

Entries	Central Zone										All India		
	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Jabalpur	Raipur	Average	Rank	Superiority%	Average	Rank	Superiority%
OS-424	312.3	368.7	598.9	247.0	444.4	529.0	429.1	418.5	4	10.8	393.6	4	10.8
OL-1769-1	275.3	599.8	539.1	256.3	538.6	569.0	289.9	438.3	2	16.0	396.5	2	11.7
OL-1802-1	291.5	361.2	582.2	248.1	380.8	506.0	323.5	384.8	6	1.9	395.3	3	11.3
Ol-1766-1	293.8	603.3	694.6	246.6	352.2	555.0	274.4	431.4	3	14.2	393.1	5	10.7
SKO-225	210.5	467.8	692.3	268.2	587.8	599.0	339.5	452.2	1	19.7	411.6	1	15.9
JO-04-19	277.6	482.9	581.0	271.2	379.2	469.0	358.7	402.8	5	6.6	392.6	6	10.6
UPO-10-3	196.6	427.5	519.7	255.4	353.1	493.0	336.1	368.8	10		373.8	7	5.3
OS-432	192.0	354.1	651.1	265.0	294.2	596.0	301.3	379.1	7	0.4	360.3	8	1.5
OS-6 (NC)	198.9	430.7	578.0	218.4	322.5	583.0	276.7	372.6	9		349.1	10	
Kent (NC)	208.2	468.9	568.8	238.2	332.8	442.0	327.7	369.5	10		355.1	9	
JHO-822 (ZC-CZ)	203.6	432.8	624.8	257.3	311.9	400.0	413.5	377.7	8				
Mean	**241.8**	**454.3**	**602.8**	**252.0**	**390.7**	**521.9**	**333.7**	**399.6**			**382.1**		
CD at 5%	17.8	64.3	27.7	21.9	32.7	105.3	36.8						
CV%	10.7	8.3	2.7	5.0	4.9	12.0	6.5						

Table 4.2: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	Hill Zone						North West Zone						
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Superi-ority%	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Aver-age	Ra-nk	Superi-ority%
OS-424	47.8	104.7	19.3	57.3	3	2.5	71.0	66.7	111.4	40.7	72.4	9	
OL-1769-1	38.9	103.2	15.8	52.6	9		76.6	63.7	124.0	44.4	77.2	6	3.6
OL-1802-1	49.8	101.8	17.6	56.4	4	0.9	73.6	70.7	133.1	36.2	78.4	4	5.2
Ol-1766-1	39.6	97.8	17.3	51.6	10		84.5	77.9	106.0	43.5	78.0	5	4.7
SKO-225	52.8	124.5	17.8	65.0	1	16.2	70.0	92.1	135.0	37.5	83.6	1	12.2
JO-04-19	36.7	112.6	19.8	56.3	6		71.0	73.9	132.1	29.7	76.7	7	2.9
UPO-10-3	41.7	111.6	19.9	57.7	2	3.2	84.4	68.6	131.4	40.9	81.3	2	9.1
OS-432	42.9	107.0	15.5	55.1	7		78.1	76.0	112.0	51.6	79.4	3	6.6
OS-6 (NC)	39.7	106.8	21.3	55.9	5		79.0	70.5	92.6	33.7	69.0	10	
Kent (NC)	36.2	102.3	19.6	52.7	8		54.5	75.4	112.5	30.8	68.3	11	
SKO-90 (ZC-HZ)	46.7	98.8	16.9	54.1	11								
OL-125 (ZC-NWZ)							86.2	59.2	119.0	33.8	74.5	8	
Mean	**43.0**	**106.5**	**18.3**	**55.9**			**75.4**	**72.3**	**119.0**	**38.4**	**76.3**		
CD at 5%	5.5	5.7	2.8				NS	16.8	19.9	9.7			
CV%	7.6	5.5	8.9				18.2	13.7	7.4	17.7			

Table 4.2: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha)

Entries	Central Zone										All India		
	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Jabalpur	Raipur	Average	Rank	Superiority%	Average	Rank	Superiority%
OS-424	53.3	79.3	79.9	71.8	61.3	123.0	117.8	83.8	4	6.9	74.9	6	5.6
OL-1769-1	51.0	127.3	100.2	68.5	79.7	133.0	85.9	92.2	1	17.6	79.5	2	12.1
OL-1802-1	53.0	79.7	97.8	62.4	46.5	118.0	77.0	76.3	11		72.6	8	2.4
Ol-1766-1	57.2	115.5	124.1	56.2	56.0	130.0	58.2	85.3	3	8.8	76.0	4	7.2
SKO-225	43.7	102.5	106.8	71.8	74.1	118.0	67.9	83.5	5	6.5	79.6	1	12.3
JO-04-19	56.8	105.4	96.3	76.9	69.4	108.0	105.8	88.4	2	12.7	78.2	3	10.2
UPO-10-3	35.3	98.1	76.5	67.3	62.8	113.0	99.0	78.9	6	0.6	75.0	5	5.8
OS-432	34.7	63.9	100.7	61.2	42.4	140.0	93.9	76.7	10		72.9	7	2.8
OS-6 (NC)	33.5	100.9	97.1	57.3	48.4	137.0	74.2	78.3	8		70.9	9	
Kent (NC)	43.2	98.9	86.1	58.7	56.6	100.0	105.3	78.4	7		70.0	10	
JHO-822 (ZC-CZ)	42.5	88.5	91.0	71.5	47.7	90.0	115.5	78.1	9				
Mean	**45.8**	**96.4**	**96.1**	**65.8**	**58.6**	**119.1**	**91.0**	**81.8**			**74.9**		
CD at 5%	9.6	13.3	4.6	9.3	4.5	24.7	17.8						
CV%	5.7	8.1	2.8	7.7	4.5	12.2	11.5						

Table 4.3: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Green Forage Yield (q/ha/day)

Entries	Palampur	Bikaner	Hisar	Ludhiana	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Raipur	Average	Rank
OS-424	2.08	3.24	2.92	5.50	3.25	3.96	6.65	3.38	4.36	5.11	4.05	7
OL-1769-1	1.89	2.61	2.59	6.20	3.20	8.33	6.91	3.37	7.28	3.05	4.54	2
OL-1802-1	2.13	3.34	3.10	6.30	3.07	3.88	8.20	3.10	4.53	3.41	4.11	5
Ol-1766-1	1.95	3.39	3.24	5.20	3.23	7.36	8.47	3.38	4.19	2.89	4.33	3
SKO-225	2.51	2.70	3.75	6.70	2.45	6.78	9.23	3.01	7.94	3.57	4.86	1
JO-04-19	1.71	3.35	2.80	6.30	2.92	5.68	8.07	3.35	4.03	3.78	4.20	4
UPO-10-3	2.00	3.45	3.08	6.30	2.07	4.60	6.42	3.50	3.76	3.54	3.87	8
OS-432	2.06	2.90	2.75	5.30	2.23	5.71	8.57	3.40	4.46	3.17	4.06	6
OS-6 (NC)	1.96	3.45	2.80	4.50	2.31	5.25	8.14	2.66	3.84	2.91	3.78	9
Kent (NC)	1.74	2.64	2.92	5.50	2.42	5.52	7.02	3.02	3.54	3.45	3.78	9
SKO-90 (ZC-HZ)	1.99											
OL-125 (ZC-NWZ)		3.18	2.82	5.70								
JHO-822 (ZC-CZ)					2.26	5.15	7.10	3.48	3.32	4.35		
Mean	**2.00**	**3.11**	**2.98**	**5.77**	**2.67**	**5.66**	**7.71**	**3.24**	**4.66**	**3.57**	**4.16**	

Table 4.4: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Raipur	Average	Rank
OS-424	0.66	0.56	0.90	0.56	0.85	0.89	0.98	0.60	5.11	1.23	2
OL-1769-1	0.71	0.53	1.00	0.59	1.77	1.29	0.90	1.08	3.05	1.21	3
OL-1802-1	0.68	0.59	1.00	0.56	0.86	1.38	0.78	0.55	3.41	1.09	5
Ol-1766-1	0.78	0.65	0.80	0.63	1.41	1.51	0.77	0.67	2.89	1.12	4
SKO-225	0.65	0.77	1.10	0.51	1.49	1.42	0.81	1.00	3.57	1.26	1
JO-04-19	0.66	0.62	1.00	0.60	1.24	1.34	0.95	0.74	3.78	1.21	3
UPO-10-3	0.78	0.57	1.00	0.37	1.05	0.94	0.92	0.67	3.54	1.09	5
OS-432	0.72	0.63	0.90	0.40	1.03	1.33	0.78	0.64	3.17	1.07	6
OS-6 (NC)	0.73	0.59	0.70	0.39	1.23	1.37	0.70	0.58	2.91	1.02	8
Kent (NC)	0.51	0.63	0.90	0.50	1.16	1.06	0.74	0.60	3.45	1.06	7
SKO-90 (ZC-HZ)											
OL-125 (ZC-NWZ)	0.80	0.49	0.90								
JHO-822 (ZC-CZ)				0.47	1.05	1.03	0.97	0.51	4.35		
Mean	**0.70**	**0.60**	**0.93**	**0.51**	**1.19**	**1.23**	**0.85**	**0.69**	**3.57**	**1.14**	

Table 4.5: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Crude Protein Yield (q/ha)

Entries	Palampur	Bikaner	Ludhiana	Hisar	Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Average	Rank
OS-424	4.0	4.0	9.7	7.2	5.5	6.8	6.9	10.0	9.1	7.0	5
OL-1769-1	3.0	4.1	12.3	7.1	9.0	8.5	10.8	11.0	6.5	8.0	1
OL-1802-1	4.1	4.5	10.1	7.7	5.9	8.7	5.8	9.6	4.9	6.8	6
Ol-1766-1	3.7	5.3	6.4	7.9	11.1	11.4	6.8	10.8	4.0	7.5	2
SKO-225	4.9	6.5	9.9	9.9	9.0	9.8	7.2	9.6	4.9	8.0	1
JO-04-19	3.9	3.8	9.6	8.2	7.3	8.2	8.3	8.7	8.5	7.4	3
UPO-10-3	4.0	4.7	10.0	7.8	7.7	6.5	6.8	9.1	7.2	7.1	4
OS-432	3.8	4.4	8.3	8.1	4.8	8.8	6.4	11.6	7.7	7.1	4
OS-6 (NC)	3.0	5.3	6.1	7.4	6.9	8.9	5.5	11.3	5.4	6.6	8
Kent (NC)	3.1	4.3	8.5	8.4	6.8	7.6	6.6	7.8	7.3	6.7	7
SKO-90 (ZC-HZ)	3.8										
OL-125 (ZC-NWZ)		7.5	10.7	6.5							
JHO-822 (ZC-CZ)					6.3	8.0	5.4	6.7	9.0		
Mean	**3.7**	**5.0**	**9.2**	**7.8**	**7.3**	**8.5**	**6.9**	**9.7**	**6.8**	**7.2**	

Table 4.6: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Crude Protein (%)

Entries	Palampur	Bikaner	Ludhiana	Hisar	Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Average	Rank
OS-424	8.5	5.7	8.7	10.7	6.9	8.5	11.2	8.2	7.7	8.5	4
OL-1769-1	7.6	5.3	9.9	11.1	7.1	8.5	13.5	8.3	7.6	8.8	2
OL-1802-1	8.2	6.0	7.6	10.9	7.4	8.9	12.5	8.2	6.4	8.5	4
Ol-1766-1	9.3	6.3	6.0	10.1	9.6	9.2	12.2	8.3	6.8	8.6	3
SKO-225	9.3	9.3	7.3	10.7	8.8	9.1	9.7	8.2	7.2	8.8	2
JO-04-19	10.5	5.3	7.3	11.1	6.9	8.5	11.9	8.1	8.0	8.6	3
UPO-10-3	9.6	5.6	7.6	11.3	7.9	8.5	10.8	8.1	7.2	8.5	4
OS-432	8.8	5.7	7.4	10.7	7.4	8.8	15.1	8.3	8.2	8.9	1
OS-6 (NC)	7.6	6.7	6.6	10.5	6.9	9.1	11.4	8.3	7.3	8.3	5
Kent (NC)	8.5	7.9	7.6	11.1	6.9	8.8	11.7	7.8	6.9	8.6	3
SKO-90 (ZC-HZ)	8.2										
OL-125 (ZC-NWZ)		8.8	9.0	10.9							
JHO-822 (ZC-CZ)					7.2	8.8	11.4	7.5	7.8		
Mean	**8.7**	**6.6**	**7.7**	**10.8**	**7.5**	**8.8**	**11.9**	**8.1**	**7.4**	**8.6**	

Table 4.7: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): Plant Height (cm)

Entries	Palam-pur	Sri-nagar	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
OS-424	113.7	137.0	128.0	104.0	129.3	140.7	147.7	139.1	115.8	113.8	118.4	134.5	118.3	117.0	125.5	5
OL-1769-1	104.3	130.5	150.0	126.9	139.6	145.7	145.9	150.4	126.4	131.2	112.3	129.7	128.3	131.1	132.3	1
OL-1802-1	119.7	135.1	150.0	121.9	141.0	129.9	143.6	152.1	137.5	106.8	122.4	140.8	113.2	98.7	129.5	3
Ol-1766-1	90.0	130.9	135.0	108.0	156.3	131.5	140.3	157.9	117.2	127.7	125.2	132.9	124.2	140.2	129.8	2
SKO-225	82.3	161.4	125.0	118.8	138.6	133.7	110.4	119.2	110.4	104.4	120.6	110.5	112.4	107.1	118.2	8
JO-04-19	88.3	142.8	130.0	109.6	137.0	122.4	133.9	136.1	109.6	118.6	143.3	125.4	112.5	112.8	123.0	7
UPO-10-3	99.0	148.1	145.0	108.0	152.6	127.3	143.1	132.0	127.3	110.8	123.3	126.3	108.7	125.1	126.9	4
OS-432	103.0	150.7	110.0	110.4	117.3	136.1	134.3	123.4	86.1	105.4	121.7	101.9	132.5	107.0	117.1	10
OS-6 (NC)	86.7	141.8	170.0	118.3	126.3	125.7	127.7	114.7	116.6	121.8	115.7	118.9	131.3	122.9	124.2	6
Kent (NC)	84.7	142.4	140.0	115.4	121.1	121.1	124.7	115.9	110.4	115.8	112.0	122.4	104.0	113.1	117.4	9
SKO-90 (ZC-HZ)	96.3	131.3														
OL-125 (ZC-NWZ)			161.0	118.8	127.0	126.9	141.4									
JHO-822 (ZC-CZ)								119.7	112.8	107.2	115.7	120.9	104.9	121.2		
Mean	**97.1**	**141.1**	**140.4**	**114.6**	**135.1**	**131.0**	**135.7**	**132.8**	**115.5**	**114.9**	**121.0**	**124.0**	**117.3**	**117.8**	**124.4**	

Table 4.8: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (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	Aver-age	Ra-nk
OS-424	0.45	0.50	0.80	0.95	0.90	0.51	0.92	0.71	0.74	0.46	0.51	0.68	1
OL-1769-1	0.43	0.47	0.22	0.95	0.67	0.42	0.42	0.72	0.79	0.57	0.26	0.54	9
OL-1802-1	0.46	0.49	0.80	0.91	0.67	0.43	0.62	0.52	0.82	0.49	0.57	0.62	3
Ol-1766-1	0.52	0.48	0.25	1.15	0.54	0.32	0.59	0.73	0.83	0.51	0.71	0.60	5
SKO-225	0.53	0.58	0.39	1.01	0.74	0.61	0.47	0.67	0.73	0.46	0.35	0.59	6
JO-04-19	0.41	0.52	0.48	0.95	0.74	0.51	1.50	0.48	0.88	0.53	0.39	0.67	2
UPO-10-3	0.48	0.54	0.32	0.92	0.54	0.46	0.68	0.68	0.77	0.50	0.73	0.60	5
OS-432	0.53	0.55	0.23	0.94	0.60	0.47	0.66	0.47	0.85	0.62	0.18	0.55	8
OS-6 (NC)	0.41	0.51	0.44	0.96	0.74	0.45	0.36	0.57	0.78	0.59	0.46	0.57	7
Kent (NC)	0.55	0.52	0.46	0.81	0.96	0.42	0.61	0.68	0.82	0.39	0.50	0.61	4
SKO-90 (ZC-HZ)	0.58	0.48											
OL-125 (ZC-NWZ)			0.29	0.81	0.82	0.46							
JHO-822 (ZC-CZ)							0.57	0.52	0.81	0.38	0.54		
Mean	**0.49**	**0.51**	**0.43**	**0.94**	**0.72**	**0.46**	**0.67**	**0.61**	**0.80**	**0.50**	**0.47**	**0.60**	

Table 4.9: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (Single Cut): ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries	ADF (%)					NDF (%)						IVDMD (%)					DDM (q/ha)	
	Palam-pur	Ludh-iana	Rah-uri	Aver-age	Ra-nk	Ana-nd	Palam-pur	Rah-uri	Ludh-iana	Aver-age	Ra-nk	Ludh-iana	His-ar	Rah-uri	Aver-age	Ra-nk	His-ar	Ra-nk
OS-424	54.6	40.9	38.0	44.5	1	79.0	64.6	56.5	58.8	64.7	5	50.6	44.4	59.1	51.4	1	29.6	6
OL-1769-1	56.2	39.7	40.4	45.4	3	79.0	62.2	58.7	57.6	64.4	3	53.2	34.6	57.7	48.5	4	22.1	11
OL-1802-1	53.4	42.3	40.0	45.2	2	70.0	63.4	59.8	64.1	64.3	2	49.8	39.7	57.5	49.0	3	28.1	8
Ol-1766-1	54.6	44.1	40.7	46.5	5	82.0	65.8	55.2	66.1	67.3	8	42.3	40.2	57.5	46.7	7	31.3	4
SKO-225	56.0	41.9	48.2	48.7	7	68.0	65.4	63.6	61.6	64.6	4	45.4	45.4	51.3	47.4	5	41.8	1
JO-04-19	57.4	42.1	44.7	48.1	6	75.0	64.0	53.3	63.6	64.0	1	44.3	41.7	53.8	46.6	8	30.8	5
UPO-10-3	55.4	43.3	49.1	49.3	9	76.0	63.2	69.6	65.3	68.5	9	48.2	42.9	50.9	47.3	6	29.4	7
OS-432	52.6	43.3	43.2	46.4	4	72.0	61.8	61.0	64.8	64.9	6	49.7	47.0	55.0	50.6	2	35.7	2
OS-6 (NC)	54.2	45.1	46.9	48.7	8	73.0	62.0	68.3	65.1	67.1	7	47.3	38.3	52.4	46.0	9	27.0	9
Kent (NC)	56.6	42.6	56.1	51.8	10	82.0	66.0	69.7	62.6	70.1	10	50.1	43.2	44.8	46.0	9	32.6	3
SKO-90 (ZC-HZ)	54.6						62.6											
OL-125 (ZC-NWZ)		40.6							58.6			52.2	39.5				23.4	10
JHO-822 (ZC-CZ)			46.3			78.0		68.2						52.6				
Mean	**55.1**	**42.4**	**44.9**	**47.4**		**75.8**	**63.7**	**62.2**	**62.6**	**66.0**		**48.5**	**41.5**	**53.9**	**47.9**		**30.2**	

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

(Reference tables 5.1 to 5.9)

In Oat (single cut), nine entries were evaluated against two national checks Kent and OS-6 and four respective zonal checks JHO-99-2 (NEZ), OL-125 (NWZ), JHO-822 (CZ) and JHO-2000-4 (SZ) at 23 locations in four different zones (NWZ, NEZ, CZ, SZ).

For green forage yield (q/ha), entries RO-11-1 (12.1%) in NWZ; entries RO-11-1 (12.4%), OS-406 (5.6%), SKO-198 (5.0%) in NEZ, OS- 406 (6.6%), OL-1689 (6.2%) in CZ and RO-11-1 (42.3%), OL-1804 (19.8%) in SZ and RO-11-1 (15.4%), OS-406 (7.3%) at all India level exhibited superiority over best zonal/national check. Other entries were either inferior or showed marginal superiority over the best check.

Similarly for dry matter yield (q/ha), entries RO-11-1 (8.1%), OL-1804 (6.6%) in NWZ; RO-11-1 (15.3%), SKO-198 (11.9%), OS- 406 (8.0%) in NEZ; OL-1689 (11.1%), JO 14-18 (10.6%), OS-406 (8.6%), RSO -8 (6.5%) in CZ; RO-11-1 ()24.2%), OL-1804 (13.2%) in SZ registered superiority over best check. At national level, RO-11-1 (12.5%), OS-406 (5.7%), RSO-8 (4.8%) recorded superiority over best check.

For forage production potential (q/ha/day), entry RO-11-1 followed by RSO-8 for green forage and entries RSO-8 and RO-11-1 for dry matter production potential were adjudged superior performers. For plant height, entry RO-11-1 (135.7 cm) ranked first. For the character leafiness, entry SKO-198 (0.73) followed by SKO-196 (0.71) were superior.
In quality parameters, entries OS-406 (6.7) followed by JO-04-18 (6.3) for crude protein yield (q/ha) and JO-04-18 (9.3%) for crude protein content recorded superiority. For other quality parameters, OL-1689 for ADF (%), NDF (%) and entry SKO-198 for IVDMD (%), and RO-11-1 for DDM (q/ha) ranked first.

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

(Reference table: 6.1)

Results of the advanced varietal trial in Oat for seed with eight entries along with two national checks, Kent and OS-6 and respective zonal checks conducted at four zones across the country revealed that for seed yield (q/ha), entry JO-04-18 performed better in NWZ (13.1%), CZ (7.1%) , SZ (12.1%). At all India level also it was superior by 17.9% over the best check OS-6.

Table 5.1: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Green Forage Yield (q/ha)

Entries	North West Zone									North East Zone									
	Bika-ner	Udai-pur	His-ar	Ludh-iana	Pant-nagar	*Jal-ore	Aver-age	Ra-nk	Super-iority%	Jor-hat	Kal-yani	Bhuba-neswar	Ran-chi	Pu-sa	Faiza-bad	Imp-hal	Aver-age	Ra-nk	Superi-ority%
OL-1689	264.2	788.6	341.7	367.0	329.4	254.7	418.2	6		246.2	473.3	163.0	263.3	366.0	337.1	488.7	334.0	6	
SKO-199	215.2	622.0	400.0	293.2	236.0	170.0	353.3	10		302.4	385.5	171.0	326.7	377.0	278.1	413.6	322.0	9	
SKO-198	170.2	469.3	388.9	243.5	230.2	224.3	300.4	12		330.5	377.7	187.5	363.3	377.0	266.7	566.3	352.7	3	5.0
RSO-8	434.7	694.2	419.4	398.1	341.2	202.0	457.5	2	1.4	246.8	391.1	284.5	276.7	311.0	331.4	418.7	322.9	8	
SKO-196	204.9	483.1	405.6	286.0	330.2	176.0	341.9	11		311.1	348.8	215.0	320.0	333.0	339.0	350.7	316.8	11	
JO-04-18	320.3	516.5	494.4	326.3	236.3	121.7	378.8	9		263.6	452.2	201.0	290.0	322.0	327.2	343.8	314.3	12	
OS-406	333.0	685.9	558.3	378.3	326.6	123.7	456.4	3	1.2	311.4	491.1	168.5	256.7	355.0	428.6	472.6	354.8	2	5.6
OL-1804	479.1	599.8	508.3	380.7	299.7	127.0	453.5	5		229.4	450.0	232.0	316.7	355.0	358.1	421.1	337.5	4	0.5
RO-11-1	477.1	749.7	544.4	358.0	401.0	200.7	506.0	1	12.1	343.8	464.4	262.0	310.0	322.0	415.2	524.9	377.5	1	12.4
Kent (NC)	399.8	558.1	333.3	391.8	308.2	117.3	398.2	7		221.6	417.7	254.5	246.7	366.0	409.5	434.9	335.8	5	
OS-6 (NC)	353.0	566.4	405.6	322.8	315.2	105.0	392.6	8		225.1	428.8	224.0	370.0	344.0	308.6	406.3	329.5	7	
OL-125 ZC (NWZ)	433.5	693.2	405.6	425.8	296.8	270.0	451.0	4											
JHO-99-2 ZC (NEZ)										256.1	352.2	273.0	290.0	299.0	327.9	445.4	320.5	10	
Mean	**340.4**	**618.9**	**433.8**	**347.6**	**304.2**	**174.4**	**409.0**			**274.0**	**419.4**	**219.7**	**302.5**	**343.9**	**344.0**	**440.6**	**334.9**		
CD at 5%	70.8	135.5	107.1	32.7	49.3	NS				6.0	23.5	15.2	45.8	30.4	64.0	25.6			
CV%	12.3	12.9	14.5	5.6	9.3	43.0				6.2	4.7	4.1	8.9	6.8	10.9	4.9			

Note: * Not included in zonal and all India average due to CV≥ 20

Table 5.1: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Green Forage Yield (q/ha)

Entries	Central Zone										South Zone						All India		
	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority%	Man-dya	Hydera-bad	Coimb-atore	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority%
OL-1689	667.4	418.6	471.7	213.1	540.3	600.0	415.0	475.2	2	6.2	87.5	272.1	210.0	189.9	4		378.4	5	3.8
SKO-199	454.6	282.2	437.0	255.5	589.4	526.0	332.6	411.0	11		103.7	186.0	152.5	147.4	11		333.6	9	
SKO-198	448.8	288.3	479.3	268.2	556.4	475.0	354.6	410.1	12		41.2	138.8	228.3	136.1	12		329.5	11	
RSO-8	638.5	441.0	464.8	268.2	608.3	416.0	423.3	465.7	4	4.2	86.7	261.0	198.5	182.1	6		379.7	3	4.1
SKO-196	468.5	323.9	512.1	274.2	562.8	447.0	336.6	417.8	10		75.4	169.4	206.1	150.3	10		332.0	10	
JO-04-18	600.3	463.8	428.2	253.0	610.0	609.0	301.5	466.5	3	4.3	53.9	219.4	186.1	153.1	9		355.4	8	
OS-406	610.7	416.0	541.4	265.0	651.7	514.0	337.9	476.7	1	6.6	58.8	252.7	193.3	168.3	7		391.2	2	7.3
OL-1804	587.6	394.9	402.7	253.6	555.6	505.0	317.1	430.9	9		106.9	322.1	271.9	233.6	2	19.8	379.4	4	4.0
RO-11-1	728.7	366.0	469.8	240.3	548.9	485.0	410.2	464.1	5	3.8	169.0	247.1	419.4	278.5	1	42.3	420.8	1	15.4
Kent (NC)	690.5	431.0	483.5	246.5	481.7	469.0	323.8	446.6	7		109.1	244.3	199.2	184.2	5		364.6	6	
OS-6 (NC)	610.7	463.0	557.4	252.2	488.9	446.0	311.9	447.1	6		78.2	258.2	250.6	195.7	3		363.0	7	
JHO-822 ZC(CZ)	585.3	453.7	384.4	248.9	471.1	559.0	336.8	434.2	8										
JHO-2000-4 ZC (SZ)											101.0	216.6	172.5	163.4	8				
Mean	**591.0**	**395.2**	**469.4**	**253.2**	**555.4**	**504.3**	**350.1**	**445.5**			**89.3**	**232.3**	**224.0**	**181.9**			**366.2**		
CD at 5%	20.5	71.4	19.9	21.6	29.2	99.7	37.3				18.7	22.4	41.6						
CV%	12.1	10.7	2.5	5.0	3.1	11.7	6.2				12.3	5.7	11.0						

Table 5.2: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Dry Matter Yield (q/ha)

Entries	North West Zone							North East Zone									
	Bikaner	Hisar	Ludhiana	Pantnagar	Average	Rank	Superiority%	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Imphal	Average	Rank	Superiority%
OL-1689	57.9	83.4	81.0	70.3	73.2	8		49.1	69.1	33.9	56.3	72.2	64.8	100.4	63.7	5	0.3
SKO-199	60.3	80.9	64.6	52.4	64.6	10		57.7	55.1	34.8	81.4	74.1	65.9	83.9	64.7	4	1.9
SKO-198	45.0	78.3	52.9	50.3	56.6	12		62.7	52.8	38.6	88.9	74.4	60.2	120.1	71.1	2	11.9
RSO-8	102.2	96.9	87.9	75.8	90.7	3	2.1	48.9	57.1	58.3	65.2	61.1	63.6	79.6	62.0	7	
SKO-196	53.6	65.9	63.1	65.3	62.0	11		62.5	49.8	44.7	74.4	65.4	59.0	75.9	61.7	9	
JO-04-18	68.4	93.4	70.3	51.3	70.9	9		48.0	63.3	41.3	75.6	63.3	63.6	67.9	60.4	10	
OS-406	68.7	111.8	79.8	64.0	81.1	5		59.1	68.7	35.1	69.8	69.9	82.3	95.2	68.6	3	8.0
OL-1804	119.0	111.3	80.6	67.8	94.7	2	6.6	42.7	65.7	48.7	60.2	69.5	67.0	63.4	59.6	11	
RO-11-1	109.8	119.7	71.4	83.2	96.0	1	8.1	65.6	67.8	55.4	71.5	63.4	82.5	106.1	73.2	1	15.3
Kent (NC)	87.7	81.1	84.4	64.4	79.4	6		44.1	59.7	52.3	47.4	72.2	81.3	87.2	63.5	6	
OS-6 (NC)	79.6	84.8	64.3	75.3	76.0	7		42.7	61.3	45.7	76.4	67.9	66.3	72.4	61.8	8	
OL-125 ZC (NWZ)	100.5	90.1	89.4	75.3	88.8	4											
JHO-99-2 ZC (NEZ)								45.6	49.3	57.3	62.6	58.9	80.8	77.7	61.7	8	
Mean	**79.4**	**91.5**	**74.1**	**66.3**	**79.4**			**52.4**	**60.0**	**45.5**	**69.1**	**67.7**	**69.8**	**85.8**	**64.3**		
CD at 5%	25.8	30.9	11.6	17.2				3.4	3.8	4.4	13.5	7.6	7.9	9.2			
CV%	19.2	19.9	9.2	15.3				8.0	8.9	5.8	11.5	6.3	6.7	9.0			

Table 5.2: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Dry Matter Yield (q/ha)

Entries	Central Zone										South Zone						All India		
	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Jabalpur	Raipur	Average	Rank	Superiority%	Mandya	Hyderabad	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
OL-1689	126.8	75.7	77.5	64.8	74.6	140.0	99.0	94.0	1	11.1	18.7	51.4	45.0	38.4	5		72.0	5	2.4
SKO-199	78.5	57.7	72.4	63.4	83.1	122.0	78.0	79.3	11		28.8	42.6	27.5	32.9	10		65.0	10	
SKO-198	73.5	54.4	76.6	74.6	88.5	107.0	79.5	79.1	12		11.8	34.1	50.4	32.1	12		65.5	9	
RSO-8	112.4	85.0	77.8	74.6	91.3	92.0	97.3	90.1	4	6.5	19.8	51.6	49.5	40.3	4		73.7	3	4.8
SKO-196	72.5	55.9	80.4	76.9	94.5	103.0	77.5	80.1	10		20.0	36.5	42.5	33.0	9		63.8	11	
JO-04-18	109.7	82.6	76.1	73.2	89.7	142.0	82.1	93.6	2	10.6	12.8	51.2	33.7	32.6	11		69.5	7	
OS-406	114.0	89.9	92.2	58.2	97.1	119.0	72.8	91.9	3	8.6	14.4	58.2	39.9	37.5	6		74.3	2	5.7
OL-1804	103.8	85.8	74.9	68.2	81.1	117.0	61.9	84.7	7		21.6	62.0	55.2	46.3	2	13.2	72.7	4	3.4
RO-11-1	122.9	77.1	86.1	55.7	74.1	113.0	82.8	87.4	5	3.3	37.6	42.7	72.2	50.8	1	24.2	79.1	1	12.5
Kent (NC)	123.4	82.3	82.3	54.5	74.2	104.0	71.3	84.6	6		24.2	48.5	50.1	40.9	3		70.3	6	
OS-6 (NC)	88.7	86.5	95.7	56.4	78.2	103.0	64.8	81.9	9		19.4	36.1	55.6	37.0	7		67.7	8	
JHO-822 ZC(CZ)	101.5	95.2	63.1	54.4	80.1	131.0	61.4	83.8	8										
JHO-2000-4 ZC (SZ)											22.1	41.9	35.4	33.1	8				
Mean	**102.3**	**77.3**	**79.6**	**64.6**	**83.9**	**116.1**	**77.4**	**85.9**			**20.9**	**46.4**	**46.4**	**37.9**			**70.3**		
CD at 5%	8.6	14.4	3.4	9.3	4.6	23.1	8.4				4.8	14.6	8.3						
CV%	5.1	11.0	2.5	8.4	3.2	11.8	6.3				13.5	18.6	10.6						

Table 5.3: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Green Forage Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Raipur	Mandya	Hyderabad	Coimbatore	Average	Rank
OL-1689	2.45	2.85	2.90	2.16	5.91	2.36	4.25	3.94	3.15	7.33	4.98	5.36	2.60	6.00	4.94	0.98	3.21	2.56	3.77	7
SKO-199	1.66	3.33	1.90	2.52	4.81	2.28	5.83	3.97	2.53	4.84	2.41	4.80	3.17	6.27	3.91	1.26	1.52	1.79	3.27	9
SKO-198	1.31	3.24	1.60	2.75	4.72	2.64	3.24	3.97	2.49	4.77	2.44	6.66	3.39	5.51	4.17	0.50	1.14	2.62	3.18	11
RSO-8	4.03	3.50	3.10	2.01	4.88	3.84	2.94	3.34	3.12	7.09	5.19	6.12	3.66	6.76	5.16	1.03	2.9	2.65	3.96	2
SKO-196	1.58	3.38	1.80	2.59	4.36	3.03	3.45	3.47	3.22	4.78	2.65	6.83	3.40	5.57	4.01	0.78	1.39	2.37	3.26	10
JO-04-18	2.97	4.12	2.60	2.31	5.65	3.05	2.68	3.39	3.14	6.06	5.27	5.87	3.48	6.42	3.59	0.56	2.38	2.19	3.65	8
OS-406	3.08	4.65	3.00	2.73	6.13	2.41	2.7	3.70	4.20	6.30	4.67	7.12	3.29	6.86	4.02	0.61	2.67	2.42	3.92	4
OL-1804	4.44	4.24	3.00	1.91	5.62	3.18	3.64	3.70	3.25	6.53	4.65	5.44	3.46	6.17	3.69	1.16	3.03	3.32	3.91	5
RO-11-1	4.42	4.54	2.80	2.80	5.80	3.64	3.26	3.35	3.84	7.44	3.85	5.80	2.96	5.43	4.77	2.01	2.75	4.82	4.13	1
Kent (NC)	3.70	2.78	3.10	1.94	5.22	3.64	4.65	3.85	3.79	7.67	5.13	6.36	3.31	5.35	3.95	1.23	2.91	2.34	3.94	3
OS-6 (NC)	3.27	3.38	2.50	1.88	5.36	3.34	4.25	3.62	2.85	6.71	5.65	6.64	3.31	5.43	3.63	0.94	3.17	3.48	3.86	6
OL-125 ZC (NWZ)	4.01	3.38	3.40																	
JHO-99-2 ZC (NEZ)				2.13	4.40	4.01	3.37	3.15	3.59											
JHO-822 ZC(CZ)										6.50	5.34	4.81	3.39	5.23	4.11					
JHO-2000-4 ZC (SZ)																1.10	2.08	2.10		
Mean	**3.08**	**3.62**	**2.64**	**2.31**	**5.24**	**3.12**	**3.69**	**3.62**	**3.26**	**6.34**	**4.35**	**5.98**	**3.29**	**5.92**	**4.16**	**1.01**	**2.43**	**2.72**	**3.71**	

Table 5.4: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Dry Matter Yield (q/ha/day)

Entries	Bikaner	Hisar	Ludhiana	Jorhat	Kalyani	Bhubaneswar	Ranchi	Pusa	Faizabad	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Raipur	Mandya	Hyderabad	Coimbatore	Average	Rank
OL-1689	0.54	0.70	0.60	0.43	0.86	0.49	0.90	0.78	0.60	1.39	0.90	0.88	0.79	0.83	1.18	0.21	0.61	0.55	0.74	4
SKO-199	0.46	0.67	0.40	0.48	0.68	0.46	1.45	0.78	0.60	0.83	0.49	0.80	0.79	0.88	0.92	0.35	0.35	0.32	0.65	6
SKO-198	0.35	0.65	0.30	0.52	0.66	0.54	0.79	0.78	0.56	0.78	0.46	1.06	0.94	0.88	0.94	0.14	0.28	0.58	0.62	7
RSO-8	0.95	0.81	0.70	0.40	0.71	0.79	0.69	0.66	0.60	1.25	1.00	1.02	1.02	1.01	1.19	0.24	0.57	0.66	0.79	1
SKO-196	0.41	0.55	0.40	0.52	0.62	0.63	0.80	0.68	0.56	0.74	0.46	1.07	0.95	0.94	0.92	0.21	0.30	0.49	0.62	7
JO-04-18	0.63	0.78	0.60	0.42	0.79	0.63	0.70	0.67	0.61	1.11	0.94	1.04	1.01	0.94	0.98	0.13	0.55	0.40	0.72	5
OS-406	0.64	0.93	0.60	0.52	0.85	0.50	0.73	0.73	0.81	1.18	1.01	1.21	0.72	1.02	0.87	0.15	0.62	0.50	0.75	3
OL-1804	1.10	0.93	0.60	0.36	0.82	0.67	0.69	0.72	0.61	1.15	1.01	1.01	0.93	0.90	0.72	0.23	0.59	0.67	0.76	2
RO-11-1	1.02	1.00	0.60	0.53	0.84	0.77	0.75	0.66	0.76	1.25	0.81	1.06	0.68	0.73	0.96	0.45	0.47	0.83	0.79	1
Kent (NC)	0.81	0.68	0.70	0.39	0.75	0.75	0.89	0.76	0.75	1.37	0.98	1.08	0.73	0.82	0.87	0.27	0.58	0.59	0.76	2
OS-6 (NC)	0.74	0.71	0.50	0.36	0.76	0.68	0.87	0.71	0.61	0.97	1.06	1.14	0.74	0.87	0.75	0.23	0.45	0.77	0.72	5
OL-125 ZC (NWZ)	0.93	0.75	0.70																	
JHO-99-2 ZC (NEZ)				0.38	0.62	0.84	0.72	0.62	0.77											
JHO-822 ZC(CZ)										1.13	1.12	0.79	0.74	0.89	0.75					
JHO-2000-4 ZC (SZ)																0.24	0.40	0.43		
Mean	**0.72**	**0.76**	**0.56**	**0.44**	**0.75**	**0.65**	**0.83**	**0.71**	**0.65**	**1.10**	**0.85**	**1.01**	**0.84**	**0.89**	**0.92**	**0.24**	**0.48**	**0.57**	**0.72**	

Table 5.5: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Crude Protein Yield (q/ha)

Entries	Bika-ner	Ludh-iana	His-ar	Jor-hat	Kal-yani	Bhuban-eswar	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
OL-1689	4.7	6.3	10.9	4.8	5.5	3.1	5.2	6.3	4.6	6.1	10.1	11.5	8.6	3.1	1.1	3.1	5.9	6
SKO-199	3.9	4.5	11.2	5.8	3.3	3.2	5.4	4.6	4.3	5.9	10.1	10.0	5.8	1.7	2.4	4.1	5.4	8
SKO-198	3.2	3.8	10.4	6.2	3.9	3.5	4.9	8.1	4.2	6.5	10.8	8.5	6.2	1.4	0.7	7.3	5.6	7
RSO-8	7.0	6.2	12.3	5.0	7.0	5.4	5.1	5.2	6.1	5.7	9.5	7.3	8.4	3.4	1.3	5.2	6.2	3
SKO-196	3.9	4.7	10.2	6.5	2.1	4.1	4.8	4.5	4.2	7.1	9.1	8.2	7.3	1.6	1.2	5.9	5.3	9
JO-04-18	6.9	5.0	12.6	4.9	8.0	3.8	5.0	4.2	6.7	6.3	10.3	11.7	6.3	2.7	1.0	5.0	6.3	2
OS-406	4.8	6.1	15.3	6.6	7.8	3.2	6.5	6.2	6.4	7.2	11.0	9.8	6.4	3.0	1.0	5.8	6.7	1
OL-1804	8.0	6.1	13.4	4.6	5.2	4.4	5.4	4.0	6.1	6.3	7.3	9.5	5.5	3.1	1.2	7.0	6.1	4
RO-11-1	7.2	5.1	15.1	6.7	7.9	5.0	6.7	6.8	5.3	6.3	8.6	9.1	5.2	2.3	1.5	8.9	6.7	1
Kent (NC)	6.4	5.8	10.8	4.6	4.0	4.8	6.8	5.1	6.1	6.3	10.2	8.4	5.6	2.9	1.7	6.4	6.0	5
OS-6 (NC)	7.1	4.6	11.6	4.3	5.6	4.2	5.3	4.7	6.2	7.2	9.5	8.4	5.3	2.2	1.3	7.3	5.9	6
OL-125 ZC (NWZ)	8.8	6.4	11.6															
JHO-99-2 ZC (NEZ)				4.8	5.3	5.2	6.5	5.1										
JHO-822 ZC(CZ)									7.4	4.9	9.9	10.6	4.6					
JHO-2000-4 ZC (SZ)														1.8	1.2	3.4		
Mean	**6.0**	**5.4**	**12.1**	**5.4**	**5.5**	**4.2**	**5.6**	**5.4**	**5.6**	**6.3**	**9.7**	**9.4**	**6.2**	**2.4**	**1.3**	**5.8**	**6.0**	

Table 5.6: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Crude Protein (%)

Entries	Bika-ner	Ludh-iana	His-ar	Jor-hat	Kal-yani	Bhuba-neswar	Faiza-bad	Ran-chi	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk
OL-1689	8.1	7.8	13.1	9.9	7.9	9.1	8.1	8.8	6.2	6.1	7.8	13.6	8.3	8.7	6.1	6.1	7.0	8.4	6
SKO-199	6.4	6.9	13.9	10.1	5.9	9.3	8.2	5.7	5.5	7.4	8.1	12.2	8.2	7.4	3.9	8.3	14.9	8.4	6
SKO-198	7.0	7.2	13.3	10.1	7.4	9.2	8.1	5.7	6.7	7.7	8.5	12.2	8.0	7.8	4.1	6.1	14.4	8.4	6
RSO-8	6.8	7.1	12.7	10.2	12.2	9.3	8.0	10.6	6.5	7.2	7.4	10.4	7.9	8.6	6.6	6.6	10.5	8.7	4
SKO-196	7.4	7.4	15.5	10.6	4.3	9.1	8.2	5.7	5.9	7.6	8.8	9.6	8.1	9.4	4.5	6.1	14.0	8.4	6
JO-04-18	10.2	7.1	13.5	10.3	12.6	9.2	7.8	10.6	6.2	8.2	8.2	11.5	8.3	7.6	5.3	7.4	14.9	9.3	1
OS-406	7.0	7.6	13.7	11.2	11.4	9.1	7.9	6.1	6.5	7.2	7.8	11.3	8.2	8.8	5.2	7.0	14.4	8.8	3
OL-1804	6.7	7.6	12.0	10.9	7.9	9.0	8.0	6.6	6.4	7.2	8.4	9.0	8.2	8.8	4.9	5.7	12.7	8.2	7
RO-11-1	6.6	7.1	12.7	10.3	11.6	8.9	8.1	5.7	6.4	6.9	7.3	11.6	8.2	6.3	5.4	3.9	12.3	8.2	7
Kent (NC)	7.3	6.9	13.3	10.5	6.7	9.2	8.3	8.8	5.8	7.4	7.6	13.7	8.1	7.8	6.0	7.0	12.7	8.6	5
OS-6 (NC)	8.9	7.1	13.7	10.3	9.1	9.3	8.0	9.2	6.5	7.2	7.5	12.2	8.2	8.2	6.0	6.6	13.1	8.9	2
OL-125 ZC (NWZ)	8.8	7.2	12.9																
JHO-99-2 ZC (NEZ)				10.6	10.7	9.0	8.0	7.4	6.6										
JHO-822 ZC(CZ)										7.7	7.8	12.3	8.2	7.5					
JHO-2000-4 ZC (SZ)															4.3	5.3	9.6		
Mean	**7.6**	**7.3**	**13.3**	**10.4**	**9.0**	**9.1**	**8.1**	**7.6**	**6.3**	**7.3**	**7.9**	**11.6**	**8.1**	**8.1**	**5.2**	**6.3**	**12.5**	**8.6**	

Table 5.7: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Plant Height (cm)

Entries	Bikaner	Hisar	Ludhiana	Pantnagar	Udaipur	Jorhat	Kalyani	Bhubaneswar	Ranchi	Faizabad	Imphal
OL-1689	132.0	143.9	122.6	128.9	141.6	156.9	170.5	124.3	128.0	134.8	149.9
SKO-199	94.0	118.0	131.1	102.9	120.3	133.7	114.9	131.4	111.0	77.5	119.2
SKO-198	80.0	100.8	122.3	103.6	107.0	122.6	113.4	132.2	106.0	73.0	95.9
RSO-8	153.0	140.7	132.0	141.3	145.4	153.9	159	155.7	126.0	124.4	144.4
SKO-196	95.0	102.3	125.8	114.3	110.9	137.1	116.9	139.2	120.0	86.8	107.2
JO-04-18	96.0	113.8	128.0	116.4	125.6	103.9	154.6	136.9	118.0	105.2	103.6
OS-406	148.0	144.0	129.3	128.8	139.4	129.7	157.9	127.3	123.0	122.0	120.9
OL-1804	188.0	135.9	138.3	137.8	141.4	141.5	162.6	147.6	146.0	114.0	124.1
RO-11-1	196.0	128.9	135.6	150.9	143.2	141.1	158.5	148.7	126.0	121.6	150.2
Kent (NC)	130.0	112.9	107.0	125.0	128.7	128.7	154.8	148.3	100.0	124.2	126.9
OS-6 (NC)	140.0	137.2	129.3	126.6	127.2	147.4	159.8	143.2	134.0	121.0	127.3
OL-125 ZC (NWZ)	170.0	138.1	136.3	141.7	142.1						
JHO-99-2 ZC (NEZ)						145.0	143.9	151.3	140.0	107.5	139.2
JHO-822 ZC(CZ)											
JHO-2000-4 ZC (SZ)											
Mean	**135.2**	**126.4**	**128.1**	**126.5**	**131.1**	**136.8**	**147.2**	**140.5**	**123.2**	**109.3**	**125.7**

Table 5.7: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Plant Height (cm)

Entries	Jhansi	Rahuri	Urulikanchan	Palghar	Anand	Jabalpur	Raipur	Mandya	Hyderabad	Coimbatore	Average	Rank
OL-1689	161.7	117.3	107.4	118.7	149.3	126.7	128.9	76.3	83.2	107.2	129.1	4
SKO-199	163.8	110.2	85.0	125.0	142.7	125.7	96.1	42.7	68.9	93.8	109.9	9
SKO-198	159.3	105.0	93.6	139.3	145.5	117.3	96.2	41.4	61.2	94.0	105.2	10
RSO-8	161.4	107.9	111.2	113.7	150.1	107.5	135.0	69.5	85.6	144.1	131.5	2
SKO-196	149.3	111.0	77.9	143.3	152.4	113.4	83.3	50.7	74.7	96.7	109.9	9
JO-04-18	149.6	109.0	105.4	117.3	154.9	133.5	73.0	57.5	53.6	87.7	111.6	8
OS-406	165.9	114.5	117.6	121.7	157.7	121.1	112.7	55.0	73.6	88.5	123.7	6
OL-1804	160.4	110.2	110.1	123.3	143.1	118.9	126.4	78.6	79.1	111.5	130.4	3
RO-11-1	183.7	125.1	124.3	110.0	148.5	120.7	131.1	90.9	91.4	124.1	135.7	1
Kent (NC)	153.6	96.0	100.2	115.7	133.3	114.6	100.9	80.0	82.4	89.5	116.8	7
OS-6 (NC)	161.2	102.8	101.0	129.2	146.0	114.4	111.9	66.1	83.7	113.0	124.9	5
OL-125 ZC (NWZ)												
JHO-99-2 ZC (NEZ)												
JHO-822 ZC(CZ)	150.7	114.4	115.6	129.7	133.9	127.0	121.0					
JHO-2000-4 ZC (SZ)								76.7	79.6	112.7		
Mean	**160.0**	**110.3**	**104.1**	**123.9**	**146.4**	**120.1**	**109.7**	**65.5**	**76.4**	**105.2**	**120.8**	

Table 5.8: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): Leaf Stem Ratio

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Pal-ghar	Jabal-pur	Rai-pur	Man-dya	Hydera-bad	Coimb-atore	Aver-age	Ra-nk
OL-1689	0.48	0.41	0.92	0.61	0.58	0.87	1.09	0.42	0.65	0.31	0.63	0.74	0.79	0.69	0.55	1.15	0.48	0.54	0.66	3
SKO-199	0.29	0.85	0.85	0.53	1.47	0.87	1.04	0.72	0.70	0.52	0.75	0.69	0.81	0.56	0.52	1.02	0.51	0.35	0.73	1
SKO-198	0.38	0.79	0.62	0.59	0.77	1.00	0.91	0.37	0.72	0.46	0.58	0.65	0.71	0.43	0.66	1.05	0.33	0.43	0.64	4
RSO-8	0.43	0.43	0.81	0.41	1.16	0.87	1.39	0.35	0.73	0.28	0.56	0.62	0.80	0.46	0.61	0.79	0.41	0.34	0.64	4
SKO-196	0.33	0.79	0.78	0.53	0.87	0.75	1.21	0.84	0.70	0.37	0.84	0.90	0.88	0.46	0.48	1.08	0.62	0.42	0.71	2
JO-04-18	0.36	0.52	0.80	0.54	0.73	0.87	1.19	0.39	0.68	0.35	0.59	0.57	0.75	0.70	0.63	0.47	0.42	0.38	0.61	7
OS-406	0.32	0.19	0.96	0.48	0.65	0.75	0.97	0.41	0.71	0.28	0.41	0.89	0.85	0.56	0.43	0.49	0.41	0.36	0.56	8
OL-1804	0.43	0.52	0.32	0.62	0.84	0.75	1.35	0.41	0.74	0.43	0.49	0.82	0.77	0.50	0.84	1.27	0.49	0.36	0.66	3
RO-11-1	0.33	0.47	0.61	0.53	0.75	1.00	1.47	0.37	0.71	0.25	0.31	0.80	0.81	0.57	0.47	0.44	0.69	0.42	0.61	7
Kent (NC)	0.40	0.43	1.00	0.53	0.69	0.75	1.30	0.43	0.68	0.28	0.54	0.92	0.79	0.48	0.64	0.85	0.33	0.34	0.63	5
OS-6 (NC)	0.31	0.56	0.67	0.42	0.85	0.75	1.24	0.34	0.71	0.44	0.47	0.69	0.84	0.45	0.52	0.98	0.64	0.34	0.62	6
OL-125 ZC (NWZ)	0.33	0.39	0.67	0.44																
JHO-99-2 ZC (NEZ)					0.66	0.75	1.41	0.40	0.70	0.26										
JHO-822 ZC(CZ)											0.38	0.73	0.83	0.60	0.51					
JHO-2000-4 ZC (SZ)																1.57	0.48	0.37		
Mean	**0.37**	**0.53**	**0.75**	**0.52**	**0.84**	**0.83**	**1.21**	**0.45**	**0.70**	**0.35**	**0.55**	**0.75**	**0.80**	**0.54**	**0.57**	**0.93**	**0.48**	**0.39**	**0.64**	

Table 5.9: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut): ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries	ADF (%)					NDF (%)						IVDMD (%)						DDM (q/ha)	
	Ludh-iana	Rah-uri	Ran-chi	Aver-age	Ra-nk	Ana-nd	Ludh-iana	Rah-uri	Ran-chi	Aver-age	Ra-nk	Rah-uri	Ludh-iana	His-ar	Ran-chi	Aver-age	Ra-nk	His-ar	Ra-nk
OL-1689	46.2	36.6	38.9	40.6	1	72.0	60.3	61.9	65.1	64.8	1	60.0	49.8	54.8	62.4	56.7	2	45.7	9
SKO-199	51.9	37.8	35.2	41.6	3	73.0	63.6	62.4	62.8	65.5	4	59.1	41.3	56.1	64.9	55.3	4	45.4	10
SKO-198	49.7	40.4	35.1	41.7	4	75.0	61.1	68.2	60.6	66.2	5	57.0	44.6	64.4	64.9	57.7	1	50.4	7
RSO-8	50.6	45.6	40.6	45.6	11	72.0	62.1	62.3	65.8	65.5	4	53.0	42.9	54.8	61.2	53.0	9	53.1	5
SKO-196	49.8	45.1	41.6	45.5	10	71.0	61.7	63.9	64.5	65.3	3	53.4	41.3	52.8	60.5	52.0	10	34.8	12
JO-04-18	48.9	39.8	33.7	40.8	2	73.0	63.9	63.6	59.2	64.9	2	57.5	43.6	56.8	65.0	55.7	3	53.1	6
OS-406	48.5	43.9	41.3	44.6	7	75.0	62.9	68.9	63.0	67.5	6	54.3	48.3	54.8	60.8	54.5	7	61.3	2
OL-1804	48.3	43.2	43.1	44.9	8	77.0	64.3	64.0	66.9	68.1	9	54.9	46.3	52.4	59.5	53.3	8	58.3	3
RO-11-1	49.3	43.9	42.2	45.1	9	73.0	62.6	66.9	68.1	67.7	8	54.3	43.8	62.4	60.1	55.2	5	74.7	1
Kent (NC)	51.3	39.0	39.5	43.3	6	75.0	64.1	65.3	66.1	67.6	7	58.1	41.0	51.0	62.0	53.0	9	41.4	11
OS-6 (NC)	50.7	38.9	39.6	43.1	5	70.0	62.6	66.2	63.1	65.5	4	58.2	43.6	56.4	61.9	55.0	6	47.8	8
OL-125 ZC (NWZ)	51.8						62.5						45.8	59.4				53.5	4
JHO-99-2 ZC (NEZ)			39.6						69.3						61.9				
JHO-822 ZC(CZ)		40.8				80.0		69.1				56.7							
JHO-2000-4 ZC (SZ)																			
Mean	**49.8**	**41.3**	**39.2**	**43.3**		**73.8**	**62.6**	**65.2**	**64.5**	**66.2**		**56.4**	**44.4**	**56.3**	**62.1**	**54.7**		**51.6**	

Table 6.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oats (Single cut) for Seed: Seed Yield (q/ha)

Entries	North West Zone						North East Zone				
	Hisar	Pantnagar	Ludhiana	Average	Rank	Superiority%	Jorhat	Ranchi	Average	Rank	Superiority%
JO-04-18	19.68	15.83	24.20	19.90	1	13.1	16.80	9.30	13.05	9	
RSO-8	7.17	8.67	11.20	9.01	8		17.38	15.60	16.49	3	
SKO-199	2.34	6.25	5.30	4.63	11		15.06	9.00	12.03	10	
SKO-198	2.53	5.67	5.90	4.70	10		12.75	8.60	10.67	11	
OS-406	10.17	10.17	15.60	11.98	5		16.80	17.00	16.90	1	1.3
OL-1804	15.64	10.08	16.10	13.94	3		19.12	12.70	15.91	4	
RO-11-1	6.26	13.33	6.90	8.83	9		17.38	12.30	14.84	6	
OL-1689	9.25	9.33	16.20	11.59	7		13.61	14.70	14.16	8	
Kent (NC)	14.72	12.75	25.30	17.59	2		13.04	16.00	14.52	7	
OS-6 (NC)	11.77	9.58	14.40	11.92	6		17.67	15.70	16.69	2	
OL-125 (ZC-NWZ)	11.56	12.50	13.10	12.39	4						
JHO-99-2 (ZC-NEZ)							17.09	13.00	15.05	5	
Mean	**10.1**	**10.4**	**14.0**	**11.5**			**16.1**	**13.1**	**14.6**		
CD at 5%	3.2	2.3	2.0				1.0	4.4			
CV%	18.4	11.5	8.3				4.3	19.6			

Table 6.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oats (Single cut) for Seed: Seed Yield (q/ha)

Entries	Central Zone						South Zone				All India		
	Jha-nsi	Jabal-pur	Rah-uri	Aver-age	Ra-nk	Superi-ority%	*Hydera-bad	Man-dya	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Super-iority%
JO-04-18	13.88	21.00	11.39	15.42	1	7.1	22.70	23.06	1	12.1	17.24	1	17.9
RSO-8	13.76	9.40	6.10	9.76	4		8.90	15.69	7		11.66	7	
SKO-199	6.25	7.43	0.59	4.75	10			1.87	10		6.01	10	
SKO-198	5.09	8.10	0.22	4.47	11			0.36	11		5.47	11	
OS-406	10.76	9.60	5.16	8.51	7		17.20	16.83	6		12.45	5	
OL-1804	12.15	7.20	8.71	9.35	6		14.50	17.11	5		13.20	4	
RO-11-1	7.52	7.83	4.01	6.45	9		9.10	13.44	8		9.89	8	
OL-1689	10.41	5.30	9.24	8.32	8		11.30	17.64	4		11.74	6	
Kent (NC)	16.19	5.43	7.41	9.68	5		18.60	20.56	2		14.60	3	
OS-6 (NC)	19.66	14.93	8.61	14.40	2		15.20	19.26	3		14.62	2	
JHO-822 (ZC-CZ)	21.40	6.73	9.63	12.59	3								
JHO-2000-4 (ZC-SZ)							13.80	8.94	9				
Mean	**12.5**	**9.4**	**6.5**	**9.4**			**14.6**	**14.1**			**11.7**		
CD at 5%	6.5	1.9	1.1				5.3	4.3					
CV%	3.9	11.5	10.2				21.2	17.0					

Note: * Not included in Zonal and all India Average due to CV≥ 20

7. AVT OAT (SC-2) - SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) REPEAT 13-14 **(Reference tables 7.1 to 7.4)**

AVT-2 (SC) conducted in 2013-14 was repeated in two locations of NWZ as per comments of Varietal Identification committee. Single entry OS-403 was evaluated along with 2 national checks (OS-6 and Kent) and one zonal check (OL-125). For GFY (q/ha), DMY (q/ha), production potential and crude protein, the checks performed better than the test entry. For plant height, test entry OS-403 was superior whereas for IVDMD%, ADF%, NDF% check OS-6 was better.

8. AVTO (SC)-2: SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) REPEAT 14-15

(Reference tables 8.1 to 8.9)

In Oat (single cut), AVT-2 trial was repeated. Eight entries were evaluated against two national checks (Kent, OS-6) and five respective zonal checks at 10 locations in five zones of the country.
For green forage yield (q/ha), entries SKO-190 (16.5%), RSO-60 (8.7%), OL-1760 (6.7%) in HZ; JHO- 2012-1 (9.3%) , OL-1760 (5.4%), JO-04-14 (4.5%) in NWZ; RSO-59 (6.2%), OL-1760 (5.2%) in NEZ RSO-59 (16.9%), JHO-2012-2 (16.6%), JHO-2012-1 (11.6%), OL-1760 (10.7%), OS-405 (9.8%), JO-04-14 (8.8%), RSO-60 (8.4%) in CZ and OS-405 (31%), RSO-60 (22.7%), OL-1760 (13.2%), JHO- 2012-1 (11.9%), RSO-59 (5.1%) in SZ registered superiority over best zonal/national check. At national level, all the entries performed better than checks with OL-1760 ranked first followed by RSO-60.

In dry matter production (q/ha), entries SKO-190 followed by OL-1760 and RSO-60 performed better than checks in HZ. Entries OL-1760 (9.3%), JHO -2012-1 (7.3%) in NWZ, entries JHO -2012-1 (19.9%), RSO-59 (18.9%), OS-405 (14.9%), JO-04-14 (14.9%), JHO-2012-1 (14.4%), RSO-60 (11.6%) in CZ; Entries OS-405 (22.1%), RSO-60 (11.9%) in SZ; exhibited their superiority. At national level, all the entries except SKO-190 performed better than checks with RSO-60 ranking first followed by OL-1760.

For fodder production potential (q/ha/day), entries RSO-59 and RSO-60 exhibited superiority over best check for green forage and dry matter production potential respectively. For growth parameter, OS-405 (121.1 cm) ranked first for plant height whereas OL-1760 was adjudged best performer for leafiness.

For quality parameters, OS-405 (6.1 q/ha) and JHO-2012-1 (8.8%) ranked first for crude protein yield and crude protein content respectively. Similarly, Check variety OS-6 ranked first for ADF (%) and NDF (%). RSO-59 ranked first for IVDMD (%) and DDM (q/ha).

Table 7.1: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single cut) (Repeat 13-14): Green Forage Yield (q/ha) & Dry Matter Yield (q/ha)

Entries	GFY (q/ha)				DMY (q/ha)			
	Pantnagar	Ludhiana	Average	Rank	Pantnagar	Ludhiana	Average	Rank
OS-403	489.7	437.5	463.6	3	65.0	98.3	81.7	3
OS-6 (NC)	373.6	452.2	412.9	4	51.9	99.7	75.8	4
Kent (NC)	451.7	487.8	469.7	2	60.6	103.3	81.9	2
OL-125 (ZC-NWZ)	456.4	543.3	499.8	1	58.7	117.0	87.8	1
Mean	**442.8**	**480.2**	**461.5**		**59.0**	**104.6**	**81.8**	
CD at 5%	59.7	28.5			10.2	9.7		
CV%	6.8	4.3			8.7	6.8		

Table 7.2: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single cut) (Repeat 13-14): Green Forage Yield (q/ha/day), Dry Matter Yield (q/ha), CPY (q/ha), CP (%)

Entries	GFY (q/ha/day)		DMY (q/ha/day)		CPY (q/ha)		CP (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
OS-403	3.50	4	0.80	2	6.9	4	7.0	3
OS-6 (NC)	3.60	3	0.80	2	8.8	1	8.8	1
Kent (NC)	3.90	2	0.80	2	7.5	3	7.3	2
OL-125 (ZC-NWZ)	4.30	1	0.90	1	8.5	2	7.3	2
Mean	**3.83**		**0.83**		**7.9**		**7.6**	

Table 7.3: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single cut) (Repeat 13-14): Plant height (cm), Leaf Stem Ratio

Entries	Plant height (cm)				Leaf Stem Ratio			
	Pantnagar	Ludhiana	Average	Rank	Pantnagar	Ludhiana	Average	Rank
OS-403	139.0	157.0	148.0	1	0.60	0.32	0.46	3
OS-6 (NC)	111.5	127.8	119.6	4	0.52	0.52	0.52	2
Kent (NC)	126.9	132.8	129.9	3	0.43	0.60	0.52	2
OL-125 (ZC-NWZ)	132.7	143.2	138.0	2	0.46	0.67	0.57	1
Mean	**127.5**	**140.2**	**133.9**		**0.50**	**0.53**	**0.52**	

Table 7.4: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single cut) (Repeat 13-14): ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Rank
OS-403	44.6	4	68.3	4	42.1	4
OS-6 (NC)	40.3	1	61.1	1	46.9	1
Kent (NC)	44.1	3	62.9	2	43.6	3
OL-125 (ZC-NWZ)	44.0	2	64.8	3	46.8	2
Mean	**43.3**		**64.3**		**44.9**	

Table 8.1: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Green Forage Yield (q/ha)

Entries	Hill Zone					North West Zone					North East Zone				
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Super-iority%	His-ar	Ludh-iana	Aver-age	Ra-nk	Super-iority%	Kal-yani	Bhuban-eswar	Aver-age	Ra-nk	Superi-ority%
JHO-2012-2	173.9	410.4	292.1	7		469.4	445.3	457.4	8		502.2	154.0	328.1	6	
RSO-59	179.2	422.6	300.9	5	2.6	561.1	424.5	492.8	5	3.5	415.5	285.0	350.3	1	6.2
RSO-60	193.6	443.5	318.6	2	8.7	452.8	539.3	496.0	4	4.2	388.8	273.5	331.2	4	0.5
OS-405	192.0	412.4	302.2	4	3.1	483.3	445.7	464.5	7		477.7	186.0	331.9	3	0.6
SKO-190	217.1	465.3	341.2	1	16.5	402.8	321.9	362.3	11		463.3	172.5	317.9	8	
JHO-2012-1	167.5	415.2	291.3	9		488.9	552.5	520.7	1	9.3	401.1	236.0	318.6	7	
OL-1760	178.1	446.9	312.5	3	6.7	488.9	514.6	501.7	2	5.4	458.8	234.5	346.7	2	5.2
JO-04-14	165.3	415.4	290.4	10		425.0	570.0	497.5	3	4.5	407.3	149.5	278.4	11	
Kent (NC)	130.7	453.1	291.9	8		405.6	451.4	428.5	9		381.1	215.0	298.1	10	
OS-6 (NC)	145.6	440.4	293.0	6		363.9	448.1	406.0	10		402.1	222.5	312.3	9	
SKO-90 (ZC-HZ)	181.9	392.4	287.1	11											
OL-125 (ZC-NWZ)						411.1	540.8	476.0	6						
JHO-99-2 (ZC-NEZ)											404.4	255.0	329.7	5	
JHO-822 (ZC-CZ)															
JHO-2000-4 (ZC-SZ)															
Mean	**175.0**	**428.9**	**301.9**			**450.3**	**477.6**	**463.9**			**427.5**	**216.7**	**322.1**		
CD at 5%	20.4	23.5				109.1	27.7				18.6	17.3			
CV%	6.8	7.4				14.3	3.4				4.7	4.7			

Table 8.1: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Green Forage Yield (q/ha)

Entries	Central Zone					South Zone					All India		
	Rah-uri	Jabal-pur	Aver-age	Ra-nk	Superi-ority%	Man-dya	Hydera-bad	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Superi-ority%
JHO-2012-2	271.1	551.0	411.1	2	16.6	113.7	233.2	173.4	9		332.4	6	7.3
RSO-59	384.7	440.0	412.4	1	16.9	154.1	233.2	193.7	5	5.1	350.0	3	12.9
RSO-60	327.4	437.0	382.2	7	8.4	172.1	280.4	226.2	2	22.7	350.8	2	13.2
OS-405	278.2	496.0	387.1	5	9.8	189.0	294.3	241.6	1	31.0	345.5	5	11.5
SKO-190	203.9	430.0	316.9	11		101.8	249.9	175.8	10		302.8	10	
JHO-2012-1	262.9	524.0	393.4	3	11.6	201.8	211.0	206.4	4	11.9	346.1	4	11.7
OL-1760	341.5	439.0	390.3	4	10.7	153.6	263.8	208.7	3	13.2	352.0	1	13.6
JO-04-14	223.6	544.0	383.8	6	8.8	163.8	211.0	187.4	6	1.7	327.5	7	5.7
Kent (NC)	300.2	392.0	346.1	9		160.2	208.3	184.3	7		309.8	8	
OS-6 (NC)	259.2	446.0	352.6	8		144.1	216.6	180.4	8		308.9	9	
JHO-822 (ZC-CZ)	292.4	360.0	326.2	10									
JHO-2000-4 (ZC-SZ)						145.4	177.7	161.5	11				
Mean	**285.9**	**459.9**	**372.9**			**154.5**	**234.5**	**194.5**			**332.6**		
CD at 5%	53.0	92.6				33.4	48.5						
CV%	10.9	11.8				12.7	12.2						

Table 8.2: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Dry Matter Yield (q/ha)

Entries	Hill Zone					North West Zone					North East Zone				
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi-ority%	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-ority%	Kal-yani	Bhuban-eswar	Aver-age	Ra-nk	Superi-ority%
JHO-2012-2	34.6	94.8	64.7	9		105.0	96.8	100.9	6	1.4	71.8	32.4	52.1	7	
RSO-59	35.3	97.6	66.5	4	0.4	111.8	93.7	102.7	4	3.2	55.2	58.2	56.7	2	1.3
RSO-60	38.2	102.5	70.3	3	6.1	87.1	118.8	102.9	3	3.4	56.7	56.0	56.3	3	0.5
OS-405	38.0	93.9	66.0	8		103.2	96.0	99.6	7	0.1	66.8	37.6	52.2	6	
SKO-190	42.8	113.2	78.0	1	17.8	81.1	67.8	74.4	11		66.2	34.9	50.6	9	
JHO-2012-1	32.9	95.9	64.4	10		91.3	122.3	106.8	2	7.3	56.1	48.5	52.3	5	
OL-1760	35.2	108.2	71.7	2	8.3	106.8	110.9	108.8	1	9.3	64.2	50.3	57.3	1	2.3
JO-04-14	33.0	97.6	65.3	7		85.1	120.1	102.6	5	3.1	59.4	30.1	44.7	11	
Kent (NC)	26.2	105.9	66.1	6		83.8	95.3	89.5	10		54.5	44.1	49.3	10	
OS-6 (NC)	28.9	103.4	66.2	5		81.2	99.2	90.2	9		57.5	46.1	51.8	8	
SKO-90 (ZC-HZ)	35.9	90.6	63.3	11											
OL-125 (ZC-NWZ)						79.3	119.8	99.5	8						
JHO-99-2 (ZC-NEZ)											60.6	51.5	56.0	4	
JHO-822 (ZC-CZ)															
JHO-2000-4 (ZC-SZ)															
Mean	**34.6**	**100.3**	**67.5**			**92.3**	**103.7**	**98.0**			**60.8**	**44.5**	**52.7**		
CD at 5%	4.0	5.8				22.7	14.9				4.3	4.2			
CV%	6.7	4.4				14.5	8.4				7.6	5.6			

Table 8.2: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Dry Matter Yield (q/ha)

Entries	Central Zone					South Zone					All India		
	Rah-uri	Jabal-pur	Aver-age	Ra-nk	Super-iority%	Man-dya	Hydera-bad	Aver-age	Ra-nk	Superi-ority%	Aver-age	Ra-nk	Super-iority%
JHO-2012-2	52.2	129.1	90.7	1	19.9	22.3	51.2	36.8	7		69.0	6	6.4
RSO-59	78.2	101.7	89.9	2	18.9	32.7	39.5	36.1	10		70.4	4	8.6
RSO-60	67.8	100.9	84.4	6	11.6	39.0	51.2	45.1	2	11.9	71.8	1	10.8
OS-405	58.6	115.1	86.9	3	14.9	36.4	62.0	49.2	1	22.1	70.8	3	9.2
SKO-190	37.4	97.3	67.4	10		35.6	44.3	40.0	4		62.1	10	
JHO-2012-1	51.4	121.7	86.5	5	14.4	34.4	42.7	38.5	6		69.7	5	7.6
OL-1760	58.8	99.4	79.1	7	5.4	29.6	47.9	38.8	5		71.1	2	9.7
JO-04-14	45.5	127.1	86.3	4	14.9	29.5	43.8	36.7	8		67.1	7	3.5
Kent (NC)	54.8	88.1	71.5	9		28.6	44.5	36.5	9		62.6	9	
OS-6 (NC)	50.1	101.1	75.6	8		34.0	46.5	40.3	3		64.8	8	
JHO-822 (ZC-CZ)	51.0	80.6	65.8	11									
JHO-2000-4 (ZC-SZ)						23.2	35.9	29.6	11				
Mean	**55.1**	**105.6**	**80.4**			**31.4**	**46.3**	**38.9**			**67.9**		
CD at 5%	10.2	21.7				6.2	9.4						
CV%	10.9	12.1				11.7	11.9						

Table 8.3: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Green Forage Yield (q/ha/day)

Entries	Palampur	Hisar	Ludhiana	Kalyani	Bhubaneswar	Rahuri	Mandya	Hyderabad	Average	Rank
JHO-2012-2	1.54	3.91	3.50	6.27	2.23	2.85	1.24	2.85	3.05	6
RSO-59	1.56	4.68	3.30	5.19	4.01	4.53	1.94	3.15	3.55	1
RSO-60	1.69	3.77	4.20	4.86	3.75	3.85	2.24	3.79	3.52	2
OS-405	1.68	4.03	3.50	5.97	2.86	2.90	2.16	3.41	3.31	4
SKO-190	1.91	3.36	2.10	5.79	2.58	1.62	1.14	2.16	2.58	10
JHO-2012-1	1.47	4.07	4.30	5.01	3.58	2.74	2.20	2.44	3.23	5
OL-1760	1.55	4.07	4.00	5.73	3.45	3.97	1.71	2.95	3.43	3
JO-04-14	1.59	3.54	4.50	5.09	2.14	2.57	1.81	2.66	2.99	7
Kent (NC)	1.25	3.38	3.50	4.76	3.07	3.45	1.81	2.51	2.97	8
OS-6 (NC)	1.38	3.03	3.50	5.02	3.23	3.09	1.74	2.54	2.94	9
SKO-90 (ZC-HZ)	1.60									
OL-125 (ZC-NWZ)		3.43	4.20							
JHO-99-2 (ZC-NEZ)				5.05	3.45					
JHO-822 (ZC-CZ)						3.40				
JHO-2000-4 (ZC-SZ)							1.60	2.00		
Mean	**1.57**	**3.75**	**3.69**	**5.34**	**3.12**	**3.18**	**1.78**	**2.77**	**3.16**	

Table 8.4: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Dry Matter Yield (q/ha/day)

Entries	Hisar	Ludhiana	Kalyani	Bhubaneswar	Rahuri	Mandya	Hyderabad	Average	Rank
JHO-2012-2	0.88	0.80	0.89	0.47	0.55	0.24	0.62	0.64	6
RSO-59	0.93	0.70	0.69	0.82	0.92	0.41	0.53	0.71	2
RSO-60	0.73	0.90	0.70	0.77	0.80	0.51	0.69	0.73	1
OS-405	0.86	0.70	0.83	0.58	0.61	0.42	0.72	0.67	4
SKO-190	0.68	0.40	0.82	0.52	0.30	0.43	0.38	0.50	9
JHO-2012-1	0.76	1.00	0.70	0.74	0.54	0.37	0.49	0.66	5
OL-1760	0.89	0.90	0.80	0.74	0.68	0.32	0.54	0.70	3
JO-04-14	0.71	0.90	0.74	0.43	0.52	0.32	0.55	0.60	8
Kent (NC)	0.70	0.70	0.68	0.63	0.63	0.32	0.54	0.60	8
OS-6 (NC)	0.68	0.80	0.71	0.67	0.60	0.41	0.54	0.63	7
OL-125 (ZC-NWZ)	0.66	0.90							
JHO-99-2 (ZC-NEZ)			0.75	0.70					
JHO-822 (ZC-CZ)					0.59				
JHO-2000-4 (ZC-SZ)						0.26	0.40		
Mean	**0.77**	**0.79**	**0.76**	**0.64**	**0.61**	**0.36**	**0.55**	**0.64**	

Table 8.5: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Crude Protein Yield (q/ha)

Entries	Palampur	Ludhiana	Hisar	Kalyani	Bhubaneswar	Rahuri	Jabalpur	Mandya	Hyderabad	Average	Rank
JHO-2012-2	3.2	7.3	12.4	5.9	2.9	3.9	10.5	1.3	2.7	5.6	5
RSO-59	3.2	7.3	14.6	3.5	5.4	5.8	8.2	1.1	2.4	5.7	4
RSO-60	3.7	9.1	11.0	4.9	5.2	4.9	8.2	2.6	3.6	5.9	3
OS-405	3.5	8.2	13.1	6.2	3.5	4.4	9.3	2.7	3.7	6.1	1
SKO-190	4.5	4.5	9.4	3.5	3.3	3.1	7.8	1.4	1.9	4.4	9
JHO-2012-1	3.3	10.3	10.8	5.2	4.5	4.7	9.9	2.4	2.6	6.0	2
OL-1760	3.0	7.9	14.0	7.1	4.4	5.5	8.0	2.1	2.4	6.0	2
JO-04-14	2.9	8.5	10.6	5.1	2.8	4.1	10.4	2.0	2.3	5.4	6
Kent (NC)	2.4	6.8	10.6	4.0	4.1	4.2	6.8	1.3	2.3	4.7	8
OS-6 (NC)	2.1	7.2	10.4	2.8	4.2	4.7	8.1	1.2	2.8	4.8	7
SKO-90 (ZC-HZ)	3.3										
OL-125 (ZC-NWZ)		8.4	10.0								
JHO-99-2 (ZC-NEZ)				3.9	4.8						
JHO-822 (ZC-CZ)						4.0	6.3				
JHO-2000-4 (ZC-SZ)								1.2	1.8		
Mean	**3.2**	**7.8**	**11.5**	**4.7**	**4.1**	**4.5**	**8.5**	**1.7**	**2.6**	**5.5**	

Table 8.6: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Crude Protein (%)

Entries	Palampur	Ludhiana	Hisar	Kalyani	Bhubaneswar	Rahuri	Jabalpur	Hyderabad	Mandya	Average	Rank
JHO-2012-2	9.3	7.5	11.8	8.2	9.0	7.4	8.2	5.2	5.7	8.0	5
RSO-59	9.0	7.8	13.1	6.4	9.2	7.4	8.1	6.0	3.5	7.8	6
RSO-60	9.6	7.7	12.7	8.7	9.2	7.3	8.1	7.0	6.6	8.5	3
OS-405	9.3	8.5	12.7	9.3	9.4	7.6	8.2	6.1	7.4	8.7	2
SKO-190	10.5	6.6	11.6	5.3	9.3	8.3	8.1	4.4	3.9	7.6	7
JHO-2012-1	9.9	8.4	11.8	9.3	9.2	9.2	8.2	6.0	7.0	8.8	1
OL-1760	8.5	7.1	13.1	11.1	8.8	9.3	8.1	5.0	7.0	8.7	2
JO-04-14	8.8	7.1	12.5	8.6	9.4	9.1	8.2	5.3	7.0	8.4	4
Kent (NC)	9.0	7.1	12.7	7.3	9.2	7.7	7.9	5.3	4.4	7.8	6
OS-6 (NC)	7.3	7.3	12.9	4.9	9.1	9.4	8.1	6.1	3.5	7.6	7
SKO-90 (ZC-HZ)	9.0										
OL-125 (ZC-NWZ)		7.0	12.7								
JHO-99-2 (ZC-NEZ)				6.4	9.4						
JHO-822 (ZC-CZ)						7.9	7.9				
JHO-2000-4 (ZC-SZ)								5.0	5.2		
Mean	**9.1**	**7.5**	**12.5**	**7.8**	**9.2**	**8.2**	**8.1**	**5.6**	**5.6**	**8.2**	

Table 8.7: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Plant Height (cm)

Entries	Palampur	Srinagar	Hisar	Ludhiana	Kalyani	Bhubaneswar	Rahuri	Jabalpur	Mandya	Hyderabad	Average	Rank
JHO-2012-2	102.3	125.0	122.3	126.0	162.1	119.1	114.8	139.2	82.9	94.0	118.8	2
RSO-59	90.7	128.5	117.4	138.0	128.4	154.3	102.3	106.9	69.4	84.3	112.0	8
RSO-60	94.7	135.1	116.3	128.3	157.6	151.1	102.1	111.2	65.7	78.8	114.1	6
OS-405	99.7	123.7	127.7	144.3	160.2	129.9	120.4	125.5	89.0	90.7	121.1	1
SKO-190	84.7	148.8	101.7	133.4	116.1	126.5	86.7	115.8	51.8	70.0	103.5	10
JHO-2012-1	90.0	126.3	115.0	132.7	155.6	143.3	105.0	130.3	79.6	89.0	116.7	4
OL-1760	102.3	142.4	124.2	125.0	152.6	139.2	104.8	114.4	90.7	74.2	117.0	3
JO-04-14	84.3	128.6	118.2	144.3	159.9	117.2	98.8	134.1	87.4	85.3	115.8	5
Kent (NC)	79.3	139.4	113.2	135.0	127.7	134.2	94.2	99.0	85.3	77.4	108.5	9
OS-6 (NC)	80.7	136.2	118.8	128.3	165.4	137.6	101.9	115.5	77.1	73.1	113.5	7
SKO-90 (ZC-HZ)	83.7	119.3										
OL-125 (ZC-NWZ)			122.1	146.3								
JHO-99-2 (ZC-NEZ)					154.9	147.3						
JHO-822 (ZC-CZ)							98.0	101.4				
JHO-2000-4 (ZC-SZ)									83.2	78.2		
Mean	**90.2**	**132.1**	**117.9**	**134.7**	**149.1**	**136.3**	**102.6**	**117.6**	**78.4**	**81.4**	**114.1**	

Table 8.8: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: Leaf Stem Ratio

Entries	Palampur	Srinagar	Hisar	Ludhiana	Kalyani	Bhubaneswar	Rahuri	Jabalpur	Mandya	Hyderabad	Average	Rank
JHO-2012-2	0.50	0.49	0.49	0.67	0.87	0.85	0.66	0.58	0.80	0.40	0.63	6
RSO-59	0.44	0.50	0.52	0.67	0.83	1.40	0.74	0.37	0.66	0.55	0.67	4
RSO-60	0.49	0.53	0.52	0.96	0.87	1.37	0.51	0.38	0.56	0.42	0.66	5
OS-405	0.59	0.50	0.52	0.89	0.75	1.09	0.68	0.48	0.59	0.57	0.67	4
SKO-190	0.49	0.59	0.69	0.94	0.87	1.21	0.66	0.35	0.91	0.50	0.72	2
JHO-2012-1	0.52	0.49	0.72	0.79	0.85	1.28	0.63	0.47	0.75	0.40	0.69	3
OL-1760	0.47	0.56	0.39	0.72	0.76	1.25	1.03	0.40	1.22	0.66	0.75	1
JO-04-14	0.50	0.52	0.56	0.90	0.78	0.93	0.90	0.52	0.91	0.67	0.72	2
Kent (NC)	0.37	0.55	0.43	0.92	0.74	1.18	0.66	0.31	0.94	0.46	0.66	5
OS-6 (NC)	0.45	0.53	0.47	0.89	0.84	0.98	0.92	0.41	0.72	0.53	0.67	4
SKO-90 (ZC-HZ)	0.44	0.48										
OL-125 (ZC-NWZ)			0.39	0.90								
JHO-99-2 (ZC-NEZ)					0.86	1.33						
JHO-822 (ZC-CZ)							0.56	0.29				
JHO-2000-4 (ZC-SZ)									1.17	0.85		
Mean	**0.48**	**0.52**	**0.52**	**0.84**	**0.82**	**1.17**	**0.72**	**0.41**	**0.84**	**0.55**	**0.68**	

Table 8.9: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oats (Single Cut) Repeat 14-15: ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries	ADF (%)					NDF (%)					IVDMD (%)					DDM (q/ha)	
	Rah-uri	Palam-pur	Ludh-iana	Aver-age	Ra-nk	Rah-uri	Palam-pur	Ludh-iana	Aver-age	Ra-nk	Rah-uri	Ludh-iana	His-ar	Aver-age	Ra-nk	His-ar	Ra-nk
JHO-2012-2	46.6	54.0	42.3	47.6	5	58.2	65.4	62.1	61.9	4	51.7	45.3	55.6	50.9	7	58.4	3
RSO-59	34.3	58.6	44.8	45.9	2	59.8	61.8	61.9	61.2	3	61.4	44.0	60.4	55.3	1	67.5	1
RSO-60	43.9	58.2	44.3	48.8	6	60.8	62.6	62.6	62.0	5	53.8	45.1	52.0	50.3	8	45.3	7
UPO-12-1																47.3	6
OS-405	43.5	57.4	41.9	47.6	5	61.9	66.2	59.6	62.6	7	54.2	49.4	45.8	49.8	9	38.1	11
SKO-190	40.6	58.0	48.3	49.0	7	57.0	61.8	61.8	60.2	2	56.5	40.3	46.9	47.9	10	51.5	4
JHO-2012-1	45.8	54.6	42.3	47.6	5	57.0	63.4	60.3	60.2	2	52.3	49.0	56.4	52.6	4	63.2	2
OL-1760	40.1	56.0	43.2	46.4	3	59.0	64.6	62.3	62.0	5	56.8	42.9	59.2	53.0	3	44.8	8
JO-04-14	37.4	56.2	46.1	46.6	4	58.7	63.4	64.1	62.1	6	59.0	45.3	52.6	52.3	5	41.4	9
Kent (NC)	38.7	55.8	44.8	46.4	3	60.3	66.4	63.9	63.5	8	57.9	46.4	49.3	51.2	6		
OS-6 (NC)	38.5	54.6	44.1	45.7	1	50.5	61.8	63.6	58.6	1	58.1	45.5	58.8	54.1	2	41.3	10
SKO-90 (ZC-HZ)		58.2					62.2									47.7	5
OL-125 (ZC-NWZ)			42.1					64.3				44.3	52.2				
JHO-822 (ZC-CZ)	45.2					54.3					52.8						
Mean	**41.4**	**56.5**	**44.0**	**47.2**		**58.0**	**63.6**	**62.4**	**61.4**		**55.9**	**45.2**	**53.6**	**51.7**		**49.7**	

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

(Reference tables 9.1 to 9.9)

In initial varietal trial in oat (multicut), nine entries were evaluated against three national checks (RO-19, Kent and UPO-212) at 18 locations in four zones (HZ, NWZ, NEZ, and CZ).

For green fodder yield (q/ha), entry JO-04-321 (6.4%) in HZ, OL-1842 (10.7%), OL-1866 (9.9%), HFO-514 (6.1%), HFO-417 (5.1%) in CZ exhibited superiority over the best zonal/national check. Other entries were either inferior to or exhibited marginal superiority over checks. For dry matter yield (q/ha) none of the entries showed significant superiority over the checks on zonal and national basis. For fodder production potential (q/ha/day), entry HFO-417 for GFY and national check Kent for DMY were top rankers.

For quality parameters, entry OL-1866 for crude protein yield (q/ha) and JO-4-321 for crude protein content (%) ranked first. For ADF %, entry JHO-15-4 and for NDF %, entry PLP-9 ranked first. For IVDMD %, entry HFO-417 ranked first.
For growth parameters, entry HFO-514 for plant height and OL-1842 and OL-1866 ranked first for leafiness.

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

(Reference tables 10.1 to 10.3)

In AVTO-1 MC, three entries along with three national checks were evaluated at three centres in Hill Zone. Entry JO-04-319 exhibited superiority of 2.7% for GFY and 4.4% for DMY for CPY (q/ha) and CP %, check UPO 212 ranked first. For plant height, entry JO-04-319 and for leafiness, entry OS-414 ranked first. For ADF%, check RO-19 and for NDF % entry JO-04-319 ranked first.

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

(Reference tables 11.1 to 11.9)

In Oat (MC), two entries namely OL-1802 and JO-04-317 promoted from AVT-1 were evaluated against three national checks Kent, RO-19 and UPO-212 at 17 locations in four zones.
For green fodder yield (q/ha), entry JO-04-317 showed superiority over best check by a margin of 12.2% in HZ; 3.5% in CZ. For dry fodder yield (q/ha) also entry JO-04-317 showed superiority over best check by a margin of 5.2% in HZ; 5.2% in CZ and 2.2 % at national level.

Coming to the forage production potential (q/ha/day), entry JO-4-317 and OL-1802 ranked first for green forage yield and dry matter yield potential respectively. For plant height entry JO-4-317 (93.5 cm) registered superiority. For the character leaf stem ratio, entry OL-1802 was best performer.
In quality parameters, national check Kent, entries OL-1802 and JO-4-317 were ranked top for crude protein yield and crude protein content (%). For other quality parameters, entry OL-1802 for ADF (%) and IVDMD (%); entry JO-4-317 for NDF (%) and DDM (q/ha) were adjudged best performers.

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

(Reference table 12.1)

Results of the advanced varietal trial in Oat (MC) for seed with two entries *i.e.* OL-1802 and JO-4-317 along with three national checks i.e. Kent, RO-19 and UPO-212 conducted at twelve locations in four zones across the country revealed that none of the entries could surpass checks in any zone or at national level.

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	Udai-pur	Aver-age	Ra-nk
OL-1842	172.0	363.4	98.8	211.4	11		500.0	554.6	515.6	869.5	609.9	4
OL-1867	193.3	367.6	145.1	235.3	2	2.7	433.3	530.2	591.1	701.8	564.1	10
JO-04-321	176.4	387.0	168.1	243.8	1	6.4	474.1	516.7	613.8	727.7	583.1	8
HFO-514	204.4	367.6	124.0	232.0	3	1.2	455.6	659.8	494.8	883.6	623.4	3
JHO-15-4	191.5	346.9	101.9	213.4	10		459.3	550.0	473.1	804.7	571.8	9
HFO-417	183.1	341.3	138.8	221.0	7		433.3	616.7	504.7	867.7	605.6	6
JHO-15-3	165.7	381.3	101.6	216.2	9		385.2	496.7	494.3	695.9	518.0	12
PLP-9	178.2	355.1	131.9	221.7	6		420.4	570.0	557.0	811.0	589.6	7
OL-1866	186.6	340.2	147.8	224.9	5		455.6	675.6	592.5	815.1	634.7	2
Kent (NC)	194.6	355.1	137.4	229.1	4		381.5	616.7	404.4	833.3	559.0	11
UPO-212 (NC)	165.3	326.2	113.4	201.6	12		503.7	616.2	585.7	894.4	650.0	1
RO-19 (NC)	144.4	376.0	129.0	216.5	8		533.3	630.0	550.1	711.4	606.2	5
Mean	**179.6**	**359.0**	**128.2**	**222.2**			**452.9**	**586.1**	**531.4**	**801.3**	**593.0**	
CD at 5%	20.5	14.4	7.3				100.1	45.4	111.3	151.8		
CV%	6.7	6.4	3.3				13.0	4.6	12.4	11.2		

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

Entries	North East Zone								Central Zone								All India		
	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Pu-sa	Ran-chi	Aver-age	Ra-nk	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority%
OL-1842	454.4	361.8	238.6	655.5	421.0	226.6	393.0	2	248.2	791.1	651.8	625.3	754.6	614.2	1	10.7	472.4	1	3.3
OL-1867	494.9	380.6	208.0	482.7	443.0	306.7	386.0	5	208.1	672.0	623.8	469.4	567.4	508.2	11		434.4	11	
JO-04-321	493.3	423.7	150.0	506.6	409.0	248.9	371.9	9	194.9	697.8	597.1	546.8	621.3	531.6	9		441.8	9	
HFO-514	469.3	334.8	236.4	577.4	476.0	262.2	392.7	3	231.9	752.2	669.1	552.2	737.0	588.5	3	6.1	471.6	3	3.1
JHO-15-4	489.1	346.1	157.0	621.9	421.0	275.6	385.1	7	234.3	731.9	606.5	606.8	675.2	570.9	5	2.9	449.6	6	
HFO-417	484.8	322.6	196.6	617.8	443.0	271.1	389.3	4	213.4	650.7	474.5	786.1	790.4	583.0	4	5.1	463.1	4	1.2
JHO-15-3	438.4	306.1	146.6	471.8	454.0	306.7	353.9	12	168.0	585.2	515.8	568.6	721.6	511.8	10		411.3	12	
PLP-9	464.0	329.7	170.6	527.4	432.0	244.4	361.3	10	215.8	536.3	674.5	599.5	783.4	561.9	6	1.2	444.5	8	
OL-1866	404.3	398.3	221.9	502.3	432.0	275.6	372.4	8	245.1	634.4	654.5	622.3	893.8	610.0	2	9.9	472.1	2	3.2
Kent (NC)	410.7	301.8	271.3	555.2	443.0	333.3	385.9	6	274.4	645.2	430.5	650.5	772.8	554.7	7		445.1	7	
UPO-212 (NC)	418.7	342.2	222.6	507.8	398.0	262.3	358.6	11	197.3	609.6	522.5	531.2	633.6	498.8	12		436.1	10	
RO-19 (NC)	448.0	314.8	228.6	756.1	421.0	315.6	414.0	1	259.6	613.3	639.8	586.9	577.0	535.3	8		457.5	5	
Mean	**455.8**	**346.9**	**204.0**	**565.2**	**432.8**	**277.4**	**380.3**		**224.3**	**660.0**	**588.4**	**595.5**	**710.7**	**555.7**			**450.0**		
CD at 5%	83.9	12.5	16.1	46.9	27.3	41.9			20.5	44.8	112.2	76.8	47.9						
CV%	10.9	11.5	4.7	4.8	7.3	8.9			12.1	4.0	11.3	7.6	4.0						

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	Super-iority%	His-ar	Ludh iana	Pant-nagar	Aver-age	Ra-nk
OL-1842	31.3	88.6	14.9	45.0	9		77.5	119.5	61.7	86.3	9
OL-1867	35.6	86.4	20.1	47.4	2		75.9	117.5	80.9	91.4	5
JO-04-321	33.4	92.2	18.4	48.0	1	2.1	80.0	110.2	75.9	88.7	7
HFO-514	37.3	86.7	17.4	47.1	3		81.2	138.8	60.6	93.5	4
JHO-15-4	34.6	82.7	17.1	44.8	10		80.3	123.7	58.4	87.5	8
HFO-417	33.8	81.4	18.8	44.7	11		81.1	130.5	61.2	90.9	6
JHO-15-3	31.3	90.9	16.9	46.4	6		81.1	106.4	61.1	82.9	11
PLP-9	34.2	84.7	17.9	45.6	7		76.2	122.6	67.2	88.7	7
OL-1866	35.4	82.4	21.8	46.5	5		83.8	138.0	77.7	99.8	3
Kent (NC)	37.5	85.3	18.3	47.0	4		70.8	132.8	54.5	86.0	10
UPO-212 (NC)	32.0	77.7	16.5	42.1	12		107.2	124.9	79.5	103.8	1
RO-19 (NC)	26.4	89.6	20.8	45.6	8		94.0	141.7	66.3	100.7	2
Mean	**33.6**	**85.7**	**18.2**	**45.8**			**82.4**	**125.6**	**67.1**	**91.7**	
CD at 5%	3.7	5.0	3.5				26.7	18.7	20.0		
CV%	6.5	3.1	11.2				19.1	8.8	17.6		

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

Entries	North East Zone								Central Zone							All India		
	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Pu-sa	Ran-chi	Aver-age	Ra-nk	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Aver-age	Ra-nk	Super-iority%
OL-1842	88.5	68.3	47.4	114.6	84.0	51.6	75.7	3	27.6	91.6	142.1	120.2	102.3	96.7	2	78.3	5	
OL-1867	90.7	75.3	41.9	92.2	78.4	60.0	73.1	6	26.3	105.1	134.7	89.3	81.5	87.4	10	76.0	9	
JO-04-321	96.5	82.4	30.4	94.6	81.6	53.9	73.2	5	22.6	83.0	127.9	106.9	92.5	86.6	11	75.4	10	
HFO-514	90.0	63.3	47.7	105.6	94.6	52.9	75.7	3	27.4	88.6	146.2	102.5	109.6	94.8	5	79.4	3	
JHO-15-4	91.5	65.8	33.1	123.9	83.7	63.3	76.9	2	26.8	88.4	127.9	119.8	112.8	95.1	4	78.5	4	
HFO-417	90.1	57.4	39.3	119.9	78.1	68.7	75.6	4	24.8	75.5	99.5	146.6	105.4	90.3	6	77.2	6	
JHO-15-3	89.1	59.5	29.9	101.9	90.3	56.4	71.2	8	20.9	74.3	110.2	113.0	123.2	88.3	8	73.9	12	
PLP-9	98.7	63.9	34.3	94.4	85.9	48.9	71.0	9	25.7	58.7	148.1	119.1	128.1	95.9	3	77.0	7	
OL-1866	88.0	75.6	45.4	92.3	85.4	64.3	75.1	5	31.8	71.0	142.2	123.1	133.7	100.4	1	81.9	1	2.6
Kent (NC)	96.0	55.2	54.5	113.5	88.1	60.8	78.0	1	30.3	76.4	91.5	123.9	115.5	87.5	9	76.8	8	
UPO-212 (NC)	85.9	66.7	44.5	95.2	79.1	63.1	72.4	7	26.1	75.7	109.1	108.1	88.1	81.4	12	75.3	11	
RO-19 (NC)	93.3	59.5	45.6	136.0	83.7	50.1	78.0	1	30.4	84.8	138.3	106.9	88.8	89.8	7	79.8	2	
Mean	**91.5**	**66.1**	**41.2**	**107.0**	**84.4**	**57.8**	**74.7**		**26.7**	**81.1**	**126.5**	**114.9**	**106.8**	**91.2**		**77.4**		
CD at 5%	15.9	3.1	3.6	9.3	6.8	11.2			8.0	5.5	25.5	15.4	7.1					
CV%	10.3	6.6	5.1	5.1	8.7	11.5			4.7	4.0	11.9	7.9	3.9					

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

Entries	Hisar	Ludhiana	Faizabad	Jorhat	Bhubaneswar	Pusa	Ranchi	Anand	Rahuri	Average	Rank
OL-1842	4.05	4.20	4.41	3.81	2.88	4.43	3.10	7.61	5.49	4.44	3
OL-1867	3.51	4.02	4.75	3.81	2.54	4.66	4.31	5.79	4.08	4.16	8
JO-04-321	3.84	3.91	4.69	4.07	1.88	4.39	3.55	6.71	4.80	4.20	7
HFO-514	3.69	5.00	4.38	3.42	2.99	5.01	3.91	6.48	4.80	4.41	4
JHO-15-4	3.72	4.17	4.52	3.37	1.94	4.39	4.30	7.04	5.83	4.36	5
HFO-417	3.51	4.67	4.53	3.10	2.52	4.61	4.44	6.26	7.28	4.55	1
JHO-15-3	3.12	3.76	3.98	3.06	1.86	4.78	5.28	5.79	4.41	4.00	11
PLP-9	3.41	4.32	4.41	3.30	2.13	4.55	3.81	5.65	5.45	4.11	10
OL-1866	3.69	5.12	3.85	4.19	2.67	4.50	4.30	6.10	4.82	4.36	5
Kent (NC)	3.09	4.67	4.02	3.18	3.48	4.61	5.55	6.20	5.97	4.53	2
UPO-212 (NC)	4.08	4.67	4.03	3.42	2.75	4.15	4.09	6.04	4.02	4.14	9
RO-19 (NC)	4.32	4.77	4.43	3.15	2.93	4.43	4.32	5.29	5.38	4.34	6
Mean	**3.67**	**4.44**	**4.33**	**3.49**	**2.55**	**4.54**	**4.25**	**6.25**	**5.19**	**4.30**	

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

Entries	Hisar	Ludhiana	Faizabad	Jorhat	Bhubaneswar	Pusa	Ranchi	Anand	Rahuri	Average	Rank
OL-1842	0.63	0.91	0.85	0.72	0.57	0.88	0.70	0.88	1.05	0.80	4
OL-1867	0.61	0.89	0.87	0.75	0.51	0.93	0.84	0.91	0.78	0.79	5
JO-04-321	0.65	0.83	0.92	0.79	0.38	0.88	0.76	0.80	0.94	0.77	6
HFO-514	0.66	1.05	0.83	0.67	0.60	0.99	0.79	0.76	0.89	0.80	4
JHO-15-4	0.65	0.94	0.84	0.63	0.41	0.87	0.98	0.85	1.15	0.81	3
HFO-417	0.66	0.99	0.84	0.55	0.50	0.92	0.76	0.73	1.36	0.81	3
JHO-15-3	0.66	0.81	0.81	0.59	0.38	0.95	0.97	0.74	0.88	0.75	7
PLP-9	0.62	0.93	0.94	0.64	0.43	0.90	0.76	0.62	1.08	0.77	6
OL-1866	0.68	1.05	0.84	0.80	0.55	0.89	1.00	0.68	0.95	0.83	2
Kent (NC)	0.57	1.01	0.94	0.58	0.70	0.92	1.08	0.73	1.14	0.85	1
UPO-212 (NC)	0.87	0.95	0.82	0.67	0.55	0.82	0.98	0.75	0.82	0.80	4
RO-19 (NC)	0.76	1.07	0.92	0.60	0.58	0.88	0.68	0.73	0.98	0.80	4
Mean	**0.67**	**0.95**	**0.87**	**0.67**	**0.51**	**0.90**	**0.86**	**0.76**	**1.00**	**0.80**	

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

Entries	Palam-pur	Ludh-iana	His-ar	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
OL-1842	2.8	13.7	10.9	7.6	3.6	4.0	8.8	14.1	11.4	8.8	9.8	8.7	5
OL-1867	3.4	14.1	11.3	8.1	3.6	3.5	7.9	15.7	10.8	7.2	7.4	8.4	8
JO-04-321	3.3	14.1	11.6	8.2	4.3	2.5	7.9	14.1	10.2	8.1	8.7	8.5	7
HFO-514	3.2	16.1	12.1	7.8	2.9	3.9	8.9	14.8	11.7	7.3	9.7	9.0	2
JHO-15-4	2.9	15.5	11.1	7.4	3.4	2.6	9.5	16.0	11.0	8.7	10.0	8.9	3
HFO-417	2.8	17.0	11.4	8.0	2.7	3.3	9.6	13.5	7.8	12.0	10.4	9.0	2
JHO-15-3	3.3	9.5	11.2	7.6	2.8	2.5	7.9	13.2	8.8	8.6	12.1	7.9	9
PLP-9	3.5	16.3	10.2	8.6	3.5	2.8	7.4	12.2	11.8	8.9	11.6	8.8	4
OL-1866	3.3	16.8	12.7	7.4	4.0	3.7	8.0	12.2	11.3	9.2	12.8	9.2	1
Kent (NC)	4.3	15.8	9.9	8.4	2.7	4.5	8.9	13.6	7.0	9.2	10.5	8.6	6
UPO-212 (NC)	3.3	11.7	16.1	6.9	3.5	3.7	8.2	14.0	8.6	8.0	8.5	8.4	8
RO-19 (NC)	2.1	17.4	13.9	7.5	2.9	3.8	10.2	13.0	11.0	8.1	8.3	8.9	3
Mean	**3.2**	**14.8**	**11.9**	**7.8**	**3.3**	**3.4**	**8.6**	**13.9**	**10.1**	**8.7**	**10.0**	**8.69**	

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

Entries	Palam-pur	Ludh-iana	His-ar	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
OL-1842	8.9	11.5	15.4	8.6	10.8	8.3	8.0	7.0	16.1	8.1	7.3	9.6	10.0	5
OL-1867	9.6	12.0	15.8	8.9	9.7	8.2	9.1	7.4	16.1	8.2	8.0	9.0	10.2	4
JO-04-321	9.9	12.8	15.8	8.5	10.6	8.3	9.1	8.8	17.3	8.1	7.6	9.5	10.5	1
HFO-514	8.5	11.6	15.8	8.8	9.2	8.3	8.9	7.4	16.7	8.2	7.2	8.9	9.9	6
JHO-15-4	8.2	12.5	15.5	8.1	10.6	7.9	8.0	9.2	18.7	8.2	7.3	8.9	10.3	3
HFO-417	8.2	13.0	15.6	8.9	9.8	8.3	8.3	7.9	18.1	8.1	8.2	9.9	10.4	2
JHO-15-3	10.5	8.9	15.2	8.5	9.6	8.3	8.6	7.0	18.2	8.1	7.6	9.8	10.0	5
PLP-9	10.2	13.3	14.5	8.7	11.1	8.3	8.2	7.0	19.3	8.2	7.4	9.1	10.4	2
OL-1866	9.3	12.2	16.2	8.4	10.6	8.2	9.2	7.0	17.3	8.2	7.4	9.6	10.3	3
Kent (NC)	11.4	11.9	15.2	8.8	10.0	8.3	8.4	7.9	18.0	7.9	7.4	9.1	10.4	2
UPO-212 (NC)	10.2	9.4	15.5	8.0	10.6	8.4	9.1	8.8	19.3	8.1	7.4	9.7	10.4	2
RO-19 (NC)	7.9	12.3	15.6	8.0	10.0	8.3	7.8	6.6	16.1	8.1	7.6	9.3	9.8	7
Mean	**9.4**	**11.8**	**15.5**	**8.5**	**10.2**	**8.3**	**8.6**	**7.7**	**17.6**	**8.1**	**7.5**	**9.4**	**10.2**	

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	Udai-pur	Faiza-bad	Bhuban-eswar	Imp-hal	Ran-chi	Jor-hat	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
OL-1842	89.8	99.5	82.0	70.8	91.5	97.0	94.2	127.1	96.6	112.5	84.1	116.1	104.6	72.8	67.6	68.4	92.2	7
OL-1867	78.0	96.9	78.4	72.4	116.6	95.2	88.8	113.5	86.2	114.2	92.1	103.2	107.7	67.6	69.5	64.2	90.3	8
JO-04-321	80.8	103.6	83.3	73.7	115.4	89.4	104.5	101.2	90.7	114.3	88.1	106.9	106.4	60.2	67.3	55.2	90.1	9
HFO-514	90.3	97.3	79.5	110.4	102.0	96.2	118.4	125.2	93.9	109.2	90.9	107.2	114.7	77.9	70.7	73.4	97.3	1
JHO-15-4	80.0	92.9	82.6	78.8	107.9	101.7	110.2	105.4	100.1	112.3	92.3	111.7	104.8	63.0	76.7	58.1	92.4	6
HFO-417	81.5	91.3	87.2	95.5	101.0	102.5	130.5	109.9	100.5	119.8	84.3	104.7	109.9	55.0	79.5	63.7	94.8	4
JHO-15-3	77.8	102.1	74.6	65.3	113.5	88.5	110.6	98.3	89.1	106.1	92.1	93.0	96.5	57.8	77.9	72.1	88.5	11
PLP-9	77.7	95.0	79.1	82.5	103.9	97.8	101.4	106.4	93.6	116.3	88.3	102.3	101.8	79.8	79.6	72.4	92.4	6
OL-1866	78.3	92.6	82.1	112.6	116.5	94.7	112.2	118.7	84.2	117.1	88.6	107.9	107.9	77.0	75.8	67.8	95.9	3
Kent (NC)	79.8	95.8	72.2	92.7	112.5	89.7	106.9	129.1	95.8	106.3	90.7	92.2	97.2	52.8	67.1	59.6	90.0	10
UPO-212 (NC)	90.0	87.3	75.7	93.2	112.2	91.8	125.5	116.1	90.1	117.5	92.0	114.7	101.9	57.5	71.2	65.5	93.9	5
RO-19 (NC)	74.3	100.6	83.2	85.1	112.9	100.2	101.2	121.2	102.1	114.0	91.6	103.8	113.6	72.4	82.1	80.4	96.2	2
Mean	**81.5**	**96.2**	**80.0**	**86.1**	**108.8**	**95.4**	**108.7**	**114.3**	**93.6**	**113.3**	**89.6**	**105.3**	**105.6**	**66.2**	**73.7**	**66.7**	**92.8**	

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	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ran-chi	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
OL-1842	0.52	0.42	0.42	0.45	0.53	0.77	1.59	1.09	1.64	0.32	0.77	0.97	0.71	0.78	1
OL-1867	0.47	0.42	0.41	0.56	0.50	0.70	0.78	0.87	1.56	0.54	0.72	0.94	0.75	0.71	6
JO-04-321	0.50	0.44	0.33	0.67	0.45	0.69	1.47	0.74	1.74	0.42	0.71	0.94	0.85	0.76	3
HFO-514	0.45	0.42	0.31	0.80	0.51	0.68	1.48	1.04	1.54	0.46	0.74	0.81	0.76	0.77	2
JHO-15-4	0.45	0.40	0.32	0.67	0.50	0.71	1.34	0.78	1.25	0.27	0.71	0.76	0.86	0.69	8
HFO-417	0.47	0.39	0.32	0.94	0.54	0.72	1.13	0.84	1.71	0.35	0.61	0.75	0.60	0.72	5
JHO-15-3	0.41	0.44	0.30	0.43	0.48	0.75	1.18	0.70	1.44	0.37	0.64	0.84	0.74	0.67	9
PLP-9	0.46	0.41	0.42	0.75	0.43	0.77	1.48	0.81	1.30	0.35	0.86	0.69	0.69	0.72	5
OL-1866	0.52	0.39	0.50	0.90	0.47	0.72	1.54	0.96	1.54	0.24	0.83	0.78	0.76	0.78	1
Kent (NC)	0.48	0.41	0.33	0.90	0.47	0.75	1.41	1.15	1.21	0.32	0.64	0.72	0.80	0.74	4
UPO-212 (NC)	0.48	0.37	0.41	0.82	0.49	0.68.	1.29	0.93	1.16	0.25	0.65	0.83	0.73	0.70	7
RO-19 (NC)	0.60	0.43	0.47	0.86	0.56	0.75	1.19	0.98	1.43	0.49	0.71	0.72	0.83	0.77	2
Mean	**0.48**	**0.41**	**0.38**	**0.73**	**0.49**	**0.73**	**1.32**	**0.91**	**1.46**	**0.37**	**0.72**	**0.81**	**0.76**	**0.74**	

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

Entries	ADF (%)		NDF (%)		IVDMD (%)				DDM (q/ha)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Hisar	Average	Rank	Hisar	Rank
OL-1842	33.4	9	57.9	8	58.1	69.0	63.6	8	51.2	9
OL-1867	31.1	4	56.6	4	58.8	66.7	62.8	10	48.5	11
JO-04-321	31.4	5	56.8	5	59.1	67.6	63.4	9	49.7	10
HFO-514	31.9	8	55.3	2	57.1	72.0	64.5	5	54.8	5
JHO-15-4	29.7	1	57.6	7	58.1	69.0	63.6	8	54.4	6
HFO-417	30.9	3	55.6	3	60.4	71.1	65.8	1	54.9	4
JHO-15-3	33.6	10	63.1	12	56.1	71.7	63.9	7	57.8	3
PLP-9	30.3	2	54.9	1	61.3	69.6	65.5	2	51.3	8
OL-1866	31.8	7	58.0	9	59.6	70.6	65.1	3	54.3	7
Kent (NC)	31.4	5	59.4	10	57.7	71.5	64.6	4	47.3	12
UPO-212 (NC)	33.4	9	61.1	11	56.8	67.5	62.2	11	67.1	1
RO-19 (NC)	31.6	6	57.3	6	59.2	69.0	64.1	6	64.0	2
Mean	**31.7**		**57.8**		**58.5**	**69.6**	**64.1**		**54.6**	

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

Entries	GFY (q/ha)						DMY (q/ha)					
	Palampur	Srinagar	Almora	Average	Rank	Superiority%	Palampur	Srinagar	Almora	Average	Rank	Superiority%
OL-1845	260.0	388.4	108.8	252.4	3		47.2	78.4	18.3	48.0	5	
JO-04-319	285.0	411.9	86.1	261.0	1	2.7	52.5	84.9	18.6	52.0	1	4.4
OS-414	240.8	378.2	127.5	248.9	5		47.0	76.6	22.2	48.6	4	
Kent (NC)	251.2	394.3	105.5	250.3	4		46.9	78.4	18.2	47.8	6	
UPO-212 (NC)	252.5	405.4	103.8	253.9	2		49.3	81.4	18.7	49.8	2	
RO-19 (NC)	243.7	372.3	129.2	248.4	6		47.2	75.8	24.6	49.2	3	
Mean	**255.5**	**391.8**	**110.2**	**252.5**			**48.4**	**79.2**	**20.1**	**49.2**		
CD at 5%	12.1	16.6	16.8				3.4	4.1	3.4			
CV%	3.1	7.6	10.1				4.6	3.3	11.2			

Table 10.2: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Crude Protein Yield (q/ha), Crude Protein (%), Plant Height (cm) & Leaf Stem Ratio

Entries	CPY (q/ha)		CP (%)		Plant height (cm)				Leaf Stem Ratio			
	Palampur	Rank	Palampur	Rank	Palampur	Srinagar	Average	Rank	Palampur	Srinagar	Average	Rank
OL-1845	4.4	4	9.4	3	74.0	96.8	85.4	5	0.49	0.47	0.48	2
JO-04-319	5.4	2	10.3	2	75.6	105.0	90.3	1	0.38	0.50	0.44	4
OS-414	4.3	5	9.2	4	70.1	95.1	82.6	6	0.55	0.46	0.51	1
Kent (NC)	4.8	3	10.3	2	72.5	101.7	87.1	3	0.45	0.47	0.46	3
UPO-212 (NC)	5.5	1	11.2	1	74.0	103.3	88.7	2	0.52	0.50	0.51	1
RO-19 (NC)	4.4	4	9.4	3	75.9	96.9	86.4	4	0.51	0.44	0.48	2
Mean	**4.8**		**10.0**		**73.7**	**99.8**	**86.7**		**0.48**	**0.47**	**0.48**	

Table 10.3: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): ADF (%) & NDF (%)

Entries	ADF (%)		NDF (%)	
	Palampur	Rank	Palampur	Rank
OL-1845	58.0	5	66.6	6
JO-04-319	57.4	4	61.8	1
OS-414	54.4	3	65.4	4
Kent (NC)	58.6	6	64.2	3
UPO-212 (NC)	54.2	2	63.4	2
RO-19 (NC)	52.6	1	65.8	5
Mean	**55.9**		**64.5**	

Table 11.1: AVTO-2 (MC): Second Advanced 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	Superiority %	His-ar	Ludh-iana	Udai-pur	Aver-age	Ra-nk
OL-1802	314.7	387.5	96.3	266.2	2	0.4	508.3	579.8	746.6	611.6	2
JO-4-317	374.0	386.9	131.3	297.4	1	12.2	516.7	514.2	742.0	591.0	3
RO-19 (NC)	263.7	361.5	86.3	237.2	5		500.0	640.7	877.4	672.7	1
UPO-212 (NC)	376.6	354.7	63.9	265.1	3		452.8	483.7	820.9	585.8	4
Kent (NC)	335.0	344.2	74.2	251.1	4		408.3	583.4	739.3	577.0	5
Mean	**332.8**	**367.0**	**90.4**	**263.4**			**477.2**	**560.4**	**785.2**	**607.6**	
CD at 5%	59.3	16.4	8.8				42.6	39.0	119.3		
CV%	11.6	6.3	6.3				5.3	4.5	8.5		

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

Entries	North East Zone									Central Zone								All India		
	Ran-chi	Pu-sa	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Aver-age	Ra-nk	Super-iority %	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Super-iority %	Aver-age	Ra-nk	Super-iority %
OL-1802	235.0	435.0	380.9	446.9	263.5	485.5	374.5	5		458.0	450.2	667.0	409.9	574.9	512.0	3		437.6	3	
JO-4-317	230.0	412.0	562.3	410.6	235.0	489.6	389.9	1	0.5	441.8	441.9	710.0	415.6	715.6	545.0	1	3.5	454.7	1	0.7
RO-19 (NC)	215.0	424.0	452.3	422.8	248.8	552.8	385.9	3		506.6	409.0	653.0	453.9	609.5	526.4	2		451.6	2	
UPO-212 (NC)	235.0	401.0	564.0	415.4	216.0	483.7	385.8	4		393.3	471.7	655.0	384.9	619.8	504.9	4		434.8	4	
Kent (NC)	252.5	357.0	544.0	399.1	277.3	497.3	387.9	2		423.3	429.2	624.0	365.6	631.5	494.7	5		428.5	5	
Mean	**233.5**	**405.8**	**500.7**	**418.9**	**248.1**	**501.8**	**384.8**			**444.6**	**440.4**	**661.8**	**406.0**	**630.2**	**516.6**			**441.5**		
CD at 5%	22.2	39.2	62.1	8.3	24.7	29.8				12.0	NS	118.3	65.2	24.5						
CV%	6.1	8.6	8.1	5.9	3.2	3.9				6.6	6.3	11.5	10.4	2.5						

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

Entries	Hill Zone						North West Zone				
	Palampur	Srinagar	Almora	Average	Rank	Superiority %	Hisar	Ludhiana	Average	Rank	Superiority %
OL-1802	61.0	78.0	18.0	52.3	4		89.0	132.1	110.6	1	1.4
JO-4-317	73.3	77.9	18.5	56.6	1	5.2	90.7	109.8	100.3	3	
RO-19 (NC)	52.2	72.7	14.4	46.5	5		77.6	140.5	109.1	2	
UPO-212 (NC)	74.3	71.3	15.9	53.8	2		78.3	107.9	93.1	5	
Kent (NC)	65.7	69.3	22.3	52.4	3		67.6	124.3	96.0	4	
Mean	**65.3**	**73.8**	**17.8**	**52.3**			**80.7**	**122.9**	**101.8**		
CD at 5%	12.3	3.4	3.2				11.8	14.9			
CV%	12.3	2.9	11.8				8.6	7.9			

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

Entries	North East Zone								Central Zone								All India		
	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Imphal	Average	Rank	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Superiority %	Average	Rank	Superiority %
OL-1802	47.4	86.3	94.6	85.4	51.4	81.3	74.4	3	70.8	56.2	142.0	81.2	68.6	83.8	3		77.7	2	1.3
JO-4-317	44.4	81.8	100.4	77.9	46.5	89.7	73.4	4	65.3	59.9	151.1	79.8	87.9	88.8	1	5.2	78.4	1	2.2
RO-19 (NC)	39.2	84.1	93.9	79.3	48.1	103.5	74.7	2	73.8	50.4	139.0	81.0	77.7	84.4	2		76.7	3	
UPO-212 (NC)	44.3	79.9	105.9	80.6	41.8	85.5	73.0	5	56.1	53.4	140.4	73.6	72.2	79.1	5		73.8	5	
Kent (NC)	50.0	70.8	101.3	70.6	55.9	101.4	75.0	1	62.0	53.7	131.6	71.2	79.1	79.5	4		74.8	4	
Mean	**45.1**	**80.6**	**99.2**	**78.7**	**48.7**	**92.3**	**74.1**		**65.6**	**54.7**	**140.8**	**77.4**	**77.1**	**83.1**			**76.3**		
CD at 5%	6.4	8.7	11.1	2.6	5.6	8.0			7.2	5.1	27.7	12.5	3.0						
CV%	9.2	7.7	7.3	4.3	3.7	5.6			3.9	5.8	12.7	10.5	2.5						

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

Entries	Hisar	Ludhiana	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Rahuri	Anand	Average	Rank
OL-1802	4.12	4.46	2.94	4.63	3.81	4.47	3.21	3.69	4.29	3.96	3
JO-4-317	4.19	4.21	2.95	4.38	5.30	4.32	2.87	3.85	4.21	4.03	1
RO-19 (NC)	4.06	4.93	2.39	4.51	4.34	4.65	2.96	4.20	3.90	3.99	2
UPO-212 (NC)	3.67	3.72	2.80	4.27	5.47	4.37	2.73	3.63	4.62	3.92	4
Kent (NC)	3.32	4.49	3.08	3.76	5.18	3.99	3.34	3.48	4.09	3.86	5
Mean	**3.87**	**4.36**	**2.83**	**4.31**	**4.82**	**4.36**	**3.02**	**3.77**	**4.22**	**3.95**	

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

Entries	Hisar	Ludhiana	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Rahuri	Anand	Average	Rank
OL-1802	0.72	1.02	0.59	0.92	0.94	0.85	0.63	0.73	0.54	0.77	1
JO-4-317	0.73	0.84	0.57	0.87	0.94	0.82	0.57	0.74	**0.57**	0.74	2
RO-19 (NC)	0.63	1.08	0.43	0.90	0.90	0.87	0.57	0.75	0.48	0.73	3
UPO-212 (NC)	0.63	0.83	0.53	0.85	1.02	0.85	0.53	0.69	0.52	0.72	4
Kent (NC)	0.55	1.02	0.61	0.75	0.96	0.71	0.67	0.68	0.51	0.72	4
Mean	**0.65**	**0.96**	**0.55**	**0.86**	**0.95**	**0.82**	**0.59**	**0.72**	**0.52**	**0.74**	

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

Entries	Palampur	Ludhiana	Hisar	Faizabad	Jorhat	Bhubaneswar	Imphal	Jabalpur	Anand	Rahuri	Urulikanchan	Average	Rank
OL-1802	6.4	18.0	10.3	7.6	4.2	4.4	6.0	11.4	10.3	7.1	6.4	8.4	1
JO-4-317	6.9	12.8	9.9	8.8	4.6	3.8	6.4	12.2	11.2	6.5	8.8	8.4	1
RO-19 (NC)	5.8	16.6	9.7	7.8	4.0	4.0	7.7	11.1	8.1	7.6	7.0	8.1	2
UPO-212 (NC)	6.8	15.4	9.3	9.0	4.1	3.4	5.9	11.3	10.7	5.5	6.6	8.0	3
Kent (NC)	6.9	17.3	10.8	8.3	4.0	4.7	8.1	10.5	9.5	5.6	6.8	8.4	1
Mean	**6.6**	**16.0**	**10.0**	**8.3**	**4.2**	**4.1**	**6.8**	**11.3**	**9.9**	**6.5**	**7.1**	**8.3**	

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

Entries	Palampur	Ludhiana	Hisar	Faizabad	Jorhat	Bhubaneswar	Imphal	Ranchi	Rahuri	Anand	Jabalpur	Urulikanchan	Average	Rank
OL-1802	10.5	13.6	17.4	8.0	10.0	8.6	8.2	8.8	8.8	18.8	8.2	9.3	10.8	1
JO-4-317	9.4	11.7	16.1	8.8	12.1	8.2	7.7	9.6	8.2	19.3	8.2	10.0	10.8	1
RO-19 (NC)	11.2	11.8	16.4	8.3	10.3	8.2	8.4	6.6	9.3	15.7	8.2	9.0	10.3	3
UPO-212 (NC)	9.2	14.3	15.9	8.6	10.3	8.2	7.9	10.6	7.4	18.5	8.2	9.2	10.7	2
Kent (NC)	10.5	13.9	16.6	8.2	11.5	8.4	8.2	8.8	7.9	18.8	8.2	8.6	10.8	1
Mean	**10.1**	**13.1**	**16.5**	**8.4**	**10.9**	**8.3**	**8.1**	**8.9**	**8.3**	**18.2**	**8.2**	**9.2**	**10.7**	

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

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Udai-pur	Ran-chi	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Jha-nsi	Jabal-pur	Ana-nd	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
OL-1802	76.1	95.2	87.5	112.8	94.2	91.0	98.0	109.9	110.3	87.7	89.8	84.7	98.2	77.6	57.4	91.4	3
JO-4-317	78.6	95.1	81.8	108.4	91.3	114.0	106.6	105.3	105.4	96.7	97.8	87.3	99.3	75.1	59.2	93.5	1
RO-19 (NC)	73.9	88.7	77.2	135.4	91.7	106.0	87.6	111.0	108.8	92.3	104.9	73.0	98.2	80.8	64.4	92.9	2
UPO-212 (NC)	80.0	87.1	80.1	90.5	93.8	107.0	101.7	106.6	99.0	89.1	103.8	74.3	97.8	76.6	62.7	90.0	4
Kent (NC)	73.9	84.5	76.4	115.6	86.6	108.0	91.6	91.9	113.5	88.3	94.7	70.0	95.2	68.3	52.8	87.4	5
Mean	**76.5**	**90.1**	**80.6**	**112.5**	**91.5**	**105.2**	**97.1**	**104.9**	**107.4**	**90.8**	**98.2**	**77.9**	**97.7**	**75.7**	**59.3**	**91.0**	

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

Entries	Palam-pur	Sri-nagar	His-ar	Ludh-iana	Ran-chi	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Jha-nsi	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk
OL-1802	0.52	0.46	0.31	0.67	0.41	0.78	1.00	1.06	0.58	0.39	0.78	0.89	0.79	0.66	1
JO-4-317	0.45	0.46	0.23	0.67	0.34	0.69	1.27	0.98	0.39	0.45	0.86	0.73	0.72	0.63	2
RO-19 (NC)	0.44	0.42	0.27	0.82	0.48	0.75	1.11	1.03	0.52	0.25	0.70	0.53	0.71	0.62	3
UPO-212 (NC)	0.47	0.41	0.29	0.67	0.54	0.73	0.99	0.94	0.49	0.39	0.74	0.76	0.83	0.63	2
Kent (NC)	0.47	0.40	0.35	0.74	0.38	0.70	1.28	1.09	0.26	0.25	0.68	0.74	0.81	0.63	2
Mean	**0.47**	**0.43**	**0.29**	**0.71**	**0.43**	**0.73**	**1.13**	**1.02**	**0.45**	**0.35**	**0.75**	**0.73**	**0.77**	**0.64**	

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

Entries	ADF (%)						NDF (%)							IVDMD (%)						DDM (q/ha)	
	Rah-uri	Palam-pur	Ludh-iana	Ran-chi	Aver-age	Ra-nk	Rah-uri	Palam-pur	Ludh-iana	Ran-chi	Ana-nd	Aver-age	Ra-nk	Rah-uri	Ludh-iana	His-ar	Ran-chi	Aver-age	Ra-nk	His-ar	Ra-nk
OL-1802	39.3	54.2	31.6	35.7	40.2	1	61.7	62.2	58.9	63.5	75.0	64.3	4	57.9	59.8	64.6	64.5	61.7	1	48.3	2
JO-4-317	39.3	53.8	33.7	37.8	41.1	2	54.3	63.8	60.0	60.7	72.0	62.2	1	57.9	58.6	63.5	63.1	60.8	3	49.0	1
RO-19 (NC)	45.1	52.4	33.3	37.9	42.2	4	60.8	64.6	57.4	64.6	71.0	63.7	3	53.4	58.8	60.9	63.0	59.0	5	40.2	4
UPO-212 (NC)	43.0	56.0	30.3	44.0	43.3	5	64.1	66.0	58.4	58.2	75.0	64.3	5	55.0	62.8	63.8	58.9	60.1	4	42.1	3
Kent (NC)	41.1	55.8	33.4	38.2	42.1	3	64.3	63.4	59.7	61.4	67.0	63.2	2	56.5	60.3	64.8	62.8	61.1	2	38.6	5
Mean	**41.5**	**54.4**	**32.5**	**38.7**	**41.8**		**61.0**	**64.0**	**58.9**	**61.7**	**72.0**	**63.5**		**56.2**	**60.1**	**63.5**	**62.5**	**60.5**		**43.7**	

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

Entries	Hill Zone				North West Zone				North East Zone				
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	His-ar	Ludh-iana	Aver-age	Ra-nk	Ran-chi	Jor-hat	Bhuban-eswar	Aver-age	Ra-nk
OL-1802	9.30	11.03	10.17	4	11.61	31.96	21.79	2	7.00	13.47	68.50	29.66	3
JO-4-317	9.63	11.40	10.52	3	12.87	26.46	19.67	4	7.50	17.81	64.50	29.94	2
Kent (NC)	16.65	11.42	14.04	1	14.77	25.63	20.20	3	6.70	15.42	64.10	28.74	4
RO-19 (NC)	8.98	10.86	9.92	5	5.32	17.67	11.50	5	5.50	16.95	59.60	27.35	5
UPO-212 (NC)	12.63	10.46	11.55	2	15.71	32.73	24.22	1	8.50	17.60	70.10	32.07	1
Mean	**11.4**	**11.0**	**11.2**		**12.1**	**26.9**	**19.5**		**7.0**	**16.3**	**65.4**	**29.6**	
CD at 5%	1.8	1.2			2.6	2.3			1.8	0.8	6.7		
CV%	10.0	6.7			12.5	5.5			17.2	3.0	3.3		

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

Entries	Central Zone							All India	
	Jhansi	Anand	Jabalpur	Rahuri	*Urulikanchan	Average	Rank	Average	Rank
OL-1802	11.57	15.00	12.45	3.74	28.31	10.69	4	17.78	4
JO-4-317	12.15	16.56	14.12	4.27	19.73	11.77	3	17.93	3
Kent (NC)	15.62	20.10	12.05	4.09	27.74	12.96	1	18.78	2
RO-19 (NC)	8.10	11.04	17.05	2.46	23.45	9.66	5	14.87	5
UPO-212 (NC)	11.57	21.98	11.37	4.32	23.17	12.31	2	19.72	1
Mean	**11.8**	**16.9**	**13.4**	**3.8**	**24.5**	**11.5**		**17.8**	
CD at 5%	1.4	3.3	2.3	0.7	N.S.				
CV%	0.8	12.8	11.5	11.2	20.1				

Note: * Not included in zonal and All India average due to CV≥ 20

13. AVTO-2 MC: SECOND ADVANCED VARIETAL TRIAL IN OAT (MULTI CUT) REPEAT 14-15

(Reference tables 13.1 to 13.5)

The AVT-2 trial in oat multicut of 14-15 was repeated with one entry JO-04-315 along with 3 checks at two locations Anand and Rahuri as per decision of VIC. For GFY (q/ha) national check ranked first whereas for DMY entry JO 04-315 exhibited marginal superiority over best check.
For production potential (q/ha/day), entry JO-04-315 ranked first for both green fodder and dry matter yield potential. For Crude protein yield (q/ha) national check UPO-212 whereas for crude protein content (%), entry JO-04-315 ranked first. For leafiness, entry JO-04-315 was superior whereas for other characters like plant height, ADF, NDF, IVDMD national checks were superior.

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

(Reference tables 14.1 to 14.10)

An initial varietal trial in Oat (Dual) comprising of eight entries along with three national checks (RO-19, UPO-212 and JHO-822) was conducted at 17 centres located at four zones of the country. Results obtained from different centres revealed that for green forage yield (q/ha), entries NDO-1101 (7.8%), OL-1760-1 (5.7%) and OL-1802 (5.5%) in NEZ registered superiority over the best check. For dry matter yield, only entries NDO-1101 and HFO-525 showed marginal superiority over the best check at central zone, whereas in other zones and national level, none of the entries could surpass checks.

For the character fodder production potential (q/ha/day), national checks maintained superiority for both green forage and dry matter production potential. Check variety RO-19 ranked first for the character plant height. For the character leafiness, entry OL-1760-1 performed better.

For quality parameters, entry OL-1802 for crude protein yield (4.5 q/ha) and entry JHO-15-6 (12%) for crude protein content exhibited superiority. Entry HFO-525 for ADF (%) and NDF (%), NDO-1101 for IVDMD (%) and JO-05-509 for DDM (q/ha) ranked first.
For seed yield (q/ha), entry JHO-15-6 ranked first at national level.

Table 13.1: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut) Repeat 14-15: Green Forage Yield (q/ha) & Dry Matter Yield (q/ha)

Entries	GFY (q/ha)				DMY (q/ha)				
	Anand	Rahuri	Average	Rank	Anand	Rahuri	Average	Rank	Superiority %
JO-04-315	519.2	656.7	587.9	2	62.7	127.4	95.0	1	0.7
RO-19 (NC)	558.8	575.0	566.9	3	60.6	113.7	87.2	4	
UPO-212 (NC)	609.0	570.0	589.5	1	74.4	114.1	94.3	2	
Kent (NC)	520.4	589.7	555.1	4	58.1	118.6	88.3	3	
Mean	**551.8**	**597.8**	**574.8**		**64.0**	**118.5**	**91.2**		
CD at 5%	34.0	68.6			4.0	14.4			
CV%	4.0	8.3			4.0	8.8			

Table 13.2: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut) Repeat 14-15: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)				DMY (q/ha/day)			
	Anand	Rahuri	Average	Rank	Anand	Rahuri	Average	Rank
JO-04-315	5.14	6.50	5.82	1	0.62	1.26	0.94	1
RO-19 (NC)	5.37	5.23	5.30	4	0.58	1.03	0.81	4
UPO-212 (NC)	5.86	5.28	5.57	2	0.72	1.06	0.89	2
Kent (NC)	5.15	5.73	5.44	3	0.57	1.15	0.86	3
Mean	**5.38**	**5.68**	**5.53**		**0.62**	**1.13**	**0.87**	

Table 13.3: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut) Repeat 14-15: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	CPY (q/ha)				CP (%)			
	Anand	Rahuri	Average	Rank	Anand	Rahuri	Average	Rank
JO-04-315	11.3	10.0	10.7	2	17.6	7.9	12.7	1
RO-19 (NC)	9.8	7.7	8.7	4	15.7	6.8	11.3	4
UPO-212 (NC)	13.2	8.6	10.9	1	17.5	7.6	12.5	2
Kent (NC)	10.1	8.4	9.2	3	17.1	7.1	12.1	3
Mean	**11.1**	**8.7**	**9.9**		**17.0**	**7.3**	**12.2**	

Table 13.4: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut) Repeat 14-15: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant height (cm)				Leaf Stem Ratio	
	Anand	Rahuri	Average	Rank	Rahuri	Rank
JO-04-315	103.4	79.2	91.3	2	0.96	1
RO-19 (NC)	110.4	82.5	96.5	1	0.84	3
UPO-212 (NC)	106.0	71.2	88.6	3	0.84	3
Kent (NC)	93.7	71.8	82.7	4	0.88	2
Mean	**103.3**	**76.2**	**89.8**		**0.88**	

Table 13.5: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut) Repeat 14-15: ADF (%), NDF (%) & IVDMD (%)

Entries	ADF (%)		NDF (%)				IVDMD (%)	
	Rahuri	Rank	Anand	Rahuri	Average	Rank	Rahuri	Rank
JO-04-315	48.6	4	71.0	61.0	66.0	2	50.7	4
RO-19 (NC)	47.8	3	75.0	59.5	67.3	3	51.3	3
UPO-212 (NC)	43.1	1	67.0	62.7	64.8	1	55.0	1
Kent (NC)	46.0	2	75.0	63.1	69.1	4	52.7	2
Mean	**46.4**		**72.0**	**61.6**	**66.8**		**52.4**	

Table 14.1 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	Hill Zone				North West Zone							North East Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Udai-pur	Aver-age	Ra-nk	Jor-hat	Bhuban-eswar	Faiza-bad	Ran-chi	Aver-age	Ra-nk	Superi-ority%
OL-1802	83.5	158.5	121.0	3	149.4	137.0	160.1	123.5	157.8	145.6	5	286.6	199.3	172.3	120.0	194.5	3	5.5
NDO-1101	63.1	133.9	98.5	10	131.1	148.2	183.3	106.7	145.5	143.0	7	270.5	206.6	211.2	106.7	198.7	1	7.8
OL-1760-1	66.6	154.4	110.5	4	129.1	118.5	177.3	75.1	263.3	152.7	3	214.0	189.3	238.9	137.7	195.0	2	5.7
HFO-525	63.5	141.0	102.3	9	110.7	133.3	140.3	114.1	178.5	135.4	9	263.0	204.0	160.0	111.1	184.5	4	0.1
JHO-15-5	53.8	137.1	95.5	11	120.2	118.5	125.9	167.4	246.6	155.7	2	204.2	167.3	155.2	75.6	150.6	11	
JHO-15-6	38.2	171.4	104.8	8	61.3	96.3	44.2	132.4	86.7	84.2	11	192.1	148.0	130.7	142.3	153.2	10	
HFO-523	64.8	149.7	107.3	6	130.0	125.9	161.4	131.4	181.5	146.0	4	228.9	127.3	195.2	88.9	160.1	9	
JO-09-509	74.2	136.1	105.1	7	148.3	133.3	142.7	122.0	171.5	143.6	6	216.0	178.0	161.1	88.9	161.0	8	
RO-19 (NC)	85.3	178.5	131.9	1	190.0	151.9	260.3	105.7	253.3	192.2	1	243.4	190.6	202.1	84.4	180.1	7	
UPO-212 (NC)	71.1	146.7	108.9	5	121.1	88.9	106.3	108.2	169.2	118.7	10	229.7	184.6	189.9	133.3	184.4	5	
JHO-822 (NC)	68.9	182.1	125.5	2	138.0	100.0	192.1	141.2	135.2	141.3	8	274.4	196.0	166.4	84.4	180.3	6	
Mean	**66.6**	**153.6**	**110.1**		**129.9**	**122.9**	**154.0**	**120.7**	**180.8**	**141.7**		**238.4**	**181.0**	**180.3**	**106.7**	**176.6**		
CD at 5%	18.8	13.7			27.8	35.2	36.1	25.6	37.2			6.2	13.9	40.2	34.9			
CV%	16.5	7.9			12.5	16.9	13.8	12.6	12.1			7.2	4.5	13.1	19.1			

Table 14.1 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)

Entries	Central Zone									All India	
	Jha-nsi	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	Jabal-pur	Aver-age	Ra-nk	Super-iority	Aver-age	Ra-nk
OL-1802	205.4	346.2	486.4	343.0	148.1	140.0	278.2	5		201.0	2
NDO-1101	203.7	251.8	496.5	217.0	160.2	176.0	250.9	7		188.9	7
OL-1760-1	173.4	262.2	258.7	328.9	160.9	146.6	221.8	9		182.1	9
HFO-525	259.2	289.3	500.2	389.6	160.7	161.3	293.4	4		198.8	4
JHO-15-5	168.3	286.3	468.2	396.3	194.0	145.3	276.4	6		190.0	6
JHO-15-6	104.4	214.7	178.7	191.1	208.5	102.6	166.6	11		132.0	11
HFO-523	208.7	367.0	476.8	362.2	196.2	192.0	300.5	1	1.0	199.3	3
JO-09-509	171.7	327.6	522.6	378.5	165.6	210.6	296.1	3		197.0	5
RO-19 (NC)	316.5	341.7	392.0	388.9	196.4	149.3	297.5	2		219.4	1
UPO-212 (NC)	191.9	222.5	285.9	198.9	165.9	170.6	205.9	10		163.8	10
JHO-822 (NC)	151.5	277.8	451.7	249.9	164.4	137.3	238.8	8		183.0	8
Mean	**195.9**	**289.7**	**410.7**	**313.1**	**174.6**	**157.4**	**256.9**			**186.8**	
CD at 5%	17.6	47.1	82.2	50.4	28.4	32.0					
CV%	10.5	9.6	11.7	9.6	9.5	11.9					

Table 14.2 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	Hill Zone				North West Zone						North East Zone						
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Aver-age	Ra-nk	Jor-hat	Bhuban-eswar	Faiza-bad	Ran-chi	Aver-age	Ra-nk	Superi-ority%
OL-1802	16.2	32.5	24.3	3	31.1	17.4	25.5	21.4	23.8	2	55.3	38.6	40.0	14.1	37.0	4	
NDO-1101	12.4	27.5	19.9	10	29.4	16.7	26.7	17.5	22.6	3	44.0	41.6	52.8	16.8	38.8	1	2.1
OL-1760-1	13.2	31.7	22.4	4	27.8	16.4	27.2	12.4	20.9	6	33.3	37.6	55.7	20.5	36.8	5	
HFO-525	12.7	28.9	20.8	9	24.0	16.2	23.1	19.1	20.6	7	43.4	41.6	48.5	20.8	38.6	2	1.6
JHO-15-5	10.8	28.1	19.5	11	25.2	17.1	20.1	21.2	20.9	6	37.1	33.7	42.7	8.5	30.5	9	
JHO-15-6	7.6	35.1	21.4	7	12.9	14.5	7.9	22.1	14.3	9	37.6	29.6	35.5	14.5	29.3	10	
HFO-523	12.8	30.7	21.8	6	27.9	15.1	22.4	20.1	21.4	5	39.9	25.2	53.9	16.4	33.8	8	
JO-09-509	14.7	27.9	21.3	8	29.8	18.7	20.5	19.6	22.1	4	42.4	36.6	46.1	18.1	35.8	6	
RO-19 (NC)	16.7	36.6	26.6	1	41.9	18.2	39.4	14.5	28.5	1	40.5	37.1	52.5	11.6	35.4	7	
UPO-212 (NC)	13.9	30.1	22.0	5	24.7	13.7	16.4	15.6	17.6	8	42.7	35.4	56.5	17.3	38.0	3	
JHO-822 (NC)	13.7	37.3	25.5	2	29.5	12.3	29.5	17.1	22.1	4	49.3	39.6	48.5	10.5	37.0	4	
Mean	**13.2**	**31.5**	**22.3**		**27.7**	**16.0**	**23.5**	**18.2**	**21.4**		**42.3**	**36.0**	**48.4**	**15.4**	**35.5**		
CD at 5%	3.9	1.5			5.5	5.4	6.5	2.9			2.1	3.3	12.1	4.9			
CV%	17.4	4.3			11.6	19.8	16.3	9.4			5.8	5.4	14.7	18.8			

Table 14.2 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)

Entries	Central Zone							All India	
	Jhansi	Rahuri	Urulikanchan	Raipur	Anand	Average	Rank	Average	Rank
OL-1802	16.3	75.3	61.8	37.4	38.4	45.9	3	34.8	2
NDO-1101	16.2	47.1	73.0	37.2	24.5	39.6	6	32.2	6
OL-1760-1	12.9	59.5	32.6	41.8	38.2	37.0	8	30.7	8
HFO-525	23.7	57.7	62.6	38.5	38.6	44.2	5	33.3	4
JHO-15-5	12.3	50.7	53.4	40.2	40.0	39.3	7	29.4	9
JHO-15-6	6.3	47.6	27.1	44.1	24.7	29.9	11	24.5	11
HFO-523	16.9	74.7	57.9	36.0	38.0	44.7	4	32.5	5
JO-09-509	12.7	58.1	84.6	33.8	40.5	46.0	2	33.6	3
RO-19 (NC)	32.5	61.1	52.5	48.3	37.3	46.4	1	36.0	1
UPO-212 (NC)	15.0	44.0	37.4	41.7	22.5	32.1	10	28.4	10
JHO-822 (NC)	10.6	55.3	54.4	32.9	28.7	36.4	9	31.3	7
Mean	**16.0**	**57.4**	**54.3**	**39.3**	**33.8**	**40.1**		**31.5**	
CD at 5%	2.1	9.2	10.1	11.8	5.5				
CV%	1.3	9.5	10.9	7.9	9.6				

Table 14.3 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha/day)

Entries	Ludhiana	Hisar	Bikaner	Jorhat	Bhubaneswar	Ranchi	Faizabad	Jhansi	Anand	Raipur	Average	Rank
OL-1802	2.50	2.28	2.11	4.21	3.62	1.43	1.64	2.74	6.02	1.97	2.85	3
NDO-1101	2.20	2.47	2.41	3.98	3.76	1.37	1.95	2.72	3.81	2.14	2.68	5
OL-1760-1	2.20	1.98	2.33	3.15	3.44	1.54	2.17	2.31	5.77	2.06	2.70	4
HFO-525	1.80	2.22	1.85	3.87	3.71	1.37	1.52	3.46	6.84	2.06	2.87	2
JHO-15-5	2.00	1.98	1.66	3.00	3.04	0.84	1.37	2.24	6.95	2.59	2.57	7
JHO-15-6	1.00	1.60	0.58	2.82	2.69	2.03	1.13	1.39	3.35	2.74	1.93	10
HFO-523	2.20	2.10	2.12	3.37	2.32	1.03	1.74	2.78	6.35	2.58	2.66	6
JO-09-509	2.50	2.22	1.88	3.18	3.24	1.18	1.53	2.29	6.64	2.18	2.68	5
RO-19 (NC)	3.20	2.53	3.43	3.58	3.47	0.91	1.88	4.22	6.82	2.52	3.26	1
UPO-212 (NC)	2.00	1.48	1.40	3.38	3.36	1.68	1.74	2.56	3.49	2.21	2.33	9
JHO-822 (NC)	2.30	1.67	2.53	4.04	3.56	1.16	1.54	2.02	4.38	2.11	2.53	8
Mean	**2.17**	**2.05**	**2.03**	**3.51**	**3.29**	**1.32**	**1.66**	**2.61**	**5.49**	**2.29**	**2.64**	

Table 14.4 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha/day)

Entries	Ludhiana	Hisar	Bikaner	Jorhat	Bhubaneswar	Ranchi	Faizabad	Jhansi	Anand	Raipur	Average	Rank
OL-1802	0.50	0.29	0.34	0.81	0.70	0.17	0.38	0.22	0.67	0.50	0.46	2
NDO-1101	0.50	0.28	0.35	0.65	0.76	0.21	0.48	0.22	0.43	0.50	0.44	4
OL-1760-1	0.50	0.27	0.36	0.49	0.68	0.23	0.51	0.17	0.67	0.54	0.44	4
HFO-525	0.40	0.27	0.30	0.64	0.76	0.26	0.44	0.32	0.68	0.49	0.45	3
JHO-15-5	0.40	0.28	0.26	0.55	0.61	0.09	0.38	0.16	0.70	0.54	0.40	7
JHO-15-6	0.20	0.24	0.10	0.55	0.54	0.21	0.31	0.08	0.43	0.58	0.32	8
HFO-523	0.50	0.25	0.29	0.59	0.46	0.19	0.48	0.23	0.67	0.47	0.41	6
JO-09-509	0.50	0.31	0.27	0.62	0.67	0.24	0.43	0.17	0.71	0.44	0.44	4
RO-19 (NC)	0.70	0.30	0.52	0.60	0.68	0.12	0.47	0.43	0.65	0.62	0.51	1
UPO-212 (NC)	0.40	0.23	0.22	0.63	0.64	0.22	0.52	0.20	0.39	0.56	0.40	7
JHO-822 (NC)	0.50	0.20	0.39	0.73	0.72	0.14	0.45	0.14	0.50	0.42	0.42	5
Mean	**0.46**	**0.27**	**0.31**	**0.62**	**0.66**	**0.19**	**0.44**	**0.21**	**0.59**	**0.51**	**0.43**	

Table 14.5 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein Yield (q/ha)

Entries	Palam-pur	Bika-ner	Ludh-iana	His-ar	Jor-hat	Bhuban-eswar	Faiza-bad	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	Aver-age	Ra-nk
OL-1802	1.2	4.7	4.3	2.2	5.2	3.6	3.3	7.6	5.7	8.6	3.2	4.5	1
NDO-1101	1.1	5.4	3.5	1.9	4.2	3.7	4.4	4.8	7.3	4.9	2.8	4.0	5
OL-1760-1	1.5	4.9	3.3	1.9	3.4	3.4	4.7	5.9	3.2	8.2	2.5	3.9	6
HFO-525	0.9	3.4	3.5	2.2	4.3	3.7	4.2	5.8	5.8	8.6	2.6	4.1	4
JHO-15-5	0.8	4.5	2.8	2.0	3.7	3.0	3.4	5.0	5.1	9.8	2.9	3.9	6
JHO-15-6	0.6	1.6	1.7	1.7	3.6	2.7	2.9	4.7	2.8	5.8	3.4	2.9	10
HFO-523	1.2	2.5	3.1	2.0	3.9	2.3	4.5	6.5	6.1	6.8	2.4	3.7	7
JO-09-509	1.5	3.6	2.5	2.3	3.9	3.2	3.9	5.5	8.3	9.0	2.4	4.2	3
RO-19 (NC)	1.7	5.8	5.4	2.0	3.8	3.4	4.5	6.1	5.0	6.9	3.5	4.4	2
UPO-212 (NC)	1.3	3.0	3.0	1.8	4.4	3.3	4.8	4.2	3.6	3.8	3.4	3.3	9
JHO-822 (NC)	1.2	3.8	2.8	1.6	4.3	3.5	4.0	5.1	5.0	6.2	2.4	3.6	8
Mean	**1.2**	**3.9**	**3.3**	**2.0**	**4.1**	**3.3**	**4.1**	**5.6**	**5.3**	**7.1**	**2.9**	**3.9**	

Table 14.6 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein (%)

Entries	Palam-pur	Bika-ner	Ludh-iana	His-ar	Jor-hat	Bhuban-eswar	Faiza-bad	Rah-uri	Urulikan-chan	Rai-pur	Ana-nd	Aver-age	Ra-nk
OL-1802	7.3	18.4	13.9	12.8	9.5	9.3	8.2	10.1	9.2	8.6	22.5	11.8	3
NDO-1101	8.8	20.3	11.8	11.1	9.7	8.9	8.4	10.2	10.1	7.5	19.9	11.5	4
OL-1760-1	11.1	18.0	11.7	11.3	10.5	9.1	8.5	9.9	9.9	6.0	21.4	11.6	4
HFO-525	7.3	14.5	14.5	13.4	10.1	8.8	8.8	10.1	9.2	6.8	22.2	11.4	5
JHO-15-5	7.3	22.6	11.3	11.9	10.2	8.9	8.0	9.9	9.5	7.2	24.5	11.9	2
JHO-15-6	7.9	20.7	13.1	11.9	9.8	9.1	8.2	9.9	10.2	7.8	23.5	12.0	1
HFO-523	9.0	11.1	11.0	13.2	9.9	9.1	8.3	8.8	10.5	6.7	17.8	10.5	9
JO-09-509	9.9	17.8	8.3	12.4	9.4	8.8	8.4	9.5	9.8	7.0	22.1	11.2	6
RO-19 (NC)	9.9	14.8	12.9	11.1	9.6	9.3	8.6	10.1	9.4	7.2	18.6	11.0	7
UPO-212 (NC)	9.0	18.2	12.0	13.0	10.4	9.4	8.5	9.6	9.7	8.1	17.1	11.4	5
JHO-822 (NC)	9.0	13.0	9.4	12.8	8.7	8.9	8.3	9.2	9.2	7.3	21.4	10.6	8
Mean	**8.8**	**17.2**	**11.8**	**12.3**	**9.8**	**9.1**	**8.4**	**9.7**	**9.7**	**7.3**	**21.0**	**11.4**	

Table 14.7 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Plant Height (cm)

Entries	Palam-pur	Ludh-iana	His-ar	Bika-ner	Pant-nagar	Udai-pur	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulikan-chan	Ana-nd	Rai-pur	Aver-age	Ra-nk
OL-1802	53.0	53.3	90.6	58.0	24.3	148.2	89.1	113.2	92.4	116.2	72.0	49.8	125.2	135.0	87.2	3
NDO-1101	53.3	48.3	90.3	53.0	21.8	134.1	91.4	119.5	94.1	93.3	67.3	68.9	112.4	134.6	84.5	5
OL-1760-1	48.3	48.0	86.4	51.0	23.3	136.8	91.9	106.4	56.4	90.3	79.2	51.3	124.8	133.2	80.5	8
HFO-525	57.7	47.0	92.8	63.0	19.2	138.8	97.0	117.4	92.5	97.0	93.2	81.0	128.9	144.2	90.7	2
JHO-15-5	40.3	41.0	85.4	36.0	26.9	128.4	81.7	91.5	95.9	85.7	78.6	85.2	117.7	124.1	79.9	9
JHO-15-6	42.0	24.3	65.9	33.0	20.3	109.7	72.0	94.4	91.5	79.6	79.2	44.1	104.2	86.7	67.6	10
HFO-523	48.7	47.0	82.4	73.0	20.4	154.6	98.0	96.5	97.9	113.4	96.4	61.8	123.7	155.6	90.7	2
JO-09-509	48.3	50.3	84.5	61.0	25.9	132.3	81.3	98.7	91.5	100.0	76.4	65.2	123.6	136.8	84.0	6
RO-19 (NC)	59.3	55.6	91.1	82.0	22.1	143.8	93.9	109.1	92.7	87.7	85.4	72.1	123.3	155.7	91.0	1
UPO-212 (NC)	48.0	48.0	88.8	74.0	29.1	141.2	95.7	103.2	85.2	89.6	87.4	42.8	119.2	134.9	84.8	4
JHO-822 (NC)	51.3	44.3	80.9	67.0	22.3	131.0	90.0	115.4	84.9	85.6	83.3	53.6	114.1	128.7	82.3	7
Mean	**50.0**	**46.1**	**85.3**	**59.2**	**23.2**	**136.3**	**89.3**	**105.9**	**88.6**	**94.4**	**81.7**	**61.4**	**119.7**	**133.6**	**83.9**	

Table 14.8 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Leaf Stem Ratio

Entries	Palam-pur	Ludh-iana	His-ar	Bika-ner	Jor-hat	Bhuban-eswar	Faiza-bad	Rah-uri	Urulikan-chan	Rai-pur	Aver-age	Rank
OL-1802	0.47	0.60	0.32	1.08	0.94	1.08	0.71	1.08	0.81	0.62	0.77	4
NDO-1101	0.51	0.43	0.32	0.79	1.26	1.12	0.75	0.88	0.87	0.75	0.77	4
OL-1760-1	0.46	0.90	0.32	2.20	1.56	0.92	0.72	1.18	0.77	0.57	0.96	1
HFO-525	0.47	0.67	0.37	1.08	1.59	1.10	0.75	1.07	0.88	0.54	0.85	2
JHO-15-5	0.51	0.34	0.23	1.67	0.62	0.80	0.72	0.75	0.84	0.47	0.70	7
JHO-15-6	0.47	0.25	0.10	1.90	0.56	0.78	0.70	1.63	0.85	0.75	0.80	3
HFO-523	0.44	0.67	0.32	1.22	1.18	0.74	0.79	0.91	0.78	0.40	0.74	6
JO-09-509	0.52	0.48	0.26	1.31	1.07	0.85	0.73	0.94	0.84	0.52	0.75	5
RO-19 (NC)	0.47	0.74	0.36	1.00	0.64	0.98	0.70	0.80	0.86	0.31	0.69	8
UPO-212 (NC)	0.50	0.43	0.31	1.13	1.00	0.87	0.72	0.98	0.85	0.72	0.75	5
JHO-822 (NC)	0.54	0.48	0.22	1.08	0.94	1.05	0.75	0.87	0.78	0.31	0.70	7
Mean	**0.49**	**0.54**	**0.28**	**1.31**	**1.03**	**0.94**	**0.73**	**1.01**	**0.83**	**0.54**	**0.77**	

Table 14.9 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)

Entries	ADF (%)		NDF (%)		IVDMD (%)				DDM (q/ha)	
	Ludhiana	Rank	Ludhiana	Rank	Ludhiana	Hisar	Average	Rank	Hisar	Rank
OL-1802	33.2	3	54.7	2	61.5	61.6	61.6	6	10.7	6
NDO-1101	34.2	6	59.3	7	59.2	69.2	64.2	1	11.6	3
OL-1760-1	34.6	8	59.1	6	58.4	67.1	62.8	3	11.0	4
HFO-525	29.6	1	54.2	1	62.0	62.0	62.0	4	10.0	7
JHO-15-5	34.5	7	60.0	9	55.8	63.7	59.8	9	10.9	5
JHO-15-6	32.5	2	56.8	3	60.4	67.0	63.7	2	9.7	8
HFO-523	35.9	9	59.6	8	54.3	63.2	58.8	11	9.6	9
JO-09-509	39.6	11	61.4	11	52.3	65.7	59.0	10	12.3	1
RO-19 (NC)	33.8	4	57.9	4	58.0	65.5	61.8	5	11.9	2
UPO-212 (NC)	34.1	5	58.3	5	56.6	64.1	60.4	8	8.8	10
JHO-822 (NC)	38.8	10	60.1	10	52.4	69.6	61.0	7	8.6	11
Mean	**34.6**		**58.3**		**57.4**	**65.3**	**61.3**		**10.5**	

Table 14.10 IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Seed Yield (q/ha)

Entries	*Palam-pur	Sri-nagar	His-ar	Bika-ner	Udai-pur	Ludh-iana	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Jha-nsi	Rah-uri	Ana-nd	Urulikan-chan	Rai-pur	Jabal-pur	Aver-age	Ra-nk
OL-1802	10.07	9.27	16.53	5.78	36.40	24.8	11.85	6.73	11.60	20.80	13.47	5.15	18.89	17.60	11.41	15.10	15.03	8
NDO-1101	6.87	8.74	19.41	13.67	26.00	11.5	14.62	8.66	13.74	17.86	13.30	4.42	15.19	20.27	13.22	15.00	14.37	9
OL-1760-1	8.07	9.43	16.78	13.00	37.80	27.9	14.27	6.07	9.73	17.06	13.47	4.33	11.11	23.47	12.64	14.00	15.40	6
HFO-525	4.57	8.37	16.82	7.67	25.80	19.0	13.37	7.20	21.73	24.00	13.30	7.96	10.74	32.53	11.92	14.40	15.66	5
JHO-15-5	10.30	8.47	17.47	8.59	29.90	22.1	14.87	4.53	14..26	23.20	13.64	4.70	7.85	28.26	15.68	15.30	15.33	7
JHO-15-6	9.40	10.17	24.22	9.06	25.50	32.8	14.40	4.07	15.06	20.80	17.68	11.05	24.07	27.20	17.19	15.10	17.89	1
HFO-523	4.37	9.22	7.81	6.22	20.90	13.8	12.57	3.73	14.66	22.40	11.11	4.47	13.88	21.33	12.22	9.90	12.28	11
JO-09-509	8.67	8.42	20.86	14.39	25.80	30.6	9.23	4.87	19.46	19.73	15.15	6.57	15.93	31.46	13.80	19.00	17.02	4
RO-19 (NC)	5.40	10.92	6.82	8.56	24.40	10.8	14.13	6.33	7.46	21.86	12.63	5.12	5.93	31.46	16.03	9.60	12.80	10
UPO-212 (NC)	3.33	8.71	22.93	11.70	29.10	35.2	11.00	5.07	11.06	19.20	11.78	6.93	25.56	25.07	15.28	20.30	17.26	3
JHO-822 (NC)	7.30	10.47	20.93	18.56	32.50	29.6	11.85	6.53	20.00	21.33	13.13	5.89	13.33	21.33	11.63	24.00	17.40	2
Mean	**7.12**	**9.29**	**17.33**	**10.65**	**28.55**	**23.47**	**12.92**	**5.80**	**14.45**	**20.75**	**13.51**	**6.05**	**14.77**	**25.45**	**13.73**	**15.61**	**15.49**	
CD at 5%	2.4	0.7	5.5	2.8	6.5	2.2	1.1	0.1	4.9	4.0	2.5	1.2	3.9	4.8	1.5	3.3		
CV%	20.0	3.6	18.6	15.3	13.4	5.5	5.5	9.1	19.8	11.2	1.5	11.2	14.7	11.1	6.5	12.4		

Note: * Not included in zonal and all India average due to CV≥ 20

15. VT Lucerne: VARIETAL TRIAL IN LUCERNE (Perennial) - 2013 – 3rd YEAR

(Reference tables 15.1 to 15.6)

The trial was established in 2013 and in third year data of five entries along with two checks were reported by 6 centres in three zones. For green fodder production (q/ha), entries ALP-1-1 (19.7%), Anand-26 (11.3%) and Anand-25 (5.3%) in NW zone, and entry TNLC-14 in south zone registered superiority over the best check. Similarly for dry matter yield (q/ha), entries ALP-1-1 (16.8%), Anand-26 (12.4%), Anand-25 (3.3%) in NW zone and entry TNLC -14 (30.5%) in south zone registered superiority over the best check.

For fodder production potential, ALP-1-1 for green fodder and check RL-88 for dry matter production potential (q/ha/day) were top rankers. For growth parameters, ALP1-1 (73.5 cm) ranked first for plant height while for leaf stem ratio, entry RL-10-2 was superior.

For quality parameters, National check RL-88 for CPY (q/ha) and entries Anand-25 and Anand-26 for crude protein (%) ranked first.

Table 15.1 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-3rd Year: Green Forage Yield (q/ha)

Entries	North West Zone					Central Zone				South Zone					All India	
	Bikaner	Hisar	Average	Rank	Superiority%	Rahuri	Urulikanchan	Average	Rank	Hyderabad	Coimbatore	Average	Rank	Superiority %	Average	Rank
Anand-25	1055.1	144.7	599.9	3	5.3	372.0	42.5	207.2	6	266.6	615.3	440.9	6		416.0	6
TNLC-14	798.4	114.2	456.3	7		234.0	53.5	143.8	7	327.6	744.4	536.0	1	13.6	378.7	7
RL-10-2	838.7	177.2	507.9	5		541.7	559.7	550.7	2	249.9	645.8	447.9	5		502.2	2
ALP-1-1 (Baif Lucerne-3)	1163.2	200.6	681.9	1	19.7	350.1	327.5	338.8	3	263.8	612.5	438.1	7		486.3	3
Anand-26	1065.0	202.3	633.6	2	11.3	355.6	175.1	265.4	4	283.2	620.8	452.0	4		450.3	4
RL-88 (NC)	730.2	245.5	487.8	6		742.8	658.2	700.5	1	322.1	620.8	471.5	2		553.3	1
Anand-2 (NC)	962.9	176.0	569.4	4		292.1	206.7	249.4	5	272.1	636.1	454.1	3		424.3	5
Mean	**944.8**	**180.1**	**562.4**			**412.6**	**289.0**	**350.8**		**283.6**	**642.2**	**462.9**			**458.7**	
CD at 5%	198.5	85.7				65.3	34.3			26.7	48.9					
CV%	11.8	16.4				8.9	6.6			5.3	4.3					

Note: Trial Failed at Ludhiana & Anand

Table 15.2 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-3rd Year: Dry Matter Yield (q/ha)

Entries	North West Zone					Central Zone				South Zone					All India	
	Bikaner	Hisar	Average	Rank	Superiority%	Rahuri	Urulikanchan	Average	Rank	Hyderabad	Coimbatore	Average	Rank	Superiority %	Average	Rank
Anand-25	309.9	52.6	181.3	3	3.3	95.1	9.7	52.4	6	51.5	79.6	65.5	6		99.7	6
TNLC-14	238.0	41.4	139.7	7		58.8	12.6	35.7	7	68.8	109.1	89.0	1	30.5	88.1	7
RL-10-2	252.9	70.8	161.8	5		135.9	131.2	133.6	2	49.1	87.4	68.3	2	0.1	121.2	2
ALP-1-1 (Baif Lucerne-3)	343.4	66.6	205.0	1	16.8	89.1	74.0	81.6	3	54.7	79.6	67.2	5		117.9	3
Anand-26	317.4	76.9	197.2	2	12.4	91.9	39.0	65.5	4	57.6	78.2	67.9	4		110.2	4
RL-88 (NC)	224.2	96.9	160.5	6		187.8	145.8	166.8	1	59.0	77.3	68.2	3		131.8	1
Anand-2 (NC)	284.5	66.4	175.5	4		76.4	46.7	61.5	5	55.3	75.3	65.3	7		100.8	5
Mean	**281.5**	**67.4**	**174.4**			**105.0**	**65.6**	**85.3**		**56.6**	**83.8**	**70.2**			**110.0**	
CD at 5%	56.6	40.6				15.2	7.8			5.3	8.3					
CV%	11.3	13.8				8.1	6.6			5.3	5.6					

Table 15.3 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-3rd Year: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)

Entries	GFY (q/ha/day)				DMY (q/ha/day)			
	Bikaner	Hisar	Average	Rank	Bikaner	Hisar	Average	Rank
Anand-25	1.54	1.20	1.37	5	0.44	0.44	0.44	4
TNLC-14	1.10	0.90	1.00	6	0.32	0.32	0.32	6
RL-10-2	1.43	1.40	1.42	4	0.42	0.50	0.46	3
ALP-1-1 (Baif Lucerne-3)	1.90	1.70	1.80	1	0.55	0.46	0.51	2
Anand-26	1.61	1.90	1.76	2	0.47	0.55	0.51	2
RL-88 (NC)	1.32	2.00	1.66	3	0.41	0.72	0.57	1
Anand-2 (NC)	1.34	1.50	1.42	4	0.38	0.41	0.40	5
Mean	**1.46**	**1.51**	**1.49**		**0.43**	**0.49**	**0.46**	

Table 15.4 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-3rd Year: Crude Protein Yield (q/ha) & Crude Protein (%)

Entries	CPY (q/ha)					CP (%)				
	Bikaner	Rahuri	Urulikanchan	Average	Rank	Bikaner	Urulikanchan	Rahuri	Average	Rank
Anand-25	69.4	17.9	1.9	29.7	5	22.4	19.7	18.8	20.3	1
TNLC-14	56.9	9.8	2.4	23.0	7	23.9	19.4	16.6	20.0	2
RL-10-2	59.2	23.2	25.5	36.0	3	23.4	19.4	17.1	20.0	2
ALP-1-1 (Baif Lucerne-3)	80.7	15.1	14.5	36.7	2	23.5	19.6	16.9	20.0	2
Anand-26	72.7	16.9	7.7	32.4	4	22.9	19.8	18.4	20.3	1
RL-88 (NC)	51.3	33.7	27.8	37.6	1	22.9	19.1	17.9	20.0	2
Anand-2 (NC)	65.1	13.7	8.9	29.2	6	22.9	19.0	17.9	19.9	3
Mean	**65.0**	**18.6**	**12.7**	**32.1**		**23.1**	**19.4**	**17.7**	**20.1**	

Table 15.5 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-3rd Year: Plant Height (cm) & Leaf Stem Ratio

Entries	Plant Height (cm)						Leaf Stem Ratio					
	Bikaner	Hisar	Rahuri	Urulikanchan	Average	Rank	Bikaner	Hisar	Rahuri	Urulikanchan	Average	Rank
Anand-25	73.8	80.1	62.5	75.8	73.1	4	1.48	0.54	0.48	1.25	0.94	4
TNLC-14	76.4	76.2	64.3	76.0	73.2	3	1.04	0.68	0.56	1.16	0.86	7
RL-10-2	69.9	79.1	65.3	74.1	72.1	5	1.61	0.61	0.66	1.18	1.01	1
ALP-1-1 (Baif Lucerne-3)	73.8	78.5	63.0	78.5	73.5	1	1.57	0.61	0.60	1.15	0.98	2
Anand-26	72.1	75.6	60.3	80.4	72.1	5	1.34	0.58	0.67	1.09	0.92	5
RL-88 (NC)	66.1	78.4	65.1	76.4	71.5	6	1.31	0.66	0.54	1.27	0.95	3
Anand-2 (NC)	74.4	81.6	61.8	75.5	73.3	2	1.22	0.68	0.52	1.20	0.91	6
Mean	**72.4**	**78.5**	**63.2**	**76.7**	**72.7**		**1.37**	**0.62**	**0.57**	**1.19**	**0.94**	

Table 15.6 VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-3rd Year: Overall performance of different entries of Lucerne (2013-2015)

Entries	GFY (q/ha)					DMY (q/ha)				
	2013	2014	2015	Average	Rank	2013	2014	2015	Average	Rank
Anand-25	455.5	622.2	416.0	497.9	6	89.3	154.1	99.7	114.4	5
TNLC-14	392.5	540.0	378.7	437.1	7	76.1	130.5	88.1	98.2	7
RL-10-2	452.6	737.3	502.2	564.0	2	87.0	180.4	121.2	129.5	2
ALP-1-1 (Baif Lucerne-3)	465.5	698.4	486.3	550.1	3	90.6	167.0	117.9	125.2	3
Anand-26	456.9	698.1	450.3	535.1	4	87.6	167.2	110.2	121.7	4
RL-88 (NC)	420.3	784.0	553.3	585.9	1	78.6	193.6	131.8	134.7	1
Anand-2 (NC)	455.7	644.9	424.3	508.3	5	88.4	152.5	100.8	113.9	6
Mean	**442.7**	**675.0**	**458.7**	**525.5**		**85.4**	**163.6**	**110.0**	**119.6**	

Forage Crop Production

The forage crop production programme was executed at 26 locations in five zones. In total 20 experiments were conducted, out of which 8 were in network (6 coordinated and 2 AVT based) and 12 were in location specific mode. The main emphasis of natural resource management under forage crops was to increase system productivity and resource use optimization in forages and forage based cropping systems. The salient research achievements of the forage crop production trials during *Rabi* 2015-16 are as follows.

A. On Going Coordinated Trials

PS-13-AST-2: Performance of perennial fodder sorghum (*sorghum bicolor* cv. COFS- 29) as influenced by planting geometry and cutting intervals under irrigated conditions)

Locations: Dharwad, Raipur and Bikaner

A coordinated trial was started during *Rabi* 2013-14 at Bikaner, Raipur and Dharwad centres to assess the effect of planting geometry and cutting intervals on growth, yield and quality (HCN content) of perennial sorghum under irrigated condition. The treatment included three planting spacing; 30, 45 and 60 cm row to row and four cutting intervals of 45, 60, 75 and 90 days. The experiment was conducted in Split Plot Design with three replications. The results of different locations indicated that planting geometry had significant influence on the growth parameter and yields (Table PS-13-AST-2a to d). The green and dry fodder yield was highest with 45 cm row spacing (1349.1 and 330.04 q/ha, respectively) followed by 30 cm row planting (1281.6 and 307.85 q/ha, respectively). The crude protein content varied in limited range and did not exhibited remarkable variation due to planting geometry. The crude protein yield was highest with 45 cm row planting (26.18 q/ha) followed by 30 cm row planting (24.35 q/ha). The cutting interval of 90 days recorded the higher plant height (147.03cm) whereas cutting interval of 60 days recorded higher green fodder, dry matter and crude protein yield. However the cutting interval of 45 days exhibited maximum green, dry and crude protein content on location mean basis. Among the different locations, higher values of green fodder, dry matter and CP yields were recorded at Dharwad.

Table PS-13-AST-2 (a): Influence of planting geometry and cutting intervals on biomass yields of perennial fodder sorghum (Cv. COFS 29)

Treatments	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
	Dhar-wad	Rai-pur	Bika-ner	Mean	Dhar-wad	Rai-pur	Bika-ner	Mean
A. Planting geometry:								
30 cm inter-row spacing	1804.8	1172.11	867.8	1281.6	426.7	255.86	241.0	307.85
45 cm inter-row spacing	2047.0	1076.62	923.7	1349.1	491.0	238.71	260.4	330.04
60 cm inter-row spacing	1456.2	1043.63	790.2	1096.7	359.4	232.31	244.0	278.57
SEm±	43.1	18.87	10.48		11.0	4.41	2.67	
CD (P=0.05)	126.5	76.07	30.74		32.4	17.79	7.82	
B Cutting interval								
45 days	1766.4	1274.54	614.7	1218.5	409.3	276.60	172.1	286.00
60 days	1972.8	1151.85	631.9	1252.2	476.4	251.91	180.5	302.94
75 days	1816.2	1107.87	683.9	1202.7	442.5	246.69	198.4	295.86
90 days	1522.1	855.56	651.2	1009.6	374.6	193.98	194.4	254.33
SEm±	49.8	23.59	12.10		12.8	5.21	3.08	
CD (P=0.05)	146.1	70.65	35.50		37.4	15.60	9.03	
CV (%)	8.45		5.63		8.99		4.95	

Table PS-13-AST-2 (b): Influence of planting geometry and cutting intervals on crude protein content and yield of perennial fodder sorghum (Cv. COFS 29)

Treatments	Crude Protein Yield (q/ha)				Crude Protein (%)			
	Dhar-wad	Rai-pur	Bika-ner	Mean	Dhar-wad	Rai-pur	Bika-ner	Mean
A. Planting geometry:								
30 cm inter-row spacing	25.96	21.52	25.57	24.35	6.08	8.35	14.14	9.52
45 cm inter-row spacing	30.20	20.16	28.17	26.18	6.16	8.39	14.41	9.65
60 cm inter-row spacing	22.25	20.00	26.17	22.81	6.19	8.57	14.28	9.68
SEm±	0.66	0.368	0.32		0.02	0.05	0.11	
CD (P=0.05)	1.95	NS	0.92		0.06	NS	0.32	
B Cutting interval								
45 days	24.55	25.07	17.77	22.46	6.00	9.06	10.33	8.46
60 days	29.18	21.89	19.11	23.39	6.13	8.69	10.58	8.47
75 days	27.48	20.00	21.97	23.15	6.21	8.11	11.08	8.47
90 days	23.34	15.28	21.06	19.89	6.23	7.89	10.84	8.32
SEm±	0.77	0.49	0.36		0.02	0.09	0.13	
CD (P=0.05)	2.25	1.47	1.07		0.07	0.28	0.37	
CV (%)	8.38		2.73		1.16		1.78	

Table PS-13-AST-2 (c): Influence of planting geometry and cutting intervals on growth parameters of perennial fodder sorghum (cv. COFS 29)

Treatments	Plant height (cm)				Tillers/m row				Leaf Stem Ratio		
	Dhar-wad	Rai-pur	Bika-ner	Mean	Dhar-wad	Rai-pur	Bika-ner	Mean	Dhar-wad	Bika-ner	Mean
A. Planting geometry											
30 cm inter-row spacing	157.5	153.93	94.6	135.34	96.7	62.56	70.91	76.72	0.302	1.13	0.72
45 cm inter-row spacing	155.2	157.72	92.2	135.04	102.2	66.88	81.22	83.43	0.310	1.19	0.75
60 cm inter-row spacing	154.5	165.65	90.1	136.75	104.1	67.49	79.74	83.78	0.319	1.20	0.76
SEm±	1.59	1.34	1.12		1.19	0.86	1.01		0.004	0.01	
CD (P=0.05)	NS	5.42	3.28		3.48	3.48	2.97		0.013	0.04	
B. Cutting interval											
45 days	136.1	127.43	63.0	108.84	81.8	44.71	55.00	60.50	0.327	0.85	0.59
60 days	146.4	153.74	67.3	122.48	95.2	55.40	58.89	69.83	0.318	0.79	0.55
75 days	161.5	168.34	71.2	133.68	109.7	74.82	59.91	81.48	0.304	0.91	0.61
90 days	178.9	186.88	75.3	147.03	117.4	87.67	58.07	87.71	0.292	0.98	0.64
SEm±	1.84	1.98	1.29		1.37	1.05	1.17		0.005	0.02	
CD (P=0.05)	5.39	5.93	3.79		4.01	3.16	3.43		0.015	0.05	
CV (%)	3.54		5.60		4.06		6.06		4.91	5.27	

Table PS-13-AST-2 (d): Influence of planting geometry and cutting intervals on monetary parameters of perennial fodder sorghum (cv. COFS 29)

Treatments	Net Return (Rs/ha)			B:C ratio	Gross return (Rs/ha)
	Raipur	Bikaner	Mean	Raipur	Raipur
A. Planting geometry:					
30 cm inter-row spacing	102069	102069	102069	2.28	111791
45 cm inter-row spacing	89904	89904	89904	2.00	104561
60 cm inter-row spacing	85780	85780	85780	1.90	103404
SEm±	2356	2356		0.061	2833
CD (P=0.05)	9501	9501		0.248	NS
B. Cutting interval					
45 days	110114	110114	110114	2.24	123287
60 days	97756	97756	97756	2.11	111589
75 days	93787	93787	93787	2.10	108186
90 days	68679	68679	68679	1.79	83280
SEm±	2947	2947		0.06	4135
CD (P=0.05)	8824	8824		0.20	12381
C. Interaction	NS				NS

CS-13-AST-1: Study on different models for year round green fodder production under irrigated condition

Location (4): Urulikanchan, Anand, Rahuri and Bikaner

The study was initiated during *kharif* 2013, to find out suitable models for year round green fodder production at four locations (Anand, Rahuri, Urulikanchan and Bikaner). The perennial BNH (CO-3) was planted during *kharif* 2013 at border and seasonal (*Kharif*, *Rabi* & *Zaid*) fodder crops in between plot as per treatments. The treatments consisted of **T_1-** Maize +cowpea- oat + berseem- Bajra + cowpea, **T_2-** sorghum + cowpea- maize + berseem – Bajra + cowpea, **T_3-** BN hybrid + cowpea-berseem- cowpea, **T_4-** BN hybrid + lucerne and **T_5-** BN hybrid + *Desmanthus*. Trial was laid out in randomized block design with four replications.

On location mean basis, it is realized that planting of T_3- Bajra napier hybrid + cowpea - berseem- cowpea recorded highest GFY (984.46 q/ha/yr) which was at par with (972.41 q/ha/yr) but significantly superior to rest of the sequences. However, in terms of DMY (221.90 q/ha/yr) and CPY (24.64 q/ha/yr) **T_4-** BN hybrid + lucerne recorded significant superiority over rest of the treatments, which was followed by T_3- Bajra napier hybrid + cowpea - berseem- cowpea (DMY-211.04 and CPY -19.79 q/ha/yr). Planting of BN hybrid + lucerne round the year green fodder production system fetched highest net monetary returns (Rs 100641/ha/yr) followed by T_3- Bajra napier hybrid + cowpea - berseem- cowpea (Rs. 86466/ha/yr). However, T5recorede significantly higher B: C ratio (3.08). Among the centers, Anand recorded maximum productivity and profitability (Table CS-13-AST-1(a) to (d)).

Table CS-13-AST-1(a): GFY and DMY of forages as influenced by different models for year round green fodder production under irrigated condition

Treatments	Green fodder yield (q/ha					Dry matter yield (q/ha)				
	Urulikanchan	Anand	Rahuri	Bikaner	Mean	Urulikanchan	Anand	Rahuri	Bikaner	Mean
T_1	617.2	1348.26	515.47	487.3	742.06	97.6	266.64	109.29	101.0	143.63
T_2	634.9	1149.05	412.86	483.2	670.00	111.3	275.50	93.97	101.8	145.64
T_3	747.3	995.05	1158.70	1036.8	984.46	126.1	246.05	252.22	219.8	211.04
T_4	897.8	796.01	1170.32	1025.5	972.41	133.5	199.64	270.66	283.8	221.90
T_5	594.5	824.05	1031.27	1008.7	864.63	104.1	211.07	255.92	242.5	203.40
SEm±	14.0	46.91	20.38	23.0		2.8	12.11	6.71	9.74	
CD at 5 (%)	42.47	144.57	58.44	70.9		8.5	37.31	19.23	29.99	
CV	4.1	9.18	4.11	5.7		5.0	10.10	5.91	10.26	

Table CS-13-AST-1(b): Crude protein yield and Cost of cultivation of forages as influenced by different models for year round green fodder production under irrigated condition

Treatments	Crude Protein Yield (q/ha)					Cost of cultivation (Rs/ha)		
	Rahuri	Urulikanchan	Anand	Bikaner	Mean	Urulikanchan	Anand	Mean
T_1	15.90	9.3	28.54	10.20	15.99	111192	52083	81638
T_2	13.88	9.2	27.28	10.68	15.26	108288	50851	79569
T_3	23.21	13.6	23.00	19.34	19.79	91741	61946	76843
T_4	28.59	16.5	21.26	32.22	24.64	108566	43085	75826
T_5	23.48	10.8	23.73	32.74	22.69	65760	36285	51023
SEm±	1.12	0.4	1.18	1.4				
CD at 5 (%)	3.20	1.1	3.62	4.2				
CV	9.20	6.1	9.50	13.1				

Table CS-13-AST-1(c): Economics of forages as influenced by different models for year round green fodder production under irrigated condition

Treatments	Net Monetary Returns (Rs./ha)				Gross Monetary Returns (Rs/ha)			Benefit : Cost ratio			
	Urulika-nchan	Ana-nd	Bika-ner	Mean	Urulikanchan	Ana-nd	Mean	Urulikanchan	Ana-nd	Bika-ner	Mean
T_1	49833	82743	50102	60893	161025	134826	89903.4	0.45	2.59	2.18	1.74
T_2	57212	64055	47477	56248	165501	114905	84233.0	0.53	2.26	1.90	1.56
T_3	92318	37560	129519	86466	184059	99505	104904.5	1.01	1.61	4.98	2.53
T_4	136576	36516	128832	100641	245142	79601	121218.1	1.26	1.85	5.15	2.75
T_5	71891	46120	129302	82438	137651	82405	91634.4	1.09	2.27	5.88	3.08
SEm±	3419	12238	3451					0.03		0.14	
CD (P=0.05)	10399.8	NS	10635					0.10		0.43	
CV	8.71	10.56	7.1					8.00		6.96	

Table CS-13-AST-1(d): Soil properties as influenced by different models for year round green fodder production under irrigated condition

Treatments	pH	E.C. (dSm^{-1})	O.C. (%)	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
Urulikanchan						
T_1	8.00	0.50	0.34	123.25	27.50	152.00
T_2	8.04	0.56	0.33	126.50	29.75	147.75
T_3	8.02	0.48	0.29	126.75	23.25	149.50
T_4	7.94	0.63	0.28	126.50	26.25	155.00
T_5	8.05	0.32	0.29	123.75	25.75	152.25
Initial	**7.85**	**0.52**	**0.30**	**138.00**	**22.67**	**285.00**
Anand						
T_1	7.85	0.12	0.36	266.6	25.1	173
T_2	7.92	0.13	0.31	297.9	30.7	206
T_3	8.06	0.12	0.34	297.9	26.9	199
T_4	8.16	0.10	0.30	266.6	23.1	163
T_5	8.30	0.11	0.32	282.2	16.5	144
Initial	**7.65**	**0.14**	**0.30**	**250.9**	**18.00**	**243**
Rahuri						
T_1	8.14	0.11	0.38	169.34	11.12	440
T_2	8.09	0.12	0.35	160.60	10.54	416
T_3	8.17	0.11	0.39	178.75	15.88	466
T_4	8.06	0.13	0.41	204.48	17.72	478
T_5	8.08	0.14	0.38	175.62	12.62	461
Initial	**8.73**	**0.24**	**0.36**	**142.0**	**13.15**	**418.0**

CS-13-AST-2: Evaluation of fodder crops under different rice fallow system

Location (3): Ranchi, Jabalpur and Bhubaneswar

A field experiment was started during *kharif* 2013 at three locations (Ranchi, Jabalpur and Bhubaneswar) to evaluate fodder crops under different rice fallow system. The treatments consisted of four methods of sowing of rice *viz.*, Conventional **(M_1)**. SRI raised bed **(M_2)**, SRI flat bed **(M_3),** and Aerobic (M_4) and three crops (oat, berseem and lathyrus) laid out in Split Plot Design and replicated three times. Result of second year's experimentation is summarized below.

On mean basis over the locations, a narrow variation in the yields was recorded under different methods of sowing (Table Table CS-13-AST-2 (a) to (d)). Nonetheless, forage crops grown after SRI flat bed method of rice recorded highest GFY (347.7q green and 61.26 q dry matter/ha) and lowest being with aerobic method. However sowing of forages after SRI flat bed method of rice attained highest DMY and CPY (61.26 & 7.68 q/ha, respectively). Under different rice establishment methods, the SRI flat bed method of rice recorded highest gross and net monetary returns as well as B:C ratio than the other systems (Rs. 136289, 99690/ha and 3.14, respectively).

Among fodder crops, growing of berseem recorded highest GFY and CP yields (456.4 and 11.39 q/ha, respectively) and lowest being with lathyrus (147.7 GFY q/ha) on mean basis. Berseem recorded 9.32 % more GFY over oat, whereas, highest DMY (82.60 q/ha) was recorded under oat crop. Oat crop recorded 18.95 and 200% more DMY over berseem and lathyrus, respectively. With respect to system productivity in terms of economics, sowing of berseem fetched highest net monetary returns (Rs 114234/ha) and benefit cost ratio (4.53).

Table CS-13-AST-2 (a): Effect of rice establishment methods and forage crops on GFY and DMY of forages under rice fallow system

Treatments	Green fodder yield (q/ha				Dry matter yield (q/ha)			
	Ranchi	Jabalpur	Bhubaneswar	Mean	Ranchi	Jabalpur	Bhubaneswar	Mean
Methods of sowing								
M_1	305.6	601.1	105.43	337.4	49.98	106.3	21.54	59.27
M_2	301.5	606.8	111.73	340.0	48.22	107.5	22.97	59.56
M_3	304.7	627.8	110.57	347.7	47.69	113.5	22.60	61.26
M_4	281.0	614.6	115.73	337.1	44.35	110.0	23.73	59.36
SEm±	5.30	0.53	1.39		0.81	0.33	0.39	
CD (P=0.05)	18.2	1.52	4.8		2.80	0.95	1.35	
Fodder crops								
C_1	377.5	700.8	174.20	417.5	59.94	147.2	40.65	82.60
C_2	399.0	898.1	72.20	456.4	59.61	136.6	12.11	69.44
C_3	118.1	238.8	86.20	147.7	23.14	44.1	15.38	27.54
SEm±	4.1	12.36	2.07		0.65	1.23	0.51	
CD (P=0.05)	12.4	36.52	6.04		1.97	4.52	1.50	
CV (%)		14.52	6.47				7.83	
Interaction C x M								
SEm±	9.2	3.6			1.40	0.36		
CD (P=0.05)	NS	9.65				0.96		

Table CS-13-AST-2 (b): Effect of rice establishment methods and forage crops on crude protein and Fodder Equivalent Yield of forages under rice fallow system.

Treatments	Crude Protein yield (q/ha)				Fodder Equivalent Yield (q/ha)			
	Jabal-pur	Bhuban-eswar	Ran-chi	Mean	Jabal-pur	Ran-chi	Bhuban-eswar	Mean
Methods of sowing								
M_1	12.5	3.00	6.91	7.47	83.8	50.28	594.89	243.0
M_2	12.7	3.12	6.67	7.50	85.5	49.56	630.43	255.2
M_3	13.4	3.06	6.58	7.68	103.9	50.20	615.63	256.6
M_4	13.0	3.17	6.13	7.43	96.2	46.3	587.26	243.3
SEm±	0.01	0.05	0.09		0.52	0.84	13.72	
CD (P=0.05)	0.03	0.17	0.33		1.15	2.91	47.46	
Fodder crops								
C_1	**11.8**	4.30	5.55	7.22	86.2	56.6	659.83	267.5
C_2	**20.5**	2.58	11.08	11.39	120.7	71.82	572.27	254.9
C_3	**6.4**	2.40	3.09	3.96	55.7	18.89	589.07	221.2
SEm±	1.23	0.07	0.09		0.32	0.68	2.37	
CD (P=0.05)	3.35	0.20	0.28		0.96	2.06	6.91	
CV	8.63	7.78	5.55		10.23		1.35	
Interaction C x M								
SEm±	0.63		0.17		0.22	1.46		
CD(P=0.05)	1.18		NS		0.66	NS		

Table CS-13-AST-2 (c): Effect of rice establishment methods and forage crops on economics of forages under rice fallow system.

Treatments	Net monetary returns (Rs/ha/year				(B:C ratio)				Gross return(Rs./ha)			
	Ran-chi	Jabal-pur	Bhuban eswar	Mean	Ran-chi	Jabal pur	Bhub aneswar	Mean	Ran-chi	Jabal-pur	Bhub-aneswar	Mean
Methods of sowing												
M_1	87311	125572	31766	81549.7	2.29	3.62	2.1	2.67	124797	172638	59489	118975
M_2	82976	131450	35209	83211.7	2.16	3.89	2.3	2.78	120643	176133	63043	119940
M_3	96103	167627	35339	99689.7	2.51	4.61	2.3	3.14	133761	213544	61563	136289
M_4	72551	152716	37106	87457.7	1.89	4.37	2.7	2.99	110218	197783	58726	122242
SEm±	731		1372		0.02		0.05		731		1372	
CD (P=0.05)	2523		4746		0.06		0.19		2523		4746	
Fodder crops												
C_1	94595	133676	39708	89326.3	2.49	4.05	2.5	3.01	132595	177926	65983	125501
C_2	119032	192247	31424	114234.3	3.01	4.53	2.2	3.25	158532	246697	57227	154152
C_3	40509	107100	3343	50317.3	1.41	3.79	2.3	2.50	76079	145450	58907	93479
SEm±	1039		236.64		0.02		0.01		1039		236.64	
CD (P=0.05)	3115		690.65		0.08		0.03		3115		690.65	
CV (%)			2.35				1.36		132595		1.35	
Interaction C x M												
SEm±	1266				0.03				1266			
CD (P=0.05)	NS				NS				NS			

Table CS-13-AST-2 (d): Effect of rice establishment methods and forage crops Physico-chemical properties and fertility status at Bhubaneswar

Treatments	Bulk density (Mg/m^3)	Particle density (Mg/m^3)	pH	Organic carbon(g/kg)	Available nutrients (kg/ha)		
					N	P	K
M1C1	1.70	2.82	6.0	3.8	210	12.2	128
M1C2	1.72	2.82	6.0	3.8	212	12.45	120
M1C3	1.72	2.85	6.0	3.7	214	12.80	124
M2C1	1.65	2.82	6.2	3.9	212	12.80	130
M2C2	1.66	2.83	6.2	4.0	215	12.65	128
M2C3	1.67	2.80	6.2	4.0	222	12.70	125
M3C1	1.66	2.81	6.0	4.0	216	12.70	128
M3C2	1.66	2.82	6.1	3.9	218	12.75	125
M3C3	1.68	2.62	6.1	3.8	220	12.70	120
M4C1	1.65	2.82	6.0	3.9	212	12.80	124
M4C2	1.65	2.83	6.0	3.8	214	12.55	120
M4C3	1.66	2.83	6.2	3.7	216	12.40	120
Initial	**1.72**	**2.85**	**5.6**	**3.4**	**215**	**12.1**	**118**

CS-13-AST-3: Evaluation of different varieties of grasspea (*Lathyrus sativus* L.) as forage crop under different sowing methods in rice based cropping system

Location: Raipur, Jorhat

The experiment was initiated during *Rabi* 2013-14 to increase the availability of legume forage through utilization of rice fallow system. The treatments consisted of four grasspea varieties at Raipur namely Mahateora, Prateek, Nirmal and Rattan and three at Jorhat (Mahateora, Prateek and Nirmal) in main plots and four sowing methods *viz*., recommended practices with 125 % more seed rate (M_1), recommended practices with 150% more seed rate (M_2), zero seed drill with 125 % more seed rate (M_3) and zero seed drill with 150 % more seed rate (M_4) in sub-plots were laid out in split plot design and replicated three times.

The results of this year experimentation indicated that Nirmal variety recorded highest green, dry and CP yields (96.62, 21.47 and 3.12 q/ha, respectively) on location mean basis which was 09.22 and 10.92% more GFY over Prateek and Mahateora, respectively. At Jorhat center also Nirmal variety recorded highest green, dry and CP yields. The Mahateora exhibited higher plant height. The respective increase in DMY of Normal was 10.61 and 12.70% over Prateek and Mahateora. Under different sowing methods, highest GFY (97.65 q/ha) and DMY (21.45 q/ha) were recorded in zero seed drill with 150 % more seed rate (M_4) followed by recommended practices with 150% more seed rate (M_2) with 94.77 and 20.85 q GFY and DMY per hectare, on location mean basic. The M_2 also exhibited higher plant height as well as leaf stem: ratio. Economic indices indicated that Raipur, the highest gross return (Rs. 28916/ha) and net return (Rs 15599/ha) was recorded in variety Ratan. Among sowing methods, the higher gross and net return was recorded in treatment - recommended practices with 150% more seed rate (Planting 20 x 10) as well as M_4, which were on par with each other (Table CS-13-AST-3 (a) to (d)).

Table CS-13-AST-3 (a): Effect of varieties and sowing methods on yield of grass pea under rice based cropping system

Treatments	Green fodder yield (q/ha)			Dry matter yield (q/ha)		
	Raipur	Jorhat	Mean	Raipur	Jorhat	Mean
Methods						
Recommended practices with 125% more seed rate	76.67	95.28	85.98	15.72	21.92	18.82
Recommended practices with 150% more seed rate	81.91	107.63	94.77	16.94	24.75	20.85
Zero seed Drill with 125% more seed rate	70.22	112.57	91.40	14.55	25.89	20.22
Zero seed Drill with 150% more seed rate	75.51	119.78	97.65	15.35	27.55	21.45
SEm±	1.71	1.199		0.318	0.276	
CD (P=0.05)	6.03	5.215		1.12	1.200	
Varieties						
Mahateora	75.76	98.46	87.11	15.44	22.65	19.05
Prateek	74.13	102.80	88.46	15.18	23.64	19.41
Ratan	86.36		86.36	17.80		17.8
Nirmal	68.06	125.18	96.62	14.14	28.79	21.47
SEm±	2.22	1.899		0.483	0.438	
CD (P=0.05)	6.53	6.133		1.41	1.366	
CV						
Interaction (Methods X Varieties)						
CD (P=0.05)	NS	2.077		NS	0.478	
CV (%)		NS			NS	

Table CS-13-AST-3 (b): Effect of varieties and sowing methods on growth parameters of grass pea under rice based cropping system

Treatments	Leaf Stem Ratio			Plant height (cm)		
	Raipur	Jorhat	Mean	Raipur	Jorhat	Mean
Methods						
Recommended practices with 125% more seed rate	0.82	0.88	0.85	62.28	84.26	73.27
Recommended practices with 150% more seed rate	0.89	0.89	0.89	74.14	89.40	81.77
Zero seed Drill with 125% more seed rate	0.80	0.90	0.85	63.82	90.83	77.33
Zero seed Drill with 150% more seed rate	0.79	0.89	0.84	61.16	92.51	76.84
SEm±	0.006	0.009		2.21	1.174	
CD (P=0.05)	0.022	NS		7.82	5.106	
Varieties						
Mahateora	0.83	0.86	0.85	72.57	86.45	43.60
Prateek	0.82	0.89	0.86	62.14	86.01	38.38
Ratan	0.88		0.88	72.12		43.48
Nirmal	0.76	0.92	0.84	54.58	95.29	34.51
SEm±	0.013	0.007		1.31	0.335	
CD (P=0.05)	0.039	0.022		3.86	1.457	
CV						
Interaction (Methods X Varieties)					2.033	
SEm±		0.015			8.628	
CD (P=0.05)	NS	NS		NS	13.54	

Table CS-13-AST-3 (c): Effect of varieties and sowing methods on economics of grass pea under rice based cropping system

Treatments	Crude protein yield (q/ha)			Crude protein content (%)		
	Raipur	Jorhat	Mean	Raipur	Jorhat	Mean
Methods						
Recommended practices with 125% more seed rate	2.30	3.11	2.71	14.65	14.19	14.42
Recommended practices with 150% more seed rate	2.48	3.62	3.05	14.63	14.62	14.63
Zero seed Drill with 125% more seed rate	2.13	3.79	2.96	14.63	14.67	14.65
Zero seed Drill with 150% more seed rate	2.24	4.08	3.16	14.58	14.79	14.69
SEm±	0.046	0.048		0.024	0.176	
CD (P=0.05)	0.163	0.208		NS	0.765	
Varieties						
Mahateora	2.26	3.31	2.79	14.67	14.58	14.63
Prateek	2.23	3.44	2.84	14.71	14.53	14.62
Ratan	2.64		2.64	14.84		14.84
Nirmal	2.02	4.21	3.12	14.26	14.60	14.43
SEm±	0.075	0.066		0.088	0.117	
CD (P=0.05)	0.221	0.213		0.257	NS	
Interaction (Methods X Varieties)						
SEm±		0.082		NS	0.305	
CD (P=0.05)	NS	NS			NS	
CV		6.35			2.85	

Table CS-13-AST-3 (d): Effect of varieties and sowing methods on economics of grass pea under rice based cropping system

Treatments	Gross return (Rs/ha)			Net return (Rs/ha)		
	Raipur	Jorhat	Mean	Raipur	Jorhat	Mean
Methods						
Recommended practices with 125% more seed rate	25620	14292	19956	12611	8632	10622
Recommended practices with 150% more seed rate	27115	16145	21630	13710	10185	11948
Zero seed Drill with 125% more seed rate	23831	16885	20358	10602	11095	10849
Zero seed Drill with 150% more seed rate	25193	17967	21580	11568	11877	11723
SEm±	356	179.86		356	126.23	
CD (P=0.05)	1258	782.38		1258	549.11	
Varieties						
Mahateora	26349	14769	20559	13032	8894	10963
Prateek	24722	15420	20071	11405	9545	10475
Ratan	28916		28916	15599		15599
Nirmal	21773	18778	20275.5	8456	12903	10680
SEm±	519	284.8		519	226.28	
CD (P=0.05)	1524	1238.8		1524	984.62	
CV						
Interaction (Methods X Varieties)						
SEm±		311.52			311.52	
CD (P=0.05)	NS	NS		NS	NS	

K-14-AST-3: Study of intercropping system of Pigeon pea with different annual fodder crops

Locations (2): Ranchi and Raipur

The experiment was initiated during 2014 to identify the suitable intercropping system higher yields of pigeonpea as well as fodder and profit maximization. The treatment consisted of seven pigeonpea based intercropping system namely; **T_1**-Pigeonpea +Sorghum (2:1), **T_2** Pigeonpea +Maize (2:1), **T_3**-Pigeonpea + Pearl Millet (2:1), **T_4**-Pigeonpea + Soybean (2:1), **T_5**-Pigeonpea + Rice bean (2:1), **T_6**-Pigeonpea + Cowpea (2:1), **T7**-Pigeonpea + Clusterbean (2:1). The experiment was laid out in RBD & replicated three times. The results indicated that, in terms of GFY and DFY, Pigeonpea +Sorghum (2:1), Pigeonpea +Maize (2:1) intercropping system remained at par with each other but significantly superior to other systems on locational mean basis (Table Table K-14-AST-3a to c) . In terms of CPY and net returns, Pigeon pea + Soybean (2:1) proved superior. The minimum pigeonpea seed yields were recorded in **T_2** Pigeonpea +Maize (2:1). The **T_1**-Pigeonpea +Sorghum (2:1), **T_3**-Pigeonpea + Pearl Millet (2:1) and **T_6**-Pigeonpea + Cowpea (2:1) treatments remained at par with each other but significantly superior to other treatments in terms of net monetary return and B: C ratio

Table K-14-AST-3 (a): Yields of intercropping system of pigeon pea with different annual fodder crops

Treatments	Yield (q/ha)								
	Green fodder			Dry matter			Pigeon pea Seed		
	Raipur	Ranchi	Mean	Raipur	Ranchi	Mean	Raipur	Jorhat	Mean
T_1	177.76	174.20	175.98	39.24	36.64	37.94	12.12	8.37	10.25
T_2	185.84	166.67	176.26	49.57	33.45	41.51	11.04	8.35	9.70
T_3	169.68	159.79	164.74	36.64	24.20	30.42	11.31	9.55	10.43
T_4	122.55	135.62	129.09	23.27	10.75	17.01	13.47	9.59	11.53
T_5	106.39	145.29	125.84	15.96	17.49	16.73	12.79	9.51	11.15
T_6	113.12	150.97	132.05	19.96	19.61	19.79	12.93	9.60	11.27
T_7	17.51	139.61	78.56	2.40	10.57	6.49	15.22	9.58	12.40
SEm+	8.33	14.30		1.88	0.38		0.43	0.17	
CD (P=0.05)	25.68	NS		5.78	1.20		1.32	0.35	
CV	11.32	16.17		12.17	3.07		5.86	2.50	

Table K-14-AST-3 (b): Quality of parameters of intercropping system of pigeon pea with different annual fodder crops

Treatments	Crude Protein yield (q/ha)			Crude Protein (%)	Leaf Stem Ration		
	Raipur	Ranchi	Mean	Ranchi	Raipur	Ranchi	Mean
T_1	3.21	2.94	3.08	8.02	0.51	0.34	0.43
T_2	4.70	2.90	3.80	8.70	0.59	0.27	0.43
T_3	3.18	1.65	2.42	6.82	0.48	0.35	0.42
T_4	4.63	1.43	3.03	13.29	0.73	0.89	0.81
T_5	2.55	2.05	2.30	11.70	0.77	1.11	0.94
T_6	3.01	2.50	2.76	12.56	0.84	0.99	0.92
T_7	0.36	1.04	0.70	9.85	0.30	1.02	0.66
SEm+	0.20	0.05		0.13	0.02	0.05	
CD (P=0.05)	0.62	0.17		0.40	0.06	0.16	
CV	11.30	4.50		2.24	5.84	12.92	

Table K-14-AST-3 (c): monetary parameters of intercropping system of pigeon pea with different annual fodder crops

Treatments	Gross return (Rs/ha)			Net returns (Rs/ha)			B:C ratio		
	Raipur	Ranchi	Mean	Raipur	Ranchi	Mean	Raipur	Ranchi	Mean
T_1	92785	76560	84673	66683	53010	59847	2.6	2.25	2.43
T_2	88072	76360	82216	61769	53110	57440	2.3	2.28	2.29
T_3	87533	74137	80835	61906	50587	56247	2.4	2.15	2.28
T_4	91641	63912	77777	64539	40162	52351	2.4	1.71	2.06
T_5	85715	71975	78845	60013	48225	54119	2.3	2.03	2.17
T_6	87533	76699	82116	62731	52949	57840	2.5	2.23	2.37
T_7	85042	66028	75535	57940	42278	50109	2.1	1.78	1.94
SEm+	1804	1002		1804.11	1002		0.07	0.041	
CD (P=0.05)	5559	3123		5559.02	3123		0.21	0.13	
CV	3.54	2.44		5.02	3.57		5.05	3.42	

R-15-AST-1: **Productivity of oat - lathyrus food fodder intercropping system as influenced by integrated nutrient management.**

Locations: Kalyani, Bhubaneswar and Ranchi

A field experiment was initiated from Rabi 2015-16 to study the productivity and profitability of food (lathyrus) + forage (oat) intercropping system influenced by INM at Kalyani, Bhubaneswar and Ranchi. The experiment was laid out in split plot design with three replications. The treatments consisted of crops in the main plot: T1-sole oat, T2- sole lathyrus, T3- oat + lathyrus (3:2) and T4- oat + lathyrus (3:3). INM was assigned in the sub plot: F1-RDF (inorganic), F2- 50% N (RDF) + 50% N (FYM) and F3-50% N (RDF) + 50% N (vermicompost). Oat cv. OS-6 and Lathyrus Cv. Nirmal were used for the study.

The mean over the location indicated that sole oat recorded maximum GFY (241q), DFY (60.49q), and CPY (5.60q) among all intercropping systems. However, in with respect to monetary parameters, sole oat and oat + lathyrus (3:2) proved superior to other treatments but remained at par with each other in terms of gross return, net return and B:C Ratio on locational mean basis. Among the centres, maximum green and dry matter productivity was recorded at Kalyani (Tables Table R-15-AST-1 a-e). Recommended dose of 80, 40 and 40 kg ha N, P_2O_5 and K_2O per hectare respectively were applied for the study. On locational mean basis, F3-50% N (RDF) + 50% N (vermicompost) recoreded significantly higher GFY, CPY and GFEY. However in monetary parameters, F1- RDF (inorganic) proved better (gross return- Rs 48054 and net return Rs. 28094/ha and B:C Ratio- 1.36).

Maximum green fodder equivalent yield (329.12 q/ha) was obtained from oat + lathyrus (3:2) but was at par with oat + lathyrus (3:3) intercropping system. Among INM, 50% N (RDF) + 50% N (vermicompost) produced maximum GFEY (335.81 q/ha). Considering the interaction effect, oat + lathyrus (3:2) with 50% (RDF) + 50% N (vermicompost) registered maximum GFY (359.1 q/ha) but at par with that of sole oat and oat + lathyrus (3:3). The GMR (Rs./ha) followed similar trend. Net monetary returns was maximum (Rs. 19408.6/ha) in T3F3 but at par with T4F3. The B:C was maximum (1.18) from oat + lathyrus (3:3) but at par with oat + lathyrus (3:2) i.e., 1.13. Considering the interaction maximum B: C was recorded from oat + lathyrus (3:3) with RDF (inorganic). LER for the intercropping systems were more than 1, hence more advantageous over sole cropping (Table R-15-AST-1 (a) to (e)).

Table R-15-AST-1 (a): Green fodder yield of oat and lathyrus as influenced by intercropping system and integrated nutrient management

Treatments	Kalyani			Bhubaneswar	Ranchi			Mean over locations
	Oat	Lathyrus	Total	Oat	Oat	Lathyrus	Total	
A. Intercropping system								
T_1 - Sole	109.9		109.9	309.4	303.7	-	303.7	241
T_2 - Sole lathyrus		43.3	43.3	-	-	105.9	105.9	49.73
T_3- oat + lathyrus (3:2)	50.5	18.9	69.4	241.0	214.5	42.6	257.1	189.17
T_4- oat + lathyrus (3:3)	36.6	22.7	59.3	189.3	163.0	57.8	220.8	156.47
SEm±	3.18	0.98		-	5.17	1.18		
CD (P=0.05)	9.31	2.87		-	20.21	4.61		
B. Integrated Nutrient Management								
F_1	76.1	28.9	105	219.0	234.1	69.8	303.9	209.30
F_2	54.9	27.2	82.1	240.0	213.2	61.8	275	199.03
F_3	66.1	29.9	96	276.6	233.4	74.7	308.1	226.90
SEm±	2.37	0.51			3.49	1.92		
CD (P=0.05)	6.94	1.46			10.76	5.91		

Table R-15-AST-1 (b): Dry matter yield of oat and lathyrus as influenced by intercropping system and integrated nutrient management

Treatments	Kalyani			Bhuban-eshwar	Ranchi			Mean over locations
	Oat	Lathyrus	Total	Oat	Oat	Lathyrus	Total	
A. Intercropping system								
T_1 - Sole	17.67		17.67	59.6	104.2	-	104.2	60.49
T_2 - Sole lathyrus		7.17	7.17	-	-	25.9	25.9	11.02
T_3 - oat + lathyrus (3:2)	9.05	3.08	12.13	43.2	74.2	14.2	88.4	47.91
T_4 - oat + lathyrus (3:3)	5.34	3.09	8.43	33.3	54.6	21.5	76.1	39.28
SEm±	1.07	0.87		-	2.12	0.31		
CD (P=0.05)	3.13	2.54		-	8.30	1.22		
B. Integrated Nutrient Management								
F_1	12.3	4.91	17.21	42.6	80.0	20.6	100.6	53.47
F_2	8.85	4.62	13.47	45.3	73.3	18.6	91.9	50.22
F_3	10.7	4.95	15.65	48.2	80.1	22.5	102.6	55.48
SEm±	0.48	0.09			1.26	0.4		
CD (P=0.05)	1.41	0.26			3.89	1.24		

Table R-15-AST-1 (c): Crude protein and green fodder equivalent yield of oat and lathyrus as influenced by intercropping system and integrated nutrient management

Treatments	Kalyani			Bhubane-shwar	Ranchi			Mean of locations	Green Fodder Equivalent (q/ha
	Oat	Lathy-rus	Total	Oat	Oat	Lathy-rus	Total		Bhuban-eshwar
A. Intercropping system									
T_1 – Sole oat	1.73		1.73	5.38	9.70		9.7	5.60	309.34
T_2-Sole lathyrus		1.42	1.42		3.51	0.99	4.5	2.96	281.84
T_3 oat + lathyrus (3:2)	1.02	0.53	1.55	4.14	10.22	0.29	10.51	5.40	329.12
T_4-oat + lathyrus (3:3)	0.51	0.41	0.92	3.30	9.15	0.46	9.61	4.61	325.90
SEm±	0.12	0.11			0.18				3.32
CD (P=0.05)	0.35	0.32			0.64				11.50
B. Integrated Nutrient Management									
F_1	1.21	0.95	2.16	3.87	8.24	0.56	8.8	4.94	289.22
F_2	0.87	0.89	1.76	4.26	7.61	0.58	8.19	4.74	309.62
F_3	1.05	0.98	2.03	4.70	8.59	0.60	9.19	5.31	335.81
SEm±	0.06	0.06			0.1				2.16
CD (P=0.05)	0.17	NS			0.3				6.31

Table R-15-AST-1 (d): Grain, Stover yield and harvest index of oat and lathyrus as influenced by intercropping system and integrated nutrient management

Treatments	Seed yield (q/ha)			Stover yield (q/ha)			Harvest index		
	Kalyani		Bhubaneswar	Bhubaneswar	Kalyani		Kalyani		Bhubaneswar
	Oat	Lathyrus	Lathyrus	Lathyrus	Oat	Lathyrus	Oat	Lathyrus	Lathyrus
A. Intercropping system									
T_1 - Sole	13.13				39.6		24.9		
T_2 - Sole lathyrus		6.56	4.63	5.70		15.6	29.6		44.8
T_3- oat + lathyrus (3:2)	8.86	5.60	1.45	1.75	26.9	14.2	24.7	28.2	45.3
T_4- oat + lathyrus (3:3)	7.66	4.90	2.24	2.75	24.9	12.8	23.5	27.6	44.5
SEm±	0.14	0.11			0.52	0.18			-
CD (P=0.05)	0.41	0.33			1.52	0.52			-
B. Integrated Nutrient Management									
F_1	11.8	6.43	2.76	3.41	35.6	16.2	24.8	28.4	44.7
F_2	8.26	4.93	2.77	3.40	26.9	12.4	23.5	28.4	45.0
F_3	9.63	5.70	2.81	3.38	28.9	13.9	24.9	29.1	45.0
SEm±	0.17	0.13			0.42	0.21			
CD (P=0.05)	0.49	0.38			1.23	0.61			

Table R-15-AST-1 (e): Gross return, Net return and B: C ratio of oat and lathyrus as influenced by intercropping system and integrated nutrient management

Treatments	Monetary Return (Rs. /ha)								B:C ratio			
	Gross return				Net return							
	Kalyani	Bhubaneswar	Ranchi	Mean of locations	Kalyani	Bhubaneswar	Ranchi	Mean of locations	Kalyani	Bhubaneswar	Ranchi	Mean
A. Intercropping system												
T_1 - Sole	50,800	30934	60644	47459	27,308	14434	35094	25612	1.16	0.88	1.37	1.14
T_2 - Sole lathyrus	31,460	28184	23825	27823	16,260	13018	-2175	10484	1.01	0.87	-0.08	0.65
T_3 - oat + lathyrus (3:2)	52,190	32912	52511	45871	28,440	17412	26811	24221	1.31	1.13	1.04	1.16
T_4 - oat + lathyrus (3:3)	45,590	32589	45600	41260	23,440	17590	19825	20285	1.06	1.18	0.77	1.00
SEm±		332	809			332	809			0.022	0.03	
CD (P=0.05)		1149	2794			1150	2794			0.074	0.1	
B. Integrated Nutrient Management												
F_1	68,350	28922	46891	48054	47,850	15297	21135		2.12	1.13	0.82	1.36
F_2	51,460	30961	42408	41610	31,960	14462	16652	21025	1.55	0.88	0.65	1.03
F_3	59,305	33581	47635	46840	35,605	17081	21879	24855	1.64	1.03	0.85	1.17
SEm±		216	582			216	582			0.014	0.02	
CD (P=0.05)		630	1746			631	1746			0.040	0.06	

B. Location Specific Trials

PS-14-AST-2: Impact of Mg and B on nutrient uptake, quality and yield of bajra napier hybrid

Location: Vellayani

The trial was conducted at Vellayani centre with the objective to assess the influence of Mg and B nutrition on the performance of bajra napier hybrid. The treatments consisted of two field conditions (open situation and under coconut garden) and five nutrient levels (POP recommendation + $MgSO_4$, 80 kg/ha+ Borax 10 kg/ha, POP recommendation + $MgSO_4$ 80kg/ha, POP recommendation +Borax 10 kg/ha, POP recommendation alone and POP without FYM (200:50:50 kg NPK/ha). Application of 200:50:50 kg NPK/ha and 25 t/ha of FYM was taken as Package of practices. Data shows that both field situation and nutrient levels had significant influence on number of tillers, GFY and DFY. Nutrient levels alone had significant impact on Leaf stem ratio. Open situation showed significantly higher values for all the growth and yield attributes and yield. Nutrient levels tested in the trial could not influence the plant height and leaf stem ratio.

Among the nutrient levels, highest green fodder yield was recorded in POP alone (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) and was on par with POP +Borax, 10 kg/ha (PS-14-AST-2 (a). The same trend was seen in DFY also, even though the impact was not significant (PS-14-AST-2 (b)).

Interaction effect was significant on number of tillers/hill, L:S ratio, GFY and DFY. Highest GFY was recorded in open situation+ POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$, 80kg/ha. In case of DFY also highest value was recorded in open situation+ POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$, 80kg/ha and was on par with Open situation+ POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) +Borax, 10 kg/ha.

Table PS-14-AST-2 (a): Impact of Mg and B on nutrient uptake, quality and yield of bajra napier hybrid

Treatments	Biomass yield (q/ha/year)		Plant height (cm)	L:S ratio	Number of tillers/hill
	Green	Dry			
A. Field condition					
Open situation	1847.26	352.93	169.05	1.89	29.62
Coconut garden	1398.96	275.8	163.97	1.87	16.98
SEm±	16.11	25.36	2.705	0.08	0.457
CD (P=0.05)	33.85	53.28	NS	NS	0.98
B. Nutrient levels					
1. POP recommendation (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$,80 kg/ha+ Borax, 10 kg/ha	1537.59	290.58	166.5	1.773	21.88
2. POP(200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$, 80kg/ha	1588.83	302.74	167.57	1.863	19.23
3. POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) +Borax, 10 kg/ha	1710.58	324.00	162.53	1.881	19.91
4. POP alone((200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure)	1726.25	344.99	165.43	1.964	22.1
5. POP without FYM (200:50:50 kg NPK/ha)	1552.3	309.52	170.53	1.947	33.39
SEm±	11.23	20.09	4.281	0.135	0.723
CD (P=0.05)	22.47	NS	NS	NS	1.51
CV (%)	2.80	2.25	4.27	11.01	5.68

Table PS-14-AST-2 (b): Interaction effect of field situation and nutrient levels on growth and yield of bajra napier hybrid

Treatments	Biomass yield (q/ha/year)	
	Green	Dry
Open situation+ POP recommendation (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$,80 kg/ha+ Borax, 10 kg/ha	1794.03	262.51
Open situation+ POP(200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$, 80kg/ha	1939.14	415.85
Open situation+ POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) +Borax, 10 kg/ha	1861.72	408.57
Open situation+ POP alone((200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure)	1784.35	357.28
Open situation+ POP without FYM (200:50:50 kg NPK/ha)	1857.08	320.42
Coconut garden+ POP recommendation (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$,80 kg/ha+ Borax, 10 kg/ha	1281.16	318.61
Coconut garden+ POP(200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + $MgSO_4$, 80kg/ha	1238.52	189.63
Coconut garden+ POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) +Borax, 10 kg/ha	1559.43	239.44
Coconut garden+ POP alone((200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure)	1668.15	332.71
Coconut garden+ POP without FYM (200:50:50 kg NPK/ha)	1247.53	298.71
SEm±	16.03	12.53
CD (P=0.05)	33.03	25.79
CV (%)	2.80	2.05

CS-14-AST-1: Studies on intensive fodder cropping systems for yield maximization

Location: Raipur

The perennial based experiment was initiated during *kharif* 2014 at Raipur with objective to identify appropriate cropping system for maximum fodder production. The treatments consisted of eight cropping systems viz., BN Hybrid + Lucerne, Setaria+ Lucerne, BN Hybrid + Cowpea (*summer*) -Luceme (winter), BN Hybrid + Cowpea (summer) / Lucerne (winter), Setaria + Cowpea (summer)/ Lucerne (winter), Setaria+ Cowpea (summer)- Berseem (winter) and B N hybrid + berseem + Cowpea (summer). Setaria+ Berseem (winter). The treatments were replicated thrice in Randomized block Design. The results indicated that, BN hybrid + Berseem system recorded significantly maximum green fodder, dry matter, net monetary return and B:C ratio (900, 185.31 q /ha Rs. 67082 /ha and 1.95, respectively) followed by B:N hybrid + Cowpea/ Berseem B:N hybrid+Luceme and BN Hybrid + Cowpea (summer)/Lucerne (winter). The cropping system B:N hybrid+ Cowpea/ Berseem recorded maximum crude protein yield (32.33 q/ha) followed by B:N hybrid+ Cowpea/ Lucerne among all the cropping system.

CS-14-AST-1 (a): Comparative performance of perennial grass based intensive fodder cropping systems

Treatment	yield (q/ha)			Income (Rs/ha)		B:C ratio	Plant height (cm)	Leaf stem ratio
	Green fodder	Dry matter	Crude Protein	Gross	Net			
1. BN Hybrid + Lucerne	852.0	173.68	21.47	85150	62199	1.81	100.63	0.54
2. Setaria + Lucerne	658.0	145.28	15.48	65780	44533	1.40	72.93	0.82
3. BN Hybrid + Cowpea (summer) / Lucerne (winter)	849.0	174.83	28.28	84890	61426	1.75	105.33	0.53
4. Setaria + Cowpea (summer)/ Lucerne (winter)	794.0	175.50	24.61	79430	57670	1.77	83.58	0.84
5. BN Hybrid + Berseem (winter)	900.0	185.31	25.27	89960	67082	1.95	107.79	0.60
6. Setaria + Berseem (winter)	705.0	155.31	17.02	70460	49286	1.55	76.29	0.80
7. BN Hybrid + Cowpea (summer)/ Berseem (winter)	871.0	181.08	32.33	87100	63709	1.82	107.00	0.55
8. Setaria + Cowpea (summer)/ Berseem (winter)	792.0	174.73	23.93	79170	57483	1.77	72.50	0.81
SEm±	42.55	9.72	1.46	4255.10	4333	0.13	3.51	0.05
CD (P=0.05)	129.07	29.48	4.42	12906.52	13143	0.40	10.66	0.15
CV (%)	9.18	9.86	10.72	9.18	12.96	13.36	6.71	12.51

CS-14-AST-2: Study of intensive annual fodder crop based cropping system

Location: Raipur

The experiment was initiated during *kharif* 2014 at Raipur with the objective to find out appropriate annual cropping system for maximum fodder production. The treatments consisted of eight cropping system viz., (T_1) Sorghum multi cut +Cowpea (2:1)- Lucerne, (T_2) Maize+ Cowpea (2:10) Luceme, (T_3) Pearl millet (multi cut) + Cowpea (2:1) – Lucerne (T_4) Maize + Rice bean (2:1) – Berseem – Sorghum (multi cut) + Cowpea (2:1) T_5 Maize + Rice bean (2:1) – Oat multi cut - Sorghum multi cut + Cowpea (2:1) T_6 Pearl millet multi cut + Rice bean (2:1) –Oat multi cut – Maize + Cowpea (2:1) T_7 Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1) T_8 Pearl millet multi cut + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1). The treatments were replicated thrice in Randomized Block Design.

The results presented in table CS-14-AST-2 (a) indicated that significantly superior green fodder and dry matter yield was recorded under Maize + rice been (2:1) oat (multi cut) –sorghum (multi cut) + cowpea (2:1) cropping system (1325, 251.74 q/ha respectively) followed by (T_6) Pearl millet multi cut + Rice bean (2:1) –Oat multi cut – Maize + Cowpea (2:1) and (T_7) Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1). Significantly higher crude protein yield was recorded under (T_7) Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1). Green fodder and dry fodder yield per day (q/ha) was maxium in cropping system involving (T_5) Maize + rice been (2:1) oat (multi cut) –sorghum (multi cut) + cowpea (2:1) (5.20 and 0.99 q/ha/day respectively). In respect to economics net, gross and return per rupees invested was maximum in maize based cropping system Maize + Rice bean (2:1) – Oat multi cut - Sorghum multi cut + Cowpea (2:1) (T_5) .

CS-14-AST-2 (a): Comparative performance of annual fodder crop based cropping system

Treatment	yield (q/ha)				Return (Rs/ha)		B:C ratio
	Green fodder	Dry matter	Crude Protein	Green fodder/ day	Gross	Net	
1. Sorghum multi cut + Cowpea (2:1) - Lucerne	850.00	170.05	20.43	3.86	85000	54063	1.7
2. Maize + Cowpea (2:1) - Lucerne	975.00	195.00	22.65	4.64	97500	64400	1.9
3. Pearl millet multi cut + Cowpea (2:1) - Lucerne	922.00	190.66	21.91	4.19	92200	59500	1.8
4. Maize + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)	998.00	203.03	22.14	3.56	99800	59429	1.5
5. Maize + Rice bean (2:1) – Oat multi cut - Sorghum multi cut + Cowpea (2:1)	1325.00	251.74	12.57	5.20	132500	87770	2.0
6. Pearl millet multi cut + Rice bean (2:1) –Oat multi cut – Maize + Cowpea (2:1)	1250.00	237.37	18.55	4.72	125000	81254	1.9
7. Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1)	1231.00	245.93	25.46	4.24	123100	77387	1.7
8. Pearl millet multi cut + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)	1160.00	232.93	23.56	3.87	116000	71277	1.6
SEm±	30.19	12.50	2.56	0.11	3019.45	3019.45	0.07
CD (P=0.05)	91.59	37.91	7.77	0.33	9158.56	9158.56	0.22
CV (%)	4.80	10.03	21.23	4.44	4.80	7.54	7.15

K-15-AST-2 L: Performance of bajra napier hybrids as influenced by nature of vegetative propagules

Location: Dharwad

Bajra napier hybrid is propagated both by stem cuttings and root slips, which involves movement of bulky material from one place to another This experiment was initiated at Dharwad from *kharif* 2015 to identify a suitable planting material for propagation of popular bajra napier hybrid varieties,. The experiment consisted of three popular varieties of the region viz. DHN 6, Co(BN) 5 and IGFRI 7; and four vegetative propagules viz. 1 eyed stem cutting, 2 eyed stem cutting, 1 eyed root slip and 2 eyed root slips. The planting was done in the month of June 2015 with the onset of monsoon with all the recommended agronomic practices except the treatments. The first cutting was taken at 75 days after planting (DAP) while subsequent cuttings were taken at 60 (±5) days coinciding with the peak vegetative growth. Observations on growth and yield parameters were recorded before each cutting. In all 6 cuttings were taken in one year and they were pooled and statistically analyzed for all the parameters. The results revealed that 2 eyed root slips followed 2 eyed stem cuttings were high green fodder yielder as compared to others (K-15-AST-2 (a)). The varieties did not differ significantly in the green fodder yield. Further the dry fodder yield was not significantly affected either by varieties or by vegetative propagules indicating at par performance of different varieties and vegetative propagules. The crude protein content and its yield too were on par among the varieties. However, both of them were significantly higher with 2 eyed root slips followed by 2 eyed stem cuttings. The weight of the vegetative propagules was lowest with the BNH var. Co (BN) 5 while the volume was lowest with the DHN 6. Among the vegetative propagules, the lowest weight and volume were recorded with the 1 eyed stem cutting, while the 2 eyed root slip recorded the highest weight and volume (K-15-AST-2 (b)). The establishment of the vegetative propagules was faster with DHN 6 followed by IGFRI 7 at both 30 and 45 DAP. Among the vegetative propagules, 2 eyed root slips followed by 2 eyed stem recorded the highest establishment and the lowest was in I eyed stem cutting. The BNH varieties did not show significant difference among themselves with regard to number of tillers/hill, plant height and weight of green and dry fodder per meter row length. The 2 eyed root slips recorded significantly higher values with regard to the above said parameters followed by 2 eyed stem cutting. The lowest values were observed in 1 eyed stem cutting.

K-15-AST-2 (a): Growth, yield and quality of bajra napier hybrids as influenced by nature of vegetative prop gules

Treatment	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein (%)	Crude protein yield (t/ha)	Plant height (cm)
Hybrids					
DHN 6	212.0	47.25	6.36	13.60	165.8
CO(BN) 5	209.4	47.28	6.40	13.48	173.2
IGFRI 7	213.3	47.31	6.39	13.73	170.5
SEm±	3.39	0.77	0.03	0.28	3.04
CD (P=0.05)	NS	NS	NS	NS	NS
Vegetative propagules					
stem cutting 1 eyed	201.6	45.95	6.30	12.75	164.7
Stem cutting 2 eyed	212.0	47.47	6.39	13.63	169.7
Root slip 1 eyed	210.4	46.68	6.38	13.52	169.7
Root slip 2 eyed	222.4	49.01	6.47	14.50	175.3
SEm±	2.32	0.73	0.02	0.14	1.12
CD (P=0.05)	6.88	NS	0.05	0.41	3.32
CV (%)	3.79	5.32	3.89	3.53	2.28

K-15-AST-2 (b): Weight (kg/ha), volume (cu m/ha) of planting material and establishment (%) of bajra napier hybrids as influenced by nature of vegetative propagules

Treatment	Weight (kg/ha)	Volume (m^3/ha)	Establishment of plants		
			30 DAT	45 DAT	60 DAT
Varieties					
DHN 6	1125.0	167.5	87.1	95.2	100
CO(BN) 5	972.9	174.7	82.5	92.1	100
IGFRI 7	1104.5	181.4	85.3	94.3	100
SEm±	5.44	2.26	0.90	1.17	
CD (P=0.05)	21.27	8.82	3.51	NS	
Vegetative propagules					
stem cutting 1 eyed	651.0	69.4	70.4	88.4	100
Stem cutting 2 eyed	1114.9	121.2	92.6	95.5	100
Root slip 1 eyed	901.1	204.7	81.8	92.9	100
Root slip 2 eyed	1602.8	302.9	95.2	98.7	100
SEm±	4.62	2.34	0.72	1.06	
CD (P=0.05)	13.72	6.96	2.14	3.14	
CV (%)	1.50	4.65	2.94	3.90	

R-14-AST-2-: Effect of cutting and nutrient management on growth, yield and quality of oat

Location: Imphal

This experiment was initiated during Rabi season of 2014-15 at Imphal with a view to evaluate oat for different purpose, viz. grain, fodder and both grain and fodder, under different nutrients and cutting management practices. Total twelve treatment comprised of T_1- No cutting (Seed) + RDF (NPK @ 60: 40:40), T_2- No cutting (Seed) + 75% RDF + 5 t FYM/ha, T_3- No cutting (Seed) + 50% RDF + 7.5t FYM/ha, T_4- No cutting (Seed) + 25% RDF + 10t FYM/ha, T_5- Single cut (60 DAS) +Seed + RDF, T_6- Single cut (60 DAS) + Seed + 75% RDF + 5 t FYM/ha, T_7- Single cut (60 DAS) +Seed+ 50% RDF + 7.5t FYM/ha, T_8- Single cut (60 DAS) + Seed + 25% RDF + 10t FYM/ha, T_9- Three cut (60, 90 & 120 DAS)+ RDF, T_{10}- Three cut (60, 90 & 120 DAS)+ 75% RDF + 5 t FYM/ha, T_{11}- Three cut (60, 90 & 120 DAS)+ 50% RDF + 7.5t FYM/ha, T_{12}. The treatment on cuts and nutrients management practices were laid out in FRBD and replicated thrice. The data presented in R-14-AST-2(a) indicated that crop grown for seed purpose only i.e. No cutting (seed) recorded higher seed yield (24.58 q/ha) followed by single cut + seed (22.92 q/ha). Crop grown for green fodder i.e. three cut (60, 90 & 120 DAS) was found to be dominant in fodder yield (564.11 q/ha) and dry matter yield (91.62 q/ha). But dual purpose treatment i.e. single cut + seed were found to be the best in terms of quality and economic. With the increase in quantity of FYM from 5 t/ha to 7.5 t/ha and decrease in RDF from 100% to 50%, there is an increase in green fodder yield, seed yield, dry matter yield, crude protein yield, crude protein content and crude protein content respectively. Economics point of view, net monetary return and benefit cost ratio were also followed the same trend.

The combined effect of three cut with 50% RDF + 7.5 t FYM/ha and no cut (seed) + 50% RDF + 7.5 t FYM / ha showed superiority over other combined effect in green fodder yield (564.11 q/ha) and seed yield (24.58 q/ha) respectively, but found non significant. In terms of net monetary return, the combined effect of single cut + seed with 50% RDF + 7.5 t FYM/ha recorded highest net return (Rs. 99017/ ha) and benefit cost ratio.

R-14-AST-2(a): Effect of cutting and nutrient management on growth, yield and quality of oat

Treatment	Yield (q/ha)				Crude protein (%)	Plant height (cm)	L:S Ratio	Return (Rs./ha)		Benefit cost ratio	Soil fertility status after cropping season		
	Green fodder	Seed Yield	Dry matter	Crude protein				Gross	Net return		N	P	K
A. Cutting													
No cutting (Seed)	-	21.42	-	-	-	100.86	-	107083	64434	2.52	265.51	19.71	200.58
Single cut (60 DAS) + Seed	217.96	20.21	29.39	3.46	11.77	76.23	0.23	133762	84081	2.70	280.43	19.93	198.72
Three cut (60, 90 & 120 DAS)	519.46	-	85.48	9.15	10.71	83.19	0.78	77940	25821	1.50	291.14	18.67	194.35
SEm±	9.58	0.97	2.09	0.37	0.39	2.21	0.03	3563	3563	0.08	2.53	0.19	1.83
CD at 5%	29.05	NS	6.34	1.11	1.19	6.48	0.09	10451	10451	0.22	7.42	0.54	5.38
B. Nutrient													
RDF (N, P_2O_5& K_2O @ 80: 40:40)	342.87	19.19	55.43	5.65	10.70	83.90	0.55	98244	54370	2.31	261.72	16.19	189.75
75% NPK of RDF + 5 t FYM/ha	345.34	21.25	52.90	6.32	11.88	92.43	0.48	105395	55545	2.13	279.78	18.97	187.58
50% NPK of RDF + 7.5t FYM/ha	404.59	23.75	62.00	7.19	12.00	85.89	0.52	70050	70050	2.43	277.13	19.93	208.21
25% NPK of RDF + 10t FYM/ha	382.06	19.07	59.42	6.06	10.38	84.81	0.48	101782	52482	2.07	297.47	22.64	205.98
SEm±	6.77	0.68	1.48	0.26	0.28	1.91	0.02	3086	3086	0.07	2.19	0.16	1.59
CD at 5%	20.54	2.07	4.48	0.78	0.84	5.62	NS	9051	9051	0.19	6.43	0.47	4.66
C. Interaction: C x N													
SEm±	13.54	1.37	2.96	0.52	0.55	3.83	0.04	6172	6172	0.13	4.38	0.32	3.18
CD at 5%	NS	NS	NS	NS	NS	11.61	NS	NS	NS	NS	13.29	0.98	9.63

R-14-AST-3: Studies on the effect of additives on silage quality of different grasses

Location: Vellayani

The experiment was conducted at Vellayani to study the effect of additives on silage quality of different grasses in *Rabi* 2015. The treatments consisted of two grasses *i.e.* NB hybrid and guinea grass along with five silage additives namely, Urea 1%, Urea 2%, Urea 1% + Jaggery 1%, Tapioca flour 1% and Jaggery 2%. The experiment was conducted in Completely Randomized Design with three replications. The result indicated that guinea grass contained higher dry matter than the NB hybrid.

The colour of the silages was slightly different according to the additives used for ensiling. Although there was slight difference in colour, the colour of all the silages were in acceptable range. Colour of silages with urea as additive had more greenish colour and the colour was yellowish green, while the silages with jaggery and tapioca flour as additive was pale green in colour. In the case of urea and jaggery mixed silage the colour was same as that of urea silage. Highest dry matter and fresh silage/pit was recorded in guinea grass silage and the effect of additives were non significant. No significant difference was noticed in pH of silages prepared from the grasses using different additives. The pH of all the silages was in acceptable range.

Total ash is the non combustible fraction of the feed, representing the total mineral content in the feed. Though the different additives tried in this experiment did not show any significant influence on the total ash content in silages, the impact of grasses on the total ash content of silage was significant. Lowest ash content (6.64) was recorded in the silage prepared from BN hybrid and highest total ash content (10.2) was recorded in guinea grass silage. Same trend was observed in acid insoluble ash content of silages, which indicates the silica present in the feed.Significantly higher protein content was recorded in silage prepared from guinea grass but additives couldn't influence the protein content of silage. Highest values of ether extract (2.198) was recorded in hybrid napier silage and among the different additives tested, urea 2% recorded highest value and was on par with all other additives.

R-14-AST-3 (a): Effect of additives on silage quality of different grasses

Treatments	Fresh silage/pit	Dry Matter Content (%)	pH	Total ash	Acid insoluble ash	Crude protein	Crude fibre	Ether extract	Nitrogen free extract
Grasses									
Hybrid Napier	23.18	35.13	4.36	6.64	1.76	5.9	40.94	2.198	44.91
Guinea grass	28.29	44.13	4.18	10.2	2.14	3.03	39.94	1.513	46.83
SEm±	0.579	1.29	0.925	0.382	0.117	0.298	1.419	0.181	1.107
CD (P=0.05)	1.208	2.71	NS	0.799	0.245	0.621	NS	0.375	NS
(b) Silage Additives									
Urea 1%	25.18	36.58	4.27	7.47	1.68	5.1	40.33	1.83	45.45
Urea 2%	27.42	43.65	4.2	8.15	1.87	4.65	39.17	2.72	46.05
Urea 1% + Jiggery 1%	26.12	38.58	4.38	8.2	2.31	3.93	42.12	1.42	46.68
Tapioca flour 1%	25.4	40.83	4.39	8.57	1.66	4.43	40.67	1.72	45.1
Jiggery 2%.	25.57	38.5	4.1	9.9	2.23	4.21	39.92	1.61	46.07
SEm±	0.916	2.04	0.146	0.605	0.185	0.471	4.679	0.284	1.751
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	0.593	NS

R-15-AST-2: Productivity of oat + pea intercropping system as influenced by integrated nutrient management

Location: Jorhat

The experiment on effect of oat + pea intercropping system under different INM practices was undertaken in *Rabi* 2015 at Jorhat to study the performance of the cropping system on productivity of both food and forage. The treatment comprised of four cropping systems i.e. Oat (Sole), Pea (Sole), Oat + Pea at 3:2 row proportion and Oat+Pea at 3:3 row proportion. All the cropping systems were evaluated with three INM practices viz. F_1= RDF (inorganic) F_2= 50% N of RDF+50%N through FYM F_3= 50% N of RDF+50%N through vermicompost. The experiment was laid out in Split plot design taking cropping system in main plot and INM treatment in sub plot with three replications.

Perusal of the data (Table) revealed that the highest GFEY of the system as a whole was highest in Pea sole (1870 q/ha). However Oat+Pea (3:3 ratio) recorded higher GFEY than Oat+Pea (3:2 ratio) being 851 and 605 q/ha. INM with 50% RDF + 50% N through vermicompost recorded the highest GFEY than other treatments. The highest LER (2.10) was also recorded in Oat+Pea (3:3 ratio) which also recorded the highest CP yield. The highest net return was recorded in Pea sole followed by Oat + Pea (3:3 ratios).

R-15-AST-2 (a) Productivity of oat + pea intercropping system as influenced by row proportion and integrated nutrient management

Treatments	Green fodder yield (q/ha)			GFEY (Oat+ Pea+ Pod) (q/ha)	Dry matter yield (q/ha)		
	Oat	Pea			Oat	Pea	Oat + Pea
		GFY	Green Pod				
A. Intercropping system							
C_1-Oat sole	455.11	-		478.33	114.86		114.86
C_2- Pea Sole		249.45	46.70	1870.67		42.62	42.62
C_3- Oat+Pea (3:2)	258.81	91.88	14.38	605.67	96.42	15.16	111.58
C_4- Oat+Pea (3:3)	236.40	119.44	20.94	851.33	113.71	20.45	134.16
SEm±				7.745			
CD (P=0.05)				47.650			
B. Integrated Nutrient Management							
F_1= RDF (inorganic)	308.97	144.30	24.99	835.64	94.17	24.28	118.45
F_2= 50% N of RDF+50%N through FYM	332.97	161.55	29.10	955.44	106.21	25.56	131.77
F_3= 50% N of RDF+50%N through Vermicompost	358.92	171.09	32.98	1063.17	124.60	28.39	152.99
SEm±				4.149			
CD (P=0.05)				18.954			
Interaction C x F							
SEm				7.181			
CD (P=0.05)				25.003			

R-15-AST-2 (b): growth quality and monetary parameters of oat - pea intercropping system as influenced by integrated nutrient management

Treatments	Plant Height (cm)		CP%		CP yield (q/ha)		LSR	Net Income (Rs/ha)	
	Oat		Oat		Pea		Oat	Pea	Oat
A. Intercropping system									
C_1-Oat sole	121.24		8.56		9.10		1.00	47833	30648
C_2- Pea Sole		60.34		14.35		6.13	1.00	187068	166290
C_3- Oat+Pea (3:2)	112.11	57.87	8.66	14.14	7.76	2.15	1.13	60556	43678
C_4- Oat+Pea (3:3)	114.52	60.75	8.47	14.45	8.87	2.96	2.10	85110	68582
SEm±	0.78	0.17	0.037	0.127	0.104	0.023		774.567	774.567
CD (P=0.05)	04.84	1.06	0.228	NS	0.643	0.142		4765.05	4765.05
B. Integrated Nutrient Management									
F_1 RDF (inorganic)	106.41	54.96	8.46	13.92	7.96	3.37	2.04	83564	67726
F_2 50% N of RDF+50% N through FYM	115.24	60.60	8.51	14.44	9.05	3.71	2.12	95544	76637
F_3 50% N of RDF+50% N through Vermicompost	126.22	63.40	8.71	14.57	10.85	4.15	2.14	106317	87535
SEm±	0.73	0.192	0.054	0.161	0.099	0.065		414.951	414.951
CD (P=0.05)	03.60	0.877	0.248	0.7386	0.454	0.299		1895.46	1895.46
Interaction C x F									
SEm±	0.136	0.332	0.094	0.280	0.172	0.113		718.717	718.717
CD (P=0.05)	NS	NS	NS	NS	0.731	0.481		2500.39	2500.39
CV (%)	4.96	10.07	15.02	3.08	4.22	02.21		19.321	22.29

R-15-AST-2(A): **Productivity of oat - chickpea intercropping system as influenced by integrated nutrient management**

Location: Imphal

This experiment was initiated during Rabi season of 2015-16 to study the effect of productivity of oat - chickpea intercropping system as influenced by integrated nutrient management. The treatment consisted of four Cropping System viz., Sole Oat (JHO-822), Sole Chickpea (JG 14), Oat + Chickpea (3:2) and Oat + Chickpea (3:3) and four Nutrient Levels; **(**RDF (N, P_2O_5& K_2O @ 60: 40:40), 50% N of RDF + 50% N through FYM, 50% N of RDF + 50%N through Vermicompost. The treatments were replicated thrice in split plot design. N was given in four splits doses (40% as basal, 20% at 30 DAS, 20% at 60 DAS and 20% at 90 DAS). The results indicated that Plant height, dry matter yield, green fodder and stover yield of oat and chickpea increased in both sole and intercropping systems due to application of all integrated sources of nutrients; significantly higher values of these parameters were recorded with application of 50% nitrogen through inorganic source + 50% through vermicompost. However, all parameters except plant height of oat and seed yield of chickpea were significantly higher under sole crop compared to its intercropping. Irrespective of nitrogen sources, intercropping system recorded LER of about 1.0 which indicates tremendous advantage of intercropping ofoat with chickpea. Total productivity of the systems in terms of green forage equivalent yield and gross returns and B: C ratio was higher in intercropping than sole cropping of oat and chickpea. Among nitrogen sources, supply of 50% of recommended N through inorganic source + 50% through vermicompost was most productive. But in terms of net monetary return, supply of 50% of recommended N through inorganic source + 50% through FYM recorded highest net return (Rs.81498/ ha).

R-15-AST-2(A): (a) Productivity of oat - chickpea intercropping system as influenced by integrated nutrient management

Treatment	Oat			Chickpea				Green Forage Equivalent Yield	LER of Intercropping System	Gross return (Rs./ha)	Net return (Rs./ha)	Benefit cost ratio
	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Plant height (cm)	Seed yield (q/ha	Harvest index (%)	Stover yield (q/ha)	Plant height (cm)					
A. Intercropping System												
Sole Oat	533.54	161.66	125.81	-	-	-	-	533.54	1	80031	42349	2.16
Sole Chickpea	-	-	-	17.46	46.22	20.79	54.11	515.20	1	103039	66557	2.86
Oat + Chickpea (3:2)	393.47	89.45	122.59	12.97	44.62	16.17	57.11	776.12	0.78	135550	98268	3.72
Oat + Chickpea (3:3)	379.28	103.22	117.44	15.66	44.39	19.72	53.00	841.39	0.73	149314	112232	4.11
SEm±	6.81	2.17	3.65	0.51	1.43	0.67	2.15	8.15	0.02	1796	1796	0.05
CD at 5%	26.73	8.53	NS	1.99	NS	2.62	NS	28.19	NS	6213	6213	0.17
B. Nutrient												
RDF (N, P_2O_5& K_2O @ 60: 40:40)	414.43	103.09	119.85	14.76	44.77	18.29	56.22	637.33	0.73	111924	80772	3.60
50% N of RDF + 50% N through FYM	437.63	117.91	122.78	15.17	41.71	21.40	55.33	663.90	0.79	116370	81498	3.34
50% N of RDF + 50% N through Vermicompost	454.23	133.32	123.22	16.17	48.75	16.98	52.67	698.46	0.75	122658	77286	2.71
SEm±	6.78	2.21	1.98	0.38	1.35	0.74	1.84	9.26	0.01	1758	1758	0.05
CD at 5%	20.89	6.80	NS	NS	4.17	2.29	NS	27.76	NS	5269	NS	0.14

R-15 AST-3: Response of phosphogypsum to various cultivars of fodder oat in sodic soil.

Location: Faizabad

The experiment was conducted during Rabi 2015-16 at Faizabad center to assess the effect of phosphogypsum on fodder production of various cultivars of oat under sodic soils. The treatments comprised of twelve combinations viz; three oat cultivars (NDO-1, NDO-2 & NDO-711) and four phosphogypsum levels (control, 125 kg (20kg S), 250 kg (40kg S) and 375 kg (60kg S)/ha] laid out in factorial randomized block design and replicated thrice. The experimental field was fertilized with recommended dose (100kg N: 40kg P_2O_5/ha). The soil of experimental field was sodic and poor in fertility (pH-8.9, EC-0.73dsm^{-1}, ESP-17.8%, organic carbon -0.21%, available N-191.2kg, P_2O_5 -16.6 kg and K_2O -182.1 kg/ha), silty loam in texture and saline in reaction. The results indicated that oat cultivar NDO-711 was found statistically superior in terms of GFY, DMY, CPY and per day productivity and closely followed by oat cultivar NDO-1 for the same parameters (R-15 AST-3 (a) & R-15 AST-3 (b)) A consistent increase in GFY, DMY, CPY and per day productivity were recorded with an increase in phosphogypsum levels from zero to 375 kg (60kg S)/ha however, these effects between 250 kg (40kg S)/ha and 375 kg(60kg S)/ha observed non significant . Oat cultivars and phosphogypsum levels exhibited non significant effects on CP%, plant height, plant populations, leaf stem ratio, days to 50% flowering and initial available nitrogen, phosphorus and potash in soils of the experimental field. After the harvest of the crop, soil of the experimental field was analyzed as per treatments for available nitrogen, phosphorus and potash. Oat cultivar showed non significant effects on available nitrogen, phosphorus and potash however, an increase in phosphogypsum levels up to 375 kg (60kg S)/ha consistently enhanced the available nitrogen, phosphorus and potash in soil. Interaction effect was found non significant for all the parameters taken in investigations.

R-15 AST-3 (a): Response of phosphogypsum to various cultivars of fodder oat in sodic soil

Treatments	Green forage yield	Dry matter yield	Crude protein yield	Crude protein (%)	Plant height	Plant population m^{-2}	Leaf stem ratio	DM (%)
A. Oat cultivars								
NDO-1	474.60	110.34	8.58	7.75	106.7	386	0.76	23.2
NDO-2	433.53	103.94	8.30	7.95	105.6	378	0.79	24.0
NDO-711	514.98	124.01	9.96	8.03	107.5	397	0.80	24.1
SEm±	20.80	5.60	0.36	0.2	3.89	12.46	-	0.60
CD (P=0.05)	43.14	11.62	0.75	NS	NS	NS	-	NS
B. Levels of Phosphogypsum								
Control	430.93	99.27	7.50	7.53	105.7	382	0.75	23.0
125 kg/ha (20kg S /ha)	459.96	110.41	8.54	7.73	106.3	387	0.78	24.0
250 kg/ha (40kg S /ha)	491.60	117.06	9.57	8.17	107.0	388	0.78	23.8
375kg/ha (60kg S /ha)	515.20	124.30	10.18	8.20	107.3	390	0.80	24.1
SEm±	24.02	6.47	0.42	0.23	4.49	14.39	-	0.7
CD (P=0.05)	49.81	13.42	0.89	NS	NS	NS	-	NS

R-15 AST-3 (b): Effect of phosphogypsum and fodder oat cultivars on soil properties in sodic soil.

Treatment	Initial			After end of the year		
	N	P	K	N	P	K
A. Cultivar						
NDO-1	191.3	16.5	182.0	201.7	17.7	203.3
NDO-2	191.1	16.6	182.4	201.1	17.4	202.2
NDO-711	191.2	16.6	181.8	202.7	18.0	204.5
SEm+	2.93	0.23	2.50	2.98	0.25	2.83
CD (P=0.05)	NS	NS	NS	NS	NS	NS
B. Phosphogypsum (Sulphur) kg/ha						
Control,	190.9	16.4	182.1	193.4	16.8	195.1
125 kg/ha (20kg S /ha)	191.1	16.6	181.9	198.5	17.6	200.6
250 kg/ha (40kg S /ha)	191.3	16.6	181.8	206.6	18.1	206.9
375kg/ha (60kg S /ha)	191.6	16.7	182.6	208.7	18.3	210.7
SEm+	3.39	0.27	2.89	3.45	0.29	3.27
CD (P=0.05)	NS	NS	NS	10.10	0.85	9.60

R-15-AST-4: Study on lucerne + oats / sarson fodder production system at variable seed rates of mixed crop under irrigated condition

Location: Bikaner

Field study was carried out at Agricultural Research Station, SKRAU, Bikaner on sandy soil during *rabi* season of 2015-16 to fulfil the objectives-(i) To find out optimum seed rate of oats/ sarson mixed cropping for long term stable green fodder, and (ii) To work out the economics of different treatments. Treatments were T_1- 100 % Seed rate oats (100 kg/ha), T_2- 100 % Seed rate lucerne (30kg/ha), T_3- T_2+10 kg/ha oats, T_4- T_2+20 kg/ha oats, T_5- T_2+30 kg/ha oats, T_6- T_2+40 kg/ha oats, T_7- T_2+0.625 kg/ha Sarson, T_8- T_2+1.250 kg/ha Sarson, T_9- T_2+1.880 kg/ha Sarson and T_{10}- T_2+2.500kg/ha Sarson in randomised block design with three replications. Experimental field soil was sandy loam in texture with medium in fertility status having OC 0.25%, and 111, 27.5, 220 kg/ha available NPK, respectively and has alkaline in reaction (pH 8.28), and EC 0.09ds/m of 2:1 soil water suspension. Fertilizers @ 20 kg N, 40 kg P2O5, 20 kg K2O 12.5 kg ZnSO4 as basal was drilled at sowing. Further 20 kg N in two equal splits at 30DAS and after first cut for green fodder was broadcasted. Total six cuts was harvested as green fodder first at 55 DAS and next cuts at 35 days interval while in oats only four cuts harvested as green fodder . The result presented in R-15-AST-4 (a) revealed that lucerne + oat/ sarson fodder production system at variable seed rate of mixed crop, lucerne + oat seed mixed treatments (T_3 - T_6) gave significantly higher GFY and DMY (except T_6) as compared to lucerne + sarson seed mixed treatments (T_7-T_{10}) and sole lucerne (T_2) but was found at par with sole oat crop (T_1) . Further data indicated that lucerne + sarson mixed crop treatments recorded higher GFY (except T_7), but the variation in GFY was statistically non significant. The highest DMY (129.8 qt/ha) was recorded in lucerne+ oat mixed with 30 kg/ha (T_5) , The highest CP % was noted in sole lucerne (T_2) followed by lucerne+ sarson mixed at 0.625 kg/ha (T_7) and both these treatment found significantly superior over rest treatments Similarly, the highest CP yield of 20.2 qt/ha was computed under lucerne sole crop (T_2) against the minimum CP yield (13.5q/ha) under oat sole crop. The maximum net return and B:C ratio found in sole oat (T_1) was at par in lucerne+ oat mixed @30 kg/ha (T_5) and both treatments showed statistically superiority over rest treatments.

R-15-AST-4 (a): performance of lucerne + oats /sarson fodder production system at variable seed rates of mixed crop under irrigated condition

Treatment	GFY (q/ha)	DMY (q/ha)	CP %	CPY (q/ha)	Net return (Rs/ha)	B:C ratio
T_1 Oat- 100 kg/ha	662.9	99.4	13.55	13.52	76434	3.32
T_2 Lucerne-20 kg/ha	553.0	115.8	17.53	20.28	57956	2.32
T_3 (T-2+O10 kg/ha)	633.3	126.4	15.94	20.18	69590	2.74
T_4 (T-2+O20 kg/ha)	637.5	126.8	15.27	19.42	69831	2.71
T_5 (T-2+O30 kg/ha)	656.0	129.8	14.85	19.29	72201	2.76
T_6 (T-2+O40 kg/ha)	642.7	121.5	14.28	17.69	69809	2.62
T_7 (T-2+S 0.625 kg/ha)	498.1	115.4	17.01	19.62	49665	1.98
T_8 (T-2+S 1.25 kg/ha)	566.5	122.0	15.85	19.31	59876	2.39
T_9 (T-2+S 1.88 kg/ha)	554.1	109.2	15.62	17.11	57960	2.30
T_{10} (T-2+ S 2.50 kg/ha)	568.4	102.3	15.38	15.73	60064	2.38
SEm±	13.20	2.45	0.36	0.54	1979	0.08
CD (P=0.05)	40.66	7.56	1.10	1.68	6098	0.24

Note-O= Oats, S= Sarson

R-15-AST-7: Standardization of Seed Rate of Berseem with Rye Grass under Mixed Cropping System

Location: NDRI, Karnal

The field experiment was conducted at NDRI, Karnal to standardize of seed rate of berseem with rye grass under mixed cropping system. The treatments consisted of **T_1**-Sole Berseem, **T_2**-Sole Rye Grass, **T_3**-100% Berseem + 100% Rye Grass, **T_4**-50% Berseem + 50% Rye Grass, **T_5**-100% Berseem + 25% Rye Grass, **T_6**-75% Berseem + 25% Rye Grass 11, **T_7**-50 Berseem + 25% Rye Grass **T_8**-100% Rye Grass +25% Berseem, **T_9**-75% Rye Grass +25% Berseem, **T_{10}**-50% Rye Grass +25% Berseem. The experiment was laid out in Randomized Block Design (RBD) with three replications. The seed was sown in wet seed bed using seed rate of Berseem @25 Kg/ha and Rye Grass @10 Kg/ha. The soil of research plots was neutral in reaction, low in available Nitrogen, medium in available Phosphorous and high in available Potassium. The Berseem variety 'Mescavi' and Rye Grass variety 'Makhkhan grass' were used for cultivation.

The results (R-15-AST-7(a) revealed that the plant height differed significantly and was maximum in T_4 (50% Berseem + 50% Rye Grass). The green Fodder yield was highest in T_8 (100% Rye Grass +25% Berseem) followed by T_6 (75% Berseem + 25% Rye Grass). The highest Dry matter yield was found in T5. Crude Protein content had the significant difference among the treatments and found at par in T_1 & T_4 T_7 and T_9. The protein percentage was highest in T_6 (75% Berseem + 25% Rye Grass). Highest benefit: cost ratio was calculated from T_8 (100% Rye Grass +25% Berseem).

The results of findings noticed the highest green fodder yield was obtained from 100% ryegrass with 25% Berseem as mixed crop. This is an advantageous combination of Berseem with ryegrass under mixed cropping system.

R-15-AST-7(a): Effect of seed rates of berseem and rye grass on growth, yield and quality of mixed cropping system

Treatments	Plant Height (cm)		Leaf Stem Ratio		Yield (t/ha)			Crude Protein (%)	B:C Ratio
	Berseem	Rye Grass	Berseem	Rye Grass	Green Fodder	Dry Matter	Crude Protein		
T_1-Sole B	76.85	0.00	0.23	0.00	97.85	3.55	0.72	20.12	0.54
T_2-Sole RG	0.00	65.93	0.00	0.99	84.08	3.03	0.54	17.79	0.42
T_3-100%B+RG	78.03	75.22	0.30	1.00	98.03	3.79	0.70	18.37	0.48
T_4-50%B+RG	83.83	73.75	0.28	1.00	99.23	3.79	0.77	20.41	0.52
T_5-100%B+25%RG	79.88	75.40	0.25	0.93	102.12	4.06	0.73	18.07	0.53
T_6-75%B+25%RG	74.62	68.22	0.24	0.96	103.01	4.09	0.93	22.75	0.54
T_7-50%B+25%RG	78.28	74.47	0.36	0.82	102.37	3.81	0.77	20.12	0.55
T_8-100%RG+25%B	81.32	74.73	0.23	0.77	111.46	4.26	0.90	21.29	0.56
T_9-75%RG+25%B	79.48	70.62	0.26	0.86	100.26	3.83	0.78	20.41	0.52
T_{10}-50%RG+25%B	74.19	69.50	0.26	0.78	94.97	3.42	0.70	17.21	0.51
SEm±	3.02	2.33	0.04	0.07	4.33	0.18	0.07	1.34	
CD (P=0.05)	6.34	4.89	0.09	0.16	9.11	0.39	0.16	2.81	

R-15-AST-5: Effect of zinc and boron on seed production potentiality of oats under lateritic soil

Location: Sriniketan, West Bengal

A field experiment was conducted during *Rabi* season of 2015-16 at Sriniketan, West Bengal to study the effect of zinc and boron on seed production potentiality of oats under lateritic soil. The experiment was laid out in randomized block design with sixteen treatments, each treatment replicated thrice. The oats (JHO-822) was raised with a row to row spacing of 30 cm and plant to plant spacing of 10 cm following the recommended package of practice. Application of $ZnSO_4$ and Borax at various levels in oats either singly or their combinations significantly influenced the yield components (viz, no. of panicles /m^2 and no. of filled grains/panicle), seed and straw yield of oats (R-15-AST-5 (a)). Combined application of $ZnSO_4$ and Borax at different levels in oats showed higher yield of oats in comparison to their sole application. The highest seed yield was recorded in the treatment having $ZnSO_4$ @ 20 kg/ha+ Borax @ 15 kg/ha (3.22 t/ha) which was statistically at par with $ZnSO_4$ @ 20 kg/ha+ Borax @ 10 kg/ha (3.12 t/ha), $ZnSO_4$ @ 25 kg/ha+ Borax @ 15 kg/ha (3.07 t/ha), $ZnSO_4$ @ 15 kg/ha+ Borax @ 15 kg/ha (2.96 t/ha).

R-15-AST-5 (a). Effect of zinc and boron on seed production potentiality of oats under lateritic soil of W.B.

Treatments	No. of panicles/ m^2	No. of filled grains/panicle	Test wt. (g)	Seed yield (t/ha)	Straw yield (t/ha)
T_1-Control	170.3	58.6	28.13	2.57	5.24
T_2-ZnSO4@15kg/ha	172.5	64.5	28.32	2.65	5.75
T_3-ZnSO4@20kg/ha	180.7	70.9	28.67	2.89	6.50
T_4-ZnSO4@25kg/ha	184.0	73.6	28.69	2.92	6.57
T_5-Borax@5kg/ha	177.6	68.9	28.25	2.59	5.72
T_6-Borax@10kg/ha	186.0	77.9	28.80	2.86	6.44
T_7-Borax@15kg/ha	189.7	80.4	28.67	2.90	6.53
T_8-ZnSO4@15kg/ha+Borax@5kg/ha	183.0	69.2	28.71	2.68	5.86
T_9-ZnSO4@15kg/ha+ Borax@10kg/ha	188.6	76.1	29.17	2.81	6.59
T_{10}-ZnSO4@15kg/ha+ Borax@15kg/ha	193.2	77.3	29.43	2.96	6.92
T_{11}-ZnSO4@20kg/ha+Borax@5kg/ha	188.5	75.2	28.70	2.97	6.76
T_{12}-ZnSO4@20kg/ha+ Borax@10kg/ha	195.3	82.8	30.80	3.13	7.48
T_{13}-ZnSO4@20kg/ha+ Borax@15kg/ha	208.7	85.3	30.73	3.22	7.53
T_{14}-ZnSO4@25kg/ha+Borax@5kg/ha	187.5	70.9	28.60	2.84	6.67
T_{15}-ZnSO4@25kg/ha+ Borax@10kg/ha	196.6	77.1	30.25	2.97	6.93
T_{16}-ZnSO4@25kg/ha+ Borax@15kg/ha	201.3	71.3	29.50	3.07	7.12
SEm $\pm$	6.36	4.32	1.76	0.15	0.45
CD (P=0.05)	12.98	8.83	3.60	0.31	0.92

C. AVT-2 BASED AGRONOMY TRIALS

20. R-14-AST-4: Effect of nitrogen levels on green fodder yield of promising entries of oat (AVTO-2-SC)

[Table Reference: 20(a)-20(m)]

Locations

Hill zone: Palampur, Srinagar
North West Zone: Ludhiana, Hisar, Pantnagar
North East Zone: Pusa, Jorhat, Kalyani
Central Zone: Anand, Jabalpur, Rahuri
South Zone: Hyderabad, Mandya

In Oat (Single cut), eight entries (RO-11-1, JO-04-18, OL-1689, SKO-198, SKO-199, RSO-8, OL-1804 and OS-406) along with two national checks namely OS-6 and Kent and four zonal checks *viz.*, OL-125 (NWZ), JHO99-2 (NEZ), JHO-822 (CZ), JHO-2000-4 (SZ) were evaluated at 11 locations across the five zones in the country.

In North West zone, for GFY and DMY, entry OL-1689 (515.4 and 108.5 q/ha, respectively) was superior to other entries. OL-1689 recorded 6.2, 17.9 and 3.7% higher green fodder yield over Kent (NC), OS-6 (NC) and RO-11-1, respectively. Entry OL-1689 also recorded 3.1, 12.4 and 5.6% higher dry matter than Kent (NC), OS-6 (NC) and OL- 125 (ZC) respectively. Entry SKO-199 demonstrated highest CPY followed by Kent (NC) and RO-11-1. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (506.4 q green and 107.5 q dry matter /ha) which was 15.61 and 5.24 % higher over 40 and 80kg N/ha, respectively in terms of green fodder. The interaction effect for dry matter and CP yield was significant at Ludhiana.

In North East zone, for GFY and DFY, entry Ro-11-1 (419.7q GFY and 79.3 q DFY/ ha) and OL-1804 (415.9 q GFY and 77.1 q DFY/ha) was superior over other entries. Entry RO-11-1 recorded 18.29 and 14.01% higher green fodder yield over Kent (NC), JHO-99-2 (NEZ) respectively. Entry RO-11-1 recorded maximum dry matter (79.3 q/ha) which was 2.85% higher over second best entry OL-1804 and 14.5% higher over OS-6(NC).Entry SKO-198 demonstrated highest CPY (7.22 q/ha) followed by RO-11-1 and SKO-199. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (438.9 q green and 80.7 q dry matter /ha) which was 37.4 and 13.2 % higher over 40 and 80kg n/ha, respectively in terms of green fodder. The interaction effect for GFY, DMY and CPY was significant at Kalyani center.

In Central zone, for GFY and DFY, entry Ro-11-1 (615.8q GFY and 120.1 q DFY/ ha) was superior over other entries. This was followed by RSO-8 (578.2 q GFY and 114.4 q DFY/ha). Entry RO-11-1 recorded 34.31, 31.9 and 6.50% higher green fodder yield over Kent (NC), JHO-99-2 (NEZ) and RSO-8, respectively. In terms of dry matter, it recorded 30.83 and 4.98% superiority over Kent (NC) and RSO-8. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (541.8 q green and 96.6 q dry matter /ha), which was 18.40 and 7.27 % higher over 40 and 80kg N/ha, respectively, in terms of green fodder. The interaction effect for GFY, DMY and CPY was significant at Jabalpur.

In South Zone, for GFY and DMY, entry RO-11-1 (270.7 and 70.3 q/ha, respectively) was superior to other entries. It was followed by RSO-8 and Kent (NC). RO-11-1 recorded 13.12 and 14.89 % higher GFY over respective entries. It also recorded 15.8% and 10.88 % higher DFY over Kent (NC) and RSO-8, respectively. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (250.0 q green and 63.4 q dry matter/ha) which was 40.13 and 15.63 % higher over 40 and 80kg N/ha, respectively in terms of green fodder. The interaction effect for dry matter was significant at both locations.

On all India mean basis, RO-11-1 produced maximum GFY (467.08 q/ha) and DFY (97.26 q/ha). It was followed by OL-1804 (443.69 q/ha) in terms of GFY and RSO-8 (93.26 q/ha) in terms of DFY. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (451.3 q green and 93.44q dry matter/ha).

Table R-15-AST -9 (a): Effect of N levels on green forage yield of promising entries of oat (AVT-2 SC)

Treatments	Green fodder yield (q/ha															
	NWZ				NEZ				CZ				SZ			Overall Mean
	His-ar	Ludh-iana	Pant-nagar	Mean	Pu-sa	Jor-hat	Kal-yani,	Mean	Ana-nd	Jabal-pur	Rah-uri	Mean	Hyde-rabad	Mand ya	Mean	
RO-11-1	289.7	585.6	614.6	496.6	355.0	361.6	542.5	419.7	610.0	507.8	729.7	615.8	313.0	228.4	270.7	467.08
JO-04-18	272.1	414.7	561.2	416.0	422.0	241.2	393.3	352.2	399.0	406.2	520.6	441.9	220.4	121.7	171.0	361.13
OL-1689	369.3	591.2	585.6	515.4	322.0	307.9	480.0	370.0	498.0	389.6	618.9	502.2	275.9	190.7	233.3	420.83
SKO-198	150.9	661.8	603.1	471.9	339.0	337.9	440.0	372.3	415.0	253.7	577.2	415.3	225.9	131.4	178.7	375.99
SKO-199	195.3	652.1	613.2	486.9	355.0	310.4	481.6	382.3	400.0	452.3	582.2	478.2	196.3	93.9	145.1	393.85
SKO-196													---			
RSO-8	282.3	600.5	591.7	491.5	372.0	322.5	485.0	393.2	486.0	540.6	708.0	578.2	266.7	212.0	239.3	442.48
OL-1804	320.2	554.8	548.3	474.4	355.0	332.7	560.0	415.9	431.0	527.0	726.7	561.6	340.7	183.3	262.0	443.61
OS-406	336.0	530.1	617.9	494.7	373.0	293.6	480.0	382.2	402.0	508.4	617.9	509.4	210.2	194.8	202.5	414.90
KENT (NC)	268.4	570.9	617.0	485.4	322.0	302.4	440.0	354.8	388.0	406.4	581.1	458.5	325.9	145.3	235.6	397.04
OS-6 (NC)	284.1	439.9	587.4	437.1	322.0	337.1	519.1	392.7	396.0	434.3	633.4	487.9	288.9	144.4	216.7	398.78
OL-125 (NWZ)	270.3	523.6	577.9	457.3									---			457.27
JHO99-2 (NEZ)					289.0	351.2	464.1	368.1					--			368.10
JHO-822 (CZ)									406.0	377.6	616.7	466.8	---			466.77
JHO-2000-4 (SZ)													272.2	145.9	209.1	209.05
SEm+	14.1	27.8	7.16		7.02	11.93	5.27		12.15	4.46	22.8		17.10	3.92		
CD (P=0.05)	40.2	82.5	20.27		21.7	34.92	15.47		35.83	12.63	67.2		53.86	11.57		
Nitrogen levels (kg/ha)																
40	235.0	488.4	590.7	438.0	280.0	303.7	374.7	319.5	413.0	373.1	586.7	457.6	231.3	125.4	178.4	363.82
80	284.7	569.2	589.6	481.2	364.0	316.5	482.0	387.5	435.0	451.8	628.5	505.1	269.4	163.0	216.2	413.97
120	309.0	612.9	597.4	506.4	398.0	334.0	584.7	438.9	470.0	485.3	670.0	541.8	300.0	200.0	250.0	451.03
SEm+	7.4	9.9	3.74		6.06	3.96	7.39		4.37	5.32	10.92		3.98	2.56		
CD (P=0.05)	20.9	28.4	NS		17.40	11.59	21.68		12.45	15.52	31.13		11.68	7.29		
Interaction V x N																
SEm+	24.5	48.12	12.40			6.86	8.74		14.48	5.46	36.22		11.44	8.49		
CD (P=0.05)	NS	NS	35.10			NS	25.61		NS	15.63	NS		33.55	24.19		
CV (%)	10.3	10.2				9.93	10.23		8.30	13.25	10.32		5.00			

Table R-15-AST-9 (b): Effect of N levels on dry matter yield of promising entries of oat (AVT-2 SC)

Treatments	Dry matter yield (q/ha)														
	NWZ				NEZ			CZ				SZ			Overall Mean
	His-ar	Ludh-iana	Pant-nagar	Mean	Jor-hat	Kal-yani	Mean	Ana-nd	Jabal-pur	Rah-uri	Mean	Hydera-bad	Man-dya	Mean	
RO-11-1	57.3	126.9	129.1	104.4	79.5	79.1	79.3	108.3	111.2	140.7	120.1	85.3	55.2	70.3	97.3
JO-04-18	54.4	76.1	117.9	82.8	53.4	69.3	61.4	76.1	86.0	96.8	86.3	49.0	28.0	38.5	70.7
OL-1689	71.6	130.6	123.3	108.5	66.0	75.0	70.5	92.6	83.4	119.0	98.3	60.9	47.5	54.2	86.99
SKO-198	29.3	133.6	126.6	96.5	80.8	67.8	74.3	74.6	48.0	104.4	75.6	63.0	32.9	47.9	76.1
SKO-199	39.3	127.2	128.8	98.4	79.6	74.2	76.9	76.5	97.4	106.5	93.5	48.2	22.4	35.3	80.01
SKO-196															
RSO-8	57.4	130.7	124.3	104.1	72.7	77.6	75.1	89.9	120.8	132.4	114.4	72.5	54.3	63.4	93.26
OL-1804	63.8	121.8	115.1	100.2	69.8	84.4	77.1	71.9	116.3	135.0	107.7	87.9	44.1	66.0	91.01
OS-406	67.1	113.9	129.7	103.6	63.9	72.9	68.4	74.7	112.2	112.3	99.7	52.7	47.6	50.2	84.7
KENT (NC)	54.1	132.0	129.6	105.2	61.2	66.3	63.7	71.1	91.0	113.4	91.8	82.5	39.0	60.7	84.02
OS-6 (NC)	56.6	109.4	123.4	96.5	69.4	69.0	69.2	71.4	93.2	127.4	97.3	73.3	43.9	58.6	83.7
OL-125 (NWZ)	54.8	131.9	121.4	102.7											102.7
JHO99-2 (NEZ)					75.3	60.5	67.9								67.9
JHO-822 (CZ)								69.3	80.0	116.2	88.5				88.5
JHO-2000-4 (SZ)												67.9	34.5	51.2	51.2
SEm±	2.80	6.70	1.50		2.39	1.08		2.17	3.21	4.40		6.92	1.94	4.4	
CD (P=0.05)	8.00	19.90	4.24		7.00	3.16		6.39	8.32	12.98		21.79	5.71	13.7	
CV (%)								8.16							
Nitrogen levels (kg/ha)															
40	46.0	104.5	124.0	91.5	66.9	57.9	62.4	75.2	77.7	106.9	76.5	58.22	30.7	44.46	74.80
80	57.0	124.4	123.8	101.7	71.2	70.7	71.0	77.8	98.6	118.1	88.2	68.6	41.0	54.8	85.12
120	62.2	134.9	125.5	107.5	72.2	89.1	80.7	85.9	107.2	130.6	96.6	75.9	50.9	63.4	93.44
SEm±	1.49	2.20	0.78		0.92	2.21		0.79	3.21	2.28		2.2	0.86		
CD (P=0.05)	4.16	6.20	NS		2.70	6.47		2.25	9.32	6.51		6.44	2.45		
Interaction															
SEm±	4.91	2.17	7.34		4.67	1.12		2.62	2.54	7.58		6.30	2.85		
CD (P=0.05)	NS	6.20	2.59		10.23	3.28		7.48	6.55	NS		NS	8.11		
CV (%)	15.50	10.30	-		1.60	6.24		5.70	10.25	11.36		10.80			

R-15-AST -9 (b-1): Interaction effect GFY (q/ha), DMY (q/ha), CPY (q/ha) of oat entries and N levels (AVT-2 SC) at Kalyani Centre

Entry/N Level	GFY (q/ha)				DMY (q/ha)				CPY (q/ha)			
	N_1	N_2	N_3	Mean	N_1	N_2	N_3	Mean	N_1	N_2	N_3	Mean
RO-11-1	417.5	547.5	662.5	542.5	70.14	74.46	92.75	79.1	5.38	4.41	7.58	5.8
JO-04-18	222.5	395.0	562.5	393.3	35.82	65.17	106.87	69.3	4.11	7.98	12.68	8.3
OL-1689	367.5	487.5	585.0	480.0	61.00	74.58	89.50	75.0	3.50	5.22	5.30	4.7
SKO-198	322.5	430.0	567.5	440.0	58.37	62.35	82.85	67.9	7.33	4.12	9.78	7.1
SKO-199	365.0	475.0	605.0	481.7	58.03	72.57	102.30	77.6	4.26	6.67	7.42	6.1
RSO-8	397.5	507.5	550.0	485.0	79.65	92.43	81.27	84.5	3.62	4.03	7.85	5.2
OL-1804	442.5	592.5	645.0	560.0	52.92	69.00	97.02	73.0	4.18	4.96	7.81	5.7
OS-406	362.5	500.0	577.5	480.0	98.86	69.88	88.95	85.9	4.16	3.96	10.00	6.0
KENT (NC)	375.0	425.0	520.0	440.0	62.25	65.02	71.76	66.3	3.57	4.06	5.74	4.5
OS-6 (NC)	435.0	507.5	615.0	519.2	54.81	67.49	84.87	69.1	5.75	5.39	7.68	6.3
JHO99-2 (NEZ)	415.0	435.0	542.5	464.2	455.65	55.68	80.29	197.2	5.98	3.68	3.35	4.3
Mean	374.8	482.0	584.8	480.5	98.86	69.88	88.95	85.9	4.71	4.95	7.74	5.8
SEm±	8.74				1.12				0.12			
CD (P=0.05)	25.61				3.28				0.35			

R-15-AST -9 (b-2): Interaction effect of GFY (q/ha), DMY (q/ha), CPY (q/ha) of oat entries and N levels (AVT-2 SC) at Jabalpur Centre

	Green fodder yield (q/ha)				Dry matter yield (q/ha)				Crude protein yield (q/ha)			
Entries	N_1	N_2	N_3	**Mean**	N_{40}	N_{80}	N_{120}	**Mean**	N_{40}	N_{80}	N_{120}	**Mean**
RO-11-1	407.6	540.3	575.6	507.8	85.0	120.7	128.0	111.2	6.8	8.9	10.5	8.7
JO-04-18	328.6	440.0	450.0	406.2	66.7	94.7	96.7	86.0	5.1	7.6	7.8	6.8
OL-1689	331.0	407.3	430.6	389.6	67.3	89.0	93.8	83.4	5.2	7.1	7.5	6.6
SKO-198	209.3	265.0	287.0	253.7	38.3	50.8	54.9	48.0	2.8	3.8	4.1	3.5
SKO-199	407.3	459.0	490.6	452.3	85.0	100.2	107.0	97.4	6.6	8.0	8.5	7.7
RSO-8	500.3	545.0	576.6	540.6	110.9	122.2	129.5	120.8	8.9	9.9	10.5	9.8
OL-1804	480.0	528.0	573.0	527.0	103.8	117.5	127.6	116.3	8.3	9.5	10.4	9.4
OS-406	446.0	535.0	544.3	508.4	95.0	119.8	121.8	112.2	7.4	9.6	9.7	8.9
KENT (NC)	310.0	428.3	481.0	406.4	62.4	90.8	120.0	91.0	4.8	7.1	8.0	6.6
OS-6 (NC)	363.0	435.3	504.6	434.3	74.8	96.3	108.6	93.2	5.6	7.7	8.6	7.3
JHO-822 (CZ)	321.3	386.6	425.0	377.6	65.7	83.1	91.2	80.0	4.9	6.5	7.1	6.2
Mean	**373.1**	**451.8**	**485.3**		**77.7**	**98.6**	**107.2**		**6.0**	**7.8**	**8.4**	
	SEm±	**CD**	**CV**		**SEm±**	**CD**	**CV**					
V	4.46	12.63			3.21	8.32						
N	5.32	15.52	13.25		3.21	9.32						
V x N	5.46	15.63			2.54	6.55	10.25					

R-15-AST -9 (b-3): Interaction effect of green forage yield of oat entries and N levels (AVT-2 SC) at Hyderabad Centre

Entries	Green forage yield (q/ha)			
	N Levels			
	40	80	120	Mean
RO-11-1	266.7	327.8	344.4	313.0
JO-04-18	183.3	233.3	244.4	220.4
OL-1689	238.9	288.9	300.0	275.9
SKO-198	211.1	222.2	244.4	225.9
SKO-199	166.7	200.0	222.2	196.3
RSO-8	227.8	266.7	305.6	266.7
OL-1804	300.0	333.3	388.9	340.7
OS-406	177.8	219.4	233.3	210.2
KENT (NC)	294.4	322.2	361.1	325.9
JHO-2000-4 (SZ)	222.2	272.2	322.2	272.2
OS-6(NC)	255.6	277.8	333.3	288.9
Mean	231.3	269.4	300.0	
	Entry	**N levels**	**Entry x N levels**	
SEm ±	17.1	4.0	11.4	
CD at 5%	53.9	11.7	33.6	

R-15-AST -9 (b-4): Interaction effect of oat entries and N levels (AVT-2 SC) on Dry matter and Crude protein yield (q/ha) at Ludhiana

Varieties	DMY (q/ha)				CPY (q/ha)			
	N levels(kg/ha)				N levels(kg/ha)			
	40	80	120	Mean	40	80	120	Mean
RO-11-1	104.0	127.5	149.2	126.9	7.05	8.65	9.05	8.25
JO-04-18	61.4	78.1	88.7	76.1	8.65	9.20	10.45	9.43
OL-1689	118.4	133.8	139.6	130.6	5.50	5.75	6.70	5.98
SKO-198	115.1	139.0	146.9	133.6	4.95	5.90	6.45	5.77
SKO-199	108.7	129.7	143.3	127.2	7.00	8.20	11.15	8.78
RSO-8	114.1	132.3	145.7	130.7	5.05	6.95	7.95	6.65
OL-1804	114.6	122.5	128.2	121.8	7.45	7.70	7.85	7.67
OS-406	92.4	120.8	128.6	113.9	7.25	7.75	8.50	7.83
KENT (NC)	118.8	132.5	144.9	132.0	7.40	7.75	8.35	7.83
OS-6 (NC)	83.2	115.0	130.0	109.4	5.95	6.55	8.40	6.97
OL-125 (NWZ)	119.4	137.7	138.6	131.9	6.00	6.20	6.45	6.22
Mean	104.5	124.4	134.9	121.28	6.57	7.33	8.30	7.83
SEm ±	2.17				0.17			
CD at 5%	6.20				0.47			

R-15-AST -9 (c): Effect of N levels crude protein yield of promising entries of oat (AVT-2 SC)

Treatments	Crude protein yield (q/ha)													Overall Mean
	NWZ			NEZ			CZ				SZ			
	Ludhiana	Hisar	Mean	Jorhat	Kalyani	Mean	Anand	Jabalpur	Rahuri	Mean	Hyderabad	Mandya	Mean	
RO-11-1	10.63	13.47	12.05	7.60	5.79	6.70	12.54	8.70	13.76	11.67	7.60	2.20	4.90	9.14
JO-04-18	7.26	13.88	10.57	4.54	8.25	6.40	9.12	6.80	8.70	8.21	5.05	1.17	3.11	7.20
OL-1689	7.85	14.40	11.125	6.05	4.67	5.36	11.11	6.60	11.33	9.68	5.70	1.71	3.71	7.71
SKO-198	7.77	14.59	11.18	7.37	7.07	7.22	7.04	3.50	8.22	6.25	5.73	1.07	3.40	6.93
SKO-199	11.39	14.18	12.785	7.34	6.11	6.73	9.88	7.70	10.25	9.28	3.77	1.03	2.40	7.96
SKO-196														
RSO-8	8.87	14.69	11.78	6.55	5.16	5.86	10.51	9.80	12.10	10.80	5.74	2.08	3.91	8.39
OL-1804	9.35	14.64	11.995	6.37	5.65	6.01	9.26	9.40	13.78	10.81	7.65	1.52	4.59	8.62
OS-406	8.99	14.49	11.74	5.79	6.04	5.92	9.43	8.90	9.25	9.19	4.08	2.37	3.23	7.70
KENT (NC)	10.36	14.28	12.32	5.61	4.45	5.03	6.60	6.60	10.03	7.74	8.10	1.53	4.82	7.51
OS-6 (NC)	7.80	14.23	11.015	6.24	6.28	6.26	8.83	7.30	11.60	9.24	6.06	1.73	3.90	7.79
OL-125 (NWZ)	8.22	14.28	11.25											11.25
JHO99-2 (NEZ)				6.66	4.33	5.50								5.50
JHO-822 (CZ)							8.04	6.20	11.10	8.45				8.45
JHO-2000-4 (SZ)											5.37	1.35	3.36	3.36
SEm±	0.55	0.15		0.23	0.25	0.24	0.26	0.21	0.51		0.85	0.10	0.48	
CD (P=0.05)	1.62	0.46		0.66	0.73	0.69	0.77	0.06	1.51		2.68	0.29	1.49	
Nitrogen levels (kg/ha)														
40	6.76	13.27	10.015	6.04	4.71	5.38	8.19	6.00	8.49	7.56	6.08	1.24	3.66	5.94
80	9.01	14.14	11.575	6.47	4.95	5.71	9.03	7.80	11.23	9.35	6.88	1.56	4.22	7.12
120	11.10	14.65	12.875	6.60	7.74	10.47	10.71	8.40	13.02	23.45	0.30	2.05	1.33	7.49
SEm±	0.17	0.34		0.10	0.09		0.09	0.63	0.20		0.87	0.06		
CD (P=0.05)	0.47	13.27		0.28	0.26		0.25	1.18	0.58		16.00	0.16		
Interaction V x N														
S.Em. ±	0.17			0.16	0.12		0.30	0.32	0.67		0.86	0.19		
C.D. at 5 %	0.47			0.48	0.35		0.86	0.95	1.93		NS	0.53		
C.V.%	10.60			10.57	3.14		5.58		11.05		4.72			

R-15-AST -9 (d): Interaction effect of crude protein (%) of oat entries and N levels (AVT-2 SC)

Treatments	Crude protein (%)								
	NWZ	NEZ			CZ	SZ			Over all mean
	Ludhiana	Jorhat	Kalyani	Mean	Rahuri	Hyderabad	Mandya	Mean	
RO-11-1	8.25	8.55	7.26	7.91	9.72	8.76	4.08	6.42	7.77
JO-04-18	9.43	7.49	11.87	9.68	9.04	10.18	4.22	7.20	8.71
OL-1689	5.98	8.17	6.22	7.20	9.48	9.33	3.64	6.49	7.14
SKO-198	5.77	8.11	10.33	9.22	7.78	9.03	3.21	6.12	7.37
SKO-199	8.78	8.22	8.24	8.23	9.53	7.76	4.53	6.145	7.84
RSO-8	6.65	8.02	6.49	7.26	9.04	7.86	3.78	5.82	6.97
OL-1804	7.67	8.13	6.74	7.44	10.21	8.63	3.51	6.07	7.48
OS-406	7.83	8.05	7.97	8.01	8.16	7.70	4.8	6.25	7.42
KENT (NC)	7.83	8.15	6.66	7.41	8.75	9.8	3.93	6.87	7.52
OS-6 (NC)	6.97	8.00	9.18	8.59	9.04	8.3	3.93	6.115	7.57
OL-125 (NWZ)	6.22				--				6.22
JHO99-2 (NEZ)		7.83	7.97	7.90	--				7.90
JHO-822 (CZ)					9.38				9.38
JHO-2000-4 (SZ)					--	7.86	3.93	5.90	5.90
SEm+	0.13	0.04	0.14		0.21	0.44	0.21	0.33	
CD (P=0.05)	0.38	0.12	0.41		0.64	1.4	0.61	1.01	
Nitrogen levels (kg/ha)									
40	6.57	8.01	8.58	8.30	7.9	8.04	4.01	8.04	7.19
80	7.33	8.07	7.06	7.57	9.32	8.87	3.87	6.44	7.42
120	8.3	8.12	8.62	8.37	10.09	9.05	4.02	6.46	8.03
SEm+	0.05	0.02	0.07		0.07	0.27	0.1		
CD (P=0.05)	0.14	0.07	0.19		0.2	0.79	NS		
Interaction									
SEm+	0.22	0.12	0.11		0.24	0.77	0.32		
CD (P=0.05)	0.48	1.47	0.28		0.69	NS	0.91		
CV (%)	5.23	0.04			4.63	8.93			

R-15-AST -9 (e): Effect of oat entries and N levels on plant height (cm) of (AVT-2 SC)

Plant height (cm)															
Treatments	NWZ				NEZ			CZ				SZ			Overall Mean
	Hisar	Ludhiana	Pantnagar	Mean	Jorhat	Kalyani	Mean	Anand	Jabalpur	Rahuri	Mean	Hyderabad	Mandya	Mean	
RO-11-1	135.90	123.00	165.00	141.30	174.60	165.60	170.10	131.80	124.20	113.11	123.04	102.89	85.93	94.41	132.20
JO-04-18	135.90	86.30	141.00	121.07	113.20	133.60	123.40	105.20	111.00	85.44	100.55	66.72	75.51	71.12	105.39
OL-1689	135.90	125.20	159.00	140.03	126.31	160.70	143.51	126.20	111.90	113.33	117.14	96.55	82.84	89.70	123.79
SKO-198	135.90	134.50	163.00	144.47	113.73	115.20	114.47	132.60	92.10	84.89	103.20	78.50	54.13	66.32	110.46
SKO-199	135.90	127.80	165.00	142.90	119.58	`	120.84	96.60	106.60	91.11	98.10	77.28	27.87	52.58	106.98
SKO-196															
RSO-8	135.90	127.10	149.00	137.33	140.36	164.90	152.63	134.00	118.50	118.56	123.69	104.33	95.33	99.83	123.69
OL-1804	135.90	114.00	156.00	135.30	139.64	161.30	150.47	108.30	114.40	103.33	108.68	93.00	75.36	84.18	124.30
OS-406	137.80	112.00	171.00	140.27	139.42	152.10	145.76	123.40	109.50	105.89	112.93	92.44	80.23	86.34	121.40
KENT (NC)	135.90	115.50	160.00	137.13	137.87	145.40	141.64	106.80	99.00	102.00	102.60	81.05	78.73	79.89	116.23
OS-6 (NC)	135.90	97.90	155.00	129.60	130.36	158.30	144.33	96.10	109.00	111.44	105.51	95.83	82.97	89.40	117.28
OL-125 (NWZ)	135.90	110.90	164.00	136.93											136.93
JHO99-2 (NEZ)					138.22	154.50	146.36								146.36
JHO-822 (CZ)								113.20	100.80	108.56	107.52				107.52
JHO-2000-4 (SZ)												81.00	74.45	77.73	77.73
SEm+	3.60	3.40	0.68		8.51	2.23		3.74	1.54	3.03	6.10	5.46	3.43	4.45	126.43
CD (P=0.05)	10.10	10.00	2.00		24.91	6.53		11.06	4.30	8.94	8.10	17.20	10.11	13.66	
Nitrogen levels (kg/ha)															
40	118.90	111.00	158.00	129.30	129.84	141.80	129.84	110.20	98.00	98.30	102.17	84.52	65.82	75.17	111.94
80	129.20	117.40	159.00	135.20	132.82	148.40	137.31	116.60	111.70	103.58	110.63	88.35	76.12	82.24	118.95
120	133.30	119.10	158.00	136.80	139.15	155.40	143.78	120.70	116.80	108.39	115.30	91.58	79.89	85.74	108.49
SEm+	1.90	1.20	0.35		1.78	1.54		1.62	1.22	1.24		1.53	1.19		
CD (P=0.05)	5.30	3.40	NS		5.21	4.51		4.61	4.50	3.53		4.47	3.39		
Interaction															
SEm+		5.81	1.17		NS	1.24		5.36	4.20	4.11		4.38	3.95		
CD (P=0.05)	6.20	NS	3.31		19.06	3.66		NS	12.36	NS		NS	11.27		
CV (%)	8.40	8.70			3.08	8.52		8.01	9.52	7.03		10.72			

R-15-AST -9 (f): Effect of oat entries and N levels on Tillers per row length of (AVT-2 SC)

Treatments	Tillers per row length										
	NWZ				NEZ			CZ		Mean	Overall Mean
	Hisar	Ludhiana	Pantnagar	Mean	Jorhat	Kalyani	Mean	Anand	Rahuri		
RO-11-1	92.90	63.10	78.78	78.26	88.00	88.60	88.30	79.00	71.33	75.17	80.24
JO-04-18	88.70	61.70	76.56	75.65	90.00	84.20	87.10	77.00	135.33	106.17	87.64
OL-1689	90.80	63.20	73.56	75.85	95.00	89.90	92.45	74.00	69.67	71.84	79.45
SKO-198	69.30	67.80	75.11	70.74	81.00	94.40	87.70	75.00	99.00	87.00	80.23
SKO-199	87.90	66.80	78.00	77.57	87.00	81.30	84.15	78.00	80.89	79.45	79.98
SKO-196									--		
RSO-8	91.50	65.30	77.78	78.19	88.00	92.30	90.15	78.00	66.00	72.00	79.84
OL-1804	76.60	62.70	75.22	71.51	97.00	82.10	89.55	75.00	75.89	75.45	77.79
OS-406	92.00	62.80	74.22	76.34	93.00	86.40	89.70	74.00	75.44	74.72	79.69
KENT (NC)	90.90	62.80	77.00	76.90	78.00	90.80	84.40	77.00	100.33	88.67	82.40
OS-6 (NC)	87.30	61.80	76.44	75.18	88.00	80.80	84.40	77.00	84.67	80.84	79.43
OL-125 (NWZ)	80.40	62.10	76.78	73.09					--		73.09
JHO99-2 (NEZ)					77.00	91.90	84.45		--		84.45
JHO-822 (CZ)								76.00	89.00	82.50	82.50
JHO-2000-4 (SZ)									--		
SEm±	3.30	0.99	0.96		5.39	1.11		3.10	3.47		2.62
CD (P=0.05)	9.40	2.95	2.71		NS	3.25		9.15	10.23		6.28
Nitrogen levels (kg/ha)											
40	82.00	62.90	77.24	74.05	86.00	69.30	77.65	76.00	77.06	76.53	75.57
80	87.60	63.90	76.94	76.15	87.00	88.20	87.60	72.00	85.48	78.74	78.96
120	88.90	64.10	74.76	75.92	90.00	105.00	97.50	75.00	95.88	85.44	83.32
SEm±	1.70	0.55	0.50		0.99	2.53		0.50			
CD (P=0.05)	4.90	NS	1.42		2.89	7.41		0.10	1.79		
Interaction V x N											
SEm±	5.80		1.66		18.37	2.04		3.06	5.93		
CD (P=0.05)	NS		4.71		NS	5.97		8.73	NS		
CV (%)	11.60	4.68			1.71	4.51		7.27	11.27		

R-15-AST -9 (f): Effect of oat entries and N levels on leaf stem ratio of (AVT-2 SC)

Leaf stem ratio														
Treatments	**NWZ**			**NEZ**			**CZ**				**SZ**			**Overall Mean**
	Ludhiana	**Pantnagar**	**Mean**	**Jorhat**	**Kalyani**	**Mean**	**Anand**	**Jabalpur**	**Rahuri**	**Mean**	**Hyderabad**	**Mandya**	**Mean**	
RO-11-1	0.81	0.40	0.61	1.05	0.83	0.94	0.67	0.68	0.48	0.61	0.31	0.71	0.51	0.66
JO-04-18	1.29	0.37	0.83	0.99	0.79	0.89	0.51	0.59	0.54	0.55	0.58	0.78	0.68	0.72
OL-1689	0.93	0.36	0.65	1.10	0.98	1.04	0.71	0.52	0.58	0.60	0.44	0.78	0.61	0.71
SKO-198	0.77	0.38	0.58	1.03	0.92	0.98	0.63	0.46	0.58	0.56	0.29	0.43	0.36	0.61
SKO-199	0.88	0.39	0.64	1.11	0.84	0.98	0.45	0.63	0.66	0.58	0.38	0.56	0.47	0.66
SKO-196														
RSO-8	0.78	0.42	0.60	1.02	0.86	0.94	0.70	0.67	0.48	0.62	0.30	0.67	0.49	0.66
OL-1804	0.75	0.38	0.57	1.03	0.93	0.98	0.60	0.60	0.49	0.56	0.38	0.77	0.58	0.66
OS-406	1.03	0.39	0.71	0.99	0.90	0.95	0.46	0.56	0.50	0.51	0.38	0.75	0.57	0.66
KENT (NC)	1.00	0.41	0.70	0.87	0.75	0.81	0.63	0.52	0.49	0.55	0.35	0.66	0.51	0.63
OS-6 (NC)	0.94	0.40	0.67	1.04	0.78	0.91	0.41	0.59	0.37	0.46	0.30	0.61	0.45	0.60
OL-125 (NWZ)	0.79	0.40	0.59											0.60
JHO99-2 (NEZ)				0.89	0.92	0.91								0.91
JHO-822 (CZ)							0.58	0.52	0.53	0.54				0.54
JHO-2000-4 (SZ)											0.46	0.73	0.59	0.60
SEm+	0.02	0.01		0.06	0.03			0.03	0.03		0.04	0.03		
CD (P=0.05)	0.07	NS		NS	0.08			0.08	0.10		0.14	0.09		
Nitrogen levels (kg/ha)														
40	0.96	0.38	0.67	1.08	0.92		0.48	0.53	0.44	0.48	0.35	0.53	0.44	0.63
80	0.88	0.39	0.63	0.89	0.85	1.00	0.57	0.60	0.52	0.56	0.37	0.69	0.53	0.64
120	0.87	0.40	0.63	1.06	0.84	0.87	0.67	0.54	0.59	0.60	0.42	0.80	0.61	0.69
SEm+	0.01	0.01	0.01	0.04	0.02	0.95		0.01	0.02		0.02	0.02		
CD (P=0.05)	0.03	NS		0.12	0.05	0.12		0.03	0.04		0.06	0.04		
Interaction														
SEm+		0.04	0.04	NS	0.01			0.01	0.05		17.40	0.05		
CD (P=0.05)	8.04	0.10	4.07	16.88	0.02	16.88		0.03	NS		0.06	0.14		
CV (%)	8.09		8.09	0.07		0.07		6.29	16.98		NS			

R-14-AST-10: Effect of N levels on forage yield of promising entries of oat (AVT-2 MC)

Locations

Hill zone: Palampur, Srinagar
North West Zone: Ludhiana, Hisar,
North East Zone: Pusa, Ranchi,
Central Zone: Anand, Jabalpur, Rahuri

In Oat (Multi cut), Two entries (JO-4-317 and OL-1802) along with three national checks namely Kent, RO-19 and UPO-212 were evaluated at 9 locations across the four zones in the country.

In hill zone, the data from only one center (Palampur) has been reported. The data from Srinagar centre could not be received. At Palampur center, JO-4-317 performed better (257.29q green and 49.5q dry matter/ha) followed by Kent (NC). The entry was superior to Kent (NC) by 2.36% and 4.87% in terms of GFY and DFY respectively. The entry responded significantly to N doses up to 120 kg/ha and recorded 14.4 and 33.84% kg higher on 80 and 40 kg N/ha respectively.

In North West zone, OL-1802 performed better (525.2q green and 90.30q dry matter/ha) followed by entry JO-4-317(515.9q green and 87.5q dry matter /ha). The entry was superior to best national check RO-19 (NC) by 8.27% and 10.89% in terms of GFY and DFY respectively. The entry responded significantly to N doses up to 120 kg/ha at both centers and recorded 11.73% and 38.14% higher GFY over 80 and 40 kg N/ha, respectively on zonal mean basis.

In North East zone, no entry could outperform the Kent (NC). Among the entries, JO-4-317 was better than OL-1802 and recorded 33.74% higher GFY over OL-1802 but was 42.46% lower to Kent in terms of GFY. The entries responded significantly to increasing N dose up to 120kg/ha. An increase of 10.37% and 34.49% was recorded with 120 kg N/ha over 80 and 40 kg N/ha respectively.

In Central zone, OL-1802 performed better (610.3q green and 119.5q dry matter/ha) followed by RO-19 (NC). The entry was superior to RO-19 (NC) by 5.51% and 14.90% in terms of GFY and DFY respectively. The entry reported significantly to N doses up to 120 kg/ha and received 7.48% and 22.94% kg higher on 80 and 40 kg N/ha respectively. The interaction effect of entries varieties was significant only Jabalpur center.

On all India mean basis, both the entries remained on par with each other on terms of GFY. However in terms of DFY OL_1802 was better and recorded 8.27% higher DFY over JO-4-317. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (483.5 q green and 98.8 q dry matter/ha).

Table R-14-AST-10 (a): Effect of N levels on green forage yield of promising entries of oat (AVT-2 MC)

Treatments	Green fodder yield (q/ha)											
	HZ	NWZ			NEZ			CZ				Over all Mean
	Palampur	Hisar	Ludhiana	Mean	Pusa	Ranchi	Mean	Anand	Jabalpur	Rahuri	Mean	
JO-4-317	251.2	410.9	620.9	515.9	399.0	254.2	326.6	396.0	548.3	681.8	542.0	445.3
OL-1802	217.6	460.9	589.4	525.2	233.0	255.5	244.2	464.0	607.8	759.2	610.3	448.4
Kent (NC)	245.4	355.4	436.9	396.2	366.0	329.8	347.9	393.0	608.6	600.5	534.0	416.9
RO-19 (NC)	218.8	424.1	546.1	485.1	291.0	334.3	312.6	457.0	570.8	707.3	578.4	443.7
UPO-212 (NC)	238.3	393.6	557.3	475.5	249.0	212.5	230.8	369.0	540.4	705.0	538.1	408.1
SEm±	3.72	15.60	11.01			2.96		11.82	18.36	28.78		
CD (P=0.05)	14.36	44.90	36.46		14.30	9.65		36.87	48.36	88.69		
Nitrogen levels (kg/ha)												
40	200.3	334.0	461.3	397.7	242.0	250.3	246.1	381.0	479.0	635.5	498.5	372.9
80	234.3	421.1	562.2	491.7	320.0	279.7	299.9	412.0	603.6	695.0	570.2	441.0
120	268.1	471.9	626.9	549.4	360.0	302.1	331.0	454.0	642.9	741.8	612.9	483.5
SEm±	6.11	12.10	6.69			1.78		5.92	16.23	19.13		
CD (P=0.05)	20.82	34.80	19.88		12.80			17.46	54.60	55.25		
Interaction												
SEm±		27.1	19.07			5.13		13.23	15.41	42.78		
CD (P=0.05)		NS	46.75			12.29		NS	45.36	NS		
CV (%)	11.71	13.30	6.00			5.25		5.52	14.12	12.38		

Table R-14-AST-10 (b): Effect of N levels on dry matter yield of promising entries of oat (AVT-2 MC)

Treatments	Dry matter yield (q/ha)									
	HZ	NWZ			NEZ	CZ				Overall mean
	Palampur	Hisar	Ludhiana	Mean	Ranchi	Anand	Jabalpur	Rahuri	Mean	
JO-4-317	49.5	79.2	95.7	87.5	84.0	67.4	108.8	133.5	103.2	88.3
OL-1802	42.0	90.96	90.30	90.6	87.6	80.4	126.0	152.1	119.5	95.6
Kent (NC)	47.2	70.9	62.8	66.8	114.0	71.3	125.6	119.6	105.5	87.3
RO-19 (NC)	42.0	83.5	79.8	81.7	115.7	70.9	120.2	121.0	104.0	90.4
UPO-212 (NC)	44.4	78.2	86.1	82.2	72.9	65.7	110.4	140.7	105.6	85.5
SEm±	1.33	2.91	2.49		1.01	1.97	1.25	5.29		
CD (P=0.05)	4.52	8.33	8.23		3.31	6.14	4.52	16.32		
Nitrogen levels (kg/ha)										
40	38.0	65.8	68.8	67.3	85.5	67.6	93.5	122.7	94.6	77.4
80	45.5	84.5	85.4	85.0	95.5	72.5	126.5	134.3	111.1	92.0
120	51.6	91.4	94.5	92.9	103.3	73.3	134.6	143.1	117.0	98.8
SEm±	1.18	2.25	1.25		0.60	0.94	2.44	3.18		
CD (P=0.05)	4.03	6.49	3.71		1.78	2.78	6.88	9.18		
Interaction										
SEm±		5.08			1.76	2.11	1.52	7.11		
CD (P=0.05)		NS			4.18	NS	4.63	NS		
CV (%)	11.82	12.5	8.99			5.13	5.56	10.66		

Table R-14-AST-10 (b-1): Interaction effect of N levels and promising entries of oat on GFY and CPY (q/ha) of (AVT-2 MC) at Ludhiana

Treatments	GFY (q/ha)				CPY (q/ha)			
	Nitrogen levels (kg/ha)				Nitrogen levels (kg/ha)			
	40	80	120	Mean	40	80	120	Mean
JO-4-317	499.2	637.8	725.8	**620.9**	5.96	8.57	9.76	**8.10**
OL-1802	497.5	614.7	655.8	**589.4**	5.78	8.25	9.71	**7.91**
Kent (NC)	379.2	442.8	488.9	**436.9**	3.97	5.16	6.65	**5.26**
RO-19 (NC)	470.6	555.3	612.5	**546.1**	4.89	7.33	8.50	**6.91**
UPO-212 (NC)	460.0	560.6	651.4	**557.3**	5.20	7.56	9.97	**7.58**
Mean	461.3	562.2	626.9		5.16	7.37	8.92	
SEm±	19.07				0.46			
CD (P=0.05)	46.75				0.79			

Table R-14-AST-10 (b-2): Interaction effect of N levels and promising entries of oat on GFY and DMY (q/ha) at Ranchi

Entries	GFY (q/ha)				DMY (q/ha)			
	Nitrogen levels (Kg/ha)				Nitrogen levels (Kg/ha)			
	40	80	120	Mean	40	80	120	Mean
JO-4-317	220.5	261.2	282.4	**254.2**	72.4	85.8	93.7	**84.0**
OL-1802	216.0	261.8	288.6	**255.5**	74.1	89.8	98.9	**87.6**
Kent (NC)	310.9	323.2	355.2	**329.8**	107.4	111.6	122.7	**113.9**
RO-19 (NC)	310.9	336.1	355.7	**334.3**	107.5	116.3	123.1	**115.7**
UPO-212 (NC)	192.9	216.2	228.4	**212.5**	66.1	74.1	78.3	**72.9**
Mean	**250.3**	**279.7**	**302.1**		**85.5**	**95.5**	**103.3**	
Between N at same T		S. Em	5.13		1.76			
		CD at 5%	12.29		4.18			

Table R-14-AST-10 (b-3): Interaction effect of N levels and promising entries of oat on GFY, DMY, CPY (q/ha) at Jabalpur

Entries	GFY (q/ha)				DMY (q/ha)				CPY (q/ha)			
	N_{40}	N_{80}	N_{120}	Mean	N_{40}	N_{80}	N_{120}	Mean	N_{40}	N_{80}	N_{120}	Mean
JO-4-317	460.0	573.9	611.0	**548.3**	89.0	115.1	122.4	**108.8**	6.5	8.9	9.4	**8.3**
OL-1802	513.9	631.2	678.4	**607.8**	100.7	133.7	143.8	**126.0**	7.7	10.6	11.3	**9.9**
Kent (NC)	526.9	634.2	664.7	**608.6**	102.6	134.0	140.2	**125.6**	7.5	10.2	10.8	**9.5**
RO-19 (NC)	483.2	585.5	643.9	**570.8**	95.8	126.2	138.6	**120.2**	7.2	9.8	10.8	**9.3**
UPO-212 (NC)	411.4	593.2	616.7	**540.4**	79.3	123.6	128.3	**110.4**	5.9	9.4	9.8	**8.4**
Mean	**479.0**	**603.6**	**642.9**		**93.5**	**126.5**	**134.6**		**7.0**	**9.7**	**10.4**	
	SEm±	**CD**	**CV**									
V x N	15.41	45.36	14.12		**V xN**	1.52	4.63	5.56	**V x N**	0.75	2.31	3.31

Table R-14-AST-10 (c): Effect of N levels on crude protein yield and crude protein (%) of promising entries of oat (AVT-2 MC)

Entries	Crude protein yield (q/ha)										Crude protein (%)	
	HZ	NWZ			NEZ	CZ				Overall Mean		
	Pala-mpur	Ludh-iana	His-ar	Mean	Ran-chi	Ana-nd	Jabal-pur	Rah-uri	Mean		Rah-uri	His-ar
JO-4-317	4.77	8.10	11.35	9.73	7.64	9.63	8.30	8.81	8.91	8.37	9.66	14.34
OL-1802	3.79	7.91	12.1	10.01	8.29	11.54	9.90	10.14	10.53	9.10	9.10	13.32
Kent (NC)	4.22	5.26	9.69	7.48	10.64	9.82	9.50	7.63	8.98	8.11	9.97	13.59
RO-19 (NC)	4.19	6.91	11.04	8.98	10.81	10.11	9.30	6.31	8.57	8.38	8.74	13.23
UPO-212 (NC)	4.62	7.58	11.19	9.39	7.15	9.10	8.40	8.19	8.56	8.03	8.51	14.32
SEm+	0.18				0.11	0.30	0.96	0.27			0.26	
CD (P=0.05)	0.66	0.88	-		0.36	0.94	2.61	0.85			0.80	0.06
Nitrogen levels (kg/ha)												
40	3.27	5.16	8.45	6.81	7.90	8.70	7.00	7.24	7.65	6.82	8.55	
80	4.34	7.37	11.47	9.42	8.94	10.11	9.70	8.38	9.40	8.62	9.19	12.85
120	5.35	8.92	12.87	10.90	9.89	11.32	10.40	9.03	10.25	9.68	9.84	13.58
SEm+	0.12				0.05	0.16	0.84	0.22			0.23	14.09
CD (P=0.05)	0.40	0.33			0.16	0.47	2.51	0.65			0.69	0.05
Interaction V x N												
S.Em. ±		0.46			0.19	0.35	0.75	0.50			0.53	
C.D. at 5 %		0.79			NS	NS	2.31	NS			NS	0.15
C.V.%	12.30	0.27				6.09	3.31	12.31			11.65	NS

Table R-14-AST-10 (d): Effect of N levels on plant height and leaf stem ratio of promising entries of oat (AVT-2 MC)

Entries	Plant height (cm)							Leaf stem ratio		
	HZ	NWZ	CZ				Overall Mean	Jabalpur	Rahuri	Mean
	Palampur	Hisar	Anand	Jabalpur	Rahuri	Mean				
JO-4-317	83.40	87.90	87.73	90.90	80.98	86.54	86.18	0.76	1.52	1.14
OL-1802	84.50	89.90	89.07	99.80	86.48	91.78	89.95	0.81	1.65	1.23
Kent (NC)	84.60	83.20	79.78	100.00	74.04	84.61	84.32	0.81	1.59	1.20
RO-19 (NC)	82.90	86.80	95.00	89.40	84.31	89.57	87.68	0.74	1.22	0.98
UPO-212 (NC)	86.40	83.80	83.52	84.70	79.36	82.53	83.56	0.74	1.53	1.14
SEm±	0.43	1.45	1.72	2.64	1.33			0.02	0.05	
CD (P=0.05)	1.65	4.19	5.36	5.62	4.12			0.06	0.16	
Nitrogen levels (kg/ha)										
40	75.60	82.60	82.96	82.30	76.85	80.70	80.06	0.72	1.32	1.02
80	85.80	87.10	87.45	95.90	80.85	88.07	87.42	0.80	1.51	1.16
120	91.60	89.30	90.65	100.60	85.40	92.22	91.51	0.81	1.68	1.25
SEm±	1.13	1.13	0.85	2.34	1.22			0.01	0.03	
CD (P=0.05)	3.86	3.25	2.50	6.21	3.52			0.04	0.09	
Interation										
SEm±		2.53	1.9	2.36	2.72			0.02	0.07	
CD (P=0.05)		NS	NS	5.84	NS			0.06	NS	
CV (%)	8.01	5.90	3.78	6.30				3.50	9.63	

Table R-14-AST-10 (e): Effect of N levels on No. of Tillers, Net return and B: C Ratio of promising entries of oat (AVT-2 MC)

Entries	No. of Tillers/ m square					Net Return (Rs.)	B:C Ratio
	Palampur	Hisar	Anand	Rahuri	Mean	Ranchi	Ranchi
JO-4-317	104.40	102.50	88.00	53.92	70.96	25391	0.99
OL-1802	103.20	96.30	89.00	43.46	66.23	25540	0.99
Kent (NC)	100.30	99.90	97.00	58.29	77.65	40403	1.58
RO-19 (NC)	102.70	90.00	79.00	59.71	69.36	41300	1.61
UPO-212 (NC)	101.40	87.40	91.00	55.46	73.23	16954	0.66
SEm±	1.53	0.83	2.38	5.10		592	0.02
CD (P=0.05)	NS	2.40	7.43	NS		1930	0.07
Nitrogen levels (kg/ha)							
40	89.3	90.1	81	49.98	65.49	25050	1.00
80	105.1	96.7	90	53.5	71.75	30391	1.19
120	112.8	98.8	95	59.03	77.02	34311	1.30
SEm±	0.85	0.64	1.77	2.05		356	0.01
CD (P=0.05)	2.88	1.83	5.22	5.93		1050	0.04
CV (%)							
Interation							
SEm±		1.40	3.95	4.59		1026	0.04
CD (P=0.05)		NS	NS	NS		2459	0.09
CV (%)	8.69	6.00	7.71	16.97			

PS-14-AST-4: Studies on the effect of planting geometry of tall fescue grass and seed rates of white clover in wet temperate conditions

Locations: Palampur and Srinagar

The experiment was initiated at two locations *viz*. Palampur and Srinagar during *Rabi* season of 2014-15, with the objectives to see the effect of tall fescue grass and white clover compounding on forage productivity, quality, soil NPK and carbon (SOC). The 11 treatments consisted of three planting geometry of tall fescue grass and three seed rates of white clover, plus sole stand of tall fescue grass and white clover has been laid out in randomized block design with three replications. The results revealed that tall fescue grass has better plant height at closer spacing of 20 x 30 cm. The plant height decreased with increase in plant spacing of tall fescue grass as well as with increase in seed rate of white clover at each planting geometry of tall fescue grass. Taller plants of white clover were noticed in its sole stand. White clover with seed rate of 2 kg/ha resulted in tall plants of white clover in each planting geometry. Leaf stem ratio of tall fescue grass also increased with increasing seed rate of white clover irrespective of planting geometry of tall fescue grass. Leaf stem ratio of tall fescue grass was better in T_6-tall fescue 30x 30 cm + white clover 3.0kg/ha. The per cent proportion of tall fescue grass decreased with increase in planting space as well as increased seed rate of white clover, whereas, proportion of white clover increased in all the planting systems with increase in its seed rate.

Treatments T_6- tall fescue 30 x 30 cm + white clover 3.0kg/ha produced higher green fodder yield (356.46 q/ha),whereas, treatment T_4- tall fescue 30 x 30 cm + white clover 1.0kg/ha produced higher dry fodder yield (84.94q/ha). Higher crude protein was noticed in sole while clover and minimum in sole tall fescue grass, among other treatments no significant difference was observed. The crude protein yield was higher in T_2 – tall fescue grass 20x30 cm + white clover 2.0 Kg/ha and followed by T_6- tall fescue 30 x 30 cm + white clover 3.0kg/ha. Higher net returns (Rs.71005/ha), B:C (3.92) and LER (1.76) were indicated in T_6- tall fescue 30 x 30 cm + white clover 3.0kg/ha. Soil nitrogen increased with increasing seed rate of white clover.

Code	Treatments	Code	Treatments
T_1	TFG 20x30 cm + WC 1.0 Kg/ha	T_7	TFG 40x40 cm + WC 1.0 Kg/ha
T_2	TFG 20x30 cm + WC 2.0 Kg/ha	T_8	TFG 40x40 cm + WC 2.0 Kg/ha
T_3	TFG 20x30 cm + WC 3.0 Kg/ha	T_9	TFG 40x40 cm + WC 3.0 Kg/ha
T_4	TFG 30x30 cm + WC 1.0 Kg/ha	T_{10}	Sole TFG 30 x 30 cm
T_5	TFG 30x30 cm + WC 2.0 Kg/ha	T_{11}	Sole WC 6.0 kg/ha
T_6	TFG 30x30 cm + WC 3.0 Kg/ha		
TFG- Tall fescue grass		WC- White clover	

Table PS-14-AST-4a: Effect of treatments on growth of tall fescue grass and white clover (Palampur)

Treatments	Mean Plant height (cm)		Mean L:S		Mean % proportion of species	
	TFG	WC	TFG	WC	TFG	WC
T_1	53.3	19.8	1.46	1.61	71.6	28.4
T_2	53.2	25.1	1.71	1.80	63.8	36.2
T_3	47.5	23.0	1.93	1.90	65.7	34.3
T_4	49.4	23.2	1.46	1.49	61.5	38.5
T_5	50.7	28.0	1.68	1.59	60.8	39.2
T_6	54.4	23.0	2.01	1.81	61.3	38.7
T_7	49.6	23.5	1.36	1.92	63.9	36.1
T_8	49.4	25.7	1.39	1.82	62.7	37.3
T_9	46.1	23.6	1.69	1.69	58.5	41.5
T_{10}	46.9	-	1.76	-	100	0
T_{11}	-	30.1	-	1.88	0	100
SEM±	1.6	1.1	0.07	0.08	7.6	1.8
CD (P=0.05)	4.5	3.1	0.19	0.22	7.4	5.1
CV %	5.5	7.8	7.4	7.9	7.6	7.2

Table PS-14-AST-4b: Effect of treatments on yield, quality and economics of tall fescue grass and white clover (Palampur)

Treatments	Total green fodder yield (q/ha)	Total Dry fodder yield (q/ha)	Crude protein yield (q/ha)	Mean Crude protein content (%)	Net returns (Rs. /ha)	B:C ratio	LER
T_1	296.64	77.13	11.81	15.3	57515	3.46	1.50
T_2	339.40	81.46	12.12	14.9	67239	3.82	1.42
T_3	341.65	75.16	10.85	14.4	67800	3.85	1.71
T_4	319.73	84.94	13.00	15.3	62321	3.54	1.34
T_5	339.75	78.14	11.96	15.3	66829	3.69	1.68
T_6	356.46	78.42	12.01	15.3	71005	3.92	1.76
T_7	291.70	67.09	10.56	15.7	56512	3.44	1.54
T_8	338.73	71.13	10.89	15.3	67070	3.81	1.68
T_9	336.02	67.20	10.29	15.3	66393	3.77	1.65
T_{10}	184.61	48.00	4.62	9.6	31843	2.23	-
T_{11}	238.72	42.97	8.65	20.1	45120	3.10	-
SEM+	6.72	2.64	0.42	0.3	-	-	-
CD (P=0.05)	19.76	7.76	1.23	0.9	-	-	-
CV %	6.8	10.6	8.4	2.8	-	-	-

Table PS-14-AST-4c: Effect of treatments on soil properties (Palampur)

Treatment	N (kg/ha)	P (kg/ha)	K (kg/ha)	pH	Total soil organic carbon (tonnes carbon/ha)
T_1	208	19	259	5.6	7.12
T_2	217	18	261	5.6	7.02
T_3	236	17	260	5.6	7.17
T_4	212	18	263	5.7	7.12
T_5	224	19	259	5.7	7.16
T_6	238	18	258	5.5	7.07
T_7	214	18	262	5.6	6.95
T_8	220	18	263	5.7	7.02
T_9	248	18	264	5.5	6.98
T_{10}	215	19	264	5.5	6.88
T_{11}	248	16	265	5.5	7.07
Initial value	212	17	242	5.7	6.91

R-14-AST-1: Studies on the production potential feasibility of annual rye grass with berseem in hill zone

Locations: Palampur and Srinagar

The experiment was started in*Rabi* 2014-15 under coordinated mode at Srinagar and Palampur centres to study the production potential feasibility of rye grass with berseem in hill zone. The experiment consisted of thirteen treatments having three genotypes of rye grass and four different seed ratios of rye grass: berseem plus sole stand of berseem was conducted in randomized block design. The results revealed that the plant height and leaf stem ratio was better in Punjab rye grass and ATMA rye grass than Kashmir collection. The proportion of species in each treatment was in agreement with the respective seed rate used in different treatments. The herbage yield in all the genotypes decreased with increasing seed proportion of berseem. Among different treatments T_9- ATMA rye grass (pure stand) produced higher green fodder yield (659.93 q/ha) and was at par with T_{10} i.e. ATMA rye grass + berseem with seed rate in 75:25 ratio. Treatments T_9 and T_{10} remaining at par with each other also produced higher dry fodder yields of 140.19 and 139.91 q/ha, respectively. The crude protein content and crude protein yield in all the genotypes increased with increasing proportion of berseem. Higher content of crude protein was observed in sole berseem and higher crude protein yield was obtained in T_{10}- ATMA rye grass + berseem (50:50), which was closely followed by T_{11}- ATMA rye grass + berseem (75:25) and T_9 - ATMA rye grass(100:0). Sole stand of ATMA rye grass indicated maximum net returns (Rs.119583/ha) with higher LER of 2.62. Better B:C ratio was noticed in T_1-sole stand of Punjab rye grass.

Code	Treatments	Code	Treatments
T_1	PRG : B (100:0)	T_8	KRG:B (25:75)
T_2	PRG : B (75:25)	T_9	ARG:B (100:0)
T_3	PRG : B (50:50)	T_{10}	ARG:B (75:25)
T_4	PRG : B (25:75)	T_{11}	ARG:B (50:50)
T_5	KRG:B (100:0)	T_{12}	ARG:B (25:75)
T_6	KRG:B (75:25)	T_{13}	Sole berseem
T_7	KRG:B (50:50)		
PRG- Punjab Rye grass		KRG-Kashmir collection	
ARG- ATMA (HP) Rye grass		B- Berseem	

Table R-14-AST-1a: Effect of treatments on growth of annual rye grass and berseem (Palampur)

Treatments	Mean Plant height (cm)		Mean L:S		Mean % proportion of species	
	Rye grass	Berseem	Rye grass	Berseem	Rye grass	Berseem
T_1	55.6	-	1.81	-	100	0
T_2	54.7	42.2	1.96	0.64	82.1	17.9
T_3	54.3	40.4	1.92	0.66	64.3	35.7
T_4	54.7	37.0	2.03	0.70	49.6	50.4
T_5	52.0	-	0.69	-	100	0
T_6	52.1	40.6	0.80	0.66	72.0	28.0
T_7	50.2	40.0	0.93	0.69	62.2	37.9
T_8	51.4	38.9	0.93	0.71	50.1	49.9
T_9	55.7	-	1.88	-	100	0
T_{10}	53.4	40.0	1.89	0.66	81.6	18.4
T_{11}	54.7	38.9	1.85	0.66	71.1	28.9
T_{12}	55.0	39.0	1.89	0.67	54.5	45.6
T_{13}	-	40.9	-	0.74	**0**	100
SEM±	0.9	1.0	0.07	0.02	3.7	1.8
CD (P=0.05)	2.6	2.9	1.18	0.05	10.8	5.3
CV %	3.9	4.1	6.1	5.1	8.6	7.5

Table R-14-AST-1b: Effect of treatments on yield, quality and economics of annual rye grass and berseem (Palampur)

Treatments	Total green fodder yield (q/ha)	Total Dry fodder yield (q/ha)	Crude protein yield (q/ha)	Mean Crude protein content (%)	Net returns (Rs. /ha)	B:C ratio	LER
T_1	610.77	134.37	15.28	11.37	112160	2.77	1.00
T_2	620.67	122.89	16.12	13.12	110317	2.46	2.55
T_3	584.71	111.68	16.55	14.83	102485	2.35	2.39
T_4	514.38	96.70	17.46	18.08	87395	2.12	2.08
T_5	504.21	113.45	12.88	11.37	86998	2.23	1.00
T_6	465.76	102.47	12.81	12.54	78614	2.08	1.90
T_7	434.82	92.83	13.00	14.00	71616	1.93	1.77
T_8	427.25	81.60	13.55	16.62	69764	1.88	1.72
T_9	659.93	139.91	18.36	13.12	119583	2.63	1.00
T_{10}	637.22	140.19	20.03	14.29	114561	2.56	2.62
T_{11}	628.73	119.46	19.49	16.33	112262	2.50	2.59
T_{12}	532.73	99.62	17.72	17.79	91716	2.21	2.18
T_{13}	418.57	75.34	14.72	19.54	67183	1.79	1.00
SEM+	12.88	2.58	0.52	0.28	-	-	-
CD (P=0.05)	37.59	7.53	1.51	0.85	-	-	-
CV %	5.6	6.8	5.6	3.26	-	-	-

Table R-14-AST-1c: Effect of treatments on soil properties (Palampur)

Treatments	N (kg/ha)	P (kg/ha)	K (kg/ha)	pH	Total soil organic carbon (tonnes carbon/ha)
T_1	205	15	247	5.6	7.06
T_2	217	14	249	5.5	7.02
T_3	226	13	248	5.6	7.17
T_4	229	14	251	5.7	6.83
T_5	206	15	247	5.6	7.16
T_6	208	14	246	5.5	6.96
T_7	214	14	250	5.6	6.95
T_8	220	14	251	5.6	7.02
T_9	213	14	252	5.5	7.06
T_{10}	215	15	252	5.6	6.97
T_{11}	218	12	253	5.5	7.02
T_{12}	225	14	250	5.6	7.18
T_{13}	234	14	258	5.6	6.97
Initial value	212	13	246	5.5	6.91

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

Locations: Palampur and Srinagar

The experiment has been conducted at both the locations and 2015-16 has been considered as year of establishment. Data of the experiment will be reported in Rabi 2016-17.

FORAGE CROP PROTECTION

PPT – 1: Survey of pathogens, insect pests and nematodes associated with Berseem and Oats ecosystems

Objective: To record the occurrence and abundance of major diseases and insect-pests in berseem, lucerne and oat

Locations: Bhubaneswar, Hyderabad, Ludhiana, Rahuri, Palampur

Bhubaneswar: Observations were recorded on oat cv Kent and Berseem CV Mescavi. The crop was sown between 2.11.2015 to 19.11.2015. The disease started appearing in 6th week after sowing and the peak was observed at 8 weeks. In oat, leaf blight caused by *Helminthosporium sp.* and root rot caused by *Sclerotium sp.* were observed. Nematode population was found to increase before sowing and after harvest (Table Bhubaneswar PPT 1).

Table: Bhubaneswar PPT 1

OAT(KENT)								
Diseases / Insects	**1st week**	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
Leaf blight (1-5 grade) (*Helminthosporium* sp.)	-	-	-	-	-	2.2	2.4	2.6
Root rot (%) *Sclerotium* sp.	-	-	-	-	-	6.4	8.2	9.4
Leaf defoliators (No/10 Plants)	-	-	-	-	-	2.6	3.2	4.4
BERSEEM (Mescavi)								
Diseases / Insects	**1st week**	**2nd week**	**3rd week**	**4th week**	**5th week**	**6th week**	**7th week**	**8th week**
Leaf spot and blight (1-5 grade)	-	-	-	-	-	1.6	2.2	2.4
Root rot (Fungal) (%)	-	-	-	-	-	4.4	6.4	8.2
Leaf defoliators (No/10 Plants)	-	-	-	-	-	2.4	3.8	4.2
NEMATODE								
Nematode (Count/250 g soil)	**Before sowing**				**At harvest**			
Helicotylenchus dihystera	168				275			
Hoplolaimus indicus	42				77			
Caloosia exilis	23				42			
Total	233				494			

Palampur: In the *rabi* 2015-16 season oat crop was severely affected by powdery mildew (95 % severity), followed by leaf blights (16%), loose smut (4%) and sucking pest (20%). In Berseem low incidence of root rot (12 %) and moderate to high intensity of leaf spot (30 %) and defoliating beetles (20 %) was observed. Defoliating beetles was the main pest (45 %) of lucerne, whereas only 15 per cent severity of leaf spot was observed (Table Palampur PPT 1).

Table Palampur PPT 1

Crop	**Diseases/ Insect-Pests**	**Date of observations (% Disease severity/incidence)**								
		16.03.15	**23.03.15**	**01.03.15**	**08.04.15**	**15.04.15**	**22.04.15**	**29.04.15**	**06.05.15**	**13.05.15**
Oats	Powdery mildew	15	25	45	70	90	95	95	95	95
	Leaf blights	3	5	7	10	12	14	16	16	16
	Loose smut	-	-	-	-	-	2	3	3	4
	Aphids & Thrips	5	10	15	18	20	-	-	-	-
Berseem	Root rot	5	7	12	-	-	-	-	-	-
	Leaf spot	-	-	-	5	15	25	30	30	30
	Defoliating beetles	-	-	-	-	7	10	12	18	20
Lucerne	Leaf spot	-	-	-	-	5	10	15	15	15
	Defoliating beetles	-	-	-	5	10	258	30	40	45

Hyderabad: Aphid incidence started from 1 std wk and leaf webber damaged plants were seen from 52nd std week in lucerne. Jassids were noticed in Berseem from 51st week while thrips were seen from 2nd std week. Crop was sown on 18.11.15 (Table Hyderabad PPT 1).

Table Hyderabad PPT 1

		Lucerne		Berseem	
Std wk		No.Aphids/ tiller	No. leaf webber damaged tillers/sq.m	No. Jassid/ tillers	No.of Thrips/ tillers
47	19-25 Nov	-		-	-
48	26-2 Dec	-		-	-
49	3-9	-		-	-
50	10-16	-		-	-
51	17-23	-		1.2	-
52	24-31	-	1.6	2.0	-
1	1-7 Jan	4.0	-	1.0	
2	8-14	3.25	-	-	1.4
3	15-21	2.75	-	1.0	-
4	22-28	1.75	-	-	2.0
5	29-4 Feb	-	1.2	1.2	1.2
6	5-11	-	-	-	-
7	12-18	-	0.4	-	-
8	19-25	-	-	-	-
9	26-4 Mar			-	0.3

Ludhiana:

Stem rot of Berseem: Stem rot on Berseem was observed on variety BL-42. Its appearance was first observed at the end of December, 2015. Disease was progressed first slowly and then at faster rate till first week of March, 2016 with maximum disease incidence of 55.6 percent (Table Ludhiana PPT 1). During this period, 8.6-16.0 mm rainfall with moderate temperature of 10.5-20.6ºC and mean relative humidity of 65-87% was observed which increased the disease incidence. Afterwards it became static and developed slowly.

Leaf blight of oat: Leaf blight of oat was appeared on OL-125 variety in the 2nd week of January, 2016. Disease development was slow till first fortnight of February, 2016 and thereafter, it increased at alarming rate upto first week of April, 2016 with favourable temperature between 10.5-27.1ºC, percent relative humidity of 53-87 and 25.9 mm of rainfall which increased the disease severity upto 67.0 percent (Table Ludhiana PPT 1).

Downy mildew of Lucerne: Downy mildew of Lucerne on variety Anand-4 was observed in the 2nd fortnight of January, 2016. Disease progressed at faster rate till first week of March, 2016 with disease severity of 49.6 percent (Table Ludhiana PPT 1). During this period, low temperature range of 9.7-27.1ºC, high relative humidity (85-97%) and high rainfall favoured the disease development. Then the disease progressed at steady pace upto first week of April, 2016 with maximum downy mildew severity of 61.0 percent.

Rust of Lucerne: Lucerne rust was recorded on Anand-4 variety (Table Ludhiana PPT 1). It was appeared in the first week of February, 2016 and progressed slowly till end of February. Then progressed at rapid rate upto end of March, 2016 with maximum disease severity of 29.7 percent with 14.8-27.1ºC temperature and 53-75% of relative humidity favoured the disease progress.

Table Ludhiana PPT 1: Percent disease severity/incidence of diseases of berseem, Lucerne, oat

Crop/ variety	disease	DOO (Date of observation)													
		28/ 12/ 15	04/ 01 /16	11/ 01 /16	18/ 01 /16	25/ 01 /16	01/ 02 /16	08/ 02 /16	15/ 02 /16	22/ 02 /16	29/ 02 /16	07/ 03 /16	15/ 03 /16	22/ 03 /16	29/ 03 /16	05/ 04/ 16
Berseem (BL-42)	Stem Rot	7.7*	15.0	19.3	27.0	33.3	38.8	42.3	44.5	48.8	51.3	55.6				
Oat (OL-125)	Leaf Blight			10.3 *	16.0	23.7	27.3	30.7	36.3	41.7	45.6	49.8	59.0	63.0	65.3	67.0
Lucerne (Anand-4)	Downy Mildew				9.0*	16.3	23.3	28.0	34.3	39.7	45.3	49.6	51.8	55.6	58.3	61.0
	Rust						3.8*	9.0	13.7	16.5	18.6	21.0	25.8	27.0	29.7	

*DOA: Date of appearance

Ludhiana Entomology Observations: The population dynamics of different insect pests in *rabi* forages in context to changing climate scenario was studied.

Population dynamics of major lepidopteran as well as sucking insect pests was studied throughout the cropping season on different crops of *rabi* forages during 2015-16. Two varieties each of berseem (vars. BL-10 and BL-42), oats (vars. Kent and OL-10) and one of lucerne (var. LLC-5) were sown in unreplicated plots (5m x 3m each) on 25.10.2015. The population of lepidopteran insect pests green semilooper, *Trichoplusia orichalcea* and gram caterpillar, *Helicoverpa armigera* was recorded under unprotected conditions from these plots by counting the number of larvae per meter row length at weekly intervals starting at the time of appearance of pest (from I week of April till IV week of May 2016) from three random spots. The population of oat aphid was recorded from the plots of oat varieties by counting the number of aphids per tiller at weekly intervals starting from last week of week January till mid March 2016. Observations on number of lucerne weevils per plant and *H. armigera* larvae per m row length were also recorded at weekly intervals in the months of March and April 2016. The data were pooled and presented in Tables 1a-c.

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 last week of May. The population of *H. armigera* appeared on berseem crop in 3rd week of April and lasted till the IV week of May, with its highest peak during last week of April 2016. Lucerne var. LLC-5 was heavily infested with lucerne weevil from I week of February till mid March 2016 during which its highest peak was observed in the 3rd week of march. The population of oat aphid was comparatively higher as compared to previous year. Maximum population of oat aphid appeared during the last week of February and starting to decrease from month of March onward (Tables ento Ludhiana PPT1a-1c).

Table Ludhiana ento PPT 1a. Incidence of lepidopteran insect pests in berseem

Variety	No. of *T. orichalcea* larvae per m row length								Mean
	01.04.16	08.04.16	15.04.16	22.04.16	29.04.16	06.05.16	13.05.16	20.05.16	
BL-10	4.35	3.49	4.47	4.58	5.44	3.27	2.29	0.8	**3.58**
BL-42	4.10	5.19	4.80	4.50	4.90	3.40	2.40	0	**3.66**
	No. of *H. armigera* larvae per m row length								
BL-10	2.67	5.33	4.60	7.33	9.0	6.44	5.44	3.90	**5.58**
BL-42	3.77	4.90	5.10	7.10	8.40	6.75	5.90	2.30	**5.52**

Table Ludhiana ento PPT 1b. Incidence of insect pests in Lucerne Var. LLC -5

Variety	No. of weevils per plant								Mean
	03.03.16	10.03.16	17.03.16	24.03.16	31.03.16	06.04.16	13.04.16	20.04.16	
LLC-5	3.45	8.57	15.66	10.42	7.44	5.10	3.96	2.10	**7.08**
	No. of *H. Armigera* larvae per m row length								
LLC-5	1.45	2.10	3.14	3.66	2.33	1.10	3.45	3.45	**2.58**

Table Ludhiana ento PPT 1c. Incidence of oat aphid in oats

Variety	No. of aphids per tiller								Mean
	02.02.2015	09.02.2015	16.02.2015	23.02.2015	02.03.2015	09.03.2015	16.03.2015	23.03.2015	
OL-10	3.33	4.00	8.33	9.66	8.66	7.33	6.33	3.66	**6.41**
Kent	4.66	4.66	5.66	8.66	7.33	5.66	4.44	2.33	**5.42**

Rahuri:

Berseem: In berseem crop, there were no insect-pests and diseases were observed throughout crop period (Table Rahuri PPT 1a)

Table Rahuri PPT 1b: Incidence of insect-pest in Berseem:

Date	No. aphids/tiller	Natural enemies/tiller		
Weekly observations		***C. carnea***	**Lady Bird Beetle grubs**	**Syrphid fly larvae**
7/12/2015 to 02/02/2016	0.00	0.00	0.00	**0.00**

Lucerne: Aphids: The population of pea aphid (*Acyrthosiphon pisum*) noticed on lucerne during 4th week of December 2015(3.67 aphids/tiller) and increased steadily at its peak level up to the 1st week of February, 2016 (115.33 aphids/tiller). Thereafter the decreasing trend of pea aphid population noticed upto 1st week of March, 2016 (4.33 aphids/tiller). After that the population of pea aphid was disappeared from the crop. The cowpea aphid (*Aphis craccivora*) started build up on Lucerne during 4th week of Dec., 2015 (2.00 /tiller) and found increasing trend up to 4th week of February, 2016 with highest population (75.67 aphids/tiller). Thereafter, population was started declining and recorded nil population during 2nd week of March, 2016. The spotted aphid (*Therioaphis maculata*) was started appearing on crop during 2nd week of February, 2016 with 25.67 aphids/tiller and it showed increasing trend up to 3rd week of February, 2016 (49.67 aphids/tiller). Then after population was started declining and showed nil population during 1st week of April, 2016. During the aphid infestation, population of predatory lady bird beetles was observed moderate to high level. (1.00 to 4.00 grubs/tiller) (Table Rahuri PPT 1b).

Lepidopteran pests: The *Spodoptrera litura* become a major and regular pest on Lucerne during summer season. Larval population was noticed during 2nd week of February, 2016 with 1.33 larvae/m^2. Then after, population increased steadily and reached to its peak population (11.00 larvae/m^2) during 4th week of April, 2016. After that the population of *S. litura* was declined and recorded nil population during 4th week of May, 2016. The population of *H. armigera* was noticed on lucerne seed crop during 3rd week of February, 2016 (1.67 larvae/m^2) and showed increasing trend upto 2nd week of April 2016 with highest population of 13.00 larvae/m^2. After that population declined and showed minimum population during 2nd week of May 2015 (5.67 larvae/m^2) (Table Rahuri PPT 1b).

Oat

Aphid: In Oat crop, aphids, *Rhopalosiphum padi* was noticed during 3rd week of Jan., 2016 (2.67 aphids/tiller) and it was reached at maximum level (150.67 aphids/ tiller) during 2nd week of February, 2016. Then it was started declining and recorded nil population on oat during the 1st week of March, 2016. During the infestation of aphids, Chrysopa, grubs of predatory lady bird beetles and syrphid fly observed on crop in the range of 1.33 to 2.00, 1.67 to 3.33 and 0.0 to 0.33 larva per tiller, respectively (Table Rahuri PPT 1c).

Diseases: There was no disease incidence recorded during on oat crop throughout the crop period.

Table Rahuri PPT 1b: Incidence of insect-pest in Lucerne

Date	No. aphids/tiller				Lady bird beetle grubs/tiller	No. of larvae/m^2	
	Pea aphid	Cowpea aphid	Spotted aphid	Total		*S. litura*	*H. armigera*
7/12/2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15/12/2015	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22/12/2015	3.67	2.00	0.00	5.67	0.00	0.00	0.00
29/12/2015	7.33	5.67	0.00	13.00	0.00	0.00	0.00
05/01/2016	15.67	7.00	0.00	22.67	0.00	0.00	0.00
12/01/2016	24.33	8.67	0.00	33.00	2.67	0.00	0.00
19/01/2016	37.67	7.33	0.00	45.00	3.00	0.00	0.00
26/01/2016	40.67	9.33	0.00	50.00	3.00	0.00	0.00
02/02/2016	115.33	12.67	0.00	128.00	3.33	0.00	0.00
09/02/2016	100.67	35.33	25.67	161.67	3.00	1.33	0.00
16/02/2016	56.33	67.00	49.67	173.00	3.33	2.67	1.67
23/02/2016	22.67	75.67	33.00	131.34	3.67	3.00	2.00
01/03/2016	12.33	42.33	30.67	85.33	4.00	3.33	3.00
07/03/2016	4.33	10.00	25.67	40.00	3.67	3.67	3.33
14/03/2016	0.00	0.00	17.33	17.33	2.67	4.33	4.67
21/03/2016	0.00	0.00	5.67	5.67	2.00	6.00	5.33
01/04/2016	0.00	0.00	2.00	2.00	1.33	5.67	8.67
07/04/2016	0.00	0.00	0.00	0.00	1.00	6.33	12.67
14/04/2016	0.00	0.00	0.00	0.00	0.00	8.67	13.00
21/04/2016	0.00	0.00	0.00	0.00	0.00	10.33	12.67
28/04/2016	0.00	0.00	0.00	0.00	0.00	11.00	10.67
05/05/2016	0.00	0.00	0.00	0.00	0.00	8.33	7.33
12/05/2016	0.00	0.00	0.00	0.00	0.00	8.00	5.67
17/05/2016	0.00	0.00	0.00	0.00	0.00	4.33	0.00
24/05/2016	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table Rahuri PPT 1c: Incidence of insect-pest in Oat

Date	No. aphids/tiller	Natural enemies/tiller		
		C. carnea	Lady Bird Beetle grubs	Syrphid fly larvae
7/12/2015	0.00	0.00	0.00	0.00
15/12/2015	0.00	0.00	0.00	0.00
22/12/2015	0.00	0.00	0.00	0.00
29/12/2015	0.00	0.00	0.00	0.00
05/01/2016	0.00	0.00	0.00	0.00
12/01/2016	0.00	0.00	0.00	0.00
19/01/2016	2.67	0.00	0.00	0.00
26/01/2016	6.00	0.00	0.00	0.00
02/02/2016	150.67	1.33	1.67	0.00
09/02/2016	75.67	2.00	3.33	0.33
16/02/2016	24.33	1.33	2.00	0.33
23/02/2016	12.67	0.00	0.00	0.00
01/03/2016	0.00	0.00	0.00	0.00
07/03/2016	0.00	0.00	0.00	0.00

PPT-2A: Field screening of *rabi*-breeding trials for resistance to diseases and insect-pests.

1. IVTB: INITIAL VARIETAL TRIAL IN BERSEEM

S N	Entries	Ludhiana			Palam pur	Bhubaneswar				Rah-uri
		Stem Rot Incidence (%)	Disease Reaction	Disease Score	root rot	Leaf spot & Blight	Reaction	Leaf defoliators	Reaction	Insect pest
1	PC-82	42.33	S	4.0	MR	1.6	R	1.8	R	Nil
2	HFB-12-4	38.00	S	4.0	R	2.2	MR	1.4	R	Nil
3	Wardan -NC	28.00	S	4.0	MR	1.2	R	0.8	HR	Nil
4	Bundel Berseem-3-ZC	-	-	-	-	1.4	R	1.2	R	Nil
5	Bundel Berseem-2-ZC	31.67	S	4.0	-	-		-		Nil
6	Mescavi -NC	42.66	S	4.0	R	1.6	R	1.6	R	Nil
7	BL-22	-	-	-	R	-		-		Nil
8	JB-05-9	41.00	S	4.0	R	2.2	MR	1.8	R	Nil
9	HFB-12-9	40.00	S	4.0	R	1.2	R	1.2	R	Nil
10	BL-42	53.81	HS	5.0						Nil
	SE					0.41		0.16		
	CD					1.23		1.05		

Rahuri : No infestation/incidence of insect-pests and diseases were observed in any of the IVT Berseem entries

Bhubaneswar: For leaf blight and pot diseases, entry JB-05-9 and HFB 12-4 were moderately resistant whereas other entries showed resistant reaction. For leaf defoliators, check Wardan was highly resistant whereas other entries were resistant.

Palampur: Wardan and PC-82 were moderately resistant to root rot, all other entries showed resistant reaction.

Ludhiana: all the entries including check showed susceptible reaction for stem rot. Local check BL-42 was highly susceptible.

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

S N	Entries	Ludhiana			Rahuri
		Stem Rot Incidence (%)	Disease Reaction	Disease Score	Insect-pest
1	JB-04-23	35.67	S	4.0	Nil
2	PC-75	41.33	S	4.0	Nil
3	Mescavi - NC	36.81	S	4.0	Nil
4	JB-4-21	28.40	S	4.0	Nil
5	Bundel Berseem-2 -ZC	30.00	S	4.0	Nil
6	Wardan - NC	40.00	S	4.0	Nil
	BL-42	52.76	HS	5.0	Nil
	BL-10	49.32	S	4.0	Nil
	BL-1	52.33	HS	5.0	Nil

Rahuri: No infestation/incidence of insect-pests and diseases were observed in any of the AVT Berseem entries

Ludhiana: All the entries including checks showed susceptible reaction

3.1: IVTO (SC): Initial Varietal Trial in Oat (single cut)

S N	Entries	Bhubaneswar			Ludhiana			Ludhiana	Rahuri
		Alternaria Leaf blight *	*Sclerotium* Root rot (%)	Leaf Defoliators (No/10 Plants)	Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids per tiller	No. of Aphids per tiller
1	OL-1847	1.6	4.66	1.8	36.00	S	4.0	3.0 (9.87)	15.59
2	OL-125	-	-	-	44.00	S	4.0	2.3 (8.74)	
3	NDO-911	1.6	2.99	1.6	49.67	S	4.0	3.3 (10.37)	40.54
4	VOS-15-23	1.2	2.33	1.2	39.38	S	4.0	1.7 (7.33)	11.43
5	VOS-15-24	1.8	3.66	2.2	36.76	S	4.0	2.0 (8.12)	43.70
6	HFO-427	1.2	5.99	1.4	51.33	HS	5.0	3.3 (8.56)	16.09
7	HFO-529	1.2	2.66	0.8	36.00	S	4.0	3.0 (9.87)	34.59
8	OL-1844	1.6	1.66	1.6	31.71	S	4.0	3.0 (9.61)	36.45
9	JO-04-22	2.2	2.66	2.4	52.81	HS	5.0	4.0 (11.47)	39.65
10	JHO-15-2	1.4	4.33	2.4	36.33	S	4.0	6.3 (14.29)	36.33
11	JHO-15-1	1.2	3.33	1.8	38.67	S	4.0	2.7 (9.26)	37.03
12	SKO-227	1.6	2.99	3.2	37.00	S	4.0	2.0 (6.55)	18.68
13	Kent	2.2	3.66	2.6	39.33	S	4.0	4.3 (11.99)	37.02
14	OS-6	1.6	5.33	1.6	53.00	HS	5.0	5.0 (12.87)	29.05
15	JHO-99-2	1.6	3.99	1.2	-	-	-		
18	OS-377								58.04
19	SKO-206	1.4	2.99	1.2	43.00	S	4.0	7.3 (15.59)	29.40
	SE	0.33	0.45	0.16					2.19
	CD (0.5)	0.99	1.36	0.49				(5.01)	6.35

Figures in parenthesis are square root transformed values

3.2: IVTO (SC): Palampur

Code No.	Entries	Powdery Mildew						
		In vitro condition			Field conditions			
		% Disease severity	Disease Ratting	Disease Reaction	%Disease severity	Disease Ratting	Disease Reaction	GFY (q/ha
1	OL-1847	50	4	S	20	3	MR	259.73
2	NDO-911	65	5	HS	50	4	S	228.80
3	VOS-15-23	80	5	HS	60	5	HS	230.40
4	VOS-15-24	70	5	HS	40	4	S	253.33
5	HFO-427	60	5	HS	25	4	S	282.13
6	HFO-529	50	4	S	30	4	S	268.27
7	OL-1844	55	5	HS	30	4	S	261.40
8	JO-04-22	60	5	HS	35	4	S	266.13
9	JHO-15-2	75	5	HS	50	4	S	231.47
10	JHO-15-1	60	5	HS	30	4	S	277.33
11	SKO-227	75	5	HS	50	4	S	228.27
12	Kent	70	5	HS	40	4	S	242.13
13	OS-6	60	5	HS	40	4	S	244.27
14	SKO-90	65	5	HS	40	4	S	262.40
15	SKO-206	65	5	HS	45	4	S	236.27

Ludhiana: The aphid *Rhopalosiphum padi* population in the test genotypes varied significantly from 1.7-7.3 aphid per tiller being significantly higher population of aphid in SKO-206, (7.3 aphids per tiller) and lowest in VOS-15-23 (1.7). The other entries showed the aphid population with non significant variations amongst them. Entries HFO-427, JO-04-22, Check OS-6 were highly susceptible whereas other entries showed susceptible reaction to leaf blight.

Rahuri: Entry VOS-15-23 showed 11.43 aphids per tiller and it was significantly lower than other entries. However, OL-1847 and HFO-427 were found at par with it. These entries recorded 15.59 and 16.09 aphids/tiller, respectively. **Resistant entries:** VOS-15-23, OL-1847, HFO-427 and SKO-227

Susceptible entries: OS-377

Hyderabad: No insects and diseases were observed in the trial

Bhubaneswar: For Alternaria leaf blight, entry JO-04-22 and national check Kent were moderately resistant, whereas other entries showed resistant reaction. For Sclerotium root rot, Ol-1844 was resistant, whereas, entries NDO-911, VOS 15-23, HFO -529, JO-04-22, SKO-206, SKO 227 were moderately resistant. Entries VOS- 15-24, JHO-15-1 and checks Kent and JHO-99-2 were susceptible. Entries OL-1847, JHO 15-2, HFO-427 and national check OS-6 were highly susceptible for Sclerotium root rot. Minimum incidence of leaf defoliators was observed in HFO-529 and maximum in SKO -227.

Palampur: All the entries were found susceptible under artificial as well as under field conditions except OL-1847 which gave moderately resistant reaction under field conditions.

4.1. AVTO (SC)-1: First Advanced Varietal Trial in Oat (single cut)

S N	Entries	*Ludhiana*			*Ludhiana*	*Rahuri*
		Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids per tiller	No. of Aphids per tiller
1	OS-424	29.33	S	4.0	1.7 (7.33)	78.63
2	OL-1769-1	27.00	S	4.0	1.3 (6.53)	45.97
3	OL-1802-1	32.00	S	4.0	2.3 (8.46)	87.90
4	OL-1766-1	24.88	MS	3.0	1.0 (5.73)	14.04
5	SKO-225	45.67	S	4.0	2.3 (8.46)	24.35
6	JO-04-19	27.33	S	4.0	1.3 (6.53)	30.69
7	OL-125	33.73	S	4.0	2.3 (8.74)	
8	UPO-10-3	39.68	S	4.0	2.0 (8.12)	19.97
9	OS-432	39.00	S	4.0	4.3 (11.99)	29.87
10	OS-6	32.33	S	4.0	1.7 (7.14)	30.78
11	Kent	41.78	S	4.0	3.7 (10.53)	46.93
12	JHO-822					43.32
	OL-1802	44.00	S	4.0	5.0 (12.87)	
	OL-1769-1	43.00	S	4.0	3.3 (10.49)	
	OL-1766-1	41.33	S	4.0	2.3 (8.55)	
	OL-9	58.67	HS	5.0	4.0 (11.53)	
	SE					2.45
	CD				(3.17)	7.22

Figures in parenthesis are square root transformed values

4.2. AVTO (SC)-1: Palampur

Code no	Entries	Powdery Mildew						
		In vitro condition			Field conditions			
		%Disease severity	Disease Ratting	Disease Reaction	%Disease severity	Disease Ratting	Disease Reaction	GFY (q/ha
1	OS-424	60	5	HS	35	4	S	239.47
2	OL-1769-1	45	4	S	50	4	S	194.13
3	OL-1802-1	45	4	S	25	4	S	249.60
4	OL-1766-1	40	4	S	45	4	S	198.93
5	SKO-225	50	4	S	25	4	S	264.53
6	JO-04-19	50	4	S	45	4	S	182.40
7	UPO-10-3	35	4	S	30	4	S	210.13
8	OS-432	40	4	S	30	4	S	216.53
9	OS-6	60	5	HS	45	4	S	200.53
10	Kent	45	4	S	45	4	S	180.80
11	SKO-90	50	4	S	35	4	S	231.47

Ludhiana: The **oat aphid, *Rhopalosiphum padi*** population in the test genotypes varied significantly from 1.0-5.0 being highest population of aphid in OL 1802, (5 aphids per tiller) and lowest in OL-1766-1 (1.0). The other entries showed the aphid population with non significant variations.

Rahuri: Entry OL-1766-1 recorded 14.04 aphids per tiller and it was significantly lesser than the other entries except UPO-10-3 (19.97/tiller). These entries were at par with each other. Resistant : OL_1766-1, UPO -10-3,; Highly susceptible: OS-424 and OL-1802-1

Ludhiana: For leaf blight, OL-1766-1 was moderately susceptible whereas all other entries including checks showed susceptible reaction.
Palampur: All the entries were found susceptible under artificial as well as under field conditions.

5.1. AVTO (SC)-2: Second advanced varietal trial in oat (single cut)

S N	Entries	Bhubaneswar			Ludhiana			Ludhiana	Rahuri
		Alternaria Leaf blight *	*Sclerotium* Root rot (%)	Leaf Defoliators (No/10 Plants)	Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids/tiller	No. of Aphids/tiller
1	OL-1689	1.4	2.33	1.2	33.66	S	4.0	2.7 (9.26)	16.60
2	Kent	1.6	3.99	1.4	25.00	MS	3.0	1.7 (7.14)	15.93
3	SKO-199	2.2	2.99	1.4	31.67	S	4.0	2.7 (9.0)	30.00
4	OS-6	1.6	4.33	1.2	28.00	S	4.0	2.0 (7.94)	29.53
5	SKO-198	1.2	4.66	1.4	42.00	S	4.0	2.0 (7.94)	74.04
6	RSO-8	1.6	1.33	1.2	46.00	S	4.0	3.0 (9.6)	79.46
7	SKO-196	2.2	3.99	2.2	53.33	HS	5.0	2.3 (8.55)	44.48
8	JO-04-18	1.2	2.33	0.8	42.71	S	4.0	2.3 (8.74)	39.77
9	OS-406	1.4	3.66	1.6	35.76	S	4.0	3.0 (9.87)	41.23
10	OL-1804	1.8	2.33	1.2	36.83	S	4.0	2.0 (7.94)	56.17
11	RO-11-1	1.4	1.99	1.4	26.33	S	4.0	1.0 (4.62)	39.50
12	OL-125	-	-	-	41.34	S	4.0	1.3 (5.41)	
13	JHO-99-2	2.4	4.33	2.2	-	-	-	-	
14	JHO-822								47.07
	OL-9	-	-	-	64.86	HS	5.0	2.3 (8.74)	
	SE	0.38	0.56	0.18					2.55
	CD (p = 0.05)	1.15	1.68	0.53				NS	7.48

Figures in parenthesis are square root transformed values

Ludhiana: The oat aphid, *Rhopalosiphum padi* population in the test genotypes varied non significantly from 1.0-3.0 being highest population of aphid in RSO-8 and OS-406 (3 aphids per tiller) and lowest in RO-11-1 (1.0). There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment. For leaf blight, entry SKO-196 was highly susceptible, whereas Kent was moderately susceptible. Other entries were susceptible.

Rahuri: Statistically entries Kent & OL-1689 were found equally effective against Lucerne aphids and recorded 15.93 and 16.60 aphids/tiller which were significantly lower than other entries.
Resistant : OL-1689 and Kent **Highly susceptible:** SKO-198 and RSO-8
Hyderabad: No insects and diseases were observed in the trial
Bhubaneswar: For Alternaria leaf blight, entries SKO-199, SKO-196, JHO 99-2 were moderately resistant, whereas all other entries showed resistant reaction. For Sclerotium root rot, entry RSO-8 was resistant, whereas entries OL-1689, JO-04-18, OL-1804, RO-11-1, SKO-199 showed moderately resistant reaction. Entries Kent, OS-6, SKO-198, SKO-196, OS-406, JHO 99-2 were susceptible to highly susceptible. For leaf defoliators, minimum incidence was recorded in JO-14-18 and maximum in JHO 99-2.

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

S N	Entries	Ludhiana			Ludhiana	Rahuri
		Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids/tiller	No. of Aphids/tiller
1	JO-04-18	38.00	S	4.0	1.3 (5.41)	17.97
2	RSO-8	40.33	S	4.0	2.3 (8.74)	19.33
3	SKO-199	37.00	S	4.0	1.7 (7.33)	38.93
4	SKO-198	26.81	S	4.0	2.3 (8.55)	79.50
5	OS-406	30.35	S	4.0	2.3 (8.74)	27.94
6	OL-1804	28.66	S	4.0	1.7 (7.14)	25.25
7	RO-11-1	43.67	S	4.0	2.3 (8.46)	47.23
8	Kent	43.53	S	4.0	2.0 (8.12)	75.77
9	OL-1689	46.78	S	4.0	1.0 (4.62)	43.54
10	OS-6	37.00	S	4.0	1.0 (3.32)	38.47
11	OL-125	28.00	S	4.0	3.3 (10.33)	
	JHO-822					32.87
	SE					**2.49**
	CD (p=0.05)				NS	**7.34**

Figures in parenthesis are square root transformed values

Ludhiana: The oat aphid, *Rhopalosiphum padi* population in the test genotypes varied non-significantly from 1.0-3-3. There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment.

Hyderabad: No insects and diseases were observed in the trial.
Rahuri: Minimum incidence of aphids were recorded in entires JO-04-18 and RSO-8, maximum incidence were recorded in SKO-198 and Kent.

7. AVT OAT (SC-2) - SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) REPEAT 13-14

S N	Entries	Ludhiana			
		Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids/tiller
1	OS-403	30.50	S	4.0	5.25 (12.59)
2	OS-6	41.00	S	4.0	8.0 (16.13)
3	Kent	29.25	S	4.0	5.5 (13.09)
4	OL-125	38.50	S	4.0	5.25 (12.70)
5	OL-1844	40.00	S	4.0	
6	OL-1847	44.00	S	4.0	
	CD				NS

Figures in parenthesis are square root transformed values

Ludhiana: All the entries showed susceptible disease reaction to leaf blight. The aphid population in the test genotypes varied non significantly from 5.25-8.0 being highest population of aphid in check OS-6 (8.0 aphids per tiller) and lowest in OS-403 and OL-125 (5.25). There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment.

8.1. AVTO (SC)-2: SECOND ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) REPEAT 14-15

S N	Entries	Bhubaneswar			Ludhiana			Ludhiana	Rahuri
		Alternaria Leaf blight *	*Sclerotium* Root rot (%)	Leaf Defoliators (No/10 Plants)	Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids/tiller	No. of Aphids/tiller
1	JHO-2012-2	1.6	2.66	1.2	19.33	MS	3.0	2.3 (8.55)	16.93
2	RSO-59	1.8	3.33	1.4	17.67	MS	3.0	1.7 (7.33)	25.26
3	RSO-60	1.4	3.66	1.8	28.00	S	4.0	2.3 (8.74)	17.17
4	OS-405	2.4	4.33	1.2	36.71	S	4.0	2.7 (9.08)	61.89
5	SKO-190	0.8	2.66	1.6	31.33	S	4.0	2.7 (9.35)	18.03
6	JHO-2012-1	1.6	2.66	1.8	20.51	MS	3.0	2.3 (8.74)	38.74
7	OL-1760	2.2	5.33	1.2	19.00	MS	3.0	2.3 (8.74)	43.79
8	OS-6	1.6	3.66	1.8	33.31	S	4.0	3.0 (9.87)	37.77
9	JO-04-14	1.4	3.99	1.4	41.00	S	4.0	2.7 (9.0)	29.13
10	Kent	2.4	2.99	2.2	47.00	S	4.0	2.3 (8.46)	73.99
11	OL-125	-	-	-	40.33	S	4.0	2.0 (7.94)	
12	JHO-99-2	1.4	1.99	1.6					
13	JHO-822								25.63
	OL-1760				52.77	HS	5.0	1.0 (5.73)	
	OL-9				61.37	HS	5.0	1.3 (6.53)	
	SE								2.43
	CD							N/A	7.16

Figures in parenthesis are square root transformed values

8.2. AVTO (SC)-2: REPEAT 14-15 – Palampur for Powdery Mildew

S N	Entries	*In vitro* condition			Field conditions			
		% Disease severity	Disease Rating	Disease Reaction	%Disease severity	Disease Rating	Disease Reaction	GFY (q/ha
1	JHO-2012-2	70	5	HS	50	4	S	173.87
2	RSO-59	55	5	HS	40	4	S	179.20
3	RSO-60	60	5	HS	25	3	MR	193.60
4	OS-405	65	5	HS	35	4	S	192.00
5	SKO-190	60	5	HS	25	3	MR	217.07
6	JHO-2012-1	70	5	HS	55	5	HS	167.47
7	SKO-90	55	5	HS	35	4	S	181.87
8	OL-1760	50	4	S	40	4	S	178.13
9	OS-6	40	4	S	40	4	S	145.60
10	JO-04-14	40	4	S	40	4	S	165.33
11	Kent	35	4	S	35	4	S	130.67

Ludhiana: JHO 2012-2, RSO-59, JHO-2012-1, OL-1760 showed moderately susceptible disease reaction to leaf blight. Rest of entries was susceptible. The aphid population in the test genotypes varied non significantly from 1.0-3-0. There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment.

Rahuri: Among the different entries JHO-2012-1 showed 16.93 aphids per tiller and it was significantly lower than the other entries except RSO-60 (17.17/tiller) and SKO-190 (18.03/tiller). **Resistant:** JHO-2012-2, RSO-60, and SKO-190; Highly **susceptible:** OS-405 and Kent

Hyderabad: No insects and diseases were observed in the trial

Bhubaneswar: For Alternaria leaf blight, entry SKO-190 was highly resistant; entries kent and OL-1760 showed moderately resistant reaction. All other entries were resistant. For Sclerotium root ort, Check JHO-99-2 was resistant, whereas entries JHO 2012-2, SKO-190, JHO-2012-1, Kent were moderately resistant. Other entries were susceptible to highly susceptible.

For leaf defoliators, maximum incidence was observed in national check Kent and minimum in OL-1760, OS-405 and JHO-2012-2

Palampur: All the entries were found susceptible under artificial as well as under field conditions except RSO-60 and SKO-190 which gave moderately resistant reaction under field conditions

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

S N	Entries	Bhubaneswar			*Ludhiana*				*Rahuri*
		Alternaria Leaf blight *	*Sclerotium* Root rot (%)	Leaf Defoliators (No/10 Plants)	Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids/tiller	No. of Aphids/tiller
1	RO-19	1.4	3.33	1.2	36.00	S	4.0	1.33 (6.53)	37.95
2	OL-1842	1.4	3.66	1.8	43.67	S	4.0	2.67 (9.26)	31.80
3	OL-1867	2.2	2.99	3.6	29.86	S	4.0	2.33 (8.55)	34.17
4	JO-04-321	1.8	4.33	2.2	27.00	S	4.0	1.67 (7.14)	16.85
5	HFO-514	1.6	3.99	2.4	23.66	MS	3.0	2.67 (9.35)	17.11
6	JHO-15-4	1.4	3.99	2.2	36.00	S	4.0	2.33 (8.74)	44.69
7	HFO-417	2.4	2.33	3.2	40.77	S	4.0	2.67 (9.35)	72.43
8	JHO-15-3	1.8	5.66	2.4	39.00	S	4.0	2.33 (8.74)	41.97
9	PLP-19	1.6	3.33	1.6	41.33	S	4.0	2.33 (8.46)	68.07
10	Kent	1.2	1.99	1.2	42.67	S	4.0	2.33 (8.55)	31.70
11	UPO-212	1.6	4.33	1.6	43.87	S	4.0	2.33 (8.74)	17.50
12	OL-1866	1.4	2.99	2.4	43.38	S	4.0	2.33 (8.46)	26.89
	OL-1842				42.81	S	4.0	1.67 (6.03)	
	OL-1866				48.00	S	4.0	2.00 (7.94)	
	OL-1867				46.00	S	4.0	3.67 (10.95)	
	SE	0.35	0.49	0.24					1.36
	CD	1.25	1.50	0.73				NS	3.99

Figures in parenthesis are square root transformed values

9.2. - Palampur

S N	Entries	Powdery Mildew						
		In vitro condition			Field conditions			
		% Disease severity	Disease Rating	Disease Reaction	%Disease severity	Disease Rating	Disease Reaction	GFY (q/ha
1	RO-19	80	5	HS	60	5	HS	144.40
2	OL-1842	60	5	HS	45	4	S	171.97
3	OL-1867	30	4	S	25	3	MR	193.30
4	JO-04-321	50	4	S	40	4	S	176.40
5	HFO-514	50	4	S	40	4	S	204.40
6	JHO-15-4	50	4	S	40	4	S	191.53
7	HFO-417	55	5	HS	45	4	S	183.07
8	JHO-15-3	50	4	S	45	4	S	165.73
9	PLP-19	40	4	S	35	4	S	178.20
10	Kent	45	4	S	40	4	S	194.63
11	UPO-212	55	4	S	40	4	S	165.30
12	OL-1866	30	4	S	30	4	S	186.63

Ludhiana: HFO-514 was moderately susceptible to leaf blight and other entries showed susceptible disease reaction. The **oat aphid, *Rhopalosiphum padi*** population in the test genotypes varied non significantly from 1.0-3.67. There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment.

Rahuri: Entries JO-04-321, HFO-514 and UPO-212 recorded 16.85, 17.11 and 17.50 aphids per tiller, respectively which were significantly lower than the other entries and were at par with each other. **Resistant:** JO-04-321, HFO-514 and UPO-212;

Moderately resistance: RO-19 and PLP-19 **Highly susceptible:** HFO-417 and PLP-19

Bhubaneswar: For Alternaria leaf blight, entries HFO-417, OL-1867 were moderately resistant, whereas other entries showed resistant reaction. For Sclerotium root rot, Kent, OL-1866, HFO-417, OL-1867 showed moderately resistant reaction whereas other entries were susceptible to highly susceptible. For leaf defoliators, maximum intensity was recorded in entries OL-1867 and HFO-417.

Palampur: All the entries were found susceptible under artificial as well as under field conditions except OL-1867 which gave moderately resistant reaction under field conditions

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

S N	Entries	Powdery Mildew						
		In vitro condition			Field conditions			
		% Disease severity	Disease Rating	Disease Reaction	%Disease severity	Disease Rating	Disease Reaction	GFY (q/ha
1	OL-1845	60	5	HS	40	4	S	259.98
2	JO-04-319	60	5	HS	35	4	S	284.98
3	Kent	70	5	HS	40	4	S	251.20
4	UPO-212	55	5	HS	40	4	S	252.48
5	RO-19	80	5	HS	50	4	S	243.73
6	OS-414	90	5	HS	65	5	HS	240.83

Palampur: All the entries were found susceptible under artificial as well as under field conditions except OL-1867 which gave moderately resistant reaction under field conditions

11.1. AVTO-2 (MC): SECOND ADVANCED VARIETAL TRIAL IN OAT (MC)

S N	Entries	Bhubaneswar			Ludhiana			Rahuri	Ludhiana
		Alternaria Leaf blight *	*Sclerotium* Root rot (%)	Leaf Defoliators (No/10 Plants)	Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of aphids /tiller	No. of Aphids/tiller
1	OL-1802	1.6	2.99	1.6	29.25	S	4.0	19.86	2.50 (8.84)
2	RO-19	1.6	3.66	1.8	39.50	S	4.0	42.92	2.75 (9.32)
3	UPO-212	2.2	2.99	3.6	40.25	S	4.0	22.00	3.0 (9.97)
4	Kent	1.4	2.33	1.2	44.25	S	4.0	16.27	2.50 (9.04)
5	JO-4-317	1.6	3.99	2.4	35.00	S	4.0	19.38	3.0 (9.83)
	OL-1802				43.25	S	4.0		
	SE	0.50	1.12	0.27				1.38	
	CD	1.52	3.38	0.81				4.26	NS

11.2. Palampur

S N	Entries	Powdery Mildew						
		In vitro condition			Field conditions			
		% Disease severity	Disease Rating	Disease Reaction	%Disease severity	Disease Rating	Disease Reaction	GFY (q/ha
1	OL-1802	60	5	HS	40	4	S	314.65
2	RO-19	90	5	HS	55	5	HS	263.65
3	UPO-212	80	5	HS	45	4	S	376.63
4	Kent	80	5	HS	40	4	S	335.00
5	JO-4-317	70	5	HS	35	4	S	373.98

Ludhiana: All entries were susceptible to leaf blight. The **oat aphid, *Rhopalosiphum padi*** population in the test genotypes varied non significantly from 2.50-3.0. There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment.

Rahuri: The entry Kent recorded 16.27 aphids per tiller which was significantly lower than the other entries except JO-04-317 & OL-1802. These entries were recorded 19.38 and 19.86 aphids per tiller, respectively. Resistant: Kent, JO-04-317, and OL-1802 Susceptible: RO-19

Bhubaneswar: For Alternaria leaf blight, Check UPO-212 was moderately resistant, whereas all other entries and checks were resistant. For Sclerotium root rot, Kent was moderately resistant whereas all other entries were susceptible. For leaf defoliators, entry JO-04-317 was moderately resistant, UPO-212 was susceptible and rest were resistant.

Palampur: All the entries were found susceptible under artificial as well as under field conditions.

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

S N	Entries	Bhubaneswar			Ludhiana			Ludhiana
		Alternaria Leaf blight *	*Sclerotium* Root rot (%)	Leaf Defoliators (No/10 Plants)	Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids/tiller
1	UPO-212	2.6	3.99	2.6	29.75	S	4.0	3.0(9.57)
2	OL-1802	2.4	3.99	2.8	42.25	S	4.0	2.5(9.04)
3	Kent	1.4	2.99	1.6	30.50	S	4.0	1.75(7.39)
4	JO-4-317	2.8	4.33	2.2	40.00	S	4.0	2.75(9.43)
5	RO-19	1.8	3.99	2.4	36.50	S	4.0	2.25(9.43)
	OL-1802				43.75	S	4.0	2.25(8.45)
SE		0.35	1.17	0.17				
CD (p = 0.05)		1.06	3.53	0.50				NS

Figures in parenthesis are square root transformed values

12.2. AVTO-2 (SEED) (MC): FOR SEED- Palampur

S N	Entries	Powdery Mildew						
		In vitro condition			Field conditions			
		% Disease severity	Disease Ratting	Disease Reaction	%Disease severity	Disease Ratting	Disease Reaction	Grain Yield (q/ha)
1	UPO-212	50	4	S	30	4	S	12.63
2	OL-1802	40	4	S	35	4	S	9.30
3	Kent	70	5	HS	40	4	S	16.65
4	JO-4-317	65	5	HS	50	4	S	9.63
5	RO-19	90	5	HS	55	5	HS	8.98

Ludhiana: All entries were susceptible to leaf blight. The aphid population in the test genotypes varied non significantly from 1.75-3.0. There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment.

Bhubaneswar: For Alternaria leaf blight Kent and RO-19 were resistant, whereas UPO-212, OL-1802 and JO-04-317 were moderately resistant. For Sclerotium root rot, Kent was moderately resistant and all toehr entreis showed resistant reaction. For leaf defoliators, minimum incidence was recorded in Kent.

Palampur: All the entries were found susceptible under artificial as well as under field conditions.

13. AVTO -2 MC: SECOND ADVANCED VARIETAL TRIAL IN OAT (MULTI CUT) REPEAT 14-15.

S N	Entries	Rahuri - Aphids/tiller
1	Kent	103.13
2	JO-04-315	74.47
3	RO-19	81.03
4	UPO-212	13.85
	SE±	**1.71**
	CD at 5%	**5.26**

Rahuri: Maximum intensity was observed in National check Kent and test entry JO -04-315 showed less aphid intensity than checks Kent, RO-19, whereas check UPO 212 showed least aphid intensity.

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

S N	Entries	Bhubaneswar			Ludhiana			Ludhiana	Rahuri	
		Alternaria Leaf blight *	*Sclerotium* Root rot (%)	Leaf Defoliators (No/10 Plants)	Leaf Blight Severity (%)	Disease Reaction	Disease Score	No. of Aphids/tiller	No. of Aphids /tiller	Reac tion
1	OL-1802	1.8	1.33	1.4	33.66	S	4.0	2.00 (7.94)	17.63	R
2	NDO-1101	1.4	3.99	1.4	35.76	S	4.0	2.67 (8.92)	16.09	R
3	OL-1760-1	1.6	2.99	1.2	30.00	S	4.0	2.33 (8.74)	17.26	R
4	RO-19	1.4	3.33	1.4	37.33	S	4.0	3.00 (9.97)	40.69	S
5	HFO-525	1.4	2.99	1.2	33.00	S	4.0	1.00 (5.73)	46.51	S
6	JHO-15-5	2.2	3.33	1.6	27.86	S	4.0	3.00 (9.87)	26.98	MR
7	JHO-15-6	1.4	3.99	1.6	40.31	S	4.0	1.67 (7.33)	29.19	MR
8	HFO-523	1.2	2.33	1.4	42.00	S	4.0	1.33 (5.23)	16.70	R
9	JO-09-509	2.	2.99	1.6	43.00	S	4.0	1.33 (5.41)	18.70	R
10	UPO-212	1.6	3.33	1.4	29.00	S	4.0	2.67 (9.08)	24.47	MR
11	JHO-822	1.2	3.66	1.2	34.00	S	4.0	2.33 (8.74)	27.36	MR
	OL-1802				40.00	S	4.0	1.33 (6.53)		
	OL-1760-1				38.33	S	4.0	1.67 (7.33)		
SE		0.35	0.54	0.35					1.69	
CD (p= 0.05)		1.06	1.64	1.05				NS	5.00	

Figures in parenthesis are square root transformed values

14.2. IVTO (DUAL): INITIAL VARIETAL TRIAL IN OAT (DUAL) - Palampur

S N	Entries	Powdery Mildew						
		In vitro condition			Field conditions			
		% Disease severity	Disease Ratting	Disease Reaction	%Disease severity	Disease Ratting	Disease Reaction	GFY (q/ha
1	OL-1802	70	5	HS	40	4	S	83.50
2	NDO-1101	75	5	HS	50	4	S	63.07
3	OL-1760-1	60	5	HS	50	4	S	66.63
4	RO-19	80	5	HS	55	5	HS	85.30
5	HFO-525	85	5	HS	60	5	HS	63.53
6	JHO-15-5	50	4	S	45	4	S	53.77
7	JHO-15-6	60	5	HS	50	4	S	38.17
8	HFO-523	70	5	HS	45	4	S	64.83
9	JO-09-509	60	5	HS	35	4	S	74.17
10	UPO-212	50	4	S	30	4	S	71.07
11	JHO-822	60	5	HS	40	4	S	68.87

Ludhiana: The aphid population in the test genotypes varied non significantly from 1.0-3.00. There was no statistical difference with respect to aphid population per tiller amongst different entries in the experiment. All entries showed susceptible reaction to leaf blight.

Rahuri: Among the different entries of dual purpose oat NDO-1101, HFO-523, OL-1760-1, OL-1802JO-09-509 recorded 16.09, 16.70, 17.26, 17.63 and 18.70 aphids per tiller, respectively and were significantly lesser than other entries.

Bhubaneswar: For Alternaria leaf blight, entries JHO15-5, JO-09-509 were moderately resistant whereas all other entries showed resistant reaction. For Sclerotium root rot, entry OL-1802 was resistant, entries NDO 1101, RO 19, JHO 15-6 were susceptible and all other entries were moderately resistant. For leaf defoliators, not much variation was observed among the entries and checks.
Palampur: All the entries were found susceptible under artificial as well as under field conditions.

PPT 17: To study the pathogenic variability of A. *Blumeria graminis* f. sp. *avenae* on oat

Location: Palampur

During 2015-16 season two isolates of oat powdery mildew *i.e.* Bir (Kangra) and Rait (Kangra) were collected and were maintained under Controlled conditions (Green house).The reaction of these isolates was studied on selected differential set to find out the pathogenic variability. The reaction of the two isolates was recorded on detached leaf method under *in vitro* as infection types *i.e.* 0-4 under sterozoom microscope on 10 differential line of oat as given in table 1. The deferential set of 10 line *i.e.* **OL-160, OAT- H 38, IG-03-148, UPO-119, OAT-TRS-RKC, IG-03-251, EC-6058, OAT902, HFO-114 and OAT-OS-121 were selected by** evaluating 70 with 7 isolates to be during 2013 and 2014. The pathogenic variability was studied after the development of differential set. The detached leaf methods for evaluation of oat germplasm under *in vitro* and scale for the recording of infection types was standardized for pea powdery mildew (Banyal, 1995) was used.

The description of infection types (Banyal, 1995) is as below:

Infection type	Description
0	No mycelium growth.
1	Sparse mycelium growth with very little sporulation.
2	Slight growth of mycelium is evident macroscopically.
3	Moderate growth of mycelium is evident macroscopically & formation of clear colonies.
4.	Abundant growth of mycelium is evident macroscopically & colonies get mixed with each other leading to the formation of mycelia.

The above infection types were employed for studying the pathogenic variability. In designating the pathotypes, only two disease reaction categories were used *viz*; resistant (R) including 0,1 and 2 infection types, and susceptible (S) including 3 and 4 infection types. The infection type and reaction type of the two isolates i.e. rait and Bir are given in tables 1 & 2.

b. Pathogenic variability:

The virulence pattern of the 11 isolates (during 2012-13, 2013-14, 2014-15 and 2015-16) of *Blumeria graminis* f. sp. *avenae* on differential set (10 lines) is given in Table 4. On the basis of reaction of 10 differentials, the 11 isolates were grouped into 6 different pathotypes (Table 5). Of the 7 isolates, one isolate was placed in pathotype PMO-1, two in pathotype PMO-2, three in pathotype PMO-3, two in pathotype PMO-4, one in pathotype PMO-5 and two in pathotype PMO-6.

Table PPT 17.1. Infection type of 2 isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew of oats on the differential set collected during 2015-16

S. No.	Isolates	Reaction type of isolates on Differential Lines									
		OL-160	OAT-H 38	IG-03-248	UPO-119	OAT-TRS-RKC	IG-03-251	EC-6058	OAT902	HFO-114	OAT-OS-121
1	Rait	1	2	1	3	2	2	2	1	2	2
2	Bir	2	3	2	4	2	2	3	2	3	2

Table PPT 17.2. Reaction type of 2 isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew of oats on the differential set collected during 2015-16

S. No.	Isolates	Reaction type of isolates on Differential Lines									
		OL-160	OAT-H 38	IG-03-248	UPO-119	OAT-TRS-RKC	IG-03-251	EC-6058	OAT902	HFO-114	OAT-OS-121
1	Kangra	R	R	R	S	R	R	R	R	R	R
2	Bir	R	S	R	S	R	R	S	R	S	R

The infection type and reaction type of all the 11 isolates collected during last 3 years are given in table 17.3 & 17.4.

Table PPT 17.3. Infection types of 7 isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew of oats on the differential set from 2013-15

S. No.	Isolates	Reaction type of isolates on Differential Lines									
		OL-160	OAT- H 38	IG-03-248	UPO-119	OAT-TRS-RKC	IG-03-251	EC-6058	OAT 902	HFO-114	OAT-OS-121
PMO-1	Agronomy	0	1	1	0	0	0	0	1	0	0
PMO-2	Tanda	2	4	2	2	2	2	2	2	3	1
PMO-3	Nagrota	1	1	1	3	1	1	2	1	1	1
PMO-4	Rajpur	0	0	0	4	1	1	4	0	4	3
PMO-5	Plant Pathology	2	1	2	2	2	2	1	4	2	3
PMO-6	Kangra	4	2	4	2	4	4	3	3	0	2
PMO-7	Fodder Farm	2	4	1	1	1	1	0	1	3	4
PMO-8	Chuantra	2	4	1	4	2	1	4	2	3	2
PMO-9	Gagal	2	2	2	3	2	2	2	2	2	2
PMO-10	Rait	1	2	1	3	2	2	2	1	2	2
PMO-11	Bir	2	3	2	4	2	2	3	2	3	2

Table PPT 17.4. Infection types of 7 isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew of oats on the differential set from 2013-15

S. No.	Isolates	Reaction type of isolates on Differential Lines									
		OL-160	OAT - H 38	IG-03-248	UPO-119	OAT-TRS-RKC	IG-03-251	EC-6058	OAT902	HFO-114	OAT-OS-121
PMO-1	Agronomy	R	R	R	R	R	R	R	R	R	R
PMO-2	Tanda	R	S	R	R	R	R	R	R	S	R
PMO-3	Nagrota	R	R	R	S	R	R	R	R	R	R
PMO-4	Rajpur	R	R	R	S	R	R	S	R	S	S
PMO-5	Plant Pathology	R	R	R	R	R	R	R	S	R	S
PMO-6	Kangra	S	R	S	R	S	S	S	S	R	R
PMO-7	Fodder Farm	R	S	R	R	R	R	R	R	S	S
PMO-8	Chuantra	R	S	R	S	R	R	S	R	S	R
PMO-9	Gagal	R	R	R	S	R	R	R	R	R	R
PMO-1	Rait	R	R	R	S	R	R	R	R	R	R
PMO-11	Bir	R	S	R	S	R	R	S	R	S	R

Table PPT 17.5. Virulence pattern of isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew of oats on differential set

S N	Isolate	Infection Types on Differential lines										Pathotypes	Virulence Frequency (R:S)
		OL-26R	OAT-H 38	IG-R3-248	UPO-229	OAT-TRS-RKC	IG-R3-252	EC-6R58	OAT 9R2	HFO-224	OAT-OS-222		
1	Agronomy	R	R	R	R	R	R	R	R	R	R	PMP-1	1R:R
2	Tanda & Kangra	S	S	S	S	S	S	S	S	S	R	PMP-2	1:9
3	Nagrota Gagal & Rait	R	R	R	S	R	R	S	R	R	R	PMP-3	8:2
4	Rajpur & Fodder Farm	R	R	R	S	R	R	S	R	S	S	PMP-4	6:4
5	Plant Pathology Farm	S	R	S	S	S	S	R	S	S	S	PMP-5	2:8
6	Chuantra & Bir	R	S	R	S	R	R	S	R	S	R	PMP-6	6:4

PPT 19: Management of soil borne diseases in clover (Egyptian clover) seed crops

Location: Ludhiana

Objective: To manage the soil borne diseases in clover seed crop mainly stem rot caused by *Sclerotinia trifoliorum.*

Observations: Spray with Carbendazim @ 1.0 kg/ha exhibited least disease incidence of stem rot that is 13.58% followed by application of neem seed powder @ 50 kg/ha (16.29%) and spray of NSKE @ 5% before disease appearance with disease incidence of 16.97 percent followed by Soil application of *Trichoderma* @ 5kg/ha with incidence of 17.33 percent as compare to control (39.55%) under natural conditions (Table PPT 19). These treatments also showed increase in green fodder yield. Green fodder yield was observed maximum with the application of Carbendazim and neem seed powder that is 560.95 and 532.69 q/ha respectively. Per cent incidence was statistically at par in all the treatments. Both the treatments also exhibited maximum seed yield (3 q/ha) in comparison to rest of the treatments. Disease incidence was recorded at weekly interval.

Table PPT 19: Effect of soil, seed treatment and foliar spray on disease incidence and GFY on clover seed crop

Treatments		Stem rot Incidence (%)	Green Fodder Yield (q/ha)	Seed Yield (q/ha)
T_1	Soil application of *Trichoderma* @ 5kg/ha	17.33	470.15	2.76
T_2	Soil application of *Pseudomonas fluorescens* @ 5kg/ha	21.20	373.01	2.67
T_3	Seed treatment with Carbendazim @ 2g/kg seed	20.31	414.60	2.76
T_4	Apply FYM @ 60 kg/ha to the plots	20.08	401.90	2.76
T_5	Apply neem seed powder @ 50 kg/ha	16.29	532.69	3.00
T_6	Spray of NSKE @ 5% before disease appearance	16.97	512.37	2.88
T_7	Spray of Carbendazim @ 1.0 kg/ha	13.58	560.95	3.04
T_8	Untreated control	39.55	350.79	2.57
CD (P=0.05)		**1.33**	**NS**	**11.56**
CV		**2.85**	**7.74**	**7.74**

PPT-20: Management of soil borne and powdery mildew diseases in red clover seed crop

Location: Palampur

The experiment was conducted to manage the powdery mildew and soil borne diseases 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 3.3 percent disease severity and 95.1 per cent disease control with 83.3 per cent increase in yield as compared to control. Seed treatment with carbendazim @ 2 g/kg seed followed by and one spray each of *Trichoderma,* wettable sulphur and hexaconazole provided best management of soil borne diseases (2.8 % severity and 85.7 % disease control) and good control of powdery mildew (5.8 % severity and 91.5 % disease control) with 100 per cent increase in yield over check.

PPT-20: Management of soil borne and powdery mildew diseases in red clover seed crop

Treatment	% Severity or incidence				Yield	
	Powdery mildew	% control	Soil borne disease	% control	(q/ha)	% increase
T_1 =Seed treatment with *Trichoderma* @ 5g/kg seed	68.3 (55.7)	0.1	7.4	62.2	0.8	33.3
T_2 =Seed treatment with carbendazim @ 2 g/kg seed	54.9 (47.8)	19.7	4.6	76.5	0.9	50.0
T_3=T_1 + Three foliar spray of *Trichoderma* @ 0.5%	46.6 (43.1)	31.9	7.0	64.2	0.9	50.0
T_4=T_2 + Three foliar spray of *Trichoderma* @ 0.5%	35.4 (36.5)	48.2	4.4	77.5	1.0	66.7
T_5=T_1 + Three foliar spray of wettable sulphur@ 0.3%	16.3 (23.8)	76.1	7.0	64.2	1.1	83.3
T_6 =T_2 + Three foliar spray of wettable sulphur@ 0.3%	12.1(20.3)	82.3	4.0	79.5	1.1	83.3
T_7=T_1 + Three foliar spray of hexaconazole @ 0.1 %	7.6 (16.0)	88.8	7.2	63.2	0.9	50.0
T_8 =T_2 + Three foliar spray of hexaconazole @ 0.1 %	3.3 (10.4)	95.1	3.9	80.1	1.1	83.3
T_9 =T_1 + One spray each of *Trichoderma,* wettable sulphur and hexaconazole	4.6 (12.4)	93.2	6.4	67.3	1.0	66.7
T_{10} =T_2 + One spray each of *Trichoderma,* wettable sulphur and hexaconazole	5.8 (13.9)	91.5	2.8	85.7	1.2	100.0
T_{11} = Control	68.4 (55.8)	-	19.6	-	0.6	-
CD (5%)	2.58	-	0.98	-	0.16	-

PPT 21: Management of foliar diseases of oat

Location: Ludhiana

Objective: The objective of study was to manage the foliar diseases of oat through seed treatment and soil application of fungicides and bioagents.

Observations: Seed treatment with Carbendazim 50WP @2g/kg seed + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS showed minimum disease severity of leaf blight in oats (28.83%) followed by seed treatment with *Trichoderma viride* (CFU 10^6/gm of formulation) @ 5g/kg of seed + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS that is 33.25 percent and seed treatment with Carbendazim 50WP @2g/kg seed + foliar application of Carbendazim 12% + Mancozeb 63% WP @ 1g/lit after 21 DAS (37.33%) as compare to check with percent leaf blight severity of 57.17. Increase in fodder and seed yield was also observed in treatments T_6 and T_7 with 515.56, 493.33 q/ha and 34.22, 28.44 q/ha respectively. All the treatments were statistically at par with each other (Table PPT 21).

Table PPT 21: Effect of foliar spray and seed treatment on leaf blight and GFY of Oats

Treatments		Leaf Blight Severity (%)	GFY (q/ha)	Seed Yield (q/ha)
T_1	Seed treatment with Carbendazim 50WP @2g/kg seed	40.17	471.11	26.00
T_2	Seed treatment with *Trichoderma viride* (CFU 10^6/gm of formulation) @ 5g/kg of seed	45.84	440.00	23.11
T_3	Seed treatment with *Trichoderma viride* (CFU 10^6/gm of formulation) @ 5g/kg of seed + foliar sprays of *T. viride* @ 0.5% at 21 DAS	44.17	453.33	23.33
T_4	T_1 + foliar application of Carbendazim 12% + Mancozeb 63% WP @ 1g/lit after 21 DAS	37.33	488.89	27.78
T_5	T_2 + foliar application of Carbendazim 12% + Mancozeb 63% WP @ 1g/lit after 21 DAS	43.83	462.22	24.67
T_6	T_1 + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS	28.83	515.56	34.22
T_7	T_2 + foliar application of Propiconazole 25 EC @ 1ml/lit after 21 DAS	33.25	493.33	28.44
T_8	Untreated control	57.17	431.11	22.22
CD (P=0.05)		**2.46**	**NS**	**3.09**
CV		**4.21**	**4.51**	**5.75**

PPT-22: Studies on biological management of *Spodoptera litura* in relation with different time of application on lucerne under field condition.

Location: Rahuri

Objective

- To find out effectiveness of different entomopathogenic fungi in combination with *SlNPV* against *S. litura* on Lucerne
- To study the efficacy of biopesticides against *S. litura* at different time of application

Design: Split Plot Design **Replications:** 3 **Fertilizers:** 20:150:40 NPK kg/ha
Plot Size: Gross: 3.40x 4.40 m Net: : 3.0X 4.0 m **Spacing:** 30 cm

Treatment:

A) Main treatments (Biopesticides)

1- Foliar application of *B. bassiana* @ $1X10^8$ CFU/g (5 g/lit)
2- Foliar application of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit)
3- Foliar application of *SlNPV* @ 1ml/lit
4- T1+T3
5- T2+T3
6- T1+T2+T3
7- Untreated control

B) Sub treatments (Time of application)

1-Foliar application at 8 am
2- Foliar application at 4 pm
3- Foliar application at 8 pm

Date of sowing	**:**	13.11.2014
Date of spraying	**:**	23/04/2016
Date of observations	**:**	Precount- 22/04/2016 at night, 27/04/2016, 29/04/2016
Date of harvesting	**:**	GFY : 07/05/16

Table 22.1 : Effect of entomopathogenic fungi and SlNPV on survival larval population of *Spodoptera litura* at 8AM, 4PM and 8 PM spray treatment

Treatments	At 8AM spray treatment (Av. No. of larvae/m2)			At 4PM spray treatment (Av. No. of larvae/m2)			At 8PM spray treatment (Av. No. of larvae/m2)		
	Pre-count	5 DAS	7 DAS	Precount	5 DAS	7 DAS	Precount	5 DAS	7 DAS
T1	10.19	7.43	4.25	9.85	8.35	6.83	10.45	3.79	2.35
	3.27	**2.82**	**2.18**	**3.22**	**2.97**	**2.71**	**3.31**	**2.07**	**1.69**
T2	10.04	7.27	4.23	9.70	7.88	6.81	10.30	3.63	2.33
	3.25	**2.78**	**2.17**	**3.19**	**2.89**	**2.70**	**3.28**	**2.03**	**1.68**
T3	10.30	7.46	3.84	9.96	8.35	6.42	10.57	3.82	1.94
	3.29	**2.82**	**2.08**	**3.23**	**2.97**	**2.63**	**3.33**	**2.08**	**1.56**
T4	10.20	6.17	2.96	9.86	6.70	5.54	10.47	2.53	0.00
	3.27	**2.58**	**1.86**	**3.22**	**2.68**	**2.45**	**3.31**	**1.74**	**0.71**
T5	10.24	6.14	2.86	9.90	6.56	5.43	10.50	2.50	0.11
	3.28	**2.57**	**1.83**	**3.22**	**2.66**	**2.43**	**3.32**	**1.73**	**0.77**
T6	10.37	5.80	2.41	9.86	6.55	4.98	10.63	2.16	0.00
	3.30	**2.51**	**1.70**	**3.22**	**2.66**	**2.34**	**3.33**	**1.62**	**0.71**
T7	10.15	12.10	13.80	9.55	12.65	12.90	10.22	12.55	12.90
	3.26	**3.55**	**3.78**	**3.17**	**3.62**	**3.66**	**3.27**	**3.61**	**3.66**
SE±	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.07	0.05
CD at 5%	N.S.	0.14	0.13	N.S.	0.16	0.14	N.S.	0.21	0.14

Bold figures indicating the values of square root n+0.5

INTERACTION EFFECT

Table 22.2: Survival larval population of S. *litura* before spray, 5 and 7 days after spray

Treatments	Survival larval population / m^2 days before spray, 5 and 7 days after spray											
	Pre - count				At 5 DAS				At 7 DAS			
	8am (C1)	4pm (C2)	8pm (C3)	Mean	8am (C1)	4pm (C2)	8pm (C3)	Mean	8am (C1)	4pm (C2)	8pm (C3)	Mean
T1	10.19 (3.27)	9.85 (3.22)	10.45 (3.31)	10.16 (3.26)	7.43 (2.82)	8.35 (2.97)	3.80 (2.07)	6.53 (2.62)	7.43 (2.82)	8.35 (2.97)	3.80 (2.07)	6.53 (2.62)
T2	10.04 (3.25)	9.70 (3.19)	10.30 (3.28)	10.01 (3.24)	7.27 (2.78)	7.88 (2.89)	3.63 (2.03)	6.26 (2.57)	7.27 (2.78)	7.88 (2.89)	3.63 (2.03)	6.26 (2.57)
T3	10.30 (3.29)	9.96 (3.23)	10.57 (3.33)	10.28 (3.28)	7.46 (2.82)	8.35 (2.97)	3.82 (2.08)	6.55 (2.62)	7.46 (2.82)	8.35 (2.97)	3.82 (2.08)	6.55 (2.62)
T4	10.20 (3.27)	9.86 (3.22)	10.47 (3.31)	10.18 (3.26)	6.17 (2.58)	6.70 (2.68)	2.53 (1.74)	5.13 (2.33)	6.17 (2.58)	6.70 (2.68)	2.53 (1.74)	5.13 (2.33)
T5	10.24 (3.28)	9.90 (3.22)	10.50 (3.32)	10.21 (3.27)	6.14 (2.57)	6.56 (2.66)	2.51 (1.73)	5.07 (2.32)	6.14 (2.57)	6.56 (2.66)	2.51 (1.73)	5.07 (2.32)
T6	10.37 (3.30)	9.86 (3.22)	10.64 (3.34)	10.29 (3.33)	5.80 (2.51)	6.55 (2.66)	2.16 (1.62)	4.84 (2.28)	5.80 (2.51)	6.55 (2.66)	2.16 (1.62)	4.84 (2.28)
T7	10.15 (3.26)	9.55 (3.17)	10.22 (3.27)	9.97 (3.24)	12.10 (3.55)	12.65 (3.62)	12.55 (3.61)	12.44 (3.59)	12.10 (3.55)	12.65 (3.62)	12.55 (3.61)	12.44 (3.59)
	10.21 (3.27)	9.81 (3.23)	10.45 (3.31)	10.16 (3.27)	7.48 (2.80)	8.14 (2.92)	4.43 (2.13)	6.69 (2.62)	7.48 (2.80)	8.14 (2.92)	4.43 (2.13)	6.69 (2.62)
		T	**C**	**T xC**		**T**	**C**	**T xC**		**T**	**C**	**T xC**
	SE±	0.029	0.019	0.050	**SE±**	0.033	0.024	0.058	**SE±**	0.033	0.024	0.058
	CD at 5%	NS	NS	NS	**CD at 5%**	0.096	0.095	0.166	**CD at 5%**	0.096	0.095	0.166

* Figures in parentheses indicate $\sqrt{n} + 0.5$transformation

The interaction effect among the treatments in respect of survival population of larvae/m^2 before spray treatment was non-significant. The range of survival larval population/m^2 was from 9.55 to 10.64 larvae/m^2.

At 5 DAS, Stastically lower survival population/m^2 was observed in treatment with mixture of *B. bassiana, N. rileyi* and SlNPV (2.16 larvae/m^2) at 8 pm spraying time. However, it was at par with mixture of *N. rileyi* and SlNPV and mixture of *B. bassiana* and SlNPV recording 2.51 and 2.53 larvae/m^2 at 8 pm spraying treatment, respectively. Among the time of application, lower survival population of larvae/m^2 was observed at 8 pm recording 4.43 larvae/m^2 which is significantly superior over the other time of application such as 8 am and 4 pm. However, the treatments, mixture of *B. bassiana, N. rileyi* and SlNPV was found significantly superior over all the treatments recording 4.84 larvae/m^2. Nevertheless, it was at par with mixture *N. rileyi* and SlNPV and mixture of *B. bassiana* and SlNPV recording 5.07 and 5.13 larvae/m^2.

At 7 DAS, Foliar application of *B. bassiana* + *N. rileyi* + SlNPV, *B. bassiana* + SlNPV and *N. rileyi* + SlNPV at 8 pm recorded 0.00, 0.00 and 0.11 survival larva/m^2, respectively at 7 DAS which were significantly at par with each other and showed their superiority as compared to other time of application. Among the treatments, lower survival population of larvae was observed with mixture of *B. bassiana, N. rileyi* and SlNPV recording 2.46 larvae/m^2. Among the time of application, statically lower survival population was observed at 8 pm, recording 2.81 larvae/m^2

Table 22.3: Interaction effect of time of application on green forage yield of lucerne due to biopesticidal treatments

Treatments (T)	Green forage yield (q/ha)			Mean(T)
	8 am (C1)	4 pm (C2)	8 pm(C3)	
1	86.94	73.72	96.78	85.81
2	87.67	74.66	99.72	87.35
3	90.28	79.50	99.08	89.62
4	90.67	78.22	100.46	89.78
5	90.83	81.83	101.18	91.28
6	92.78	81.99	103.94	92.90
7	77.02	70.36	73.71	73.71
Mean	88.03	77.18	96.42	
SE± (TxC) CD at 5% (TxC)	2.26 6.50			
SE± (C) CD at 5% (C)	1.81 7.11			
SE± (T) CD at 5% (T)	1.31 3.75			

Results: The higher green forage yield (103.94 q/ha) of lucerne was obtained from the treatment combination of *B. basssiana*, *N. rileyi* and SlNPV sprayed during 8 pm on lucerne and it was significantly higher than the other treatments and other time of applications. However, it was at par with mixture of *N. rileyi*, SlNPV @ $1x10^8$ cfu/g + 250 LE/ ha, mixture of *B. bassiana*, SlNPV @ $1x10^8$ cfu/g + 250 LE/ ha , SlNPV alone @ 250 LE/ha, *N. rileyi* alone @$1x10^8$ cfu/ml recording 101.18, 100.46, 99.08, 99.72 q/ha, respectively. Among the treatments, highest green forage yield was obtained with mixture of *B. bassiana, N. rileyi* and SlNPV recording 92.90 q/ha. However, it was at par with mixture of *N. rileyi,* SlNPV , mixture of *B. bassiana*, SlNPV and SlNPV alone recording 91.28, 89.78, and 89.62 q/ha, respectively. Among the time of application, higher green forage was obtained at 8 pm, recording 96.42 q/ha which is significantly superior over other time of application.

Table PPT22-4: Incremental cost benefit ratio (ICBR) due to treatments at different time of application

S N	ICBR			Mean
	8 am	4 pm	8 pm	
T1	1:1.54	1:-0.14	1:4.92	1:2.11
T2	1:1.73	1:0.10	1:5.67	1:2.50
T3	1:2.19	1:1.20	1:5.10	1:2.83
T4	1:1.41	1:0.39	1:3.73	1:1.84
T5	1:1.44	1:1.03	1:3.85	1:2.11
T6	1:1.20	1:0.62	1:3.22	1:1.68
Mean	1:1.59	1:0.53	1:4.41	1:2.18

Results: Maximum ICBR (1:2.83) due to individual treatment of SLNPV alone. However, among the different time of application 8 PM showed highest (1:4.41) ICBR than the other time of application. Application of biopesticides at 8 PM is suitable time for the highest return.

PPT-22: Studies on biological management of *Spodoptera litura* in relation with different time of application on lucerne under field condition.

Location: Hyderabad

Result: Incidence of *S.litura* was not observed. Hence treatments were not imposed

PPT-23: Biological control of *Helicoverpa armigera* on Lucerne seed crop
Location: Rahuri
Objective:

- To find out effectiveness of different entomopathogenic fungi in combination with *HaNPV* against *H. armigera* on Lucerne seed crop
- To study the effect of biopesticides on honey bee activities

Design: RBD **Replications:** 3 **Plot Size:** Gross: 3.40x 4.40 m Net: : 3.0X 4.0 m

Spacing: 30 cm **Fertilizers:** 20:150:40 NPK kg/ha
Treatments: 7

- T1- Foliar application of *B. bassiana* @ $1X10^8$ CFU/g (5 g/lit)
- T2- Foliar application of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit)
- T3- Foliar application of *HaNPV* @ 1ml/lit
- T4- T1+T3
- T5- T2+T3
- T6- T1+T2+T3
- T7- Untreated control

Date of sowing	**:**	13.11.2014
Date of spraying	**:**	*H. armigera*-17/04/2016 and 28/04/2016
Date of observations	**:**	*H. armigera*- 16/06/16, 21/04/2016, 23/04/2016, 27/04/2016, 2/05/2016 and 4/05/2016
Date of harvesting	**:**	Seed : 20/05/16

*** Sprays were given at evening and observations were also taken at evening time**

Table PPT23-1 : Effect of entomopathogenic fungi and *Ha*NPV on survival larval population of *Helicoverpa armigera*, honey bees and seed yield (Av. of 2 sprays)

Treatments	Av. No. of larvae/m2			Av. No. of bees		Seed yield (q/ha)
	Pre-count	at 5 DAS	at 7 DAS	2nd DAS at 11 AM		
	Mean	Mean	Mean	bee Visits	bees/plot/minute	
T1	6.71 **2.67**	4.89 **2.29**	3.51 **1.95**	24.00	6.00	2.46
T2	6.56 **2.64**	4.73 **2.25**	3.49 **1.95**	22.00	5.00	2.46
T3	6.83 **2.69**	4.92 **2.30**	3.10 **1.84**	22.33	5.33	2.48
T4	6.73 **2.67**	3.63 **1.99**	2.22 **1.55**	21.33	5.33	2.69
T5	6.76 **2.68**	3.60 **1.98**	2.11 **1.51**	21.67	5.33	2.78
T6	6.90 **2.70**	3.26 **1.89**	1.66 **1.33**	25.00	5.67	2.90
T7	9.65 **3.18**	13.65 **3.75**	14.05 **3.81**	23.33	5.67	0.64
SE±	0.07	0.06	0.06	0.90	0.50	0.06
CD at 5%	0.20	0.18	0.18	N.S.	N.S.	0.18

Bold figures indicating transformed values of √n+0.5, DAS: Days after spraying

Table 23.2: Effect of entomopathogenic fungi and *Ha*NPV on survival larval population of *H. armigera*, honey bee activities and seed yield of lucerne

Treatment	(Av. No. Survival larvae/m^2 days			bee visits at 11 AM		Seed Yield (q/ha)
	Pre count			2nd DAS spraying		
		5 DAS	7DAS	bee Visits	No. of bees/ plot/ minute	
T1	6.71 **2.67**	4.89 **2.29**	3.51 **1.95**	32.67	5.00	2.46
T2	6.56 **2.64**	4.73 **2.25**	3.49 **1.95**	31.33	4.00	2.46
T3	6.83 **2.69**	4.92 **2.30**	3.10 **1.84**	30.67	4.33	2.48
T4	6.73 **2.67**	3.63 **1.99**	2.22 **1.55**	29.00	4.33	2.69
T5	6.76 **2.68**	3.60 **1.98**	2.11 **1.51**	28.33	4.33	2.78
T6	6.90 **2.70**	3.26 **1.89**	1.66 **1.33**	31.33	4.67	2.90
T7	9.65 **3.18**	13.65 **3.75**	14.05 **3.81**	29.00	4.67	0.64
SE±	0.07	0.06	0.06	0.90	0.50	0.06
CD at 5%	0.20	0.18	0.18	N.S.	N.S.	0.18

Bold figures indicating the values of square root n+0.5

Results: At 5 DAS treatment combinations of *B. bassiana* (1x108 cfu/g), *N. rileyi* (1x108cfu/g) and HaNPV (250 LE/ha) gave excellent control of *H. armigera*. However, treatment combinations of *N. rileyi* and HaNPV @ $1x10^8$ cfu/g+ 250 LE/ha and combination of *B. bassiana* and HaNPV @ $1x10^8$ cfu/g+ 250 LE/ha, were statistically at par with each other for reducing the larval population of *H. armigera* and recorded 3.26, 3.60 and 3.63 larvae/m^2 at 5 days after

At seven days after treatment, combination of *B. bassina*, *N. rileyi* and HaNPV and combination of *N. rileyi* and HaNPV were statistically at par with each other recording 1.66 and 2.11 larvae/ m^2, respectively.

Honey bee activities: There were non significant differences among the treatments in respect of bee visits and average number of bees/plot/min at 2nd days after treatment. However, the range of bee visits /plot/min. at 11 a.m. was 28.33 to 32.67 at 2nd days after spraying. As regards average number of bees/plot/min., it was ranged from 4.00 to 5.00 at 11a.m. 2nd days after spraying.

Seed Yield: The treatment combinations of *B. bassiana, N. rileyi* and HaNPV recorded highest seed yield (2.9 q/ha) of lucerne and it was significantly higher than the remaining treatments. However, treatment combinations of *N. rileyi* and HaNPV (2.78 q/ha) was at par with it.

Table PPT23-2: Incremental cost benefit ratio (ICBR)

Treatment	Increased Seed yield over control	Value of seed (Rs.)	Treat cost Rs	Net profit	ICBR
T1	1.82	91000	1950	89050	45.67
T2	1.82	91000	1950	89050	45.67
T3	1.84	92000	2200	89800	40.82
T4	2.05	102500	2950	99550	33.75
T5	2.14	107000	2950	104050	35.27
T6	2.26	113000	3700	109300	29.54

Seed Rs. 50000/quintal

Insecticides	Qty /spray	For 2 spray	Cost (Rs.)	Labour charges (Rs)	Total cost (Rs)
B.bassiana	2500 g	5.0 kg	750	1200	1950
N. releyi	2500 g	5.0 kg	750	1200	1950
HaNPV	500ml	1.0 lit.	1000	1200	2200
T4-T1+T3	2500g+500ml	5.0 kg+1.0 lit	1750	1200	2950
T5- T2+T3	2500g+500ml	5.0 kg+1.0 lit	1750	1200	2950
T6- T1+ T2+T3	2500+2500 g+500ml	5.0+5.0 kg+1.0lit	2500	1200	3700

Cost of all entomopathogenic fungi: Rs. 150/ kg
Labour + spray pump charges : Rs. 600/ha per spray

Economics: The highest ICBR recorded in individual treatments of *B.bassiana* and *N. releyi* (1:45.67) However, maximum net profit obtained due to treatment combination of *B.bassiana, N. releyi* and HaNPV (Rs. 109300/-).

PPT 23: Biological control of *H.armigera* on Lucerne seed crop

Location: Hyderabad

Incidence of *H.armigera* was not observed. Hence treatments were not imposed

PPT-24: Validation of disease management in white clover

Location: Palampur

The experiment was conducted to validate the management technology of powdery mildew (*Erysiphe trifolii)* and clover rot (*Sclerotinia trifoliorum*) in the seed crop of clover. It was observed that integrated management *i.e.* Seed treatment with carbendazim @ 2 g/kg and *Trichoderma viride* @ 5g/kg seed followed by alternate sprays of carbendazim (@ 0.1%) and hexaconazole (@0.05%) provided best management of powdery mildew (10.3% disease severity and 84.2 % disease control) and clover rot (3.5% incidence and 62.4 % disease control) as compared to control i.e. 65.3 per cent powdery mildew and 9.3 per cent clover rot. Seed treatment with *T. viride* @ 5g/kg + Foliar spray of carbendazim @ 0.1 % + Foliar spray of hexaconazole @ 0.05 % also provided 80.9 per cent powdery mildew and 32.2 per cent clover rot control over the check.

PPT-24: Validation of disease management in white clover

Treatment	Per Cent Disease Severity/Incidence				Seed yield (q/ha)
	Powdery mildew		Clover rot		
	% disease severity	% control	% disease incidence	%control	
T_1	12.5	80.9	6.3	32.2	1st year of trial and no seed yield obtained
T_2	10.3	84.2	3.5	62.4	
T_3	65.3		9.3		

T_1 = Seed treatment with *T. viride* @ 5g/kg + Foliar spray of carbendazim @ 0.1 % + Foliar spray of hexaconazole @ 0.05 %
T_2 =Seed treatment with carbendazim @ 2 g/kg seed + Seed treatment with *T. viride* @ 5g/kg + Foliar spray of carbendazim @ 0.1 % + Foliar spray of hexaconazole @ 0.05 %
T_3 =Control

Recommendation: At Palampur, on the basis of three years data and one more year validation trial, seed treatment with carbendazim @ 2 g/kg and *Trichoderma viride* @ 5g/kg seed followed by alternate sprays of carbendazim (@ 0.1%) and hexaconazole (@0.05%) is recommended for the management of powdery mildew (*Erysiphe trifolii)* and clover rot (*Sclerotinia trifoliorum*) in the seed crop of clover.

PPT 25: Validation of entomopathogenic fungi against insect pests of lucerne
Location: Hyderabad

Aphid management

Treatment	Pre-treatment count Aphids/10 tillers	Post treatment count Aphids/10 tillers at 5 DAS	% reduction over control	GFY (q/ha)
T1	57	27	50.65	132.0
T2	89	36	58	145.0
T5	173	165	--	120.0

T1- Foliar application of *L.lecani*
T2- Foliar application of *L.lecani+M.anisopliae*
T5- Untreated control

Combination treatment of *L.lecani* and *M.anisopliae* was found better than *L.lecani* alone in validation trial with 58 and 50.65 per cent reduction over control and increase in GFY respectively.

PPT-25: Validation of entnomopathogenic fungi on insect pests of Lucerne
Location: Rahuri

Design: RBD **Replications:** 4 **Plot Size:** 250 sq. m./plot
Spacing: 30 cm **Fertilizers:** 20:150:40 NPK kg/ha
Treatments: 5

- **T1-** Foliar application of *L. lecani* @ $1X10^8$ CFU/g (5 g/lit)
- **T2-** Foliar application of *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) + *M. anisopliae* @ $1X10^8$ CFU/g (5 g/lit)
- **T3-** Foliar application of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit)
- **T4-** Foliar application of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) + *B. bassiana* @ $1X10^8$ CFU/g (5 g/lit)
- **T5-** Untreated control

Date of spraying	**:**	For Aphid-16/02/16 For *Spodoptera litura*: 21/3/2016 For *H. armigera*-14/04/2016 and 24/04/2016
Date of observations	**:**	For Aphid and LBB ï 15/02/16, 23/02/16 For *Spodoptera litura*: 20/3/2016, 28/03/2016 For *H. armigera*- 14/04/16, 21/04/2016 and 04/05/2016
Date of harvesting	**:**	Green Forage - 25/02/16 for aphid and 7/04/2016 for *S. litura* Seed : 19/05/2016

*** Sprays were given at evening and observations were also taken at evening time**

Table 25.1: Influence of different entomopathogenic fungi on survival population of aphids, Lady bird beetle (LBB), *S. litura*, *H. armigera*, green forage and seed yield of Lucerne

Treatments	No. of aphids/tiller		LBB/ tiller	GFY (q/ha)	Av. No. *S. litura* larvae/m^2			Av. No. *H. armigera* larvae/m^2		
	Pre count	7 DAS	7DAS		Pre count	7DAS	GFY (q/ha)	Pre count	7DAS	Seed yield (q/ha)
T1	45.20	11.63	2.61	81.96	10.15	10.67	56.93	7.82	8.00	1.48
T2	42.78	11.03	2.63	83.30	9.98	10.19	57.61	7.65	7.52	1.56
T3	44.37	25.94	2.48	67.68	10.32	1.93	76.21	7.99	1.22	2.28
T4	43.51	27.08	2.50	67.93	10.19	1.53	80.53	7.86	1.12	2.35
T5	42.89	62.27	2.75	56.13	10.10	12.68	52.99	7.77	10.01	1.30
SE ±	**2.2**	**2.19**	**0.24**	**1.78**	**0.31**	**0.35**	**1.50**	**0.30**	**0.34**	**0.07**
CD at 5%	**N.S.**	**6.74**	**N.S.**	**5.47**	**N.S.**	**1.08**	**4.60**	**N.S.**	**1.07**	**0.22**

Result: Precount of aphids, *S. litura* and *H. armigera* population was non-significant
Aphids: Treatment with mixture of *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) + *M. anisopliae* @ $1X10^8$ CFU/g (5 g/lit) **(T1)** and *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) **(T2)** recorded significantly lower number of aphids *viz.,* 11.03 and 11.63 at 7 DAS as compared to other treatments.

Lady bird beetles: All the entries showed safe to lady bird beetle grubs as the non significant differences were observed 7 days after application of biopesticides.

GFY: Treatment T2 and T1 recorded 83.30 and 81.96 q/ha green forage yield which was significantly higher than other treatments

***Spodoptera litura* :** Treatment of mixture of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) + *B. bassiana* @ $1X10^8$ CFU/g (5 g/lit) (**T4**) and *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) (**T3**) showed significantly lower number of survival larval population (1.53 and 1.93 larvae/m^2) 7 DAS with highest green forage yield (80.53 and 76.21 q/ha).

Helicoverpa armigera: Mixture of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) + *B. bassiana* @ $1X10^8$ CFU/g (5 g/lit) (**T4**) and *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) (**T3**) showed significantly lower number of survival larval population (1.12 and 1.22 larvae/m^2) 7 DAS with highest seed yield (2.35 and 2.28 q/ha).

Recommendation: At Rahuri

- On the basis of 3 years results and one more year validation as and when 20 aphids/tiller noticed on Lucerne, mixture of *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) + *M. anisopliae* @ $1X10^8$ CFU/g (5 g/lit) or *L. lecani* @ $1X10^8$ CFU/g (5 g/lit) alone as a foliar application is recommended for the control of aphids on Lucerne as a ecofriendly treatments.
- For the control of *S. litura* and *H. armigera* as an when 2 larvae per square meter /per running meter appeared on Lucerne, foliar application of mixture of *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) + *B. bassiana* @ $1X10^8$ CFU/g (5 g/lit) or *N. releyi* @ $1X10^8$ CFU/g (5 g/lit) alone as ecofirendly treatments are recommended.

Forage Crops Breeder Seed Production

[Indent year Rabi 2016-17]
[Production year Rabi 2015-16]
(Table Reference: Tables BSP 1 & BSP 2)

The indent for Breeder Seed Production was received from DAC, GOI for 29 varieties in four forage crops *viz*., Oat (14), Berseem (11), Lucerne (3) and Gobhi Sarson (1). The quantity allocated was 409.13 q and it was assigned to eleven Breeder Seed producing centres of the different SAUs/ NGO/ ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (357.75 q) followed by Berseem (46.63 q) and Lucerne (4.60 q) and minimum for Gobhi Sarson (0.15 q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centres revealed that in Berseem and Gobhi Sarson, the overall breeder seed production was more than the allocated quantity. However, there was marginal shortfall in Oat and Lucerne.

In Berseem, the production was 50.8 q (4.17 q surplus) against the allocated quantity of 46.63 q. Coming to center wise scenario, PAU, Ludhiana; IGFRI, Jhansi were net surplus producers whereas HAU, Hisar and JNKVV, Jabalpur were net deficit producers in Berseem.

In Oat, the production was 355.63 q (2.12 q deficit) against the allocation of 357.75 q. PAU, Ludhiana; IGFRI, Jhansi; GBPUAT, Pantnagar; HAU, Hisar, SKUAST-K, Srinagar were net surplus producers whereas NDUAT, Faizabad; BAIF, Urulikanchan; MPKV, Rahuri were net deficit producers in oat.

Similarly in Lucerne, there were 0.74 q deficit in production (3.86 q) with respect to 4.60 q allocation. AAU, Anand was deficit seed producer in Lucerne.

In Gobhi Sarson, the production was 0.20 q against the allocation of 0.15 q (0.05 q surplus) and as indent was for only one variety, HPKVV, Palampur was net surplus producer.

The overall breeder seed production was 410.49 q against the indent of 409.13 q (Table BSP 1 & 2).

Table BSP 1: Centre wise Breeder Seed Production (q) during *Rabi 2015-16*

[Indent Rabi 2016-17]
[Production year Rabi 2015-16]

Berseem

S No	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Surplus/ Deficit
1.	**Punjab**	BL-42	7.83	7.83	8.50	(+) 0.67
	PAU, Ludhiana	BL-180	2.0	2.0	2.00	-
		BL-10	20.25	20.25	22.00	(+) 1.75
		BL-1	5.3	5.3	5.30	-
2.	**Uttar Pradesh**					
	IGFRI, Jhansi	BB-3	3.5	3.5	3.0	(-)0.5
		BB-2	0.45	0.45	2.0	(+) 1.55
		Wardan	2.35	2.35	4.50	(+) 2.15
3.	**Haryana**					
	CCS HAU, Hisar	H. Berseem-1	0.50	0.50	0.0	(-) 0.50
		Mescavi	1.2	1.2	1.5	(+) 0.30
4.	**Madhya Pradesh**					
	JNKVV, Jabalpur	JB-5	0.5	0.5	1.0	(+) 0.5
		JB-1	2.75	2.75	1.0	(-) 1.75
		Total	**46.63**	**46.63**	**50.8**	**(+) 4.17**

Oat

S No	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Surplus/ Deficit
1	**Punjab**	OL-10	1.0	1.0	8.00	(+) 7.00
	PAU, Ludhiana	Kent	229.6	53.0	53.00	-
2.	**Maharashtra**					
	BAIF, Urulikanchan	Kent		30.0	27.00	(-) 3.00
	MPKV, Rahuri	RO-19	25.0	25.0	11.00 **	(-) 14.00
3.	**Gujarat**					
	AAU, Anand	Kent		45.0	45.0	-
4.	**Uttarakhand**					
	GBPUAT, Pantnagar	UPO-212	1.75	1.75	4.00	(+) 2.25
5.	**Uttar Pradesh**					
	IGFRI, Jhansi	JHO-2000-4	5.0	5.0	5.30	(+) 0.30
		JHO-99-2	22.4	22.4	20.60	(-) 1.8
		JHO-99-1	4.0	4.0	4	-
		JHO-882	30.0	30.0	26.24	(-) 3.76
		JHO-851	6.0	6.0	7.74	(+) 1.74
		Kent		101.6	107.25	(+) 5.65
	NDUA&T, Faizabad	NDO-1	1.0	1.0	0	(-) 1.0
		NDO-2	5.0	5.0	0	(-) 5.0
6.	**Haryana**					
	CCS HAU, Hisar	OS-6	5.0	5.0	8.0**	(+) 3.0
		HJ-8	12.0	12.0	16.0**	(+) 4.0
7.	**Jammu & Kashmir**					
	SKUAST, Srinagar	Shalimar Oat-1	10.0	10.0	12.50	(+) 2.50
		Total	357.75	357.75	**355.63**	**(-) 2.12**

Additionally 2.5 q of Kent seed produced by MPKV, Rahuri
**** = Unprocessed**

Lucerne

S No	Producing centre	Variety	Allocation as per DAC	Allocation BSP-I	Production	Surplus/ Deficit
1.	**Maharashtra**					
	MPKV, Rahuri	RL-88	0.10	0.10	0.11**	(+) 0.01
2.	**Gujarat**					
	AAU, Anand	Anand-3	0.90	0.90	0.15	(-) 0.75
		Anand-2	3.60	3.60	3.60	**-**
		Total	4.60	4.60	**3.86**	**(-) 0.74**

**** = Unprocessed**

Gobhi Sarson

S No	Producing centre	Variety	Allocation BSP-I	Allocation as per DAC	Production	Surplus/ Deficit
1	**Himachal Pradesh**	Him Sarson-1	0.15	0.15	0.20	(+) 0.05
	CSK HPKVV, Palampur					
		Total	**0.15**	**0.15**	**0.20**	(+) 0.05

Table BSP 2: Variety wise breeder seed production (q) during Rabi 2015-16

[Indent Rabi 2016-17]
[Production year Rabi 2015-16]

Crop	S No.	Variety	Produced by	Year of Notification	Allocation as per DAC	Allocation BSP-1	Production	Surplus (+) / Deficit (-)
Berseem	1	BL-42	PAU, Ludhiana	2007	7.83	7.83	8.50	(+) 0.67
	2	BL-180	PAU, Ludhiana	2006	2.0	2.0	2.00	-
	3	BL-10	PAU, Ludhiana	1985	20.25	20.25	22.00	(+) 1.75
	4	BL-1	PAU, Ludhiana	1978	5.3	5.3	5.30	-
	5	BB-3	IGFRI, Jhansi	2001	3.5	3.5	3.0	(-) 0.50
	6	BB-2	IGFRI, Jhansi	1997	0.45	0.45	2.0	(+)1.55
	7	Wardan	IGFRI, Jhansi	1982	2.35	2.35	4.50	(+) 2.15
	8	H. Berseem-1	CCS HAU, Hisar	2006	0.50	0.50	0	(-) 0.50
	9	Mascavi	CCS HAU, Hisar	1975	1.2	1.2	1.5	(+) 0.3
	10	JB-5	JNKVV, Jabalpur	2005	0.5	0.5	1.0	(+) 0.5
	11	JB-1	JNKVV, Jabalpur	1982	2.75	2.75	1.0	(-) 1.75
			Total		**46.63**	**46.63**	**50.8**	**(+) 4.17**
Oat	1	OL-10	PAU, Ludhiana	2014	1.0	1.0	8.00	(+) 7.00
	2	Kent	PAU, Ludhiana	1975	229.6	53.0	53.00	-
	3	Kent	BAIF, Urulikanchan	1975		30.0	27.0	(-) 3.0
	4	Kent	IGFRI, Jhansi	1975		101.6	107.25	(+) 5.65
	5	Kent	AAU, Anand	1975		45.0	45.0	-
	6	RO-19	MPKV, Rahuri	2007	25.0	25.0	11.0**	(-) 14.0
	7	UPO-212	GBPUAT, Pantnagar	1990	1.75	1.75	4.00	(+) 2.25
	8	JHO-2000-4	IGFRI, Jhansi	2006	5.0	5.0	5.30	(+) 0.30
	9	JHO-99-2	IGFRI, Jhansi	2005	22.4	22.4	20.60	(-) 1.8
	10	JHO-99-1	IGFRI, Jhansi	2007	4.0	4.0	4	-
	11	JHO-882	IGFRI, Jhansi	1989	30.0	30.0	26.24	(-) 3.76
	12	JHO-851	IGFRI, Jhansi	1998	6.0	6.0	7.74	(+) 1.74
	13	OS-6	CCS HAU, Hisar	1982	5.0	5.0	8.0	(+) 3.0
	14	HJ-8	CCS HAU, Hisar	1998	12.0	12.0	16.0	(+) 4.0
	15	Shalimar Oat-1	SKUAST-K, Srinagar	2013	10.0	10.0	12.50	(+) 2.50
	16	NDO-1	NDUA&T, Faizabad	2010	1.0	1.0	0***	(-) 1.0
	17	NDO-2	NDUA&T, Faizabad	2013	5.0	5.0	0***	(-) 5.0
			Total		**357.75**	**357.75**	**355.63**	**(-) 2.12**
Lucerne	1	RL-88	MPKV, Rahuri	1996	0.10	0.10	0.11	(+) 0.01
	2	Anand-3	AAU, Anand	1995	0.9	0.9	0.15	(-) 0.75
	3	Anand-2	AAU, Anand	1984	3.6	3.6	3.60	-
			Total		4.6	4.6	3.86	(-) 0.74
Gobhi Sarson	1	Him Sarson-1	CSK HPKVV, Palampur	2009	0.15	0.15	0.20	(+) 0.05
			Total		0.15	0.15	0.20	(+) 0.05
Grand Total								

- **At NDUAT, Faizabad,** the Breeder Seed of NDO-1 was produced 9.75q during the Rabi 2012-13 and seed was not lifted as per DAC allotment. Hence keeping such quantity in mind, the B/S of NDO-1 and NDO-2 were not produced during Rabi 2015-16 (reported by Seed Production Unit, NDUAT, Faizabad).
- **At MPKV, Rahuri** less production of oat variety RO -19 was due to water scarcity during crop period.
- **At IGFRI, Jhansi** due to delay in sowing followed by sudden rise in temperature during winter season reduced yield in some varieties

All India Coordinated Research Project on Forage Crops

FTDs ALLOTTED TO AICRP (FC & U) CENTRES FOR RABI 2015-16

S. No.	Centre name	Crop-wise FTDs to be conducted during Rabi 2015-16					Total
		Berseem	Lucerne	Oat (SC)	Oat (MC)	Other crops	
1.	Jorhat			20			20
2.	Kalyani	5		20		5 (Lathyrus)	30
3.	Ranchi	5		5		5 (Lathyrus)	15
4.	Faizabad			10			10
5.	Jabalpur	10			5		15
6.	Anand		10	10			20
7.	BAIF Urul.	5		10			15
8.	Rahuri	5			10		15
9.	Bikaner		10	15			25
10.	Ludhiana	10			15	25 (rye grass)	50
11.	Hisar	20		20			40
12.	Pantnagar	30			10	20 (spring maize)	60
13.	Coimbatore		5			5 (Guinea grass) 15 (cowpea)	25
14.	Hyderabad		10	20		10 (Hedge lucerne)	40
15.	Mandya		10	10			20
16.	Palampur				10	5 (Tall fescue)	15
17.	Vellayani					15 (Napier Bajra)	15
18.	Raipur				5	5 (Lathyrus)	10
19.	Imphal			20	20		40
20.	Karjat	10		10			20
21.	Srinagar			50			50
Total		**100**	**45**	**220**	**75**	**110**	**550**

TRIBAL SUB-PLAN ACTIVITIES

It is compilation of activities reported by different centres and is a consolidated report of 2015-16

JNKVV, Jabalpur

Forty farmers in kanhisang village district Dindori Madhya Pradesh were provided with improved seeds and package of practices for enhancing fodder production. The improved varieties include African Tall in Maize, JRBJ05-2 in rice bean, IGFRI-7 in Hybrid Napier, JB5 in Berseem and Jawahar oat 1 &2 in Oat. This helped in increasing the productivity of milk health of animals and the tribals as well. In Kisan sangosthi, literatures related on forage production technology were distributed.

GBPUAT, Pantnagar

Total 1586 farmers including 584 direct beneficiaries and 1002 farmers as indirect beneficiaries were benefitted by different field activities organized under TSP program. Maize (African Tall), sorghum, berseem, oat, cowpea and ricebean seed were distributed among selected farmers along with NPK, urea weedicides, insecticides and fungicides. 24 farmers' training programs were organized in selected tribal villages i.e. Kanpura, Balkhera and Kaithulia, Pehsaini, Balkhera, Saronja and Gaganpur Block Sitarganj (U S Nagar) and Rajpura-2, Nandpur and Khempur (Gadarpur Block), U S Nagar Uttarakhand, 20 field days were organized where farmers were trained about production technology. 20 farmers from two villages i.e. Kanpura and Kaithulia were selected for soil testing. 02 Farmers' Fair-Cum Exhibition was organized for benefit of tribal farming communities.

BAIF, Urulikanchan

2 villages Chondvade and Belakund were identified and meetings were conducted for identification of technology and farmers. Fifty HDPE silage bags were procured for 50 beneficiaries for ensilaging and quality enhancement 50 farmers were supplied with Hybrid Napier BNH-10 cuttings (500 stumps/ farmer) to promote new varieties of perennial grass for round the year green fodder availability. 50 farmers were benefitted by providing diesel pump set and PVC pipes (10 units) to generate water lifting mechanism for irrigation. As per the need of farmers and site situation 2 diesel pump, 4 monoblock & 5 submersible electric pumps, 1020 m PVC pipes were purchased and supplied among 50 farmers in groups to support water resources development. 50 farmers benefitted from two villages by supply of chaff cutter (2 units), which created common facilities for chaffing of jawar straw and other crop residues. 50 farmers benefited by training. Farmers Training module developed. 50 farmers (10 Groups) were distributed bucks (10 bucks) to improve local goats with Osmanabadi breed in two villages.

SKUAST-K, Srinagar

TSP interventions were implemented at Upper reaches of Bandipora, Budgam,Ganderbal and Kupwara districts of Kashmir region and Drass and Kargil of Ladkh region. Agricultural, Livestock and fodder related interventions were demonstrated to uplift the socio-economic condition of tribal farmers under adopted villages. The Fodder maize (African tall) has been introduced in Drass and Kargil as a source of fodder first time. Thirty (30) tribal families of Kaksar (12), Lobar (10) and Garkon(08) villages of district Kargil were selected. The crop was excellent and farmers were very enthusiastic to extend fodder maize (African tall) cultivation in maximum area of District Kargil. Oats var. SKO-90 and SKO-96 were introduced to 50 tribal farmers of Budgam (15), Ganderbal (15) and Kupwara (20) districts of Kashmir and 20kg oat seed per beneficiary along with inorganic fertilizers (Urea, DAP & MOP) were provided. The crops are in field and in good condition. One Tribal village namely Mattayan located near Drass of Kargil district consisting of sixty seven (67) families was adopted for forage technology. The crop Oats will be grown as summer crop in this area. The beneficiaries will be provided with oatss seed, Vermicompost and Farm kits/agri-tools. Awareness programme on "Cultivation of summer Oats" to the tribal farmers of Mattayn village of Drass-Kargil were conducted during September-2015. One day training programme on "Production technology on fodder crops" was organised in the month of July-2015 at MLRI-Manasbal for fifty tribal families.

Assam Agricultural University, Jorhat

Organised four training programs on Scientific Farming System along with Animal health camp cum field day. Distributed improved varieties of Perennial Grasses like Setaria, Hybrid Napier, Para and Congo signal grass Annual Fodder - Oat and Maize. Distributed vegetable seed like pumpkin, Okra and Tomato to increase income of the farmers by utilizing rice fellows. Distributed Sprayer to each family. Distributed "Bonraja" Breed of Poultry which is a dual type i.e. both for meat and egg. Besides small farm tools, weeder and grass cutter for harvesting forage crops etc has been distributed. Permanent Fodder plots in 6 villages covering 2 districts were created.

CSKHPKV Palampur
Twenty families in Jhikhli Bheth in Kangra district surveyed for benchmark data. Establishment and success of planted material observed. 20 families selected in Baijnath block surveyed for benchmark data and material of winter species supplied. Agrochemicais and planting material of improved forage species viz., setaria grass, NBH, Tall Fescue grass and white cloverhave been distributed/planted among farmers in the selected areas.

Vellayani, Kerala
The programme was implemented in Trivandrum district, Kerala and the beneficiaries belongs to mundela, cherukode and Karuvilanchi tribal areas. 65 farm families were benefitted. Kid goats and fodder planting material was distributed to farmers. The fodder technologies were appreciated by farmers.

MPKV, Rahuri
40 tribal families from village Dhulipada, Post Dhanrat, Tal. Navapur, district Nandurbar, Maharastra are identified for implementation of TSP-2015-16. Maize variety African Tall seed, BxN hybrid sets, Laxmi sickle, Khurpi, University diary and six forage variety folders in regional language. Also training on fodder production will be organized to the beneficiary farmers.

CAU, IMPHAL
Ninety families from 3 different villages of Churachandpur District, Manipur and 90 nos. of families from 3 different villages of Ukhrul District, Manipur were benefited. Programme on “Fodder production round the year”, on 30th June and 1st of July 2015 was conducted in district Churachandpur, Manipur. TSP programme on “Improvement of Animal Products through Green Fodder” were conducted on 11th January and 20th February, 2016 in district Ukhrul, Manipur. Fertilizers, Fodder rice bean seed, Fodder maize seed, Napier hybrid cuttings, plant protection chemicals, Fertilizers, Knapsack sprayer were provided.

PJTSAU, Hyderabad.
10 Tribal families were identified in Girgaon, Tamsi (mandal), Adilabad district as beneficiaries under TSP programme. distributed inputs viz., fertilizer, seed etc. (Maize, APBN-1, Fodder Cowpea , Hedge leucerne)

BAU, Ranchi
Training was conducted for 50 farmers on quality green fodder production at Udrangi and Bhouro Panchayat of Lohardaga. 15 FTDs were conducted on Oat, Lathyrus and Berseem.

Forage In-house Breeding Activities-Rabi-2015-16

AICRP (FC&U), Indira Gandhi Krishi Viswavidhyalaya, Raipur

Germplasm enrichment and evaluation

- **Collection of land races in cowpea: Eight three (**83) trait specific germplasm accessions with passport data were characterized and forage types were identified.
- **Lathyrus: One hundred thirty nine (**139) germplasm accessions were evaluated and forage types were identified. The germplasm belonged to three groups
  - A) **Low ODAP Group:** included 93 entries in which RLK 700, RLK 1392, 1446,382 having the forage type characteristics were selected. Low ODAP group had < 0.19 % ODAP, days to 50 % flowering < 70-76 days (late type) and larger leaf size (width and breadth).
  - **B) Late Flowering Group:** included 41 entries and late flowering entries namely RLK 88, 1363, 1961, 1923,1962, 345 showed better forage type characteristics,
  - C) **Broad Leaf Group:** included 28 entries and better performing entries 552, 652, 1638 and 75 were identified. The group had broad leaf.

Crossing programme

- **Oat:** Intervarietal crossing attempted in various combinations using parents JHO-822, OS-6, RO-19
- **Lathyrus:** Intervarietal crossing attempted in various combinations using parents Mahateora, Pusa-24, Ratan, BK-5, Nirmal, BK-20-5

AICRP (FC&U), Anand Agricultural University, Anand

Varieties released:

- Forage Sorghum: Variety GAFS-12 (SC) Released at State level in 2016
- Guinea grass: Variety CO (GG)-3: Endorsed for State level in 2016

Germplasm maintenance: Lucerne - 210 Lines

New Germplasm collection: - 34 lines were collected

S N	Crop	Germplasm number	Source
1.	Lucerne	25	Kutchh district & Saurashtra region
2.	Sorghum	5	Kutchh district & Saurashtra region
3.	Clitoria	1	Deesa
4.	Maize	1	NDDB
5.	Bajra	2	Saurashtra

Generation of materials/ entries/ crosses made:

Crop	Cross made	Cross advanced	Selection made
Lucerne	5	12 F_1	--
		44 F_3	28
		25 F_3	20
		30 F_4	21

Polycross materials: 5x5 crosses were made during *Rabi* 2014-15. The 25 F_1 seeds of these crosses were sown during *Rabi*-2015 for identification of superior plant. About 71 plants selected on the basis of morphological characters. These plants will be sown during *Rabi*-2016.

AICRP (FC&U), Punjab Agricultural University, Ludhiana.

Varieties released at Central or State level (in last 5 years):

Crop	Variety	Year of release	State/Central
Oats	OL 10	2014	State
Sorghum	PSC 4	2015	State
Bajra Napier Hybrid	PBN 346	2016	State

OAT:

Station and Multilocation Trials

A total of six evaluation trials (5 stations and 1 multilocation) were conducted.

S. N.	Description of the Trial	Promising entries on yield basis
1.	Multi location Fodder Trial in oats-multi cut	OL 1842, OL 1866 , OL 1867, OL 1845, OL 1802,
2.	Multi location Fodder Trial in oatsð Single cut	OL 1804, OL 1847, OL 1760, OL 1869, OL 1844, OL 1689
3.	Small Scale fodder trial Oats-1-multicut	OL 1879, OL 1876, OL 1874, OL 1881, OL 1878
4.	Small Scale fodder trial Oats-2-multicut	OL 1894, OL 1890, OL 1884
5.	Main Fodder Trial in Oats-MC, SC and Dual	MC: OL1866, OL1869, OL1873 SC: OL1861, OL1862, OL 1871, OL 1802 OL 1869,OL 1857, OL 1760

Germplasm Collection, Maintenance and Evaluation

- A total of 120 germplasm lines have been obtained from NBPGR, Regional Station Shimla which include both indigenous and exotic lines. These lines were evaluated and maintained in separate germplasm evaluation nursery. Superior lines have been employed in hybridization.
- A total of 520 germplasm lines were maintained following standard breeding procedures.

Hybridization

- A total of one hundred and fifty crosses have been attempted involving promising genotypes and exotic germplasm accessions.
- Attempts were made to develop inter-generic hybrids between oat and maize (6000 florets were hand emasculated and hand pollinated using maize pollen) along with the further standardization of the embryo culture protocol to develop plants through embryo rescue/ovary culture under the project entitled ñIntrogression in oat by developing oat-maize addition (OMA) linesò which was sanctioned by UGC, New Delhi.

Breeding material handled

- A total of 964 progenies in different generations were handled following standard breeding methods and procedures: F_1 (80); F_2 (59); F_3 (312); F_4 (257); F_5 (20); F_6 (236).
- Maintenance breeding was continued in crops viz; Lucerne and Ryegrass.
- Thirty seven poly cross progenies in berseem were handled as per the standard procedure.

Berseem: A total of two evaluation trials (1 station and 1 multi location) were conducted.

S.N.	Description of the Trial	Promising entries on yield basis
1.	Berseem multilocation trial	PC 75, PC 82
2.	Local Fodder Trial-Berseem	PC 75, PC 82, BL 205

- A total of 37 polycross progenies were maintained and evaluated against the best check.
- Single plant selections were made from M_2 population of gamma rays irradiated BL 42.

PGR status (evaluated/maintained) of different forage crops: Germplasm maintained/ handled (1034) It includes Oats (520); Berseem (500); Lucerne (08); Ryegrass (06)

Entries contributed by PAU, Ludhiana, in AICRP (FCU) breeding Trials:

- 18 in oat,
- 2 in Berseem
- three in NB hybrid

Seed production (Q)

Crop	Variety	Nucleus seed	Breeder seed	Foundation seed
Oats	Kent	0.65	53.0	
	OL 9	0.55	-	
	OL 10	1.75	8.0	
Berseem	BL 10	0.50	22.0	
	BL 42	0.50	8.50	5.0
	BL 1	0.10	5.30	
	BL 22	0.10	-	
	BL 180	0.40	20.0	
Metha	ML 150	-	1.0	
Ryegrass	PBRG 1	-	0.5	

Besides the recommended varieties, seed of advanced lines and selected elite material was also produced in oats, berseem and lucerne.

AICRP (FC&U), BCKV, Kalyani

Lathyrus germplasm: Two local germplasm of lathyrus were collected from Haringhata and Gayeshpur area of Nadia district of West Bengal and maintained.

Germplasm maintained

Name of the crop	Total number of lines
Rice bean	250
Coix	3

Breeder seed production:

- Rice bean (Bidhan Rice bean 1) ï 22 kg
- Rice bean (Bidhan Rice bean 2) ï 16 kg
- Coix (Bidhan Coix 1) ï 19 kg

TFL seed production

- Oat (cv. OS-6) ï 62 kg
- Lathyrus (cv. Nirmal) ï 51 kg
- Lathyrus (local cultivar) ï 9 kg

Management of BN hybrid during *rabi*, 2015-16

- BN hybrid (CO-3) : 1500 cuttings (Approx.) [Nos.]
- BN hybrid (CO-4) : 1200 cuttings (Approx.) [Nos.]

AICRP (FC&U), SKRAU, Bikaner

- **Variety development:** One lucerne variety RRB-07-1 (Krishna) developed from Bikaner centre has been released and notified for North West zone of the country in 2016.
- **Breeding work:** Seeds obtained from polycrosses made during Rabi-2014-15 were evaluated during Rabi-2015-16. Superior plants were selected to make better composite population. New polycrosses were made among ten selected entries of lucerne. Seed harvested from such crosses will be evaluated in Rabi-2016-17 for further use. Selection of superior plants was also done from the seed material generated from crosses made in previous years**.**
- **Germplasm:** 25
- **Seed multiplication:** Seed of newly developed variety Krishna of lucerne from Bikaner centre was further multiplied to take its seed production on a large isolated area in future for distribution to farmers.

AICRP (FC&U), PJTSAU, Hyderabad

Germplasm Holding:

S. N.	Crop	No. collections	Source
1.	Fodder Cowpea *(Vigna unguiculata)*	40	1. NBPGR, Regional Station, Hyderabad 2. RARS, ANGRAU, Tirupathi 3. Local collections
2.	Fodder Maize *(Zea mays)*	45	Maize Research centre, ANGRAU
3.	Fodder Bajra *Pennisetum glaucum* *Pennisetum Orientale*	30 22 8	ICRISAT, Hyderabad.
4.	Napier Grass*(Pennisetum purpureum)*	16	TNAU, Coimbatore.
5	Lucerne *(Medicago sativa)*	10	--
6	Hedge lucerne	6	Local Collections

Fodder Maize:

- Seed multiplication of a promising fodder maize culture TSFM 15-2, developed through mass selection in source population of IC 83220 was taken up during Rabi 2015-16. The culture has recorded 5.5% and 16.5% increase in green fodder yield and dry fodder yield respectively over check variety African tall in Station PVT, Kharif 2015 trial. The culture is early in flowering with 70 - 75 days to 50% silking. Proposed for testing in IVTM , Kharif 2016.
- Seed multiplication of Promising Maize population (TSFM -15-5) developed from G1 group (African tall) of polycross population was taken up during Rabi 2015-16 . The entry was found to be promising with 8% increase in green fodder and 15% increase in dry fodder yield over African tall in station PVT, Kharif 2015.Hence proposed to test in IVTM, Kharif 2016.

Forage cowpea

- Seed multiplication of promising entry TSFC 11-6 (CO4 X UPC 625) was taken up during Rabi 2015-16.The entry was found to be promising with 12% and 8% increasing GFY and DFY respectively over the best check variety BL-1. Proposed to test in IVTC, Kharif 2016.
- Seed of the promising entry TSFC 12-15 that was promoted for testing in AVTC-1, Kharif 2016 was multiplied during Rabi 2015-16.

Bajra Napier Hybrids: Following six fresh crosses were made during *Rabi* 2015-16

SN	Bajra Napier Hybrids	SN	Bajra Napier Hybrids
1	RBC-2x FD 433	4	Giant Bajra x FD 441
2	Giant Bajra x FD 433	5	Rijko Bajra x FD 438
3	Baif Bajra x FD 441	6	Gaint Bajra x FD 438

Fodder bajra: Seed of the promising entries viz., TSFB 10-5, TSFB 13-12 and TSFB14-10 which were promoted for testing in AVTPM-1, Kharif 2016 was multiplied during Rabi 2015-16.

AICRP (FC&U), Birsa Agricultural University, Ranchi

Multiplication of seeds: Oat, Lathyrus

Lathyrus: Local germplasm were collected from different villages of Jharkhand. Eight germplasm were maintained and evaluated

Oat: Ten Oat Germplasm were maintained, seven different fresh crosses were made in Oat. Evaluation of oat F3 generation

Station Trial

- Seven entries of oat were evaluated against two checks and two entries were selected on the basis of GFY, DMY and plant height.
- Seven entries of lathyrus were evaluated against two checks and two entries were selected on the basis of GFY, DMY and plant height.

AICRP (FC&U), UAS, Bangalore ZARS Mandya

Cowpea

- **Advancing of F_6 generation: 16** stabilised lines were sown on 29-11-2015. MFC-09-15, MFC-09-21 and MFC-09-23 stabilised lines were selected in F_7 generation for station varietal trial. Two of them were also nominated for IVT during kharif 2016. These lines are selected for high green forage yield and seed yield.
- **Raising of F_4 generation & evaluation for forage traits:** 81 F4- lines were evaluated and 13 genotypes were selected for promising fodder types based on the traits Late flowering, more branches, high leaf stem ratio, high biomass.
- **Selection of parents:** Selected the Channaraypattna Local for high leaf stem ratio & Goa Local for high biomass.
- **Evaluation of New Germplasm:** In order to find out new source for good fodder traits a total of 70 Germplasm collected from AICRP on arid legumes and farmerôs field were screened in a preliminary evaluation during rabi-2015 (DOS 12-12-2015). C-157, IC-25105, Goa local, Chandrayapattana local and KM-5-1-1 were selected based on forage traits and diseases tolerance against YMV and Rust.

Maize

- **Evaluation of F_8 generation (Maize):** A total of 161 germplasm were evaluated and categorised based on seed colour and other parameters

Horse gram

- **Evaluation of New Germplasm:** A total of 35 new horse gram germplasm were screened for fodder traits and YMV tolerance. Few promising genotypes for YMV tolerance with good foliage have been identified for further evaluation.

Dolichos bean (Lablab Bean)

- **Evaluation of New Germplasm for fodder traits:** Since Dolichos / field bean is one of the popular fodder as well as dual purpose legume in the region, 48 field bean typical types having more fodder value were collected from various parts of peninsular India and maintained.

AICRP (FC&U), Tamil Nadu Agricultural University, Coimbatore

Poly cross breeding programme in Lucerne

- Poly-cross breeding programme in Lucerne was initiated during *rabi* 2011-12 and is being continued as per technical programme finalized.
- From the selected progenies, most promising individual plants (41) were identified, tagged and numbered and allowed for seed production during summer 2014. The OP seed of selected promising plants (41) were harvested individually and were sown on 09.02.2015 in a single row of 3 m length spaced at 30 cm for progeny test. The most promising 20 lines selected based on GFY were allowed for seed production during summer 2015 and the seeds collected were sown on 25.02.2016 for further studies.

Future plan of work

- The mother plants of those selected progenies will be vegetatively propagated meanwhile in pro-trays. The selected clones will be planted in isolation and allowed to random mate for development of synthetic population during summer 2016. The new synthetic population so developed at each location will be evaluated against National and zonal checks in Perennial Varietal Trial under the aegis of All India Coordinated Research Project on Forage Crops and Utilization during *rabi* 2016-17.

Seed multiplication in Lucerne: Seed multiplication of five promising entries identified from previous Poly cross breeding programme have been taken up during summer 2016 further promotion.

AICRP (FC&U), BAIF, Urulikanchan

Lucerne

- **Evaluation of Germplasm:** Forty five accessions of Lucerne collected from Maharashtra & Gujarat are being evaluated for growth parameters, forage yield,quality, perenniality. The data for sixteen cut was generated for yield, quality and growth characters.
- **Polycross Programme:** New cycle of polycross was established (*Rabi* 2015-16) involving eight genotypes namely BAL08-1, RLG 08-1, ALS-11, BAL08-6, RLG 08-10, ALS-2, BAIF lucerne-1 and Alamdar-51. Equal number of seeds of each genotype was mixed together and seed sowing was done at 10 cm distance in lines spaced at 25 cm from each other. After two cut, all the individual plants were left for crossing. The crossing was affected by insects.

Maize

- **Crossing programme:**
  a. **Maize x Teosinte-** Two parents namely Maize A. Tall and Teosinte Ludhiana-1 (TL-1) were involved in the crossing programme. Seeds of both parents were sown separately in small plots and hand pollination was done to make the crosses. Seeds were obtained from direct and reverse crosses.
  b. Another crossing programme was undertaken using eleven promising inbred lines and African Tall variety as under. Seeds of all the crosses were obtained and will be evaluated in *kharif*-2016.

Red grain colour	White grain colour
BAIF 314 x BAIF 295	BAIF 242 x African Tall
BAIF 299 x BAIF 295	BAIF 271 x African Tall
BAIF 250 x BAIF 295	BAIF 303 x African Tall
BAIF 256 x BAIF 295	BAIF 245 x African Tall
BAIF 251 x BAIF 295	BAIF 282 x African Tall
	BAIF 283 x African Tall

AICRP (FC&U), Assam Agricultural University, Jorhat

Maize:

- **Development of Maize composite:** Development of forage composite maize variety is in progress. During *rabi* 2015-16 seed multiplication was done with the seeds of selected plants.
- **Maintenance of Maize germplasm:** 35 numbers of maize germplasm were grown and evaluated for fodder yield and quality.

Ricebean:

- **Evaluation of germplasm for rabi season:** Suitable entries selected for *rabi* season were grown and evaluated for their fodder yield and quality.

Lathyrus:

- **Evaluation of germplasm**: Ten selected promising entries were grown and evaluated for fodder yield and quality.
- **Mutation breeding programme**: A mutation breeding programme is undertaken with an objective to develop a forage lathyrus variety with high green forage yield, dry matter yield, high CP% and low level of ODAP content. Seeds of variety ñNirmalò were treated with 10 different concentrations of aqua solutions of EMS (0.1 to 1%). Treated seeds were sown in randomized block design with two replications. Seeds of each plant of each treatment were harvested separately and kept for further evaluation and selection in *rabi* 2016-17.

AICRP (FC&U), CSKHPKV, Palampur

Germplasm collected: Twenty germplasm of White Clover collected from Kangra and Mandi districts

Germplasm Holding

Crop	No. of collections
Tall Fescue Grass (*Festuca arundinacea)*	58
Rye Grass (*Lolium perenne)*	8
Red Clover (*Trifolium pratense)*	9
White Clover (*Trifolium repens)*	58
Oat (*Avena* spp.)	135

Germplasm evaluation:

- One hundred and twenty one genotypes of oat were evaluated for forage yield and powdery mildew resistance in simple lattice design. Genotypes ADG-96, JPO-35, OL-9, EC-528896 and EC-528895 were found resistant to powdery mildew as well as superior for forage yield and related traits.

Generation of breeding material

Oat

- Fifty one different crosses among diverse genotypes involving *Avena sativa* x *A. sativa*, and *A. sativa* x *A. sterilis* were made to create genetic variability and the material is in segregating, backcross and advance generations. About 250 breeding lines have been selected. Promising entries developed through hybridization programme were evaluated in the multi-location station trials. Seed of three promising entries have been multiplied for inclusion in coordinated trials.
- Mapping populations involving HJ-8 (susceptible) and JPO-46 and KRR-AK-26 (resistant) parents have been developed to identify molecular markers linked to powdery mildew resistance. Resistant and susceptible parents were screened for polymorphic survey using SSR markers.

Tall Fescue Grass

- Mean performance of 32 elite genotypes against checks revealed that genotypes Hima-3 and EC-178181 were superior for most of the traits. Genotypes Hima-4, Sel.-8, Hima-1, Sel.-49, Sel.-85, Sel.-88, EC-178181, Hima-3 and Sel.-48 showing genetic diversity on the basis of D^2 statistic, RAPD and SSR were multiplied to be used as parents in polycross breeding programme for development of synthetics in Tall Fescue grass.

Rye Grass

- Eight rye grass populations were evaluated and multiplied. Two promising entries will be contributed in coordinated programme.

White clover

- Four populations namely, PWC-3, PWC-22 and PWC- 25 and PWC-26 are under evaluation.

Red clover

- Restricted Recurrent Phenotypic Selection has been taken up for developing superior populations.

AICRP (FC&U), Kerala Agricultural University, Vellayani

In house breeding trials

- **Evaluation of guinea grass cultures:** Data reveals that cultures have significant influence on all the parameters. Significantly higher values of plant height were recorded by T_1 and number of tillers by T_5. Highest green fodder yield and dry fodder yield was recorded by T_2 (GG-08-01).
- **Evaluation of BN hybrid cultures:** Significantly higher values of GFY and DFY was recorded by T_1 (NB-08-11). Highest number of tillers was recorded by T_3 and T_6. Highest plant height was recorded by T_5.

AICRP (FC&U), JNKVV, Jabalpur

Germplasm holding: It includes Oat: 127 and Berseem: 119 lines

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 rise the M_1 generation.
- In Wardan, seven superior bulks were selected from mutated population.

Oat

- Under National crossing programme crosses have been attempted with Kent and JO1 with *Avena sterilis*. Seeds were grown as second filial generation.
- 39 advanced lines were evaluated for different fodder traits.
- No. of crosses made - 9
- Segregating material advanced/ handled - 31 ((F2 onwards)
- Advance breeding lines - 52

AICRP (FC&U), NDUAT, Faizabad

Germplasm collection, evaluation & maintenance

S.N.	Crop/species	New collections during 2015-16	Sources of collection	Total collections
1.	oat	12	Barabanki , Ghazipur, Raebareli & Sultanpur Distt.	170
2.	Berseem	06	Barabanki , Ghazipur, Raebareli & Sultanpur Distt	30

Breeding Programme: Twelve new crosses in oat were made during Rabi 2015-16

S.N.	Cross combinations	S.N.	Cross combinations
1	NDO911 x *Avena sterilis*	7	NDO 952 x *Avena sterilis*
2	NDO911 x LC-8	8	NDO 952 x LC-8
3	NDO911 x LC-9	9	NDO 952 x LC-9
4	NDO951 x *Avena sterilis*	10	NDO1709 x *Avena sterilis*
5	NDO951 x LC-8	11	NDO 1709 x LC-8
6	NDO951 x LC-9	12	NDO 1709 x LC-9

Segregating generations ´EF$_1$-16, F$_2$-16, F$_3$-11, F$_4$-10, F$_5$-12 and F$_6$-08

Advance lines -11

One station trial viz., VT Station on fodder oat was conducted. Fourteen genotypes were tested against two checks viz., NDO-1 and NDO-2.

AICRP (FC&U), MPKV, Rahuri

Polycross Programme of Lucerne: The new polycross programme was initiated from Rabi-2011-12 onwards. The details of parental lines included in the programme are as follow.

Center Code (1st letter)	Center	Entry Code (2nd letter)	Name of the entry	Plant Number (3rd letter)
A	AAU, Anand	A	Anand-24	P-1 to P-5
A	AAU, Anand	L	AL-3	---do---
B	BAIF, Urilikanchan	B	BAIF- Lucerne-1	---do---
C	TNAU, Coimbatore	T	TNFD-118	---do---
R	MPKV, Rahuri	R	RLG-08-01	---do---

Detail procedure of Lucerne Polycross programme:

Season		Activity
Rabi-2011-12	:	Sowing of Lucerne Polycross Programme
Summer-2012	:	Polycross Seed Production Programme under insect proof net.
	:	The Seed obtained from 100 plants in polycross progarmme at each location were harvested individually, numbered and shared among the participating centers.
Rabi-2012-13	:	The seed obtained from 100 plants (25 x 4) centers) was sown in single row of 4 m length spaced at 30 cm along with checks in an augmented block design (November,2012)
	:	The 100 progenies were evaluated for GFY and DMY.
Rabi-2013-14	:	Out of 100 progenies the best 24 progenies were identified on the basis of one year data on GFY, DMY and pest/disease resistance
	:	From selected progenies, most promising individual plants (48) were identified, tagged and numbered (November, 2013).
Summer 2014	:	The promising plants in selected progenies were allowed to random mate by open pollination
	:	The OP seed of selected promising plants (48) was harvested individually.
Rabi-2014-15	:	The OP seed of 48 IPS were sown in a single row of 3m length spaced at 30 cm for progeny test (Dec., 2014).
	:	The 48 progenies were evaluated for forage yield
Rabi-2015-16	**:**	**From 48 progenies, best 30 progenies selected.**
		The clones of 30 superior plants tagged during *rabi* 2015-16 made and planted in isolation.
Summer-2016	:	Seed will be produced from clones of 30 superior plants.
Rabi-2016-17	:	The seed of synthetic population developed will be tested in trials

CROSSING PROGRAMME IN OAT:

Generation	Oat Cross	Selections made
F_2	1) Kent x JHO-2010-4	45 IPS
	2) Kent x JO-03-309	45 IPS
F_5	1) RO-19 x UPO-09-3	15 Bulk
	2) RO-19 x JHO-09-3	13 Bulk

GERMPLASM EVALUATION IN LUCERNE: Thirty four entries were evaluated for 18 cuts taken. The pooled data of 18 cuts, indicate that for GFY the entry RLG-2014-2 (1778.56 q/ha); for DMY, RLG-2014-33(358.96 q/ha) and RLG-2014-30 (357.11 q/ha); for CPY, RLG-2014-20(71.90 q/ha), RLG-2014-19(69.36 q/ha) and RLG-2014-27 (69.00 q/ha) were found numerically superior over national check RL-88 (1737.61, 347.70 & 68.36 q/ha) respectively.

AICRP (FC&U), GBPUAT, Pantnagar

OAT (*Avena sativa* L.)

Germplasm maintenance: A total of 305 oat germplasm lines comprising indigenous, exotic and improved genetic stocks have been planted for maintenance and evaluation during the season.

Crossing nursery: Based on growth habit, leafiness, tillering, days to heading, growth rate, maturity and seed yielding ability certain genetic donors for different desirable traits / trait combinations have been identified for their use in the crossing nursery. Ten new crosses were attempted during the season. However, the F_1 seed from only four new cross combinations could be obtained due to strong desiccating winds and high temperature during the crossing programme.

New Crosses:

- (UPO 201 x UPO 247) -1-5 x OS-6
- (Cocker -72 -27 x Swan) -11 x UPO 212
- (OX 251) -24 -1 -1 x JHO 822
- (UPO 201 x UPO 247) -1-5 x JHO 822

F_1 crosses: The following ten crosses, made during the previous season, were planted for evaluation and raising the F_2 seed.

1	Otter x (UPO 201 x UPO 247)-1-5	2	(Portal/Kent//UPO 212) -20-1-1 x (Ox 795)-5-1
3	Otter x EC 246122	4	UPO 276 x EC 246197
5	(Cockor-72-27 x Swan)-11 x UPO 275	6	New -5 x (Portal/Kent//UPO 212) -20-1-1
7	EC 246187 x EC 246190	8	UPO -04-4 x New -5
9	Lang x EC ï 246122	10	EC 246207 x EC 246190

Breeding Materials: Oat Breeding materials comprising early generation 9 F_2 populations, 389 F_3s, 75 F_4s, 107 F_5s and advanced generation 150 F_6, 100 F_7 & 87 F_8 / F_9 progenies were grown and within / between line, single panicle / plant selections were made following the pedigree breeding and other methods.

Station Evaluations: On the basis of preliminary station evaluations certain advanced generation lines were identified for further testing and evaluation in larger field plots. A Station Evaluation Trial comprising 30 advanced generation oat lines and two national checks viz., UPO 212 and UPO 94 was conducted during the season.

Coordinated Varietal Trials: All the nine Coordinated Varietal Trials including 8 on oats and one on berseem allotted to the centre were successfully conducted as per the approved technical programme. However, from the trial on multicut oat, AVTO-2 (MC)/Seed, no seed could be harvested due to very heavy infestation of unidentified caterpillars on foliage and spikelets.

Multiplication of Promising Lines: Six promising advanced breeding lines and the entries already in the National Coordinated and State Varietal Trials were multiplied for their use in the ongoing oat research programme.

Nucleus and Breeder Seed Production: Nucleus seed production of our released oat varieties UPO 212 and UPO 94 was undertaken during the season. Breeder seed of UPO 212 (4.0 q) was also produced during *Rabi* 2015-16 season as per BSP ï I indent (1.75 q) from the PC (FCU), IGFRI, Jhansi for the centre.

AICRP (FC&U), CCS Haryana Agricultural University, Hisar

Varieties released and notified:

- **Berseem Variety HB 2** has been released and notified by Central Sub-committee on crop standards, notification and release of varieties for agricultural crops for Haryana state vide SO 1146 (E) dated 24.4.2014. It is a Longer duration variety with light green foliage, big head size, higher leaf: stem ratio, better regeneration, variety is resistant to stem rot disease (<10% disease incidence) which is the major problem in berseem growing areas of Haryana. GFY ï 750-800q/ha.
- **Oat variety OS 377** has been released and notified by Central Sub-committee on crop standards, notification and release of varieties for agricultural crops for Central Zone (States of Uttar Pradesh, Maharashtra, Gujarat, Chhattisgarh and Madhya Pradesh) vide SO 268 (E) dated **28.1.2015**. It is suitable for timely sown, irrigated and single cut system. This variety is capable of providing 537q/ha of green fodder. It gave about 12.0% more green fodder yield than the national checks Kent and OS 6. It also gives a high of 122q/ha of dry matter. It also has better nutritional qualities. It is Moderately Resistant to Leaf Blight disease. It is also bold seeded and is capable of giving 25q/ha of seed.

Project sanctioned

Name of the Project	Name of the scientist initiating the project	Funding agency	Present position
Farmersô trainings on scientific cultivation of forage crops to ensure quality seed production	PI: Dr. S.K. Pahuja Co-PI: Dr Y. Jindal Dr. R.S. Sheoran	RKVY	Sanctioned for two years *i.e.* 2015-2017

Research Activity

- A total of **21 experiments** consisting of **51 trials** on **11 crops** were conducted
- Conducted **12 experiments** during *Kharif* 2015 consisting of **23 trials on 8 crops** *viz*. Cowpea, Pearl millet, Teosinte, Maize, Bajra Napier Hybrid, *Clitoria ternatea*, *Cenchrus ciliaris* and *Pennisetum*.
- Conducted **9 experiments** during *Rabi* 2015-16 consisting of **28 trials on 3 crops** *viz*. Berseem, Oats and Lucerne.

BERSEEM

Collection, maintenance and evaluation of germplasm: The berseem germplasm contains 225 lines of indigenous sources and 27 of exotic origin. This year half of the germplasm was grown for maintenance purpose.

Evaluation of varietal trials for fodder yield and its components: Three station trials

- **Large Scale Trial (LST):** 8 genotypes were evaluated for fodder yield against four checks.
- **Small Scale Trial (SST):** 8 genotypes were evaluated for fodder yield against four checks
- **Progeny Row Trial (PRT):** 16 genotypes were tested against four checks.

Mutation breeding in berseem - creation of genetic variability for morphological characters in Berseem using chemical mutagen i.e. EMS (State plan).

- **M1 generation: T**hree doses of EMS (0.05%, 0.1%, 0.3% and 0.5%) were given to dry seeds of HB 1, HB 2 and Mescavi. Treated and untreated seeds (100 each) were sown immediately in the field in three rows of five meter length each to rise the M_1 generation.
- **Selection of superior plant progenies in different generations:** On the basis of their evaluation against checks (on three cut basis) 18 superior progenies were selected from M_2 generation of different treatments which will be grown in M_3.

Evaluation of promising Berseem genotypes for fodder yield (AICRP-FCU).

- **Initial Varietal Trial (IVTB):**
- **Advance Varietal Trial -1 (AVTB-1) :**

OATS

- **Collection, maintenance and evaluation of Oats germplasm (State plan):** 580 oats germplasm lines were grown for maintenance and evaluation.
- **Development of breeding material through hybridization in oat (State plan):** Fresh crosses were attempted between desirable and diverse parents. Breeding material in different filial generations were advanced and single plants selected.

Evaluation of varietal trials for fodder yield and its components (State plan).

Following seven trials were conducted during *Rabi* 2015-16

1. LST (Single Cut)	:	9+3checks;	2. LST (Multi Cut):	12+4checks;
3. LST (Dual)	:	8+4checks;	4. SST (Single Cut):	9+3checks;
5. SST (Multi Cut)	:	12+4checks;	6. PRT (Single Cut):	18+3checks;
7. PRT (Multi Cut)	:	18+3checks;		

Evaluation of promising Oats genotypes for fodder yield (AICRP-FCU): A total of **eleven** trials under All India Coordinated breeding trials on Oats were conducted during *Rabi* 2015-16

LUCERNE: Varietal Trial on Lucerne-2013 (AICRP-FCU): Seven genotypes were evaluated.

Genotypes contributed/promoted in AICRP (FC) trials during *Rabi* 2015-16

Crop	Trial	Entry
Berseem	National Check	Mascavi
	IVTB	HFB-12-9; HFB-12-4
Oats	Zonal Check	OS 377 (CZ)
	National Check	OS-6
	IVT (SC)	HFO 427; HFO 529
	AVT (SC)-1 (SC)	OS 424; OS 432
	AVT (SC-2); AVT (SC-2 AGRO)	OS-406
	IVT (MC)	HFO-417; HFO 514
	AVT-1 (MC)	OS-414
	AVT-2-Repeat	OS-403; OS-405
	IVT (DUAL)	HFO-523; HFO-525

Nucleus and TFL Seed Production: Sufficient quantity of Mescavi, HB 1 and HB 2 seed was produced along with 60 Kgs. of nucleus seed of these three varieties.

Other Activities Rabi-2015-16

AICRP (FC&U), AAU, Anand

Research Paper

Patel, P.M., Patel M.R., Shroff, J.C. and Parmar, H.P. (2016). Effect of multi micronutrients mixture grades on seed yield of Lucerne (cv. Anand-2). *Green Farming* Vol.7 No.1 January ï February 2016 pp : 191-193

Book

Parmar, H.P., Patel, P.M., Saiyad M.R., Shroff, J.C., Desai, D.H., Soni, N.V. and Patel, B.S. (2016). Grasscharana Pako.

Book chapter

Parmar, H.P., Patel, P.M., Saiyad, M.R., Shroff, J.C. and Desai, D.H. (2016). Modern cultivation practices of forage crops. Book : "Dairy Business and value addition of milk" January, 2016, PP-26-29

Parmar, H.P., Patel, P.M., Saiyad, M.R., Shroff, J.C. and Desai, D.H. (2016). Hydroponics Book: "Dairy Business and value addition of milk" January, 2016, PP-30

Student guided:

- Plant Breeding : 2 ; Agronomy : 4

FTD conducted:

- Lucerne Var. Anand-2 : 10; Oat Var. Kent : 10

Extension activity:

- Krushi Mahotsav was arranged 9th to 31st May, 2016 and all the Forage Scientists participated.

Seed /planting materials sold farmers/ others:

- Rooted slips of Hybrid Napier (APBN-1, Co-3 and BNH-10) sold to farmers
- Seed of Lucerne, Oat and Forage Bajra sold to farmers

Externally funded project: Two

- Evaluation of Performance of Makkhan grass hybrid (UPL Ltd.): Grant Rs.1.2 Lakhs
- "Quality Seed Production in Fodder Crops" Grant Rs.6.00 Lakhs

AICRP (FC&U), KAU, Vellayani

Publications

Ishrath, P.K and Usha C. Thomas 2016. Recent trends in fodder production and preservation. *Advances in life sciences* **5(10);** ISSN 2278-3849, 3912-3921.

Mareen Abraham and Usha C. Thomas, 2016. Forage research for livestock development in Kerala. *Advances and current issues in Agriculture*. **III: 67-72.**

Usha C Thomas, P. K. Ishrath, and Mareen Abraham 2016. Silage in bags- An easy way of fodder preservation. *Souvenir NGM kharif 2016.*, ICAR & SKUAST-K, Srinagar.

Usha C Thomas, S. R. Saru and Mareen Abraham 2016. Banana based fodder intercropping in the homesteads of Kerala. *28th Kerala Science Congress*, Malappuram, Kerala

Ishrath P.K and Usha C Thomas. 2016. Suguna- a high yielding fodder variety. *Malayala manorama daily*

Student(s) guidance

- Plant Breeding and Genetics ï M.Sc. (Agri.) 2; Ph. D. - 2
- M.Sc. (Agri.) in Agronomy-2

Teaching- Courses Handled

B.Sc. (Ag) courses- 4

PG Course-

- Breeding of major crops(3+0) Agrostology and Agroforestry

Trainings attended

- Dr. Usha C Thomas has attended UNEP workshop on Sustainable Agriculture Development at IMG, Thiruvannathapuram on 19.4.2016

AICRP (FC&U), PAU, Ludhiana

Research papers

Tiwana, U. S., G. K. Taggar, Upasana Rani, Ajaib Singh and Pritpal Singh. 2015. Evaluation of sorghum genotypes for fodder under different nitrogen levels. *Progressive Research* 10: 429-433.

Goyal M and Tiwana US 2016 Ensiling legume with cereal fodder influences quality of silage mixture. *Indian J. Anim. Nutr.* 33(2): 228-232.

Kaur R, Goyal M and Tiwana US. 2016. Influence of seasonal variation on oxalate accumulation in Napier Bajra hybrid under different nitrogen environment. *Range Management and Agroforestry* (in press)

Goyal M and Asthir B 2016. Role of sulphydral compounds on antioxidant defense mechanism under high temperature stress in wheat. *Indian J Agric. Biochem.*(in press)

Papers presented in Symposia/Workshops:

Simranjit Singh, Upasana Rani, Asmita Sirari, Davinderpal Singh and US Tiwana. 2015. Evaluation of different fungicides as seed dressers and poison food technique against *Fusariuym solani* EGY 1 causing wilt of guar (*Cyamopsis tetragonoloba* L.). Paper presented in *Brain storming meeting on production of pulses in Indo-Gangetic plains of India* held at PAU, Ludhiana on August 31, 2015 (pp 62).

Tiwana, US, Sukhpreet Singh, Meenakshi Goyal, PK Kingra and Avtar Singh. 2015. Forage production potential and nitrate nitrogen in Napier Bajra hybrid as influenced by nitrogen dose under shaded and un-shaded environments. Paper presented in *23rd International Grassland Congress on "Sustainable use of Grassland Resources for Forage Production, Biodiversity"* held at Delhi from November 20-24, 2015 (Paper ID 693).

Goyal, Meenakshi, Rupinder Kaur and US Tiwana. 2015. Evaluation of quality traits of nitrogen treated Napier Bajra hybrid plants in different cuts using different nitrogen sources. Paper presented in *23rd International Grassland Congress on "Sustainable use of Grassland Resources for Forage Production, Biodiversity"* held at Delhi from November 20-24, 2015 (Paper ID 1056).

Students guided: M. Sc. : 5 ; Ph.D. : 3

FTDs conducted: 30 : Oats var. OL 10: 21; Ryegrass var. PBRG 1: 9

Training conducted for farmers/NGO/Govt. Officials: Lectures delivered -21

TV/Radio talks: TV: 2; Radio: 2

Details of seed/Planting material sold to farmers during Rabi 2014-15:

Crop	Variety	TL (q)	C/S (q)	F/S (q)	B/S (q)
Berseem	BL 10	24.65	--	--	13.08
	BL 42	18.06	--	0.30	7.00
	BL 1	--	--	--	3.25
Oats	OL 10	83.5	--	--	4.70
	Kent	6.30	--	28.10	52.0
Rye grass	PBRG 1	1.61	--	--	0.10
Total		**134.12**	**--**	**28.40**	**80.13**

External funded Projects: 3

S N	Name of the Project/Scheme	Funding Agency	Amount
1.	Developing guidelines for conduct of DUS test for oat, cowpea and guinea grass. CSS-74 (PC 6115)	PPVFRA	14.92 Lakhs
2.	Alien genes introgression in oat by developing oat maize addition lines	UGC	9.31 Lakhs
3.	Development of Pearl millet forage hybrids and Pearl millet-Napier (PN) hybrids for high biomass and quality suited for different agro climatic zones of India	CGIAR-DCCG	1.75 Lakhs

AICRP (FC&U), TNAU, Coimbatore

Awards and Honours

- C. Babu, G. Vijayakumar, K. Velayudham, K. Iyanar, A. Kalamani and K. Thiyagarajan (2016). ó**Best Team Researcher Award**ô by M/s. Hatsun Agro Product Ltd., Chennai in recognition of the development of ócumbu Napier hybrid CO (BN) 5ô

Research articles

Dhasarathan, M., C. Babu, and K. Iyanar. 2015. Genetic analysis for fodder yield and component traits in maize (*Zea mays* L.). *Electron. J. Plant Breed.*, 6 (1): 43-53.

Dhasarathan, M., C. Babu, and K. Iyanar 2015. Combining ability and gene action studies for yield and quality traits in Baby corn (*Zea mays* L.). SABRAO *Journal of Breeding and Genetics* 47 (1) 60-69.

Iyanar, K., C. Babu, N. Kumaravadivel, A. Kalamani, K. Velayudham and K. Sathia Bama. 2015. A high yielding multicut fodder Sorghum CO 31. *Electron. J. Plant Breed.*, 6 (1): 54-57.

Velayudham, K., C. Babu and K. Iyanar.2015. Influence of Phosphorous levels on Green fodder yield and quality of fodder cowpea genotypes. *Madras Agric. J.*, 102 (1-3): 40-42.

Book chapter (with ISBN)

Babu, C., K. Iyanar and A. Kalamani. 2016. ó**H**igh green fodder yielding new forage varieties for livestockô. **In**: II Conference on Scientific Agriculture in Tamil, Trichy, May. 05&06, 2016. pp. 104-108 **(ISBN: 81-902877-3-7)**.

Popular articles

Babu, C., K. Iyanar and A. Kalamani 2016. High green fodder yielding new fodder cowpea variety CO 9. *Uzhavarin Valarum Velanmai*. Malar-7, Ithal-7, pp. 29 - 32.

Parthiban, K.T and **C. Babu** 2016. Use of Malai vembu as fodder. *Uzhavarin Valarum Velanmai*. Malar-7, Ithal-6, pp. 14 - 16.

Important persons visited: Dr. John Niezen, Hatsun Agro Product Ltd., Chennai
Student(s) guided: M.Sc. (Agri.) in PBG ï 2; Ph.D. in PBG - 1
FTDs conducted: 20
Training conducted for farmers/ NGO/ Govt. officials: 5
TV/ Radio talk delivered by AICRP-FC staff/ extension activities: TV-1; Radio talk-1

Forage crops seed production details (2015-16)

S. No.	Forage crops	Total quantity (kg)			
		Breeder seed	Foundation seed	TFL seed	Total
1.	Multicut fodder sorghum CO (FS) 29	200		1094.9	**1294.9**
2.	Multicut fodder sorghum CO 31	-	-	47.5	**47.5**
3.	Fodder maize- African tall	-	1948.0	2020.0	**3968.0**
4.	Fodder cowpea CO (FC) 8	-	56.0	58.0	**114.0**
5.	Fodder cowpea CO 9			15.0	**15.0**
6.	Lucerne CO 2	-	-	12.25	**12.25**
7.	Hedge Lucerne	-	-	835.0	**835.0**
8.	Subabul	-	-	41.9	**41.9**
9.	Agathi	-	-	134.2	**134.2**
	Grand total	**200**	**2004**	**4258.75**	**6462.75**

Quantity of planting material produced and supplied (2015-16)

S. No.	Crop	Planting material (Nos.)
1.	BN hybrid CO (CN) 4	74,710
2.	BN hybrid CO (BN) 5	22,47,687
2.	Guinea grass CO (GG) 3	49,498

Externally funded projects: 1

Title of the Scheme	Sponsors	Duration	Outlay
Development of pearl millet forage hybrids and pearl millet ï napier (PN) hybrids for high biomass and quality suited for different agro climatic zones of India.	CGIAR- Dry land Cereals ï Competitive Grants 2015	2015-16	50,000 USD

AICRP (FC&U), PJTSAU, Hyderabad

Research papers

Shanti, M., R. BalajiNaik, K. B. Suneeta Devi, J. Rajsekhara Reddy and Ch.Chiranjeevi 2015 Effect of Biogas poultry manure on soil fertility in cereal-legume based cropping system. *International Journal of Bio-resource and Stress Management* 6(1): 81-86

Susheela, R., M. Shanti, T. Shashikala, V. Chandrika and M. Anuradha2015 Fodder yield and quality of fodder pearlmillet genotypes as influenced by different levels of nitrogen *Annals of plant and soil Research* 17(special issue) 228-230

Raghavendra, B. M., R. Susheela, V. Praveen Rao, A. Madhavi 2015 Efficacy of different weed management practices on growth &Yield of direct wet seeded rice sown through drum seeder *The Bioscan* 10(1):97-101

Srinivas, B., M. Shanti T. Satish kumar 2016 Effect of sewage waters on production and quality of various forage crops under different nitrogen levels *Green farming* 1(1):63-68

Popular articles

- Shashikala T. - Vesaviki anuvaina pasugrasalu-Vyavasayam magazine, March 2016

Details of FTDs : Total 40 consisting of Lucerne (10), Hedge lucerne (10), Oats (20)

Tribal Sub Plan: 10 Tribal families were identified in Girgaon, Tamsi (mandal), Adilabad District as beneficiaries. Distributed inputs viz., fertilizer, seed etc. (Maize, APBN-1, Fodder Cowpea , Hedge Lucerne. Fodders are being grown and fed to the sheep.

Conferences / Meetings attended

- Asia Pacific weed science conference at PJTSAU, Hyderabad during October 2015
- International Grassland Congress held at New Delhi from 20-24th November, 2015
- 5-8 Dec, 2015-Dr Shanti, Scientist (SSAC) attended 80th Annual convention of ISSS Council at GKVK, Bengaluru.
- All scientists attended ZREAC meetings Kharif 2016 at Nalgonda on 7.5.16
- T. Shashikala participated ZREAC meeting at sangareddy on 10.5.16
- All scientists attended NGM kharif 2016 at SKAUST-K, Srinagar during 16-17 April 2016

Radio talks

- M. Shanti-Rythulu Illalo chesuko dagga pasuvula mepu, daanalu-24.1.16
- T. Shashikala ï Pacchimeta korata adhigaminchadaniki soochanalu-17.2.16

TV Programmes

- M. Shanti-Alternative fodder crops and Need for soil testing and evaluation of soil test report-19.1.16
- T. Shashikala- Vesavilo pasugrasala sagu melakuvalu-Phone-in live-DD Yadagiri-26.2.16

Student Guidance

- Major advisor : 2
- M.Sc.(Ag) Dept of Genetics and Plant Breeding
- M.Sc.(Ag) in Agronomy
- Minor advisor : 3

AICRP (FC&U), UAS Bangalore, ZARS, Mandya

Research papers

Shekara BG, Lohitaswa HC, Chikkarugi Nagesh, Krishnappa. MR and Manasa. N. Enhancing Productivity of Fodder Sorghum under Saline-Alkali Soils in Cauvery Command Area. *Environment & Ecology 2016*, 34 (1A): 388-390.

Shekara BG, Lohithaswa HC, Chikkarugi NM and Manasa N. Intensive Forage Production through Silvi-Pasture System under Rainfed ecosystem. *Environment & Ecology* 2016. 34 (4D): 2617-2620.

Shekara BG, Lohithaswa HC, Chikkarugi NM and Manasa N. Fodder production potential of maize grown for baby corn and green cob. *Research Journal of Agricultural Sciences* 2016.7(2): 425-427.

Kannada Folder

HC Lohithaswa, B G Shekara, P. Mahadevu, Nagesh Chikkarugi and Manasa N, (2016) Paustidayak Mevin Bele Alasande.

BG Shekara, Mahadevayya, H. P. Dinakar, P. Mahadevu, Nagesh Chikkarugi and Manasa N, (2016) Sangrahana Vidhanagalu hagu ona mevu paustikaran.

Presentations in Conferences / Symposium / Seminars / other fora:

- Dr. P Mahadevu, Sr. Scientist (GPB), AICRP on Forage crops & Utilization attended winter school on ñIntegration of conventional and biotechnological approaches for improvement of dual purpose crops and grassesò, January 28 to February 17, 2016, *Organized by* Crop Improvement Division, ICAR-IGFRI

Important persons visited to AICRP_FC centre

- Dr. H Shivanna, Honorable, Vice chancellor UAS, GKVK, Bengaluru.
- Dr. T Sheshadri, Director of research, UAS, GKVK, Bengaluru
- Dr. Jagadeeshwar, Director of Extension, UAS, Bengaluru.
- Dr. D P Kumar, Director of Education, UAS, Bengaluru
- Mr. Prasanna, Administrative Officer, CADA, Mysore.

Student(s) guided: M.Sc. (Agri.) in Agronomy- 3
Training conducted for farmers/ NGO/ Govt. officials: 3-Training programme & **5**-Field days
TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 2

Seed/ planting material sold to farmers/ others, interaction with farmers, NGO and Govt. staff

S. No.	Forage crops	Planting Material Sold
1.	Napier Bajra Hybrid (Co-3)	40000
2	Guinea grass (JHGG-08-1)	10000
3	Rhodes grass (Selection)	5000
4	Signal grass (Selection)	5000

Externally funded projects: 4

GOK projects

- Development of High oil corn (*Zea mays*) hybrids for high quality feeds.
- Maintenance breeding of Fodder cowpea varieties (KBC-2, MFC-08-14,MFC-09-1).

RKVY projects

- Augmenting Fodder Production and establishing fodder seed bank at University of Agricultural Sciences, Bangalore (2013-14) (RKVY project) budget outlay of 1.00 crores.
- Enhancing quality seed production in important fodder crops and demonstration of production technologies and low cost forage equipments to accelerate fodder production in Karnataka with budget outlay of 0.50 crores.

AICRP (FC&U), BAIF, Urulikanchan

Publications

Takawale, P. S., Jade, S. S. and Ghorpade, S. D. (2016) Leguminous blocks: Nutritional values and Economics, *Agric. Sci. Digest.,*36 (2): 149-151

Important persons visited to AICRPFC centre

- Mr. M. C. Beniwal, Under Secretary (IFD), Ministry of Environment, Forest & Climate Change, New Delhi
- Dr. Uriel Safriel, Hebrew University of Jerusalem, Jerusalem, Israel

FTDs conducted: Fifteen demonstrations of Oat & Berseem were conducted at farmerôs field in three villages to make aware the farmers about new fodder varieties and their production technologies.

TSP activities: Various activities were implemented in Chondvade and Belakund villages of Nandurbar district of Maharashtra. The total no. of farmers benefited was fifty. The activity wise achievements are as under.

Activities	Objective	No. of Participants	Type of assets/activities achieved
Supply of Hy. Napier cuttings (500 stumps/ farmer)	To promote new varieties of perennial grass for round the year green fodder availability	50	Stem cuttings of BNH-10 were distributed to the farmers and well established in the field
Ensilaging and quality enhancement of pasture grasses (50 units)	To demonstrate the technology of silage making and improve nutritive quality of native pasture grasses	50	Fifty HDPE silage bags were procured for preparation of silage from Hy. Napier grass and distributed all the participants.
Supply of chaffcutter (2 units)	To create common facilities for chaffing of sorghum straw and other crop residues	50 from two villages	Two chaff cutters were provided in two villages for availing the common facility of chaffing by participants.
Provide diesel pump set and PVC pipes (10 units)	To generate water lifting mechanism for irrigation	50	After survey, as per the need of farmers and site situation 2 diesel pump, 4 monoblock & 5 submersible electric pumps, 1020 m PVC pipes were supplied among 50 farmers in groups to support water resources development.
Distribution of bucks (10 bucks)	To improve local goats with Osmanabadi breed	50 10 Groups	Ten bucks were purchased from genuine source and provided to five groups of farmers in two villages.
Training of Farmers	To build the capacities of the farmers	50	Training module developed and imparted to the participating farmers.

Training conducted for farmers/ NGO/ Govt. officials: 48 training programmes on ñLivestock Management and Fodder Developmentò were organised by BAIF at Urulikanchan. In all 889 representatives of various institutions from Govt., NGOs, Dairy Cooperatives and individuals from Maharashtra, Gujarat, Chhattisgarh and Odisha participated.

TV/Radio talk: Participated in two meetings of Agricultural Advisory Committee for Krishidarshan Programme of Doordarshan Kendra, Pune. The success stories of fodder cultivation by dairy and goat farmers were shared among the members.

Details of seed/ planting material sold: The multiplication and supply of seed and planting material of forage crops is done as institutional activity. The technical staffs of the project orients and guides the dairy farmers about the new varieties of the fodder crops and also the new package of practices.

AICRP (FC&U), BCKV, Kalyani

Research papers

Jana K., S. K. Das and A. M. Puste (2015). Production economics of mat-sedges (*Cyperus tegetum* Roxb.) cultivation as influenced by water management practices for economic stability of resource-poor rural people of West Bengal, India. *International Journal of Environmental & Agricultural Research.* 1 (2): 27-31.

Jana K., C. K. Kundu, A. M. Puste, S. Biswas and P. Bandyopadhyay (2016). Jobôs tear (*Coix* spp.): An important forage crop grown in marshy areas. Souvenir, National Group Meet, *Kharif*, 2016, held at SKUAT, Shalimar, Srinagar, May 16-17, 2016: 94-103.

Roy D. C. and K. Jana (2016). Biomass production and quality of berseem fodder (*Trifolium alexandrinum* L.) as influenced by application of phosphorus and phosphate solubilizing bacteria. *Advances in Life Sciences* 5 (4), 2016: 1225-1229.

Jana K., S. K. Das, G. K. Mallick, B. Biswas, A. M. Puste and M. Mondal (2015). Performance of promising aromatic rice entries and rapeseed-mustard varieties grown as ópaira cropô under red and laterite areas of West Bengal, India. *Annals of Plant Sciences* 4 (12), 2015: 1236-1238.

Das S. K. and K. Jana (2016). Effect of seed hydro-priming and urea spray on yield parameters, yield and quality of lentil (*Lens culinaris* medikus). *Legume Research* (LR-3446), 2016: 1- 4.

Das S. K. and K. Jana (2015). Production of delayed sown pigeonpea through spacing adjustment and variety. *Indian Agriculturist*, 59 (2): 91-95.

Das S. K., B. Biswas and K. Jana (2016). Effect of farm yard manure, phosphorus and sulphur on yield parameters, yield, nodulation, nutrient uptake and quality of chickpea. *Journal of Applied and Natural Science*, 8 (2): 545 ï 549.

Popular articles: 1 (in bengali)

Student(s) guided:

- M. Sc. (Ag.) in Agronomy - 2
- Ph. D. in Agronomy- 1

Teaching: Course No. 509, Agronomy of fodder and forage crops and other courses

No. of FTDs conducted: 30 units (*Rabi*, 2015-16)

- Berseem (cv. Wardan) - 5 units
- Oat (SC) (cv. OS-6) ï 20 units
- Lathyrus (cv. Nirmal) ï 5 units

Breeder Seed production

- Ricebean (Bidhan Ricebean-1) ï 22 kg
- Ricebean (Bidhan Ricebean-2) ï 16 kg
- Jobôs Tear/ Coix - (Bidhan Coix-1) ï 19 kg

TFL seed production

- Oat (cv. OS-6) ï 62 kg
- Lathyrus (cv. Nirmal) ï 51 kg
- Lathyrus (local cultivar) ï 9 kg
- Berseem (cv. Wardan) ï Very good vegetative growth

Management of BN hybrid

- BN hybrid (CO-3) : 1500 cuttings (Approx.) [Nos.]
- BN hybrid (CO-4) : 1200 cuttings (Approx.) [Nos.]

Training conducted for farmers: 1

Participated in Agricultural Fair: participated in ó*Krishi mela'*, organized by KVK, Nadia of BCKV at Gayeshpur and ó*Rabi Sammelan cum Technology week-2016'* at Hooghly KVK of BCKV at Chinsurah, West Bengal for dissemination of forage technology and supplied the forage planting materials to farmers.

Externally Funded Project: 1 (Private Company)

Participated in seminar/farmers' meeting etc:

- Meet with farmers at different villages of Nadia and North 24 Parganas districts for dissemination of forage technology.
- National Seminar on ôSustainable Agriculture for food security and better environmentô on December 17-18, 2015 at FACC, BCKV, Kalyani.
- Participation in National Seminar on ôEnvironmental concern for fertilizer use in futureô organized by society for fertilizers and environment (SFE) in collaboration with BCKV and NAAS at FACC, BCKV, Kalyani on 26th Feb., 2016.
- Participation in National Seminar on ôRecent advances in statistical tools for agriculture and allied sciencesô at FACC BCKV, Kalyani on 3rd -5th March, 2016.

Awareness development: Seed production of oat and lathyrus by farmers.

Transfer of technology:

- Distributed the seeds of berseem and lathyrus to the resource poor farmers for popularizing as an under canopy legume crop in the mango, banana & guava orchards.
- Introduction of berseem as forage crop and lathyrus as *paira* crop in Ranibandh area in Bankura district in red and laterite zone of West Bengal.
- Trainings to the farmers of different districts of West Bengal
- Participated in Agricultural Fair (*Krishi Mela*) conducted by KVK (Gayeshpur, Nadia) and KVK (Chinsurah, Hooghly) under BCKV for dissemination of forage technology.
- Distributions of leaflets among the farmers for dissemination of forage technology.
- Distributed the planting material (cuttings) of BN hybrid (Variety: CO 3 & CO 4) to the resource poor farmers in Bankura, Purulia, Paschim Medinipur (West Midnapur) districts in Western Part of West Bengal and Nadia, North-24 PGS, Cooch Behar districts etc.

AICRP (FC&U), NDUAT, Faizabad

Publications

Yadav, R. S.; Ram, C.N.; Singh, Bhagwan.; Singh, .S.P. and Singh, A.K. 2016. Performance of forage grasses on reclamation of saline sodic soil. Fourth National Symposium on Transforming Indian Agriculture towards Food and Nutritional Security held at IGFRI, Jhansi Feb.20-21, 2016. PP. 97-98.

Yadav, R. S.; Singh, Bhagwan.; Singh, .S.P. and Singh, A.K. 2016. Effect of soil amendments on productivity of rice ï Berseem cropping system and changes in soil properties of sodic soil. National Conference on Science for Rural India-2016 held at B.R.D.P.G. College, Deoria (U.P.) January 30-31, 2016. PP. 46-47.

Yadav, R. S.; Singh, Bhagwan.; Singh, .S.P. and Singh, A.K. 2016. Influence of soil amendments on productivity of rice ï Berseem cropping system and changes in soil properties of sodic soil. Fourth Uttar Pradesh Agricultural Science Congress 2016 held at CSAUAT, Kanpur March. 2-4, 2016. PP. 214.

Popular articles:

Singh, R.K.: Singh, R.V.; Prakash ,N.; Shahi, G. and **Yadav, R.S**.2016. Arhar ki kheti. MAC Krishi Jagran 21(5):74-75.

Participation in Seminar/Symposia:

- Participated in 4th Uttar Pradesh Agricultural Science Congress 2016 held at CSAUAT, Kanpur.

Courses taught:

- Agron 624 (M.Sc.Ag) ï Management of saline and alkali soils
- CEL-421(B.Sc.Ag)- Pesticide and plant protection equipments

FTD conducted: Fodder oat (NDO-1)-10

Radio Talks: 1

AICRP (FC&U), SKUAST -K

Publications

Ahmad, M., Zaffar, G., Razvi S. M., Dar Z.A. (2015). Genetic analysis for beta glucan, grain protein and other important traits in oats (*Avena sativa* L.) *Indian Journal of Genetics and Plant Breeding*. 75(1):136-139.

Ahmad M., Zaffar G., Mehraj U., Jehangir I A., Lone A.A. (2015). Stability analysis for forge quality traits in Oats (*Avena sativa* L.) over environments. *International Journal of Science and Nature*. 6(4);590-595

Dar, N.A., K. N. and Ansarul Haq (2016) . Effect of sowing dates, different cultivars and fertility levels on growth and yield of fodder Oats . *Forage research* 41(4) :2016 PP: 249-252

Demonstrations cum Field visit to Line Departments, KVKôs and Farmers ï 05:

- Demonstration cum Field visits on ñperennial and annual fodder cropsò to the officials from agriculture department and KVK of district Bandipora on 28-05-2015.
- Organized One day training programme on ñProduction technology on fodder cropsò to the tribal farmers of district Ganderbal in collaboration with concerned KVK under Tribal Sub Plan of AICRP-FC at MLRI-Manasbal on 11-06-2015.
- Exposure visit of woman farmers of Tehsil Sumbal & Pattan of Baramulla district on Technology demonstration on ñcultivation of perennial foddersò sponsored by IGSSS-NGO, Kashmir on 18-16-2015.
- Demonstration cum Field visit on ñProduction of fodder cropsò organized by Department of Animal husbandry of district Ganderbal on 08-07-2015.
- Awereness programme on ñCultivation of summer Oatsò to the tribal farmers of Mattayn village of Drass-Kargil under tribal sub-plan on 22-08-2015.

FTDs Conducted on Fodder Oats:- 50

S. No	Variety	No. of FTD's	District covered
01	SKO-90	20	Bandipora & Ganderbal
02	SKO-20	10	Budgam
03	Sabzaar	20	Kargil

Forage Crop seed production details (2015-16):-

SN	Forage crops	Total quantity (kg)			
		Nucleus seed	Breeder seed	Foundation/TLS	Total
1.	Oats (Sabzaar)	50.0	1200.0	-	**1250.0**
2.	Oats (SKO-90)	45.0	1550.0	-	**1595.0**
3.	Oats (SKO-20)	40.0	1250.0		**1290.0**
4.	Oats (SKO-96)	30.0	-	800.0	**830.0**
5.	Oats (SKO-108)	20.0	-	600.0	**620.0**
	Grand Total	**185.0**	**4000.0**	**1400.0**	**5585.0**

Students Guided (Co-Advisor):- 02

TV/Radio talks: - 02

Tribal Sub Plan:-

Number of individuals/families/villages benefited	Type of assets created	Any other information
30 Tribal families were identified in Kaksar, Lobar and Garkon villages of district Kargil as beneficiaries. In addition to this one tribal village namely Mattayan near Drass, Kargil having sixty seven (67) families were identified under this programme.	Distributed inputs viz., fertilizer, vermicompost, seed etc (Maize, Oats) and agri-inputs to the selected beneficiaries.	Summer oats var. Sabzaar and SKO-90 were sown in the month of May-2016 at Mattayan Drass of district kargil.

Publications

Jaipal and S. S. Shekhawat (2016). Genetic variability and divergence studies in oats (*Avena sativa* L.) for green fodder and grain yield. *Forage Res*., **42** (1): 51 - 55.

Jaipal and S. S. Shekhawat (2016). Character association studies in oats (*Avena sativa* L.) for green fodder and grain yield. *Forage Res*., **42** (1): 24 - 29.

Shekhawat, S. S. (ed) (2016). *Advances and Current Issues in Agriculture*, VoI. III. Shiksha Prakashan, S. M. S. Highway, Jaipur. (ISBN: 978-93-82138-72-3)

S. M. Kumawat, Dushyant Singh, Mohd. Arif, Suresh Kumar, P. S. Rathore and S.L. Godara 2015. Effect of planting material and geometry on sewan (*Lasiurus sindicus* Henr.*)* productivity. Vol.(41) No.3, pp 228-232, Forage Research.

S.M. Kumawat, Mohd. Arif, Dushyant Singh, S.L. Godara and S.S. Shekhawat. Effect of growth regulators on growth, yield and quality of Sewan grass (*Lasiurus sindicus* Henr.). Accepted by RMA, IGFRI, Jhansi.

Shekhawat, S. S., R. S. Shekhawat, S. L. Godara and S. M. Kumawat (2016). Azolla: Ek uttam pashu ahar. Centre for Forage management, ARS, SKRAU, Bikaner.

Shekhawat, S. S. (2016). Sustainable utilization of forge resources of Rajasthan. In : SKUAST-K Souvenir, National Group Meet (Kharif-2016), AICRP on Forage Crops and Utilization.

Kumawat, S. M. and S. S. Shekhawat (2016). Fodder diversity and its utilization for livestock in Rajasthan. In : SKUAST-K Souvenir, National Group Meet (Kharif-2016), AICRP on Forage Crops and Utilization.

S. S. Shekhawat, H. L. Deshwal, N. K. Pareek, and Susheel Kumar. Technical Summary (Kharif-2015) of Agricultural Research Station, SKRAU, Bikaner (2015). Compiled and edited

Seminar/Symposium

- Shekhawat, S. S., S. M. Kumawat and S. L. Godara (2016). Fodder production from watershed areas for rural livelihood in arid region of Rajasthan. In: 25th National Conference on ñNatural Resource Management in Arid and Semi-Arid Ecosystem for Climate Resilient Agriculture and Rural Developmentò held on Feb. 17-19, 2016 at SKRAU, Bikaner.
- Shekhawat, S. S. (2016). Genetic improvement of forage crops and grasses of arid region of Rajasthan. In: 25th National Conference on ñNatural Resource Management in Arid and Semi-Arid Ecosystem for Climate Resilient Agriculture and Rural Developmentò held on Feb. 17-19, 2016 at SKRAU, Bikaner.
- Shekhawat, D. K. and S. S. Shekhawat (2016). Soil conservation by forage plant species in arid region of Rajasthan. In: 25th National Conference on ñNatural Resource Management in Arid and Semi-Arid Ecosystem for Climate Resilient Agriculture and Rural Developmentò held on Feb. 17-19, 2016 at SKRAU, Bikaner.
- S. S. Shekhawat attended Workshop on ñImproving Water Productivity in IGNP ï Expanding Dimensionsò at Institute of Agri-Business Management, organised by CAZRI Regional Research Station, Bikaner under ICAR-ICARDA collaborative project on March 2, 2016.
- S. S. Shekhawat attended a Workshop on ñProfessional Human Resource Requirements in Agricultureò at Institute of Agri-Business Management, SKRAU, Bikaner on May 25, 2016.

Radio Talk: 2

List of important persons visited to AICRP- FCU centre

- H. P. Parmar and P.M. Patel of Anand Agicultural University, Anand visited as Monitoring Team members for Rabi 15-16 experiments during January 19-20, 2016.
- A. S. Kharub and S. C. Gill of IIWBR, Karnal visited for monitoring of barley dual purpose trial on March 10, 2016.

Student (s) guided and teaching work

- S. S. Shekhawat : Guided one M. Sc. (Ag.) and one Ph.D. students as Major Adviser and one Ph.D. student as Co-Adviser. Taught one PG course on Heterosis Breeding (PBG-532).
- S. M. Kumawat: Teaching (2 courses: Agro. 611 and Agro. 521), Guiding (1)- One Ph.D. Examination related work for UG courses: 2

Details of FTDs conducted: 25

Training conducted for farmers/ NGO/Govt. Officials

- Farmers were given training for green fodder production during Rabi season on November 14, 2016 at the time of distribution of demonstrations.
- Dr. S. S. Shekhawat gave lecture to Jaisalmer farmers on ôRabi Kalin Hara Chara Utpadan at CAZRI Regional Research Station, Bikaner in the training on ñShusk kshetron me krishi utpadakta vridhi hetu navacharò on March 10, 2016.
- Lecture delivered to forage farmers by Dr. S. M. Kumawat: 2

Other examinations conducted: Dr. S. S. Shekhawat conducted practical examinations

Seed/ planting material sold

- Green fodder and dry fodder produced from the experiments sold worth approx. Rs. 18000/-.
- Sewan seed collection / production (46.5 q) worth Rs. 10.18 lakhs in RKVY project.

Externally funded project

1. RKVY project on augmenting sewan grass seed production
2. Azolla Demonstrations Scheme of Govt. of Rajasthan.

Other assignments- Dr. S. S. Shekhawat

- Breeder Incharge for seed production at KVK, Abusar, Jhunjhunu and KVK, Chandgothi of SKRAU,
- Incharge of Technical Cell of Agricultural Research Station, SKRAU, Bikaner.
- Co-Editor of Souvenir published for 25th National Conference on ñNatural Resource Management in Arid and Semi-Arid Ecosystem for Climate Resilient Agriculture and Rural Developmentò

AICRP (FC&U), AAU, Jorhat

Research Paper

Sharma K. K., P. Sutradhar and S. B. Neog (2015). Productivity of Perennial Grasses Under *Machillus bombicinii* Tree in Assam. *XXIII International Grassland Congress* - IGC 2015, held on 20 - 24 November 2015 at Delhi NCR, India

Krishna Abhishek, Vinit Kumar, H. C. Pandey, Shahid Ahmed, Vikas Kumar and K K Sharma (2015). To study the micro and macro nutrient, pH and EC on soil quality at Bundelkhand Region. *Agricultural Science Research Journal* 5(5); 77- 84, May 2015

Sharma K. K. and S. B. Neog (2015).Prospect and Management of Forage Crops in Assam. Souvenir, National Group meet, Kharif, 2015, held at PJTSAU, Hyderabad, April 17-18,2015

Chakrabarty, M and S. B. Neog (2015). Studies on genetic variability in forage maize. *Forage Res*. 41(2): 126-129

Extension leaflet

- Cultivation of perennial forage crops in Assam (in Assamese)
- Cultivation of forage crops in Assam (in Assamese)
- Feeding nutritious forage crops (in Assamese)

Student(s) guided: M.Sc. (Agri.) in 2 in PBG and in Agronomy-3; Ph.D in Agronomy- 2

FTDs conducted: 20

TSP activities: Adopted 7 villages in two TSP districts viz. Dhemaji and Karbi Anglong

Training conducted for farmers/ NGO/ Govt. officials: 8

TV/ Radio talk delivered by AICRP-FC staff/ extension activities: 3

Forage crops seed/planting materials supplied (2015-16) - kg

S N	Forage crops	Total Slips (No)	Foundation seed	TFL seed
1.	Hybrid Napier CO-3, CO-4	1.0 lakh		
2.	Setaria Kazungula, PSS-1	1.2 lakh	-	
3.	Rice bean Var. Shyamalima		25 kg	
4.	Oat Var. Kent and JHO 822			3.00 q
	Grand Total	**2.20 lakh**	**25.00 Kg**	**3.00 q**

AICRP (FC&U), JNKVV, Jabalpur

Publications

Jha A K., Shrivastva Arti , Raguvanshi, N. S. 2014. Effect of weed control practices on the fodder and seed productivity of Berseem under irrigated condition of Madhya Pradesh. *Range management & Agroforestry* 35 (1) 61-65

Jha A K. , Shrivastva Arti, Raguvanshi, N. S 2015. Influence of physiological parameters and yield by different maize based cropping system . *The Bioscane* 10 (1):203-205

Basha MH, Mehta AK, Gour VK, Satish Kachare, Bisen P. 2015. Effect of Ethyl Methane Sulphonate (EMS) on Germination, Root and Shoot Length of Oat (*Avena sativa* L.). *Environment & Ecology*. 34 (2A): 750-754.

Paper presented in Seminar/ Conference and Symposium

Khariya Anil and Jha A. K. 2015. effect of propaquizafop on weeds and yield of soybean in ò National Conference on **innovative agriculture for rural prosperity on 27 7 28 November, 2015** in Bhopal

Anoop Kumar Mehta, Basha MH, Gour VK, M Neeta, S.K. Biliaya, Satish Kachare. 2015. Genetic diversity analysis of mutant lines of Oat (*Avena sativa* L.) based on RAPD and ISSR analysis. Sustainable use of Grassland Resources for Forage Production, Biodiversity and Environmental Protection. *In*: XXIII International Grassland Congress.held at New Delhi (Extended Abstracts-Paper ID-274)

Important Persons visited:

- Board Members of Vishwa Vidyalaya.
- Dr. P. M. Gaur International Scientist, ICRISAT Hyderabad.
- Dr. Raj Gupta Dirctor, BISA
- Dr. Gurbachan Singh Chairman, ASRB ,New Delhi
- Dr. A. K. Singh , Vice chancellor RVSKVV, Gwalior

TV/Radio talks: Radio talks = 2

Students guided: M. Sc. - 1

FTDs conducted:

- Berseem JB1, JB5 = 12
- Oat JO1, Kent = 8

TSP activity: 31 demonstrations of different fodder crops at tribal block of Dindori (M.P.) and organised Kisan Sangosthi on 6th March 2015.

AICRP (FC&U), IGKV, Raipur

Research guidance

- PG research students : 2 (as major advisor) and 2 (as committee member)
- PG Thesis Submitted: 1

Teaching:

- PG : GP-502: Principals of cytogenetics
- PhD GP-608 Advances in breeding of major field crops
- PhD GP-606 Crop evolution

Tribal sub-Plan

- Activities carried out in Korea district in collaboration with respective KVK for the welfare of tribal communities. The activities included forage production demonstrations in 5 Acre area on community basis. Seeds of improved varieties, various farm inputs, fodder crops along with package of practices was given to farmers and technology was demonstrated on community basis. The area was protected by fencing. Produce of the forage production area will be sold to government and private dairies of area. As a result, tribal farmers will have better option for income generation besides increasing the milk production and less dependency on concentrated feed.

Forage Technology Demonstration Programme

- FTDs were conducted to promote location specific varieties / package of practices and other technologies suited to location. During *Rabi* 2015-16, **a total of 10 FTDs [B**erseem (5) and oat (5)] with 1 acre area by each farmer were conducted on farmerôs field of 4 Villages from 2 Block of Raipur district.

Publications

Banyal, D. K., Chaudhary, Jaya and Singh, Amar.2015. Evaluation of pea (*Pisumsativum*) germplasm for inheritance of resistance to powdery mildew (*Erysiphe pisi*). *Indian Phytopathology.* 68:166-171

Chaudhary Jaya., Banyal D. K. and Sharma P.N. 2015. Variability in *Phytophthoranicotianae*var. *nicotianae*causing leaf blight and fruit rot on sweet pepper (*Capsicum annuum*) in North-western Himalayas. *Indian Phytopathology.* 68:172-178

Gunjan Guleria and Naveen Kumar (2016). "Production efficiency, forage yield, nutrient uptake and quality of sorghum sudan grass hybrid (*Sorghum bicolor* × *Sorghum sudanense*) + cowpea (*Vigna unguiculata*) intercropping system as influenced by sowing methods and varying seed rates of cowpea" *Indian Journal of Agronomy* (ISA2016(5) 107

Katoch K K and Naveen Kumar (2016). Crop Diversification an oppurtunity to improve the livelihood of hill farmers. *National Seminar on "Integrating Agri- Horticulture and allied research for Food and nutritional security in the era of global climate disruption"*. March 4-6, 2016 at ICAR Research Complex for NEH region, Meghalaya

Katoch Rajan and Sunil Kumar Singh (2016). Biotechnological interventions for improvement of plant nutritional value: From mechanism to application. *In Phytonutritional improvement of crops,* Noureddine Benkeblia eds. Wiley press, Southern Gate, Chichester, West Sussex.

Katoch Rajan, Ankur Tripathi and Nisha Thakur (2016). Current perspective of plant protection strategies with the use of inhibitory proteins against insects. *Indian Journal of Agril. Biochemistry*. Accepted.

Katoch Rajan, Kanika Sharma, Sunil Kumar Singh and Neelam Thakur (2015). Evaluation and characterization of trypsin inhibitor from rice bean with inhibitory activity against gut proteases of *Spodoptera litura. Zeitschrift für Naturforschung* 70(11-12) C: 287-295.

Kumar Naveen and Gunjan Guleria (2015) Strategies for the management of grasslands in Himachal Pradesh. Souvenir, National group meet *Kharif* 2016 held at SKUAST Srinagar, May,16-18, 2016

Kumar Naveen, B R Sood and Sunil Kumar (2015) Performance of improved forage species under dry temperate conditions of North western Himalayas. *Haryana journal of Agronomy* Accepted (31.7.2015)

Kumar Naveen, B. R. Sood, Sunil Kumar (2015). Performance of improved forage species under dry temperate conditions of north western Himalayas. International Grassland Congress, New Delhi, 20-24 November, 2015

Kumar Suman., Singh Amar and Banyal D K.(2015). First record of occurrence and distribution of bacterial canker of capsicum under protected cultivation in Himachal Pradesh. *Plant Disease Research 30*:61-66

Kumar Sunil and Naveen Kumar (2016). Study on the performane of vegetative barriers and improved forage species on productivity of degraded grasslands. *Journal of Agronomy and Soil*. JAC-05-2016-0228

Sharma Sanjay, Ankita sharma, S Rana and Naveen Kumar (2016). Evaluation of muti-nutrient extractants for determination of available p, k and micro nutrient cations for soil analysis in North ï Western Himalayas. *Communications in Soil Science and Plant Analysis*. LCSS-2016-0328

Singh S.K., Katoch, R. and Kapila, R.K. (2015). Genetic and biochemical diversity among *valeriana jatamansi* populations from Himachal Pradesh. *The Scientific World Journal* Vol. 2015, Article ID 863913, 10 pages http://dx.doi.org/10.1155/2015/863913.

Best poster award

Chaudhary, Jaya and Banyal, D. K.2016. Study of inheritance of resistance to powdery mildew of pea using different isolates of *Erysiphe pisi*ò was presented in *6th International Conference"Plant, Pathogens and People, Challenges in Plant Pathology to benefit humankind" 23-27 February 2016, New Delhi, India,* Indian Phytopathological Society, New Delhi

Seminar/ Workshop/ Group meeting attended

Naveen Kumar, VK sood and DK Banyal. International Grassland Congress, at New Delhi, 20-24 November 2015.

Naveen Kumar, VK Sood, DK Banyal and Rajan Katoch. Zero Budgeting Natural Farming, CSK HPKV Palampur ,27-30 April,2016

Naveen Kumar, V K sood, D K Banyal and Rajan Katoch. Agricultural Officer Workshop *Kharif* 2016 on 22.04.2016

D K Banyal : Seminar on ñUse of Technical words in Agricultureô organized by GOI, HRD ministry at Palampur on 19-20thMay 2016

Courses tought

Course No	Course Title	Cr. Hr.
LPM 121	Fodder Production and Grassland Management	1+1
Agron 510	Agrostology and Agro-forestry	2+1
Pl Path 511	Chemicals in Plant Disease Management	2+1
Pl Path 518	Epidemiology and Forecasting of Plant Diseases	2+1=3
Pl Path 605	Principles and Procedures of certification	1+0=1
GP 605	Advanced Plant Breeding Systems	2+0
GP 607	Breeding Designer Crops	1+1
Biochem.621	Genomics proteomics and metabolomics	2+0=2
Biochem 693	Special problems in Ph.D	0+1=1
Biochem 351	Biochemistry	2+1=3

Other activities

Students guidance	:	11 (as major advisor) ; 24 (Member advisory committee)
Forage technology consultations		10
Lectures deliveres to farmers and developent officers		4
Popular article	:	2
Radio talk		3
Forage Calendar for round the year fodder supply	:	1
Tribal Sub plan:	:	• Bench mark survey of 40 familiesô selected in Baijnath block have been completed.
Linkage with NGOs	:	• CORDï ñChinmaya Organisation of Rural Developmentò, Tapovan, Dharamshala • Society for Environmental & Rural Awakening (ERA), Khudian, Distt Kangra
Linkage with other programme and institutes:	:	• IVRI Regional Research Station Palampur • AICRP (IFS) • AICRP (Agroforestry)
Association in Ad-hoc Projects	:	• Scientists are associated in 6 Ad hoc projects • One new project proposal has been submitted
Resource generation (MSP)	:	• Rs. 11,27,299 (FY 2015-16)

AICRP (FC&U), BAU, Ranchi

Teaching UG and PG courses at University

Publication-1 Abstract -1

Radio Talk – 3

Attended National symposium on ñInnovative Breeding approaches for Agricultural Security.ò at BAU Ranchi during March 2016.

FTD - Forage Technology Demonstration

- **Oat:** variety ï Kent ï 10 FTDs conducted in Ranchi and Darisai districts.
- **Berseem: Variety –Wardan** 10 FTDs conducted in Ranchi and Darisai districts.
- **Multicut Oat** varietyï Kent 10 FTDs conducted in Ranchi and Darisai districts.
- **Oat +Berseem:** 10 FTDs conducted in Ranchi district.

TSP - Tribal Sub Plan

- **Training Programme-**Total Six (6), days training programme on ñ**Quality Green Forage Production Technology and Awareness programme on Forage crops**ò conducted at Three (3) days in Sherenghatu and three (3) days in Bhashmundo villages of Lohardaga district. Total 300 Tribal farmers are benefitted.

AICRP (FC&U), MPKV, Rahuri

Research papers :

Damame S.V., R.N. Bhingarde & S.B. Gore. (2015). Forage and grain productivity, quality and economics of some maize (*Zea mays* L.) varieties. *Applied Biological Research* 17(3): 259-265.

Technical articles

S.V. Damame, S.B. Gore, A.B. Tambe & A.H. Sonone. (2016). Trees as a source of fodder for livestock in Maharashtra. *In: Souvenir, National Group Meet Kharif- 2016, AICRP on Forage Crops & Utilization*. Pp: 89-93.

A.B. Tambe, A.H. Sonone & S.V. Damame. (2016). Viruses are entomogenous entities. *In: Souvenir, National Group Meet Kharif- 2016, AICRP on Forage Crops & Utilization*. Pp: 119-137.

Popular articles

Dr. Shivaji Damame, Sarika Gore, & Dhananjay Gaikwad . May 2016. *Chara Pikatil Ann Ghatak*. Page No. 33

Visits

- Monitoring team consisting Dr. Shashikala, OIC & Dr. Mrs. Sushila, Scientist (Agronomy), PJTSAU, Hyderabad visited to project on 3-4, Feb., 2016 and monitored *rabi* trials conducted at project farm.
- 412 farmers visited the project during rabi 2015-16

Student Guide:

M.Sc. (Agri.)

- Plant Breeding Prof. A. H. Sonone : 01
- Entomology Dr. A. B. Tambe : 02
- Biochemistry Dr. S. V. Damame : 01

Training conducted for farmers/ NGO/ Govt. Officials: 2

HRD for the AICRP-FC & U staff:

- Dr. S.V. Damame attended training on ñPlant omics- Emerging Tools & Techniques for Crop Improvementò organized at IARI, New Delhi from 18-11-2015 to 8-12-2015.

Radio talk: Two

- Forage production & protection technology during rabi season
- Rabi forage crops & their management

Seed Production (rabi-15-16)

Sr. No.	Crop	Stage	Unprocessed Yield (q)
1.	Oat Phule Harita (RO-19)	Nucleus	0.80
2.	Oat Phule Harita (RO-19)	Breeder	0.51
3.	Oat Phule Harita (RO-19)	Truthful	0.36
4.	Oat Kent	Breeder	2.01
5.	Lucerne RL-88	Nucleus	0.20
6.	Berseem (Vardan)	Truthful	0.70
7.	African Tall	Nucleus	0.50
8.	African Tall	Truthful	0.40

Externally funded project:

Laboratory testing of forage quality during rabi 2015-16

SN	Company	Particulars	Testing fee (Rs.)
1	Bisco Bio Sciences Pvt. Ltd, Secunderabad	fodder quality of 12 maize hybrids	24,000
2	UPL Advanta, Hyderabad	fodder quality of 6 sorghum & one pearl millet hybrid.	36,900
3	UPL Advanta, Hyderabad	fodder quality of 2 sorghum hybrids.	9300
4	Ajeet Seeds Pvt. Ltd, Aurangabad	fodder quality of 15 sorghum hybrids.	7500

Research Articles

Jindal, Y., Phogat, D. S., Joshi, U.N. and Mall, A.K. (2016). Forage maize genotypes performance for fodder yield and its attributes with quality parameters at Hisar and all-India level. *Forage Res.,* 41 (4): pp. 208-211.

Jindal, Yogesh, Arora, R.N., Phogat, D.S., Pahuja, S.K., Midha, L.K., Gandhi, S.K. and Joshi, U.N. (2016). OS 377ï A new forage single-cut oat variety for the central zone of India. *Forage Res.,* 41 (4): pp. 242-245.

Jindal, Y. and U.N. Joshi (2016). Sustainable utilization of forage resources for animal and human nutritional securityò in Haryana. Paper published in Souvenir during ñNational Group Meetò (*Kharif* 2015) of AICRP (Forage Crops) at SKUAST, Srinagar 16-18th May, 2016 pp 76-88.

Godara, A.S., Satpal, U.N. Joshi and Yogesh Jindal (2016). Response of berseem (*Trifolium alexandrinum* L.) genotypes to different phosphorous levels. *Forage Res.,* 42 (1): pp. 40- 43.

Booklets

Pahuja, S.K., Khatri, R.S., Phogat, D.S., Sheoran, R.S., Jindal, Yogesh, Arya, Satyawan, Kumari, Pummy, Satpal, Panchta, Ravish and Tokas Jayanti (2016). **चारा फसल क उनत यो गक** (*Chara faslon ki unnat prodyogiki)* (Package of Practice on different forage crops). Forage Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar (p-36).

Pahuja, S.K., Khatri, R.S., Phogat, D.S., Sheoran, R.S., Jindal, Yogesh, Arya, Satyawan, Kumari, Pummy, Satpal and Panchta, Ravish (2016). **चारा फसल क उनत कम** (*Chara faslon ki unnat kismain)*. Forage Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar (p-32).

Pannu R. K.; R.K. Walia and Y. Jindal (2015). **Significant Achievements – COA** for the year 2014-15. Published by College of Agriculture, CCS HAU, Hisar (p-108).

Technical Bulletins

Phogat D.S., Yogesh Jindal, Ravish Panchta and S.K. Pahuja (2016). लोबया - गम के मौसम का हरा सोना (*Lobia - grmi ke mausam ka hara sona*) Tech. Bull. TB/2015-16/FC/**04**. Forage Section, CCS HAU, Hisar.

Jindal Yogesh, D.S. Phogat, R.S. Sheoran and S.K. Pahuja (2016). बरसीम - सद का बेहतरम हरा चारा (*Berseem - sardiyo ka behtareen hara chara*) Tech. Bull. TB/2015-16/FC/**05**. Forage Section, CCS HAU, Hisar.

Phogat D.S., Yogesh Jindal, R.S. Sheoran and S.K. Pahuja (2016). जई - सद का बढ़या हरा चारा (*Jai - sardiyo ka badia hara chara*) Tech. Bull. TB/2015-16/FC/**06**. Forage Section, CCS HAU, Hisar.

Sheoran, R.S., Sajjan Sihag,Pummy Kumari, Satpal and S.K. Pahuja (2016). *Hare chare se silage evam hay banana.* Tech. Bull. TB/2015-16/FC/**07**. Forage Section, CCS HAU, Hisar.

Sheoran, R.S., Satpal, Pummy Kumari and S.K. Pahuja (2016). *Pashuon ko poora saal hara chara uplabdh karwane hetu fasal chakar*. Tech. Bull. TB/2015-16/FC/**03**. Forage Section, CCS HAU, Hisar.

Popular Articles (6)

Sheoran R.S., Satpal and Yogesh Jindal (2016): Makchari: der tk hara chara dene wali fasal (मकचर देर तक हरा चारा देने वाल फसल) in Haryana Kheti: 49 (5): 29

Jindal Yogesh and S.K. Pahuja (2016): Shushk evm ardh shushk kshetro ke liye ï Anjan Ghaas (शुक एवं अध शुक े के लए - अंजन घास) in Haryana Kheti: 49 (5): 30

Jindal Yogesh and S.K. Pahuja (2016): Napier Bajra sankar ghaas (नेपयर बाजरा संकर घास) in Haryana Kheti: 49 (5): 32

Sheoran R.S. and Satpal (2016): *Hare chare ke liye makka ki kheti*. Haryana Kheti: 49 (5): 30.

Satpal, S.K. Pahuja and R.S. Sheoran (2016): *Garmiyon va kharif mein hara chara utpadan*. Haryana Kheti: 49 (5): 4.

Satpal, Sheoran R. S**.** and Kathwal Rajesh (2015). *Rabi ki chara faslon ka prabandhan*. Haryana kheti **48**(12) pp; 9-10.

Extension pamphlets: Seven pamphlets (in Hindi) were published and distributed to the farmers:

1. बरसीम - सद का बेहतरम हरा चारा (*Berseem - sardiyo ka behtareen hara chara*)
2. जई - सद का बडीआ हरा चारा (*Jai - sardiyo ka badia hara chara*)
3. वार क उनत कम क समग सफारश(*Jowar ki unnat kismo ki smagra sifarishe*)
4. लोबया - गम के मौसम का हरा सोना (*Lobia - grmi ke mausam ka hara sona*)

5. गुआर - बारानी खेती का सोना (*Guar - barani kheti ka sona*)
6. हरे चारे से साइलेज एवं हे बनाना (*Hare chare se silage evm Hay banana*)
7. पशुओं को पूरा साल हरा चारा उपल□ध करवाने हेतु फसल च□ (*Pashuon ko pura saal hara chara uplabdh krvane hetu fasal chakra*)

Additional Duties- Dr. Y. Jindal

- **Incharge, Computer Centre, COA**
- **Nodal officer** ï Post Matric Scholarship and Merit cum Means Scholarship for minorities students of CCS HAU, Hisar.
- **Nodal officer** ï Scholarship of minorities ï collection of Statistics in the University.

Extension Activities

- *'Kisan Mela', 'Farm Darshan'* and T & V training system on monthly basis on the stall and on demonstration plot.

Radio Talks

- 17.9.2015 ï Chare ke liye Berseem ki Kasht ï Dr. Y. Jindal ï A.I.R., Rohtak
- 1.6.2016 - Chare ke liye jowar ki kasht - R.S.Sheoran - AIR Rohtak

Fodder Technology Demonstrations (FTDs): Sixteen FTDôs on Berseem varieties HB1 and HB 2

RKVY Project: (New Project): ñFarmersôtrainings on scientific cultivation of forage crops to ensure quality seed productionò for 2 years (2015-16 and 2016-17).

Farmer's Training on quality seed production: During 2015-16 twenty farmers trainings were imparted to 1200 farmers in twenty districts of Haryana as given under:

- Farmers were provided with pamphlets on cultivation of different forage crops. Farmers took keen interest in the deliberations and they were given improved technology for seed production in different forage crops.

Farmer's Training on quality seed production:

- During 2016-17, twenty farmers trainings will be imparted to 1200 farmers in twenty districts.
- Farmers will be provided with pamphlets on cultivation of different forage crops.
- Farmers will also be provided the seed of improved varieties of our crops.

Courses taught

Course No.	Course title	Name of the teacher
PB 201	Principles of Plant Breeding	Dr. Y. Jindal
GP 401	Crop Improvement	Dr. Y. Jindal
GP 403	Heterosis Breeding in Crop Plants	Dr. Y. Jindal
Agron. 509	Agronomy of Fodder & Forage Crops	Dr. R.S. Sheoran

Ph.D. /M.Sc. Students being supervised

S N	Name of student	Major adviser	Degree
1	Mr. Parbhat Kumar	Dr. D.S. Phogat/ Dr. Y. Jindal	M.Sc.
2.	Ms. Tanvi Kumari	Dr. Y. Jindal/ Dr. D.S. Phogat	M.Sc.
3.	Parbhat Kumar	Dr DS Phogat & Dr Y Jindal	Ph.D.
4.	Monika	Dr RS Sheoran	M.Sc.

AICRP (FC&U), GBPUAT, Pantnagar

Research papers

Pal, M. S. 2016. Effect of varieties and phosphorus fertilization on yield and quality of cowpea fodder in Mollisols of India. *Indian Journal of Plant & Soil* 3(1): 27-29.

Geeta Pandey, Rajendra Prasad, Birendra Prasad and Priyamvada Chauhan. 2015. Co-efficient of variation, heritability, genetic advance and variability for ricebean genotypes under mid hill condition of Uttatakand. *Journal of Applied and Natural Sciences* 7 (2): 794-798.

Ruwali Y and J. S. Verma. 2016. Comparative suitability of phenotypic expressions and microsatellite markers in classifying oat (*Avena sativa* L.) genotypes. *Range Management and Agroforestry* (Accepted).

Geeta panday, Rajendra Prasad, Birendra Prasad and Priyambda Chauhan. 2015. Coefficient of variation, heritability, genetic advance and variability for Rice bean (*Vigna umbellata* (thumb)) genotypes under mid hill condition of Uttarakhand. *J of Applied and Natural Sciences*, 7(2):794-798.

Proceedings seminar/ conferences

Pal, M. S. 2016. Scholastic frontier technologies for sustainable food production. Lecture delivered in CAFT training on ôRevitalizing soil and crop productivity for secured agricultureô held from 3 to 23 Feb. 2016 at Department of Agronomy, Pantnagar

Pal, M S. 2016. Improved cultural practices and cutting management in sorghum, berseem and other multicut crops in view of good seed production. Advanced training on,ô Fodder Seed Productionô organized by ICAR-IISS, Mau (UP) from 15 to 19 March 2016 at GBPUAT, Pantnagar.

Pal, M S. 2016. Weed control in fodder crops. Advanced training on,ô Fodder Seed Productionô organized by ICAR-IISS, Mau (UP) from 15 to 19 March 2016 at GBPUAT, Pantnagar.

Prasad, B. 2016. Quality seed production technology of oat and legume forages. Advanced training on ôFodder Seed Productionô organized by ICAR-IISS, Mau (UP) from 15 to 19 March 2016 at GBPUAT, Pantnagar.

Popular articles

Verma J. S. 2015. Quality seed production in Forage Cowpea. *Kisan Bharati* 46 (6): 19-20

Verma J. S. 2015. Scientific cultivation of Berseem for Nutritious green fodder. *Kisan Bharati* 47 (1): 38, 40

Verma J. S. 2015. Management and care of cultivated winter forage crops. *Kisan Bharati* 47 (3): 36-38

Pal, M. S. 2016. Harvest quality green fodder from Hybrid Napier grass. *Indian Farmers' Digest* 49 (06): 50-52.

Kanojia, R K and Pal, M S. 2016. Improved techniques of direct sowing of rice through drum seeder. *Kisan Bharti* 47 (9): 16 &36.

Verma J. S. and Shamboo Prasad. 2016. Forage Cowpeas for quality green fodder. *Indian Farmers' Digest.* 49 (5) : 42-45.

Book

- Advances in Seed Science and Technology edited by P. S. Shukla and Birendra Prasad, published by Biotech Books, New Delhi. ISBN 978-81-7622-352-2 .381p.

Out reach activities

- **TSP-Forage Crops:** 108 farmers in Rabi and 71 in Spring/Summer season 2015-16 in Kanpura, Belkhera and Kaithulia villages of Sitarganj block (U S Nagar), Uttarakhand were selected. All farmers belong to scheduled tribe caste, ôTharuô. The forage demonstrations on berseem and oat in Rabi and maize (African Tall), cowpea and rice bean in summer season were conducted. The inputs like seed, fertilizers and chemicals were distributed.
- **FTDs-Forage Crops:** 75 field demonstrations on rabi and summer forage crops like berseem, oat, Makkhan grass (Rabi season), and maize, sorghum, cowpea and ricebean (Summer season) were conducted on farmers fields in Sitarganj, Khatima and Gadarpur blocks of U S Nagar and Kotabagh of Nainital districts. The inputs like seed and fertilizers were distributed to only few very poor farmers. The farmers meeting were guided for forage production.

Important visits

- **Dr Y K Singh**: Officer-in Charge, Country Representative, The Royal Barenbrug Group, The Netherland,
- **Dr S Ray Smith**, Professor & Forage Extension Specialist, University of Kentucky, USA visited forage program in November 2015,
- **Dr Yogesh Jindal**, Forage Breeder, HAU, Hisar visited forage program 11- 12th March 2016
- **Dr. Harish Gularia**, Head of WWF, Uttarakhand
- **Dr Jagdish Prasad Yadvendra** visited Pantnagar Centre on 4th June 2016.

Technology developed

- Oat variety UPO-06-1 has been developed
- Application of 75% NPK coupled with seed treatment with Azotobacter+ Azospirillum gave significantly higher net returns than 100% NPK+seed treatment with Azotobacter+ Azospirillum. Therefore, 25Kg NPK may be saved with application of 75% NPK+ seed treatment with Azotobacter+ Azospirillum

Awards:

- **Dr. Birendra Prasad** awarded with outstanding achievement award by Astha Foundation in the discipline of Plant Breeding on GRISAAS-2015 during 12-13 Dec 2015 at Rajmata Vijayaraje Scindhia Krishi Vishwavidhylaya, Gwalior, MP.
- **Dr. Birendra Prasad** conferred Excellence in teaching awards for his outstanding contribution in the field of Plant Breeding on the occasion of international conference on AFBSAH-2016 organized by Department of MCE in Collaboration with Society of Biotechnology at Allahabad.

Capacity building

- 21 days training on ôRevitalizing soil and crop productivity for secured agriculture from 3-23 Feb 2016 was organized under CAFT Agronomy. **Dr Mahendra Singh Pal, Professor Agronomy served as the course coordinator.**
- 10 Farmersô meeting organized in selected villages under TSP and FTDs,
- 12 field days were organized.

Radio Talks: 11

Student guidance: 07 M Sc. and 03 Ph.D. students,

New facility developed

- Forage Cafeteria of 1.5 ha has been developed and 10 grasses and 6 species of important fodder trees of Uttarakhand hills like Bhimal, Timil, Kharik, Queral, Subabbol, fueons have been planted. The seasonal crops are grown for demonstrating the agro techniques to all stakeholders including farmers, growers, dairymen, officials involved in fodder production.

APPENDIX-III

WEATHER REPORT FOR RABI-2015-16

The weather report of the AICRP-FCU Coordinating Centres, Voluntary Centres and Head quarter across the different zones during *Rabi* 2015-16 have been presented in this section. The weather parameters prevalent during the season from 40th Standard Meteorological Week (October 01-07, 2015) to 21st Standard Meteorological Week (May 21-27, 2016) were taken into consideration, which covers the *Rabi* season, 2015-16 for all the testing/ experimenting locations for 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, Almora was the coolest location recording -2.2^{0}C during 52nd SMW. Maximum temperature was recorded at Palampur (32.0^{0}C) during 20th SMW. The average minimum temperature over the season was recorded lowest at Almora (5.25^{0}C). The Palampur and Almora centres recorded total rainfall of 374 and 146.3 mm, respectively, during the period. In North-East zone, Ranchi recorded the lowest minimum temperature (3.1^{0}C) during 4th SMW whereas maximum temperature was recorded at Kalyani (41.5^{0}C) during 15th SMW. Minimum variation for maximum temperature over the season was observed at Jorhat. In North-West zone, Hisar and Bikaner recorded lowest minimum temperature (3.5^{0}C) during 1st SMW, whereas, maximum temperature was recorded at Bikaner (47.4^{0}C) during 20th SMW. In Central zone, Raipur recorded the lowest minimum temperature (4.2^{0}C) during 4th SMW whereas the maximum temperature was recorded at Anand (43.3^{0}C) during 20th SMW. In South zone, the lowest minimum temperature was recorded at Mandya (11.0^{0}C) during 2nd SMW. The maximum temperature was recorded at Hyderabad (41.1^{0}C) during 17th SMW. 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 J & K, Tamil Nadu and Andhra Pradesh as evident from the rainfall data presented in tables (M1 to M13). In Hill zone, Palampur received higher rainfall (374 mm) as compared to Almora (146.3 mm). In North-East zone, Jorhat received highest rainfall (918.3 mm) followed by Imphal (698.3 mm) and lowest being with Ranchi (266.3 mm). The maximum number of rainy days was recorded at Jorhat (51 days). In North-West zone, Pantnagar received highest rainfall (129.6 mm) in 11 rainy days followed by Ludhiana (93.7mm). Bikaner received lowest rainfall (31.3 mm) in 4 rainy days. In Central zone, maximum rainfall and maximum number of rainy days (249.3.3 mm, 19 days) was recorded at Rahuri followed by Raipur (109.5 mm) and lowest being with Faizabad (20.3 mm, 5 days). In South zone, Mandya received maximum rainfall (242.8 mm) in 15 rainy days followed by Hyderabad (216.1 mm in 11 days).

Relative Humidity

In Hill zone, the morning, higher afternoon and average RH was recorded higher at Almora compared to Palampur throughout the season and it indicated that Almora is more humid than Palampur. In North-East zone, maximum average RH of 94.9% was recorded at Jorhat during morning hours followed by 92.2 % at Kalyani. The average minimum RH during morning and afternoon hours was recorded at Jorhat (70.3%) and Kalyani (56.0%) respectively. In North-West zone, maximum average RH of the season was recorded at Ludhiana (85.8%) in morning hours and 42 in afternoon. The lowest RH during morning as well as evening hours was recorded at Bikaner (71.7 and 39.1% respectively). In Central zone, maximum RH in morning (86.8 %) and evening hours (35.5 & 36.5%) was recorded at Jabalpur and Raipur. In South zone, maximum average RH of the season in morning and evening hours (92.0 and 76.3%) was recorded at Vellayani. The lowest average RH of the season (78.4 & 35.3%) in morning and evening hours, respectively, was recorded at Hyderabad. In the tables RH1 and RH2 refers to morning and afternoon RH respectively.

Sunshine hours

In Hill zone, higher average sunshine hours were recorded maximum at Almora Palampur (7.40) followed by Palampur (7.09) during the crop season. This indicates the weather was fairly clear at both the stations during the period. In North-West zone, higher average sunshine hours were recorded at Bikaner (7.93) followed by Hisar (6.84) during the crop season. Lowest average sunshine hours were recorded at Pantnagar (6.47). In North-East zone, maximum average sunshine hours were recorded at Ranchi (8.19) followed by Kalyani (6.2) during the crop season. Lowest average sunshine hours were recorded at Jorhat (4.08). In Central zone, maximum average sunshine hours were recorded at Anand (9.35) followed by Jabalpur (8.0) during the crop season. Lowest average sunshine hours were recorded at Raipur (7.5). In South zone, maximum average sunshine hours were recorded at Hyderabad (8.2). Lowest average sunshine hours were recorded at Mandya (5.3) during the crop season.

Std. Week No.	Period	Std. Week No.	Period
40	01-07 Oct, 2015	05	29-04 Feb, 2016
41	08-14 Oct, 2015	06	05-11 Feb, 2016
42	15-21 Oct, 2015	07	12-18 Feb, 2016
43	22-28 Oct, 2015	08	19-25 Feb, 2016
44	29-04 Nov, 2015	09	26-04 March, 2016
45	05-11 Nov, 2015	10	05-11 March, 2016
46	12-18 Nov, 2015	11	12-18 March, 2016
47	19-25 Nov, 2015	12	19-25 March, 2016
48	26-02 Dec, 2015	13	26-01 April, 2016
49	03-09 Dec, 2015	14	02-08 April, 2016
50	10-16 Dec, 2015	15	09-15 April,2016
51	17-23 Dec, 2015	16	16-22 April,2016
52	24-31 Dec, 2015	17	23-29 April,2016
01	01-06 Jan, 2016	18	30-06 May, 2016
02	07-14 Jan, 2016	19	07-13 May, 2016
03	15-21 Jan, 2016	20	14-20 May, 2016
04	22-28 Jan, 2016	21	21-27 May, 2016

Table M 1: Meteorological data in Hill zone during crop growth period of Rabi 2015-16

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	27.7	13.8	64.0	48.0	-	10.5	30.6	11.6	91.9	49.3	-	-	9.1
41	26.5	14.7	82.0	65.0	0.6	7.9	29.4	13.4	87.1	64.3	40.0	1	5.9
42	25.1	12.9	73.0	52.0	9.0	7.0	27.1	13.4	87.5	50.5	-	-	7.2
43	23.4	10.5	72.0	48.0	13.2	7.1	27.3	6.4	79.6	43.4	-	-	8.4
44	22.6	10.2	80.0	54.0	-	7.1	24.6	5.9	88.1	39.8	-	-	6.7
45	20.5	9.3	70.0	53.0	9.8	4.2	24.5	3.9	89.5	57.6	-	-	6.6
46	22.9	9.2	65.0	41.0	-	8.4	25.7	0.4	88.9	44.9	-	-	8.6
47	22.3	8.0	71.0	50.0	-	8.4	25.4	4.9	93.1	46.9	-	-	7.9
48	20.9	7.6	75.0	47.0	6.6	6.0	23.0	3.1	89.6	40.9	-	-	6.9
49	20.2	6.9	71.0	54.0	-	7.4	21.8	1.8	96.5	57.2	-	-	6.0
50	15.4	4.5	84.0	70.0	42.6	4.1	19.2	2.9	94.5	53.4	-	-	6.0
51	14.4	1.8	86.0	55.0	2.4	6.6	18.9	-1.0	98.9	52.1	-	-	6.7
52	17.8	3.6	63.0	45.0	-	7.1	22.4	-2.2	92.3	48.9	-	-	7.4
01	18.4	5.6	62.0	45.0	-	6.4	21.4	-1.2	87.9	40.7	-	-	7.3
02	16.9	4.1	81.0	50.0	2.4	6.9	18.2	-0.4	90.4	41.9	-	-	6.5
03	15.4	1.8	79.0	51.0	-	7.1	16.8	-1.6	88.9	45.3	3.0	1	6.3
04	15.4	2.0	74.0	46.0	-	6.9	19.1	-1.9	93.6	43.7	-	-	7.5
05	17.5	4.5	80.0	49.0	5.2	7.5	21.4	0.5	91.9	47.1	-	-	7.5
06	17.6	4.6	77.0	50.0	35.2	8.0	20.0	0.6	94.3	46.9	6.0	1	6.5
07	17.7	5.1	70.0	38.0	-	7.1	22.2	0.1	79.8	53.0	-	-	7.4
08	21.6	8.1	71.0	56.0	11.0	7.4	24.6	6.6	79.3	49.7	4.0	1	6.9
09	22.2	8.9	74.0	47.0	-	8.4	24.6	4.9	81.0	46.0	-	-	7.6
10	22.5	8.9	69.0	43.0	49.0	7.1	25.1	5.6	77.9	35.7	7.0	2	6.3
11	19.1	8.8	68.0	59.0	60.2	4.6	21.6	7.6	85.0	58.0	30.3	4	5.6
12	20.9	8.9	57.0	43.0	30.8	5.7	26.4	6.4	74.0	42.1	-	-	9.3
13	26.0	12.0	56.0	40.0	-	6.9	28.5	9.4	68.0	33.6	-	-	8.9
14	27.2	14.6	64.0	40.0	1.4	4.4	29.1	10.8	65.0	30.0	2.0	1	6.6
15	25.9	12.5	60.0	30.0	2.8	6.7	31.6	8.8	53.0	30.1	-	-	9.6
16	30.0	15.9	54.0	29.0	10.8	8.1	32.6	11.9	71.4	30.0	-	-	9.8
17	28.3	13.9	40.0	22.0	1.0	8.7	31.8	10.7	78.3	26.7	-	-	8.7
18	31.2	16.6	39.0	24.0	10.4	8.4	31.0	10.1	76.7	41.0	2.0	1	6.6
19	28.1	16.4	69.0	56.0	31.6	4.8	27.9	14.2	86.4	66.0	49.0	4	5.6
20	32.0	18.7	42.0	30.0	0.2	10.6	33.6	5.8	76.2	45.0	3.0	1	10.3
21	31.0	16.5	57.0	47.0	38.2	7.4							
Mean/ Total	**22.49**	**9.45**	**67.62**	**46.38**	**374.40**	**7.09**	**25.07**	**5.25**	**84.14**	**45.51**	**146.30**		**7.40**

Table M 2: Meteorological data in North West zone during crop growth period of Rabi 2015-16

Std. Week No.	HISAR						BIKANER						
	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	36.6	19.3	82.0	30.0	-	9.7	38.0	20.4	70.1	39.0	-	-	9.7
41	36.7	20.1	68.0	28.0	-	9.3	37.7	20.0	77.5	44.2	-	-	9.7
42	35.2	20.1	85.0	33.0	-	7.7	36.1	19.2	69.4	41.0	-	-	9.4
43	32.3	16.7	80.0	35.0	7.0	8.4	32.5	14.3	65.8	30.5	1	4.2	9.1
44	28.0	14.2	94.0	38.0	-	4.9	31.0	13.6	72.2	28.5	-	1.2	7.5
45	27.4	15.5	94.0	51.0	2.9	3.6	28.4	13.0	74.7	43.0	-	-	2.7
46	29.1	12.8	86.0	36.0	-	7.5	30.9	12.5	74.5	43.1		-	7.1
47	27.7	9.0	91.0	36.0	-	7.7	30.3	10.6	60.4	30.1	-	-	7.8
48	25.3	9.5	95.0	50.0	-	4.2	26.8	8.5	80.2	36.1	-	-	6.1
49	25.5	8.8	97.0	51.0	-	5.5	28.9	7.9	73.0	25.1	-	-	7.5
50	21.4	7.1	95.0	45.0	-	5.2	21.6	4.0	88.1	47.7	-	-	6.8
51	20.6	3.5	98.0	44.0	-	6.2	22.1	3.5	89.2	29.0	-	-	7.1
52	21.3	4.0	93.0	42.0	-	6.4	24.9	5.8	81.1	35.1	-	-	7.9
01	22.7	6.4	97.0	58.0	-	4.9	26.9	7.7	77.4	52.1	-	-	5.7
02	22.4	8.4	95.0	59.0	-	4.9	24.0	6.9	89.0	55.4	-	-	7.0
03	15.3	6.1	90.0	75.0	-	2.2	21.1	4.6	91.8	63.8	-	-	5.9
04	16.4	5.5	97.0	66.0	-	4.2	22.3	4.1	89.0	61.4	-	-	7.1
05	22.1	7.1	95.0	53.0	-	6.2	25.5	7.0	75.7	45.0	-	-	7.7
06	22.9	6.3	91.0	52.0	-	6.8	26.7	8.3	68.6	40.7	-	-	9.2
07	21.9	6.2	92.0	53.0	5.3	6.7	23.9	7.3	84.4	60.4	-	0.5	8.4
08	26.0	10.3	94.0	45.0	-	7.2	29.5	10.1	85.1	52.6	1.0	4.4	6.6
09	29.0	11.2	92.0	47.0	-	8.2	34.3	14.3	78.9	49.9	-	-	9.3
10	28.1	13.0	94.0	53.0	14.7	8.2	29.3	15.3	83.3	66.7	1.0	4.8	8.0
11	28.6	14.5	92.0	54.0	6.2	6.9	32.8	14.2	79.6	64.7	1.0	16.2	8.6
12	30.8	13.4	84.0	43.0	4.3	8.5	35.3	16.7	63.9	23.0	-	-	9.0
13	32.4	14.7	81.0	37.0	-	8.9	37.2	17.6	52.1	17.1	-	-	8.9
14	36.9	19.1	71.0	34.0	-	5.9	37.3	22.3	51.4	27.3	-	-	7.6
15	35.6	16.3	67.0	29.0	-	9.7	38.4	19.9	58.1	24.0	-	-	8.9
16	40.0	21.0	56.0	23.0	-	8.3	39.6	24.9	50.4	19.6	-	-	8.4
17	38.5	17.6	51.0	19.0	-	10.2	41.3	20.9	62.6	17.4	-	-	10.2
18	41.0	21.4	48.0	24.0	-	7.8	40.4	24.8	53.3	25.7	-	-	7.9
19	-	-	-	-	-	-	44.5	27.6	53.9	34.0	-	-	10.0
20	-	-	-	-	-	-	47.4	28.3	53.1	22.9	-	-	10.7
21	-	-	-	-	-	-	43.4	30.8	68.7	34.6	-	-	6.2
Mean/ Total	**28.31**	**12.23**	**85.32**	**43.32**	**40.4**	**6.84**	**32.07**	**14.32**	**71.96**	**39.14**	**4.00**	**21.0**	**7.93**

Table M 3: Meteorological data in North West zone during crop growth period of Rabi 2015-16

Std. Week No.	LUDHIANA						PANTNAGAR						
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
40	33.1	20.5	93.0	47.0	-	-	32.9	20.2	83.0	51.0	-	-	9.5
41	32.7	22.0	87.0	52.0	1	7.0	32.5	20.3	83.0	52.0	-	-	7.5
42	31.5	19.2	94.0	46.0	-	-	31.5	19.3	86.0	51.0	-	-	5.1
43	29.5	16.4	84.0	39.0	1	9.0	31.2	13.9	88.0	48.0	-	-	8.7
44	27.8	14.4	94.0	43.0	-	-	29.0	13.7	90.0	43.0	1	5.0	6.2
45	26.8	14.8	88.0	42.0	-	-	28.0	12.1	91.0	43.0	1	2.0	6.6
46	28.0	12.5	89.0	30.0	-	-	29.0	11.9	91.0	38.0	-	-	7.8
47	27.0	9.9	94.0	29.0	-	-	27.7	11.3	92.0	41.0	-	-	7.2
48	24.7	11.4	93.0	48.0	-	-	26.7	12.6	91.0	46.0	-	-	3.7
49	23.8	10.0	96.0	47.0	-	-	24.6	10.2	96.0	49.0	-	-	1.8
50	20.0	7.9	91.0	44.0	-	1.7	21.1	10.3	94.0	64.0	-	-	2.1
51	20.0	4.9	95.0	38.0	-	-	20.5	4.6	96.0	50.0	-	-	5.3
52	20.4	5.3	94.0	37.0	-	-	21.0	5.0	95.0	46.0	-	-	6.1
01	21.1	7.3	95.0	49.0	-	-	23.6	6.9	92.0	39.0	-	-	6.0
02	19.1	7.9	94.0	59.0	1	16.0	22.3	7.0	94.0	49.0	-	-	4.3
03	13.0	8.0	94.0	77.0	-	-	17.4	6.6	94.0	64.0	-	-	2.3
04	14.1	5.2	97.0	69.0	-	0.4	17.9	4.1	94.0	53.0	-	-	3.3
05	20.5	7.6	93.0	52.0	1	3.0	22.2	6.8	96.0	48.0	-	-	4.8
06	21.4	8.2	89.0	48.0	-	0.8	23.3	8.3	93.0	46.0	-	-	5.4
07	22.1	7.5	89.0	41.0	-	0.6	26.4	9.4	82.0	32.0	-	-	6.8
08	24.2	11.7	94.0	53.0	1	7.4	26.4	11.8	87.0	44.0	-	2.5	4.6
09	28.1	12.9	94.0	42.0	-	-	29.1	12.1	88.0	37.0	-	-	7.6
10	26.7	14.5	90.0	47.0	2	23.0	30.3	13.6	86.0	37.0	-	-	8.3
11	24.2	14.2	91.0	56.0	2	14.9	29.0	13.8	81.0	36.0	1	0.9	6.6
12	29.8	14.5	84.0	36.0	1	3.2	31.9	14.2	78.0	28.0	-	-	9.3
13	31.7	16.0	84.0	34.0	-	-	33.7	16.0	78.0	32.0	-	-	7.0
14	34.3	20.1	70.0	30.0	-	-	35.6	20.4	65.0	32.0	-	-	6.9
15	35.1	18.0	65.0	22.0	-	0.4	37.3	17.2	64.0	29.0	-	-	10.4
16	38.9	22.3	59.0	21.0	-	2.6	38.7	21.5	70.0	32.0	1	20.0	7.5
17	37.8	18.1	52.0	13.0	-	-	38.9	16.9	71.0	27.0	-	-	11.1
18	39.2	22.4	49.0	23.0	-	2.4	37.2	20.8	64.0	30.0	1	19.6	7.5
19	39.1	25.5	57.0	28.0	-	1.2	33.9	22.5	73.0	45.0	2	38.2	5.5
20							38.5	23.9	61.0	35.0	-	-	8.4
21							33.9	22.8	72.0	50.0	4	41.4	8.8
Mean/ Total	**27.05**	**13.47**	**85.38**	**41.94**	**10.00**	**93.6**	**28.92**	**13.59**	**84.09**	**42.6**		**129.6**	**6.47**

Table M 4: Meteorological data in Central zone during crop growth period of Rabi 2015-16

Std. Week No.	URULIKANCHAN						JHANSI					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2		
40	32.2	20.9	99.9	61.9	4	43.4	37.1	20.1	78.0	47.0	-	-
41	33.4	21.2	98.0	61.4	1	40.0	37.2	19.1	76.0	38.0	-	-
42	25.1	33.2	96.0	58.7	-	-	36.2	19.5	84.0	36.0	-	-
43	33.1	15.3	99.7	39.1	-	-	34.6	16.9	80.0	38.0	1.0	16.2
44	31.3	16.4	99.3	44.3	-	-	26.9	15.6	91.0	51.0	1.0	17.8
45	31.3	14.4	97.6	27.7	-	-	31.3	17.0	88.0	43.0	1.0	3.0
46	30.7	13.5	99.0	25.4	-	-	31.2	14.6	88.0	40.0	-	-
47	29.1	11.5	92.4	29.4	2	82.2	28.3	10.7	88.0	39.0	-	-
48	30.2	17.5	91.6	37.7	-	-	28.0	13.8	84.0	54.0	1.0	4.4
49	30.6	12.9	93.9	26.1	-	-	27.1	10.2	88.0	42.0	-	-
50	28.9	16.9	70.1	28.6	-	-	25.1	9.2	88.0	42.0	-	-
51	23.5	20.4	37.1	29.4	-	-	21.4	5.2	89.0	49.0	-	-
52	24.6	22.2	34.1	27.7	-	-	23.4	6.7	87.0	43.0	-	-
01	33.9	19.3	79.9	30.2	-	-	25.5	8.2	86.0	46.0	-	-
02	30.2	19.9	84.4	22.7	-	-	26.1	8.8	82.0	48.0	-	-
03	31.4	19.3	95.9	26.6	-	-	15.0	6.8	92.0	81.0	1.0	8.0
04	33.8	19.3	95.0	30.6	-	-	22.5	5.5	91.0	56.0	-	0.4
05	35.7	19.8	89.1	27.3	-	-	25.4	9.2	83.0	48.0	-	-
06	34.8	20.5	85.3	22.6	-	-	24.3	8.0	83.0	44.0	-	-
07	34.9	21.3	90.1	22.0	-	-	25.6	10.6	83.0	49.0	-	-
08	36.8	23.6	84.1	20.1	-	-	29.5	12.0	79.0	39.0	-	-
09	36.4	23.8	96.1	37.0	-	-	30.1	12.6	83.0	42.0	-	-
10	36.7	23.9	88.1	17.7	-	-	31.3	15.6	82.0	46.0	-	0.4
11	35.5	24.9	69.7	16.0	-	-	31.0	15.2	85.0	42.0	1.0	7.4
12	39.0	24.1	64.1	14.6	-	-	34.8	15.1	80.0	32.0	-	-
13	39.5	26.8	74.0	16.4	-	-	36.3	16.5	73.0	29.0	-	-
14	40.0	26.3	77.0	17.7	-	-	38.8	20.0	65.0	28.0	-	-
15	38.7	25.4	93.4	17.7	-	-	39.0	20.6	52.0	23.0	-	-
16	41.1	28.3	86.1	24.3	-	-	41.5	24.0	34.0	22.0	-	-
17	39.8	25.0	65.7	16.1	-	-	40.5	22.1	47.0	24.0	-	-
18	41.0	25.8	78.7	19.4	-	-	42.8	22.6	51.0	23.0	1.0	5.2
19	40.0	26.6	80.0	23.9	-	-						
20	41.0	29.5	74.7	16.7	-	-						
21	38.1	28.7	74.4	22.0	-	-						
Mean/ Total	**34.19**	**21.72**	**83.37**	**28.21**	**7.00**	**83.4**	**30.57**	**13.94**	**78.71**	**41.42**	**7.00**	**62.8**

Table M 5: Meteorological data in Central zone during crop growth period of Rabi 2015-16

Std. Week No.	ANAND							RAHURI					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2		
40	37.0	21.9	88.0	39.0	-	-	9.4	34.1	22.2	70.0	40.0	6	5.0
41	37.7	22.4	88.0	38.0	-	4.0	9.2	34.0	19.6	64.0	33.0	-	-
42	38.8	20.7	98.0	35.0	-	-	9.6	33.7	20.9	72.0	43.0	1	7.4
43	36.5	19.2	88.0	33.0	-	-	8.6	29.4	16.1	72.0	57.0	2	13.4
44	33.9	17.1	78.0	40.0	-	-	9.8	32.0	14.0	56.0	36.0	-	1.1
45	35.8	16.9	92.0	31.0	-	-	9.0	31.8	15.9	57.0	33.0	-	-
46	34.9	16.1	87.0	34.0	-	-	9.4	29.7	20.1	81.0	63.0	2	95.6
47	33.7	18.3	68.0	36.0	-	-	7.9	29.8	15.2	69.0	41.0	-	-
48	32.1	16.0	69.0	33.0	-	-	8.3	29.6	12.1	57.0	29.0	-	-
49	33.0	11.7	86.0	32.0	-	-	9.5	29.1	10.9	55.0	32.0	-	-
50	28.6	10.5	85.0	32.0	-	-	9.4	29.2	14.6	67.0	47.0	-	-
51	27.7	8.1	78.1	30.4	-	-	9.4	25.2	7.5	52.0	34.0	-	-
52	25.3	8.3	68.6	28.3	-	-	7.8	27.2	8.2	56.0	37.0	-	-
01	31.9	10.7	94.1	36.4	-	-	9.1	24.9	12.7	74.0	55.0	-	1.2
02	30.0	10.4	92.3	39.4	-	-	9.0	27.2	6.8	48.0	26.0	-	-
03	27.5	10.2	90.3	44.0	-	-	7.4	28.6	10.5	54.0	33.0	-	-
04	28.2	6.6	93.9	33.4	-	-	9.6	29.4	14.0	62.0	37.0	-	-
05	30.4	13.2	88.0	40.4	-	-	9.2	30.1	12.9	52.0	35.0	-	-
06	29.9	11.1	76.7	31.1	-	-	10.0	31.3	12.3	51.0	24.0	-	-
07	29.8	14.7	80.4	33.6	-	-	8.5	33.0	13.0	53.0	23.0	-	-
08	33.0	15.4	79.0	38.4	-	-	8.9	33.2	14.7	54.0	23.0	-	-
09	36.0	18.5	66.8	31.5	-	-	9.3	28.9	13.0	65.0	37.0	2	42.2
10	35.2	19.1	70.7	26.1	-	-	9.9	31.9	14.8	52.0	37.0	3	65.2
11	34.9	19.8	71.7	28.7	-	-	9.7	31.0	16.8	67.0	39.0	2	11.0
12	38.4	19.9	66.1	20.3	-	-	9.8	35.3	19.2	45.0	23.0	-	-
13	38.9	19.8	73.7	22.1	-	-	9.1	36.4	19.4	54.0	20.0	-	-
14	37.2	23.5	70.6	29.2	-	-	9.1	35.8	16.1	51.0	20.0	-	-
15	38.6	24.1	60.5	22.7	-	-	10.4	33.9	19.5	65.0	37.0	1	7.2
16	39.0	23.9	58.6	28.9	-	-	10.6	37.2	21.5	48.0	22.0	-	-
17	37.7	24.4	66.3	30.7	-	-	9.1	39.1	20.5	40.0	14.0	-	-
18	40.2	25.1	75.4	32.1	-	-	9.2	40.4	21.0	36.0	16.0	-	-
19	40.5	26.9	73.1	32.3	1.0	10.3	10.6	39.6	24.4	41.0	19.0	-	-
20	43.3	27.1	70.4	27.0	-	-	11.2	38.6	23.5	48.0	28.0	-	-
21	39.7	28.2	76.6	42.3	-	-	10.8	41.1	23.6	49.0	22.0	-	-
Mean/ Total	**34.57**	**17.64**	**78.50**	**32.71**	**1.00**	**14.3**	**9.35**	**32.40**	**16.10**	**56.97**	**39.8**	**19**	**249.3**

Table M 6: Meteorological data in Central zone during crop growth period of Rabi 2015-16

Std. Week No.	JABALPUR							RAIPUR					
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2		
40	33.0	19.5	88.0	35.0	-	-	9.3	33.7	24.4	92.0	51.0	-	7.7
41	35.0	17.9	88.0	31.0	-	-	9.5	33.9	22.2	89.0	47.0	-	8.7
42	34.0	19.0	86.0	36.0	-	-	9.2	33.4	22.8	91.0	45.0	-	8.7
43	33.0	18.4	87.0	47.0	-	-	6.9	33.7	21.3	90.0	37.0	-	8.2
44	28.0	17.0	92.0	58.0	1	40.0	5.8	30.0	19.4	90.0	55.0	-	6.7
45	31.0	17.9	88.0	40.0	-	-	5.8	31.7	18.8	91.0	37.0	-	7.8
46	31.0	14.1	89.0	35.0	-	-	7.6	31.7	16.3	89.0	33.0	-	7.5
47	29.0	12.7	89.0	36.0	-	-	6.7	30.6	15.5	88.0	36.0	-	8.3
48	31.0	14.5	88.0	34.0	-	-	7.2	31.9	16.7	87.0	34.0	-	7.5
49	28.0	9.2	92.0	30.0	-	-	7.8	31.2	14.8	88.0	31.0	-	8.0
50	27.0	9.2	82.0	32.0	-	-	7.6	30.1	17.3	77.0	46.0	4.4	4.4
51	24.0	7.0	86.0	37.0	-	-	7.0	27.7	16.6	85.0	52.0	9.4	2.0
52	24.0	5.4	91.0	25.0	-	-	8.6	26.9	10.8	87.0	29.0	-	6.2
01	27.5	7.9	88.0	27.0	-	-	8.5	25.0	14.8	95.0	52.0	9.4	4.5
02	26.7	8.0	81.0	32.0	-	-	7.7	25.8	8.0	90.0	29.0	-	9.2
03	22.2	11.5	92.0	65.0	2	12.2	5.4	26.0	8.3	90.0	29.0	-	8.3
04	23.3	4.2	94.0	29.0	-	-	9.6	28.9	13.5	88.0	37.0	-	7.4
05	27.7	9.1	92.0	35.0	-	-	9.3	28.3	11.7	88.0	29.0	-	7.6
06	26.4	8.4	84.0	34.0	-	-	8.3	29.9	14.0	83.0	36.0	-	5.7
07	28.5	11.3	88.0	40.0	-	-	6.9	29.3	13.6	88.0	39.0	2.2	8.2
08	30.2	11.8	90.0	32.0	-	-	7.4	33.5	15.7	84.0	28.0	-	9.8
09	30.5	13.4	85.0	34.0	-	-	8.5	30.8	18.5	83.0	49.0	19.2	6.7
10	31.9	17.0	88.0	47.0	2	29.6	8.0	31.3	16.6	81.0	34.0	-	8.1
11	30.9	15.0	85.0	37.0	2	6.5	8.7	34.1	19.9	76.0	33.0	0.1	7.6
12	34.5	14.1	67.0	18.0	-	-	10.2	35.1	18.7	66.0	22.0	-	9.0
13	35.8	16.4	78.0	17.0	1	8.0	10.0	37.3	21.5	66.0	31.0	-	7.2
14								39.1	22.8	65.0	26.0	-	8.2
15								33.7	20.8	83.0	49.0	21.6	5.4
16								38.0	24.6	71.0	33.0	14.2	9.4
17								38.1	24.1	74.0	34.0	15.6	9.0
18								39.6	25.4	73.0	36.0	12.4	7.7
19								40.2	26.2	65.0	36.0	-	7.3
20								39.8	27.2	63.0	31.0	1	7.8
21								45.7	29.5	40.0	14.0	-	9.3
Mean/ Total	**29.4**	**12.7**	**86.8**	**35.5**	**8.0**	**96.3**	**8.0**	**32.8**	**18.6**	**81.1**	**36.5**	**109.5**	**7.50**

Table M 7: Meteorological data in North East zone during crop growth period of Rabi 2015-16

Std. Week No.	JORHAT							RANCHI						
	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	33.4	24.0	92.0	72.0	-	-	5.7	30.0	20.9	83.1	61.0	2.0	37.1	8.3
41	30.9	21.8	87.0	73.0	2	33.8	5.5	30.0	21.1	82.1	58.9	1.0	12.5	8.9
42	30.7	20.7	92.0	68.0	1	4.4	7.9	28.7	19.5	81.6	71.4	-	-	9.2
43	30.0	18.8	93.0	70.0	1	8.6	6.6	28.2	15.3	84.1	65.4	-	-	9.0
44	29.5	19.0	94.0	72.0	1	6.9	5.3	26.9	17.1	82.6	62.3	2.0	65.5	5.1
45	27.1	15.7	95.0	64.0	-	-	6.2	27.5	16.0	83.0	66.0	-	-	7.9
46	27.9	15.4	94.0	67.0	1	3.3	5.8	27.0	13.0	83.4	62.0	-	-	8.4
47	26.8	13.3	98.0	71.0	-	-	6.5	26.4	11.6	83.9	71.0	-	-	8.2
48	27.0	12.9	96.0	66.0	-	-	7.9	27.7	12.7	83.6	61.4	-	-	8.2
49	23.7	12.7	100.0	75.0	1	14.1	3.5	26.5	11.7	83.1	66.1	-	-	7.5
50	21.9	13.8	100.0	80.0	2	21.1	0.4	23.7	10.7	83.0	68.4	-	-	4.2
51	21.9	8.6	99.0	63.0	-	0.5	5.8	21.0	8.3	83.6	69.4	1.0	3.2	5.1
52	23.1	8.2	99.0	64.0	-	-	5.9	19.9	6.9	83.4	70.0	-	-	8.4
01	25.3	9.1	100.0	63.0	-	-	6.9	22.6	5.3	83.4	72.3	-	-	8.5
02	23.1	9.9	99.0	72.0	2	29.4	3.2	24.1	6.3	83.3	70.7	-	-	9.3
03	20.2	10.8	99.0	80.0	1	5.8	1.8	24.6	11.0	82.1	69.9	2.0	7.3	5.0
04	21.1	10.2	99.0	69.0	-	-	3.3	21.2	3.1	85.1	59.3	-	-	9.3
05	20.7	10.7	100.0	76.0	-	-	1.2	26.0	8.6	85.9	54.0	-	-	9.6
06	22.8	12.6	98.0	68.0	-	1.4	1.7	26.1	9.1	86.0	53.6	-	-	8.7
07	24.5	13.2	96.0	62.0	-	-	1.6	28.1	12.8	87.3	46.3	-	2.1	6.6
08	26.1	15.9	95.0	70.0	1	5.2	2.9	30.1	13.6	86.6	40.0	-	-	9.4
09	28.3	13.1	92.0	56.0	1	3.8	6.2	28.4	14.6	86.9	50.3	-	1.0	8.8
10	25.7	15.9	92.0	68.0	1	19.5	3.8	31.2	15.7	84.7	42.9	1.0	20.3	7.9
11	28.2	16.9	90.0	57.0	-	0.8	3.8	31.2	15.3	85.9	40.9	1.0	12.6	7.5
12	26.6	16.0	90.0	63.0	2	30.6	4.1	34.1	16.9	83.1	31.3	-	-	8.6
13	27.8	17.6	93.0	70.0	4	38.9	2.5	35.5	18.1	83.9	39.9	-	-	8.6
14	28.4	20.2	91.0	71.0	3	27.7	2.7	37.1	19.6	81.1	30.3	-	-	8.2
15	28.5	19.8	90.0	71.0	1	12.6	5.1	39.5	21.5	80.7	33.7	-	-	9.8
16	24.9	19.7	96.0	91.0	5	258.6	0.3	40.2	23.4	79.6	32.9	-	-	10.9
17	27.1	20.5	95.0	74.0	5	101.4	4.0	39.5	22.4	80.0	48.0	-	-	9.2
18	28.6	20.6	92.0	72.0	3	15.8	1.9	39.0	23.4	79.4	34.3	-	-	10.0
19	31.9	22.4	88.0	70.0	1	28.2	4.2	36.4	22.1	78.9	36.3	1.0	82.5	7.0
20	26.5	21.6	97.0	85.0	7	146.5	0.2	36.5	23.7	80.7	40.7	1.0	5.0	7.9
21	30.1	22.9	94.0	78.0	5	99.4	3.2	37.3	23.8	82.9	40.0	2.0	17.2	9.3
Mean/ Total	**26.5**	**16.0**	**94.9**	**70.3**	**51.0**	**36.7**	**4.05**	**29.8**	**15.2**	**83.2**	**53.6**	**14**	**266.3**	**8.19**

Table M 8: Meteorological data in North East zone during crop growth period of Rabi 2015-16

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	31.4	23.1	90.0	68.9	2.2	1	7.3	35.0	26.0	93.4	64.1	2	32.9	7.3
41	26.9	22.4	89.7	80.9	109.6	6	2.7	33.0	24.7	97.0	66.9	1	7.0	5.7
42	26.8	21.4	77.0	79.1	11.1	2	5.8	33.4	23.8	94.1	65.1	2	2.2	7.6
43	28.9	16.5	88.3	64.1	0.0	0	8.4	33.3	21.4	92.4	53.4	-	-	8.10
44	26.0	15.5	89.6	69.4	14.4	2	5.1	31.4	21.4	94.0	63.6	-	-	5.1
45	26.5	14.1	91.3	56.0	0.0	0	8.1	32.4	20.1	92.6	50.6	-	-	7.9
46	26.5	11.8	86.6	50.7	0.0	0	8.5	32.1	18.10	92.7	52.3	-	-	6.2
47	24.9	10.9	89.0	62.4	0.0	0	6.6	32.2	17.4	93.9	48.9	-	-	7.9
48	25.0	8.4	88.6	48.9	0.0	0	8.7	30.4	18.5	92.7	58.4	-	-	3.5
49	23.0	9.6	92.6	58.6	0.4	1	4.7	28.7	17.9	93.7	67.3	-	-	3.4
50	21.4	8.3	92.3	64.4	0.0	0	3.2	26.6	17.2	92.6	57.7	-	-	1.9
51	21.6	5.5	90.7	55.3	0.0	0	6.5	23.7	12.3	95.1	58.4	1	6.6	3.7
52	21.2	1.9	88.3	47.7	0.0	0	7.0	25.1	11.1	91.0	48.3	-	-	4.3
01	22.4	4.8	92.0	52.3	4.4		6.9	26.4	11.3	92.6	56.3	-	-	3.4
02	21.5	4.0	91.4	46.7	5.5		6.5	27.0	12.1	93.1	47.3	-	-	5.7
03	22.6	5.4	92.1	48.4	0.2		6.2	25.4	11.1	91.7	54.1	1	0.3	2.6
04	21.8	3.9	88.9	43.4	-		7.2	23.5	9.3	93.4	50.4	-	-	6.0
05	22.9	7.2	91.3	45.6	0.2		4.8	28.1	14.9	92.4	48.6	-	-	5.7
06	23.3	8.8	91.3	56.1	12.8		5.2	28.4	14.6	92.1	59.9	1	3.9	4.0
07	26.3	9.1	86.4	42.4	-		6.6	31.2	19.8	94.9	56.1	-	-	4.9
08	26.2	13.1	83.4	55.4	22.8		6.2	33.6	19.9	90.0	45.1	2	11.1	6.5
09	27.5	9.9	90.3	40.1	2.4		7.9	31.5	20.1	96.6	61.4	3	33.3	6.7
10	27.6	13.0	91.1	47.7	18.6		7.2	33.7	21.6	92.3	49.7	-	-	7.4
11	26.8	11.9	81.3	48.6	1.4		7.1	34.1	21.3	89.3	40.7	-	-	7.5
12	28.6	13.7	89.6	49.0	16.7		6.7	35.0	21.5	90.7	44.4	1	16.0	7.8
13	27.4	13.3	88.0	58.1	41.9		4.9	35.1	23.8	92.4	49.9	1	3.4	7.2
14	27.4	16.3	87.1	60.3	40.4		4.2	36.3	25.3	91.3	52.6	1	1.0	6.1
15	29.7	17.1	87.4	55.4	30.0		8.2	41.5	26.2	90.1	36.6	-	-	9.5
16	27.4	17.8	85.1	79.4	47.2		2.7	39.3	27.1	85.9	49.1	-	-	8.3
17	29.2	18.9	82.7	66.0	83.6		8.0	40.1	27.5	88.1	45.3	-	-	9.0
18	29.2	19.3	88.0	62.1	39.6		5.1	38.1	25.2	86.1	48.7	2	17.8	7.9
19	31.1	21.6	86.0	59.6	37.6		6.8	36.3	25.7	89.4	55.7	2	71.5	8.5
20	27.0	20.7	93.1	85.6	194.2		2.2	35.1	24.1	91.5	64.4	5	66.2	7.3
21	30.0	22.5	92.4	73.4	98.8		5.9	34.0	24.9	94.7	66.3	5	20.1	6.1
Mean/ Total	**26.5**	**13.0**	**88.5**	**56.0**	**698.3**		**6.0**	**32.1**	**19.9**	**92.2**	**54.0**	**30**	**293**	**6.2**

Table M 9: Meteorological data in North East zone during crop growth period of Rabi 2015-16

Std. Week No.	BHUBANESHWAR						
	Temperature (C)		Humidity (%)		Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			
40	33.9	24.7	92.0	75.0	3	35.8	6.4
41	32.7	22.9	92.0	64.0	3	36.4	5.8
42	32.9	23.9	93.0	68.0	1	3.3	7.1
43	33.6	22.8	96.0	58.0	-	-	7.5
44	30.2	22.0	90.0	68.0	2	7.5	5.1
45	31.8	21.7	91.0	63.0	-	-	7.8
46	31.5	19.7	89.0	52.0	1	0.8	6.2
47	30.7	17.8	90.0	45.0	-	-	8.0
48	31.5	21.0	93.0	54.0	-	-	4.1
49	31.0	18.8	90.0	48.0	-	-	5.0
50	30.9	18.7	89.0	56.0	2	5.1	4.9
51	26.7	17.6	83.0	62.0	1	9.7	1.4
52	27.7	14.0	82.0	40.0	-	-	5.5
01	29.3	16.3	96.0	44.0	-	-	5.0
02	30.4	14.1	93.0	31.0	-	-	7.1
03	31.0	16.9	91.0	39.0	1	0.6	5.5
04	28.5	14.4	89.0	44.0	-	-	6.0
05	32.8	20.5	93.0	35.0	-	-	6.3
06	32.4	19.7	93.0	40.0	-	-	5.8
07	35.5	21.3	87.0	38.0	-	-	6.7
08	37.3	22.8	86.0	42.0	-	-	6.4
09	34.0	21.3	89.0	49.0	2	3.0	6.1
10	36.7	22.1	87.0	34.0	-	-	6.8
11	36.6	23.2	86.0	44.0	1	1.3	7.1
12	38.6	24.8	86.0	38.0	-	-	7.5
13	37.0	24.6	83.0	43.0	1	0.2	7.1
14	39.5	26.2	82.0	41.0	-	-	6.8
15	42.5	26.8	87.0	29.0	-	-	7.9
16	39.9	26.6	85.0	40.0	-	-	8.3
17	41.3	26.9	88.0	36.0	-	-	8.4
18	40.9	25.9	82.0	35.0	1	7.6	8.4
Mean/ Total	**33.8**	**21.3**	**88.8**	**46.9**	**19.0**	**111.3**	**6.39**

Table M 10: Meteorological data in North East zone during crop growth period of Rabi 2015-16

Std. Week No.	FAIZABAD						
	Temperature (C)		Humidity (%)		Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			
40	31.2	21.0	67.1	49.5	-	-	6.8
41	34.3	20.3	67.0	46.8	-	-	7.3
42	35.2	19.2	70.4	52.1	-	-	5.8
43	28.8	18.7	68.2	53.0	-	-	6.1
44	30.3	13.7	79.1	53.1	-	-	4.6
45	32.6	13.2	76.2	44.0	-	-	4.6
46	30.7	12.4	79.5	43.2	-	-	5.6
47	30.6	11.0	77.0	43.5	-	-	5.6
48	29.5	12.5	82.1	51.2	-	-	4.6
49	26.1	9.4	92.7	64.7	-	-	3.5
50	23.8	7.7	92.5	59.2	-	-	3.2
51	23.0	5.2	84.5	47.1	-	-	3.9
52	27.2	6.2	86.2	52.8	-	-	6.1
01	24.9	6.5	89.8	47.2	-	-	4.9
02	25.1	7.5	86.2	48.2	-	-	5.1
03	20.1	7.8	89.7	65.5	-	-	2.7
04	22.7	5.2	88.5	52.5	-	-	3.1
05	25.6	8.5	78.7	48.7	-	-	4.6
06	25.4	7.5	80.8	46.7	-	-	5.3
07	28.3	6.3	77.8	43.7	1	1.2	4.8
08	28.9	11.6	78.7	41.8	-	-	6.1
09	29.7	13.4	85.0	47.0	-	-	8.1
10	32.0	15.1	79.4	44.5	1	1.4	7.9
11	30.9	14.5	70.5	37.4	1	3.2	6.1
12	33.4	15.4	55.5	30.8	-	-	7.9
13	35.2	14.1	59.6	32.0	-	-	6.1
14	39.4	20.3	60.0	28.1	-	-	7.7
15	40.3	21.7	47.0	25.0	-	-	8.6
16	41.4	23.5	55.2	31.8	-	-	8.2
17	41.6	20.5	48.5	27.7	-	-	8.2
18	38.9	22.5	58.7	29.7	1	12.1	7.7
19	38.0	24.2	61.5	36.0	-	-	8.5
20	40.9	26.6	63.8	35.7	-	-	9.4
21	37.5	24.6	67.2	39.5	1	2.4	7.9
Mean/ Total	**31.3**	**14.3**	**73.7**	**44.1**	**5**	**20.3**	**6.1**

Table M 11: Meteorological data in South zone during crop growth period of Rabi 2015-16

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)
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2		
40	31.4	21.1	96.0	55.0	2	34.6	5.8	31.2	23.9	91.9	79.0	6	34.8
41	33.4	19.6	88.4	37.4	-	-	7.9	31.3	23.8	92.6	80.6	5	149.1
42	32.8	19.1	91.7	42.0	-	-	8.4	31.4	24.4	91.1	78.9	2	20.7
43	32.4	18.1	89.3	43.6	-	-	8.9	31.2	24.2	93.3	82.4	4	50.9
44	31.3	20.7	91.7	50.9	1	18.3	7.3	31.1	23.5	92.7	83.1	7	204.1
45	31.3	17.4	90.6	73.6	-	-	7.3	31.6	24.1	93.1	79.4	3	30.6
46	30.0	15.8	85.1	52.9	-	-	6.7	31.5	23.6	92.1	81.7	5	65.7
47	29.4	19.1	83.0	53.9	-	0.8	6.6	32.0	24.0	94.1	76.9	4	66.6
48	30.4	17.8	87.4	47.0	-	-	7.7	31.7	23.8	92.6	80.7	3	57.5
49	29.4	14.4	91.7	36.7	-	1.4	7.0	31.1	24.2	95.0	85.7	4	42.7
50	32.2	17.0	90.0	37.0	-	-	7.6	31.8	23.9	94.9	89.7	4	168.3
51	32.4	15.7	92.9	35.3	-	-	8.9	31.0	22.8	94.1	79.0	2	21.5
52	30.0	11.1	73.3	24.6	-	-	8.8	32.1	22.2	91.7	76.9	-	-
01	30.4	11.8	84.1	26.0	-	-	9.6	32.4	21.8	91.9	72.1	-	-
02	29.2	11.0	78.4	25.6	-	-	9.1	32.4	22.6	93.0	70.7	-	-
03	29.1	16.6	76.6	36.4	-	-	6.8	31.7	22.1	90.4	71.9	-	-
04	29.1	15.6	79.4	37.3	-	-	7.2	32.8	24.2	92.9	74.9	-	0.4
05	32.9	13.6	70.7	25.6	-	-	9.7	32.2	21.7	92.4	72.0	-	-
06	32.6	16.9	81.3	32.7	-	-	8.7	32.5	22.8	94.6	74.4	1	41.8
07	32.9	17.3	80.4	29.4	-	-	8.6	32.7	23.9	92.1	75.1	-	1.0
08	35.4	17.4	78.0	25.4	-	-	9.5	33.7	23.7	91.1	72.0	1	65.4
09	33.3	21.4	80.4	37.1	-	-	7.1	33.9	23.5	90.1	70.1	-	-
10	35.2	18.4	69.0	25.6	-	-	7.6	33.7	23.5	90.9	71.1	1	61.2
11	36.1	21.6	77.4	30.9	-	-	8.0	35.1	24.8	89.1	64.9	-	-
12	38.2	20.5	66.6	24.6	-	-	8.9	35.1	26.2	90.0	68.0	-	-
13	37.6	21.4	75.3	31.1	1	3.0	7.8	34.5	25.0	91.1	71.6	-	-
14	38.9	22.7	62.7	22.7	-	-	8.7	35.2	26.3	90.7	76.7	-	0.8
15	39.9	22.6	59.0	19.9	-	-	9.7	35.4	26.3	91.9	75.7	-	0.9
16	41.2	25.5	66.9	20.1	1	2.6	9.3	35.5	26.4	92.7	80.0	2	17.1
17	41.4	25.6	45.1	19.6	-	-	9.7	35.2	26.9	88.6	76.4	-	-
18	40.2	23.9	62.9	29.0	3	92.6	9.2	35.7	26.0	90.0	75.0	1	21.3
19	35.9	22.1	79.1	36.1	2	47.2	8.5						
20	36.5	24.8	72.0	43.0	-	1.2	6.3						
21	39.4	25.7	69.3	32.1	1	14.4	9.4						
Mean/ Total	**33.9**	**18.9**	**78.4**	**35.3**	**11.0**	**216.1**	**8.2**	**32.9**	**24.1**	**92.0**	**76.3**	**55.0**	**1122.4**

Table M 12: Meteorological data in South Zone during crop growth period of Rabi 2015-16

Std. Week No.	COIMBATORE					MANDYA						
	Temperature (C)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.				Max.	Min.	RH1	RH2			
40	-	-	-	-	-	29.3	20.9	91.0	60.0	1.0	21.0	2.1
41	-	-	-	-	-	29.2	18.8	91.0	57.0	-	-	6.2
42	-	-	-	-	-	29.6	18.6	91.0	59.0	-	-	7.3
43	-	-	-	-	-	29.8	19.4	90.0	63.0	1.0	22.0	5.2
44	-	-	-	-	-	29.3	18.6	88.0	58.0	5.0	108.2	2.3
45	28.4	22.4	4	51.1	5.2	29.6	14.9	91.0	57.0	2.0	37.4	0.8
46	27.6	21.8	2	12.6	3.8	29.7	14.9	91.0	59.0	1.0	7.0	0.0
47	28.2	22.9	2	19.6	3.1	28.9	14.7	91.0	59.0	1.0	16.8	1.6
48	29.2	20.4	1	9.8	6.4	29.5	15.7	89.0	61.0	2.0	6.6	3.8
49	27.3	22.3	2	23.3	2.1	29.6	15.9	86.0	64.0	1.0	3.8	4.3
50	29.3	23.2	-	0.4	3.3	28.8	15.6	90.0	65.0	-	-	4.1
51	29.5	20.8	-	-	8.1	28.6	15.1	90.0	68.0	-	-	5.3
52	30.1	19.9	-	-	8.3	28.6	12.8	90.0	66.6	-	-	5.7
01	29.9	16.7	-	-	9.3	29.9	9.6	71.0	30.0	-	-	3.4
02	29.3	18.6	-	-	6.7	29.5	11.0	75.0	33.0	-	-	6.6
03	30.1	20.6	-	-	6.2	30.3	12.9	85.0	41.0	-	-	5.7
04	30.3	22.4	-	0.2	4.4	30.3	16.1	83.0	60.0	-	-	6.7
05	32.6	18.1	-	-	8.0	29.7	14.8	92.0	63.0	-	-	7.7
06	32.5	21.1	-	-	7.8	30.4	13.8	89.0	60.0	-	-	7.2
07	33.5	21.8	-	-	8.9	30.7	15.3	91.0	63.0	-	-	7.4
08	34.7	22.8	-	-	9.3	34.3	17.1	77.7	71.0	-	-	6.9
09	33.4	23.3	-	-	8.5	34.4	14.8	82.0	69.0	-	-	8.1
10	34.7	23.3	-	-	8.6	35.1	14.7	80.0	77.0	-	-	4.8
11	36.4	24.6	-	-	8.7	35.9	14.8	72.0	58.0	-	-	3.3
12	37.2	24.5	-	-	8.8	36.7	15.4	86.0	60.0	-	-	6.1
13	36.2	24.4	-	-	9.4	36.4	15.6	79.0	65.0	-	-	6.4
14	37.1	24.8	-	-	9.5	36.6	16.2	77.7	67.0	-	-	6.4
15	36.8	25.7	-	4.2	7.4	36.8	17.4	86.0	68.0	-	-	6.4
16	37.4	25.8	1	-	8.2	37.1	16.0	84.0	64.0	-	-	6.6
17	37.7	25.7	-	-	9.9	37.4	16.0	87.0	66.0	-	-	6.6
18	37.8	25.5	-	-	9.2	37.9	15.8	85.0	63.0	-	-	6.6
19	35.5	24.4	3	46.3	7.8	37.3	16.6	83.0	64.0	1.0	20.0	6.3
20	32.1	24.6	2	15.1	6.7	37.1	16.1	83.0	67.0	-		6.1
21	35.1	24.7	-	-	8.9	36.0	15.0	80.0	71.0	-		5.0
Mean/ Total	**32.8**	**22.7**	**17.0**	**182.6**	**7.3**	**32.4**	**15.6**	**85.2**	**61.1**	**15.0**	**242.8**	**5.3**

Table M 13: Meteorological data in South Zone during crop growth period of Rabi 2015-16

Std. Week No.	DHARWAD					
	Temperature (C)		Humidity (%)		Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2		
40	29.7	20.5	95.0	68.0	4	165.8
41	30.2	20.5	89.0	56.0	2	11.6
42	32.4	19.3	71.0	35.0	-	-
43	32.2	17.9	61.0	32.0	-	-
44	30.9	19.6	90.0	65.0	3	7.6
45	30.8	18.3	81.0	48.0	-	-
46	30.3	16.7	83.0	50.0	-	-
47	28.6	19.6	83.0	68.0	2	23.4
48	30.6	16.8	85.0	46.0	-	-
49	29.4	14.6	79.0	39.0	-	-
50	31.7	18.1	82.0	40.0	-	-
51	31.5	17.0	82.0	38.0	-	-
52	30.0	12.5	60.0	23.0	-	-
01	30.3	13.6	52.0	23.0	-	-
02	29.7	12.0	49.0	21.0	-	-
03	28.2	14.5	72.0	41.0	-	-
04	30.7	16.0	63.0	36.0	-	-
05	33.7	14.8	44.0	20.0	-	-
06	32.6	17.0	75.0	34.0	-	-
07	32.0	17.0	60.0	35.0	-	-
08	35.0	20.3	57.0	32.0	-	-
09	34.5	20.2	58.0	27.0	-	-
10	35.7	20.4	51.0	24.0	-	-
11	34.9	19.3	53.0	24.0	-	-
12	38.0	21.4	42.0	20.0	-	-
13	36.7	21.1	76.0	44.0	-	-
14	-	-	-	-	-	-
15	-	-	-	-	-	-
16	-	-	-	-	-	-
17	-	-	-	-	-	-
18	-	-	-	-	-	-
19	-	-	-	-	-	-
20	-	-	-	-	-	-
21	-	-	-	-	-	-
Mean/ Total	**11**	**208.4**	**11**	**208.4**	**11**	**208.4**

APPENDIX-IV: FORAGE CROPS BREEDING TRIALS AT A GLANCE: (RABI-2015-16)

Zone	Location	Tr .-1 IVTB	Tr.-2 AVTB-1	Tr. -3 IVTO (SC)	Tr. -4 AVTO (SC-1)	Tr.-5 AVTO (SC-2)	Tr. -6 AVTO (SC-2) (Seed)	Tr. -7 AVTO(SC-2) Rept. 13-14(Final)	Tr. -8 AVTO(SC-2) Rep. 14-15(F)	Tr. -9 IVTO (MC)	Tr. -10 AVTO-1 (MC)	Tr. -11 AVTO-2 (MC)	Tr. -12 AVTO-2 (Seed) (MC)	Tr. -13 AVTO-2 (MC) Rep. 14-15 (Final)	Tr. -14 IVTO (Dual)	Tr. -15 VT Lucerne (P)- 2013 3rd Year	Total
1 (HZ)	Palampur	DR		DR	DR				DR	DR	DR	DR	DR		DR		9/9
2	Srinagar	DR		DR	DR				DR	DR	DR	DR	DR		DR		9/9
3	Almora			DR	DR					DR	DR	DR					5/5
4	Mukteshwar			DNR						DNR	DNR						0/3
5 (NWZ)	Bikaner		DR	DR	DR	DR									DR	DR	6/6
6	Jalore		DR	DR	DR	DR				DNR		DNR			DNR		4/7
7	Hisar	DR	DR	DR	DR	DR	DR		DR	DR		DR	DR		DR	DR	12/12
8	Ludhiana	DR	DR	DR	DR	DR	DR	DR	DR	DR		DR	DR		DR	DNR	12/13
9	Pantnagar	DR		DR	DR	DR	DR	DR		DR			DNR		DR		8/9
10	Udaipur	DR	DR		DR	DR				DR		DR			DR		7/7
11	Meerut	DR	DR	DR													3/3
12	Dhari			DR													1/1
13 (CZ)	Jhansi	DR	DR	DR	DR	DR	DR			DR		DR	DR		DR		10/10
14	Rahuri	DR	DR	DR	DR	DR	DR		DR	DR		DR	DR	DR	DR	DR	13/13
15	Urulikanchan	DR	DR	DR	DR	DR				DR		DR	DR		DR	DR	10/10
16	Karjat	DNR	DNR	DNR													0/3
17	Kanpur	DNR	DNR	DNR	DNR	DNR											0/5
18	Anand			DR	DR	DR				DR		DR	DR	DR	DR	DNR	8/9
19	Jabalpur	DR	DR	DR	DR	DR	DR		DR	DR		DR	DR		DR		11/11
20	Raipur	DR	DR	DR	DR	DR									DR		6/6
21	Palgarh			DR	DR	DR											3/3
22 (NEZ)	Jorhat			DR		DR	DR			DR		DR	DR		DR		7/7
23	Kalyani	DR		DR		DR			DR								4/4
24	Bhubaneswar	DR		DR		DR			DR	DR		DR	DR		DR		8/8
25	Ranchi	DR		DR		DR	DR			DR		DR	DR		DR		8/8
26	Pusa	DR		DR		DR				DR		DR					5/5
27	Faizabad	DR		DR		DR				DR		DR			DR		6/6
28	CAU Imphal			DR		DR				DR		DR					4/4
29 (SZ)	Hyderabad			DR		DR	DR		DR							DR	5/5
30	Mandya			DR		DR	DR		DR								4/4
31	Coimbatore			DR		DR										DR	3/3
32	Karaikal			DNR													0/1
33	Mattupetty			DR													1/1
34	Raichur			DNR													0/1
Total Location		**17/19**	**11/13**	**28/33**	**16/17**	**23/24**	**10/10**	**2/2**	**10/10**	**18/20**	**3/4**	**17/18**	**12/13**	**2/2**	**17/18**	**6/8**	**192/211**

DR=Data Reported**, DNR=**Data not reported**, Data Report (%) =90.99**

APPENDIX-V: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (RABI-2015-16)

Location	CS-13-AST-1	PS-13-AST-2	CS-13-AST-2	CS-13-AST-3	K-14-AST-3	R-15-AST-1	K-15-AST-2 L	R-13-AST-1	CS-14-AST-1	PS-14-AST-2	CS-14-AST-2	PS-14-AST-4	R-14-AST-1	R-14-AST-2	R-14-AST-3	R-15-AST-2	R-15-AST-2(A)	R-15 AST-3	R-15-AST-4	R-15-AST-5	R-15-AST-7	R-14-AST-4	R-14-AST-10	K-15-AST-12	Total allotted	Total DR &TC/ allotted
Hill Zone																										
Palampur												TC	DR									DR	DR	TC	5	5/5
Srinagar								*				TC	*									*	*	TC	2	2/2
North West Zone																										
Hisar																						DR	DR		2	2/2
Pantnagar																						DR			1	1/1
Bikaner	DR	DR																	DR						3	3/3
Ludhiana																						DR	DR		2	2/2
Karnal																					DR				1	1/1
Faizabad																		DR							1	1/1
Ranchi			DR		DR	DR																	DR		4	4/4
Kalyani						DR																DR			2	2/2
Bhubaneswar			DR			DR																			2	2/2
Jorhat				DR												DR						DR			3	3/3
Imphal														DR			DR								2	2/2
Pusa																						DR	DR		2	2/2
Sri Niketan																				DR					1	8/1
Central Zone																										
Jabalpur			DR																			DR	DR		3	3/3
Rahuri	DR																					DR	DR		3	3/3
Urulikanchan	DR																								1	1/1
Anand	DR																					DR	DR		3	3/3
Raipur		DR		DR	DR				DR		DR														5	5/5
South Zone																										
Hyderabad																						DR			1	1/1
Mandya																						DR			1	1/1
Vellayani										DR					DR										2	2/2
Dharwad		DR					DR																		2	2/2
Total (DR & TC)	4	3	3	2	2	3	1	*	1	1	1	2	1	1	1	1	1	1	1	1	1	12	8	2	54	54/54

Trial conducted but data could not be received due to disturbance

DR- Data reported; **TC**- Trial conducted; Success (%) of data reporting/trial conducted ï 54/54= 100%

APPENDIX –VI: FORAGE CROP PROTECTION TRIALS AT A GLANCE (RABI- 2015-16)

Locations/Trials	PPT-1	PPT-2A	PPT-17A	PPT-19	PPT-20	PPT-21	PPT-22	PPT-23	PPT-24	PPT-25
Palampur (HZ)	DR	DR	DR	-	DR	-	-	-	DR	-
Ludhiana (NWZ)	DR	DR	-	DR	-	DR	-	-	-	-
Bhubaneswar (NEZ)	DR	DR	-	-	-	-	-	-	-	-
Jhansi (CZ)	DNR	DNR	-	-	-	DNR	-	-	-	DNR
Rahuri (CZ)	DR	DR	-	-	-	-	DR	DR	-	DR
Hyderabad (SZ)	DR	DR	-	-	-	-	DR	DR	-	DR
Total	5/6	5/6	1/1	1/1	1/1	1/2	2/2	2/2	1/1	2/3

Abbreviations: DR = Data Reported; **DNR** =Data not reported; **Data Reporting (%)** = 87.5

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