

## **Foreword**

The country inhabits 15 per cent of world livestock population on 2 per cent geographical area, which itself is an indicative of the extent of livestock pressure on our resources in comparison to other countries. Due to competing land use, area under cultivated fodder is static for last two decades at around 8.4 m ha. This sector with its burden of limitation can hardly compete with other sectors of agriculture. Hence, only option available is to catalyze horizontal increase in underutilized areas and vertical increase in the forage productivity to meet out the ever increasing demand of the fodder for economic livestock production. At present the productivity of cultivated fodder crops is low, due to least attention and allocation of minimal production resources on one hand and non availability of the production techniques to stakeholders involved in the forage resource development. This needs to be tackled by educating the farmers about the production packages of fodder crops like selection of appropriate forage species, varieties and management techniques to sustain forage yields and soil fertility.

The country has varied agro climatic conditions as well as farming situation. In these circumstances, the objective of improving the suitable varieties and forage productivity is complicated. Each crop has to be dealt with concise manner to accommodate the information on sowing technique, varieties, nutrient management, water management, plant protection, quality attributes and harvesting. AICRP on Forage Crops & Utilization is pursuing successfully the mandate for development of varieties, technique for raising cultivated forage crops and grasses of annual and perennial nature and eco-friendly plant protection technologies.

I would like to sincerely acknowledge Project coordinator and other scientists of PC (FC&U) unit who have contributed in the preparation of the Annual Report *Rabi-2014-15* and helped in achieving the set targets. This Annual Report is a brief compilation of outcome of activities carried out by different centers and result of various trials during the year 2014-15.

**(P. K. Ghosh)**  
**Director**  
**ICAR-Indian Grassland & Fodder Research Institute,**  
**Jhansi-284 003 (UP)**

## PREFACE

Annual Report (2014-15), Part II-Rabi 2014-15, embodies the results of various research trials conducted to evaluate the new breeding lines and develop technologies for augmenting 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 test of newly developed genetic material for single and dual-purpose forage species of annuals and perennials are compiled in Crop Improvement chapter. The findings on improving the forage productivity of crops and cropping system through stubble management, weed management, INM, thiourea and micronutrient application are presented in Crop Production chapter. The chapter also encompasses the results of the studies on yield maximization by determining the various niches and suitably applying the agronomic principles and agronomical trials of AVT entries. 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.

The cooperation of my colleagues at Project Coordinating unit, Dr AK Mall, (SS & PI, Plant Breeding), Dr RK Agrawal (PS & PI, Agronomy), Dr P Saxena (PS & PI, Crop Protection) and Technical Officers, Shri ON Arya and Shri HK Agrawal, in coordinating, conducting field trials, analysis and synthesis of data of trials conducted at all the locations are appreciated. The efforts of Shri Dayal in photocopying and organizing this report are sincerely acknowledged.

The administrative support and cooperation received from Dr PK Ghosh, Director, and other colleagues at IGFR is thankfully acknowledged.

Meeting all the targeted activities would not have been possible but for the active leadership support, guidance and encouragement received from Dr. S Ayyappan, Secretary DARE & DG ICAR; Dr JS Sandhu, DDG (CS) and Dr IS Solanki, ADG (FFC). Each and every one in the team at AICRP on Forage Crops & Utilization gratefully acknowledges their guidance and support.

Dated: September, 2015  
Place: Jhansi

A K Roy  
Project Coordinator

## EXECUTIVE SUMMARY

The present report contains results of the coordinated trials conducted on Crop Improvement, Crop Production, Crop Protection as well as the Breeder Seed Production of forage crops during *Rabi* 2014-15 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. Weather data are also reported to correlate the growth and yield of forage crops with weather parameters at different sites during crop period. The report also includes various other activities carried out by the AICRP-FC&U centres for enhancing the forage resources including research, teaching and extension.

### A. FORAGE CROP IMPROVEMENT

In *Rabi* 2014-15, fifteen breeding trials of three annuals and one annual & perennial forage species comprising test entries along with their respective checks were conducted at 32 locations placed in five zones. The forage species evaluated were Berseem, Oat (single cut, multi cut and dual purpose) and Lathyrus in annuals and Lucerne in perennial. In annuals, there were two trials in Berseem, five trials in Oat (single cut, multi cut and dual), and one in Lathyrus. In perennial Lucerne trial one is in second year of evaluation. These forage trials on annuals were classified into three groups *viz.*, Initial Varietal Trial (IVT), Advanced Varietal Trial Stage-1 (AVT-1) and Advanced Varietal Trial Stage-2 (AVT-2) whereas in perennials, same trial is being evaluated for three consecutive years. The summarized results of different forage evaluation trials are as below:

#### BERSEEM

**An IVT in Berseem** comprising of five entries along with two national checks and three zonal checks was conducted at 19 centres located in four different zones of the country. For green forage yield (q/ha), PC-75 and JB-4-21 in North West zone and JB-04-23, JB-4-21 and PC-75 in Central zone registered their superiority over best check. At national level, JB-04-23, JB-4-21 and PC-75 recorded superiority for green forage yield. For dry matter yield (q/ha), PC-75, JB-4-21 and JB-04-23 in North West and Central zone as well as at national level exhibited superiority over check. In quality parameters, entry JB-04-23 for crude protein yield and entry HFB-63 for crude protein content ranked first.

**An AVT-2 in Berseem** (single cut) trial comprising of four entries along with two national checks and one zonal check was conducted at eight centres located in two zones (Central and North West). For green forage and dry matter yield, all the test entries in North West zone, Central zone and at national level registered superiority over zonal/ national checks. In quality parameters, entry JBSC-4 for crude protein yield and crude protein content ranked first.

**AVTB-2 Seed** (single cut) **in Berseem trial** with four entries along with two national checks and one zonal check conducted at six locations revealed that entries JBSC-2, JBSC-4 and JBSC-3 in North West zone and all the entries in Central zone as well as at national level registered superiority over the national checks.

#### OAT

**In IVT Oat (Single cut)**, nine entries along with two national checks and five zonal checks for respective zones were evaluated at 28 locations across the five zones.

For green forage yield (q/ha), entries UPO-10-3, OS-424, SKO-228 in Hill zone; entries UPO-10-3, OL-1802-1, OS-424, OL-1769-1, JO-04-19, OL-1766-1 in North West zone; OL-1802-1 and OL-1766-1 in North East zone; OL-1802-1, OL-1766-1, OS-424, SKO-225, OL-1769-1 and JO-04-19 in Central zone; entries OS-432 in South zone exhibited superiority over best check. At national level, entry OL-1802-1 with 12.6 per cent superiority

was best performer. For quality parameters, entries OS-424 for crude protein yield and SKO-228 for crude protein content were superior.

**In AVT-1 Oat (SC)**, eleven entries along with two national checks and zonal checks were evaluated at 24 locations in four different zones. For green forage yield, entries RO-11-1, OS-406, OL-1804 in North West zone; entries OL-1804, RO-11-1, JO-04-18 in North-East zone; entries RO-11-1, RSO-8, SKO-199, SKO-198 in Central zone; entries RSO-8, OS-406, RO-11-1 and OL-1804 in South zone exhibited superiority over best check. At national level, all the test entries recorded their superiority over best national check except entries JHO-13-5 and OL-1689.

**In AVT-2 Oat (SC)**, nine entries were evaluated against two national checks and five respective zonal checks at 26 locations in five different zones. For green forage yield, entries OL-1760, OS-405, SKO-190, RSO-60, JO-04-14 and RSO-59 in North-West zone; entries JO-04-14 in North-East zone and entries UPO-12-1, OL-1760, OS-405, JO-04-14 in Central zone and UPO-12-1, JHO-2012-2, OL-1760, OS-405, JO-04-14 in South zone exhibited superiority over best check. At national level, all the test entries recorded superiority over best national check except JHO-2012-1 and RSO-59.

**In AVT-2 Oat (SC) seed**, nine entries along with two national checks were evaluated at five zones. For seed yield (q/ha), entries JO-04-14 and JHO-2012-2 in Hill zone and entries SKO-190 and JHO-2012-2 in North East zone were superior. At national level, entry JHO-2012-2 showed superiority over the national checks.

**In IVT Oat (Multi cut)**, nine entries along with three national checks were evaluated at 18 centres located in four zones of the country. For green forage yield, entries OS-414, OL-1845, JO-04-319 and RSO-9 in Hill zone and entry PLP-18 in North East zone exhibited superiority over best check. At national level, entries RSO-9 and RSO-68 performed better than checks.

**In Oat AVT-1 (MC)**, five entries were evaluated against three national checks at 18 locations in four zones of the country. For green forage yield (q/ha), entries JO-4-317 and OL-1802 in Hill zone and entry OL-1802 in Central zone performed better than best check. At national level, entry OL-1802 recorded superiority over best national check.

**In AVTO-2 (MC)**, three entries were evaluated against three national checks. None of the entries was found superior than the checks for green forage (q/ha) as well as dry matter yield except JO-04-315 for GFY.

**In AVTO-2 (MC) (Seed)**, three entries along with three national checks were evaluated at five locations across the country. For seed yield (q/ha), entry HFO-488 was found superior over national checks. At national level, seed yield of HFO-488 was 24.5 q/ha followed by check Kent (22.7 q/ha).

### **Oat (dual purpose)**

**In IVT Oat (Dual)**, five entries along with three national checks were evaluated at 18 centres located at four zones of the country. For green forage yield (q/ha), entry RSO-15 in North West zone; entries OS-409, JO-09-508, OL-10 and RSO-15 in North East zone registered their superiority over best check. The entry OS-409 was recorded superior at national level. For seed yield (q/ha), the national check JHO-822 recorded 24.83 q/ha seed yield at national level.

### **LATHYRUS**

**In IVT Lathyrus**, four entries namely BK-20-5, JLSJ-09-3, JCL-7 and BK-5 along with three national checks were evaluated at nine centres in North-East and Central zone. For green forage and dry matter yield, national check Nirmal was superior at national level. For fodder production potential (q/ha/day), check Nirmal for green forage and entry BK-5 for dry matter production potential were best performers.

### **LUCERNE (ANNUAL)**

**In IVT Lucerne (Annual)**, five entries along with two national checks were evaluated at ten locations in three zones of the country. Entry Anand-26 for dry matter yield was superior over national checks. For fodder production potential, check Anand-2 established superiority both for green forage and dry matter production potential.

### **LUCERNE (PERENNIAL)**

**Varietal trial on Lucerne (Perennial)-2013** comprising of seven entries viz. ALP-1-1, TNLC-14, Anand-25, Anand-26 and RL-10-2 along with two national checks was established during *Rabi*-2013 at nine centres of the North-West, Central and South zone but this year data has been received from eight centres. For green forage and dry matter yield, VTL-2-1 ranked first at national level. For quality parameters, VTL-2-1 for crude protein yield and VTL-2-2 for crude protein content were superior.

## **B. FORAGE CROP PRODUCTION**

The forage crop production programme was executed at 23 locations in five zones of the country. In total 25 experiments were conducted, out of which 14 were in network (11 coordinated and 3 AVT based) and 8 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.

### **CS-12-AST-1: Effect of stubble management and INM on forage productivity in Rice – Oat cropping system.**

The experiment was conducted at two locations with a view to increase forage productivity in rice fallow system through integrated management and saving time during turn around period through rice stubble management. Maximum yield (48.6 q grain, 56.0 q straw and 693.1 q GFEY/ha) at Bhubaneswar were recorded with conventional tillage. At Jorhat also, highest green forage yield (269.6q/ha) and dry matter yield (59.3 q/ha) were recorded in conventional tillage. In both the locations, the highest GFEY, (758 q/ha) net monetary return (Rs. 69772/ha) and crude protein yield (5.4 q/ha) was with application of 25% N through FYM + 50 % NPK of RDF + Biofertilizer (*Azotobacter* + PSB) + GM.

### **R-12-AST-1: Performance of dual purpose forage crops under different cutting management system**

The experiment was executed to study the effect of cutting management on forage and grain potential of forage crops at thirteen locations in Hill, North West, North East and Central zones. Twelve treatment combinations consisting of three forage crops viz., oat, barley and wheat and four cutting management practices were taken. In Hill zone (Palampur, Almora and Srinagar), oat recorded maximum height at all centres and produced significantly higher GFY (138.1 q/ha), which was 95.3% and 133.3% more than barley and wheat. Maximum green and dry biomass yield of the crops was recorded at Srinagar. At Palampur, oat resulted in significantly higher oat green forage equivalent yield (531.6 q/ha), which was at par with wheat (530.7). Wheat and oat crop also demonstrated higher net return (Rs. 60309 and 59247/ha) and B:C ratio (3.1 and 2.9). Harvesting for fodder at 90 DAS produced 135.1q/ha GFY, which reflected in increase of 45.0 and 61.7% in comparison to cutting at 80 and 70 DAS. In North West zone (Ludhiana, Hisar and Bikaner), oat produced highest GFY and DMY (191.6 & 34.0 q/ha) over barley (146.4 & 30.9 q/ha) and wheat (94.1 & 17.6 q/ha). Contrary to GFY, wheat crop recorded highest grain yield (54.8 q/ha) on mean basis. Oat crop proved superior in terms of net monetary return (Rs 53302/ha) and benefit cost ratio at Bikaner. In North East Zone (Jorhat and Bhubaneswar), oat crop produced higher GFY (187.6 q/ha), DMY (40.4 q/ha), grain (16.6 q/ha), green fodder equivalent yield (579.8 q/ha) as well as net monetary return (Rs. 45749/ha). In Central zone (Jabalpur, Anand, Urulikanchan and Raipur), oat crop recorded highest GFY (373.8 q/ha), DMY (65.1 q/ha) and CPY (5.6 q/ha), net monetary return (Rs 49674/ha) and benefit cost ratio (2.4).

In all zones, harvesting of crop(s) at 70 DAS for dual purpose produced proved better in terms of GFY and DMY over cutting at 50 or 60 DAS. But cutting of crop(s) for green fodder as well as grain at 50 DAS fetched highest net monetary return and B:C ratio.

### **R-12-AST-2: Effect of weed management on forage and seed yield of berseem (*Trifolium alexandrinum*)**

The field experiment was conducted at seven locations to assess the impact of weed management and effect of herbicides in controlling of weeds in berseem. In North West zone (Ludhiana and Pantnagar) imazethapyr @ 0.1 kg a.i./ha immediately after harvest of 1<sup>st</sup> and 2<sup>nd</sup> cut in berseem, recorded significantly higher GFY (618.4 q/ha), DMY (68.1 q/ha), seed yield (5.1 q/ha), stover yield (62.1 q/ha), net monetary return (Rs 146101/ha) and B:C ratio (4.9). In Central zone also (Raipur, Jabalpur, Rahuri and Urulikanchan), application of Imazethapyr @ 0.10 kg a. i./ha (immediately after harvest of 1<sup>st</sup> & 2<sup>nd</sup> cut) in berseem resulted in highest GFY (441.8 q/ha), DMY (59.6 q/ha), seed yield (3.20 q/ha), stover yield (33.7 q/ha) and net monetary return (Rs 94393/ha). Whereas, in North East zone (Ranchi), the application of pendimethalin @ 0.40 kg a.i. /ha recorded significantly highest GFY, (536.25 q/ha) over rest of the treatments. However, higher seed yield (1.5 q/ha), net monetary return (Rs 167767/ha) and benefit cost ratio (6.8) were obtained with Pendimethalin @ 0.3 kg a.i./ha.

### **R-12-AST-3: Effect of integrated nutrient management on yield and quality of oat**

The experiment was conducted at Kalyani and Imphal to assess the effect of nitrogen and FYM level with 10 combinations of INM. The maximum plant height was recorded with T6- N@100 kg/ha+FYM @7.5 t/ha (152.1 cm). Among the two centres, higher green, dry matter and crude protein yield were noticed at Imphal. On locational mean basis, application of N@120 kg/ha+FYM@7.5 t/ha recorded highest green fodder yield (435.3 q/ha).

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

The experiment was conducted at four locations (Anand, Rahuri, Urulikanchan and Bikaner) to find out suitable models for year round green fodder production. On location mean basis, planting of Bajra x napier hybrid + (cowpea - berseem- cowpea) recorded highest GFY, DMY and CPY (975.61 q, 201.55 q & 22.02.16 q/ha, respectively). However, planting of BxN hybrid + lucerne system fetched highest net monetary returns (Rs 82308/ha/yr) and B: C ratio (2.66).

### **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 coordinated trial was conducted at Bikaner, Raipur and Dharwad centres to assess the effect of three planting geometry and four cutting intervals on growth, yield and quality of perennial sorghum under irrigated condition. Planting of perennial fodder sorghum at 60 cm row recorded higher plant height (155.08 cm) and number of tillers/m row (70.12). The green and dry fodder yield was highest with 45 cm row spacing (1374.85, 331.07 q/ha, respectively). The cutting interval of 60 days recorded higher green fodder, dry matter and crude protein yield. Among the locations, higher values of green fodder, dry matter and CP yields were recorded at Dharwad.

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

A field experiment was conducted at three locations (Ranchi, Jabalpur and Bhubaneswar) to evaluate oat, berseem and lathyrus crops under four rice fallow systems. The result indicated a narrow variation in the yields recorded under different methods of sowing. 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 (Rs. 131276, 53156/ha and 2.56, respectively). Among fodder crops, growing of berseem recorded highest GFY and CP yields (447.18 and 11.94 q/ha, respectively)

### **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 experiment was initiated to increase the availability of legume forage through utilization of rice fallow system at Jorhat and Raipur. The treatments consisted of four grasspea varieties and four sowing methods. The results indicated that Prateek variety recorded highest plant height, GFY and DMY (69.71 cm, 99.10 and 19.69 q/ha, respectively), which was 03.1 and 10.2% more GFY over Nirmal and Mahateora, respectively. Sowing as per recommended practices with 150% more seed rate (planting 20 x 10) produced highest GFY (107.87 q/ha), DMY (21.47 q/ha) and net return (Rs. 21504/ha).

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

The experiment was conducted under coordinated mode at Srinagar and Palampur centres to study the production potential and feasibility of rye grass with berseem in hill zone. The results revealed that the performance of the treatment was better at Palampur than Srinagar. Among the thirteen crops - seed rate combinations, ATMA Ryegrass: berseem (100:0) produced maximum green fodder, gross and net returns/ha (514.5 q, Rs. 130158 and Rs. 84757/ha, respectively). It was also observed that both crude protein content and crude protein yield showed increasing trend with increasing berseem ratios.

#### **PS-12-AST-2: Performance of Bajra Napier hybrid grass as influenced by micro-nutrients under irrigated conditions**

The experiment was at Coimbatore with a view to study the effect of conjoint application of organic manure, inorganic fertilizers and micronutrients on forage yield and economics of BN hybrid grass. The results revealed that among nine treatment combinations, application of NPK + FeSO<sub>4</sub> @ 50 kg/ha + ZnSO<sub>4</sub>@ 25 kg/ha to Bajra Napier hybrid recorded significantly highest GFY (3695 q/ha), DMY (735 q/ha), CPY (81.6 q/ha), crude protein content (11%), net monetary returns (Rs. 422656/ ha/yr) and benefit cost ratio (4.21).

#### **R-12-AST-4: Effect of sowing time and Zn & thiourea spray on seed yield of dual purpose oat**

The experiment was conducted at Bikaner to observe the effect of sowing time, Zn and thiourea application on productivity of dual purpose oats on sandy soil. The trial comprised of combinations of three sowing and five treatments of Zn & Thiourea application schedule. Data reveals that, timely sown oat (15<sup>th</sup> November) recorded significantly higher plant height by 10.3 & 11.17%, GFY by 46.8 & 10.4%, DMY by 42.2& 62.2%, grain yield by 22.6 & 8.4%, straw yield by 17.8 & 44.7%, net returns by Rs.22807 & Rs.27858 per hectare, and B:C ratio by 40.4 & 54.1%, as compared to early and late sowing, respectively. Further, the basal application of ZnSO<sub>4</sub> @25 kg/ha at sowing recorded the maximum plant height (62.9 cm) and grain yield (19.8 q/ha)

#### **R-13-AST-1: Yield potential of cereals with forage legumes under pure stand and mixtures**

The experiment was conducted at Srinagar to evaluate fodder yield potential and quality of cereals and legumes in mono as well as in mixed cropping system. In pure stand, cereal crops produced maximum fresh and dry biomass than sole legumes and the highest green fodder yield (359.20 q/ha) was attained by oat, whereas, in mixtures, intercropping with vetch gave higher fresh biomass than field pea.

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

The perennial grasses based experiment was initiated at Raipur with the objective to identify appropriate cropping system for maximum fodder production, nutrient use and water use efficiency. The results indicated that, BN hybrid + Berseem system recorded significantly higher green fodder, dry matter, net monetary return and B:C ratio (692.9, 148.9 q, Rs. 14647/ha and 0.73, respectively).

#### **PS-14-AST-2- Impact of Mg and B on nutrient uptake, quality and yield of Bajra x Napier hybrid**

The experiment was initiated at Vellayani with the objective to assess the influence of Mg and B nutrition on the performance of Bajra x Napier hybrid under open or shade conditions. Shade levels and nutrient levels had significant effect on GFY of BxN grass during first, fourth and fifth harvests. System in open situation + POP + MgSO<sub>4</sub> 80 kg/ha + Borax 10 kg/ha recorded highest DMY during second and third harvests and was at par with open situation + POP alone during second harvest.

#### **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, nutrient use and water use efficiency. The results indicated that among nine cropping systems, Maize + rice bean (2:1) - oat (multi cut) - sorghum (multi cut) + cowpea (2:1) recorded maximum GFY, DMY and net return/ha (1095 q, 242.62 q and Rs. 9769/ ha, respectively).

**R-14-AST-2: Effect of Integrated Nutrient Management on yield and quality of oat**

This experiment was carried out to evaluate oat for grain, fodder and both grain and fodder under three cutting management practices and four nutrients levels. The three cut at 60, 90 & 120 DAS was found best for green fodder (509.99 q/ha) and dry matter productivity (58.70 q/ha).

But dual purpose *i.e.*, single cut + seed was found best in terms of quality and economics. The combined effect of three cuts with 50% RDF + 7.5 t FYM/ha and no cut (seed) + 50% RDF + 7.5 t FYM / ha showed superiority over other treatment combinations in terms of GFY (551.00 q/ha) and seed yield (22.38 q/ha) respectively,

**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 in *Rabi* 2015. The result indicated that guinea grass contained higher dry matter than NB hybrid. The guinea grass with addition of 2 percent urea (silage additive) recorded higher dry matter content. The silage from all treatment was palatable and similar in colour.

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

In Hill zone (Palampur and Srinagar), oat (Single cut), nine entries along with two national checks and five zonal checks were evaluated in initial varietal trial at 12 locations across the five zones in the country. For green forage and crude protein yield, entry RSO-59 proved best and was at par with OL-1760 and SKO-90 (HZ); whereas, entry SKO-190 exhibited highest dry matter productivity (66.1 q/ha). In North West zone (Ludhiana, Hisar and Pantnagar), for green forage and dry matter, entry OS-405 (521.7 and 79.8 q/ha, respectively) proved significantly superior to other entries. Entry SKO-190 demonstrated highest crude protein yield.

In North East zone (Jorhat, Ranchi and Kalyani), for green forage, entry JHO-2012-2 (384.6 q/ha) was significantly superior to other entries. Zonal check, JHO-99-2 (NEZ) recorded maximum dry matter.

In Central Zone (Jhansi and Jabalpur), for green forage and dry matter, entry OS-405 (362.2 and 76.6 q/ha, respectively) was significantly superior to other entries.

In South zone (Coimbatore), for green forage and dry matter, entry OL-1760 (338.3 and 74.3 q/ha, respectively) was significantly superior to other entries.

On all India mean basis, OL-125 produced higher GFY, whereas, JHO-99-2 ranked first in terms of dry matter productivity. 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 -5: Effect of N levels on forage yield of promising entries of oat (AVT-2 MC)**

An initial varietal trial in Oat (multicut) comprising of three entries (JO-04-315, HFO-488, PLP-14) along with three national checks (Kent, UPO-212 and RO-19) was conducted at five centers located in Central zone. For green forage, entry PLP-14 proved better and recorded maximum GFY (628.3q/ha) which was at par with HFO-488. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (643.2 q green and 79.7 q dry matter/ha) which was 32.5 and 12.8 % higher over 40 and 80kg N/ha respectively.

**R-14-AST-6: Effect of P levels on forage yield of promising entries of Berseem (AVT-SC)**

An initial varietal trial in Berseem comprising of four entries along with two national checks (Wardan and Mescavi) and one zonal check (BB-2) was conducted at six centers (Jhansi, Jabalpur, Raturi, Urulikanchan, Hisar and Ludhiana). All the testing entries surpassed the best checks at zonal as well as national level for GFY and DMY. Entry JBSC-4 recorded highest green, dry and crude protein yields over all other entries and checks. It was to the tune of 42.7% in NW zone, 31.35 in the central zone and 35.75% on national level over the best check. The application of graded level of phosphorus brought consistent improvement in GFY, DMY recording maximum with 100 kgP<sub>2</sub>O<sub>5</sub> kg/ha.

## C. FORAGE CROP PROTECTION

During the reporting period, eleven forage crop protection trials were conducted in three major forage crops *i.e.* berseem, lucerne and oats at seven centres *viz.* Bhubaneswar, Hyderabad, Jhansi, Ludhiana, Palampur and Rahuri and Dharwad. Major emphasis was on prevalence/ occurrence of diseases and pests in different *Rabi* crops under different agro-climatic conditions and strengthening of pest management technologies to minimise losses incurred by pest and diseases.

### OCCURRENCE OF INSECT PESTS AND DISEASES

**In berseem**, stem rot (*Sclerotinia trifoliorum*) and root rot (*Rhizoctonia solani*) were the major diseases. The stem rot started from first week of January up to first week of February. Disease development was favoured by low temperature (< 15°C) and high humidity (>85%). The root rot appeared in the last week of March and continued to increase (40%) up to last harvest. The intensities leaf spots varied from location to location.

Aphids, white fly (*Myzus persicae*), leaf defoliators and green semilooper (*Thysanoplusia orichalcea*) and army worm (*Helicoverpa armigera*) were the major pests of berseem. Aphids, white fly was noticed for the first time during the *Rabi* 14-15 at Rahuri centre. The population of green semilooper as well as gram caterpillar (*H. armigera*) started appearing on the berseem genotypes in the first week of April. The population of *T. orichalcea* was maximum in 3<sup>rd</sup> week of April and infestation reduced afterwards. The population of *H. armigera* continued on berseem crop till IV<sup>th</sup> week of May.

**In lucerne**, rust (*Uromyces striatus*), Leaf spots, pea aphid (*Acyrtosiphon pisum*), *Spodoptera litura*, weevil (*Hypera postica*), pod borers (*Helicoverpa armigera*), defoliating beetles, spotted alfalfa aphid, leaf miner, and leaf folder appeared major constraints. The population of pea aphid, *Spodoptera litura* was noticed on lucerne during 2<sup>nd</sup> week of December and increased up to 1<sup>st</sup> week of February. Thereafter, the decreasing trend of pea aphid population was noticed. The cowpea aphid (*Aphis craccivora*) build up started on lucerne during 2<sup>nd</sup> week of December and showed increasing trend up to 3<sup>rd</sup> week of January. The spotted aphid (*Therioaphis maculata*) is predominant species in Western Maharashtra; it started appearing on crop during 2<sup>nd</sup> week of January, 2015. This year population of *S. litura* was not observed on lucerne throughout the crop growth period at Rahuri.

**In Oat**, aphid (*Rhopalosiphum padi*) was noticed during 4<sup>th</sup> week of January. During the infestation, aphids, *Chrysopa*, grubs of predatory lady bird beetles and syrphid fly was observed on crop in the range of 0.67-1.67, 1.00-3.33 and 0.0-0.67 larvae per tiller, respectively. Leaf blight (*Helminthosporium avenae*), leaf spots and leaf defoliators were also recorded on oats. At Palampur oat crop was severely affected by powdery mildew (90% severity) followed by leaf blights (22%), loose smut (5%) and sucking pest (15%).

### SCREENING OF RABI BREEDING MATERIALS

#### Field screening

**Lucerne (Annual-2014) – IVT:** Presence of aphid population was observed in the range of 22.40-38.21 aphid/tiller with least population being in RL-88 and highest in Anand-26. At Ludhiana, AL-140004 showed moderately resistant reaction. At Jhansi, AL-140004 and AL-140003 showed moderately resistance reaction (< 10% incidence) to rust (*Uromyces* sp.).

**Oat:**

**Oats (Single cut):** In **IVT**, entries OS-424 and OL-1802-1 were resistant to leaf blight at Jhansi, whereas at Palampur only Kent showed resistant reactions to powdery mildew. At Ludhiana, all the entries showed susceptible to highly susceptible reactions. At Rahuri, entry OL-1766-1 showed least number of aphids (17.37 aphids/tiller), followed OL-1769-1 (19.87), OS-424 (20.10) and OS 432 (21.92), which were at par.

In **AVTO SC-1**, at Jhansi, SKO-196, SKO-199, RSO-8, OL-1804 and JHO-2000-4 showed resistant reaction to leaf blight disease. However, at Ludhiana, all the entries showed susceptible to highly susceptible reactions against leaf blight. At Palampur centre, none of the entries showed resistant reaction against powdery mildew. At Rahuri, entry RO-11-1 showed least aphid infestation (25.87aphids/tiller) followed by JO-04-18 (28.27), NDO-952 (29.80), JHO-822 (35.50), SKO-198 (35.60), JHO-99-2 (35.90), RSO-08 (37.13) and JHO-2000-4 (40.53). Highest infestation of aphids was noticed on variety Kent.

In **AVTO (SC-2)**, at Palampur centre, none of the entries showed resistant reaction against powdery mildew. At Jhansi, UPO-12-1 and RSO-60 showed resistant reaction. At Rahuri, entry RSO-60 recorded 12.93 aphids per tiller and it was significantly lower than the other entries, except 5 entries which were at par [OS-06 (14.20), OS -405 (14.50), JHO-212-1 (15.00), JHO-99-2 (19.13) and SKO-190 (19.77)]. At Ludhiana, all the entries showed susceptible to highly susceptible reactions.

In **AVTO (SC-2) seed**, at Palampur centre, none of the entries showed resistant reactions against powdery mildew. At Jhansi, all the entries showed resistant reaction. At Rahuri, entry UPO-12-1 (13.33) showed significantly lower number of aphids per tiller, this was at par with 4 entries [JO-04-14 (14.50), OS-6 (14.50), SKO-90 (15.10) and JHO-2012-1 (15.60)]. At Ludhiana, all the entries showed susceptible to highly susceptible reactions.

In **IVT Oat (dual)** trial, all the entries were resistant to moderately resistant to leaf blight at Jhansi. However, at Ludhiana and Palampur centres all the entries showed susceptible to highly susceptible reactions. At Rahuri, RSO-15 recorded least number of aphids per tiller (9.93 aphids/ tiller) followed by RO-19 (12.03), JO-09-508 (13.87) and UPO-212 (14.80). At Bhubaneswar, minimum leaf blight severity was observed in entry RO-19 (4.7% and 10.6 %) and maximum in entry RSO-15 (7.5% and 20.5%) in first and second cut respectively.

In **IVT oat (MC)**, all the entries showed resistant to moderately resistant to leaf blight disease at Jhansi. All the entries showed susceptible to highly susceptible reaction to leaf blight at Ludhiana and Palampur centre except RSO-68 & UPO-212. At Rahuri, entry OL-1845 showed significantly less number of aphids per tiller (10.93). However, entries RSO-69 (11.20), UPO-212 (11.70), PLP-18 (12.17), OL-10 (12.33), OS-414 (12.83) and RSO-9 (13.50) were found at par with it.

In **AVT -1 oat (MC)**, all the entries were highly susceptible to leaf blight at Ludhiana. At Jhansi, entries JHO-13-4 and Kent were resistant while at Palampur, none of the entries showed resistant reaction to Powdery mildew. At Bhubaneswar, Leaf blight severity was minimum in entry RO -19 (8.0 %) and maximum in entry RSO-60 (10.6 %). At Rahuri, entry OL-1802 recorded least (9.67) aphids per tiller followed by UPO-212 (11.80), RO-19 (11.83) and JO-4-317 (12.87).

In **AVTO-2 oat (MC)**, all the entries were found susceptible to highly susceptible to leaf blight and powdery mildew at Ludhiana and Palampur centre respectively. At Rahuri centre, entry PLP-14 recorded 8.78 aphids per tiller and it was significantly lower than the others, except JO-04-315 (9.28) RO-19 (11.38) and HFO-488 (11.83) which was at par. At Jhansi, all entries were found moderately resistant to leaf blight. At Bhubaneswar, minimum leaf blight severity was observed in PLP-14 (4.4 %) while it was highest in entry RO-19 (6.2 %).

**In AVT seed oat (MC)**, all the entries were found susceptible to highly susceptible to leaf blight at Ludhiana. At Rahuri, JO-04-315 recorded significantly lower number of aphids (10.78) per tiller and it was at par with PLP-14 (11.28), UPO-212 (11.88) and HFO-488 (13.45). At Jhansi, entries JO-04-315 and UPO-212 were found resistant while at Palampur, none of the entries showed resistant reaction to Powdery mildew.

#### **Screening under artificial epiphytotic conditions for resistance to root and stem rot in Berseem**

**In IVT Berseem**, entries were tested in the permanent stem rot and root rot sick plots. Single cut entries were susceptible to moderately resistant to root and stem rot diseases at Jhansi centre. Incidence of root rot of berseem was very low at Palampur. Warden showed least (2.78 aphids/tiller) number of aphids followed by Mescavi (3.00), BB-2 (3.78), JBSC-2 (4.33) and Warden (5.45). These entries were at par with each other at Rahuri. In Bhubaneswar, minimum root rot severity was observed in JB-4-21 (1.6 %) while maximum severity was recorded in entry HFB-63 (8.6 %).

**AVT-2 Berseem**, all the entries were resistant to moderately resistant to root rot and stem rot diseases at Jhansi. However at Ludhiana none of the entries showed resistant reaction. In berseem crop, for the first time aphid *Myzus persicae* was noticed on crop during *Rabi 14-15*. At Rahuri, Bundel Berseem-2 recorded significantly lower (3.78/tiller) number of aphids per tiller, which was at par with entries JBSC-1, Mescavi, Warden and JBSC-3.

**AVT-2 seed Berseem**, all the entries showed susceptibility to stem rot disease at Ludhiana. In Jhansi, test entries showed various degree of resistance to stem and root rot diseases. At Rahuri, entries JBSC-2, BB-2, Warden and Mescavi recorded 4.00, 4.11, 4.22 and 4.22 aphids per tiller. These entries were at par with each other.

#### **PEST & DISEASE MANAGEMENT**

**Integrated disease management of White Clover:** At Palampur, 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 (*Erysiphe trifolii*) severity (2.5%) and clover rot (*Sclerotinia trifoliorum*) (1.2%) with maximum seed yield (1.2 q/ha).

**Pathogenic variability of *Blumeria graminis* (Syn. *Erysiphe graminis*) f. sp. *avenae* on oat:** The reaction of two isolates of *B. graminis* was studied *in vitro* on ten differential set by detached leaf method. Virulence patterns of isolates were grouped into 6 different pathotypes.

**Evaluation of Entomopathogenic fungi on pests of lucerne:** Entomopathogenic fungi *viz.*, *Verticillium lecanii* @ 4x10<sup>6</sup> cfu/ml (2g/l) and *Metarhizium anisopliae* @ 4x10<sup>6</sup> cfu/ml (2g/l) and half dose of each these treatments were more effective in managing the insect pests of lucerne. Both the treatments were at par with each other. At Rahuri, *V. lecanii* and *M. anisopliae* alone and in combination showed excellent control of aphids. At Dharwad, the treatments with *V.lecanii* or *B.bassiana* combined with *M.anisopliae* or *N.rileyi* also controlled the aphids. It is opined that the mortality of aphids was purely due to *V. lecanii* or *B. bassiana* and not due to either *M. anisoplea* or *N. rileyii*.

**Management of soil borne diseases in clover seed crops:** Spray with carbendazim @ 1.0kg/ha gave maximum protection to stem rot (incidence 10.0 %) followed by spray with NSKE@ 5% before disease appearance and application of neem seed powder @ 50kg/ha, respectively in clover seed crop.

**Management of soil borne and powdery mildew diseases in Red Clover:** At Palampur, seed treatment with carbendazim (2 g/kg seed) followed by three foliar spray of hexaconazole (0.1 %) effectively managed powdery mildew (disease severity 2.6%) and seed treatment with carbendazim (2 g/kg seed) followed by one spray each of *Trichoderma*, wettable sulphur and hexaconazole provided best management of soil borne diseases (2.4%) in red clover.

#### **MANAGEMENT OF FOLIAR DISEASES OF OAT**

The trial comprised of 8 treatments. Disease was not so prone in all the treatments because of heavy rain in throughout the season. However, Minimum (11.33 %) blight incidence due to *Helminthosporium avenae* was observed in T7 (Seed treatment with *Trichoderma viride* + Foliar application of Propiconazole 25 EC after 21 DAS) as compared to untreated control (24.66%). Increase in both fodder and seed yield were also recorded in these treatments.

**Studies on biological management of *Spodoptera litura* in relation to time of application on lucerne under field conditions:** The experiment was conducted at Rahuri and Hyderabad centres but due to non observance of *Spodoptera litura* incidence in the trials, data could not be recorded.

**Biological control of *Helicoverpa armigera* on lucerne/berseem seed crop:** Two entomopathogenic fungi viz., *B. bassiana* and *N. releyi* and virus *Ha NPV* in alone or in combinations were evaluated for the control of *H. armigera* on lucerne seed crop. Among different treatments, combination of *B. bassiana* and *N. releyi* and *HaNPV* recorded significantly lower number of larvae per square meter at 5 (1.60 larvae) and 7 (0.00 larvae) days after application of treatment. The treatment was found safe to honey bees and gave maximum seed yield (1.87 q/ha) and ICBR (1:9.89). At Ludhiana, treatments T<sub>2</sub> (Foliar application of *N. releyi* @ 1x10<sup>8</sup> CFU/g (5 g/lit)) and T<sub>3</sub> (Foliar application of *HaNPV* @ 1ml/lit) recorded lower mean number of *H. armigera* larvae per m row length at 5 and 7 days after spray (DAS). However, treatment Indoxacarb 15.8 EC @ 500 ml/ha (standard check) recorded lowest mean number of *H. armigera* larvae per m row length. The number of honeybees per plot before as well as after 18h of treatment varied non-significantly in all the treatments. Among the biopesticides treatments, the treatment of *B. bassiana* @ 1X10<sup>8</sup> CFU/g (5 g/lit) + *N. releyi* @ 1X10<sup>8</sup> CFU/g (5 g/lit) + *HaNPV* @ 1ml/lit recorded the highest seed yield.

#### **D. BREEDER SEED PRODUCTION**

In Rabi 2014-15, the indent for Breeder Seed Production was received from DAC, GOI for 25 varieties in three forage crops viz., Oat, Berseem and Lucerne. The quantity allocated was 328.28 q and it was assigned to ten different producing centres. Among quantity indented, the maximum was for Oat (282.65 q) followed by Berseem (41.25 q) and Lucerne (4.4 q). The final BSP-IV received from different centres revealed that the overall production was less than the allocated quantity due to intermittent rain during flowering (IGFRI, Jhansi), at maturity (GBPUA&T, Pantnagar) and crop logged by heavy rain and high wind velocity. Coming to crop wise scenario, as compared to allocation in the Berseem, the production was 40.94 q (0.16 q deficits). In Oat, the production was 216.15 q against the allocation of 282.65 q. Similarly in Lucerne, there were 2.75 q deficits in production with respect to 4.4 q allocation. The overall breeder seed production was 69.54 q less as evident from seed production of 258.74 q against the indent for 328.28 q.

## **E. FORAGE TECHNOLOGY DEMONSTRATION**

During *Rabi* 2014-15, a total of 788 FTDs were conducted on farmer's field of 19 states across the country. Major forage crops demonstrated were berseem (180), lucerne (75), oat (400), tall fescue (5), lathyrus (20), oat + berseem (15), guinea (10), BxN hybrid (15) *Rabi* maize (20), cowpea (8) and rye grass (40).

## **F. TRIBAL SUB PLAN (TSP) ACTIVITIES**

During 2014-15, under the TSP sub plan, various activities were carried out by AICRP centers in 09 states in collaboration with respective KVKs, universities, other agencies for the welfare of tribal communities. The activities included 14 trainings, 272 demonstrations, 4 exhibitions, 11 exposure visits and total beneficiaries were 638. The activities were centered around training and demonstrations on fodder cultivations, livestock development – sheep, goat and their managements, distribution of improved seeds, rooted slips, farm inputs *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	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
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	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	Bihar			
		(Approved)					

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.	Pondicherry, PJLNCA & RI, Karaikal	Pondicherry
	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 ON FORAGE CROPS (Crop Improvement): ENTRIES CODE FOR *Rabi* 2014-15**

Contributor	Entry name	Code name	Contributor	Entry name	Code name	Contributor	Entry name	Code name
<b>1. IVT Berseem</b>			<b>4. IVT in Oat (SC)</b>			<b>6. AVT-2 in Oat (SC)</b>		
Jabalpur	JB-04-23	IVTB-1	Ludhiana	OL-1766-1	IVTOSC-15	Pantnagar	UPO-12-1	AVTO2SC-1
Ludhiana	PC-75	IVTB-4	Ludhiana	OL-1769-1	IVTOSC-3	Jhansi	JHO-2012-2	AVTO2SC-8
Jabalpur	JB-4-21	IVTB-5	Ludhiana	OL-1802-1	IVTOSC-5	Rahuri	RSO-59	AVTO2SC-11
Hisar	HFB-51	IVTB-8	Srinagar	SKO-225	IVTOSC-16	Rahuri	RSO-60	AVTO2SC-2
Hisar	HFB-63	IVTB-2	Srinagar	SKO-228	IVTOSC-2	Srinagar	SKO-190	AVTO2SC-9
NC	Wardan	IVTB-9	Hisar	OS-424	IVTOSC-4	Hisar	OS-405	AVTO2SC-12
NC	Mescavi	IVTB-10	Hisar	OS-432	IVTOSC-7	Jhansi	JHO-2012-1	AVTO2SC-3
ZC (HZ)	BL-22	IVTB-3	Jabalpur	JO-04-19	IVTOSC-8	Ludhiana	OL-1760	AVTO2SC-13
ZC (CZ)	BB-2	IVTB-6	Pantnagar	UPO-10-3	IVTOSC-9	Jabalpur	JO-04-14	AVTO2SC-10
ZC (NWZ)	BB-2	IVTB-7	NC	Kent	IVTOSC-1	NC	Kent	AVTO2SC-14
ZC (NEZ)	BB-3	IVTB-11	NC	OS-6	IVTOSC-10	NC	OS-6	AVTO2SC-4
			ZC (HZ)	SKO-90	IVTOSC-11	ZC (HZ)	SKO-90	AVTO2SC-5
<b>Contributor</b>	<b>Entry name</b>	<b>Code name</b>	ZC (NWZ)	OL-125	IVTOSC-12	ZC (NWZ)	OL-125	AVTO2SC-15
<b>2. AVT-2 in Berseem (SC)</b>			ZC (NEZ)	JHO-99-2	IVTOSC-6	ZC (NEZ)	JHO-99-2	AVTO2SC-6
Jhansi	JBSC-1	AVT-2B-7	ZC (CZ)	JHO-822	IVTOSC-13	ZC (CZ)	JHO-822	AVTO2SC-16
Jhansi	JBSC-2	AVT-2B-1	ZC (SZ)	JHO-2000-4	IVTOSC-14	ZC (SZ)	JHO-2000-4	AVTO2SC-7
Jhansi	JBSC-3	AVT-2B-3	<b>Contributor</b>	<b>Entry name</b>	<b>Code name</b>	<b>Contributor</b>	<b>Entry name</b>	<b>Code name</b>
Jhansi	JBSC-4	AVT-2B-8	<b>5. AVT-1 in Oat (SC)</b>			<b>7. AVT-2 Oat (Seed)</b>		
NC	Wardan	AVT-2B-2	Jhansi	JHO-13-5	AVTO1SC-1	Pantnagar	UPO-12-1	AVTO2SCS-2
NC	Mescavi	AVT-2B-4	Jabalpur	JO-04-18	AVTO1SC-7	Jhansi	JHO-2012-2	AVTO2SCS-9
ZC (CZ)	BB-2	AVT-2B-5	Faizabad	NDO-952	AVTO1SC-10	Rahuri	RSO-59	AVTO2SCS-14
ZC (NWZ)	BB-2	AVT-2B-6	Ludhiana	OL-1689	AVTO1SC-2	Rahuri	RSO-60	AVTO2SCS-1
			Ludhiana	OL-1804	AVTO1SC-16	Srinagar	SKO-190	AVTO2SCS-10
			Hisar	OS-406	AVTO1SC-4	Hisar	OS-405	AVTO2SCS-15
<b>Contributor</b>	<b>Entry name</b>	<b>Code name</b>	Rahuri	RO-11-1	AVTO1SC-9	Jhansi	JHO-2012-1	AVTO2SCS-3
<b>3. AVT-2 in Berseem (SC) (Seed)</b>			Rahuri	RSO-8	AVTO1SC-15	Ludhiana	OL-1760	AVTO2SCS-11
Jhansi	JBSC-1	AVT-2BS-4	Srinagar	SKO-196	AVTO1SC-3	Jabalpur	JO-04-14	AVTO2SCS-4
Jhansi	JBSC-2	AVT-2BS-5	Srinagar	SKO-198	AVTO1SC-11	NC	Kent	AVTO2SCS-5
Jhansi	JBSC-3	AVT-2BS-1	Srinagar	SKO-199	AVTO1SC-14	NC	OS-6	AVTO2SCS-12
Jhansi	JBSC-4	AVT-2BS-3	NC	Kent	AVTO1SC-6	ZC (HZ)	SKO-90	AVTO2SCS-6
NC	Wardan	AVT-2BS-6	NC	OS-6	AVTO1SC-13	ZC (NWZ)	OL-125	AVTO2SCS-16
NC	Mescavi	AVT-2BS-7	ZC (NWZ)	OL-125	AVTO1SC-5	ZC (NEZ)	JHO-99-2	AVTO2SCS-13
ZC (CZ)	BB-2	AVT-2BS-2	ZC (NEZ)	JHO-99-2	AVTO1SC-12	ZC (CZ)	JHO-822	AVTO2SCS-8
ZC (NWZ)	BB-2	AVT-2BS-8	ZC (CZ)	JHO-822	AVTO1SC-8	ZC (SZ)	JHO-2000-4	AVTO2SCS-7
			ZC (SZ)	JHO-2000-4	AVTO1SC-17			

Contributor	Entry name	Code name	Contributor	Entry name	Code name	<b>DECODES OF ENTRIES OF AVT AGRONOMICAL TRIAL RABI-2014-15</b>	
<b>8. IVTO (MC)</b>			<b>11. AVTO-2 (MC) (Seed)</b>			<b>R-14-AST -4: Effect of N levels on forage yield of promising entries of oat (AVT-2 SC)</b>	
Palampur	PLP-18	IVTOMC-11	Jabalpur	JO-04-315	AVTO2MCS-5	<b>Name of entry</b>	<b>Code name</b>
Hisar	OS-414	IVTOMC-1	Hisar	HFO-488	AVTO2MCS-1	RSO-60	AVTOSC-2-1
Ludhiana	OL-10	IVTOMC-7	Palampur	PLP-14	AVTO2MCS-4	JHO-99-2 (NEZ)	AVTOSC-2-2
Ludhiana	OL-1843	IVTOMC-8	NC	Kent	AVTO2MCS-3	RSO-59	AVTOSC-2-3
Ludhiana	OL-1845	IVTOMC-2	NC	UPO-212	AVTO2MSC-6	OL-125 (NWZ)	AVTOSC-2-4
Rahuri	RSO-9	IVTOMC-3	NC	RO-19	AVTO2MSC-2	SKO-190	AVTOSC-2-5
Rahuri	RSO-68	IVTOMC-9				UPO-12-1	AVTOSC-2-6
Rahuri	RSO-69	IVTOMC-12	<b>12. IVT Oat (Dual)</b>			OS-405	AVTOSC-2-7
Jabalpur	JO-04-319	IVTOMC-4	Hisar	OS-409	IVTOD-6	Kent (NC)	AVTOSC-2-8
NC	Kent	IVTOMC-6	Ludhiana	OL-10	IVTOD-1	JHO-2012-1	AVTOSC-2-9
NC	UPO-212	IVTOMC-10	Palampur	PLP-14	IVTOD-7	OL-1760	AVTOSC-2-10
NC	RO-19	IVTOMC-5	Jabalpur	JO-09-508	IVTOD-2	JO-04-14	AVTOSC-2-11
			Rahuri	RSO-15	IVTOD-3	OS-6 (NC)	AVTOSC-2-12
			NC	RO-19	IVTOD-8	JHO-2000-4 (SZ)	AVTOSC-2-13
<b>9. AVTO-1 (MC)</b>			NC	UPO-212	IVTOD-4	SKO-90 (HZ)	AVTOSC-2-14
Hisar	OS-385	AVTO1MC-6	NC	JHO-822	IVTOD-5	JHO-2012-2	AVTOSC-2-15
Jabalpur	JO-4-317	AVTO1MC-1				JHO-822 (CZ)	AVTOSC-2-16
Rahuri	RSO-60	AVTO1MC-7	<b>13. IVT Lathyrus</b>				
Jhansi	JHO-13-4	AVTO1MC-2	Kalyani	BK-20-5	IVTLa-1	<b>R-14-AST -5: Effect of N levels on forage yield of promising entries of oat (AVT-2 MC)</b>	
Ludhiana	OL-1802	AVTO1MC-8	Kalyani	BK-5	IVTLa-7	Kent (NC)	AVTOMC-2-1
NC	Kent	AVTO1MC-3	Jorhat	JCL-7	IVTLa-6	HFO-488	AVTOMC-2-2
NC	UPO-212	AVTO1MC-4	Jabalpur	JLSJ-09-3	IVTLa-5	PLP-14	AVTOMC-2-3
NC	RO-19	AVTO1MC-5	NC	Nirmal	IVTLa-3	RO-19 (NC)	AVTOMC-2-4
			NC	Mahateora	IVTLa-4	JO-04-315	AVTOMC-2-5
			NC	Prateek	IVTLa-2	UPO-212 (NC)	AVTOMC-2-6
<b>10. AVTO-2 (MC)</b>			<b>14. IVT Lucerne (Annual)-2014</b>			<b>R-14-AST -6-: Effect of P levels on forage yield of promising entries of berseem (AVT-2 SC)</b>	
Jabalpur	JO-04-315	AVTO2MC-2	Advanta	AL-140001	IVTLu-2	Mescavi (NC)	AVTBSC-1-1
Hisar	HFO-488	AVTO2MC-4	Advanta	AL-140002	IVTLu-1	JBSC-2	AVTBSC-1-2
Palampur	PLP-14	AVTO2MC-1	Advanta	AL-140003	IVTLu-6	JBSC-3	AVTBSC-1-3
NC	Kent	AVTO2MC-3	Advanta	AL-140004	IVTLu-5	JBSC-4	AVTBSC-1-4
NC	UPO-212	AVTO2MC-6	Anand	Anand-26	IVTLu-3	Wardan (NC)	AVTBSC-1-5
NC	RO-19	AVTO2MC-5	NC	Anand-2	IVTLu-4	JBSC-1	AVTBSC-1-6
			NC	RL-88	IVTLu-7	Bundel Berseem-2 (ZC-NW & CZ)	AVTBSC-1-7



# CONTENTS

Executive Summary			
AICRP on Forage Crops & Utilization State-wise Zones and Coordinated Centers and Testing Locations			
AICRP on Forage Crops & Utilization Entries Code with Name and Contributors Rabi-2014-15			
<b>CHAPTER-1: FORAGE CROP IMPROVEMENT</b>			<b>1-62</b>
<b>BERSEEM</b>			<b>1-9</b>
1.	IVTB	Initial Varietal Trial in Berseem	1-7
2.	AVTB-2 (SC)	Second Advanced Varietal Trial in Berseem (SC)	7-9
3.	AVTB-2 (SC) (Seed)	Second Advanced Varietal Trial in Berseem (SC) for Seed	9
<b>OAT</b>			<b>10-54</b>
4.	IVTO (SC)	Initial Varietal Trial in Oat (SC)	10-17
5.	AVTO (SC-1)	First Advanced Varietal Trial in Oat (SC)	18-24
6.	AVTO (SC)-2	Second Advanced Varietal Trial in Oat (SC)	25-32
7.	AVTO (SC)-2 (Seed)	Second Advanced Varietal Trial in Oat (SC) for Seed	33
8.	IVTO (MC)	Initial Varietal Trial in Oat (MC)	34-40
9.	AVTO-1 (MC)	First Advanced Varietal Trial in Oat (MC)	41-45
10.	AVTO-2 (MC)	Second Advanced Varietal Trial in Oat (MC)	46-48
11.	AVTO-2 (Seed) (MC)	Second Advanced Varietal Trial in Oat (MC) for Seed	48
12.	IVTO (Dual)	Initial Varietal Trial in Oat (Dual)	49-54
<b>LATHYRUS</b>			<b>55-57</b>
13.	IVTL	Initial Varietal Trial in Lathyrus	55-57
<b>LUCERNE</b>			<b>58-62</b>
14.	IVTL-2014	Initial Varietal Trial in Lucerne (Annual) -2014-15	58-61
15.	VTL (P)-2013	Varietal Trial in Lucerne (Perennial)-II <sup>nd</sup> Year	61-62
<b>CHAPTER-2: FORAGE CROP PRODUCTION</b>			<b>63-114</b>
<b>A. ON-GOING COORDINATED TRIALS</b>			
1.	CS-12 AST-1	Effect of stubble management and INM on forage productivity in rice-oat cropping system	63-65
2.	R-12-AST-1	Performance of dual purpose forage crops under different cutting management system	66-74
3.	R-12-AST-2	Effect of weed management on forage seed yield of berseem ( <i>Trifolium alexandrinum L.</i> )	75-80
4.	R-12-AST-3	Effect of integrated nutrient management on yield and quality of oat	81
5.	CS-13-AST-1	Study of different models for year round green fodder production under irrigated condition	82
6.	PS-13-AST-2	Performance of perennial fodder sorghum ( <i>Sorghum bicolor</i> cv. COFS29) as influenced by planting geometry and cutting intervals under irrigated conditions	83-84
7.	PS-14-AST-3	Response of congo-signal grass ( <i>Brachiaria ruziziensis</i> (var. DBRS 1) to planting geometry and N levels under variable soil moisture conditions	85
8.	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	85
9.	CS-13-AST-2	Evaluation of fodder crops under different rice fallow system	85-86
10.	CS-13-AST-3	Evaluation of different varieties of grasspea ( <i>Lathyrus sativus L.</i> ) as forage crop under sowing methods in rice based cropping system	87-88
<b>B. NEW COORDINATED TRIALS</b>			
11.	R-14-AST-1	Studies on the production potential feasibility of annual rye grass with berseem in hill zone	89-90

<b>C. LOCATION SPECIFIC TRIALS</b>			
12.	PS-12-AST-2	Performance of bajra napier hybrid grass as influenced by micro-nutrients under irrigated conditions	91
13.	R-12-AST-4	Effect of sowing time and Zn & thiourea spray on seed yield of dual purpose oat	92
14.	R-13-AST-1	Yield potential of cereals with forage legumes under pure stand and mixtures	93
15.	CS-14-AST-1	Studies on intensive fodder cropping system for yield maximization	94
16.	PS-14-AST-2	Impact of Mg and B on nutrient uptake, quality and yield of Bajra Napier hybrid	95
17.	CS-14-AST-2	Study of intensive annual fodder crop based cropping system	96
18.	R-14-AST-2	Effect of Integrated Nutrient Management on yield and quality of oat	97
19.	R-14-AST-3	Studies on the effect of additives on silage quality of different grasses	98
<b>D. AVT-2 BASED AGRONOMY TRIALS</b>			
20.	R-14-AST-4	Effect of Nitrogen levels on forage yield of promising entries of oat (AVT-2 SC)	99-108
21.	R-14-AST-5	Effect of Nitrogen levels on forage yield of promising entries of oat (AVT-2 MC)	109-110
22.	R-14-AST-6	Effect of P levels on forage yield of promising entries of berseem (AVT-2 SC)	111-113
<b>E. MISCELLANEOUS TRIALS</b>			
23.	PS-14-AST-1(Kharif)	Effect of straw mulch on the water requirement, weeds and productivity of BN hybrid	114
24.	PS-12-AST-3 (Kharif)	Enhancing the production potential of various forage crops in coconut gardens through nutrient management	114
25.	CS-13-AST-4 (Kharif)	Residual effect of P applied to wheat on the succeeding summer fodders in sorghum-wheat-summer fodders cropping system	114
<b>CHAPTER-3 : FORAGE CROP PROTECTION</b>			<b>115-131</b>
1.	PPT-1	Monitoring insect-pests and diseases associated with berseem, lucerne and oat eco system	115-117
2.	PPT-2A	Field screening of Rabi breeding materials for resistance to insect-pest and diseases	117-121
3.	PPT-2B	Evaluation of berseem entries for resistance to root and stem rot diseases under sick plot	121-122
4.	PPT-12	Integrated disease management in white clover	122
5.	PPT-17	To study pathogenic variability of <i>Blumeria graminis</i> (syn. <i>Erysiphe graminis</i> F. sp. <i>Avenae</i> on oats	123
6.	PPT-18	Evaluation of entamopathogenic fungi on insect pests of lucerne	124-127
7.	PPT-19	Management of soil borne diseases in clover seed crops	128
8.	PPT-20	Management of soil borne and powdery mildew diseases in red clover seed crop	128-129
9.	PPT-21	Management of foliar diseases of oat	129-130
10.	PPT-22	Studies on biological management of <i>Spodoptera litura</i> in relation with different time of application on Lucerne under field condition	130
11.	PPT-23	Biological control of <i>Helicoverpa armigera</i> on Lucerne/berseem seed crop	130-131
<b>CHAPTER-4 : BREEDER SEED PRODUCTION</b>			<b>132-134</b>
<b>MONITORING DETAILS</b>			
<b>APPENDICES</b>			
1.	Appendix-I	In House Breeding Activities	A1 - A11
2.	Appendix-II	Other Activities	B1- B19
3.	Appendix-III	Weather Report Rabi 2014-15	C1- C13
4.	Appendix-IV	Forage Crop Breeding Trials at a Glance	D1
5.	Appendix-V	Forage Crop Production Trials at a Glance	D2
6.	Appendix-VI	Forage Crop Protection Trials at a Glance	D3
7.	Appendix-VII	Directory of Scientific Staff	E1 - E7

## **1. IVTB: INITIAL VARIETAL TRIAL IN BERSEEM**

**(Reference tables 1.1 to 1.9)**

An initial varietal trial in berseem comprising of five entries along with two national checks (Wardan and Mescavi) and three zonal checks in respective zones (BL-22, BB-2 and BB-3) was conducted at 19 centers located in four different zones of the country. For green forage yield (q/ha), PC-75 (3.3%) and JB-4-21 (2.7%) in North West zone and JB-04-23 (10.7%), JB-4-21 (9.0%) and PC-75 (5.3%) in Central zone registered their superiority over best zonal/national checks. At national level, JB-04-23 (5.9%), JB-4-21 (5.9%) and PC-75 (4.7%) recorded superiority for green forage yield. For dry matter yield PC-75, JB-4-21 and JB-04-23 in North West and Central zone as well as at national level exhibited superiority over check. For green forage production potential JB-4-21 and for dry matter production potential (q/ha/day) JB-04-23 registered superiority over zonal/national check. Entry JB-4-21 ranked first for the character plant height. For the character leafiness, entries JB-4-23 and HFB-63 performed better.

In quality parameters, entry JB-04-23 for crude protein yield (q/ha) and entry HFB-63 for crude protein content (%) ranked first. Entry JB-04-23 for ADF (%) and NDF (%) and national check Wardan for IVDMD (%) exhibited their superiority.

## **2. AVTB-2 (SC): SECOND ADVANCED VARIETAL TRIAL IN BERSEEM (SINGLE CUT)**

**(Reference tables 2.1 to 2.6)**

An advanced varietal trial in Berseem (single cut) comprising of four entries along with two national checks (Wardan and Mescavi) and one zonal check (BB-2) was conducted at eight centres located in two zones (Central and North West) . For green forage and dry matter yield, all the test entries in North West zone, Central zone and at national level registered superiority over zonal/national checks. In green forage and dry matter production potential (q/ha/day), all the test entries registered their superiority over national check.

Test entry JBSC-1 (56.9 cm) ranked first for the character plant height. For the character leafiness, entry Mescavi (0.83) performed better. In quality parameters, entry JBSC-4 for crude protein yield (q/ha) and crude protein content (%) ranked first. National check Wardan for ADF (%), JBSC-3 for NDF (%) and DDM (q/ha) while, JBSC-4 for IVDMD (%) were best performers.

## **3. AVTB-2 (SC) (SEED): SECOND ADVANCED VARIETAL TRIAL IN BERSEEM (SINGLE CUT) FOR SEED**

**(Reference table 3.1)**

Results of the advanced varietal trial in Berseem for seed with four entries, JBSC-1, JBSC-2, JBSC-3 and JBSC-4 along with two national checks, Wardan and Mescavi and one zonal check (BB-2) conducted at six locations across the country revealed that for seed yield (q/ha), entries JBSC-2 (19.7%), JBSC-4 (14.3%) and JBSC-3 (7.1%) in North West zone and all the entries in Central zone as well as at national level registered superiority over the national checks.

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

Entries	Hill Zone			North West Zone									North East Zone						
	Palam-pur	Ra-nk	Superi- ority	Bika- ner	His- ar	Ludh- iana	Jal- ore	Mee- rut	Udai- pur	Ave- rage	Ra- nk	Superi- ority	Kal- yani	Ran- chi	Faiza- bad	Bhuban- eswar	Pu- sa	Aver- age	Ra- nk
JB-04-23	379.3	4		33.4	664.8	613.0	130.0	492.1	280.4	368.9	4		259.3	247.4	332.8	94.7	140.0	214.8	2
HFB-63	332.9	6		52.8	625.9	548.5	81.7	498.1	189.3	332.7	7		246.0	222.2	266.2	92.4	246.0	214.6	3
PC-75	425.4	2		64.4	729.6	654.3	90.0	546.7	244.1	388.2	1	3.3	65.8	273.2	298.0	87.7	258.0	196.5	5
JB-4-21	361.5	5		28.6	774.1	645.2	125.3	489.7	247.0	385.0	2	2.7	180.5	217.6	280.7	115.1	246.0	208.0	4
HFB-51	317.4	7		62.8	679.6	427.0	105.0	553.7	206.7	339.1	6		270.7	236.1	179.4	86.3	210.0	196.5	5
Wardan (NC)	182.9	8		32.3	664.8	381.3	79.0	525.9	143.0	304.4	8		225.2	268.5	83.9	99.6	234.0	182.2	7
Mescavi (NC)	402.3	3		61.8	720.4	523.1	93.3	609.3	245.6	375.6	3		171.3	226.8	231.5	90.7	210.0	186.1	6
BL-22 ZC (HZ)	460.3	1																	
BB-2 ZC (NWZ-CZ)				30.6	759.3	519.6	134.3	500.4	239.3	363.9	5								
BB-3 ZC (NEZ)													233.5	263.9	312.5	89.9	252.0	230.4	1
<b>Mean</b>	<b>357.7</b>			<b>45.8</b>	<b>702.3</b>	<b>539.0</b>	<b>104.8</b>	<b>527.0</b>	<b>224.4</b>	<b>357.2</b>			<b>206.6</b>	<b>244.5</b>	<b>248.1</b>	<b>94.5</b>	<b>224.5</b>	<b>203.6</b>	
<b>CD at 5%</b>	43.7			14.8	30.0	122.6	1.2	36.1	21.3				3.9	40.3	54.6	8.8	21.9		
<b>CV%</b>	7.0			18.2	10.0	13.0	6.4	3.9	5.4				13.2	9.3	12.6	7.4	10.7		

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

Entries	Central Zone										All India		
	Jha- nsi	Rah- uri	Jabal- pur	Urulikan- chan	Kar- jat	Kan- pur	Rai- pur	Aver- age	Ra- nk	Superi- ority	Aver- age	Ra- nk	Superi- ority
JB-04-23	446.7	354.1	941.0	108.7	177.9	644.4	290.1	423.3	1	10.7	349.0	1	5.9
HFB-63	359.8	262.1	859.1	117.3	194.7	433.3	259.9	355.2	7		309.9	5	
PC-75	490.3	309.2	920.1	113.9	153.7	629.6	201.6	402.6	3	5.3	345.0	3	4.7
JB-4-21	478.5	291.5	874.4	132.9	260.6	625.9	253.5	416.8	2	9.0	348.9	2	5.9
HFB-51	380.1	283.2	841.1	118.5	148.6	477.8	303.7	364.7	6		309.9	5	
Wardan (NC)	166.0	109.5	781.9	145.1	166.1	200.0	272.8	263.0	8		250.6	6	
Mescavi (NC)	433.1	294.6	789.7	147.4	207.4	485.2	319.2	382.4	4		329.6	4	
BB-2 ZC (NWZ-CZ)	390.9	309.4	849.4	146.8	199.3	559.3	191.0	378.0	5				
<b>Mean</b>	<b>393.2</b>	<b>276.7</b>	<b>857.1</b>	<b>128.8</b>	<b>188.5</b>	<b>506.9</b>	<b>261.5</b>	<b>373.3</b>			<b>320.4</b>		
<b>CD at 5%</b>	98.6	48.7	174.7	N.S.	46.4	70.2	31.6						
<b>CV%</b>	8.7	10.1	11.7	16.1	14.0	7.9	7.1						

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

Entries	Hill Zone		North West Zone						North East Zone							
	Palam-pur	Ra-nk	Bika-ner	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-riority	Kal-yani	Ran-chi	Faiza-bad	Bhuba-neswar	Pu-sa	Aver-age	Ra-nk	Superi-riority
JB-04-23	70.2	4	8.6	66.4	171.5	82.2	3	11.8	86.0	39.0	79.3	19.0	44.1	53.5	1	0.4
HFB-63	63.6	6	11.6	66.0	124.2	67.3	6		79.7	39.3	63.9	18.2	46.1	49.5	3	
PC-75	79.4	2	15.7	84.6	171.8	90.7	1	23.4	21.2	46.4	67.1	17.4	44.1	39.2	8	
JB-4-21	67.8	5	7.1	79.6	167.0	84.6	2	15.1	58.1	40.7	56.7	22.9	37.5	43.2	6	
HFB-51	59.0	7	15.8	78.3	104.1	66.1	7		89.4	38.9	35.1	17.2	41.8	44.5	4	
Wardan (NC)	33.9	8	8.2	75.9	62.5	48.9	8		74.3	52.1	18.1	19.4	37.6	40.3	7	
Mescavi (NC)	75.9	3	14.0	84.9	121.7	73.5	4		56.4	36.4	60.4	18.1	45.2	43.3	5	
BL-22 ZC (HZ)	84.4	1														
BB-2 ZC (NWZ-CZ)			7.7	85.1	123.3	72.0	5									
BB-3 ZC (NEZ)									75.5	45.1	74.4	18.1		53.3	2	
<b>Mean</b>	<b>66.8</b>		<b>11.1</b>	<b>77.6</b>	<b>130.8</b>	<b>73.2</b>			<b>67.6</b>	<b>42.2</b>	<b>56.9</b>	<b>18.8</b>	<b>42.3</b>	<b>45.8</b>		
<b>CD at 5%</b>	5.9		3.9	11.8	16.8				1.9	8.5	9.9	1.6	3.9			
<b>CV%</b>	5.0		19.7	8.9	11.9				15.5	11.5	10.1	6.8	9.6			

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

Entries	Central Zone										All India		
	Jha-nsi	Rah-uri	Jabal-pur	Urulikan-chan	*Kar-jat	Kan-pur	Rai-pur	Aver-age	Ra-nk	Superi-riority	Aver-age	Ra-nk	Superi-riority
JB-04-23	90.1	70.7	136.4	14.1	32.5	95.5	85.4	75.0	1	8.3	71.8	1	12.5
HFB-63	75.2	55.8	126.8	14.0	34.1	68.1	79.7	64.8	7		62.2	5	
PC-75	100.8	61.5	121.3	12.1	35.4	95.2	67.9	70.6	3	1.9	67.1	2	5.2
JB-4-21	97.4	59.0	126.3	17.7	42.3	88.1	79.6	72.9	2	5.2	67.0	3	5.0
HFB-51	76.7	60.8	133.6	14.5	30.4	71.1	79.1	66.6	6		61.0	6	
Wardan (NC)	34.1	23.6	103.8	18.2	33.0	34.4	87.3	47.8	8		45.6	7	
Mescavi (NC)	86.0	59.5	114.7	18.8	41.1	70.7	94.0	69.3	4		63.8	4	
BB-2 ZC (NWZ-CZ)	85.1	62.7	124.0	20.1	37.8	78.1	66.8	67.8	5				
<b>Mean</b>	<b>80.7</b>	<b>56.7</b>	<b>123.4</b>	<b>16.2</b>	<b>35.8</b>	<b>75.2</b>	<b>80.0</b>	<b>66.8</b>			<b>62.6</b>		
<b>CD at 5%</b>	16.4	10.8	26.5	4.5	12.6	6.1	7.2						
<b>CV%</b>	7.0	10.9	12.3	15.7	20.2	4.6	5.3						

Note: \* Not Included in zonal and all India Average due to CV ≥ 20

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

Entries	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Bhuban-eswar	Kar-jat	Kan-pur	Rai-pur	Faiza-bad	Aver-age	Ra-nk
JB-04-23	0.23	4.85	3.60	2.18	1.90	1.58	2.62	5.86	3.72	2.17	2.87	2
HFB-63	0.37	4.61	3.30	2.07	1.71	1.54	2.63	3.94	3.51	1.74	2.54	5
PC-75	0.45	5.29	3.90	0.55	2.10	1.46	2.08	5.72	2.80	1.95	2.63	4
JB-4-21	0.20	5.54	3.80	1.52	1.67	1.92	3.83	5.69	3.21	1.83	2.92	1
HFB-51	0.44	5.00	2.50	2.28	1.82	1.44	1.86	4.34	3.80	1.17	2.47	6
Wardan (NC)	0.23	4.72	2.30	1.89	2.06	1.66	2.44	1.82	3.90	0.55	2.16	7
Mescavi (NC)	0.43	5.29	3.10	1.44	1.74	1.51	3.05	4.41	4.20	1.52	2.67	3
BL-22 ZC (HZ)												
BB-2 ZC (NWZ-CZ)	0.21	5.45	3.10				2.62	5.08	2.73			
BB-3 ZC (NEZ)				1.96	2.03	1.50				2.04		
<b>Mean</b>	<b>0.32</b>	<b>5.09</b>	<b>3.20</b>	<b>1.74</b>	<b>1.88</b>	<b>1.58</b>	<b>2.64</b>	<b>4.61</b>	<b>3.48</b>	<b>1.62</b>	<b>2.61</b>	

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

Entries	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Bhuban-eswar	Kar-jat	Kan-pur	Rai-pur	Faiza-bad	Aver-age	Ra-nk
JB-04-23	0.06	0.46	1.00	0.72	0.30	0.32	0.45	0.87	1.09	0.52	0.58	1
HFB-63	0.08	0.48	0.70	0.67	0.30	0.30	0.51	0.62	1.08	0.42	0.52	4
PC-75	0.11	0.59	1.00	0.18	0.36	0.29	0.49	0.87	0.94	0.44	0.53	3
JB-4-21	0.05	0.55	1.00	0.49	0.31	0.38	0.67	0.80	1.01	0.37	0.56	2
HFB-51	0.11	0.56	0.60	0.75	0.30	0.29	0.34	0.65	0.99	0.23	0.48	5
Wardan (NC)	0.06	0.53	0.40	0.63	0.40	0.32	0.49	0.31	1.25	0.12	0.45	6
Mescavi (NC)	0.10	0.61	0.70	0.47	0.28	0.30	0.55	0.64	1.24	0.36	0.53	3
BL-22 ZC (HZ)												
BB-2 ZC (NWZ-CZ)	0.05	0.60	0.70				0.41	0.71	0.95			
BB-3 ZC (NEZ)				0.64	0.35	0.30				0.49		
<b>Mean</b>	<b>0.08</b>	<b>0.55</b>	<b>0.76</b>	<b>0.57</b>	<b>0.33</b>	<b>0.31</b>	<b>0.49</b>	<b>0.68</b>	<b>1.07</b>	<b>0.37</b>	<b>0.52</b>	

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

Entries	Palam-pur	Ludh-iana	Kal-yani	Faiza-bad	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chaan	Rai-pur	Aver-age	Ra-nk
JB-04-23	13.3	48.0	68.2	13.8	4.2	11.0	19.2	2.6	14.0	21.6	1
HFB-63	12.8	33.2	72.2	10.8	4.1	9.9	17.8	2.6	11.7	19.5	4
PC-75	13.9	45.7	64.4	11.4	3.9	10.2	16.9	2.3	9.6	19.8	3
JB-4-21	12.2	43.6	72.1	9.3	5.1	9.9	18.0	3.3	10.7	20.5	2
HFB-51	11.0	27.3	73.9	5.5	3.9	10.8	19.3	2.7	12.3	18.5	6
Wardan (NC)	7.0	12.5	65.2	2.9	4.4	4.2	14.3	3.5	13.2	14.1	7
Mescavi (NC)	13.9	30.2	69.7	9.4	4.0	10.5	16.0	3.6	15.3	19.2	5
BL-22 ZC (HZ)	16.0										
BB-2 ZC (NWZ-CZ)		32.9				10.8	17.5	3.7	9.6		
BB-3 ZC (NEZ)			65.9	12.0	4.1						
<b>Mean</b>	<b>12.5</b>	<b>34.2</b>	<b>69.0</b>	<b>9.4</b>	<b>4.2</b>	<b>9.7</b>	<b>17.4</b>	<b>3.0</b>	<b>12.0</b>	<b>19.0</b>	

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

Entries	Palam-pur	Ludh-iana	His-ar	Faiza-bad	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chaan	Rai-pur	Ran-chi	Bika-ner	Aver-age	Ra-nk
JB-04-23	19.0	28.0	18.9	17.4	22.0	15.5	14.1	18.7	16.5	21.9	13.9	18.7	2
HFB-63	20.1	26.7	19.0	16.9	22.5	17.7	14.0	18.8	14.8	21.4	14.5	18.8	1
PC-75	17.5	26.6	19.5	17.0	22.4	16.5	14.1	19.2	14.2	20.1	12.6	18.1	6
JB-4-21	18.1	26.1	19.2	16.4	22.3	16.8	14.1	18.7	13.5	20.5	14.0	18.2	5
HFB-51	18.7	26.2	19.1	15.6	22.4	17.7	14.1	18.5	15.2	20.1	13.9	18.3	4
Wardan (NC)	20.7	20.0	18.8	16.2	22.6	18.0	14.0	19.2	15.1	21.4	14.8	18.3	4
Mescavi (NC)	18.4	24.8	19.3	17.1	22.2	17.7	14.0	19.2	16.3	21.4	14.6	18.6	3
BL-22 ZC (HZ)	19.0												
BB-2 ZC (NWZ-CZ)		26.7	19.4			17.3	14.0	18.4	14.4		14.0		
BB-3 ZC (NEZ)				16.1	22.5					21.9			
<b>Mean</b>	<b>18.9</b>	<b>25.6</b>	<b>19.2</b>	<b>16.6</b>	<b>22.4</b>	<b>17.1</b>	<b>14.0</b>	<b>18.8</b>	<b>15.0</b>	<b>21.1</b>	<b>14.0</b>	<b>18.4</b>	

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Jal-ore	Udai-pur	Ran-chi	Faiza-bad	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Kar-jat	Kan-pur	Rai-pur	Kal-yani	Aver-age	Ran-k
JB-04-23	43.3	51.0	59.9	52.7	31.2	41.0	34.3	55.2	71.5	50.4	54.8	41.1	67.0	50.4	44.4	68.2	51.0	3
HFB-63	43.4	50.0	60.3	49.4	30.0	35.5	40.9	56.7	73.5	43.0	49.5	42.8	67.0	45.7	41.4	72.2	50.1	2
PC-75	39.0	52.0	63.9	57.6	29.3	36.2	42.7	51.2	64.3	39.5	52.1	38.7	77.0	48.9	35.1	64.4	49.5	4
JB-4-21	43.3	53.0	64.4	56.6	29.7	40.1	43.6	54.5	77.7	46.3	48.2	41.1	65.0	52.8	39.7	72.1	51.7	1
HFB-51	40.2	54.0	61.5	38.0	30.3	35.1	39.4	50.1	64.2	43.7	44.3	39.6	64.0	45.7	45.6	73.9	48.1	5
Wardan (NC)	39.7	56.0	60.6	35.2	32.7	30.9	41.5	51.2	74.6	43.2	37.5	39.1	69.0	49.2	39.9	65.2	47.8	6
Mescavi (NC)	41.8	58.5	65.5	46.8	30.5	40.5	43.1	55.6	67.3	44.2	40.9	41.4	71.0	47.4	51.3	69.7	51.0	3
BL-22 ZC (HZ)	42.1																	
BB-2 ZC (NWZ-CZ)		52.0	62.7	46.1	30.5	36.0				49.7	43.8	43.6	62.0	52.1	42.6			
BB-3 ZC (NEZ)							41.9	54.8	68.6							65.9		
<b>Mean</b>	<b>41.6</b>	<b>53.3</b>	<b>62.4</b>	<b>47.8</b>	<b>30.5</b>	<b>36.9</b>	<b>40.9</b>	<b>53.7</b>	<b>70.2</b>	<b>45.0</b>	<b>46.4</b>	<b>40.9</b>	<b>67.8</b>	<b>49.0</b>	<b>42.5</b>	<b>69.0</b>	<b>49.9</b>	

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

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Kal-yani	Ran-chi	Faiza-bad	Bhuban-eswar	Rah-uri	Jabal-pur	Urulikan-chan	Kar-jat	Kan-pur	Rai-pur	Aver-age	Ran-k
JB-04-23	0.39	0.98	0.88	1.44	0.61	0.81	0.70	1.09	0.87	0.81	0.66	0.61	0.33	0.86	0.79	1
HFB-63	0.38	0.92	0.81	1.23	0.61	0.81	0.71	1.01	1.11	0.70	0.88	0.63	0.58	0.75	0.79	1
PC-75	0.48	1.00	0.80	1.02	0.61	0.74	0.68	0.87	0.93	0.66	0.61	0.71	0.38	0.84	0.74	4
JB-4-21	0.33	0.98	0.75	0.97	0.61	0.58	0.65	1.12	0.87	0.62	0.76	0.68	0.44	0.83	0.73	5
HFB-51	0.38	0.91	0.80	1.07	0.66	0.77	0.61	0.84	1.12	0.66	0.64	0.67	0.57	1.01	0.77	2
Wardan (NC)	0.42	0.89	0.91	1.08	0.54	0.67	0.70	1.14	1.25	0.48	0.84	0.63	0.51	0.74	0.77	2
Mescavi (NC)	0.43	0.98	0.71	0.98	0.56	0.67	0.75	0.94	0.94	0.47	0.92	0.65	0.45	1.09	0.75	3
BL-22 ZC (HZ)	0.42															
BB-2 ZC (NWZ-CZ)		0.97	0.67	1.01					0.90	0.52	0.72	0.70	0.37	0.75		
BB-3 ZC (NEZ)					0.61	0.71	0.73	0.91								
<b>Mean</b>	<b>0.40</b>	<b>0.95</b>	<b>0.79</b>	<b>1.10</b>	<b>0.60</b>	<b>0.72</b>	<b>0.69</b>	<b>0.99</b>	<b>1.00</b>	<b>0.62</b>	<b>0.75</b>	<b>0.66</b>	<b>0.45</b>	<b>0.86</b>	<b>0.76</b>	

**Table 1.9: IVT Berseem: Initial Varietal Trial in Berseem: ADF (%), NDF (%) & IVDMD (%)**

Entries	ADF (%)		NDF (%)		IVDMD (%)	
	Ludhiana	Rank	Ludhiana	Rank	Hisar	Rank
JB-04-23	23.6	1	31.2	1	55.7	4
HFB-63	26.8	6	37.9	4	56.9	3
PC-75	26.8	6	37.4	3	57.9	2
JB-4-21	25.1	3	38.1	5	54.6	7
HFB-51	24.6	2	36.6	2	54.1	8
Wardan (NC)	27.4	7	39.8	8	60.0	1
Mescavi (NC)	25.6	4	38.4	6	55.5	6
BL-22 ZC (HZ)						
BB-2 ZC (NWZ-CZ)	26.1	5	39.6	7	55.6	5
BB-3 ZC (NEZ)						
<b>Mean</b>	<b>25.8</b>		<b>37.4</b>		<b>56.3</b>	

**Table 2.1: AVT-2: Second Advanced Varietal Trial in Berseem (SC): Green Forage Yield (q/ha)**

Cont...

Entries	North West Zone						Central Zone							All India			
	Bika-ner	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-osity%	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Jabal-pur	Aver-age	Ra-nk	Superi-osity%	Aver-age	Ra-nk	Superi-osity%
JBSC-2	19.2	319.4	115.3	151.3	3	72.1	318.0	122.5	33.9	76.0	412.2	192.5	4	33.4	177.1	3	43.7
JBSC-3	17.6	330.6	98.6	148.9	4	69.3	315.9	103.4	30.2	90.8	429.9	194.0	3	34.4	177.1	3	43.7
JBSC-1	36.7	325.0	113.9	158.5	2	80.3	339.2	146.7	19.6	97.9	382.2	197.1	1	36.6	182.6	2	48.2
JBSC-4	63.9	305.6	133.3	167.6	1	90.7	334.8	124.7	22.5	72.2	422.6	195.4	2	35.4	184.9	1	50.0
Wardan (NC)	6.7	133.3	16.7	52.2	7		128.2	16.3	23.7	79.5	165.5	82.6	7		71.2	6	
Mescavi (NC)	28.8	161.1	65.3	85.1	6		233.0	58.9	31.5	86.7	221.7	126.4	6		110.9	5	
BB-2 ZC (NWZ-CZ)	37.4	166.7	59.7	87.9	5		259.4	87.8	34.3	80.7	259.2	144.3	5		123.2	4	
<b>Mean</b>	<b>30.0</b>	<b>248.8</b>	<b>86.1</b>	<b>121.7</b>			<b>275.5</b>	<b>94.3</b>	<b>27.9</b>	<b>83.4</b>	<b>327.6</b>	<b>161.8</b>			<b>146.7</b>		
<b>CD at 5%</b>	10.4	60.7	15.9				86.4	13.1	9.4	8.9	71.3						
<b>CV%</b>	19.5	14.4	10.4				11.0	7.8	18.8	6.0	12.2						

**Table 2.2: AVT-2: Second Advanced Varietal Trial in Berseem (SC): Dry Matter Yield (q/ha)**

Entries	North West Zone						Central Zone						All India				
	Bika-ner	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-osity%	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Jabal-pur	Aver-age	Ra-nk	Superi-osity%	Aver-age	Ra-nk	Superi-osity%
JBSC-2	3.9	41.3	24.3	23.2	2	58.9	71.1	24.6	6.4	15.2	66.9	36.8	2	47.7	31.7	3	50.9
JBSC-3	3.9	43.3	20.8	22.7	4	55.5	81.3	18.4	5.8	19.4	70.6	39.1	1	57.0	32.9	1	56.7
JBSC-1	7.7	37.1	23.9	22.9	3	56.8	71.4	23.9	3.7	17.3	61.4	35.5	3	42.6	30.8	4	46.7
JBSC-4	14.6	37.8	28.0	26.8	1	83.6	65.9	20.7	4.3	13.3	69.5	34.7	4	51.4	31.8	2	51.4
Wardan (NC)	1.1	17.2	3.5	7.3	7		23.7	2.7	4.2	16.6	24.8	14.4	7		11.7	7	
Mescavi (NC)	5.2	20.2	13.7	13.0	6		32.7	9.0	6.0	17.7	35.2	20.1	6		17.5	6	
BB-2 ZC (NWZ-CZ)	6.5	24.6	12.6	14.6	5		45.6	14.1	6.5	16.7	41.5	24.9	5		21.0	5	
<b>Mean</b>	<b>6.1</b>	<b>31.6</b>	<b>18.1</b>	<b>18.6</b>			<b>55.9</b>	<b>16.2</b>	<b>5.3</b>	<b>16.6</b>	<b>52.8</b>	<b>29.4</b>			<b>25.3</b>		
<b>CD at 5%</b>	2.1	8.0	3.2				14.5	2.3	1.8	1.6	11.6						
<b>CV%</b>	19.6	14.9	10.0				9.1	7.8	18.9	5.5	12.3						

**Table 2.3: AVT-2: Second Advanced Varietal Trial in Berseem (SC): 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	Urulikan-chan	Kar-jat	Aver-age	Ra-nk	Bika-ner	His-ar	Ludh-iana	Urulikan-chan	Kar-jat	Aver-age	Ra-nk
JBSC-2	0.18	4.70	1.90	0.56	1.27	1.72	4	0.04	0.61	0.40	0.11	0.25	0.28	2
JBSC-3	0.16	4.86	1.60	0.50	1.51	1.73	3	0.04	0.64	0.30	0.10	0.32	0.28	2
JBSC-1	0.34	4.78	1.80	0.33	1.63	1.78	1	0.07	0.55	0.40	0.06	0.29	0.27	3
JBSC-4	0.60	4.49	2.20	0.37	1.20	1.77	2	0.14	0.56	0.50	0.07	0.22	0.30	1
Wardan (NC)	0.06	1.96	0.30	0.39	1.33	0.81	6	0.01	0.25	0.10	0.07	0.28	0.14	6
Mescavi (NC)	0.27	2.37	1.10	0.52	1.44	1.14	5	0.05	0.30	0.20	0.10	0.30	0.19	5
BB-2 ZC (NWZ-CZ)	0.35	2.45	1.00	0.57	1.35	1.14	5	0.06	0.36	0.20	0.11	0.28	0.20	4
<b>Mean</b>	<b>0.28</b>	<b>3.66</b>	<b>1.41</b>	<b>0.46</b>	<b>1.39</b>	<b>1.44</b>		<b>0.06</b>	<b>0.47</b>	<b>0.30</b>	<b>0.09</b>	<b>0.28</b>	<b>0.24</b>	

**Table 2.4: AVT-2: Second Advanced Varietal Trial in Berseem (SC): Crude Protein Yield (q/ha) & Crude Protein (%)**

Entries	CPY (q/ha)							CP (%)							
	Ludh-iana	His-ar	Rah-uri	Urulikan-chan	Jabal-pur	Aver-age	Ra-nk	Ludh-iana	His-ar	Rah-uri	Urulikan-chan	Jabal-pur	Bika-ner	Aver-age	Ra-nk
JBSC-2	4.9	10.1	4.8	1.2	10.3	6.3	2	20.1	24.5	19.4	18.5	15.5	14.6	18.8	6
JBSC-3	5.4	10.4	3.5	1.1	10.9	6.3	2	26.0	24.1	19.3	18.3	15.6	13.4	19.5	3
JBSC-1	6.7	8.8	4.5	0.7	9.4	6.0	3	28.1	23.6	18.6	17.9	15.5	13.7	19.6	2
JBSC-4	7.5	8.8	4.2	0.8	10.7	6.4	1	26.9	23.2	20.2	18.2	15.5	14.1	19.7	1
Wardan (NC)	0.9	4.0	0.5	0.8	3.3	1.9	6	26.9	23.4	15.3	18.0	13.3	14.2	18.5	7
Mescavi (NC)	3.6	4.6	1.6	1.1	5.3	3.2	5	26.2	23.0	17.5	18.5	15.1	14.0	19.0	5
BB-2 ZC (NWZ-CZ)	3.4	5.7	2.5	1.2	6.3	3.8	4	26.7	23.0	17.9	18.5	15.2	14.2	19.2	4
<b>Mean</b>	<b>4.6</b>	<b>7.5</b>	<b>3.1</b>	<b>1.0</b>	<b>8.0</b>	<b>4.8</b>		<b>25.8</b>	<b>23.5</b>	<b>18.3</b>	<b>18.3</b>	<b>15.1</b>	<b>14.0</b>	<b>19.2</b>	

**Table 2.5: AVT-2: Second Advanced Varietal Trial in Berseem (SC): Plant Height (cm) & Leaf Stem Ratio**

Entries	Plant Height (cm)									Leaf Stem Ratio								
	Bika-ner	His-ar	Ludh-iana	Rah-uri	Urulikan-chan	Kar-jat	Jabal-pur	Aver-age	Ran-k	Bika-ner	His-ar	Ludh-iana	Urulikan-chan	Kar-jat	Jabal-pur	Rah-uri	Aver-age	Ran-k
JBSC-2	43.0	54.9	32.0	51.4	42.3	55.2	101.0	54.3	3	0.61	0.61	1.23	0.88	0.63	0.48	0.83	0.75	4
JBSC-3	37.0	64.8	33.2	49.2	39.4	62.1	105.4	55.9	2	0.78	0.49	1.02	0.94	0.69	0.55	0.81	0.75	4
JBSC-1	61.0	63.7	30.0	47.3	36.6	65.4	94.4	56.9	1	0.76	0.90	1.00	0.69	0.69	0.50	0.80	0.76	3
JBSC-4	46.0	62.3	29.7	53.3	32.4	53.8	92.5	52.9	4	0.73	0.45	1.08	0.88	0.55	0.49	0.84	0.72	5
Wardan (NC)	35.0	38.7	20.3	54.5	41.0	57.2	70.1	45.3	7	0.75	1.28	0.97	0.75	0.57	0.37	0.86	0.79	2
Mescavi (NC)	36.0	46.0	27.8	49.5	49.9	60.8	74.4	49.2	6	0.85	1.26	0.97	0.80	0.71	0.40	0.81	0.83	1
BB-2 ZC (NWZ-CZ)	49.0	43.8	30.2	42.9	36.8	59.8	82.5	49.3	5	0.79	1.15	0.83	0.78	0.63	0.45	0.92	0.79	2
<b>Mean</b>	<b>43.9</b>	<b>53.5</b>	<b>29.0</b>	<b>49.7</b>	<b>39.8</b>	<b>59.2</b>	<b>88.6</b>	<b>51.9</b>		<b>0.75</b>	<b>0.88</b>	<b>1.01</b>	<b>0.82</b>	<b>0.64</b>	<b>0.46</b>	<b>0.84</b>	<b>0.77</b>	

**Table 2.6: AVT-2 Second Advanced Varietal Trial in Berseem (SC): ADF (%), NDF (%), IVDMD (%) & DDM (q/ha)**

Entries	ADF (%)				NDF (%)				IVDMD (%)				DDM (q/ha)	
	Ludh-iana	Rah-uri	Aver-age	Ran-k	Ludh-iana	Rah-uri	Aver-age	Ran-k	Rah-uri	His-ar	Aver-age	Ran-k	His-ar	Ran-k
JBSC-2	28.0	50.9	39.5	6	38.8	57.3	48.1	5	49.2	61.4	55.3	7	25.4	2
JBSC-3	26.3	48.2	37.3	4	36.4	55.1	45.8	1	51.3	63.0	57.2	4	27.3	1
JBSC-1	23.8	51.3	37.6	5	35.1	61.1	48.1	5	48.9	63.8	56.4	6	23.7	4
JBSC-4	24.0	50.5	37.3	4	36.3	59.9	48.1	5	59.6	64.8	62.2	1	24.5	3
Wardan (NC)	23.0	49.3	36.2	1	34.5	59.1	46.8	2	50.5	62.4	56.5	5	10.7	7
Mescavi (NC)	27.4	45.2	36.3	2	39.7	54.7	47.2	4	53.7	65.2	59.5	2	13.2	6
BB-2 ZC (NWZ-CZ)	27.1	45.6	36.4	3	36.4	57.7	47.1	3	53.4	65.0	59.2	3	16.0	5
<b>Mean</b>	<b>25.7</b>	<b>48.7</b>	<b>37.2</b>		<b>36.7</b>	<b>57.8</b>	<b>47.3</b>		<b>52.4</b>	<b>63.7</b>	<b>58.0</b>		<b>20.1</b>	

**Table 3.1: AVT-2 (Seed): Second Advanced Varietal Trial in Berseem (Seed) (SC): Seed Yield (q/ha)**

Entries	North West Zone					Central Zone							All India		
	His-ar	Ludh-iana	Aver-age	Ran-k	Superi- ority%	Jha- nsi	Urulikan- chan	Jabal- pur	Rah- uri	Aver- age	Ran- k	Superi- ority%	Aver- age	Ran- k	Superi- ority%
JBSC-3	9.58	10.70	10.14	3	7.1	1.04	0.78	2.97	12.79	4.39	4	2.6	6.31	3	5.0
JBSC-4	10.14	11.50	10.82	2	14.3	0.99	2.94	3.86	12.69	5.12	1	19.6	7.02	1	16.8
JBSC-1	8.06	10.70	9.38	5		0.63	1.31	4.66	12.16	4.69	3	9.5	6.25	4	3.9
JBSC-2	10.28	12.40	11.34	1	19.7	0.53	2.17	3.48	13.13	4.83	2	12.9	7.00	2	16.5
Wardan (NC)	5.64	6.00	5.82	7		0.27	1.22	5.44	7.66	3.65	6		4.37	7	
Mescavi (NC)	7.78	9.70	8.74	6		0.16	3.53	2.56	3.20	2.36	7		4.49	6	
BB-2 ZC (NWZ-CZ)	6.33	12.60	9.47	4		0.24	2.50	5.99	8.41	4.28	5		6.01	5	
<b>Mean</b>	<b>8.26</b>	<b>10.51</b>	<b>9.39</b>			<b>0.55</b>	<b>2.06</b>	<b>4.14</b>	<b>10.01</b>	<b>4.19</b>			<b>5.92</b>		
<b>CD at 5%</b>	2.41	1.25				0.20	0.65	0.80	1.74						
<b>CV%</b>	17.22	1.32				12.58	17.63	10.85	9.75						

#### 4. IVTO (SC): INITIAL VARIETAL TRIAL IN OAT (SINGLE CUT) (Reference tables 4.1 to 4.9)

In Oat (single cut), nine entries along with two national checks namely OS-6 and Kent and five zonal checks *viz.*, SKO-90, OL-125, JHO-99-2, JHO-822 and JHO-2000-4 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 UPO-10-3 (12.5%) OS-424 (11.9%), SKO-228 (4.9%) in Hill zone; entries UPO-10-3 (18.6%), OL-1802-1 (16.7%), OS-424 (15.0%) OL-1769-1 (14.2%), JO-04-19 (13.6%), OL-1766-1 (12.3%), SKO-225 (2.3%) in North West zone; OL-1802-1 (2.3%) and OL-1766-1 (1.4%) in North East zone; OL-1802-1 (15.1%), OL-1766-1 (12.8%), OS-424 (9.8%), SKO-225 (9.5%), OL-1769-1 (8.1%) and JO-04-19 (3.0%) in Central zone; entries OS-432 (1.9%) in South zone exhibited superiority over best national/zonal check. At national level, entry OL-1802-1 with 12.6 per cent superiority was best performer.

For dry matter yield (q/ha), entries OS-424 (15.3%), UPO-10-3 (11.4%) and SKO-228 (6.7%) in Hill zone; entries OS-424 (11.3%), OL-1802-1 (8.8%), OL-1769-1 (5.4%) and OL-1766-1 (2.9%) in North West zone; entries OL-1766-1 (2.5%), OS-424 (2.3%) and OL-1769-1 (1.2%) in North East zone; entries OS-424 (23.6%), OL-1766-1 (16.7%), OL-1769-1 (15.9%), OL-1802-1 (14.7%), SKO-225 (13.0%) and JO-04-19 (6.9%) in central zone and entries OS-432 (5.3%) and OL-1766-1 (1.0%) in South zone exhibited superiority over checks. At national level, OS-424 (9.9%) was best performer.

For fodder production potential (q/ha/day), OL-1766-1 for green forage yield and dry matter yield registered its superiority. For plant height, OL-1766-1 was again adjudged best performer. For the character leafiness (L/S ratio), entry SKO-228 ranked first.

For quality parameters, entry OS-424 for crude protein yield (q/ha) and SKO-228 for crude protein content (%) proved superiority. For other quality parameters, entry OL-1766-1 for NDF (%), SKO-228 for ADF (%) and OL-1802-1 for IVDMD (%) and DDM (q/ha) registered superiority over best national check.

**Table 4.1: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Green Forage Yield (q/ha)**

Entries	Hill Zone					North West Zone									
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Superi- ority%	Bika- ner	Jal- ore	His- ar	Ludh- iana	Pant- nagar	Udai- pur	Aver- age	Ra-nk	Superi- ority%	
SKO-228	348.9	498.4	423.6	3	4.9	93.0	285.0	533.3	388.9	340.7	363.0	334.0	12		
OL-1769-1	268.0	484.9	376.4	6		235.3	205.0	792.6	735.2	622.2	700.0	548.4	4	14.2	
OS-424	423.1	480.7	451.9	2	11.9	244.7	153.3	811.1	888.9	548.1	670.4	552.7	3	15.0	
OL-1802-1	287.5	432.2	359.9	8		296.8	144.0	1000.0	648.1	599.9	674.8	560.6	2	16.7	
OS-432	295.1	418.9	357.0	9		195.6	131.3	737.0	564.8	418.5	696.3	457.3	10		
JO-04-19	280.0	431.2	355.6	10		227.8	140.0	944.4	559.3	659.2	741.5	545.4	5	13.6	
UPO-10-3	459.1	449.4	454.2	1	12.5	287.1	249.0	1074.1	633.7	603.6	568.9	569.4	1	18.6	
OL-1766-1	295.5	451.4	373.5	7		233.9	141.7	896.3	555.6	584.4	825.9	539.6	6	12.3	
SKO-225	281.3	522.2	401.8	5		202.6	160.0	851.9	550.0	500.0	685.2	491.6	7	2.3	
Kent (NC)	240.4	445.2	342.8	12		211.3	140.7	833.3	511.1	459.2	618.5	462.3	9		
OS-6 (NC)	254.2	435.4	344.8	11		203.1	133.7	696.3	466.7	425.9	631.9	426.3	11		
SKO-90 ZC (HZ)	340.0	467.5	403.7	4											
OL-125 ZC (NWZ)						251.9	170.7	714.8	518.5	507.4	718.5	480.3	8		
<b>Mean</b>	<b>314.4</b>	<b>459.8</b>	<b>387.1</b>			<b>223.6</b>	<b>171.2</b>	<b>823.8</b>	<b>585.1</b>	<b>522.4</b>	<b>657.9</b>	<b>497.3</b>			
<b>CD at 5%</b>	53.7	33.7				50.9	27.7	148.3	84.0	121.0	127.8				
<b>CV%</b>	10.1	8.1				13.4	9.1	10.6	8.5	13.7	11.5				

**Table 4.1: IVT Oat (SC): Initial Varietal Trial in Oat (SC): 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	Kan- pur	Pa-lghar	Ana- nd	Jabal- pur	Rai- pur	Aver-age	Ra-nk	Superi- ority%	
SKO-228	239.1	312.1	317.9	280.0	425.0	480.0	283.1	333.9	10		371.5	303.9	768.0	448.2	359.0	491.5	318.4	437.2	11			
OL-1769-1	319.9	354.6	322.6	240.0	450.0	362.7	408.2	351.1	7		518.0	596.3	808.0	500.0	273.2	565.0	474.5	413.5	518.6	5	8.1	
OS-424	272.4	370.1	348.8	275.6	414.0	421.3	426.7	361.3	4		551.9	680.6	513.0	614.8	294.9	621.0	458.5	479.0	526.7	3	9.8	
OL-1802-1	325.0	329.6	311.9	288.9	418.0	469.3	446.8	369.9	1	2.3	535.0	837.6	630.6	625.9	244.7	667.0	479.8	397.3	552.2	1	15.1	
OS-432	309.3	334.0	247.4	231.1	451.0	544.0	329.3	349.4	8		479.5	444.9	744.0	596.3	226.5	411.0	433.2	220.8	444.5	10		
JO-04-19	286.9	359.6	291.3	240.0	406.0	517.3	295.3	342.3	9		502.6	561.2	726.4	581.5	254.0	515.0	565.2	247.7	494.2	6	3.0	
UPO-10-3	271.7	354.6	391.0	266.7	381.0	506.7	352.1	360.5	5		539.6	399.6	250.7	511.1	593.0	474.5	224.2	427.5	12			
OL-1766-1	265.0	323.2	303.3	271.1	433.0	541.3	428.2	366.4	2	1.4	528.8	662.6	706.6	592.6	534.0	450.5	310.7	540.8	2	12.8		
SKO-225	247.4	342.6	287.4	271.1	373.0	522.7	251.4	327.9	11		465.6	614.9	891.7	511.1	544.0	362.5	287.2	525.3	4	9.5		
Kent (NC)	329.3	340.1	284.6	253.3	455.0	506.7		361.5	3		433.2	490.3	730.6	470.4	217.9	531.0	390.5	327.0	448.9	9		
OS-6 (NC)	259.9	338.8	257.9	284.4	433.0	514.7	414.4	357.6	6		488.7	600.5	713.3	537.0	294.8	559.0	449.2	177.3	477.5	8		
JHO-99-2 ZC (NEZ)	245.8	341.0	272.6	293.3	381.0	517.3	478.0	361.3	4													
JHO-822 ZC (CZ)											465.6	562.1	684.0	574.1	256.9	566.0	447.8	280.1	479.6	7		
<b>Mean</b>	<b>281.0</b>	<b>341.7</b>	<b>303.1</b>	<b>266.3</b>	<b>418.3</b>	<b>492.0</b>	<b>374.0</b>	<b>353.6</b>			<b>490.0</b>	<b>562.9</b>	<b>680.6</b>	<b>546.9</b>	<b>257.9</b>	<b>538.8</b>	<b>456.5</b>	<b>306.9</b>	<b>489.4</b>			
<b>CD at 5%</b>	5.4	16.9	13.6	31.2	36.7	69.0	13.7				17.4	83.7	82.7	49.6	12.1	98.7	86.8	24.5				
<b>CV%</b>	5.6	5.4	3.5	6.9	8.2	8.4	3.0				10.3	8.8	7.1	5.4	2.7	10.8	12.2	4.7				

**Table 4.1: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Green Forage Yield (q/ha)**

Entries	South Zone								All India		
	Hyderabad	Mandya	Coimbatore	Raichur	Mattupetty	Average	Rank	Superiority%	Average	Rank	Superiority%
SKO-228	414.8	225.7	137.0	122.5	105.5	201.1	12		342.8	11	
OL-1769-1	355.5	313.6	351.9	127.8	301.1	290.0	11		432.1	5	6.3
OS-424	422.2	316.4	351.9	197.0	274.4	312.4	10		447.3	3	10.0
OL-1802-1	418.5	306.4	470.4	213.0	331.1	347.9	6		458.2	1	12.6
OS-432	444.4	333.3	555.6	181.0	333.3	369.5	1	1.9	403.8	10	
JO-04-19	429.6	331.5	474.1	170.4	393.7	359.9	3		433.3	4	6.6
UPO-10-3	407.4	300.3	407.4	194.3	291.1	320.1	9		423.8	7	4.2
OL-1766-1	414.8	322.2	492.6	154.4	381.1	353.0	4		448.2	2	10.2
SKO-225	377.7	365.4	425.9	143.8	431.1	348.8	5		424.8	6	4.5
Kent (NC)	594.4	297.3	344.4	133.1	353.3	344.5	7		405.3	9	
OS-6 (NC)	459.2	275.3	585.2	159.7	334.4	362.7	2		406.6	8	
JHO-2000-4 ZC (SZ)	403.7	278.9	448.1	186.3	347.7	332.9	8				
<b>Mean</b>	<b>428.5</b>	<b>305.5</b>	<b>420.4</b>	<b>165.3</b>	<b>323.2</b>	<b>328.6</b>			<b>420.6</b>		
<b>CD at 5%</b>	43.2	59.7	69.3	46.5	52.3						
<b>CV%</b>	6.0	11.9	9.7	16.6	11.5						

**Table 4.2: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Dry Matter Yield (q/ha)**

Entries	Hill Zone					North West Zone							
	Palam-pur	Sri-nagar	Aver-age	Ran-k	Superi-osity%	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Mee-rut	Aver-age	Ran-k	Superi-osity%
SKO-228	69.4	113.2	91.3	3	6.7	24.1	45.2	81.6	61.6	88.8	60.3	12	
OL-1769-1	54.8	110.1	82.4	6		61.7	104.7	155.1	106.3	43.3	94.2	3	5.4
OS-424	87.0	110.4	98.7	1	15.3	59.6	104.9	186.9	96.7	49.6	99.5	1	11.3
OL-1802-1	57.3	98.1	77.7	8		88.9	126.4	136.1	92.2	42.7	97.3	2	8.8
OS-432	58.5	94.9	76.7	10		51.7	100.7	119.2	87.8	56.2	83.1	8	
JO-04-19	56.4	97.6	77.0	9		50.8	112.2	117.6	107.0	51.1	87.7	7	
UPO-10-3	89.1	101.7	95.4	2	11.4	82.7	99.6	133.5	83.2	43.7	88.5	6	
OL-1766-1	58.8	103.5	81.2	7		64.4	111.4	117.4	110.5	56.2	92.0	4	2.9
SKO-225	55.9	118.3	87.1	4		50.7	113.9	115.8	80.7	43.7	80.9	9	
Kent (NC)	47.5	99.7	73.6	12		51.3	124.8	107.4	108.1	55.5	89.4	5	
OS-6 (NC)	49.6	98.8	74.2	11		55.0	96.3	98.7	77.0	50.7	75.5	11	
SKO-90 ZC (HZ)	65.3	105.9	85.6	5									
OL-125 ZC (NWZ)						63.2	85.8	108.9	83.1	37.7	75.8	10	
<b>Mean</b>	<b>62.5</b>	<b>104.4</b>	<b>83.4</b>			<b>58.7</b>	<b>102.2</b>	<b>123.2</b>	<b>91.2</b>	<b>51.6</b>	<b>85.4</b>		
<b>CD at 5%</b>	11.3	8.1				13.1	27.2	17.4	16.9	9.1			
<b>CV%</b>	10.7	7.8				13.1	15.7	6.3	10.9	10.4			

**Table 4.2: IVT Oat (SC): Initial Varietal Trial in Oat (SC): 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	Kan-pur	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Superi- ority%
SKO-228	44.7	89.5	66.4	62.0	83.8	98.7	58.7	72.0	12		97.9	50.2	153.6	155.5		54.1	107.0	57.6	96.6	11	
OL-1769-1	60.4	100.5	64.3	96.1	89.5	80.5	101.1	84.6	3	1.2	87.9	111.2	188.3	174.1	75.6	83.6	104.5	122.4	118.4	3	15.9
OS-424	47.9	103.6	73.1	90.5	81.8	88.0	113.5	85.5	2	2.3	111.6	155.6	101.5	213.3	86.7	114.3	98.0	128.4	126.2	1	23.6
OL-1802-1	58.1	90.1	66.1	80.1	83.3	84.8	94.5	79.6	9		60.2	157.1	135.5	217.4	71.5	113.5	104.0	78.7	117.2	4	14.7
OS-432	53.0	93.5	51.9	85.3	89.0	110.4	86.3	81.3	7		109.6	59.4	153.4	206.6	66.5	72.8	91.2	42.3	100.2	8	
JO-04-19	49.9	103.1	62.4	84.3	79.5	103.5	61.8	77.8	11		90.5	112.8	139.6	201.5	70.8	79.7	124.1	54.6	109.2	6	6.9
UPO-10-3	47.9	97.0	78.4	75.6	75.8	102.4	69.1	78.0	10		108.0	76.8	54.7	177.0		107.9	101.2	36.3	94.6	12	
OL-1766-1	50.1	95.9	62.1	103.3	86.4	108.3	94.1	85.7	1	2.5	89.4	114.3	136.1	205.5		81.7	95.7	110.9	119.1	2	16.7
SKO-225	39.6	94.9	60.5	102.0	73.7	106.4	74.7	78.8	8		96.0	113.2	184.2	177.0		74.0	69.0	94.1	115.4	5	13.0
Kent (NC)	63.9	93.0	59.3	87.9	89.6	107.7		83.6	4		95.5	80.2	167.7	163.3	66.8	72.7	75.0	64.6	98.2	9	
OS-6 (NC)	51.0	94.9	55.0	96.1	86.4	96.4	94.1	82.0	6		83.0	115.5	145.6	185.9	84.0	85.0	95.8	22.3	102.1	7	
JHO-99-2 ZC (NEZ)	39.9	101.1	56.7	90.5	76.1	107.2	111.6	83.3	5												
JHO-822 ZC (CZ)											90.8	92.3	96.6	198.9	78.9	82.6	95.0	48.1	97.9	10	
<b>Mean</b>	<b>50.5</b>	<b>96.4</b>	<b>63.0</b>	<b>87.8</b>	<b>82.9</b>	<b>99.5</b>	<b>87.2</b>	<b>81.0</b>			<b>93.4</b>	<b>103.2</b>	<b>138.1</b>	<b>189.7</b>	<b>75.1</b>	<b>85.2</b>	<b>96.7</b>	<b>71.7</b>	<b>107.9</b>		
<b>CD at 5%</b>	3.6	6.5	3.3	20.7	7.3	11.2	9.7				12.6	14.7	16.4	17.1	4.4	16.3	19.0	11.3			
<b>CV%</b>	8.7	10.2	4.2	13.8	7.8	6.7	9.3				7.4	8.4	7.0	5.3	3.3	11.3	11.6	13.7			

**Table 4.2: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Dry Matter Yield (q/ha)**

Entries	South Zone						All India			
	Hyderabad	Mandya	Coimbatore	Mattupetty	Average	Rank	Superiority%	Average	Rank	Superiority%
SKO-228	84.4	45.5	30.4	16.2	44.1	12		73.6	11	
OL-1769-1	79.9	91.8	72.9	60.1	76.2	10		95.4	3	6.7
OS-424	87.1	63.7	54.2	49.1	63.5	11		98.3	1	9.9
OL-1802-1	95.9	66.0	107.3	54.4	80.9	8		94.6	4	5.8
OS-432	102.3	98.2	135.0	69.3	101.2	1	5.3	90.2	6	0.9
JO-04-19	91.2	66.2	83.0	86.9	81.8	7		89.9	7	0.6
UPO-10-3	94.9	67.4	97.0	53.1	78.1	9		86.2	10	
OL-1766-1	98.9	81.3	125.2	83.1	97.1	2	1.0	97.8	2	9.3
SKO-225	85.4	57.5	103.5	96.8	85.8	5		91.3	5	2.1
Kent (NC)	123.6	66.7	79.0	83.7	88.3	4		89.4	8	
OS-6 (NC)	110.1	60.7	127.9	85.7	96.1	3		88.5	9	
JHO-2000-4 ZC (SZ)	93.3	60.9	110.8	76.2	85.3	6				
<b>Mean</b>	<b>95.6</b>	<b>68.8</b>	<b>93.9</b>	<b>67.9</b>	<b>81.5</b>			<b>90.5</b>		
<b>CD at 5%</b>	14.6	15.8	17.1	10.1						
<b>CV%</b>	9.0	13.5	10.8	10.5						

**Table 4.3: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Green Forage Yield (q/ha/day)**

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Ran-chi	Bhuban-eswar	Pu-sa	Faiza-bad	Jha-nsi	Rah-uri	Urulikan-chan	Kan-pur	Pal-ghar	Ana-nd	Rai-pur	Hydera-bad	Coimb-atore	Aver-age	Ran-k
SKO-228	2.35	0.67	4.70	3.20	2.97	2.03	3.63	2.88	4.82	4.62	4.36	2.97	2.74	8.73	4.35		3.02	3.00	5.48		3.70	9
OL-1769-1	2.14	2.28	7.00	6.00	5.74	3.82	4.55	2.47	4.14	4.69	4.02	5.76	7.85	10.10	6.17	3.36	6.21	3.94	3.60	4.29	4.91	4
OS-424	3.04	2.38	7.20	7.30	5.03	2.77	4.30	3.44	5.63	4.50	4.29	5.21	6.81	5.46	7.23	4.02	6.27	4.48	5.32	4.09	4.94	3
OL-1802-1	2.20	2.54	8.80	5.30	5.26	3.71	3.83	2.98	3.85	4.49	4.94	5.57	8.82	6.50	7.73	3.15	6.74	3.90	5.03	5.23	5.03	2
OS-432	2.33	1.90	6.50	4.60	3.86	4.07	4.28	2.51	3.02	4.75	6.11	5.33	6.85	9.54	7.36	3.29	5.48	1.92	5.47	6.54	4.78	6
JO-04-19	2.14	2.21	8.40	4.60	5.78	3.44	4.18	2.61	3.43	4.37	4.56	5.58	6.24	8.55	7.36	3.24	5.66	2.36	5.44	5.39	4.78	6
UPO-10-3	3.29	2.45	9.50	5.20	5.00	2.92	4.12	2.75	5.08	4.23	4.69	4.95	3.81	2.64	6.01		5.39	2.26	6.52	4.29	4.48	8
OL-1766-1	2.27	2.27	7.90	4.60	5.13	3.29	3.76	2.79	4.04	4.56	5.58	5.51	8.08	8.83	7.32		5.87	2.88	5.98	5.47	5.06	1
SKO-225	2.23	1.97	7.50	4.50	4.67	3.16	4.39	2.88	4.17	4.09	5.87	5.17	7.41	10.87	6.81		6.55	2.71	5.51	5.19	5.03	2
Kent (NC)	1.90	2.05	7.40	4.20	4.29	4.17	3.96	2.69	4.38	4.79	5.69	4.81	5.77	7.69	6.14	2.93	5.84	1.67	7.70	4.05	4.61	7
OS-6 (NC)	2.03	1.97	6.20	3.80	3.96	3.22	3.94	2.96	4.03	4.61	5.65	5.43	7.51	8.81	7.07	3.89	6.14	1.76	7.10	7.14	4.86	5
SKO-90 ZC (HZ)	2.31																					
OL-125 ZC (NWZ)		2.45	6.30	4.30	4.74																	
JHO-99-2 ZC (NEZ)						3.01	3.97	3.12	3.41	4.19	5.38											
JHO-822 ZC (CZ)												5.17	6.54	8.77	7.27	3.19	6.36	2.67				
JHO-2000-4 ZC (SZ)																			4.39	5.27		
<b>Mean</b>	<b>2.35</b>	<b>2.10</b>	<b>7.28</b>	<b>4.80</b>	<b>4.70</b>	<b>3.30</b>	<b>4.08</b>	<b>2.84</b>	<b>4.17</b>	<b>4.49</b>	<b>5.10</b>	<b>5.12</b>	<b>6.53</b>	<b>8.04</b>	<b>6.74</b>	<b>3.38</b>	<b>5.79</b>	<b>2.80</b>	<b>5.63</b>	<b>5.18</b>	<b>4.74</b>	

**Table 4.4: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Dry Matter Yield (q/ha/day)**

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Jha-nsi	Rah-uri	Urulikan-chan	Kan-pur	Pal-ghar	Ana-nd	Rai-pur	Hydera-bad	Coimb-atore	Aver-age	Ran-k
SKO-228	0.17	0.40	0.70	0.54	0.38	1.04	1.01	0.64	0.91	0.89	0.78	0.45	1.75	1.51		0.05	0.54	1.12		0.76	9
OL-1769-1	0.60	0.93	1.30	0.98	0.72	1.29	0.82	0.99	0.93	0.89	0.98	1.46	2.35	2.15	0.93	0.07	1.17	0.81	0.89	1.07	3
OS-424	0.58	0.93	1.50	0.89	0.47	1.21	1.18	1.13	0.89	0.90	1.05	1.56	1.08	2.51	1.18	0.10	1.20	1.10	0.63	1.06	4
OL-1802-1	0.76	1.12	1.10	0.81	0.66	1.05	0.82	0.83	0.89	0.89	0.63	1.65	1.40	2.68	0.92	0.10	0.77	1.15	1.19	1.02	6
OS-432	0.50	0.89	1.00	0.81	0.66	1.20	0.63	0.93	0.94	1.24	1.22	0.91	1.97	2.55	0.96	0.11	0.39	1.26	1.59	1.04	5
JO-04-19	0.49	0.99	1.00	0.94	0.60	1.20	0.73	0.91	0.85	1.11	1.01	1.25	1.64	2.55	0.90	0.07	0.52	1.16	0.94	0.99	7
UPO-10-3	0.71	0.88	1.10	0.69	0.52	1.13	1.02	0.78	0.84	0.99	0.99	0.73	0.58	2.08		0.07	0.37	1.52	1.02	0.89	8
OL-1766-1	0.62	0.99	1.00	0.97	0.62	1.10	0.83	1.06	0.91	1.11	0.93	1.39	1.70	2.54		0.10	1.03	1.43	1.39	1.10	1
SKO-225	0.49	1.01	0.90	0.75	0.51	1.22	0.88	1.08	0.81	1.19	1.07	1.36	2.25	2.36		0.09	0.89	1.25	1.26	1.08	2
Kent (NC)	0.50	1.10	0.90	1.01	0.81	1.08	0.91	0.94	0.94	1.21	1.06	0.94	1.77	2.15	0.90	0.09	0.95	1.60	0.93	1.04	5
OS-6 (NC)	0.53	0.85	0.80	0.72	0.63	1.10	0.86	1.00	0.92	1.05	0.92	1.44	1.80	2.45	1.11	0.10	0.22	1.71	1.56	1.04	5
SKO-90 ZC (HZ)																					
OL-125 ZC (NWZ)	0.61	0.76	0.90	0.78																	
JHO-99-2 ZC (NEZ)					0.49	1.18	0.71	0.96	0.84	1.11											
JHO-822 ZC (CZ)											1.01	1.07	1.24	2.52	0.98	0.08	0.46				
JHO-2000-4 ZC (SZ)																		1.02	1.30		
<b>Mean</b>	<b>0.55</b>	<b>0.90</b>	<b>1.02</b>	<b>0.82</b>	<b>0.59</b>	<b>1.15</b>	<b>0.87</b>	<b>0.94</b>	<b>0.89</b>	<b>1.05</b>	<b>0.97</b>	<b>1.19</b>	<b>1.63</b>	<b>2.34</b>	<b>0.99</b>	<b>0.09</b>	<b>0.71</b>	<b>1.26</b>	<b>1.16</b>	<b>1.01</b>	

**Table 4.5: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Crude Protein Yield (q/ha)**

Entries	Palam-pur	Ludh-iana	His-ar	Jor-hat	Bhuban-eswar	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Man-dya	Coimb-atore	Hydera-bad	Aver-age	Ran-k
SKO-228	5.8	7.4	4.4	4.3	6.1	8.3	2.3	4.5	10.9	5.7	8.8	4.5	2.6	4.4	7.4	5.8	8
OL-1769-1	5.3	13.0	10.5	5.6	6.2	6.5	3.3	10.8	14.4	6.6	8.8	9.0	6.0	7.3	4.9	7.9	3
OS-424	6.6	17.4	10.7	4.9	6.7	7.3	3.9	13.9	9.5	10.2	8.0	10.5	5.3	6.4	4.6	8.4	1
OL-1802-1	5.0	10.2	12.6	5.0	6.1	7.0	3.4	11.3	11.2	9.5	8.4	6.2	5.7	10.9	5.9	7.9	3
OS-432	5.1	9.4	10.1	5.0	4.7	9.4	3.2	5.8	13.0	8.6	7.5	3.6	6.1	15.4	6.2	7.5	5
JO-04-19	5.4	10.5	11	4.8	5.6	8.5	2.2	10.6	11.8	6.6	10.9	5.1	4.3	10.1	5.7	7.5	5
UPO-10-3	8.6	9.3	8.9	5.0	7.5	8.5	2.3	7.5	4.6	7.7	8.1	2.8	4.4	12.3	8.3	7.0	7
OL-1766-1	5.5	8.8	12.1	5.0	5.8	9.2	3.1	11.6	11.4	9.0	7.2	7.0	6.1	10.4	4.7	7.8	4
SKO-225	5.4	8.3	11.2	4.0	5.5	8.5	2.7	10.2	17.4	7.4	5.2	7.0	4.8	14.5	8.2	8.0	2
Kent (NC)	4.4	10.0	12.2	6.2	5.4	8.6		7.5	12.8	8.0	5.5	5.6	6.4	9.7	8.6	7.9	3
OS-6 (NC)	4.3	7.3	9.8	4.9	4.9	8.1	3.0	10.4	12.5	9.2	7.6	1.9	4.5	10.8	8.1	7.2	6
SKO-90 ZC (HZ)	5.5																
OL-125 ZC (NWZ)		8.2	8.8														
JHO-99-2 ZC (NEZ)				4.1	5.2	9.0	3.7										
JHO-822 ZC (CZ)								7.5	9.4	7.4	7.6	4.2					
JHO-2000-4 ZC (SZ)													4.0	12.1	6.1		
<b>Mean</b>	<b>5.6</b>	<b>10.0</b>	<b>10.2</b>	<b>4.9</b>	<b>5.8</b>	<b>8.2</b>	<b>3.0</b>	<b>9.3</b>	<b>11.6</b>	<b>8.0</b>	<b>7.8</b>	<b>5.6</b>	<b>5.0</b>	<b>10.4</b>	<b>6.6</b>	<b>7.5</b>	

**Table 4.6: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Crude Protein (%)**

Entries	Palam-pur	Ludh-iana	His-ar	Jor-hat	Bhuban-eswar	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Man-dya	Coimba-tore	Mattu-petty	Hydera-bad	Ran-chi	Bika-ner	Aver-age	Ran-k
SKO-228	8.5	9.1	9.8	9.9	9.2	8.4	6.5	8.9	7.1	10.5	8.4	7.8	5.7	14.4	11.4	8.7	5.2	11.9	9.0	1
OL-1769-1	9.6	8.4	10.0	9.4	9.6	8.1	5.2	9.8	7.6	7.9	8.4	7.4	6.6	10.1	7.4	6.1	5.7	9.9	8.2	6
OS-424	7.6	9.3	10.2	10.4	9.1	8.3	4.7	8.9	9.3	8.9	8.2	8.2	8.3	11.8	7.4	5.3	7.4	9.4	8.5	3
OL-1802-1	8.8	7.5	10.0	8.7	9.3	8.3	4.6	7.2	8.2	8.4	8.2	7.8	8.7	10.1	7.4	6.1	5.2	9.4	8.0	7
OS-432	8.8	7.9	10.0	9.5	9.1	8.5	4.7	9.8	8.5	11.8	8.2	8.6	6.1	11.4	8.3	6.1	5.7	9.9	8.5	3
JO-04-19	9.6	8.9	9.8	9.7	8.9	8.2	5.5	9.4	8.5	8.3	8.4	9.4	6.6	12.3	6.6	6.1	6.1	11.3	8.5	3
UPO-10-3	9.6	7.0	9.0	10.5	9.5	8.3	4.9	9.8	8.4	7.1	8.1	7.6	6.6	12.7	8.3	8.7	5.7	10.5	8.5	3
OL-1766-1	9.3	7.5	10.8	10.1	9.3	8.5	4.7	10.2	8.3	11.0	7.7	6.3	7.4	8.3	10.1	4.8	6.6	9.9	8.4	4
SKO-225	9.6	7.2	9.8	10.2	9.1	8.0	4.9	9.0	9.5	10.0	7.4	7.5	8.3	14.0	9.2	9.4	6.6	10.2	8.9	2
Kent (NC)	9.3	9.3	9.8	9.8	9.1	8.0		9.4	7.7	11.0	7.4	8.7	9.5	12.3	6.6	7.0		10.5	9.0	1
OS-6 (NC)	8.8	7.4	10.2	9.6	9.0	8.4	4.9	9.0	8.6	10.9	8.1	8.8	7.4	8.3	6.6	7.4	6.1	10.6	8.3	5
SKO-90 ZC (HZ)	8.5																			
OL-125 ZC (NWZ)		7.5	10.2															10.5		
JHO-99-2 ZC (NEZ)				10.4	9.2	8.4	5.0										6.1			
JHO-822 ZC (CZ)								8.1	9.7	9.0	8.1	8.8								
JHO-2000-4 ZC (SZ)													6.6	10.9	7.4	6.6				
<b>Mean</b>	<b>9.0</b>	<b>8.1</b>	<b>10.0</b>	<b>9.8</b>	<b>9.2</b>	<b>8.3</b>	<b>5.1</b>	<b>9.1</b>	<b>8.5</b>	<b>9.6</b>	<b>8.0</b>	<b>8.1</b>	<b>7.3</b>	<b>11.4</b>	<b>8.1</b>	<b>6.9</b>	<b>6.0</b>	<b>10.3</b>	<b>8.5</b>	

**Table 4.7: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Plant Height (cm)**

Entries	Palam-pur	Sri-nagar	Bika-ner	Jal-ore	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Meer-ut	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	CAU Imphal	Jha-nsi
SKO-228	118.3	164.0	90.0	71.7	68.9	105.0	80.0	29.3	110.0	88.7	91.5	170.9	91.6	70.5	70.1	114.9
OL-1769-1	136.0	169.7	147.0	140.0	110.1	139.0	167.7	155.3	100.0	151.2	147.9	173.3	85.8	138.0	126.1	140.4
OS-424	133.3	158.7	123.0	141.7	114.0	131.0	165.7	142.6	100.0	148.7	142.7	167.4	119.6	127.2	132.4	159.1
OL-1802-1	119.7	119.3	128.0	121.7	118.1	128.7	169.3	143.3	100.0	161.9	130.9	165.1	118.5	124.5	122.9	146.8
OS-432	134.7	149.3	124.0	110.0	116.2	123.7	157.1	135.1	110.0	129.3	148.3	139.9	112.3	134.5	116.1	143.8
JO-04-19	117.0	149.7	99.0	107.3	108.0	125.7	162.7	126.7	105.0	147.9	124.4	158.2	105.6	130.7	118.4	132.2
UPO-10-3	114.7	130.7	115.0	115.0	111.6	143.0	171.1	128.4	103.0	145.2	112.9	175.4	109.4	125.2	121.7	140.7
OL-1766-1	123.0	142.3	143.0	133.0	110.2	137.3	169.8	156.1	116.0	156.5	154.0	163.2	119.1	130.6	132.0	155.7
SKO-225	121.3	159.0	99.0	98.3	110.9	122.0	144.5	138.2	180.0	151.1	139.3	153.6	120.5	125.0	105.3	123.6
Kent (NC)	129.0	135.7	116.0	105.0	117.0	115.3	137.5	135.1	115.0	130.9	140.4	149.5	115.3	115.7		138.3
OS-6 (NC)	126.3	136.3	122.0	134.0	114.0	117.7	151.8	154.1	100.0	139.7	110.3	146.3	82.6	128.4	125.7	144.3
SKO-90 ZC (HZ)	128.0	158.0														
OL-125 ZC (NWZ)			125.0	131.7	116.0	126.3	162.9	148.1	110.0							
JHO-99-2 ZC (NEZ)										154.1	146.2	144.2	114.4	120.8	130.6	
JHO-822 ZC (CZ)																135.2
JHO-2000-4 ZC (SZ)																
<b>Mean</b>	<b>125.1</b>	<b>147.7</b>	<b>119.3</b>	<b>117.5</b>	<b>109.6</b>	<b>126.2</b>	<b>153.3</b>	<b>132.7</b>	<b>112.4</b>	<b>142.1</b>	<b>132.4</b>	<b>158.9</b>	<b>107.9</b>	<b>122.6</b>	<b>118.3</b>	<b>139.6</b>

**Table 4.7: IVT Oat (SC): Initial Varietal Trial in Oat (SC): Plant Height (cm)**

Entries	Rah-uri	Urulikan-ghan	Kan-pur	Pal-ghar	Ana-nd	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimba-tore	Rai-chur	Mattu-petty	Aver-age	Ran-k
SKO-228	56.4	136.6	90.2		78.5	125.5	109.5	93.1	60.8	38.3	81.4	48.8	90.9	11
OL-1769-1	126.4	115.3	126.5	142.0	146.1	115.3	121.0	96.2	82.5	120.3	96.3	108.9	129.4	2
OS-424	134.2	97.9	124.6	159.0	150.3	111.4	142.2	70.9	75.2	92.3	120.3	98.5	128.0	3
OL-1802-1	111.4	105.9	129.2	121.3	159.0	121.1	118.0	94.3	86.7	104.3	113.1	110.3	124.8	4
OS-432	88.0	113.3	119.5	116.3	127.8	110.9	133.0	102.7	73.3	151.0	99.7	102.6	122.2	6
JO-04-19	111.9	121.1	122.8	127.7	133.9	134.9	133.1	95.5	67.0	106.0	106.7	128.1	121.7	7
UPO-10-3	118.6	59.6	123.1		146.4	129.1	104.4	100.5	56.6	106.7	93.5	104.8	118.7	9
OL-1766-1	120.0	104.8	128.3		156.1	103.9	166.2	93.0	64.8	131.0	122.3	123.7	131.7	1
SKO-225	108.2	114.0	129.2		134.0	93.1	114.0	102.9	66.8	129.0	99.1	131.4	122.7	5
Kent (NC)	105.8	113.4	120.9	96.0	133.7	95.0	109.5	88.5	74.8	98.7	100.0	132.0	117.2	10
OS-6 (NC)	117.4	106.8	121.2	132.0	128.2	108.9	104.5	82.5	57.4	151.0	114.4	114.0	120.4	8
SKO-90 ZC (HZ)														
OL-125 ZC (NWZ)														
JHO-99-2 ZC (NEZ)														
JHO-822 ZC (CZ)	105.2	112.7	118.7	113.3	139.1	107.7	109.9							
JHO-2000-4 ZC (SZ)								94.1	58.1	106.7	109.4	117.9		
<b>Mean</b>	<b>108.6</b>	<b>108.4</b>	<b>121.2</b>	<b>126.0</b>	<b>136.1</b>	<b>113.1</b>	<b>122.1</b>	<b>92.9</b>	<b>68.7</b>	<b>111.3</b>	<b>104.7</b>	<b>110.1</b>	<b>120.7</b>	

**Table 4.8: IVT Oat (SC): Initial Varietal Trial in Oat (SC): 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	CAU Imphal	Rah-uri	Urulikan-chan	Kan-pur	Pal-ghar	Jabal-pur	Rai-pur	Hydera-bad	Man-dya	Coimba-tore	Ave-rage	Ran-k
SKO-228	0.45	0.52	1.18	0.79	0.67	0.91	0.70	0.81	1.09	0.51	0.63	0.34	1.90	0.91	0.44		0.66	0.39	0.48	0.46	1.00	0.74	1
OL-1769-1	0.36	0.49	0.51	0.49	0.56	0.39	0.73	0.93	1.18	0.26	0.61	0.29	0.45	0.85	0.33	0.88	0.52	0.91	0.49	0.33	0.27	0.56	8
OS-424	0.46	0.47	0.86	0.52	0.33	0.46	0.77	0.86	1.29	0.31	0.63	0.41	0.63	0.47	0.38	0.91	0.62	0.98	1.24	0.76	0.38	0.65	3
OL-1802-1	0.38	0.41	0.77	0.67	0.47	0.33	0.64	0.75	0.99	0.36	0.58	0.39	0.72	0.53	0.36	0.71	0.53	0.70	0.59	0.66	0.33	0.57	7
OS-432	0.43	0.38	0.58	0.47	1.04	0.33	0.93	0.92	0.81	0.24	0.71	0.39	0.55	0.59	0.32	0.78	0.48	0.41	0.43	0.26	0.29	0.54	9
JO-04-19	0.48	0.41	0.84	0.69	0.37	0.25	0.82	0.93	0.95	0.45	0.73	0.40	0.61	0.66	0.31	0.89	0.76	0.46	0.58	0.66	0.31	0.60	6
UPO-10-3	0.47	0.38	0.91	0.56	0.67	0.43	0.82	0.92	1.22	0.72	0.74	0.44	0.64	0.83	0.37		0.71	0.39	0.54	0.86	0.56	0.66	2
OL-1766-1	0.51	0.41	0.51	0.56	1.50	0.33	0.81	0.87	0.98	0.28	0.75	0.31	0.55	0.79	0.25		0.46	0.96	0.50	0.33	0.29	0.60	6
SKO-225	0.48	0.54	0.72	0.43	0.85	0.39	0.87	0.92	0.94	0.24	0.73	0.43	0.47	0.76	0.27		0.50	0.89	0.45	0.30	0.25	0.57	7
Kent (NC)	0.43	0.42	1.00	0.39	1.00	0.45	0.76	0.75	0.85	0.33	0.65		0.53	0.57	0.27	0.81	0.45	0.75	1.51	0.53	0.36	0.64	4
OS-6 (NC)	0.46	0.44	0.84	0.41	0.54	0.35	0.81	0.92	0.92	0.39	0.73	0.35	0.48	0.69	0.27	0.91	0.52	0.44	1.64	0.63	0.35	0.62	5
SKO-90 ZC (HZ)	0.51	0.48																					
OL-125 ZC (NWZ)			0.63	0.47	1.56	0.35																	
JHO-99-2 ZC (NEZ)							0.96	0.87	0.87	0.49	0.70	0.34											
JHO-822 ZC (CZ)													0.50	0.74	0.32	0.86	0.50	0.49					
JHO-2000-4 ZC (SZ)																			0.55	0.70	0.30		
<b>Mean</b>	<b>0.45</b>	<b>0.45</b>	<b>0.78</b>	<b>0.54</b>	<b>0.80</b>	<b>0.41</b>	<b>0.80</b>	<b>0.87</b>	<b>1.01</b>	<b>0.38</b>	<b>0.68</b>	<b>0.37</b>	<b>0.67</b>	<b>0.70</b>	<b>0.32</b>	<b>0.84</b>	<b>0.56</b>	<b>0.65</b>	<b>0.75</b>	<b>0.54</b>	<b>0.39</b>	<b>0.61</b>	

**Table 4.9: IVT Oat (SC): Initial Varietal Trial in Oat (SC): NDF (%), ADF (%), IVDMD (%) & DDM (q/ha)**

Entries	NDF (%)				ADF (%)		IVDMD (%)		DDM (q/ha)	
	Anand	Ludhiana	Average	Rank	Ludhiana	Rank	Hisar	Rank	Hisar	Rank
SKO-228	57.0	53.5	55.3	3	32.2	1	52.0	10	23.5	12
OL-1769-1	57.0	56.9	57.0	7	36.9	5	53.2	9	55.7	7
OS-424	54.0	56.4	55.2	2	32.8	3	56.6	4	59.4	6
OL-1802-1	57.0	57.9	57.5	8	38.9	7	57.5	1	72.7	1
OS-432	55.0	57.9	56.5	6	39.9	10	54.2	8	54.6	8
JO-04-19	54.0	57.3	55.7	4	37.3	6	54.6	7	61.3	5
UPO-10-3	53.0	58.4	55.7	4	36.6	4	54.2	8	54.0	9
OL-1766-1	51.0	57.4	54.2	1	39.8	9	57.4	2	63.9	3
SKO-225	56.0	59.3	57.7	9	38.9	8	55.6	6	63.3	4
Kent (NC)	58.0	54.3	56.2	5	32.4	2	56.8	3	70.9	2
OS-6 (NC)	56.0	56.9	56.5	6	40.3	12	49.4	11	47.6	11
SKO-90 ZC (HZ)										
OL-125 ZC (NWZ)		57.8			40.1	11	56.5	5	48.5	10
JHO-99-2 ZC (NEZ)										
JHO-822 ZC (CZ)	56.0									
JHO-2000-4 ZC (SZ)										
<b>Mean</b>	<b>55.3</b>	<b>57.0</b>	<b>56.1</b>		<b>37.2</b>		<b>54.8</b>		<b>56.3</b>	

## 5. AVTO (SC)-1: FIRST ADVANCED VARIETAL TRIAL IN OAT (SINGLE CUT) (Reference tables 5.1 to 5.9)

In Oat (single cut), eleven entries promoted from IVT were evaluated against two national checks (Kent and OS-6) and zonal checks in respective zones (JHO-99-2, OL-125, JHO-822 and JHO-2000-4) at 24 locations in four different zones of the country. For green forage yield (q/ha), entries RO-11-1 (5.0%), OS-406 (4.6%), OL-1804 (4.5%) and RSO-8 (3.3%) in North West zone; entries OL-1804 (16.9%), RO-11-1 (10.1%), JO-04-18 (8.8%) and JHO-13-5 (1.2%) in North-East zone; entries RO-11-1 (18.0%), RSO-8 (9.6%), SKO-199 (4.9%), SKO-198 (4.7%), OS-406 (1.4%) and NDO-952 (1.0%) in Central zone; entries RSO-8 (13.3%), OS-406 (12.2%), RO-11-1 (7.6%) OL-1804 (4.9%) and NDO-952 (3.5%) in South zone exhibited superiority over best check. At national level, all the test entries recorded their superiority over best national check except entries JHO-13-5 and OL-1689.

Similarly for dry matter yield (q/ha), entries RO-11-1 (13.3%), RSO-8 (11.8%), OL-1804 (10.3%), SKO-196 (9.1%), OL-1689 (5.4%), OS-406 (3.2%) and NDO-952 (2.4%) in North West zone; entries OL-1804 (12.8%), JO-04-18 (6.5%), RO-11-1 (6.0%) and RSO-8 (0.5%) in North-East zone; entries RO-11-1 (26.9%), RSO-8 (11.8%), OS-406 (10.7%), SKO-198 (9.8%), SKO-199 (9.4%), SKO-196 (5.8%) and NDO-952 (1.6%) in Central zone and entries RO-11-1 (9.2%), RSO-8 (3.5%) and OS-406 (2.3%) in South zone proved their superiority over respective best zonal or national check. At national level also all the test entries except JHO-13-5 and OL-1689 recorded their superiority over national check.

In green forage production and dry matter production potential (q/ha/day), entry RO-11-1 ranked first. For plant height (cm), entry RO-11-1 (126.0 cm) was ranked first. For the character leafiness, NDO-952 (0.82) was adjudged best performers.

For quality parameters, entry RO-11-1 (7.8 q/ha) for crude protein yield and RSO-8 (9.0%) for crude protein content ranked first. For other quality parameters, check variety OS-6 for NDF (%), RSO-8 for ADF (%), SKO-196 for IVDMD (%) and OS-406 for DDM (q/ha) were superior.

**Table 5.1: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Green Forage Yield (q/ha)**

Entries	North West Zone									North East Zone									
	Bika-ner	Jal-ore	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Aver-age	Ran-k	Super-iority%	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	CAU-Imphal	Aver-age	Ran-k	Super-iority%
JHO-13-5	306.2	147.3	697.2	541.7	505.4	425.0	437.1	12		248.8	427.3	265.0	373.3	403.0	281.9	395.1	342.1	4	1.2
OL-1689	373.1	143.7	641.7	675.0	458.2	455.5	457.9	10		244.5	403.5	275.0	250.0	373.0	325.7	421.4	327.6	9	
SKO-196	399.5	403.0	716.7	615.0	369.0	444.4	491.3	5		211.5	434.6	451.7	243.3	450.0	269.0	327.6	341.1	5	0.9
OS-406	336.3	175.3	730.6	644.4	584.5	612.2	513.9	2	4.6	281.3	487.6	242.0	210.0	374.0	247.6	401.4	320.5	13	
JO-04-18	332.2	103.0	711.1	581.9	600.8	405.5	455.8	11		298.4	541.5	382.1	166.7	460.0	310.8	414.7	367.7	3	8.8
RO-11-1	508.7	73.3	669.4	770.8	477.6	595.8	515.9	1	5.0	297.8	504.8	330.0	226.7	407.0	295.2	542.9	372.1	2	10.1
NDO-952	316.4	81.7	727.8	683.3	599.2	502.8	485.2	6		228.5	465.1	371.0	206.7	433.0	239.6	430.9	339.3	6	0.4
SKO-198	376.9	170.0	755.6	622.2	388.8	505.5	469.8	8		242.5	412.1	325.0	220.0	366.0	221.0	476.9	323.3	12	
SKO-199	409.8	170.0	733.3	463.9	627.0	477.8	480.3	7		135.0	508.1	273.5	196.7	388.0	203.8	373.6	297.0	14	
RSO-8	355.4	100.3	772.2	647.2	602.5	568.0	507.6	4	3.3	271.4	510.1	240.0	266.7	362.0	358.1		334.7	8	
OL-1804	355.8	95.0	725.0	654.2	617.3	633.3	513.4	3	4.5	312.0	498.7	433.7	310.0	450.0	366.5		395.1	1	16.9
Kent (NC)	307.1	102.3	586.1	594.4	510.9	508.3	434.8	13		296.0	444.0	302.0	246.7	373.0	259.0	365.1	326.6	10	
OS-6 (NC)	298.1	94.3	722.2	550.0	565.9	552.8	463.9	9		289.7	502.3	389.2	206.7	381.0	236.2	360.0	337.9	7	
OL-125 ZC (NWZ)	309.9	153.3	650.0	598.6	591.4	644.4	491.3	5											
JHO-99-2 ZC (NEZ)										273.4	440.4	356.0	246.7	429.0	219.0		327.4	11	
<b>Mean</b>	<b>356.1</b>	<b>143.8</b>	<b>702.8</b>	<b>617.3</b>	<b>535.6</b>	<b>523.7</b>	<b>479.9</b>			<b>259.3</b>	<b>470.0</b>	<b>331.2</b>	<b>240.7</b>	<b>403.5</b>	<b>273.8</b>	<b>410.0</b>	<b>339.4</b>		
<b>CD at 5%</b>	81.9	12.8	119.3	63.8	89.2	100.6				5.9	19.4	24.1	30.7	32.4	63.2	16.0			
<b>CV%</b>	13.5	5.0	10.0	6.2	9.9	11.3				5.8	2.5	4.34	7.8	7.8	14.1	3.2			

**Table 5.1: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Green Forage Yield (q/ha)**

Entries	Central Zone											South Zone						All India		
	Jha-nsi	Rah-uri	Urulikan-ghan	Pal-ghar	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ran-k	Super-iority%	Hydera-bad	Man-dya	Coimba-tore	Aver-age	Ran-k	Super-iority%	Aver-age	Ran-k	Super-iority%
JHO-13-5	170.7	275.4	655.0	274.2	788.9	486.7	442.0	255.6	418.6	10		394.3	244.7	352.8	330.6	11		389.9	12	
OL-1689	193.3	322.0	400.1	246.5	663.9	508.9	434.0	250.2	377.3	14		460.9	231.0	283.3	325.1	12		376.4	13	
SKO-196	189.8	262.2	679.1		752.8	497.8	375.0	264.0	431.5	8		410.9	246.8	397.2	351.6	8		409.2	6	3.4
OS-406	261.7	362.6	462.0	255.5	791.7	592.8	531.0	354.4	451.5	5	1.4	460.9	282.4	447.2	396.9	2	12.2	422.1	4	6.7
JO-04-18	206.3	356.7	394.3	268.2	716.7	488.9	564.0	299.1	411.8	12		416.5	255.9	383.3	351.9	7		402.4	8	1.7
RO-11-1	300.7	449.8	753.4	253.0	863.9	635.0	554.0	394.3	525.5	1	18.0	435.9	230.9	475.0	380.6	3	7.6	460.2	1	16.3
NDO-952	211.5	371.6	492.4	265.0	783.3	560.3	515.0	399.5	449.8	6	1.0	530.9	178.3	388.9	366.0	5	3.5	416.0	5	5.1
SKO-198	212.3	343.9	587.7		744.4	611.7	467.0	297.2	466.3	4	4.7	438.7	229.7	241.7	303.3	13		402.5	7	1.7
SKO-199	253.9	382.4	832.5	240.3	661.1	652.2	412.0	305.7	467.5	3	4.9	397.1	226.9	241.7	288.6	14		398.6	9	0.7
RSO-8	249.6	417.1	710.6	248.9	836.1	620.8	403.0	419.8	488.2	2	9.6	535.9	316.9	350.0	400.9	1	13.3	441.9	2	11.7
OL-1804	186.3	339.3	321.0	231.6	811.1	630.3	484.0	437.0	430.1	9		497.0	265.5	350.0	370.8	4	4.9	435.0	3	9.9
Kent (NC)		425.1	461.6	253.6	655.6	550.3	430.0	341.3	445.3	7		438.7	140.1	436.1	338.3	10		392.5	11	
OS-6 (NC)	168.1	344.2	662.9	213.1	691.7	506.9	427.0	305.5	414.9	11		416.5	192.4	419.4	342.8	9		395.7	10	
JHO-822 ZC (CZ)	192.4	359.5	308.2	268.2	677.8	641.1	440.0	385.6	409.1	13										
JHO-2000-4 ZC (SZ)												447.0	219.4	394.4	353.6	6				
<b>Mean</b>	<b>215.1</b>	<b>358.0</b>	<b>551.5</b>	<b>251.5</b>	<b>745.6</b>	<b>570.3</b>	<b>462.7</b>	<b>336.4</b>	<b>442.0</b>			<b>448.7</b>	<b>232.9</b>	<b>368.6</b>	<b>350.1</b>			<b>410.9</b>		
<b>CD at 5%</b>	15.7	58.4	37.0	21.9	40.7	44.9	87.8	28.1				113.6	31.8	52.4						
<b>CV%</b>	9.3	9.7	4.0	5.1	3.2	4.7	11.3	4.9				15.4	8.1	8.5						

**Table 5.2: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Dry Matter Yield (q/ha)**

Entries	North West Zone								North East Zone									
	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Mec-rut	Aver-age	Ra-nk	Super-iority%	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	CAU – Imphal	Aver-age	Ra-nk	Super-iority%
JHO-13-5	67.1	83.9	114.2	88.1	41.4	78.9	14		42.2	125.4	55.3	121.6	78.9	63.2	76.7	80.5	9	
OL-1689	78.2	80.2	142.4	78.7	59.1	87.7	5	5.4	45.9	115.6	56.3	77.9	74.9	67.0	84.2	74.5	13	
SKO-196	106.1	81.3	129.3	74.1	63.0	90.8	4	9.1	41.5	124.6	92.4	68.1	90.5	54.9	93.9	80.8	8	
OS-406	73.1	99.6	135.7	82.9	38.0	85.9	6	3.2	51.4	141.4	49.5	72.9	73.8	48.8	92.7	75.8	11	
JO-04-18	61.6	88.7	122.7	82.3	47.3	80.5	13		52.9	157.2	75.9	99.0	91.8	60.2	84.8	88.8	2	6.5
RO-11-1	103.3	90.0	162.3	76.6	39.4	94.3	1	13.3	57.1	141.3	67.2	74.4	80.8	60.6	137.2	88.4	3	6.0
NDO-952	63.5	90.3	143.9	83.6	45.0	85.2	7	2.4	45.2	138.0	78.2	78.9	85.9	59.0	81.1	80.9	7	
SKO-198	101.9	80.1	131.1	63.6	31.8	81.7	10		44.8	115.4	68.9	53.8	72.9	57.1	112.8	75.1	12	
SKO-199	94.2	79.1	97.8	107.0	32.5	82.1	9		25.7	147.4	55.1	72.8	77.1	52.6	92.4	74.7	14	
RSO-8	104.8	102.7	136.5	83.0	38.0	93.0	2	11.8	44.6	151.4	47.7	118.1	71.4	69.7		83.8	4	0.5
OL-1804	94.3	93.0	137.7	87.4	46.4	91.8	3	10.3	56.8	149.6	87.7	111.1	90.4	68.7		94.1	1	12.8
Kent (NC)	61.1	97.7	124.9	75.6	47.5	81.3	11		52.7	128.8	60.8	145.0	74.5	51.8	70.1	83.4	5	
OS-6 (NC)	73.9	98.2	115.7	80.4	47.8	83.2	8		54.3	140.7	81.1	81.3	76.4	57.1	80.3	81.6	6	
OL-125 ZC (NWZ)	59.8	86.4	126.1	86.2	45.0	80.7	12											
JHO-99-2 ZC (NEZ)									49.4	129.1	70.8	89.8	85.5	56.0		80.1	10	
<b>Mean</b>	<b>81.6</b>	<b>89.4</b>	<b>130.0</b>	<b>82.1</b>	<b>44.4</b>	<b>85.5</b>			<b>47.5</b>	<b>136.1</b>	<b>67.6</b>	<b>90.3</b>	<b>80.3</b>	<b>59.1</b>	<b>91.5</b>	<b>81.6</b>		
<b>CD at 5%</b>	23.7	27.8	13.4	12.7	6.3				3.2	7.0	6.3	26.9	8.1	6.7	9.8			
<b>CV%</b>	17.1	18.3	4.2	9.2	8.5				7.4	3.1	5.5	18.1	9.4	6.9	8.9			

**Table 5.2: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Dry Matter Yield (q/ha)**

Entries	Central Zone											South Zone						All India		
	Jha-nsi	Rah-uri	Urulikan-chan	Pal-ghar	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority%	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ra-nk	Super-iority%	Aver-age	Ra-nk	Super-iority%
JHO-13-5	48.4	59.7	131.0	76.9	268.2	62.8	98.1	66.5	101.4	10		88.1	54.9	74.7	72.5	12		86.4	11	
OL-1689	74.4	70.2	88.9	54.5	225.7	66.7	96.1	59.6	92.0	14		81.6	61.8	59.5	67.6	13		82.6	12	
SKO-196	89.6	48.4	126.9		256.3	87.1	73.3	86.7	109.8	6	5.8	97.1	60.0	88.4	81.8	5		92.4	5	5.0
OS-406	80.7	75.2	102.8	63.4	269.2	111.4	118.6	99.0	115.0	3	10.7	111.0	37.1	103.4	83.8	3	2.3	92.7	4	5.3
JO-04-18	76.9	72.2	71.4	74.6	243.8	64.0	132.7	71.8	100.9	11		80.9	61.8	96.7	79.8	7		90.1	6	2.3
RO-11-1	118.8	100.7	135.8	73.2	293.8	103.5	129.7	98.0	131.7	1	26.9	107.6	60.3	100.2	89.4	1	9.2	104.9	1	19.2
NDO-952	78.2	66.7	84.6	58.2	266.3	65.0	121.8	103.2	105.5	7	1.6	108.8	46.5	79.2	78.2	8		90.0	7	2.3
SKO-198	83.6	71.5	132.4		253.2	91.8	104.4	61.2	114.0	4	9.8	106.6	64.2	58.4	76.4	9		89.2	8	1.4
SKO-199	100.5	81.6	156.3	55.7	225.2	110.2	83.0	87.5	112.5	5	9.4	85.6	59.0	50.2	64.9	14		88.2	9	0.2
RSO-8	83.9	88.9	137.3	54.4	284.3	86.9	78.8	113.4	116.0	2	11.8	116.6	64.3	73.6	84.8	2	3.5	97.7	2	11.0
OL-1804	58.5	69.5	61.0	53.7	275.7	70.6	108.4	117.5	101.9	9		93.6	48.0	83.3	75.0	10		93.8	3	6.6
Kent (NC)		88.7	81.1	68.2	223.2	74.3	91.5	99.3	103.8	8		88.9	24.6	104.8	72.8	11		88.0	10	
OS-6 (NC)	52.4	67.9	142.0	64.8	235.5	73.0	85.7	70.9	99.0	12		98.1	45.5	102.1	81.9	4		88.0	10	
JHO-822 ZC (CZ)	61.6	77.3	61.6	74.6	230.7	84.0	90.4	91.2	96.4	13										
JHO-2000-4 ZC (SZ)												97.0	51.4	96.8	81.7	6				
<b>Mean</b>	<b>77.5</b>	<b>74.2</b>	<b>108.1</b>	<b>64.3</b>	<b>253.7</b>	<b>82.2</b>	<b>100.9</b>	<b>87.5</b>	<b>107.1</b>			<b>97.3</b>	<b>52.8</b>	<b>83.7</b>	<b>77.9</b>			<b>91.1</b>		
<b>CD at 5%</b>	20.8	12.1	7.3	9.3	13.7	6.5	18.0	10.9				13.6	9.5	16.1						
<b>CV%</b>	12.4	9.7	4.0	8.5	3.2	4.7	10.6	7.3				8.3	10.8	11.5						

**Table 5.3: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Green Forage Yield (q/ha/day)**

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Jha-nsi	Rah-uri	Urulikan-ghan	Pal-ghar	Kan-pur	Ana-nd	Rai-pur	Hydera-bad	Man-dya	Coimb-atore	Aver-age	Ran-k
JHO-13-5	2.86	6.17	4.40	4.51	2.26	5.03	3.40	3.93	4.39	2.61	1.84	3.36	6.97	3.40	9.74	5.35	2.97	5.77	3.68	4.10	4.34	8
OL-1689	3.49	5.68	5.50	3.95	2.24	5.17	3.09	2.47	4.05	3.04	2.10	3.83	5.33	3.31	8.74	5.59	2.94	6.84	3.16	3.33	4.19	10
SKO-196	3.30	6.34	5.00	2.75	2.01	5.11	6.36	2.34	4.79	2.31	2.13	2.38	9.84		7.38	4.37	2.93	5.21	3.38	4.32	4.33	9
OS-406	3.14	6.47	5.30	5.35	2.68	5.74	3.14	2.14	4.07	2.29	2.62	4.17	5.50	3.17	9.77	5.99	3.58	6.46	3.96	5.20	4.54	6
JO-04-18	3.10	6.29	4.80	5.56	2.71	6.37	5.03	1.77	5.11	2.71	2.19	4.20	5.40	3.39	9.19	5.37	3.40	5.96	3.97	4.51	4.55	5
RO-11-1	4.75	5.92	6.30	3.85	2.86	5.94	4.65	2.31	4.47	2.68	3.07	4.73	10.61	3.48	10.05	6.41	3.90	5.45	3.55	5.28	5.01	1
NDO-952	2.96	6.44	5.60	5.55	2.16	5.96	5.30	2.29	4.76	2.06	2.27	4.42	6.57	3.29	9.79	6.30	3.92	7.18	3.68	4.32	4.74	4
SKO-198	3.12	6.69	5.10	3.05	2.35	4.85	4.92	2.16	3.89	1.92	2.12	3.07	7.00		8.66	5.37	3.38	5.82	3.25	2.60	4.18	11
SKO-199	3.39	6.49	3.80	4.68	1.30	5.98	3.51	1.97	4.22	1.75	2.51	3.45	11.56	2.96	6.48	5.67	3.56	3.65	3.78	2.54	4.16	12
RSO-8	3.32	6.83	5.30	5.53	2.58	6.00	3.00	2.67	3.93	3.44	2.50	5.15	9.35	3.39	10.03	6.90	4.08	7.05	4.80	4.12	5.00	2
OL-1804	3.33	6.42	5.40	5.72	3.06	6.39	5.94	3.44	4.74	3.42	1.86	3.95	4.12	2.80	10.67	7.08	4.28	6.77	4.24	4.07	4.89	3
Kent (NC)	2.87	5.19	4.90	4.73	2.96	5.69	4.14	2.65	4.14	2.44		5.18	6.07	3.46	8.40	6.18	3.31	6.18	2.48	5.07	4.53	7
OS-6 (NC)	2.79	6.39	4.50	5.21	2.96	6.44	4.58	2.17	4.14	2.17	1.83	4.30	7.62	2.60	8.87	6.11	3.51	5.86	3.60	5.12	4.54	6
OL-125 ZC (NWZ)	2.90	5.75	4.90	5.48																		
JHO-99-2 ZC (NEZ)					2.49	5.65	4.81	2.60	4.56	1.89												
JHO-822 ZC (CZ)											2.07	4.55	3.67	3.66	8.92	7.72	4.33					
JHO-2000-4 ZC (SZ)																		6.15	3.48	4.70		
Mean	3.24	6.22	5.06	4.71	2.47	5.74	4.42	2.49	4.38	2.48	2.24	4.05	7.12	3.24	9.05	6.03	3.58	6.03	3.64	4.23	4.54	

**Table 5.4: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Dry Matter Yield (q/ha/day)**

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Jha-nsi	Rah-uri	Urulikan-ghan	Pal-ghar	Kan-pur	Ana-nd	Rai-pur	Hydera-bad	Coimb-atore	Aver-age	Ran-k	
JHO-13-5	0.63	0.74	0.90	0.79	0.38	1.47	0.71	1.28	0.86	0.58	0.52	0.73	1.39	0.95	3.31	0.69	0.77	1.29	0.87	0.99	9	
OL-1689	0.73	0.71	1.20	0.68	0.42	1.48	0.63	0.77	0.81	0.62	0.81	0.84	1.19	0.73	2.97	0.73	0.70	1.21	0.70	0.94	11	
SKO-196	0.88	0.72	1.10	0.55	0.40	1.47	1.30	0.65	0.96	0.47	1.01	0.44	1.84		2.51	0.76	0.96	1.23	0.96	1.01	8	
OS-406	0.68	0.88	1.10	0.76	0.49	1.66	0.64	0.74	0.80	0.45	0.81	0.86	1.22	0.79	3.33	1.13	1.00	1.56	1.20	1.06	5	
JO-04-18	0.58	0.79	1.00	0.76	0.48	1.85	1.00	1.05	1.02	0.54	0.82	0.85	0.98	0.94	3.13	0.70	0.82	1.16	1.14	1.03	7	
RO-11-1	0.97	0.80	1.30	0.62	0.55	1.66	0.95	0.76	0.89	0.55	1.21	1.06	1.91	1.01	3.42	1.05	0.97	1.34	1.11	1.16	1	
NDO-952	0.59	0.80	1.20	0.77	0.43	1.77	1.12	0.88	0.94	0.51	0.84	0.79	1.13	0.72	3.33	0.73	1.01	1.47	0.88	1.05	6	
SKO-198	0.84	0.71	1.10	0.50	0.43	1.36	1.04	0.53	0.78	0.49	0.84	0.64	1.58		2.94	0.80	0.70	1.42	0.63	0.96	10	
SKO-199	0.78	0.70	0.80	0.80	0.25	1.73	0.71	0.73	0.84	0.45	0.99	0.74	2.17	0.68	2.21	0.96	1.02	0.79	0.53	0.94	11	
RSO-8	0.98	0.91	1.10	0.76	0.42	1.78	0.60	1.18	0.78	0.67	0.84	1.10	1.81	0.74	3.51	0.97	1.10	1.54	0.87	1.14	2	
OL-1804	0.88	0.82	1.10	0.81	0.56	1.92	1.20	1.23	0.95	0.64	0.58	0.81	0.78	0.65	3.63	0.79	1.15	1.27	0.97	1.09	3	
Kent (NC)	0.57	0.86	1.00	0.70	0.53	1.65	0.83	1.55	0.83	0.49		1.08	1.07	0.93	2.86	0.83	0.96	1.25	1.22	1.07	4	
OS-6 (NC)	0.69	0.87	0.90	0.74	0.55	1.80	0.96	0.85	0.83	0.52	0.57	0.85	1.63	0.79	3.02	0.88	0.81	1.38	1.24	1.05	6	
OL-125 ZC (NWZ)	0.56	0.76	1.00	0.80																		
JHO-99-2 ZC (NEZ)					0.45	1.66	0.96	0.94	0.91	0.48												
JHO-822 ZC (CZ)											0.66	0.98	0.73	1.02	3.04	1.01	1.02					
JHO-2000-4 ZC (SZ)																		1.33	1.15			
Mean	0.74	0.79	1.06	0.72	0.45	1.66	0.90	0.94	0.87	0.53	0.81	0.84	1.39	0.83	3.09	0.86	0.93	1.30	0.96	1.04		

**Table 5.5: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Crude Protein Yield (q/ha)**

Entries	Ludhiana	Hisar	Jorhat	Bhubaneswar	Faizabad	CAU – Imphal	Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Mandya	Hyderabad	Coimbatore	Average	Rank
JHO-13-5	9.7	8.1	4.1	5.3	5.1	4.6	4.4	11.1	6.4	7.8	5.0	5.3	6.9	8.9	6.6	6
OL-1689	13.7	7.5	4.6	5.3	5.6	5.3	5.2	7.3	6.6	7.6	4.2	5.7	4.4	4.2	6.2	9
SKO-196	10.6	7.3	4.1	8.7	4.3	5.3	4.0	10.2	7.9	5.4	5.1	4.5	6.8	7.1	6.5	7
OS-406	12.3	9.8	5.2	4.6	3.7	5.6	7.2	7.8	9.3	9.5	6.3	2.8	8.8	7.1	7.1	3
JO-04-18	8.1	8.7	5.6	7.3	4.8	5.2	5.9	5.8	6.3	10.9	4.3	4.3	5.3	9.3	6.6	6
RO-11-1	9.1	8.8	5.8	6.3	4.5	7.4	7.3	11.0	8.6	10.6	5.3	4.3	8.4	12.3	7.8	1
NDO-952	8.5	8.5	4.8	7.3	4.3	5.4	5.9	7.1	5.9	9.9	5.2	3.1	8.6	5.1	6.4	8
SKO-198	7.3	7.9	4.4	6.6	4.2	6.8	7.3	10.3	7.6	8.4	3.7	4.8	9.3	7.6	6.9	4
SKO-199	5.5	7.8	2.6	5.2	4.2	5.9	6.4	12.9	9.3	6.3	6.2	4.2	6.3	4.7	6.2	9
RSO-8	13.2	10.3	4.7	4.2	5.6		6.6	11.0	8.5	5.9	7.1	4.8	8.1	9.0	7.6	2
OL-1804	12.8	9.7	5.5	8.4	5.6		4.9	5.0	3.3	8.8	7.1	4.0	6.5	7.2	6.8	5
Kent (NC)	8.2	8.8	5.4	5.7	4.0	4.1	6.3	6.9	6.2	7.2	6.7	1.8	4.7	10.2	6.2	9
OS-6 (NC)	6.6	10.6	5.4	7.6	4.5	4.2	5.4	11.1	7.8	6.6	4.8	3.6	7.7	11.4	6.9	4
OL-125 ZC (NWZ)	12.1	9.0														
JHO-99-2 ZC (NEZ)			5.1	6.7	4.1											
JHO-822 ZC (CZ)							5.7	4.6	7.9	7.0	6.5					
JHO-2000-4 ZC (SZ)												3.8	5.9	9.3		
<b>Mean</b>	<b>9.8</b>	<b>8.8</b>	<b>4.8</b>	<b>6.4</b>	<b>4.6</b>	<b>5.4</b>	<b>5.9</b>	<b>8.7</b>	<b>7.2</b>	<b>8.0</b>	<b>5.5</b>	<b>4.1</b>	<b>7.0</b>	<b>8.1</b>	<b>6.8</b>	

**Table 5.6: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Crude Protein (%)**

Entries	Ludhiana	Hisar	Pantnagar	Jorhat	Kalyani	Bhubaneswar	Faizabad	Imp-hal	Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Mandya	Hyderabad	Coimbatore	Ranchi	Bikaner	Average	Rank
JHO-13-5	8.5	9.6	8.8	9.8	11.0	9.6	8.0	6.0	7.4	8.5	10.2	8.0	7.6	9.6	7.9	11.8	6.1	9.3	8.8	2
OL-1689	9.6	9.4	7.9	10.1	8.3	9.4	8.3	6.4	7.4	8.2	9.9	8.0	7.1	9.2	5.3	7.0	5.7	10.7	8.2	6
SKO-196	8.2	9.0	7.0	9.9	10.7	9.5	7.8	5.6	8.2	8.1	9.1	7.4	5.9	7.4	7.0	7.9	6.6	11.0	8.1	7
OS-406	9.1	9.8	7.9	10.1	9.1	9.3	7.5	6.1	9.6	7.6	8.3	8.2	6.4	7.4	7.9	7.0	7.0	9.8	8.2	6
JO-04-18	6.6	9.8	9.6	10.6	14.0	9.6	7.9	6.1	8.2	8.1	9.9	8.2	5.9	7.0	6.6	9.6	6.1	11.0	8.6	3
RO-11-1	5.6	9.8	8.8	10.3	12.1	9.4	8.0	5.4	7.3	8.1	8.3	8.2	5.4	7.0	7.9	12.3	5.7	10.2	8.3	5
NDO-952	5.9	9.4	7.9	10.6	9.2	9.3	7.2	6.7	8.8	8.3	9.0	8.2	5.0	6.6	7.9	6.1	5.7	10.0	7.9	8
SKO-198	5.6	9.8	8.8	10.0	8.2	9.5	7.3	6.0	10.2	7.8	8.3	8.1	6.1	7.4	8.8	13.1	7.0	9.4	8.4	4
SKO-199	5.6	9.8	9.6	10.5	12.0	9.4	8.0	6.3	7.9	8.3	8.4	7.7	7.1	7.0	7.4	9.5	5.7	9.7	8.3	5
RSO-8	9.7	10.0	9.6	10.5	15.2	8.8	8.1		7.4	8.0	9.8	7.7	6.2	7.4	7.0	12.3	5.7	9.0	9.0	1
OL-1804	9.3	10.4	8.8	9.8	11.7	9.6	8.2		7.1	8.3	4.6	8.1	6.0	8.3	7.0	8.8	5.7	8.6	8.2	6
Kent (NC)	6.6	9.0	8.8	10.3	12.3	9.4	7.7	5.9	7.1	8.5	8.4	7.8	6.8	7.4	5.3	9.6	6.1	10.0	8.2	6
OS-6 (NC)	5.7	10.8	7.9	10.1	8.3	9.3	7.8	5.2	7.9	7.8	10.7	7.7	6.7	7.9	7.9	11.4	6.1	9.2	8.2	6
OL-125 ZC (NWZ)	9.6	10.4	7.9																10.5	
JHO-99-2 ZC (NEZ)				10.5	9.9	9.4	7.4													
JHO-822 ZC (CZ)									7.4	7.4	9.4	7.9	7.1							7.5
JHO-2000-4 ZC (SZ)														7.3	6.1	9.6				
<b>Mean</b>	<b>7.5</b>	<b>9.8</b>	<b>8.5</b>	<b>10.2</b>	<b>10.8</b>	<b>9.4</b>	<b>7.8</b>	<b>6.0</b>	<b>8.0</b>	<b>8.1</b>	<b>8.9</b>	<b>7.9</b>	<b>6.4</b>	<b>7.6</b>	<b>7.1</b>	<b>9.7</b>	<b>6.2</b>	<b>9.9</b>	<b>8.3</b>	

**Table 5.7: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Plant Height (cm)**

Entries	Bikaner	Jalore	Hisar	Ludhiana	Pantnagar	Udaipur	Meerut	Jorhat	Kalyani	Bhubaneswar	Ranchi	Faizabad	Imphal	Jhansi
JHO-13-5	141.0	98.3	110.1	110.0	151.0	126.1	110.0	113.6	144.4	132.2	103.6	118.5	112.3	121.3
OL-1689	130.0	90.0	113.9	127.7	146.6	130.6	115.0	138.7	145.5	142.2	103.6	122.6	119.0	128.8
SKO-196	110.0	91.0	103.3	114.0	128.5	97.2	115.0	105.1	105.0	177.3	72.6	98.4	91.8	119.1
OS-406	142.0	106.7	115.3	124.0	161.0	158.8	95.0	130.2	136.7	128.4	87.8	110.5	112.4	132.6
JO-04-18	126.0	101.3	113.6	114.3	168.9	140.7	100.0	125.7	141.5	170.8	101.3	118.4	117.3	123.0
RO-11-1	180.0	95.0	123.9	110.7	144.9	143.9	95.0	159.2	102.7	149.2	107.7	115.7	149.1	152.6
NDO-952	112.0	75.0	109.2	114.3	168.8	146.4	105.0	135.6	140.9	160.3	104.7	112.5	123.3	132.3
SKO-198	130.0	81.7	103.4	111.0	142.8	121.4	105.0	116.7	109.4	148.2	69.9	105.7	112.3	125.2
SKO-199	134.0	70.0	91.3	111.7	132.0	121.0	110.0	102.5	96.1	133.1	74.2	80.5	101.3	130.2
RSO-8	145.0	100.3	118.1	121.0	167.2	140.7	68.0	143.0	136.2	124.6	113.8	122.7		142.1
OL-1804	143.0	92.3	118.9	117.7	165.1	155.0	99.0	135.8	142.2	167.9	111.7	114.8		141.3
Kent (NC)	90.0	99.7	111.0	115.7	159.0	137.7	100.0	126.9	142.1	137.3	93.2	108.2	110.1	
OS-6 (NC)	142.0	87.7	122.4	108.0	164.6	146.1	100.0	134.3	142.7	174.3	102.5	122.6	110.1	133.4
OL-125 ZC (NWZ)	114.0	107.7	112.8	117.7	173.3	143.8	160.0							
JHO-99-2 ZC (NEZ)								147.7	141.8	153.2	107.2	103.8		
JHO-822 ZC (CZ)														129.1
JHO-2000-4 ZC (SZ)														
<b>Mean</b>	<b>131.4</b>	<b>92.6</b>	<b>111.9</b>	<b>115.6</b>	<b>155.3</b>	<b>136.4</b>	<b>105.5</b>	<b>129.6</b>	<b>130.5</b>	<b>149.9</b>	<b>96.7</b>	<b>111.1</b>	<b>114.5</b>	<b>131.6</b>

**Table 5.7: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): Plant Height (cm)**

Entries	Rah- uri	Urulikan- chan	Pal- ghar	Kan- pur	Ana- nd	Jabal- pur	Rai- pur	Hydera- bad	Man- dya	Coimb- atore	Aver- age	Ra- nk
JHO-13-5	82.3	103.2	143.3	117.4	140.0	109.8	117.0	91.0	54.9	119.0	115.4	9
OL-1689	100.5	113.9	115.7	128.6	153.7	108.3	124.8	98.4	54.7	119.7	119.7	7
SKO-196	81.1	99.7		92.5	133.5	96.4	105.3	95.6	59.6	85.3	103.4	12
OS-406	95.7	115.3	125.0	131.5	152.1	124.6	130.1	93.6	62.7	124.0	120.7	6
JO-04-18	104.4	104.0	139.3	127.1	150.7	134.4	117.7	100.8	84.7	101.7	122.0	5
RO-11-1	107.1	112.1	117.3	144.9	160.8	129.1	131.1	108.2	55.8	127.3	126.0	1
NDO-952	98.1	98.2	121.7	129.2	156.9	117.6	134.3	99.5	73.9	127.3	120.7	6
SKO-198	88.9	102.7		118.0	155.0	120.2	127.9	102.6	55.8	94.7	110.8	10
SKO-199	81.9	85.4	110.0	93.8	128.1	104.3	111.2	89.0	83.0	146.7	105.1	11
RSO-8	124.3	105.9	129.7	127.1	145.9	109.6	150.6	104.9	87.5	142.7	124.8	3
OL-1804	97.1	109.3	120.7	158.4	157.9	121.0	136.6	98.8	76.4	92.7	124.9	2
Kent (NC)	88.2	100.8	123.3	131.0	145.6	112.5	137.0	90.5	74.2	123.0	115.5	8
OS-6 (NC)	119.9	123.0	118.7	119.6	137.6	105.9	137.3	110.3	55.0	145.7	123.5	4
OL-125 ZC (NWZ)												
JHO-99-2 ZC (NEZ)												
JHO-822 ZC (CZ)	97.3	114.3	113.7	129.5	140.1	113.5	137.6					
JHO-2000-4 ZC (SZ)								92.9	51.7	96.3		
<b>Mean</b>	<b>97.6</b>	<b>106.3</b>	<b>123.2</b>	<b>124.9</b>	<b>147.0</b>	<b>114.8</b>	<b>128.5</b>	<b>98.3</b>	<b>66.4</b>	<b>117.6</b>	<b>117.9</b>	

**Table 5.8: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): 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	Kan- pur	Jabal- pur	Rai- pur	Hydera- bad	Man- dya	Coimb- atore	Aver- age	Ran- k
JHO-13-5	1.12	0.61	0.67	0.36	0.81	0.81	0.75	0.26	0.64	0.37	0.73	0.71	0.88	0.25	0.56	0.38	0.55	0.84	0.28	0.61	6
OL-1689	0.93	0.61	0.61	0.30	0.84	0.93	0.79	0.40	0.71	0.35	0.64	0.77	0.79	0.26	0.52	0.41	0.52	0.53	0.31	0.59	8
SKO-196	0.42	0.67	0.67	0.26	0.64	1.00	1.24	0.81	0.70	0.50	0.75	0.56	0.37	0.40	0.51	0.62	0.37	0.46	0.61	0.61	6
OS-406	1.08	0.61	0.92	0.40	0.94	0.75	0.75	0.29	0.72	0.38	0.63	0.75	0.81	0.19	0.73	0.37	0.47	0.54	0.23	0.61	6
JO-04-18	1.20	0.43	1.13	0.37	0.69	1.00	1.15	0.30	0.74	0.36	0.41	0.51	0.71	0.23	0.79	0.59	0.43	0.70	0.21	0.63	4
RO-11-1	1.18	0.56	0.67	0.39	0.88	0.86	0.94	0.36	0.75	0.30	0.52	0.48	0.75	0.23	0.76	0.56	0.43	0.55	0.36	0.61	6
NDO-952	1.17	0.56	4.26	0.43	0.94	0.93	1.07	0.21	0.68	0.52	0.63	0.60	0.85	0.18	0.68	0.62	0.43	0.67	0.22	0.82	1
SKO-198	0.45	0.67	0.92	0.38	0.84	0.92	0.89	0.81	0.67	0.45	0.47	0.72	0.35	0.62	0.41	0.45	0.45	0.73	0.42	0.62	5
SKO-199	0.26	0.61	0.25	0.30	0.90	0.93	0.78	0.42	0.70	0.56	0.66	0.50	0.81	0.33	0.50	0.57	0.52	0.56	0.25	0.55	9
RSO-8	1.11	0.79	0.67	0.41	1.01	0.81	0.74	0.28	0.74	0.71	0.51	0.83	0.17	0.55	0.60	0.45	0.50	0.21	0.62	0.62	5
OL-1804	0.98	0.47	1.50	0.40	1.30	0.87	1.21	0.38	0.75	0.67	0.54	0.80	0.17	0.70	0.48	0.57	0.68	0.27	0.71	0.71	2
Kent (NC)	1.15	0.39	1.50	0.42	0.77	0.93	0.84	0.22	0.73	0.33	0.75	0.73	0.77	0.14	0.52	0.65	0.48	0.68	0.34	0.65	3
OS-6 (NC)	0.99	0.59	0.96	0.37	0.82	0.80	1.19	0.28	0.69	0.33	0.64	0.54	0.79	0.27	0.55	0.38	0.37	0.61	0.25	0.60	7
OL-125 ZC (NWZ)	1.04	0.43	0.96	0.36																	
JHO-99-2 ZC (NEZ)					0.68	0.87	0.97	0.22													
JHO-822 ZC (CZ)											0.79	0.65	0.80	0.17	0.51	0.41					
JHO-2000-4 ZC (SZ)									0.74								0.58	0.64	0.24		
<b>Mean</b>	<b>0.93</b>	<b>0.57</b>	<b>1.12</b>	<b>0.37</b>	<b>0.86</b>	<b>0.89</b>	<b>0.95</b>	<b>0.37</b>	<b>0.71</b>	<b>0.40</b>	<b>0.64</b>	<b>0.61</b>	<b>0.80</b>	<b>0.24</b>	<b>0.60</b>	<b>0.50</b>	<b>0.49</b>	<b>0.61</b>	<b>0.29</b>	<b>0.63</b>	

**Table 5.9: AVT Oat (SC-1): First Advanced Varietal Trial in Oat (SC): NDF (%), ADF (%), IVDMD (%) & DDM (q/ha)**

Entries	NDF (%)							ADF (%)						IVDMD (%)					DDM (q/ha)		
	Ana- nd	Pant- nagar	Ludh- iana	Rah- uri	Ran- chi	Aver- age	Ran- k	Pant- nagar	Ludh- iana	Rah- uri	Ran- chi	Aver- age	Ran- k	Rah- uri	His- ar	Ran- chi	Aver- age	Ran- k	His- ar	Ran- k	
JHO-13-5	69.0	64.2	50.3	54.6	58.0	59.2	7	56.6	35.3	34.1	36.1	40.5	3	62.7	52.5	60.8	58.7	3	44.1	11	
OL-1689	64.0	67.8	48.5	55.3	61.0	59.3	8	58.0	33.9	34.6	38.4	41.2	5	62.4	49.0	59.0	56.8	9	39.3	14	
SKO-196	69.0	65.4	60.7	53.9	50.5	59.9	10	55.8	39.0	35.5	30.9	40.3	2	61.6	55.0	64.8	60.5	1	44.7	9	
OS-406	68.0	63.8	47.9	51.5	61.4	58.5	4	55.2	32.0	35.5	43.5	41.6	7	61.6	54.6	55.0	57.1	8	54.4	1	
JO-04-18	68.0	65.8	53.8	54.9	61.9	60.9	12	56.6	36.1	38.1	37.3	42.0	8	59.6	56.5	59.8	58.6	4	50.1	6	
RO-11-1	66.0	62.2	56.2	57.6	54.6	59.3	8	54.4	36.7	42.8	36.4	42.6	9	56.0	55.8	60.5	57.4	7	50.2	5	
NDO-952	62.0	64.6	56.8	54.7	55.7	58.8	5	55.4	37.1	34.9	35.9	40.8	4	61.7	54.8	60.9	59.1	2	49.5	7	
SKO-198	69.0	63.8	60.9	54.3	47.1	59.0	6	57.8	39.4	37.5	30.9	41.4	6	60.1	50.8	64.8	58.6	4	40.7	13	
SKO-199	61.0	65.4	53.4	55.3	62.9	59.6	9	58.6	38.0	35.9	39.4	43.0	10	61.3	52.6	58.2	57.4	7	41.6	12	
RSO-8	63.0	62	51.6	52.6	57.1	57.3	2	54.2	31.5	33.9	35.3	38.7	1	63.2	49.4	61.4	58.0	5	50.7	4	
OL-1804	66.0	64.6	47.9	56.2	54.5	57.8	3	56.0	33.2	33.9	38.3	40.3	2	62.9	47.8	59.1	56.6	10	44.5	10	
Kent (NC)	67.0	65.2	54.3	55.0	59.3	60.2	11	57.2	35.8	35.9	37.4	41.6	7	61.7	52.3	59.8	57.9	6	51.1	3	
OS-6 (NC)	61.0	63.6	53.4	53.8	54.2	57.2	1	58.2	37.8	33.2	42.9	43.0	10	63.4	53.4	55.5	57.4	7	52.4	2	
OL-125 ZC (NWZ)		66.6	51.3					58.2	34.3						57.1					49.3	8
JHO-99-2 ZC (NEZ)						55.0					40.6					57.3					
JHO-822 ZC (CZ)	69.0			53.4						39.5				58.5							
JHO-2000-4 ZC (SZ)																					
<b>Mean</b>	<b>65.9</b>	<b>64.6</b>	<b>53.4</b>	<b>54.5</b>	<b>56.7</b>	<b>59.0</b>		<b>56.6</b>	<b>35.7</b>	<b>36.1</b>	<b>37.4</b>	<b>41.3</b>		<b>61.2</b>	<b>53.0</b>	<b>59.8</b>	<b>58.0</b>		<b>47.3</b>		

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

**(Reference tables 6.1 to 6.9)**

In Oat (single cut), nine entries were evaluated against two national checks Kent and OS-6 and five respective zonal checks SKO-90, JHO-99-2, OL-125, JHO-822 and JHO-2000-4 at 26 locations in five different zones. For green forage yield (q/ha), entries OL-1760 (8.2%), OS-405 (7.9%), SKO-190 (7.8%), RSO-60 (6.8%), JO-04-14 and RSO-59 (4.2%), JHO-2012-2 (2.9%) and UPO-12-1 (2.1%) in North-West zone; entries JO-04-14 (7.4%), JHO-2012-2 (2.0%) and UPO-12-1 (0.9%) in North-East zone and entries UPO-12-1 (7.1%), OL-1760 (6.7%), OS-405 (4.7%), JO-04-14 (4.5%), SKO-190 (1.6%) and RSO-60 (0.9%) in Central zone and UPO-12-1 (19.1%), JHO-2012-2 (11.4%), OL-1760 (9.9%), OS-405 (8.8%), JO-04-14 (7.2%) and RSO-60 (2.3%) in South zone exhibited superiority over best zonal/national check. At national level, all the test entries recorded superiority over best national check except JHO-2012-1 and RSO-59.

Similarly for dry matter yield (q/ha), entries RSO-60 (6.1%), RSO-59 (4.9%) and SKO-190 (0.5%) in North-West zone; entry JO-04-14 (0.8%) in North-East zone; entries UPO-12-1 (6.4%), OS-405 (4.2%), OL-1760 (2.1%) and JO-04-14 (1.9%) in Central zone and entries JHO-2012-2 (20.9%), OS-405 (12.8%), OL-1760 (12.6%), JO-04-14 (10.1%), SKO-190 (4.1%) and RSO-60 (3.2%) in South zone registered superiority over best check. At national level, UPO-12-1 (7.4%) followed by OS-405 (4.4%) recorded superiority over best national check.

For forage production potential (q/ha/day), entry RSO-60 for green forage and dry matter production potential was adjudged superior performer. For plant height, entry OS-405 (133.6 cm) was adjudged best performers. For the character leafiness, check variety Kent maintained its superiority.

In quality parameters, entries UPO-12-1 for crude protein yield (q/ha) and national check Kent and OS-6 (8.7%) for crude protein content recorded superiority. For other quality parameters, JO-04-14 for IVDMD (%), JHO-2012-1 for ADF (%) and NDF (%) and Kent for DDM (q/ha) ranked first.

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

**(Reference table: 7.1)**

Results of the advanced varietal trial in Oat for seed with nine entries along with two national checks, Kent and OS-6 conducted at five zones across the country revealed that for seed yield (q/ha), entries JO-04-14 and JHO-2012-2 (5.2%) and SKO-190 (3.3%) in Hill zone and entries SKO-190 (12.4%) and JHO-2012-2 (11.9%) in North East zone performed better. At national level, entry JHO-2012-2 (8.9%) showed superiority over the national checks. Seed yield of entry JHO-2012-2 was 22.26 q/ha which was followed by check variety Kent (20.45 q/ha).

**Table 6.1: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Green Forage Yield (q/ha)**

Entries	Hill Zone				North West Zone								
	Palam-pur	Sri-nagar	Average	Rank	Bika-ner	Jal-ore	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Average	Rank	Super-iority%
UPO-12-1	379.1	411.3	395.2	5	285.5	258.3	730.6	583.3	529.2	476.4	477.2	8	2.1
RSO-60	299.5	414.2	356.9	8	306.4	199.7	591.7	620.8	628.9	647.2	499.1	4	6.8
JHO-2012-1	406.2	439.5	422.9	2	306.3	390.7	636.1	568.6	323.5	416.7	440.3	11	
JHO-2012-2	269.3	441.0	355.2	9	238.6	250.0	658.3	568.1	653.9	515.3	480.7	7	2.9
SKO-190	328.4	509.6	419.0	3	331.7	336.7	761.1	518.1	620.8	455.5	504.0	3	7.8
JO-04-14	283.1	467.8	375.5	6	290.8	150.0	752.8	513.9	587.0	628.3	487.1	5	4.2
RSO-59	270.2	407.5	338.8	12	268.8	168.3	755.6	577.8	604.5	545.8	486.8	6	4.2
OS-405	377.3	459.1	418.2	4	290.7	150.7	700.0	631.9	624.8	627.2	504.2	2	7.9
OL-1760	316.9	408.2	362.5	7	344.8	163.3	694.4	547.2	670.8	614.1	505.8	1	8.2
OS-6 (NC)	253.3	434.5	343.9	10	210.1	180.0	575.0	427.8	542.9	576.4	418.7	12	
Kent (NC)	200.0	483.1	341.5	11	319.6	140.0	752.8	463.9	610.8	516.6	467.3	9	
SKO-90 ZC (HZ)	330.6	524.8	427.7	1									
OL-125 ZC (NWZ)					245.9	158.3	666.7	505.6	629.2	583.3	464.8	10	
<b>Mean</b>	<b>309.5</b>	<b>450.1</b>	<b>379.8</b>		<b>286.6</b>	<b>212.2</b>	<b>689.6</b>	<b>543.9</b>	<b>585.5</b>	<b>550.2</b>	<b>478.0</b>		
<b>CD at 5%</b>	57.2	21.8			NS	47.1	52.0	53.5	76.2	105.9			
<b>CV%</b>	10.9	6.9			17.8	13.1	4.4	5.8	7.7	11.4			

**Table 6.1: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): 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	Average	Rank	Super-iority%	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Average	Rank	Super-iority%	
UPO-12-1	316.3	431.5	234.5	346.7	400.0	297.9	410.0	348.1	3	0.9	214.1	456.7	779.9	142.6	752.5	792.5	465.0	340.0	492.9	1	7.1	
RSO-60	271.7	462.3	387.5	273.3	416.0	262.9	257.7	333.0	8		216.7	533.2	694.2	142.6	672.0	754.7	464.0	237.1	464.3	6	0.9	
JHO-2012-1	248.5	262.1	333.0	230.0	370.0	293.7	356.2	299.1	12		107.5	547.1	579.1	200.0	230.5	735.6	494.0	244.6	392.3	12		
JHO-2012-2	256.1	509.8	432.1	276.7	405.0	265.9	318.2	352.0	2	2.0	143.0	500.5	549.0	134.8	699.7	746.4	457.0	234.2	433.1	10		
SKO-190	235.5	367.1	311.0	286.7	351.0	245.7	372.3	309.9	11		134.3	578.7	516.3	177.8	626.8	923.3	500.0	284.6	467.7	5	1.6	
JO-04-14	300.4	470.9	496.8	243.3	405.0	308.6	369.1	370.6	1	7.4	225.3	552.3	594.4	177.8	710.8	752.2	570.0	265.2	481.0	4	4.5	
RSO-59	272.6	467.6	255.5	263.3	384.0	299.0	270.3	316.0	10		236.6	574.1	572.3	222.2	680.3	757.8	376.0	232.0	456.4	8		
OS-405	306.2	490.4	402.0	223.3	351.0	245.7	332.8	335.9	7		248.7	469.6	541.0	218.5	766.4	779.4	461.0	368.7	481.7	3	4.7	
OL-1760	283.3	478.4	262.0	266.7	347.0	259.0	348.8	320.7	9		196.7	630.8	624.8	270.4	744.1	738.1	509.0	212.9	490.9	2	6.7	
OS-6 (NC)	221.9	507.6	461.8	250.0	418.0	207.6	326.8	342.0	6		155.1	481.1	667.9	177.8	694.1	732.2	419.0	354.4	460.2	7		
Kent (NC)	236.9	451.5	445.5	270.0	450.0	236.2	325.9	345.1	5		169.9	472.7	588.7	253.7	649.7	720.3	516.0	253.3	453.0	9		
JHO-99-2 ZC (NEZ)	246.5	480.9	362.1	250.0	400.0	293.3	386.2	345.6	4													
JHO-822 ZC (CZ)											131.7	479.0	535.3	155.6	666.4	707.8	479.0	265.0	427.5	11		
<b>Mean</b>	<b>266.3</b>	<b>448.3</b>	<b>365.3</b>	<b>265.0</b>	<b>391.4</b>	<b>268.0</b>	<b>339.5</b>	<b>334.8</b>			<b>181.6</b>	<b>523.0</b>	<b>603.6</b>	<b>189.5</b>	<b>657.8</b>	<b>761.7</b>	<b>475.8</b>	<b>274.3</b>	<b>458.4</b>			
<b>CD at 5%</b>	4.9	20.5	32.3	23.8	41.2	42.2	20.6				16.2	82.1	55.5	30.0	41.6	56.9	89.6	19.8				
<b>CV%</b>	5.2	4.7	5.2	5.3	11.7	9.3	5.1				9.6	9.3	5.4	9.3	3.7	4.4	11.1	4.2				

**Table 6.1: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Green Forage Yield (q/ha)**

Entries	South Zone						All India		
	Mandya	Hyderabad	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
UPO-12-1	304.8	333.2	541.7	393.2	1	19.1	431.3	1	7.1
RSO-60	241.2	336.0	436.1	337.8	6	2.3	414.1	5	2.9
JHO-2012-1	219.0	299.9	322.2	280.4	12		367.7	11	
JHO-2012-2	241.7	388.7	472.2	367.6	2	11.4	408.7	7	1.5
SKO-190	287.7	288.8	391.7	322.7	9		413.1	6	2.6
JO-04-14	289.0	324.9	450.0	354.6	5	7.2	430.0	2	6.8
RSO-59	238.4	336.0	330.6	301.6	11		398.7	9	
OS-405	266.7	402.6	408.3	359.2	4	8.8	428.6	3	6.5
OL-1760	244.1	341.5	502.8	362.8	3	9.9	423.8	4	5.3
OS-6 (NC)	232.1	333.2	425.0	330.1	7		394.8	10	
Kent (NC)	220.8	358.2	361.1	313.4	10		402.6	8	
JHO-2000-4 ZC (SZ)	223.3	361.0	405.6	330.0	8				
<b>Mean</b>	<b>250.7</b>	<b>342.0</b>	<b>420.6</b>	<b>337.8</b>			<b>410.3</b>		
CD at 5%	34.8	42.6	44.6						
CV%	8.2	7.4	6.3						

**Table 6.2: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Dry Matter Yield (q/ha)**

Entries	Hill Zone				North West Zone							
	Palam-pur	Sri-nagar	Average	Rank	Bikaner	His-ar	Ludh-iana	Pant-nagar	Mee-rut	Average	Rank	Superiority%
UPO-12-1	76.9	99.7	88.3	5	71.3	88.4	122.4	99.7	50.8	86.5	6	
RSO-60	58.4	98.8	78.6	10	78.3	86.9	130.3	101.5	78.9	95.2	1	6.1
JHO-2012-1	79.6	105.6	92.6	8	71.2	70.6	118.9	86.4	38.0	77.0	10	
JHO-2012-2	53.6	105.8	79.7	9	58.6	76.7	119.1	76.5	50.3	76.2	11	
SKO-190	65.8	121.3	93.5	2	74.4	91.3	109.7	121.8	53.9	90.2	3	0.5
JO-04-14	55.3	112.2	83.8	6	66.9	90.3	108.5	88.8	63.9	83.7	8	
RSO-59	54.3	97.9	76.1	12	63.7	103.6	121.7	94.1	87.2	94.1	2	4.9
OS-405	75.9	110.3	93.1	3	69.7	90.7	132.9	90.8	60.8	89.0	5	
OL-1760	62.2	98.0	80.1	7	64.3	93.1	115.2	84.6	73.4	86.1	7	
OS-6 (NC)	49.5	105.6	77.5	11	49.7	87.8	90.3	87.6	82.7	79.6	9	
Kent (NC)	40.1	117.3	78.7	9	70.0	105.5	97.8	94.5	80.8	89.7	4	
SKO-90 ZC (HZ)	64.3	125.9	95.1	1								
OL-125 ZC (NWZ)					65.1	95.6	106.3	111.5	70.2	89.7	4	
<b>Mean</b>	<b>61.3</b>	<b>108.2</b>	<b>84.8</b>		<b>66.9</b>	<b>90.0</b>	<b>114.4</b>	<b>94.8</b>	<b>65.9</b>	<b>86.4</b>		
CD at 5%	11.7	5.3			NS	27.9	8.4	27.0	7.2			
CV%	11.2	4.6			18.3	18.3	14.5	16.8	7.4			

**Table 6.2: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Dry Matter Yield (q/ha)**

Entries	North East Zone										Central Zone										
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	CAU – Imphal	Average	Rank	Superiority%	Jha-nsi	Rah-uri	Urulikan-chan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Average	Rank	Superiority%
UPO-12-1	59.1	122.3	45.6	117.2	78.9	74.3	104.2	85.9	3		37.2	96.5	139.5	27.8	256.6	137.9	102.5	61.3	107.4	1	6.4
RSO-60	52.5	131.1	77.2	85.6	82.9	56.6	55.1	77.3	10		35.8	101.3	105.9	31.3	229.4	101.9	102.2	52.6	95.0	7	
JHO-2012-1	45.0	74.3	68.0	67.5	72.8	57.0	74.1	65.5	12		17.4	106.0	120.2	44.8	78.6	115.5	109.3	52.3	80.5	12	
JHO-2012-2	47.9	139.4	86.6	96.8	80.4	51.0	65.2	81.0	4		21.9	100.9	77.5	29.4	238.8	97.8	101.2	39.1	88.3	11	
SKO-190	37.5	106.5	61.0	84.5	69.5	49.5	82.6	70.1	11		30.7	111.0	78.6	34.1	212.1	157.0	111.1	49.0	97.9	6	
JO-04-14	58.0	139.7	98.2	86.6	80.0	67.8	86.9	88.2	1	0.8	39.1	101.9	88.0	39.1	242.4	148.2	128.3	35.9	102.9	4	1.9
RSO-59	53.1	129.4	51.6	79.3	75.4	66.9	88.4	77.7	8		39.1	109.2	89.3	46.4	232.1	109.1	79.2	45.3	93.7	8	
OS-405	60.5	142.2	78.7	67.6	69.0	59.0	73.3	78.6	7		44.8	98.9	80.6	42.8	261.6	140.3	99.8	72.2	105.1	2	4.2
OL-1760	59.0	134.0	54.7	78.3	68.4	64.4	77.2	76.6	9		28.6	113.1	100.2	49.9	253.8	115.1	121.8	41.5	103.0	3	2.1
OS-6 (NC)	41.7	143.8	93.5	90.0	83.9	43.0	60.1	79.4	5		29.5	99.4	133.7	38.6	242.4	113.5	90.5	59.3	100.9	5	
Kent (NC)	47.1	134.0	88.0	100.2	88.6	59.0	95.9	87.5	2		25.9	86.9	94.0	47.9	221.9	109.5	114.8	46.0	93.4	9	
JHO-99-2 ZC (NEZ)	43.4	137.9	73.1	91.4	78.9	49.3	77.4	78.8	6												
JHO-822 ZC (CZ)											23.8	92.1	88.0	35.7	227.4	104.0	105.8	52.2	91.1	10	
<b>Mean</b>	<b>50.4</b>	<b>127.9</b>	<b>73.0</b>	<b>87.1</b>	<b>77.4</b>	<b>58.2</b>	<b>78.4</b>	<b>78.9</b>			<b>31.2</b>	<b>101.4</b>	<b>99.6</b>	<b>39.0</b>	<b>224.8</b>	<b>120.8</b>	<b>105.5</b>	<b>50.6</b>	<b>96.6</b>		
<b>CD at 5%</b>	3.3	8.0	8.4	17.6	6.9	14.6	6.9				8.6	15.8	9.4	4.7	13.5	9.2	18.7	5.6			
<b>CV%</b>	8.0	8.8	6.8	11.9	9.3	14.8	7.4				5.1	9.2	5.5	7.2	3.5	4.5	10.4	6.5			

**Table 6.2: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Dry Matter Yield (q/ha)**

Entries	South Zone						All India		
	Mandya	Hyderabad	Coimbatore	Average	Rank	Superiority%	Average	Rank	Superiority%
UPO-12-1	80.4	80.4	110.8	90.5	1		93.7	1	7.4
RSO-60	54.3	78.2	99.0	77.2	6	3.2	86.6	6	
JHO-2012-1	55.4	67.6	62.3	61.8	11		74.3	11	
JHO-2012-2	67.5	77.9	126.1	90.5	1	20.9	83.4	10	
SKO-190	71.6	70.4	91.6	77.9	5	4.1	85.8	7	
JO-04-14	67.6	75.1	104.6	82.4	4	10.1	90.9	3	4.2
RSO-59	57.0	82.8	80.2	73.3	9		85.4	9	
OS-405	66.7	98.3	87.2	84.1	3	12.8	91.0	2	4.4
OL-1760	63.6	75.6	113.3	84.2	2	12.6	88.1	4	1.0
OS-6 (NC)	61.2	81.6	81.1	74.6	8		85.6	8	
Kent (NC)	49.2	86.7	78.9	71.6	10		87.2	5	
JHO-2000-4 ZC (SZ)	55.7	83.9	84.8	74.8	7				
<b>Mean</b>	<b>62.5</b>	<b>79.9</b>	<b>93.3</b>	<b>78.6</b>			<b>86.6</b>		
<b>CD at 5%</b>	7.6	20.2	18.3						
<b>CV%</b>	7.2	15.3	11.6						

**Table 6.3: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Green Forage Yield (q/ha/day)**

Entries	Palam-pur	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Rai-pur	Man-dya	Hydera-bad	Coimb-atore	Aver-age	Ran-k
UPO-12-1	2.72	2.36	6.47	4.80	4.23	3.37	4.90	3.40	3.30	4.30	3.27	2.11	4.66	8.48	2.55	8.65	7.93	3.86	4.99	4.59	5.70	4.60	5
RSO-60	2.28	2.89	5.24	5.10	5.52	2.89	5.44	5.17	2.73	4.47	3.45	2.19	6.50	8.57	3.32	9.21	8.98	2.73	4.31	5.01	4.85	4.80	1
JHO-2012-1	2.91	2.53	5.63	4.70	2.42	2.64	2.98	4.63	2.15	3.89	3.09	1.20	4.97	6.16	4.76	2.28	7.74	2.78	3.78	4.29	3.46	3.76	9
JHO-2012-2	2.05	2.25	5.83	4.70	5.80	2.59	5.79	5.27	2.69	4.35	3.45	1.38	5.89	7.04	2.59	8.54	8.78	2.60	4.01	5.56	5.76	4.62	4
SKO-190	2.24	2.74	6.74	4.20	4.75	2.38	4.17	4.32	2.49	3.73	2.73	1.04	4.95	6.45	4.04	5.89	8.79	3.13	4.81	4.11	4.12	4.18	8
JO-04-14	2.16	2.74	6.66	4.20	5.15	3.03	5.35	5.71	2.25	4.26	4.22	2.41	6.35	7.72	2.96	9.00	7.92	3.05	4.31	5.00	5.49	4.76	2
RSO-59	2.06	2.54	6.69	4.70	5.30	2.75	5.50	3.70	2.61	4.04	4.04	2.55	7.09	7.53	5.05	9.32	8.92	2.58	3.61	4.73	3.67	4.71	3
OS-405	2.71	2.74	6.19	5.20	5.42	3.09	5.57	5.09	2.11	3.86	3.15	2.50	4.74	6.94	4.46	8.81	8.20	3.96	4.10	5.67	4.44	4.71	3
OL-1760	2.43	3.25	6.15	4.50	5.68	2.86	5.44	3.74	2.49	3.73	3.45	1.99	7.42	8.33	4.66	9.08	7.94	2.48	4.39	4.83	5.92	4.80	1
OS-6 (NC)	2.04	1.98	5.09	3.50	4.80	2.24	5.97	5.25	2.23	4.59	2.81	1.73	6.01	7.42	2.96	8.68	9.04	3.89	3.63	4.83	4.83	4.45	7
Kent (NC)	1.59	3.02	6.66	3.80	5.45	2.39	5.31	5.24	2.48	4.89	3.19	1.73	5.63	7.36	4.23	8.67	8.57	2.75	3.12	5.35	3.80	4.54	6
SKO-90 ZC (HZ)	2.25																						
OL-125 ZC (NWZ)		2.32	5.90	4.10	5.58																		
JHO-99-2 ZC (NEZ)						2.49	5.66	4.96	2.40	4.30	3.81												
JHO-822 ZC (CZ)												1.26	5.84	6.37	3.17	8.89	8.74	3.05					
JHO-2000-4 ZC (SZ)																			3.49	5.23	4.95		
Mean	2.29	2.61	6.10	4.46	5.01	2.73	5.17	4.71	2.49	4.20	3.39	1.84	5.84	7.36	3.73	8.09	8.46	3.07	4.05	4.93	4.75	4.54	

**Table 6.4: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Dry Matter Yield (q/ha/day)**

Entries	Bika-ner	His-ar	Ludh-iana	Pant-nagar	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Faiza-bad	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Kan-pur	Ana-nd	Rai-pur	Hydera-bad	Coimb-atore	Aver-age	Ran-k	
UPO-12-1	0.59	0.78	1.00	0.80	0.63	1.39	0.66	1.12	0.85	0.81	0.33	0.98	1.52	0.50	2.95	1.38	0.70	1.23	1.17	1.02	5	
RSO-60	0.74	0.77	1.10	0.89	0.56	1.54	1.03	0.86	0.89	0.74	0.39	1.24	1.31	0.73	3.14	1.21	0.60	1.26	1.10	1.06	1	
JHO-2012-1	0.59	0.62	1.00	0.65	0.48	0.84	0.94	0.63	0.77	0.59	0.19	0.96	1.28	1.07	0.78	1.22	0.59	1.02	0.67	0.78	9	
JHO-2012-2	0.55	0.68	1.00	0.68	0.48	1.58	1.06	0.94	0.86	0.65	0.28	1.19	0.99	0.57	2.91	1.15	0.43	1.29	1.54	0.99	7	
SKO-190	0.61	0.81	0.90	0.93	0.38	1.21	0.85	0.73	0.74	0.55	0.26	0.95	0.98	0.77	2.00	1.49	0.54	1.09	0.96	0.88	8	
JO-04-14	0.63	0.80	0.90	0.78	0.59	1.59	1.13	0.80	0.84	0.92	0.45	1.17	1.14	0.65	3.07	1.56	0.41	1.21	1.28	1.05	2	
RSO-59	0.60	0.92	1.00	0.83	0.54	1.52	0.75	0.78	0.79	0.90	0.44	1.35	1.17	1.06	3.18	1.28	0.50	1.39	0.89	1.05	2	
OS-405	0.66	0.80	1.10	0.79	0.61	1.62	1.00	0.64	0.76	0.75	0.48	1.00	1.03	0.87	3.01	1.48	0.78	1.42	0.95	1.04	3	
OL-1760	0.61	0.82	0.90	0.72	0.60	1.52	0.78	0.73	0.74	0.85	0.39	1.33	1.34	0.86	3.09	1.24	0.48	1.18	1.33	1.03	4	
OS-6 (NC)	0.47	0.78	0.70	0.78	0.42	1.69	1.06	0.80	0.92	0.58	0.35	1.24	1.49	0.64	3.03	1.40	0.65	1.31	0.92	1.01	6	
Kent (NC)	0.66	0.93	0.80	0.84	0.48	1.58	1.04	0.92	0.96	0.79	0.35	1.03	1.18	0.80	2.96	1.30	0.50	1.34	0.83	1.02	5	
SKO-90 ZC (HZ)																						
OL-125 ZC (NWZ)	0.61	0.85	0.90	0.99																		
JHO-99-2 ZC (NEZ)					0.44	1.62	1.00	0.88	0.85	0.64												
JHO-822 ZC (CZ)											0.24	1.12	1.05	0.73	3.03	1.28	0.60					
JHO-2000-4 ZC (SZ)																		1.28	1.03			
Mean	0.61	0.80	0.94	0.81	0.52	1.48	0.94	0.82	0.83	0.73	0.35	1.13	1.21	0.77	2.76	1.33	0.57	1.25	1.06	0.99		

**Table 6.5: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Crude Protein Yield (q/ha)**

Entries	Palam-pur	Ludh-iana	His-ar	Jor-hat	Bhuban-eswar	Faiza-bad	Imp-hal	Rah-uri	Urulikan-chan	Ana-nd	Jabal-pur	Rai-pur	Coimb-atore	Man-dya	Hydera-bad	Aver-age	Ra-nk
UPO-12-1	7.4	8.7	9.2	5.4	4.5	5.1	6.0	6.9	11.4	12.4	8.2	4.8	12.7	5.3	5.3	7.5	1
RSO-60	5.3	14.2	9.0	4.9	7.4	5.2	3.2	8.7	9.8	10.2	8.2	4.3	8.7	3.8	4.5	7.2	3
JHO-2012-1	8.2	13.4	6.8	4.5	6.3	4.3	4.5	7.9	9.4	9.1	8.8	4.6	6.1	3.4	3.9	6.7	6
JHO-2012-2	5.2	12.0	8.0	5.0	8.2	5.0	3.8	7.2	6.9	9.2	8.1	2.9	13.3	4.7	4.8	7.0	5
SKO-190	6.7	6.9	8.8	3.8	5.9	5.0	5.2	8.4	7.3	14.0	9.0	3.2	10.0	4.4	5.6	7.0	5
JO-04-14	4.8	7.8	9.2	5.4	9.4	5.0	4.9	7.3	8.2	14.5	10.4	2.2	8.5	4.2	5.3	7.1	4
RSO-59	4.1	8.4	11.0	5.4	4.9	4.6	5.1	7.8	8.3	10.3	5.9	3.2	5.6	3.3	6.5	6.3	9
OS-405	7.3	10.1	8.9	5.6	7.6	4.5	4.6	8.1	7.2	13.6	7.5	5.9	7.6	3.9	6.8	7.3	2
OL-1760	6.2	10.1	9.6	5.5	5.0	4.7	4.3	9.2	9.0	11.8	9.8	2.9	11.9	4.2	6.2	7.3	2
OS-6 (NC)	4.3	7.8	8.5	4.3	8.8	3.9	3.5	8.2	10.0	10.9	7.2	5.2	7.8	4.5	3.9	6.6	7
Kent (NC)	4.0	7.2	10.1	4.9	8.5	4.3	5.5	5.9	8.4	9.6	9.3	3.7	8.3	3.3	4.9	6.5	8
SKO-90 ZC (HZ)	6.0																
OL-125 ZC (NWZ)		8.8	9.2														
JHO-99-2 ZC (NEZ)				4.1	6.9	4.1	4.9										
JHO-822 ZC (CZ)								7.7	8.0	9.7	8.4	3.7					
JHO-2000-4 ZC (SZ)													8.2	3.4	5.9		
<b>Mean</b>	<b>5.8</b>	<b>9.6</b>	<b>9.0</b>	<b>4.9</b>	<b>6.9</b>	<b>4.6</b>	<b>4.6</b>	<b>7.8</b>	<b>8.6</b>	<b>11.3</b>	<b>8.4</b>	<b>3.9</b>	<b>9.0</b>	<b>4.0</b>	<b>5.3</b>	<b>7.0</b>	

**Table 6.6: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Crude Protein (%)**

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	Pant-nagar	Coimb-atore	Man-dya	Hydera-bad	Ran-chi	Bika-ner	Aver-age	Ra-nk
UPO-12-1	9.6	9.6	7.1	10.4	9.3	8.5	9.8	8.0	5.8	7.1	8.2	9.0	8.1	7.8	9.6	11.4	6.6	6.6	6.1	8.8	8.4	3
RSO-60	9.0	8.8	10.9	10.4	9.5	9.7	9.5	7.8	5.8	8.6	9.3	10.0	8.1	8.2	8.8	8.7	7.0	5.7	5.2	8.9	8.5	2
JHO-2012-1	10.2	9.6	11.3	9.6	10.0	4.7	9.3	7.9	6.0	7.4	7.8	7.9	8.1	8.8	9.6	9.6	6.1	5.7	5.2	9.9	8.2	5
JHO-2012-2	9.6	10.5	10.1	10.5	10.6	8.0	9.5	8.3	5.8	7.1	8.9	9.5	8.0	7.4	10.5	10.5	7.0	6.1	6.1	10.6	8.7	1
SKO-190	10.2	8.8	6.3	9.7	10.3	10.0	9.7	8.3	6.3	7.6	9.3	8.9	8.2	6.6	8.8	10.9	6.2	7.9	5.2	10.8	8.5	2
JO-04-14	8.8	7.9	7.2	10.2	9.4	9.4	9.6	8.5	5.6	7.1	9.3	9.8	8.2	6.0	7.9	8.3	6.2	7.0	5.7	10.2	8.1	6
RSO-59	7.6	7.9	6.9	10.6	10.3	11.3	9.4	8.1	5.7	7.1	9.3	9.5	7.6	7.1	7.9	7.0	5.8	7.9	6.1	10.1	8.2	5
OS-405	9.6	7.0	7.6	9.8	9.4	10.6	9.7	8.0	6.3	8.1	8.9	9.7	7.6	8.2	7.0	8.8	5.9	7.0	6.6	9.5	8.3	4
OL-1760	9.9	7.9	8.8	10.4	9.4	11.5	9.1	8.2	5.5	8.2	8.9	10.2	8.2	6.9	7.9	10.5	6.6	8.3	7.0	10.4	8.7	1
OS-6 (NC)	8.8	9.6	8.6	9.7	10.5	13.6	9.4	8.0	5.8	8.3	7.5	9.6	8.0	8.8	9.6	9.6	7.4	4.8	7.0	10.0	8.7	1
Kent (NC)	9.9	9.6	7.4	9.6	10.5	12.6	9.6	8.1	5.7	6.8	9.0	8.8	8.2	8.0	9.6	10.5	6.7	5.7	5.7	11.4	8.7	1
SKO-90 ZC (HZ)	9.3																					
OL-125 ZC (NWZ)		8.8	8.3	9.6																	8.8	
JHO-99-2 ZC (NEZ)					9.5	11.5	9.4	8.1	6.3													5.7
JHO-822 ZC (CZ)										8.4	9.1	9.3	8.1	7.1	8.8							
JHO-2000-4 ZC (SZ)																9.6	6.1	7.0				
<b>Mean</b>	<b>9.4</b>	<b>8.8</b>	<b>8.4</b>	<b>10.0</b>	<b>9.9</b>	<b>10.1</b>	<b>9.5</b>	<b>8.1</b>	<b>5.9</b>	<b>7.7</b>	<b>8.8</b>	<b>9.3</b>	<b>8.0</b>	<b>7.6</b>	<b>8.8</b>	<b>9.6</b>	<b>6.5</b>	<b>6.6</b>	<b>6.0</b>	<b>9.9</b>	<b>8.4</b>	

**Table 6.7: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Plant Height (cm)**

Entries	Palam-pur	Sri-nagar	Bika-ner	Jal-ore	His-ar	Ludh-iana	Pant-nagar	Udai-pur	Mee-rut	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Faiza-bad	Imp-hal	Jha-nsi	Rah-uri
UPO-12-1	137.3	148.0	110.0	110.0	101.2	140.3	177.1	158.1	164.0	136.3	128.6	106.5	102.4	115.2	118.4	137.6	128.3
RSO-60	113.0	131.3	125.0	115.0	103.4	111.3	126.7	138.8	170.0	109.8	149.4	155.4	121.4	110.5	104.2	132.4	103.3
JHO-2012-1	126.3	126.0	126.0	114.3	103.2	135.7	165.0	121.7	110.0	140.8	107.6	144.3	81.8	96.4	108.0	126.9	121.1
JHO-2012-2	118.3	146.3	135.0	115.0	108.7	129.3	167.8	138.6	165.0	118.8	135.4	162.9	123.2	115.3	118.6	145.0	114.0
SKO-190	122.0	164.7	126.0	108.3	102.1	120.0	172.8	108.4	159.0	109.1	96.7	137.2	92.3	108.8	106.6	127.3	117.1
JO-04-14	123.0	154.0	133.0	108.3	108.9	126.3	169.3	154.0	170.0	116.2	138.9	169.2	121.8	115.7	109.8	151.2	108.3
RSO-59	113.7	125.3	130.0	111.7	104.7	112.3	125.3	131.6	165.0	115.8	138.8	120.5	127.6	118.4	102.3	131.4	115.0
OS-405	142.3	148.3	153.0	123.3	112.7	124.3	159.0	157.4	175.0	126.7	130.9	158.4	128.2	119.4	108.3	157.2	139.9
OL-1760	118.3	133.0	153.0	114.3	103.0	122.7	159.4	148.3	170.0	111.5	94.0	129.5	124.3	120.7	115.8	140.7	115.3
OS-6 (NC)	121.7	145.0	146.0	120.0	110.9	112.0	158.1	139.3	156.0	101.0	139.0	166.1	122.6	98.8	107.7	142.7	109.3
Kent (NC)	119.0	159.0	134.0	103.3	99.9	110.0	160.8	132.2	166.0	115.6	117.7	164.2	127.3	125.5	111.4	131.1	102.0
SKO-90 ZC (HZ)	122.0	158.7															
OL-125 ZC (NWZ)			120.0	108.7	104.1	119.7	167.9	145.2	175.0								
JHO-99-2 ZC (NEZ)										140.9	166.7	150.8	119.1	102.5	112.0		
JHO-822 ZC (CZ)																125.3	104.7
JHO-2000-4 ZC (SZ)																	
<b>Mean</b>	<b>123.1</b>	<b>145.0</b>	<b>132.6</b>	<b>112.7</b>	<b>105.2</b>	<b>122.0</b>	<b>159.1</b>	<b>139.5</b>	<b>162.1</b>	<b>120.2</b>	<b>128.6</b>	<b>147.1</b>	<b>116.0</b>	<b>112.3</b>	<b>110.3</b>	<b>137.4</b>	<b>114.9</b>

**Table 6.7: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): Plant Height (cm)**

Entries	Urulikan-ghan	Kar-jat	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Man-dya	Hydera-bad	Coimb-atore	Aver-age	Ran-k
UPO-12-1	113.8	101.7	129.6	157.8	119.8	146.4	57.0	98.5	149.0	126.7	5
RSO-60	116.2	115.2	132.6	138.7	112.5	148.9	71.9	92.4	119.0	121.9	8
JHO-2012-1	101.8	121.4	103.3	155.5	117.5	127.6	67.8	92.8	124.3	118.0	10
JHO-2012-2	110.8	132.7	127.0	146.7	113.8	145.4	75.3	95.5	120.3	127.9	3
SKO-190	116.0	127.8	98.7	142.8	126.1	126.5	111.0	99.0	104.0	120.4	9
JO-04-14	105.7	125.7	127.7	156.1	122.8	148.9	82.1	92.2	128.7	129.5	2
RSO-59	100.3	135.4	139.4	143.6	94.6	155.4	73.6	88.3	110.7	120.4	9
OS-405	102.1	127.2	131.6	164.3	112.4	161.3	62.1	109.0	139.3	133.6	1
OL-1760	106.3	138.1	124.4	159.4	122.7	154.6	78.1	85.9	122.3	125.6	6
OS-6 (NC)	111.2	120.7	129.1	141.3	111.4	162.4	120.1	100.3	126.0	127.6	4
Kent (NC)	111.9	136.7	122.2	141.5	120.4	156.3	56.9	89.1	114.7	124.2	7
SKO-90 ZC (HZ)											
OL-125 ZC (NWZ)											
JHO-99-2 ZC (NEZ)											
JHO-822 ZC (CZ)	109.6	128.7	126.5	140.1	115.4	149.7					
JHO-2000-4 ZC (SZ)							86.3	87.7	122.7		
<b>Mean</b>	<b>108.8</b>	<b>125.9</b>	<b>124.3</b>	<b>149.0</b>	<b>115.8</b>	<b>148.6</b>	<b>78.5</b>	<b>94.2</b>	<b>123.4</b>	<b>125.1</b>	

**Table 6.8: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): 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	Karj-at	Kan-pur	Ana-nd	Jabal-pur	Rai-pur	Man-dya	Hydera-bad	Coimb-atore	Aver-age	Ran-k
UPO-12-1	0.51	0.38	0.73	0.79	0.60	0.52	0.72	0.81	0.81	0.32	0.72	0.40	0.92	0.77	0.73	0.27	2.15	0.52	0.54	0.60	0.48	0.27	0.66	8
RSO-60	0.57	0.41	0.79	0.35	0.92	0.46	0.44	0.75	1.12	0.36	0.70	0.36	0.48	1.14	0.68	0.17	2.87	0.52	0.49	0.46	0.49	0.29	0.67	7
JHO-2012-1	0.57	0.38	0.67	0.67	0.90	0.27	0.84	0.93	0.98	0.34	0.68	0.44	0.72	0.78	0.71	0.36	2.09	0.62	0.41	0.53	0.48	0.32	0.67	7
JHO-2012-2	0.49	0.42	0.45	0.56	1.33	0.42	0.82	0.80	1.21	0.31	0.75	0.40	0.51	0.86	0.67	0.27	2.95	0.53	0.43	0.53	0.50	0.37	0.71	4
SKO-190	0.52	0.51	0.57	1.00	0.60	0.71	1.01	0.81	0.95	0.45	0.77	0.50	0.58	0.67	0.61	0.36	1.83	0.63	0.42	0.46	0.44	0.42	0.67	7
JO-04-14	0.55	0.45	1.00	0.32	1.17	0.47	0.83	0.93	1.38	0.31	0.70	0.71	0.73	1.18	0.55	0.17	1.61	0.75	0.52	0.60	0.48	0.36	0.72	3
RSO-59	0.54	0.44	0.70	0.79	1.70	0.47	0.73	0.75	0.84	0.23	0.68	1.30	0.63	0.59	0.70	0.14	2.00	0.40	0.59	0.66	0.44	0.37	0.71	4
OS-405	0.48	0.48	0.90	1.00	0.67	0.45	0.67	0.93	1.17	0.32	0.69	0.38	0.75	1.19	0.64	0.18	1.63	0.48	0.58	0.60	0.42	0.50	0.69	5
OL-1760	0.47	0.40	0.87	0.47	0.72	0.45	0.94	0.86	0.92	0.30	0.71	0.38	0.60	1.11	0.58	0.24	2.15	0.72	0.63	0.60	0.48	0.37	0.68	6
OS-6 (NC)	0.48	0.40	0.60	0.56	1.30	0.42	0.85	0.86	1.31	0.25	0.75	0.79	0.73	0.71	0.58	0.25	2.75	0.49	0.56	0.66	0.50	0.42	0.74	2
Kent (NC)	0.43	0.49	0.66	0.54	2.33	0.38	1.06	0.87	1.27	0.20	0.78	1.64	0.62	1.14	0.63	0.23	1.83	0.58	0.53	0.60	0.50	0.35	0.80	1
SKO-90 ZC (HZ)	0.48	0.54																						
OL-125 ZC (NWZ)			1.03	0.56	0.78	0.45																		
JHO-99-2 ZC (NEZ)							0.76	1.00	1.08	0.22	0.72	0.30												
JHO-822 ZC (CZ)													0.46	0.93	0.59	0.18	1.58	0.67	0.61					
JHO-2000-4 ZC (SZ)																				0.70	0.50	0.37		
Mean	0.51	0.44	0.75	0.63	1.09	0.46	0.81	0.86	1.09	0.30	0.72	0.63	0.64	0.92	0.64	0.23	2.12	0.58	0.53	0.58	0.48	0.37	0.70	

**Table 6.9: AVT Oat (SC)-2: Second Advanced Varietal Trial in Oat (SC): NDF (%), ADF (%), IVDMD (%) & DDM (q/ha)**

Entries	NDF (%)								ADF (%)						IVDMD (%)					DDM (q/ha)				
	Ana-nd	Pant-nagar	Rah-uri	Palam-pur	Ludh-iana	Ran-chi	Aver-age	Ran-k	Pant-nagar	Ludh-iana	Rah-uri	Palam-pur	Ran-chi	Aver-age	Ran-k	Rah-uri	His-ar	Ran-chi	Aver-age	Ran-k	His-ar	Ran-k		
UPO-12-1	68.0	63.8	55.2	62.6	52.2	56.7	59.8	3	57.8	34.3	36.1	56.6	38.9	44.7	4	59.5	47.8	58.6	55.3	3	42.3	7		
RSO-60	74.0	65.2	54.0	64.0	47.5	58.1	60.5	6	55.4	32.1	38.4	58.0	38.6	44.5	3	57.7	46.4	58.8	54.3	5	40.3	9		
JHO-2012-1	64.0	63.4	60.0	66.2	42.4	58.1	59.0	1	54.6	29.6	37.7	56.2	39.6	43.5	1	58.3	43.3	58.1	53.2	8	30.6	11		
JHO-2012-2	70.0	65.8	59.6	63.8	46.6	53.5	59.9	4	58.6	32.8	43.9	54.2	37.7	45.4	6	53.5	50.2	59.5	54.4	4	38.5	10		
SKO-190	66.0	66.0	58.9	62.2	56.8	49.5	59.9	4	54.0	38.4	39.0	57.6	36.9	45.2	5	57.3	49.4	60.2	55.6	2	45.1	5		
JO-04-14	65.0	61.8	58.4	62.0	53.6	59.0	60.0	5	55.2	34.7	38.9	58.2	34.6	44.3	2	57.4	51.4	61.9	56.9	1	46.4	3		
RSO-59	64.0	63.8	62.1	65.0	54.9	59.0	61.5	7	56.6	33.9	43.2	54.0	43.2	46.2	8	54.0	48.6	55.2	52.6	9	50.4	2		
OS-405	72.0	65.6	62.1	63.4	52.8	56.7	62.1	10	57.6	36.3	39.7	56.2	41.1	46.2	8	56.7	49.5	56.9	54.4	4	44.9	6		
OL-1760	71.0	66.2	60.4	64.2	50.3	57.4	61.6	8	55.8	32.9	40.7	57.2	46.7	46.7	10	56.0	48.2	52.5	52.2	10	44.9	6		
OS-6 (NC)	65.0	62.2	61.0	63.0	51.6	54.9	59.6	2	57.8	33.4	41.7	55.8	38.9	45.5	7	55.2	46.8	58.6	53.5	7	41.1	8		
Kent (NC)	74.0	61.8	61.0	62.2	54.6	58.5	62.0	9	56.2	38.4	41.4	56.2	40.5	46.5	9	55.4	49.2	57.4	54.0	6	51.9	1		
SKO-90 ZC (HZ)				66.0								56.6												
OL-125 ZC (NWZ)		64.4			50.9				56.0	33.8													46.3	4
JHO-99-2 ZC (NEZ)						54.8							37.4						59.8					
JHO-822 ZC (CZ)	73.0		42.8								39.6					56.8								
JHO-2000-4 ZC (SZ)																								
Mean	68.8	64.2	57.9	63.7	51.2	56.4	60.5		56.3	34.2	40.0	56.4	39.5	45.3		56.5	48.3	58.1	54.2			43.6		

**Table 7.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oat (SC) for Seed: Seed Yield (q/ha)**

Entries	Hill Zone					North West Zone		North East Zone				
	Palam-pur	Sri-nagar	Average	Rank	Superiority%	His-ar	Rank	Ran-chi	Jor-hat	Average	Rank	Superiority%
RSO-60	17.90	27.89	22.90	8		22.67	4	26.70	11.64	19.17	6	
UPO-12-1	28.87	23.36	26.12	5		16.11	9	26.00	9.19	17.60	9	
JHO-2012-1	17.77	24.37	21.07	11		14.03	10	20.60	11.32	15.96	11	
JO-04-14	28.10	28.13	28.12	2	5.2	17.36	8	25.30	13.21	19.26	5	
JHO-2012-2	29.77	26.68	28.23	1	5.2	18.75	7	31.70	15.06	23.38	2	11.9
SKO-190	25.93	29.53	27.73	3	3.3	10.42	12	31.70	15.22	23.46	1	12.4
OL-1760	26.77	22.98	24.88	6		22.36	5	26.70	8.74	17.72	8	
RSO-59	16.10	26.05	21.08	10		24.03	3	23.30	12.20	17.75	7	
OS-405	20.30	24.58	22.44	9		10.56	11	23.30	10.33	16.82	10	
Kent (NC)	29.43	24.16	26.80	4		24.44	2	25.30	13.75	19.53	4	
OS-6 (NC)	16.53	23.22	19.88	12		26.25	1	31.00	10.70	20.85	3	
SKO-90 ZC (HZ)	23.60	22.57	23.09	7								
OL-125 ZC (NWZ)						19.44	6					
JHO-99-2 ZC (NEZ)								14.30	12.43	13.37	12	
<b>Mean</b>	<b>23.42</b>	<b>25.29</b>	<b>24.36</b>			<b>18.87</b>		<b>25.49</b>	<b>11.98</b>	<b>18.74</b>		
<b>CD at 5%</b>	7.03	2.16				6.14		7.90	0.81			
<b>CV%</b>	17.72	4.85				19.17		19.25	4.00			

Note: Trial failed at Pantnagar (seed not recorded due to heavy rain)

**Table 7.1: AVT Oat (SC)-2 (Seed): Second Advanced Varietal Trial in Oat (SC) for Seed: Seed Yield (q/ha)**

Entries	Central Zone					South Zone				All India		
	Rah-uri	Jabal-pur	Jha-nsi	Average	Rank	Man-dya	Hydera-bad	Average	Rank	Average	Rank	Superiority%
RSO-60	19.58	13.93	13.22	15.57	11	8.03	12.80	10.42	9	17.44	9	
UPO-12-1	10.85	28.76	13.04	17.55	8	10.00	9.70	9.85	10	17.59	8	
JHO-2012-1	27.47	31.10	11.44	23.34	3	7.23	15.30	11.27	6	18.06	7	
JO-04-14	23.22	25.60	13.17	20.67	5	8.60	14.70	11.65	5	19.74	3	
JHO-2012-2	26.82	32.36	13.52	24.23	2	12.90	15.00	13.95	2	22.26	1	8.9
SKO-190	6.09	22.10	5.50	11.23	12	8.60	7.80	8.20	11	16.29	10	
OL-1760	19.22	29.60	6.72	18.51	6	7.68	13.30	10.49	8	18.41	5	
RSO-59	18.86	27.26	7.54	17.89	7	11.40	16.10	13.75	3	18.28	6	
OS-405	16.75	24.30	8.88	16.65	10	9.33	5.60	7.47	12	15.39	11	
Kent (NC)	15.58	33.76	13.65	21.00	4	7.50	16.90	12.20	4	20.45	2	
OS-6 (NC)	19.90	20.36	11.27	17.18	9	12.30	18.30	15.30	1	18.98	4	
JHO-822 ZC (CZ)	23.71	36.00	16.12	25.28	1							
JHO-2000-4 ZC (SZ)						8.90	12.20	10.55	7			
<b>Mean</b>	<b>19.00</b>	<b>27.09</b>	<b>11.17</b>	<b>19.09</b>		<b>9.37</b>	<b>13.14</b>	<b>11.26</b>		<b>18.44</b>		
<b>CD at 5%</b>	3.12	5.01	6.35			1.69	3.00					
<b>CV%</b>	9.70	10.96	3.75			7.84	13.50					

## **8. IVTO (MC): INITIAL VARIETAL TRIAL IN OAT (MULTI CUT)**

**(Reference tables 8.1 to 8.9)**

An initial varietal trial in Oat (Multi cut) comprising of nine entries along with three national checks (Kent, UPO-212 and RO-19) was conducted at 18 centres located in four zones of the country. For green forage yield, entries OS-414 (21.0%), OL-1845 (8.3%), JO-04-319 (6.9%), RSO-9 (3.4%), OL-10 (1.2%) and RSO-69 (0.6%) in Hill zone and entry PLP-18 (2.2%) in North East zone exhibited superiority over best zonal/national check. At national level, entries RSO-9 (3.1%) and RSO-68 (1.6%) performed better than checks.

Similarly for dry matter yield (q/ha), entries OS-414 (14.6%), OL-1845 (12.3%), RSO-9 (5.5%) and JO-04-319 (3.6%) in Hill zone; entry JO-04-319 (1.3%) in North-West zone and entry PLP-18 (0.6%) in North-East zone registered superiority over best check. At national level, RSO-68 (2.0%) recorded superiority over best national check. For the character forage production potential (q/ha/day), RSO-9 was ranked first for green forage production potential as well as for dry matter production potential. For plant height, entry national check RO-19 (91.6 cm) ranked first whereas for leafiness, entry OL-1843 (0.82) established its superiority.

In quality parameters, OS-414 (11.0 q/ha) ranked first for crude protein yield whereas entries OL-1845 and OL-10 (10.7%) were adjudged best performers for crude protein content. For other quality parameters, OL-1845 for IVDMD (%), OL-10 for ADF (%), PLP-18 for NDF (%) and UPO-212 for DDM (q/ha) were observed to be best performers.

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

**(Reference tables 9.1 to 9.9)**

In Oat (Multi cut), five entries were evaluated against three national checks (Kent, RO-19 and UPO-212) at 18 locations in four zones of the country. For green forage yield (q/ha), entries JO-4-317 (4.6%) and OL-1802 (3.5%) in Hill zone and entries OL-1802 (12.2%) and OS-385 (0.9%) in Central zone performed better than best zonal/national check. At national level, entry OL-1802 (2.8%) recorded superiority over best national check.

While in dry matter production (q/ha), entries JO-4-317 (8.2%), OL-1802 (7.8%) and OS-385 (0.3%) in Hill zone; entry OS-385 (3.5%) in North West zone; entry OL-1802 (8.7%) in North East zone; entries OL-1802 (16.1%), JO-4-317 (1.5%) and OS-385 (0.5%) in Central zone exhibited their superiority. At national level, entries OL-1802 (8.2%) and OS-385 (1.1%) recorded superiority over best national check. For fodder production potential (q/ha/day), entry OL-1802 exhibited superiority over best check for green forage and check variety Kent for dry matter production potential.

For growth parameter, OS-385 (95.7 cm) ranked first for plant height whereas check varieties Kent and UPO-212 (0.69) was adjudged best performer for leafiness.

In quality parameters, OL-1802 (9.4 q/ha) for crude protein yield and UPO-212, JHO-13-4 and RSO-60 (10.2%) for crude protein content proved their superiority. Similarly, OL-1802 for ADF (%), IVDMD (%) and NDF (%) and JHO-13-4 for DDM (q/ha) were adjudged best performers.

**Table 8.1: 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	Average	Rank	Superiority%	His-ar	Jal-ore	Ludh-iana	Udai-pur	Average	Rank
OS-414	340.0	418.6	140.2	299.6	1	21.0	392.6	451.3	574.1	594.4	503.1	4
OL-1845	366.2	408.8	109.9	295.0	2	8.3	370.4	401.3	517.0	640.7	482.4	7
RSO-9	333.3	355.1	156.2	281.5	4	3.4	459.3	518.0	509.6	655.2	535.5	2
JO-04-319	297.7	396.8	179.3	291.3	3	6.9	363.0	351.7	520.7	783.7	504.8	3
OL-10	309.7	370.1	147.3	275.7	5	1.2	518.5	324.0	418.5	603.3	466.1	9
OL-1843	294.2	370.2	110.0	258.1	11		407.4	392.4	504.1	611.5	478.9	8
RSO-68	313.7	326.2	142.3	260.8	9		481.5	293.3	533.3	671.1	494.8	5
PLP-18	328.4	353.6	123.8	268.6	8		392.6	293.0	487.0	681.5	463.5	10
RSO-69	328.4	332.5	158.3	273.1	6	0.6	592.6	281.7	268.5	691.9	458.7	11
RO-19 (NC)	291.1	351.2	133.2	258.5	10		451.9	458.0	565.2	684.1	539.8	1
Kent (NC)	300.0	309.3	111.1	240.1	12		414.8	384.3	448.9	730.7	494.7	6
UPO-212 (NC)	327.5	341.5	147.8	272.3	7		377.8	323.3	483.0	608.5	448.2	12
<b>Mean</b>	<b>319.2</b>	<b>361.2</b>	<b>138.3</b>	<b>272.9</b>			<b>435.2</b>	<b>372.7</b>	<b>485.8</b>	<b>663.1</b>	<b>489.2</b>	
<b>CD at 5%</b>	37.2	32.2	6.5				147.6	6.8	60.0	72.9		
<b>CV%</b>	6.9	12.3	2.8				11.9	10.3	7.3	6.5		

**Table 8.1: 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	Average	Rank	Superiority%	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Average	Rank	Average	Rank	Superiority%
OS-414	477.3	314.4	337.9	554.9	433.0	337.7	409.2	9		726.9	751.0	726.5	716.4	696.2	723.4	5	499.1	5	
OL-1845	466.7	237.6	310.7	749.7	477.0	306.7	424.7	8		649.8	661.0	701.1	710.3	929.0	730.2	2	500.8	4	
RSO-9	450.7	321.4	494.3	776.7	438.0	288.8	461.7	4		763.9	697.0	670.4	774.7	665.4	714.3	7	518.2	1	3.1
JO-04-319	410.7	268.9	269.9	811.9	366.0	324.4	408.6	10		742.3	682.0	779.5	814.0	431.0	689.8	9	488.5	9	
OL-10	408.0	258.7	399.0	610.1	385.0	328.8	398.3	11		659.1	668.0	589.1	788.6	877.1	716.4	6	481.3	11	
OL-1843	429.9	348.1	347.9	791.4	410.0	306.7	439.0	5		646.7	663.0	566.5	743.2	824.2	688.7	10	487.1	10	
RSO-68	440.0	314.8	503.0	814.3	392.0	342.3	467.7	3		703.0	671.0	683.8	826.5	740.5	725.0	4	510.7	2	1.6
PLP-18	552.0	293.6	454.9	746.7	460.0	382.3	481.6	1	2.2	677.6	657.0	661.0	784.8	589.3	673.9	11	495.5	6	
RSO-69	418.7	389.6	289.9	842.2	377.0	315.6	438.8	6		748.5	701.0	601.1	833.0	744.0	725.5	3	495.2	7	
RO-19 (NC)	514.7	292.0	245.9		407.0	324.4	356.8	12		711.5	<b>773.0</b>	701.1	829.8	808.1	764.7	1	502.5	3	
Kent (NC)	456.0	241.9	423.9	756.1	438.0	311.1	437.8	7		643.6	625.0	618.3	704.3	738.4	665.9	12	480.9	12	
UPO-212 (NC)	536.0	264.2	378.6	916.3	363.0	368.9	471.2	2		720.7	668.0	630.1	727.0	712.8	691.7	8	494.2	8	
<b>Mean</b>	<b>463.4</b>	<b>295.4</b>	<b>371.3</b>	<b>760.9</b>	<b>412.2</b>	<b>328.1</b>	<b>433.0</b>			<b>699.5</b>	<b>684.8</b>	<b>660.7</b>	<b>771.1</b>	<b>729.7</b>	<b>709.1</b>		<b>496.2</b>		
<b>CD at 5%</b>	12.3	9.4	27.1	48.3	31.7	38.8				17.2	64.9	140.6	118.2	184.7					
<b>CV%</b>	15.9	9.3	4.3	3.7	8.5	6.9				10.2	5.6	12.5	9.1	14.9					

**Table 8.2: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)**

Entries	Hill Zone						North West Zone					North East Zone								
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Superi-osity%	His-ar	Ludh-iana	Avera-ge	Ra-nk	Superi-osity%	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Pu-sa	Ran-chi	Aver-age	Ra-nk	Superi-osity%
OS-414	68.5	82.4	22.5	57.8	1	14.6	85.1	126.2	105.7	7		108.3	57.1	67.3	106.9	85.4	90.4	85.9	7	
OL-1845	73.6	81.4	14.9	56.6	2	12.3	101.4	113.2	107.3	6		96.0	43.8	62.8	125.0	94.1	88.0	84.9	9	
RSO-9	66.5	69.8	23.5	53.2	3	5.5	93.4	111.2	102.3	9		84.8	58.0	99.1	127.5	87.4	82.4	89.9	4	
JO-04-319	58.9	78.0	19.8	52.2	4	3.6	112.8	113.9	113.4	1	1.3	87.5	49.2	54.4	142.2	73.1	86.7	82.2	10	
OL-10	60.1	73.4	19.2	50.9	5		99.0	91.5	95.3	11		82.7	45.9	80.1	98.8	75.6	91.6	79.1	11	
OL-1843	57.0	71.8	17.3	48.7	7		111.3	110.2	110.8	3		91.2	61.8	69.2	138.8	80.9	73.2	85.8	8	
RSO-68	60.9	64.2	20.5	48.6	8		104.9	116.1	110.5	4		87.5	54.7	100.4	129.8	76.7	95.3	90.7	3	
PLP-18	63.0	70.6	17.8	50.4	6		97.3	106.3	101.8	10		104.5	54.3	91.3	134.1	90.7	107.9	97.1	1	0.6
RSO-69	62.7	65.4	23.1	50.4	6		107.6	58.6	83.1	12		86.9	72.6	59.9	142.3	74.5	89.7	87.7	5	
RO-19 (NC)	56.9	69.1	18.2	48.1	9		100.2	123.7	112.0	2		105.6	54.0	50.4		80.1	89.2	75.9	12	
Kent (NC)	58.7	61.9	17.5	46.0	10		110.4	98.5	104.5	8		93.9	45.3	85.1	137.4	86.1	74.1	87.0	6	
UPO-212 (NC)	65.0	67.1	20.7	50.9	5		110.4	105.5	108.0	5		105.1	49.3	74.6	165.8	71.3	112.7	96.5	2	
<b>Mean</b>	<b>62.6</b>	<b>71.3</b>	<b>19.6</b>	<b>51.2</b>			<b>102.8</b>	<b>106.2</b>	<b>104.5</b>			<b>94.5</b>	<b>53.8</b>	<b>74.5</b>	<b>131.7</b>	<b>81.3</b>	<b>90.1</b>	<b>86.9</b>		
<b>CD at 5%</b>	7.1	6.4	5.3				24.5	12.7				11.5	2.6	6.0	14.2	8.7	19.1			
<b>CV%</b>	6.7	11.2	15.9				14.1	7.1				7.2	6.1	4.8	6.3	10.4	12.4			

**Table 8.2: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)**

Entries	Central Zone						All India			
	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Average	Rank	Superiority%
OS-414	165.5	94.3	150.2	138.3	94.7	128.6	3	96.4	3	
OL-1845	141.1	83.6	144.5	125.6	139.9	127.0	5	95.6	4	
RSO-9	178.3	93.1	132.1	134.0	88.5	125.2	6	95.6	4	
JO-04-319	183.2	89.3	158.5	145.0	59.0	127.0	5	94.5	6	
OL-10	121.4	76.8	115.8	143.6	117.0	114.9	10	87.0	11	
OL-1843	155.8	79.8	110.3	149.4	106.4	120.4	8	92.8	8	
RSO-68	180.5	84.5	154.9	146.2	102.6	133.7	2	98.7	1	2.0
PLP-18	142.3	81.5	128.5	125.2	78.0	111.1	11	93.3	7	
RSO-69	173.2	89.1	119.8	156.2	99.8	127.6	4	92.6	9	
RO-19 (NC)	173.2	102.0	140.1	151.0	104.7	134.2	1	94.6	5	
Kent (NC)	157.0	87.2	121.8	125.1	95.2	117.3	9	90.9	10	
UPO-212 (NC)	159.7	96.2	121.6	132.8	91.2	120.3	7	96.8	2	
<b>Mean</b>	<b>160.9</b>	<b>88.1</b>	<b>133.2</b>	<b>139.4</b>	<b>98.1</b>	<b>123.9</b>		<b>94.1</b>		
<b>CD at 5%</b>	10.7	8.6	28.9	22.1	24.9					
<b>CV%</b>	6.3	5.8	13.0	9.4	14.9					

**Table 8.3: 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
OS-414	2.45	4.70	4.92	3.21	3.67	4.51	4.02	7.44	6.70	4.62	6
OL-1845	2.31	4.20	4.81	2.42	3.27	4.97	4.38	7.26	7.81	4.60	7
RSO-9	2.87	4.20	4.64	3.30	5.55	4.61	4.58	6.90	7.60	4.92	1
JO-04-319	2.27	4.30	4.23	2.76	2.97	3.98	4.70	7.26	8.31	4.53	8
OL-10	3.24	3.40	4.21	2.69	4.20	4.05	4.83	7.11	7.97	4.63	5
OL-1843	2.55	4.10	4.43	3.61	3.59	4.46	3.88	6.77	7.01	4.49	9
RSO-68	3.01	4.40	4.54	3.31	5.59	4.08	4.07	6.64	7.95	4.84	3
PLP-18	2.45	4.00	5.69	3.05	4.95	5.00	4.44	6.70	7.77	4.89	2
RSO-69	3.70	2.20	4.32	4.05	3.08	4.09	3.76	6.94	8.01	4.46	10
RO-19 (NC)	2.82	4.60	5.31	3.03	2.73	4.42	4.11	7.36	7.61	4.67	4
Kent (NC)	2.59	3.70	4.70	2.51	4.56	4.61	4.71	6.87	7.19	4.60	7
UPO-212 (NC)	2.36	4.00	5.52	2.78	3.94	3.95	4.34	7.11	7.42	4.60	7
<b>Mean</b>	<b>2.72</b>	<b>3.98</b>	<b>4.78</b>	<b>3.06</b>	<b>4.01</b>	<b>4.39</b>	<b>4.32</b>	<b>7.03</b>	<b>7.61</b>	<b>4.66</b>	

**Table 8.4: 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
OS-414	0.30	1.00	1.12	0.58	0.73	0.89	1.08	0.93	1.29	0.88	4
OL-1845	0.32	0.90	0.99	0.45	0.66	0.98	1.26	0.92	1.38	0.87	5
RSO-9	0.36	0.90	0.87	0.60	1.11	0.92	1.31	0.92	1.31	0.92	1
JO-04-319	0.32	0.90	0.90	0.51	0.60	0.79	1.26	0.95	1.48	0.86	6
OL-10	0.46	0.70	0.85	0.48	0.84	0.80	1.35	0.82	1.45	0.86	6
OL-1843	0.38	0.90	0.94	0.64	0.71	0.88	0.93	0.81	1.41	0.84	8
RSO-68	0.45	1.00	0.90	0.57	1.12	0.80	1.13	0.84	1.41	0.91	2
PLP-18	0.37	0.90	1.07	0.56	0.99	0.99	1.25	0.83	1.24	0.91	2
RSO-69	0.57	0.50	0.90	0.75	0.64	0.81	1.07	0.88	1.50	0.85	7
RO-19 (NC)	0.38	1.00	1.09	0.56	0.56	0.87	1.13	0.97	1.39	0.88	4
Kent (NC)	0.37	0.80	0.97	0.47	0.92	0.91	1.12	0.96	1.28	0.87	5
UPO-212 (NC)	0.30	0.90	1.08	0.52	0.78	0.78	1.32	1.02	1.36	0.89	3
<b>Mean</b>	<b>0.38</b>	<b>0.87</b>	<b>0.97</b>	<b>0.56</b>	<b>0.80</b>	<b>0.87</b>	<b>1.18</b>	<b>0.90</b>	<b>1.37</b>	<b>0.88</b>	

**Table 8.5: 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
OS-414	5.2	27.1	9.8	9.1	6.2	6.4	13.1	12.5	12.1	10.4	9.3	11.0	1
OL-1845	6.4	24.1	10.2	8.0	4.7	5.9	10.5	11.1	11.7	10.6	14.2	10.7	3
RSO-9	6.0	24.3	10.6	6.8	6.0	9.4	13.6	10.8	10.2	8.9	9.2	10.5	4
JO-04-319	5.1	23.5	11.6	7.4	4.9	5.1	11.2	11.7	12.9	13.9	5.7	10.3	5
OL-10	6.0	19.9	12.7	6.6	5.1	7.6	8.9	10.2	8.9	13.3	11.6	10.1	6
OL-1843	5.3	17.7	11.9	7.6	6.0	6.6	11.7	10.4	8.5	15.2	10.4	10.1	6
RSO-68	5.4	20.7	12.1	7.3	5.6	9.6	13.4	10.7	10.2	12.9	10.0	10.7	3
PLP-18	5.9	22.8	10.9	8.6	6.2	8.6	13.2	10.7	10.5	10.5	8.0	10.5	4
RSO-69	5.8	8.3	13.3	7.3	8.6	5.5	13.9	12.8	9.4	13.4	9.7	9.8	7
RO-19 (NC)	5.5	23.4	11.3	8.8	5.5	4.7		13.1	11.4	14.0	10.6	10.8	2
Kent (NC)	5.1	18.0	11.4	7.6	5.0	8.1	14.5	11.8	9.4	10.7	9.3	10.1	6
UPO-212 (NC)	5.9	22.3	12.1	8.7	4.9	7.2	14.9	10.4	9.9	13.5	9.1	10.8	2
<b>Mean</b>	<b>5.6</b>	<b>21.0</b>	<b>11.5</b>	<b>7.8</b>	<b>5.7</b>	<b>7.1</b>	<b>12.6</b>	<b>11.4</b>	<b>10.4</b>	<b>12.3</b>	<b>9.8</b>	<b>10.5</b>	

**Table 8.6: 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	Ana-nd	Rah-uri	Urulikan-chan	Jabal-pur	Ran-chi	Aver-age	Ra-nk
OS-414	7.6	21.5	13.3	8.4	11.0	9.5	7.2	13.3	7.5	9.8	8.3	7.4	10.4	4
OL-1845	8.8	21.3	12.7	8.3	10.9	9.4	8.1	13.3	8.4	10.1	8.3	8.3	10.7	1
RSO-9	9.0	21.8	13.0	8.0	10.5	9.5	7.7	11.6	6.7	10.4	8.1	6.1	10.2	6
JO-04-319	8.8	20.6	13.2	8.5	10.2	9.4	7.2	13.1	9.6	9.7	8.4	7.0	10.5	3
OL-10	9.9	21.8	14.0	8.0	11.4	9.5	7.0	13.3	9.3	9.9	8.1	6.1	10.7	1
OL-1843	9.3	16.1	12.8	8.3	10.0	9.5	7.0	13.0	10.1	9.8	8.1	5.7	10.0	7
RSO-68	8.8	17.8	13.1	8.4	10.3	9.5	7.1	12.7	8.8	9.8	8.0	5.2	10.0	7
PLP-18	9.3	21.5	12.9	8.2	11.4	9.5	6.8	13.2	8.4	10.3	8.2	6.6	10.5	3
RSO-69	9.3	14.1	13.1	8.4	12.0	9.2	7.1	14.3	8.6	9.7	8.1	5.7	10.0	7
RO-19 (NC)	9.6	18.9	12.7	8.3	10.2	9.3		12.9	9.3	10.1	8.3	6.6	10.6	2
Kent (NC)	8.8	18.3	12.4	8.1	11.4	9.5	8.6	13.5	8.6	9.8	8.1	6.6	10.3	5
UPO-212 (NC)	9.0	21.1	13.8	8.3	10.3	9.6	7.3	10.8	10.1	10.0	8.3	6.6	10.4	4
<b>Mean</b>	<b>9.0</b>	<b>19.6</b>	<b>13.1</b>	<b>8.3</b>	<b>10.8</b>	<b>9.4</b>	<b>7.4</b>	<b>12.9</b>	<b>8.8</b>	<b>9.9</b>	<b>8.2</b>	<b>6.5</b>	<b>10.3</b>	

**Table 8.7: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Plant Height (cm)**

Entries	Palam-pur	Sri-nagar	His-ar	Jal-ore	Ludh-iana	Udai-pur	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ran-chi	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ran-k
OS-414	94.3	102.0	95.9	69.7	70.1	91.1	112.5	73.2	98.8	70.3	88.0	111.0	102.4	71.5	90.2	58.7	87.5	9
OL-1845	86.7	98.3	104.7	68.0	80.6	89.5	108.7	85.1	95.5	80.7	100.0	105.3	108.0	71.0	70.4	75.0	89.2	5
RSO-9	90.8	88.7	99.1	66.0	80.6	80.9	121.5	83.7	109.4	83.5	78.0	112.7	113.7	66.9	77.1	68.3	88.8	7
JO-04-319	95.8	93.7	97.6	65.0	71.2	85.0	132.2	81.5	93.4	90.7	105.0	125.9	95.0	82.3	80.2	63.1	91.1	2
OL-10	89.8	88.7	106.0	61.5	71.5	88.7	102.8	82.4	103.1	88.5	105.0	113.8	108.4	58.7	76.0	82.5	89.2	5
OL-1843	89.3	92.0	92.3	59.8	78.3	86.0	129.5	91.3	97.3	88.3	106.0	115.6	102.9	60.5	73.4	72.6	89.7	4
RSO-68	83.0	81.7	84.7	55.3	75.5	75.1	118.2	75.3	113.7	88.3	128.0	111.7	116.6	81.0	78.5	88.1	90.9	3
PLP-18	92.3	91.3	100.4	51.2	79.2	89.4	116.7	88.0	107.2	89.1	82.0	115.0	110.4	62.6	73.9	75.8	89.0	6
RSO-69	79.0	80.0	86.0	62.5	79.3	75.8	108.7	91.6	94.3	83.0	83.0	115.1	116.6	58.0	79.6	68.2	85.0	11
RO-19 (NC)	89.2	88.7	100.1	78.5	70.4	85.4	131.2	85.7	91.5		80.0	124.0	113.2	81.0	85.9	69.1	91.6	1
Kent (NC)	91.8	82.3	94.1	63.7	80.7	86.1	114.5	88.6	105.5	84.6	92.0	115.3	101.7	65.5	68.8	62.8	87.4	10
UPO-212 (NC)	96.3	84.0	95.2	61.3	71.5	90.9	116.5	81.6	101.4	98.9	94.0	119.4	95.3	72.3	70.1	61.9	88.2	8
<b>Mean</b>	<b>89.9</b>	<b>89.3</b>	<b>96.3</b>	<b>63.5</b>	<b>75.7</b>	<b>85.3</b>	<b>117.8</b>	<b>84.0</b>	<b>100.9</b>	<b>86.0</b>	<b>95.1</b>	<b>115.4</b>	<b>107.0</b>	<b>69.3</b>	<b>77.0</b>	<b>70.5</b>	<b>89.0</b>	

**Table 8.8: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): Leaf Stem Ratio**

Entries	Palam-pur	Sri-nagar	Ludh-iana	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Ran-chi	Jabal-pur	Rah-uri	Urulikan-chan	His-ar	Aver-age	Ran-k
OS-414	0.49	0.44	0.70	0.75	1.19	0.93	0.44	0.30	0.51	1.28	0.88	1.59	0.79	3
OL-1845	0.38	0.45	0.50	0.77	0.56	0.81	0.41	0.18	0.48	1.37	0.94	1.70	0.71	7
RSO-9	0.33	0.40	0.30	0.80	0.60	1.21	0.31	0.28	0.48	0.87	0.75	2.01	0.70	8
JO-04-319	0.46	0.39	0.90	0.81	0.68	0.75	0.31	0.24	0.66	1.30	0.85	1.99	0.78	4
OL-10	0.39	0.44	0.90	0.80	0.73	1.05	0.48	0.30	0.42	0.98	0.60	1.18	0.69	9
OL-1843	0.36	0.43	1.00	0.79	1.22	0.89	0.43	0.26	0.41	1.49	0.74	1.82	0.82	1
RSO-68	0.37	0.39	0.70	0.84	0.83	1.26	0.50	0.27	0.65	1.08	0.69	1.57	0.76	5
PLP-18	0.42	0.42	0.30	0.81	0.65	1.17	0.44	0.26	0.52	1.48	0.81	1.82	0.76	5
RSO-69	0.42	0.40	0.60	0.79	0.65	0.77	0.35	0.21	0.47	1.02	0.88	1.28	0.65	10
RO-19 (NC)	0.40	0.37	0.40	0.79	1.00	0.73		0.34	0.60	0.95	0.76	1.59	0.72	6
Kent (NC)	0.37	0.40	0.30	0.81	0.67	1.08	0.32	0.29	0.49	1.20	0.86	1.64	0.70	8
UPO-212 (NC)	0.33	0.44	0.70	0.82	0.68	0.98	0.35	0.24	0.52	1.54	1.03	2.07	0.81	2
<b>Mean</b>	<b>0.39</b>	<b>0.41</b>	<b>0.61</b>	<b>0.80</b>	<b>0.79</b>	<b>0.97</b>	<b>0.39</b>	<b>0.26</b>	<b>0.52</b>	<b>1.21</b>	<b>0.82</b>	<b>1.69</b>	<b>0.74</b>	

**Table 8.9: IVTO (MC): Initial Varietal Trial in Oat (Multi cut): NDF (%), ADF (%), IVDMD (%) & DDM (q/ha)**

Entries	NDF (%)				ADF (%)		IVDMD (%)		DDM (q/ha)	
	Anand	Ludhiana	Average	Rank	Ludhiana	Rank	Hisar	Rank	Hisar	Rank
OS-414	61.5	53.0	57.3	4	34.1	4	56.7	10	47.8	12
OL-1845	60.0	54.4	57.2	3	35.3	6	71.6	1	61.3	5
RSO-9	61.0	54.4	57.7	5	35.1	5	56.1	11	50.9	11
JO-04-319	59.0	62.3	60.7	8	36.5	9	62.4	3	64.4	2
OL-10	57.5	55.3	56.4	2	32.7	1	59.4	7	57.4	8
OL-1843	58.0	60.1	59.1	7	38.1	11	61.4	4	62.8	3
RSO-68	62.0	62.6	62.3	12	36.4	8	57.8	8	55.2	9
PLP-18	57.0	55.0	56.0	1	33.2	2	57.6	9	52.9	10
RSO-69	59.5	64.1	61.8	11	39.4	12	60.4	5	61.6	4
RO-19 (NC)	62.0	60.4	61.2	10	36	7	60.2	6	58.2	7
Kent (NC)	62.5	59.6	61.1	9	37.1	10	55.4	12	60.2	6
UPO-212 (NC)	63.0	54.7	58.9	6	33.6	3	67.4	2	64.8	1
<b>Mean</b>	<b>60.3</b>	<b>58.0</b>	<b>59.1</b>		<b>35.6</b>		<b>60.5</b>		<b>58.1</b>	

**Table 9.1: AVTO-1 (MC): First 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	Superi-osity%	His-ar	Jal-ore	Ludh-iana	Udai-pur	Aver-age	Ra-nk
JO-4-317	320.4	398.3	182.1	300.3	1	4.6	641.7	369.0	554.2	652.5	554.4	4
JHO-13-4	302.6	326.3	160.8	263.2	7		619.4	392.3	420.8	591.1	505.9	8
OS-385	300.4	344.7	202.2	282.4	4		663.9	310.8	590.3	707.7	568.2	3
RSO-60	302.2	354.3	155.1	270.5	5		719.4	271.7	379.2	690.3	515.2	7
OL-1802	304.4	382.0	204.9	297.1	2	3.5	644.4	405.0	561.1	680.5	572.8	2
Kent (NC)	296.0	313.3	146.9	252.1	8		597.2	351.7	495.8	618.3	515.8	6
UPO-212 (NC)	310.6	376.0	117.4	268.0	6		575.0	341.0	527.8	658.9	525.7	5
RO-19 (NC)	323.5	339.3	198.3	287.0	3		691.7	375.0	548.6	695.5	577.7	1
<b>Mean</b>	<b>307.5</b>	<b>354.3</b>	<b>171.0</b>	<b>277.6</b>			<b>644.1</b>	<b>352.1</b>	<b>509.7</b>	<b>661.9</b>	<b>541.9</b>	
<b>CD at 5%</b>	NS	21.4	23.6				122.4	5.6	113.2	90.0		
<b>CV%</b>	6.3	11.4	7.9				11.2	3.5	12.7	7.8		

**Table 9.1: AVTO-1 (MC): First 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	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Superi-osity%	Aver-age	Ra-nk	Superi-osity%
JO-4-317	286.7	425.0	506.7	383.5	346.5	609.2	426.3	7	488.8	570.0	525.0	439.2	307.1	466.0	4		444.8	4	
JHO-13-4	256.7	388.0	525.7	371.6	518.8	479.3	423.4	8	360.5	417.0	525.0	396.1	403.0	420.3	8		414.2	8	
OS-385	370.0	427.0	567.6	432.5	441.5	656.4	482.5	3	443.7	593.0	590.0	402.0	390.5	483.8	2	0.9	468.6	3	
RSO-60	370.0	377.0	563.8	447.5	536.8	533.4	471.4	4	405.6	519.0	571.0	393.1	353.2	448.4	6		441.3	5	
OL-1802	270.0	422.0	525.7	429.9	470.0	792.5	485.0	2	464.5	583.0	689.0	525.2	427.4	537.8	1	12.2	487.9	1	2.8
Kent (NC)	283.3	470.0	523.8	354.8	396.5	539.5	428.0	6	448.9	510.0	480.0	471.5	395.8	461.2	5		427.4	7	
UPO-212 (NC)	233.3	394.0	514.3	443.5	368.8	701.2	442.5	5	407.3	511.0	504.0	410.7	394.1	445.4	7		432.7	6	
RO-19 (NC)	360.0	433.0	531.4	407.6	498.8	744.8	495.9	1	428.1	629.0	558.0	408.5	373.4	479.4	3		474.7	2	
<b>Mean</b>	<b>303.8</b>	<b>417.0</b>	<b>532.4</b>	<b>408.9</b>	<b>447.2</b>	<b>632.0</b>	<b>456.9</b>		<b>431.0</b>	<b>541.5</b>	<b>555.3</b>	<b>430.8</b>	<b>380.5</b>	<b>467.8</b>			<b>448.9</b>		
<b>CD at 5%</b>	26.2	40.8	55.4	6.6	24.0	64.1			17.0	66.2	128.2	51.2	N.S.						
<b>CV%</b>	4.9	11.3	5.9	6.6	3.1	<b>5.8</b>			9.7	7.0	13.3	6.8	17.7						

**Table 9.2: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha)**

Entries	Hill Zone						North West Zone				
	Palam-pur	Sri-nagar	Alm-ora	Aver-age	Ra-nk	Superi-riority%	His-ar	Ludh-iana	Aver-age	Ra-nk	Superi-riority%
JO-4-317	63.9	79.0	27.3	56.7	1	8.2	81.5	120.8	101.2	5	3.5
JHO-13-4	60.3	65.9	24.6	50.3	6		94.8	92.0	93.4	7	
OS-385	58.0	69.9	33.3	53.8	3	0.3	86.1	129.4	107.8	1	
RSO-60	58.2	71.5	19.3	49.7	7		81.5	82.9	82.2	8	
OL-1802	59.5	76.4	33.6	56.5	2	7.8	79.7	123.1	101.4	4	
Kent (NC)	57.9	62.6	22.2	47.6	8		79.1	109.1	94.1	6	
UPO-212 (NC)	59.2	75.2	18.6	51.0	5		88.4	116.1	102.3	3	
RO-19 (NC)	63.5	68.9	24.7	52.4	4		88.3	120.0	104.2	2	
<b>Mean</b>	<b>60.1</b>	<b>71.2</b>	<b>25.4</b>	<b>52.2</b>			<b>84.9</b>	<b>111.7</b>	<b>98.3</b>		
<b>CD at 5%</b>	NS	5.4	7.3				18.7	24.7			
<b>CV%</b>	6.2	7.7	16.4				12.9	10.2			

**Table 9.2: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter 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	Superi-riority%	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra-nk	Superi-riority%	Aver-age	Ra-nk	Superi-riority%
JO-4-317	66.1	83.8	100.2	68.7	69.8	105.2	82.3	8		110.2	75.8	100.3	83.6	43.0	82.6	2	1.5	81.2	4	1.1
JHO-13-4	68.2	77.5	103.2	62.0	104.3	102.2	86.2	7		70.3	64.4	99.7	84.8	55.3	74.9	8		77.8	7	
OS-385	93.3	84.2	86.9	79.8	89.3	110.4	90.7	3		83.9	73.2	121.1	75.0	55.8	81.8	3	0.5	84.6	2	
RSO-60	78.2	74.4	92.2	87.3	107.3	99.2	89.8	4		83.4	66.6	118.4	68.9	49.8	77.4	6		77.7	8	
OL-1802	68.0	84.2	98.7	80.4	95.5	167.0	99.0	1	8.7	94.0	74.3	143.0	103.0	58.3	94.5	1	16.1	90.6	1	
Kent (NC)	80.8	93.8	100.0	67.7	80.2	102.2	87.5	6		92.0	69.6	91.6	88.7	60.7	80.5	5		79.5	6	
UPO-212 (NC)	65.6	77.7	95.6	82.5	74.1	129.9	87.6	5		80.0	64.6	95.2	78.1	61.9	76.0	7		80.3	5	
RO-19 (NC)	75.6	85.4	88.8	74.4	99.9	122.7	91.1	2		85.5	77.1	114.2	76.5	53.8	81.4	4		83.7	3	
<b>Mean</b>	<b>74.5</b>	<b>82.6</b>	<b>95.7</b>	<b>75.3</b>	<b>90.0</b>	<b>117.4</b>	<b>89.3</b>			<b>87.4</b>	<b>70.7</b>	<b>110.4</b>	<b>82.3</b>	<b>54.8</b>	<b>81.1</b>			<b>81.9</b>		
<b>CD at 5%</b>	15.8	7.6	8.8	3.0	6.4	16.4				9.0	8.7	24.6	10.7	N.S.						
<b>CV%</b>	12.0	9.6	5.3	7.1	4.0	7.9				5.1	7.0	12.7	7.4	17.8						

**Table 9.3: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha/day)**

Entries	Hisar	Ludhiana	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Jhansi	Anand	Rahuri	Average	Rank
JO-4-317	2.36	4.50	3.02	4.52	5.06	3.52	4.08	4.70	6.20	4.57	4.25	5
JHO-13-4	1.67	3.40	2.88	4.13	5.25	3.41	5.77	3.50	4.85	4.50	3.94	8
OS-385	2.92	4.80	3.30	4.64	5.67	3.97	5.02	3.76	6.45	3.62	4.41	2
RSO-60	2.71	3.10	3.22	4.09	5.63	4.13	5.90	3.83	5.30	4.14	4.20	6
OL-1802	2.60	4.60	2.41	4.49	5.25	3.97	5.28	4.42	6.20	5.31	4.45	1
Kent (NC)	2.78	4.10	3.26	5.11	5.23	3.31	4.61	4.36	5.80	5.30	4.39	3
UPO-212 (NC)	1.88	4.30	2.08	4.28	5.14	4.12	4.24	3.95	5.68	4.37	4.00	7
RO-19 (NC)	2.74	4.50	3.16	4.71	5.31	3.79	5.54	3.60	6.69	3.71	4.37	4
<b>Mean</b>	<b>2.46</b>	<b>4.16</b>	<b>2.92</b>	<b>4.50</b>	<b>5.32</b>	<b>3.78</b>	<b>5.05</b>	<b>4.02</b>	<b>5.90</b>	<b>4.44</b>	<b>4.25</b>	

**Table 9.4: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Dry Matter Yield (q/ha/day)**

Entries	Hisar	Ludhiana	Ranchi	Pusa	Faizabad	Jorhat	Bhubaneswar	Jhansi	Anand	Rahuri	Average	Rank
JO-4-317	0.28	1.00	0.69	0.89	1.00	0.63	0.82	1.06	0.82	0.87	0.81	3
JHO-13-4	0.19	0.80	0.77	0.82	1.03	0.57	1.16	0.68	0.75	0.96	0.77	5
OS-385	0.37	1.10	0.83	0.92	0.86	0.75	1.02	0.71	0.80	0.68	0.80	4
RSO-60	0.31	0.70	0.68	0.81	0.92	0.66	1.18	0.79	0.68	0.73	0.74	8
OL-1802	0.28	1.00	0.61	0.89	0.98	0.74	1.07	0.89	0.79	1.04	0.83	2
Kent (NC)	0.37	0.90	0.93	1.02	0.99	0.63	0.93	0.89	0.79	1.00	0.85	1
UPO-212 (NC)	0.23	1.00	0.58	0.84	0.95	0.77	0.85	0.78	0.72	0.83	0.75	7
RO-19 (NC)	0.33	1.00	0.66	0.93	0.88	0.49	1.11	0.72	0.82	0.70	0.76	6
<b>Mean</b>	<b>0.30</b>	<b>0.94</b>	<b>0.72</b>	<b>0.89</b>	<b>0.95</b>	<b>0.65</b>	<b>1.02</b>	<b>0.82</b>	<b>0.77</b>	<b>0.85</b>	<b>0.79</b>	

**Table 9.5: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Crude Protein Yield (q/ha)**

Entries	Palam-pur	Ludh-iana	His-ar	Faiza-bad	Jor-hat	Bhuban-eswar	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Imp-hal	Aver-age	Ra-nk
JO-4-317	6.1	11.6	9.2	8.1	10.5	6.6	11.4	7.5	7.6	3.7	16.5	9.0	2
JHO-13-4	6.5	14.1	9.5	8.5	9.6	9.7	9.6	7.4	6.7	5.0	7.0	8.5	5
OS-385	5.9	15.0	9.9	7.1	11.4	8.4	8.8	9.5	6.8	4.9	7.1	8.6	4
RSO-60	5.1	12.1	9.3	7.7	12.9	10.2	9.3	9.6	6.7	4.5	6.5	8.2	6
OL-1802	6.1	12.5	8.3	8.1	12.5	9.0	10.4	11.6	8.8	5.3	10.7	9.4	1
Kent (NC)	5.4	13.7	9.2	8.3	9.9	7.5	8.8	6.9	7.9	5.4	6.5	8.1	7
UPO-212 (NC)	6.6	13.7	9.9	7.7	12.5	7.1	9.2	7.1	7.0	5.6	8.3	8.6	4
RO-19 (NC)	6.9	12.0	10.7	7.2	10.9	9.3	10.5	8.5	6.8	4.9	7.7	8.7	3
<b>Mean</b>	<b>6.1</b>	<b>13.2</b>	<b>9.5</b>	<b>7.8</b>	<b>11.3</b>	<b>8.5</b>	<b>9.7</b>	<b>8.5</b>	<b>7.3</b>	<b>4.9</b>	<b>8.8</b>	<b>8.6</b>	

**Table 9.6: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Crude Protein (%)**

Entries	Palam-pur	Ludh-iana	His-ar	Faiza-bad	Jor-hat	Bhuban-eswar	Ana-nd	Rah-uri	Urulikan-chan	Imp-hal	Jabal-pur	Ran-chi	Aver-age	Ra-nk
JO-4-317	9.6	11.6	13.3	8.1	10.5	9.4	15.1	9.1	8.7	7.1	7.8	10.1	10.0	2
JHO-13-4	10.8	14.1	13.2	8.2	10.6	9.3	14.9	7.9	9.0	7.6	7.7	9.2	10.2	1
OS-385	10.2	15.0	13.0	8.2	10.2	9.4	12.0	9.1	8.8	7.0	8.1	7.9	9.9	3
RSO-60	8.8	14.6	13.4	8.3	11.0	9.5	14.0	9.7	9.1	7.7	8.2	7.9	10.2	1
OL-1802	10.2	12.5	12.7	8.2	10.2	9.5	14.1	8.6	9.0	7.7	8.2	8.3	9.9	3
Kent (NC)	9.3	13.7	12.8	8.3	10.4	9.4	12.7	8.9	8.9	7.9	7.8	9.2	9.9	3
UPO-212 (NC)	11.1	13.7	13.8	8.0	10.3	9.6	14.3	8.9	9.0	7.8	7.9	8.3	10.2	1
RO-19 (NC)	10.8	12.0	13.9	8.1	10.7	9.3	13.6	8.9	9.1	6.8	8.0	7.9	9.9	3
<b>Mean</b>	<b>10.1</b>	<b>13.4</b>	<b>13.3</b>	<b>8.2</b>	<b>10.5</b>	<b>9.4</b>	<b>13.8</b>	<b>8.9</b>	<b>8.9</b>	<b>7.5</b>	<b>8.0</b>	<b>8.6</b>	<b>10.0</b>	

**Table 9.7: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Plant Height (cm)**

Entries	Palam-pur	Sri-nagar	His-ar	Jal-ore	Ludh-iana	Udai-pur	Ran-chi	Faiza-bad	Jor-hat	Bhuban-eswar	Imp-hal	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ran-k
JO-4-317	90.2	102.4	94.8	73.3	106.0	103.0	104.0	122.5	88.1	87.4	77.0	141.4	97.8	75.7	72.0	41.2	92.3	3
JHO-13-4	84.5	80.1	88.6	68.7	98.3	86.1	103.0	108.7	88.3	107.2	67.3	117.2	93.9	72.7	61.2	53.3	86.2	7
OS-385	87.3	85.4	102.8	72.7	110.1	100.9	97.0	104.2	105.7	96.5	78.0	156.6	101.2	86.6	97.1	48.9	95.7	1
RSO-60	78.2	89.9	85.0	58.8	106.2	95.2	90.0	120.5	97.7	112.4	67.4	140.4	97.4	81.2	72.6	47.8	90.0	6
OL-1802	89.0	96.2	92.4	73.8	102.3	95.9	96.0	111.0	90.3	99.8	73.9	130.3	101.6	93.2	79.9	49.2	92.2	4
Kent (NC)	83.8	78.8	93.3	66.5	94.0	86.5	107.0	101.2	88.9	94.6	74.8	124.0	96.3	55.5	64.6	49.2	84.9	8
UPO-212 (NC)	91.0	99.1	91.8	64.3	99.7	102.5	98.0	128.5	90.9	90.1	82.3	126.8	100.9	61.2	69.9	50.8	90.5	5
RO-19 (NC)	80.8	86.9	102.3	66.0	101.2	97.3	82.0	125.7	104.8	105.1	83.9	153.2	100.9	73.1	92.3	45.9	93.8	2
<b>Mean</b>	<b>85.6</b>	<b>89.9</b>	<b>93.9</b>	<b>68.0</b>	<b>102.2</b>	<b>95.9</b>	<b>97.1</b>	<b>115.3</b>	<b>94.3</b>	<b>99.1</b>	<b>75.6</b>	<b>136.3</b>	<b>98.8</b>	<b>74.9</b>	<b>76.2</b>	<b>48.3</b>	<b>90.7</b>	

**Table 9.8: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): Leaf Stem Ratio**

Entries	Palam-pur	Sri-nagar	Ludh-iana	Ran-chi	Faiza-bad	Bhuban-eswar	Imp-hal	Jabal-pur	Rah-uri	Urulikan-chan	His-ar	Aver-age	Ran-k
JO-4-317	0.47	0.43	1.00	0.30	0.81	0.79	0.32	0.58	1.10	0.74	0.46	0.64	5
JHO-13-4	0.36	0.41	0.90	0.24	0.80	1.14	0.33	0.62	1.45	0.67	0.53	0.68	2
OS-385	0.44	0.40	0.70	0.31	0.79	0.95	0.41	0.75	0.98	0.74	0.85	0.66	4
RSO-60	0.53	0.40	0.6	0.35	0.78	1.17	0.33	0.69	1.00	0.72	0.65	0.66	4
OL-1802	0.39	0.41	0.50	0.21	0.80	1.04	0.45	0.75	1.57	0.69	0.55	0.67	3
Kent (NC)	0.34	0.44	1.00	0.18	0.83	0.91	0.27	0.53	1.60	0.83	0.63	0.69	1
UPO-212 (NC)	0.50	0.42	1.10	0.29	0.80	0.85	0.34	0.52	1.39	0.76	0.65	0.69	1
RO-19 (NC)	0.48	0.38	0.60	0.33	0.81	1.08	0.43	0.62	0.92	0.74	0.83	0.66	4
<b>Mean</b>	<b>0.44</b>	<b>0.41</b>	<b>0.90</b>	<b>0.28</b>	<b>0.80</b>	<b>0.99</b>	<b>0.36</b>	<b>0.63</b>	<b>1.25</b>	<b>0.74</b>	<b>0.64</b>	<b>0.67</b>	

**Table 9.9: AVTO-1 (MC): First Advanced Varietal Trial in Oat (Multi cut): NDF (%), ADF (%) & IVDMD (%), DDM (q/ha)**

Entries	NDF (%)						ADF (%)					IVDMD (%)				DDM (q/ha)	
	Ana-nd	Ludh-iana	Palam-pur	Rah-uri	Aver-age	Ran-k	Ludh-iana	Palam-pur	Rah-uri	Aver-age	Ran-k	Rah-uri	His-ar	Aver-age	Ran-k	His-ar	Ran-k
JO-4-317	55.5	59.1	64.6	48.8	57.0	4	36.9	54.2	40.6	43.9	6	57.0	56.5	56.7	4	22.5	5
JHO-13-4	56.0	58.2	64.0	47.9	56.5	2	35.1	56.6	39.2	43.6	4	58.1	55.3	56.7	4	25.9	1
OS-385	61.5	56.4	64.6	47.5	57.5	7	31.7	58.0	36.0	41.9	2	60.2	54.5	57.4	2	23.2	3
RSO-60	58.0	57.6	64.0	49.9	57.4	6	37.2	55.6	37.3	43.4	3	59.6	54.8	57.2	3	22.0	6
OL-1802	57.5	61.0	62.6	44.5	56.4	1	36.8	56.6	31.3	41.6	1	64.2	51.5	57.9	1	20.3	8
Kent (NC)	58.0	59.5	66.2	45.1	57.2	5	36.1	55.4	39.7	43.7	5	57.7	55.0	56.3	5	21.5	7
UPO-212 (NC)	57.0	58.4	63.4	48.4	56.8	3	34.9	54.6	40.6	43.4	3	57.3	54.2	55.7	7	23.3	2
RO-19 (NC)	58.0	59.9	63.8	50.4	58.0	8	38.0	57.4	36.5	44.0	7	60.2	51.5	55.8	6	22.6	4
<b>Mean</b>	<b>57.7</b>	<b>58.8</b>	<b>64.2</b>	<b>47.8</b>	<b>57.1</b>		<b>35.8</b>	<b>56.1</b>	<b>37.6</b>	<b>43.2</b>		<b>59.3</b>	<b>54.2</b>	<b>56.7</b>		<b>22.7</b>	

**10. AVTO-2 (MC): SECOND ADVANCED VARIETAL TRIAL IN OAT (MC):**  
**(Reference tables 10.1 to 10.5)**

In Oat (MC), three entries namely PLP-14, JO-04-315 and HFO-488 promoted from AVT-1 were evaluated against three national checks Kent, RO-19 and UPO-212. None of the entries was found superior than the checks for green forage (q/ha) as well as dry matter yield except JO-04-315 for GFY. Coming to the forage production potential (q/ha/day), entry PLP-14 (5.12 q/ha/day) recorded superiority for green forage yield whereas national check RO-19 (1.16 q/ha/day) proved superior for dry matter yield potential. For plant height, check RO-19 (98.7 cm) registered superiority. For the character leaf stem ratio, check variety Kent (1.09) maintained its superiority.

In quality parameters, national checks RO-19 (10.6 q/ha); HFO-488 and PLP-14 (10.5%) proved superiority for crude protein yield and crude protein content, respectively. For other quality parameters, UPO-212 for ADF (%) and IVDMD (%) and Kent and HFO-488 for NDF (%) were adjudged best performers.

**11. AVTO-2 (SEED): SECOND ADVANCED VARIETAL TRIAL IN OAT (MC) FOR SEED**  
**(Reference table 11.1)**

Results of the advanced varietal trial in Oat (MC) for seed with three entries *i.e.* HFO-488, PLP-14 and JO-04-315 along with three national checks *i.e.* Kent, RO-19 and UPO-212 conducted at five locations across the country revealed that for seed yield (q/ha), entry HFO-488 was found superior over national checks. At national level, seed yield of HFO-488 was 24.5 q/ha followed by check Kent (22.7 q/ha).

**12. IVTO (DUAL): INITIAL VARIETAL TRIAL IN OAT (DUAL)**  
**(Reference tables 12.1 to 12.10)**

An initial varietal trial in Oat (Dual) comprising of five entries along with three national checks (RO-19, UPO-212 and JHO-822) was conducted at 18 centres located at four zones of the country. Results obtained from different centres revealed that for green forage yield (q/ha), entry RSO-15 (1.8%) in North West zone; entries OS-409 (16.4%), JO-09-508 (16.2%), OL-10 (8.2%) and RSO-15 (7.5%) in North East zone registered their superiority over best check. The entry OS-409 (1.5%) recorded superiority at national level. Similarly for dry matter yield (q/ha), entries OL-10 (13.1%), RSO-15 (10.1%) and OS-409 (0.2%) in North West zone and JO-09-508 (23.5%), OS-409 (8.5%), OL-10 (6.9%) and RSO-15 (0.8%) in North East zone, while entries OL-10 (4.5%), JO-09-508 (3.7%) and OS-409 (0.3%) at national level registered superiority. For the character fodder production potential (q/ha/day), OS-409 for green forage and OL-10 for dry matter production potential were adjudged best performers.

Entry OL-10 (92.7 cm) ranked first for the character plant height. For the character leafiness, entry PLP-14 (1.31) performed better.

For quality parameters, entry OL-10 for crude protein yield (4.2 q/ha) and check variety JHO-822 for crude protein content (11.4%) exhibited superiority. Check variety UPO-212 for ADF (%) and NDF (%), PLP-14 for IVDMD (%) and OL-10 for DDM (q/ha) ranked first.

For seed yield (q/ha), the national check JHO-822 recorded 24.83 q/ha seed yield at national level.

**Table 10.1: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha) & Dry Matter Yield (q/ha)**

Entries	GFY (q/ha)								DMY (q/ha)						
	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Sup. %	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank
PLP-14	403.9	613.0	605.0	567.4	712.1	580.3	3		157.3	89.2	117.5	102.8	113.3	116.0	3
JO-04-315	369.2	574.0	647.0	570.2	883.7	608.8	1	1.9	146.1	80.6	130.1	116.8	130.2	120.8	2
HFO-488	370.9	549.0	564.0	568.4	757.9	562.0	4		140.1	79.1	109.3	106.2	116.5	110.2	4
Kent (NC)	324.1	548.0	511.0	512.1	740.7	527.2	6		104.6	77.5	96.8	96.5	106.6	96.4	6
RO-19 (NC)	333.7	642.0	599.0	615.8	797.9	597.7	2		162.7	89.6	118.5	132.2	115.3	123.7	1
UPO-212 (NC)	346.7	580.0	499.0	551.7	783.6	552.2	5		136.5	76.2	94.4	113.1	115.7	107.2	5
<b>Mean</b>	<b>358.1</b>	<b>584.3</b>	<b>570.8</b>	<b>564.3</b>	<b>779.4</b>	<b>571.4</b>			<b>141.2</b>	<b>82.0</b>	<b>111.1</b>	<b>111.3</b>	<b>116.3</b>	<b>112.4</b>	
<b>CD at 5%</b>	19.5	46.0	100.3	57.6	45.8				14.7	6.5	20.3	11.2	6.7		
<b>CV%</b>	10.7	5.2	11.6	6.8	3.9				8.1	5.2	12.1	6.7	3.8		

**Table 10.2: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)**

Entries	GFY (q/ha/day)					DMY (q/ha/day)				
	Jhansi	Anand	Rahuri	Average	Rank	Jhansi	Anand	Rahuri	Average	Rank
PLP-14	3.77	6.07	5.51	5.12	1	1.47	0.88	1.00	1.12	2
JO-04-315	3.48	5.98	5.65	5.04	2	1.38	0.84	1.16	1.12	2
HFO-488	3.50	5.60	5.57	4.89	3	1.32	0.81	1.04	1.06	3
Kent (NC)	3.03	5.59	5.12	4.58	4	0.98	0.79	0.97	0.91	4
RO-19 (NC)	2.90	6.11	5.65	4.89	3	1.41	0.85	1.21	1.16	1
UPO-212 (NC)	3.24	5.92	5.52	4.89	3	1.28	0.78	1.13	1.06	3
<b>Mean</b>	<b>3.32</b>	<b>5.88</b>	<b>5.50</b>	<b>4.90</b>		<b>1.31</b>	<b>0.83</b>	<b>1.08</b>	<b>1.07</b>	

**Table 10.3: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Crude Protein Yield (q/ha) & Crude Protein (%)**

Entries	CPY (q/ha)						CP (%)				
	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Anand	Rahuri	Urulikanchan	Average	Rank
PLP-14	12.6	9.5	9.0	9.9	10.3	3	14.1	8.8	8.7	10.5	1
JO-04-315	10.4	10.4	8.9	11.7	10.4	2	13.0	7.6	9.0	9.8	5
HFO-488	11.1	8.7	9.3	10.4	9.9	4	14.0	8.7	8.9	10.5	1
Kent (NC)	9.8	7.7	8.8	9.7	9.0	6	12.7	9.1	9.1	10.3	2
RO-19 (NC)	11.7	9.5	11.4	9.9	10.6	1	13.1	8.6	8.6	10.1	4
UPO-212 (NC)	9.9	7.4	9.7	10.4	9.4	5	13.0	8.6	9.0	10.2	3
<b>Mean</b>	<b>10.9</b>	<b>8.9</b>	<b>9.5</b>	<b>10.3</b>	<b>9.9</b>		<b>13.3</b>	<b>8.6</b>	<b>8.9</b>	<b>10.3</b>	

**Table 10.4: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): Plant Height (cm) & Leaf Stem Ratio**

Entries	Plant height (cm)							Leaf Stem Ratio				
	Jha-nsi	Ana-nd	Jabal-pur	Rah-uri	Urulikan-chan	Aver-age	Ra- nk	Jabal-pur	Rah-uri	Urulika-nchan	Aver-age	Ra- nk
PLP-14	127.3	103.5	81.9	78.5	56.7	89.6	3	0.81	1.50	0.89	1.07	2
JO-04-315	126.6	93.9	89.3	87.9	62.6	92.1	2	0.85	1.34	0.72	0.97	5
HFO-488	121.3	97.3	83.1	81.6	60.8	88.8	4	0.75	1.54	0.85	1.05	3
Kent (NC)	120.7	92.4	82.4	78.5	58.9	86.6	5	0.78	1.51	0.97	1.09	1
RO-19 (NC)	137.0	107.8	81.0	98.9	68.6	98.7	1	0.80	1.25	0.85	0.97	5
UPO-212 (NC)	119.3	91.1	73.4	79.9	62.1	85.2	6	0.68	1.53	0.89	1.03	4
<b>Mean</b>	<b>125.4</b>	<b>97.7</b>	<b>81.9</b>	<b>84.2</b>	<b>61.6</b>	<b>90.1</b>		<b>0.78</b>	<b>1.44</b>	<b>0.86</b>	<b>1.03</b>	

**Table 10.5: AVTO-2 (MC): Second Advanced Varietal Trial in Oat (Multi cut): ADF (%), NDF (%) & IVDMD (%)**

Entries	ADF (%)		NDF (%)				IVDMD (%)	
	Rahuri	Rank	Rahuri	Anand	Average	Rank	Rahuri	Rank
PLP-14	34.5	3	48.2	59.5	53.8	2	62.6	3
JO-04-315	36.9	5	51.3	58.0	54.6	3	60.6	5
HFO-488	39.9	6	46.5	57.5	52.0	1	58.3	6
Kent (NC)	32.0	2	46.5	57.5	52.0	1	63.7	2
RO-19 (NC)	34.8	4	50.2	62.0	56.1	4	62.3	4
UPO-212 (NC)	31.3	1	46.9	65.5	56.2	5	64.7	1
<b>Mean</b>	<b>34.9</b>		<b>48.3</b>	<b>60.0</b>	<b>54.1</b>		<b>62.0</b>	

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

Entries	Jhansi	Anand	Jabalpur	Rahuri	Urulikanchan	Average	Rank	Sup. %
HFO-488	12.8	26.0	36.4	16.3	30.9	24.5	1	7.9
PLP-14	7.8	10.6	25.9	16.5	28.3	17.8	5	
JO-04-315	8.5	20.2	16.2	15.5	35.5	19.2	4	
RO-19 (NC)	9.5	13.1	19.9	11.1	28.9	16.5	6	
Kent (NC)	8.5	23.3	21.9	24.5	35.2	22.7	2	
UPO-212 (NC)	10.0	22.1	24.5	14.3	41.5	22.5	3	
<b>Mean</b>	<b>9.5</b>	<b>19.2</b>	<b>24.1</b>	<b>16.4</b>	<b>33.4</b>	<b>20.5</b>		
<b>CD at 5%</b>	2.4	3.8	21.3	1.6	8.6			
<b>CV%</b>	1.3	13.2	15.5	6.6	17.0			

**Table 12.1: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)**

Entries	Hill Zone					North West Zone							
	Palam-pur	Sri-nagar	Average	Rank	Superiority%	Ludh-iana	His-ar	Bika-ner	Jal-ore	Udai-pur	Average	Rank	Superiority%
OL-10	91.9	164.0	128.0	5		229.6	151.9	240.6	178.3	84.4	177.0	3	
JO-09-508	90.2	171.0	130.6	3		235.2	107.4	191.0	244.5	93.6	174.3	4	
RSO-15	105.3	173.0	139.2	2		251.9	129.6	225.2	217.9	98.3	184.6	1	1.8
OS-409	100.4	159.2	129.8	4		209.6	125.9	220.5	195.2	84.7	167.2	6	
PLP-14	89.3	162.3	125.8	6		197.8	129.6	216.5	167.7	94.1	161.1	7	
UPO-212 (NC)	100.9	179.0	139.9	1		234.4	107.4	205.1	256.2	103.6	181.3	2	
JHO-822 (NC)	80.8	154.9	117.9	8		203.3	88.9	215.1	139.2	92.2	147.7	8	
RO-19 (NC)	96.0	151.9	124.0	7		207.8	129.6	239.4	201.2	65.0	168.6	5	
<b>Mean</b>	<b>94.4</b>	<b>164.4</b>	<b>129.4</b>			<b>221.2</b>	<b>121.3</b>	<b>219.2</b>	<b>200.0</b>	<b>89.5</b>	<b>170.2</b>		
<b>CD at 5%</b>	NS	15.8				22.9	31.2	NS	5.1	16.6			
<b>CV%</b>	10.9	11.3				5.9	12.6	17.6	1.9	10.6			

**Table 12.1: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)**

Entries	North East Zone						
	Jorhat	Bhubaneswar	Ranchi	Faizabad	Average	Rank	Superiority%
OL-10	125.4	345.9	160.0	290.7	230.5	3	8.2
JO-09-508	182.7	447.5	97.7	262.4	247.6	2	16.2
RSO-15	204.6	457.2	102.3	152.0	229.0	4	7.5
OS-409	180.7	406.6	137.7	267.2	248.1	1	16.4
PLP-14	218.0	324.6	120.0	149.3	203.0	8	
UPO-212 (NC)	230.1	305.7	151.1	144.0	207.7	6	
JHO-822 (NC)	195.2	379.9	115.6	138.7	207.3	7	
RO-19 (NC)	204.2	361.2	111.1	176.0	213.1	5	
<b>Mean</b>	<b>192.6</b>	<b>378.6</b>	<b>124.4</b>	<b>197.5</b>	<b>223.3</b>		
<b>CD at 5%</b>	8.4	30.8	40.3	41.4			
<b>CV%</b>	12.3	4.7	18.3	12.0			

**Table 12.1: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha)**

Entries	Central Zone										All India		
	Jha-nsi	Rah-uri	Urulika-nchan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk	Super-iority	Aver-age	Ra-nk	Super-iority
OL-10	200.4	233.8	381.3	148.9	290.0	181.2	211.7	235.3	4		206.1	4	
JO-09-508	209.7	251.4	379.2	163.3	202.0	207.9	185.6	228.4	5		206.8	3	
RSO-15	246.7	249.1	378.6	159.1	248.0	155.9	154.4	227.4	6		206.1	4	
OS-409	237.4	248.2	461.3	150.0	250.0	163.9	215.2	246.6	2		211.9	1	1.5
PLP-14	175.8	213.9	379.7	124.8	212.0	127.9	142.3	196.6	8		180.3	7	
UPO-212 (NC)	209.7	256.5	419.2	222.2	253.0	186.6	194.0	248.7	1		208.8	2	
JHO-822 (NC)	200.4	194.9	467.2	142.2	206.0	181.2	170.4	223.2	7		187.0	6	
RO-19 (NC)	243.6	275.0	325.3	183.3	284.0	154.6	210.9	239.5	3		201.1	5	
<b>Mean</b>	<b>215.4</b>	<b>240.4</b>	<b>399.0</b>	<b>161.7</b>	<b>243.1</b>	<b>169.9</b>	<b>185.5</b>	<b>230.7</b>			<b>201.0</b>		
<b>CD at 5%</b>	13.4	46.1	55.9	38.3	45.2	40.1	16.5						
<b>CV%</b>	7.7	11.0	7.9	13.5	10.6	13.5	5.2						

**Table 12.2: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)**

Entries	Hill Zone					North West Zone					
	Palam-pur	Sri-nagar	Aver-age	Ra-nk	Super-iority%	Ludh-iana	His-ar	Bika-ner	Aver-age	Ra-nk	Super-iority
OL-10	17.0	32.7	24.8	5		36.2	21.1	40.3	32.5	1	13.1
JO-09-508	17.2	35.4	26.3	3		37.1	11.1	32.4	26.9	7	
RSO-15	19.2	35.8	27.5	2		39.7	17.8	37.4	31.6	2	10.1
OS-409	18.5	31.7	25.1	4		33.2	17.1	37.4	29.2	3	0.2
PLP-14	16.5	33.7	25.1	4		31.2	16.0	35.0	27.4	6	
UPO-212 (NC)	18.8	36.4	27.6	1		37.1	13.7	34.5	28.4	5	
JHO-822 (NC)	15.2	31.5	23.4	7		32.1	10.0	34.6	25.6	8	
RO-19 (NC)	18.1	30.9	24.5	6		32.9	14.3	38.8	28.7	4	
<b>Mean</b>	<b>17.6</b>	<b>33.5</b>	<b>25.5</b>			<b>34.9</b>	<b>15.1</b>	<b>36.3</b>	<b>28.8</b>		
<b>CD at 5%</b>	NS	1.4				4.8	4.2	NS			
<b>CV%</b>	11.0	5.1				5.9	16.4	17.3			

**Table 12.2: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)**

Entries	North East Zone						
	Jorhat	Bhubaneswar	Faizabad	*Ranchi	Average	Rank	Superiority%
OL-10	22.7	67.5	72.0	26.0	54.1	3	6.9
JO-09-508	33.1	89.7	64.5	13.6	62.5	1	23.5
RSO-15	36.6	89.3	27.2	12.1	51.0	4	0.8
OS-409	30.5	83.0	51.2	18.3	54.9	2	8.5
PLP-14	41.1	63.0	38.9	19.9	47.7	6	
UPO-212 (NC)	37.1	60.5	33.3	22.9	43.7	8	
JHO-822 (NC)	35.1	75.5	28.3	17.6	46.3	7	
RO-19 (NC)	36.9	70.3	44.5	16.9	50.6	5	
<b>Mean</b>	<b>34.1</b>	<b>74.9</b>	<b>45.0</b>	<b>18.4</b>	<b>51.3</b>		
<b>CD at 5%</b>	2.0	5.7	20.9	6.7			
<b>CV%</b>	7.0	4.4	8.4	20.7			

Note: \* Not included in zonal and all India average due to CV  $\geq$  20

**Table 12.2: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha)**

Entries	Central Zone								All India			
	Rah- uri	Urulika- nchan	Kar- jat	Ana- nd	Jabal- pur	Rai- pur	Aver- age	Ran- k	Superi- ority	Aver- age	Ran- k	Superi- ority
OL-10	31.5	53.56	44.7	38.6	34.9	42.9	41.0	2		39.7	1	4.5
JO-09-508	36.4	49.48	46.3	25.9	37.8	35.3	38.5	4		39.4	2	3.7
RSO-15	32.4	47.76	44.6	32.3	27.4	33.0	36.2	7		37.2	5	
OS-409	34.1	52.76	37.5	30.5	29.6	46.9	38.6	3		38.1	3	0.3
PLP-14	32.1	43.54	35.4	26.5	22.4	28.8	31.5	8		33.1	8	
UPO-212 (NC)	37.2	55.00	54.2	37.9	34.0	42.7	43.5	1		38.0	4	
JHO-822 (NC)	26.3	60.64	38.1	26.1	32.9	34.1	36.4	6		34.3	7	
RO-19 (NC)	37.9	40.57	45.8	31.8	26.9	42.5	37.6	5		36.6	6	
<b>Mean</b>	<b>33.5</b>	<b>50.4</b>	<b>43.3</b>	<b>31.2</b>	<b>30.7</b>	<b>38.3</b>	<b>37.9</b>			<b>37.1</b>		
<b>CD at 5%</b>	6.4	6.9	8.3	5.9	7.3	4.3						
<b>CV%</b>	10.9	7.8	10.0	10.8	13.7	6.2						

**Table 12.3: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Green Forage Yield (q/ha/day)**

Entries	Ludhiana	Hisar	Bikaner	Jorhat	Bhubaneswar	Ranchi	Faizabad	Karjat	Anand	Raipur	Average	Rank
OL-10	3.40	2.02	2.97	2.02	5.77	2.16	2.96	2.48	5.27	2.79	3.18	2
JO-09-508	3.50	1.43	2.36	2.95	7.46	1.14	2.62	2.92	3.67	2.58	3.06	5
RSO-15	3.80	1.73	2.78	3.30	7.62	0.96	1.50	3.00	4.51	2.17	3.14	3
OS-409	3.10	1.68	2.72	2.91	6.78	1.98	2.42	2.78	4.55	3.03	3.20	1
PLP-14	3.00	1.73	2.67	3.52	5.41	1.74	1.55	2.01	3.85	1.90	2.74	8
UPO-212 (NC)	3.50	1.43	2.53	3.71	5.09	1.76	1.41	3.53	4.60	2.46	3.00	6
JHO-822 (NC)	3.00	1.19	2.66	3.15	6.33	1.58	1.26	2.41	3.75	2.37	2.77	7
RO-19 (NC)	3.10	1.73	2.96	3.29	6.02	1.08	1.79	3.11	5.16	2.70	3.09	4
<b>Mean</b>	<b>3.30</b>	<b>1.62</b>	<b>2.71</b>	<b>3.11</b>	<b>6.31</b>	<b>1.55</b>	<b>1.94</b>	<b>2.78</b>	<b>4.42</b>	<b>2.50</b>	<b>3.02</b>	

**Table 12.4: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Dry Matter Yield (q/ha/day)**

Entries	Ludhiana	Hisar	Bikaner	Jorhat	Bhubaneswar	Ranchi	Faizabad	Karjat	Anand	Raipur	Average	Rank
OL-10	0.50	0.28	0.50	0.37	1.13	0.35	0.73	0.75	0.70	0.56	0.59	1
JO-09-508	0.60	0.15	0.40	0.53	1.50	0.16	0.64	0.83	0.47	0.49	0.58	2
RSO-15	0.60	0.24	0.46	0.59	1.49	0.11	0.27	0.84	0.59	0.46	0.56	4
OS-409	0.50	0.23	0.46	0.49	1.38	0.26	0.46	0.69	0.55	0.66	0.57	3
PLP-14	0.50	0.21	0.43	0.66	1.05	0.29	0.40	0.57	0.48	0.38	0.50	7
UPO-212 (NC)	0.60	0.18	0.43	0.60	1.01	0.27	0.33	0.86	0.69	0.54	0.55	5
JHO-822 (NC)	0.50	0.13	0.43	0.57	1.26	0.24	0.26	0.65	0.47	0.47	0.50	7
RO-19 (NC)	0.50	0.19	0.48	0.60	1.17	0.16	0.45	0.78	0.58	0.54	0.54	6
<b>Mean</b>	<b>0.54</b>	<b>0.20</b>	<b>0.45</b>	<b>0.55</b>	<b>1.25</b>	<b>0.23</b>	<b>0.44</b>	<b>0.75</b>	<b>0.57</b>	<b>0.51</b>	<b>0.55</b>	

**Table 12.5: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein Yield (g/ha)**

Entries	Palam-pur	Ludhiana	Hisar	Jorhat	Bhubaneswar	Faizabad	Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Average	Rank
OL-10	1.5	5.9	1.9	2.5	6.6	5.8	2.9	5.5	7.3	2.8	3.4	4.2	1
JO-09-508	1.4	5.6	0.9	3.4	8.4	5.2	2.9	4.8	4.6	3.2	2.7	3.9	3
RSO-15	1.8	6.3	1.5	3.7	8.7	2.2	3.0	4.4	5.8	2.2	2.7	3.8	4
OS-409	1.6	5.9	1.5	3.0	7.6	4.3	3.1	5.1	6.3	2.5	3.7	4.0	2
PLP-14	1.4	5.5	1.4	4.4	6.2	3.3	2.7	4.2	5.7	1.7	2.3	3.5	6
UPO-212 (NC)	1.9	6.5	1.2	4.2	5.8	2.7	2.6	5.3	6.0	2.8	3.9	3.9	3
JHO-822 (NC)	1.7	4.9	0.9	4.4	7.2	2.3	2.2	6.4	4.8	2.6	2.6	3.6	5
RO-19 (NC)	1.9	5.5	1.1	4.4	6.9	3.8	2.9	4.1	5.7	2.2	3.6	3.8	4
<b>Mean</b>	<b>1.7</b>	<b>5.8</b>	<b>1.3</b>	<b>3.7</b>	<b>7.2</b>	<b>3.7</b>	<b>2.8</b>	<b>5.0</b>	<b>5.8</b>	<b>2.5</b>	<b>3.1</b>	<b>3.9</b>	

**Table 12.6: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Crude Protein (%)**

Entries	Palam-pur	Ludh-iana	His-ar	Jor-hat	Bhuban-eswar	Faiza-bad	Rah-uri	Urulika-nchan	Ana-nd	Rai-pur	Jabal-pur	Bika-ner	Aver-age	Ra-nk
OL-10	9.0	16.2	8.8	11.1	9.8	8.1	9.4	10.4	18.9	8.0	8.6	14.4	11.0	4
JO-09-508	8.2	15.2	8.5	10.4	9.3	8.0	8.1	9.7	17.8	7.5	8.6	13.8	10.4	8
RSO-15	9.3	15.9	8.2	10.3	9.7	8.2	9.4	9.1	18.0	8.3	8.4	14.2	10.7	7
OS-409	8.8	17.8	8.7	10.1	9.2	8.3	8.9	9.6	20.6	7.9	8.6	14.5	11.1	3
PLP-14	8.5	17.6	8.7	10.7	9.8	8.4	8.5	9.8	21.4	8.1	8.3	14.7	11.2	2
UPO-212 (NC)	10.2	17.6	9.0	11.4	9.6	8.0	6.9	9.6	15.8	9.1	8.6	13.6	10.8	6
JHO-822 (NC)	11.1	15.4	9.0	12.7	9.5	8.1	8.5	10.5	17.9	7.7	8.5	18.1	11.4	1
RO-19 (NC)	10.5	16.8	8.0	12.0	9.8	8.5	7.6	10.0	17.9	8.4	8.5	13.2	10.9	5
<b>Mean</b>	<b>9.4</b>	<b>16.6</b>	<b>8.6</b>	<b>11.1</b>	<b>9.6</b>	<b>8.2</b>	<b>8.4</b>	<b>9.8</b>	<b>18.5</b>	<b>8.1</b>	<b>8.5</b>	<b>14.5</b>	<b>11.0</b>	

**Table 12.7: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Plant Height (cm)**

Entries	Palam-pur	Ludh-iana	His-ar	Bika-ner	Jal-ore	Udai-pur	Jor-hat	Bhuban-eswar	Ran-chi	Faiza-bad	Rah-uri	Urulika-nchan	Kar-jat	Ana-nd	Jabal-pur	Rai-pur	Aver-age	Ra-nk
OL-10	57.3	83.0	53.3	85.0	82.0	135.1	82.9	121.5	61.0	150.2	75.4	59.9	108.6	99.6	97.4	130.6	92.7	1
JO-09-508	46.7	84.9	39.7	50.0	67.3	130.6	86.7	138.8	64.0	134.8	72.4	56.7	117.4	87.9	103.8	103.7	86.6	6
RSO-15	55.7	82.2	52.0	60.0	69.8	120.7	83.3	144.6	66.0	137.2	71.9	59.8	101.6	87.8	85.4	134.8	88.3	3
OS-409	47.0	82.9	40.8	55.0	63.0	128.4	97.4	133.6	64.0	154.4	72.4	62.8	110.9	95.1	90.1	111.0	88.1	4
PLP-14	47.3	93.4	41.2	40.0	64.2	139.4	82.1	114.8	68.0	140.5	60.4	59.1	105.6	85.3	85.9	94.3	82.6	8
UPO-212 (NC)	55.3	87.3	42.7	60.0	58.3	149.3	87.9	113.0	68.0	146.4	65.6	53.9	124.4	86.7	85.3	112.5	87.3	5
JHO-822 (NC)	59.7	89.1	33.7	40.0	68.0	126.6	81.9	128.8	65.0	133.8	63.2	62.7	118.3	79.5	91.4	139.5	86.3	7
RO-19 (NC)	51.3	82.8	41.2	55.0	72.5	121.1	109.0	124.6	65.0	160.4	80.4	68.1	119.4	94.2	89.8	109.4	90.3	2
<b>Mean</b>	<b>52.5</b>	<b>85.7</b>	<b>43.1</b>	<b>55.6</b>	<b>68.1</b>	<b>131.4</b>	<b>88.9</b>	<b>127.4</b>	<b>65.1</b>	<b>144.7</b>	<b>70.2</b>	<b>60.4</b>	<b>113.3</b>	<b>89.5</b>	<b>91.1</b>	<b>117.0</b>	<b>87.8</b>	

**Table 12.8: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Leaf Stem Ratio**

Entries	Ludhiana	Hisar	Bikaner	Jorhat	Bhubaneswar	Faizabad	Urulikanchan	Karjat	Jabalpur	Raipur	Average	Rank
OL-10	2.08	0.53	1.70	0.71	0.97	0.61	1.38	0.70	0.92	0.99	1.06	4
JO-09-508	3.00	0.27	1.83	0.73	1.19	0.60	1.15	0.59	0.96	0.73	1.10	3
RSO-15	1.67	0.65	1.07	0.89	1.24	0.57	1.30	0.63	1.02	0.65	0.97	7
OS-409	3.17	0.54	1.44	1.12	1.13	0.63	1.20	0.51	0.94	0.88	1.16	2
PLP-14	4.71	0.48	1.83	0.77	0.94	0.68	1.18	0.66	1.01	0.87	1.31	1
UPO-212 (NC)	2.45	0.45	1.91	0.84	0.86	0.56	1.29	0.49	0.96	0.69	1.05	5
JHO-822 (NC)	2.08	0.39	1.50	0.89	1.08	0.55	1.14	0.54	0.88	0.79	0.98	6
RO-19 (NC)	2.33	0.49	1.41	0.73	1.03	0.70	1.29	0.57	0.99	0.99	1.05	5
<b>Mean</b>	<b>2.69</b>	<b>0.48</b>	<b>1.59</b>	<b>0.84</b>	<b>1.06</b>	<b>0.61</b>	<b>1.24</b>	<b>0.59</b>	<b>0.96</b>	<b>0.82</b>	<b>1.09</b>	

**Table 12.9: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): NDF (%), ADF (%), IVDMD (%) & DDM (q/ha)**

Entries	NDF (%)		ADF (%)		IVDMD (%)		DDM (q/ha)	
	Ludhiana	Rank	Ludhiana	Rank	Hisar	Rank	Hisar	Rank
OL-10	36.8	4	52.2	5	54.7	3	11.5	1
JO-09-508	37.2	5	53.5	6	55.1	2	6.1	7
RSO-15	37.9	6	53.8	7	53.2	4	9.5	2
OS-409	36.1	3	51.3	3	52.3	5	8.9	4
PLP-14	35.5	2	50.4	2	57.5	1	9.2	3
UPO-212 (NC)	33.4	1	49.7	1	53.2	4	7.3	6
JHO-822 (NC)	38.1	7	54.3	8	49.5	6	5.0	8
RO-19 (NC)	38.4	8	51.9	4	57.5	1	8.2	5
<b>Mean</b>	<b>36.7</b>		<b>52.1</b>		<b>54.1</b>		<b>8.2</b>	

**Table 12.10: IVT Oat (Dual): Initial Varietal Trial in Oat (Dual): Seed Yield (q/ha)**

Entries	Palampur	Srinagar	Ludhiana	Hisar	Bikaner	Udaiapur	Jorhat	Bhubaneswar	Ranchi	Faizabad	Jhansi	Rahuri	Urulikanchan	Anand	Jabalpur	Raipur	Average	Rank
OL-10	12.30	9.73	36.40	18.00	6.96	15.50	9.23	2.60	38.67	23.33	11.56	24.98	27.20	27.78	29.85	13.13	19.20	5
JO-09-508	12.40	11.70	45.00	18.70	6.85	15.80	11.85	6.33	42.13	27.33	11.41	19.45	28.80	25.56	23.80	12.50	19.98	4
RSO-15	12.87	8.37	48.40	18.50	6.22	31.20	14.62	5.40	37.33	32.40	11.18	27.12	29.86	38.15	26.30	13.04	22.56	3
OS-409	11.07	11.00	19.70	8.70	4.44	7.10	14.87	3.67	24.80	10.93	5.86	11.92	32.00	15.56	28.47	15.27	14.08	7
PLP-14	14.53	10.33	29.00	10.20	4.96	15.60	14.40	2.80	22.27	15.20	10.02	13.64	32.53	20.00	31.93	15.70	16.44	6
UPO-212 (NC)	11.97	9.43	59.40	15.60	6.85	22.20	14.27	3.27	33.33	34.77	11.25	29.15	33.60	41.48	20.47	16.14	22.70	2
JHO-822 (NC)	15.73	9.17	54.20	15.60	15.41	32.00	13.37	5.73	33.33	34.93	13.88	26.22	34.13	45.19	34.39	14.06	24.83	1
RO-19 (NC)	9.30	8.27	18.90	8.40	6.78	6.90	12.57	3.47	20.00	17.20	6.88	11.36	25.07	17.78	36.12	15.38	14.02	8
<b>Mean</b>	<b>12.52</b>	<b>9.75</b>	<b>38.88</b>	<b>14.21</b>	<b>7.31</b>	<b>18.29</b>	<b>13.15</b>	<b>4.16</b>	<b>31.48</b>	<b>24.51</b>	<b>10.25</b>	<b>20.48</b>	<b>30.40</b>	<b>28.94</b>	<b>28.92</b>	<b>14.40</b>	<b>19.23</b>	
<b>CD at 5%</b>	2.56	0.88	13.36	3.90	2.14	4.15	1.11	3.00	11.73	7.40	2.43	3.75	N.S.	7.40	5.00	3.37		
<b>CV%</b>	11.69	4.52	3.70	16.00	17.06	13.00	6.23	6.10	21.08	17.28	1.39	10.46	11.11	14.60	10.60	13.71		

### **13. IVTL: INITIAL VARIETAL TRIAL IN LATHYRUS**

**(Reference tables 13.1 to 13.5)**

An initial varietal trial in Lathyrus comprising of four entries namely BK-20-5, JLSJ-09-3, JCL-7 and BK-5 along with three national checks Nirmal, Prateek and Mahateora was conducted at nine centres in North-East and Central zone of the country. For green forage and dry matter yield national check Nirmal was superior at national level. For fodder production potential (q/ha/day), check Nirmal for green forage (1.98 q/ha/day) and entry BK-5 for dry matter production potential (0.53 q/ha/day) were adjudged best performers.

For growth parameters, check Nirmal (63.0 cm) ranked first for plant height. For the character leafiness, entry JCL-7 (1.06) was observed best performer.

For quality parameters, entry JLSJ-09-3 and BK-5 for crude protein yield (4.6 q/ha) and JCL-7 for crude protein content (15.7%) recorded superiority.

### **14. IVT Lucerne: INITIAL VARIETAL TRIAL IN LUCERNE (Annual)**

**(Reference tables 14.1 to 14.6)**

An initial varietal trial in Lucerne with five entries along with two national checks Anand-2 and RL-88 was conducted at ten locations in three zones of the country. Entry Anand-26 for dry matter yield (6.3%) proved superiority over national checks. For fodder production potential, check Anand-2 established superiority both for green forage and dry matter production potential (q/ha/day).

For growth parameters, check Anand-2 (62.8 cm) ranked first followed by RL-88 (61.6 cm) for plant height while for leaf stem ratio, entry AL-140001 (1.61) was superior. For quality parameters, check variety Anand-2 for crude protein yield (24.5 q/ha) and AL-140002 for crude protein content (21.6%) recorded superiority. For other quality parameters, entry Anand-26 for ADF (%) and NDF (%) was adjudged best performers.

### **15. VTL (P)-2013: VARIETAL EVALUATION TRIAL IN LUCERNE (PERENNIAL)-2<sup>nd</sup> YEAR**

**(Reference tables 15.1 to 15.5)**

The varietal trial on Lucerne (Perennial) comprising of seven entries *viz.* ALP-1-1, TNLC-14, Anand-25, Anand-26 and RL-10-2 along with two national checks *i.e.* Anand-2 and RL-88 was established during *Rabi*-2013 at nine centers of the North-West, Central and South zone but this year data has been received from eight centers. This is being the second year of evaluation hence all the entries are in coded form, it will be decoded after completion of trial in the third and final year of evaluation. Results obtained from testing locations clearly revealed that for green forage and dry matter yield (q/ha) VTL-2-1 ranked first at national level. For the forage production potential (q/ha/day), VTL-2-1 was found better in performance. For the characters plant height (cm) and leaf stem ratio, VTL-2-2 ranked first. For quality parameters, VTL-2-1 for crude protein yield (q/ha) and VTL-2-2 for crude protein content (%) proved their superiority.

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

Entries	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Jha-nsi	Jabal-pur	Kan-pur	Rai-pur	Aver-age	Ran-k	Superi- ority%
BK-20-5	169.0	118.8	95.2	138.9	75.0	135.0	247.0	144.4	113.5	137.4	4	
JLSJ-09-3	238.7	101.1	101.4	92.7	80.0	115.4	298.4	137.0	104.3	141.0	2	
JCL-7	205.4	109.4	91.7	143.5	62.0	111.0	238.7	118.5	79.3	128.8	5	
BK-5	182.7	136.1	118.1	97.2	73.0	131.3	241.5	151.9	116.8	138.7	3	
Prateek (NC)	156.4	67.2	130.3	125.0	50.0	100.2	237.3	137.0	78.9	120.3	6	
Nirmal (NC)	192.9	112.7	98.6	134.3	75.0	147.1	255.4	170.4	118.1	144.9	1	
Mahateora (NC)	159.9	85.5	90.4	120.4	55.0	112.1	194.3	159.3	102.5	119.9	7	
<b>Mean</b>	<b>186.4</b>	<b>104.4</b>	<b>103.7</b>	<b>121.7</b>	<b>67.1</b>	<b>121.7</b>	<b>244.7</b>	<b>145.5</b>	<b>101.9</b>	<b>133.0</b>		
<b>CD at 5%</b>	2.5	10.0	6.5	26.9	9.3	6.5	54.5	26.8	17.9			
<b>CV%</b>	7.5	9.8	4.9	12.3	11.2	3.0	12.5	10.4	10.3			

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

Entries	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Pu-sa	Jha-nsi	Jabal-pur	Kan-pur	Rai-pur	Aver-age	Ran-k	Superi- ority%
BK-20-5	33.1	40.5	18.9	26.8	17.1	30.8	43.5	59.6	27.0	33.0	3	
JLSJ-09-3	48.3	34.3	19.8	22.9	18.2	21.7	53.3	56.3	26.3	33.4	2	
JCL-7	35.8	36.6	18.0	30.6	14.1	19.7	41.7	49.9	14.2	28.9	6	
BK-5	36.9	46.7	23.2	20.8	16.6	22.2	42.1	61.1	30.7	33.4	2	
Prateek (NC)	30.8	23.9	25.8	29.0	11.4	23.2	41.6	55.9	21.6	29.2	4	
Nirmal (NC)	33.7	36.5	19.4	32.9	17.1	26.4	44.8	72.2	23.6	34.1	1	
Mahateora (NC)	30.3	28.1	18.3	25.6	12.5	24.5	33.4	67.0	22.6	29.1	5	
<b>Mean</b>	<b>35.5</b>	<b>35.2</b>	<b>20.5</b>	<b>26.9</b>	<b>15.3</b>	<b>24.1</b>	<b>42.9</b>	<b>60.3</b>	<b>23.7</b>	<b>31.6</b>		
<b>CD at 5%</b>	2.7	5.2	1.3	7.5	1.8	1.4	9.7	11.5	5.4			
<b>CV%</b>	9.6	6.9	4.8	15.7	10.6	3.2	12.6	13.2	13.4			

**Table 13.3: IVT Lathyrus: Initial Varietal Trial in Lathyrus: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)**

Entries	GFY (q/ha/day)								DMY (q/ha/day)							
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Kan-pur	Rai-pur	Aver-age	Ran-k	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Kan-pur	Rai-pur	Aver-age	Ran-k
BK-20-5	2.52	1.52	1.80	1.69	2.22	1.51	1.88	4	0.49	0.52	0.36	0.33	0.92	0.36	0.50	4
JLSJ-09-3	3.67	1.30	1.84	1.08	2.08	1.49	1.91	3	0.74	0.44	0.36	0.27	0.85	0.38	0.51	3
JCL-7	2.05	1.40	1.70	1.63	1.58	1.17	1.59	7	0.36	0.47	0.33	0.35	0.67	0.21	0.40	7
BK-5	2.77	1.75	2.07	1.14	2.37	1.67	1.96	2	0.56	0.60	0.41	0.24	0.96	0.44	0.53	1
Prateek (NC)	2.27	0.86	2.14	1.58	2.11	1.10	1.68	6	0.45	0.31	0.42	0.37	0.86	0.30	0.45	6
Nirmal (NC)	2.88	1.45	1.67	1.72	2.62	1.55	1.98	1	0.50	0.47	0.33	0.42	1.11	0.31	0.52	2
Mahateora (NC)	2.28	1.10	1.59	1.50	2.57	1.38	1.74	5	0.43	0.36	0.32	0.32	1.02	0.31	0.46	5
<b>Mean</b>	<b>2.64</b>	<b>1.34</b>	<b>1.83</b>	<b>1.48</b>	<b>2.22</b>	<b>1.41</b>	<b>1.82</b>		<b>0.50</b>	<b>0.45</b>	<b>0.36</b>	<b>0.33</b>	<b>0.91</b>	<b>0.33</b>	<b>0.48</b>	

**Table 13.4: IVT Lathyrus: Initial Varietal Trial in Lathyrus: Crude Protein Yield (q/ha) & Crude Protein (%)**

Entries	CPY (q/ha)							CP (%)						
	Jor-hat	Kal-yani	Bhuban-eswar	Jabal-pur	Rai-pur	Aver-age	Ran-k	Jor-hat	Bhuban-eswar	Jabal-pur	Rai-pur	Ran-chi	Aver-age	Ran-k
BK-20-5	4.0	4.3	2.8	6.2	3.7	4.2	2	12.3	14.9	14.4	13.8	21.4	15.4	2
JLSJ-09-3	5.7	3.5	3.0	7.6	3.4	4.6	1	11.9	15.1	14.5	12.8	21.9	15.2	3
JCL-7	4.3	5.3	2.8	5.8	2.0	4.0	4	12.1	15.4	14.4	13.7	22.7	15.7	1
BK-5	4.3	5.3	3.5	6.0	4.2	4.6	1	11.9	15.1	14.3	13.6	20.1	15.0	4
Prateek (NC)	3.9	3.2	3.9	6.0	2.9	4.0	4	12.6	14.9	14.4	13.3	21.0	15.2	3
Nirmal (NC)	3.9	4.1	3.0	6.4	3.2	4.1	3	11.8	15.7	14.5	13.7	20.1	15.2	3
Mahateora (NC)	3.6	3.4	2.7	4.7	3.1	3.5	5	12.0	14.6	14.3	13.9	20.1	15.0	4
<b>Mean</b>	<b>4.2</b>	<b>4.2</b>	<b>3.1</b>	<b>6.1</b>	<b>3.2</b>	<b>4.1</b>		<b>12.1</b>	<b>15.1</b>	<b>14.4</b>	<b>13.5</b>	<b>13.5</b>	<b>13.8</b>	

**Table 13.5: IVT Lathyrus: Initial Varietal Trial in Lathyrus: Plant Height (cm) & Leaf Stem Ratio**

Entries	Plant Height (cm)										Leaf Stem Ratio								
	Jor-hat	Kal-yani	Bhuban-eswar	Ran-chi	Jha-nsi	Jabal-pur	Kan-pur	Rai-pur	Aver-age	Ran-k	Jor-hat	Kal-yani	Bhuban-eswar	Jha-nsi	Jabal-pur	Kan-pur	Rai-pur	Aver-age	Ran-k
BK-20-5	50.0	76.6	59.2	72.0	65.0	66.0	51.0	52.9	61.6	3	1.54	0.69	0.84	0.62	1.04	1.41	0.90	1.01	3
JLSJ-09-3	62.7	83.8	58.4	50.0	57.0	82.7	43.7	56.7	61.9	2	1.42	0.62	0.98	0.64	1.13	1.26	1.03	1.01	3
JCL-7	47.9	56.8	52.1	45.0	62.0	65.1	42.0	55.6	53.3	7	1.74	0.65	0.78	0.81	1.04	1.34	1.06	1.06	1
BK-5	49.0	87.7	61.4	46.0	62.0	73.1	47.8	58.4	60.7	4	1.34	0.79	0.93	0.64	1.10	1.25	1.11	1.02	2
Prateek (NC)	42.1	66.7	64.5	69.0	52.0	60.1	44.4	42.4	55.1	5	1.60	0.53	0.96	0.68	1.03	1.52	0.76	1.01	3
Nirmal (NC)	50.0	85.5	62.3	69.0	62.0	70.3	51.8	53.4	63.0	1	1.43	0.67	0.89	0.75	1.05	1.30	0.88	1.00	4
Mahateora (NC)	43.7	71.5	55.4	65.0	54.0	47.9	46.5	48.3	54.0	6	1.84	0.58	0.81	0.78	0.91	1.21	0.78	0.99	5
<b>Mean</b>	<b>49.3</b>	<b>75.5</b>	<b>59.0</b>	<b>59.4</b>	<b>59.1</b>	<b>66.5</b>	<b>46.7</b>	<b>52.5</b>	<b>58.5</b>		<b>1.56</b>	<b>0.65</b>	<b>0.88</b>	<b>0.70</b>	<b>1.04</b>	<b>1.33</b>	<b>0.93</b>	<b>1.01</b>	

**Table 14.1: IVT Lucerne -2014: Initial Varietal Trial in Lucerne (Annual)-2014-15: Green Forage Yield (q/ha)**

Entries	North West Zone						Central Zone						
	Ludh-iana	Bika-ner	Udai-pur	Aver-age	Ra-nk	Superi-riority%	Rah-uri	Urulika-nchan	Ana-nd	Rai-pur	Aver-age	Ra-nk	Superi-riority%
AL-140002	334.8	239.8	514.2	362.9	6		266.5	610.3	516.0	126.2	379.7	6	
AL-140001	301.9	323.2	476.4	367.2	5		275.5	678.4	483.0	148.4	396.3	5	
Anand-26	377.4	330.9	531.9	413.4	2		474.8	786.6	<b>993.0</b>	177.8	608.0	2	
AL-140004	295.6	310.5	444.2	350.1	7		269.1	570.5	484.0	172.1	373.9	7	
AL-140003	308.3	352.8	491.4	384.1	4		290.6	657.9	504.0	279.2	432.9	4	
Anand-2 (NC)	380.9	310.3	541.9	411.1	3		568.0	779.6	968.0	357.9	668.4	1	
RL-88 (NC)	360.4	344.0	544.4	416.3	1		545.0	640.4	807.0	304.3	574.2	3	
<b>Mean</b>	<b>337.0</b>	<b>315.9</b>	<b>506.3</b>	<b>386.4</b>			<b>384.2</b>	<b>674.8</b>	<b>679.3</b>	<b>223.7</b>	<b>490.5</b>		
<b>CD at 5%</b>	NS	NS	39.1				72.5	84.9	66.3	18.6			
<b>CV%</b>	10.1	18.7	4.3				10.6	7.0	5.3	4.9			

**Table 14.1: IVT Lucerne -2014: Initial Varietal Trial in Lucerne (Annual)-2014-15: Green Forage Yield (q/ha)**

Entries	South Zone						All India		
	Hydera-bad	Man-dya	Rai-chur	Aver-age	Ra-nk	Superi-riority%	Aver-age	Ra-nk	Superi-riority%
AL-140002	294.3	131.1	149.7	191.7	2		318.3	6	
AL-140001	301.3	99.3	155.1	185.2	5		324.2	5	
Anand-26	237.4	157.4	177.3	190.7	3		424.4	2	
AL-140004	236.0	104.7	161.8	167.5	7		304.8	7	
AL-140003	219.4	154.0	130.6	168.0	6		338.8	4	
Anand-2 (NC)	229.1	147.0	186.3	187.5	4		446.9	1	
RL-88 (NC)	272.1	160.3	166.8	199.7	1		414.5	3	
<b>Mean</b>	<b>255.7</b>	<b>136.2</b>	<b>161.1</b>	<b>184.3</b>			<b>367.4</b>		
<b>CD at 5%</b>	24.0	15.9	36.3						
<b>CV%</b>	5.3	6.6	12.2						

**Table 14.2: IVT Lucerne -2014: Initial Varietal Trial in Lucerne (Annual)-2014-15: Dry Matter Yield (q/ha)**

Entries	North West Zone					Central Zone						
	Ludhiana	Bikaner	Average	Rank	Superiority%	Rahuri	Urulikanchan	Anand	Raipur	Average	Rank	Superiority%
AL-140002	127.4	62.2	94.8	7	6.3	67.8	105.2	103.9	21.2	74.5	6	
AL-140001	117.5	86.0	101.7	5		75.4	125.3	96.5	38.9	84.0	4	
Anand-26	155.0	89.8	122.4	1		121.5	144.1	203.2	44.8	128.4	3	
AL-140004	118.9	81.7	100.3	6		67.6	97.5	96.5	24.9	71.6	7	
AL-140003	123.8	86.6	105.2	4		70.3	115.6	97.5	49.4	83.2	5	
Anand-2 (NC)	145.3	84.9	115.1	2		136.2	129.9	196.9	127.5	147.6	1	
RL-88 (NC)	135.0	91.3	113.1	3		130.6	111.3	168.6	122.5	133.3	2	
<b>Mean</b>	<b>131.8</b>	<b>83.2</b>	<b>107.5</b>			<b>95.6</b>	<b>118.4</b>	<b>137.6</b>	<b>61.3</b>	<b>103.2</b>		
<b>CD at 5%</b>	NS	NS			17.6	15.4	16.8	6.2				
<b>CV%</b>	9.2	16.1			10.3	7.2	6.6	5.9				

**Table 14.2: IVT Lucerne -2014: Initial Varietal Trial in Lucerne (Annual)-2014-15: Dry Matter Yield (q/ha)**

Entries	South Zone					All India		
	Hyderabad	Mandya	Average	Rank	Superiority%	Average	Rank	Superiority%
AL-140002	54.9	29.9	42.4	2	40.5	71.6	6	88.6
AL-140001	59.2	19.2	39.2	5		77.2	5	
Anand-26	47.3	35.6	41.4	4		105.2	3	
AL-140004	48.0	23.8	35.9	7		69.9	7	
AL-140003	47.0	37.2	42.1	3		78.4	4	
Anand-2 (NC)	48.1	31.8	39.9	6		112.6	1	
RL-88 (NC)	55.6	29.6	42.6	1		105.6	2	
<b>Mean</b>	<b>51.4</b>	<b>29.6</b>	<b>40.5</b>					
<b>CD at 5%</b>	7.2	4.5						
<b>CV%</b>	7.9	8.6						

**Table 14.3: IVT Lucerne -2014: Initial Varietal Trial in Lucerne (Annual)-2014-15: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)**

Entries	GFY (q/ha/day)						DMY (q/ha/day)					
	Ludh-iana	Bika-ner	Ana-nd	Rai-pur	Aver-age	Ra-nk	Ludh-iana	Bika-ner	Ana-nd	Rai-pur	Aver-age	Ra-nk
AL-140002	1.60	1.23	2.57	0.78	1.55	6	0.60	0.32	0.52	0.13	0.39	7
AL-140001	1.40	1.66	2.4	0.94	1.60	5	0.60	0.44	0.48	0.25	0.44	5
Anand-26	1.80	1.70	4.94	1.22	2.42	2	0.70	0.46	1.01	0.31	0.62	3
AL-140004	1.40	1.59	2.41	1.01	1.60	5	0.60	0.42	0.48	0.15	0.41	6
AL-140003	1.50	1.81	2.51	1.62	1.86	4	0.60	0.44	0.49	0.29	0.46	4
Anand-2 (NC)	1.80	1.59	4.82	2.06	2.57	1	0.70	0.44	0.98	0.70	0.71	1
RL-88 (NC)	1.70	1.76	4.01	1.73	2.30	3	0.60	0.47	0.84	0.70	0.65	2
<b>Mean</b>	<b>1.60</b>	<b>1.62</b>	<b>3.38</b>	<b>1.34</b>	<b>1.98</b>		<b>0.63</b>	<b>0.43</b>	<b>0.69</b>	<b>0.36</b>	<b>0.53</b>	

**Table 14.4: IVT Lucerne-2014: Initial Varietal Trial in Lucerne (Annual)-2014-15: Crude Protein Yield (q/ha) & Crude Protein (%)**

Entries	CPY (q/ha)										CP (%)									
	Ludh-iana	Rah-uri	Urulika-nchan	Ana-nd	Rai-pur	Man-dya	Hydera-bad	Aver-age	Ra-nk	Ludh-iana	Rah-uri	Urulika-nchan	Ana-nd	Rai-pur	Man-dya	Hydera-bad	Bika-ner	Aver-age	Ra-nk	
AL-140002	34.9	14.3	19.8	26.2	3.5	2.8	11.4	16.1	6	27.4	21.1	18.8	24.3	16.7	18.8	20.2	25.7	21.6	1	
AL-140001	32.9	14.1	23.5	23.9	6.9	2.8	10.6	16.4	5	28.0	18.6	18.7	24.0	17.9	18.0	19.6	18.2	20.4	3	
Anand-26	43.4	23.3	27.4	52.1	8.9	2.4	11.6	24.1	2	28.0	19.2	19.0	25.0	19.8	18.4	18.8	19.6	21.0	2	
AL-140004	27.8	13.4	17.9	23.1	4.6	2.4	9.0	14.0	7	23.4	19.8	18.4	23.3	18.6	14.0	15.5	17.4	18.8	6	
AL-140003	31.2	13.7	21.0	25.0	8.7	5.0	10.7	16.5	4	25.2	19.5	18.2	24.5	17.6	17.5	19.5	19.4	20.2	4	
Anand-2 (NC)	37.0	26.0	24.7	49.9	23.0	2.9	8.4	24.5	1	25.5	19.1	19.0	24.7	18.0	17.1	17.9	19.1	20.0	5	
RL-88 (NC)	31.9	25.1	19.0	41.7	20.5	2.8	7.5	21.2	3	23.6	19.2	17.1	24.6	16.7	16.6	14.1	18.9	18.8	6	
<b>Mean</b>	<b>34.2</b>	<b>18.6</b>	<b>21.9</b>	<b>34.6</b>	<b>10.9</b>	<b>3.0</b>	<b>9.9</b>	<b>19.0</b>		<b>25.9</b>	<b>19.5</b>	<b>18.5</b>	<b>24.4</b>	<b>17.9</b>	<b>17.2</b>	<b>17.9</b>	<b>19.7</b>	<b>20.1</b>		

**Table 14.5: IVT Lucerne -2014: Initial Varietal Trial in Lucerne (Annual)-2014-15: Plant Height (cm) & Leaf Stem Ratio**

Entries	Plant height (cm)											Leaf Stem Ratio									
	Ludh-iana	Bika-ner	Udai-pur	Rah-uri	Urulika-nchan	Ana-nd	Rai-pur	Man-dya	Rai-chur	Aver-age	Ra-nk	Ludh-iana	Bika-ner	Rah-uri	Urulika-nchan	Rai-pur	Man-dya	Aver-age	Ra-nk		
AL-140002	52.1	41.4	41.1	32.3	74.9	51.2	56.5	42.5	44.1	48.4	6	0.90	1.56	1.78	0.89	0.91	3.28	1.55	2		
AL-140001	50.5	48.8	37.2	34.7	75.4	49.7	54.9	47.2	50.7	49.9	5	1.00	1.35	2.27	0.81	1.00	3.20	1.61	1		
Anand-26	47.4	61.6	59.2	41.3	77.3	80.9	63.6	65.2	47.9	60.5	3	1.23	1.25	1.58	0.72	0.87	1.10	1.13	7		
AL-140004	44.5	48.6	40.8	38.3	75.6	51.8	48.3	38.1	45.7	48.0	7	1.00	1.54	2.34	0.77	0.94	2.15	1.46	3		
AL-140003	47.8	58.0	40.3	34.8	78.6	49.0	60.7	42.1	44.7	50.7	4	0.90	1.30	2.28	0.86	0.88	2.05	1.38	4		
Anand-2 (NC)	49.1	65.8	59.4	46.2	74.1	79.9	68.8	60.9	61.3	62.8	1	0.70	1.20	1.81	0.75	0.83	1.77	1.18	6		
RL-88 (NC)	47.8	68.0	49.7	45.8	80.8	75.2	72.8	59.0	55.1	61.6	2	1.00	0.99	2.09	0.74	1.04	2.03	1.32	5		
<b>Mean</b>	<b>48.5</b>	<b>56.0</b>	<b>46.8</b>	<b>39.1</b>	<b>76.7</b>	<b>62.5</b>	<b>60.8</b>	<b>50.7</b>	<b>49.9</b>	<b>54.6</b>		<b>0.96</b>	<b>1.31</b>	<b>2.02</b>	<b>0.79</b>	<b>0.92</b>	<b>2.23</b>	<b>1.37</b>			

**Table 14.6: IVT Lucerne -2014: Initial Varietal Trial in Lucerne (Annual)-2014-15: ADF (%) & NDF (%)**

Entries	ADF (%)		NDF (%)	
	Ludhiana	Rank	Ludhiana	Rank
AL-140002	27.3	3	33.9	3
AL-140001	26.9	2	33.3	2
Anand-26	26.5	1	33.0	1
AL-140004	30.0	7	39.0	6
AL-140003	29.1	6	36.9	5
Anand-2 (NC)	28.3	4	36.1	4
RL-88 (NC)	28.4	5	39.9	7
<b>Mean</b>	<b>28.1</b>		<b>36.0</b>	

**Table 15.1: VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-2<sup>nd</sup> Year: Green Forage Yield (q/ha)**

Entries	North West Zone					Central Zone					South Zone				All India	
	Ludhiana	Bikaner	Hisar	Average	Rank	Rahuri	Urulikanchan	Anand	Average	Rank	Hyderabad	Coimbatore	Average	Rank	Average	Rank
VTL-13-1	448.4	504.7	451.4	468.2	1	1165.7	1642.9	1075.0	1294.5	1	302.7	681.6	492.2	7	784.0	1
VTL-13-2	318.4	693.1	222.2	411.2	5	1147.5	939.2	664.0	916.9	6	276.3	716.7	496.5	6	622.2	6
VTL-13-3	257.7	549.3	156.9	321.3	7	986.1	812.2	313.0	703.8	7	311.0	933.9	622.4	1	540.0	7
VTL-13-4	400.7	559.1	318.1	426.0	4	1167.0	1627.4	678.0	1157.5	2	224.9	923.3	574.1	2	737.3	2
VTL-13-5	207.7	697.4	286.1	397.1	6	1059.0	1168.2	635.0	954.1	5	286.0	819.4	552.7	3	644.9	5
VTL-13-6	251.3	738.5	322.2	437.3	3	1065.2	1627.6	553.0	1081.9	3	255.5	774.1	514.8	5	698.4	3
VTL-13-7	249.2	735.3	368.1	450.9	2	1182.6	1233.5	752.0	1056.0	4	263.8	800.5	532.2	4	698.1	4
<b>Mean</b>	<b>304.8</b>	<b>639.6</b>	<b>303.6</b>	<b>416.0</b>		<b>1110.4</b>	<b>1293.0</b>	<b>667.1</b>	<b>1023.5</b>		<b>274.3</b>	<b>807.1</b>	<b>540.7</b>		<b>675.0</b>	
<b>CD at 5%</b>	109.2	167.7	115.3			141.5	283.6	59.4			36.9	84.8				
<b>CV%</b>	28.9	14.7	18.36			7.2	12.2	4.6			7.6	5.9				

**Table 15.2: VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-2<sup>nd</sup> Year: Dry Matter Yield (q/ha)**

Entries	North West Zone					Central Zone					South Zone				All India	
	Ludhiana	Bikaner	Hisar	Average	Rank	Rahuri	Urulikanchan	Anand	Average	Rank	Hyderabad	Coimbatore	Average	Rank	Average	Rank
VTL-13-1	137.4	163.8	154.4	151.9	1	340.6	363.8	229.7	311.4	1	56.4	103.0	79.7	7	193.6	1
VTL-13-2	98.0	218.3	72.5	129.6	4	328.2	213.5	142.2	228.0	6	54.4	105.7	80.1	6	154.1	5
VTL-13-3	60.7	174.5	51.0	95.4	7	282.1	190.5	70.1	180.9	7	61.9	153.1	107.5	1	130.5	7
VTL-13-4	106.7	178.7	108.7	131.4	2	330.3	381.5	147.8	286.6	2	47.2	142.3	94.8	2	180.4	2
VTL-13-5	28.6	219.0	92.3	113.3	6	299.5	263.8	140.2	234.5	5	58.1	118.3	88.2	3	152.5	6
VTL-13-6	35.0	237.5	102.5	125.0	5	303.1	367.8	121.1	264.0	3	54.8	113.9	84.3	5	167.0	4
VTL-13-7	34.7	233.6	123.0	130.4	3	336.8	274.8	162.1	257.9	4	53.4	118.9	86.2	4	167.2	3
<b>Mean</b>	<b>71.6</b>	<b>203.6</b>	<b>100.6</b>	<b>125.3</b>		<b>317.2</b>	<b>293.7</b>	<b>144.7</b>	<b>251.9</b>		<b>55.2</b>	<b>122.2</b>	<b>88.7</b>		<b>163.6</b>	
<b>CD at 5%</b>	14.7	50.5	43.8			40.8	64.0	13.5			7.0	12.5				
<b>CV%</b>	28.3	14.0	15.7			7.2	12.1	4.8			7.2	5.7				

**Table 15.3: VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-2<sup>nd</sup> Year: Green Forage Yield (q/ha/day) & Dry Matter Yield (q/ha/day)**

Entries	GFY (q/ha/day)						DMY (q/ha/day)					
	Ludh-iana	Bika-ner	His-ar	Ana-nd	Aver-age	Ra-nk	Ludh-iana	Bika-ner	His-ar	Ana-nd	Aver-age	Ra-nk
VTL-13-1	2.50	1.31	2.30	2.76	2.22	1	0.80	0.42	0.77	0.59	0.64	1
VTL-13-2	1.80	1.80	1.10	1.70	1.60	4	0.50	0.57	0.36	0.36	0.45	4
VTL-13-3	1.40	1.42	0.80	0.80	1.11	7	0.30	0.45	0.25	0.18	0.29	7
VTL-13-4	2.20	1.45	1.60	1.74	1.75	3	0.60	0.46	0.54	0.38	0.49	2
VTL-13-5	1.20	1.81	1.40	1.63	1.51	6	0.20	0.57	0.46	0.36	0.40	6
VTL-13-6	1.40	1.91	1.60	1.42	1.58	5	0.20	0.62	0.51	0.31	0.41	5
VTL-13-7	1.40	1.90	1.80	1.93	1.76	2	0.20	0.61	0.61	0.42	0.46	3
<b>Mean</b>	<b>1.70</b>	<b>1.66</b>	<b>1.51</b>	<b>1.71</b>	<b>1.65</b>		<b>0.40</b>	<b>0.53</b>	<b>0.50</b>	<b>0.37</b>	<b>0.45</b>	

**Table 15.4: VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-2<sup>nd</sup> Year: Crude Protein Yield (q/ha) & Crude Protein (%)**

Entries	CPY (q/ha)					CP (%)							
	Rah-uri	Urulikan- chan	Ana-nd	Aver-age	Ra-nk	Rah-uri	Urulikan- chan	Ana-nd	His-ar	Bika-ner	Aver-age	Ra-nk	
VTL-13-1	64.0	69.3	50.8	61.4	1	18.8	19.1	21.9	17.9	24.7	20.5	3	
VTL-13-2	60.2	42.0	32.7	45.0	6	18.4	19.7	21.9	17.5	27.9	21.1	1	
VTL-13-3	52.2	37.0	15.0	34.7	7	18.5	19.4	20.6	17.9	25.6	20.4	4	
VTL-13-4	60.6	74.1	31.5	55.4	2	18.4	19.4	20.8	16.9	23.6	19.8	7	
VTL-13-5	57.6	50.2	30.5	46.1	5	19.2	19.0	21.1	17.8	23.3	20.1	5	
VTL-13-6	60.9	71.9	27.9	53.6	3	20.1	19.6	21.7	17.9	24.0	20.7	2	
VTL-13-7	60.4	54.3	36.4	50.3	4	17.9	19.8	21.2	17.1	24.1	20.0	6	
<b>Mean</b>	<b>59.4</b>	<b>57.0</b>	<b>32.1</b>	<b>49.5</b>		<b>18.7</b>	<b>19.4</b>	<b>21.3</b>	<b>17.6</b>	<b>24.7</b>	<b>20.4</b>		

**Table 15.5: VT Lucerne (P)-2013: Varietal Trial in Lucerne (Perennial)-2<sup>nd</sup> Year: Plant height (cm) & Leaf Stem Ratio**

Entries	Plant height (cm)								Leaf Stem Ratio							
	Ludh-iana	Bika-ner	His-ar	Rah-uri	Urulikan- chan	Ana-nd	Aver-age	Ra-nk	Ludh-iana	Bika-ner	His-ar	Rah-uri	Urulikan- chan	Aver-age	Ra-nk	
VTL-13-1	56.3	74.1	83.5	78.7	76.4	71.6	73.4	2	0.90	1.12	0.65	0.92	1.26	0.97	2	
VTL-13-2	50.1	85.7	87.6	77.3	75.8	66.3	73.8	1	1.00	1.08	0.70	0.85	1.25	0.98	1	
VTL-13-3	27.4	91.7	83.3	76.7	76.0	59.6	69.1	7	0.60	0.84	0.75	0.78	1.14	0.82	6	
VTL-13-4	53.6	78.4	87.2	75.3	74.1	65.0	72.3	3	0.70	1.13	0.68	0.85	1.19	0.91	5	
VTL-13-5	28.6	87.3	88.3	74.7	75.5	63.9	69.7	5	1.00	0.86	0.77	0.93	1.22	0.96	3	
VTL-13-6	32.1	81.0	88.8	75.3	78.5	61.3	69.5	6	0.90	1.04	0.71	0.76	1.15	0.91	5	
VTL-13-7	30.1	81.3	84.6	75.3	80.4	68.0	70.0	4	1.23	0.86	0.68	0.85	1.09	0.94	4	
<b>Mean</b>	<b>39.7</b>	<b>82.8</b>	<b>86.2</b>	<b>76.2</b>	<b>76.7</b>	<b>65.1</b>	<b>71.1</b>		<b>0.90</b>	<b>0.99</b>	<b>0.71</b>	<b>0.85</b>	<b>1.19</b>	<b>0.93</b>		



## Forage Crop Production

The forage crop production programme was executed at 23 locations in five zones. In total 22 experiments were conducted, out of which 14 were in network (11 coordinated and 3 AVT based) and 8 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* 2014-15 are as follows.

### A. ON-GOING COORDINATED TRIALS

#### 1. CS-12-AST-1: Effect of stubble management and INM on forage productivity in Rice – Oat cropping system.

Location: Jorhat and Bhubaneswar

Table Ref: [1(a)–1(c)]

The experiment was initiated during *kharif* 2012 with a view to increase forage productivity in rice fallow system through integrated management and saving time during turn around period (harvesting of long to medium duration *kharif* rice and sowing of oat) through rice stubble management, thereby reducing the time needed for normal tillage operation. The trial was conducted at two locations in split plot design with three replications taking three cutting management treatments *viz.* **S<sub>1</sub>** - cutting rice stubble at ground level, **S<sub>2</sub>** - 30 cm height and **S<sub>3</sub>**- conventional tillage, in main plot. The INM treatments; **M<sub>1</sub>**- 100% RDF of NPK, **M<sub>2</sub>**- 50% N through FYM + 50 % RDF of NPK, **M<sub>3</sub>**- 25% N through FYM + 50 % RDF of NPK + Biofertilizer (*Azotobacter* + PSB) + green manure and **M<sub>4</sub>**- 50 % of N through FYM+ GM + Biofertilizer (*Azotobacter* + PSB) were allocated to sub plot.

The different cutting management treatments significantly affected the yields at Bhubaneswar and recorded maximum (48.6 q grain, 56.0 q straw and 693.1 q GFEY/ha) with conventional tillage (S<sub>3</sub>). In terms of oat forage yields, highest green forage (269.6 q/ha) and dry matter yield (59.3 q/ha) were recorded in conventional tillage at Jorhat followed by cutting rice at stubble height of 30 cm and sowing oat behind the plough. Among Integrated Nutrient Management treatments, M<sub>2</sub>, M<sub>3</sub> and M<sub>4</sub> remained at par with each other but recorded significantly higher GFY and DMY over M<sub>1</sub>- 100% RDF of NPK (209.6 and 46.1q/ha). At Bhubaneswar paddy harvesting at ground level recorded significantly higher GFY and DMY of oat, whereas, at Jorhat, conventional tillage proved better in terms of GFY and DMY of oats. In both the locations, the highest GFEY was recorded in the treatment M<sub>3</sub>. Again the highest net monetary return (Rs 36241/ha and Rs 59320/ha, respectively) and crude protein yield (4.20 q/ha and 6.59 q/ha, respectively) were recorded in M<sub>3</sub> in both the location. However, at Bhubaneswar the highest net monetary return and crude protein yield was recorded with cutting rice stubble at ground level. On the other hand at Jorhat the highest net monetary was recorded in cutting rice stubble at 30 cm height. Interaction effect on GFEY was observed only at Bhubaneswar.

Cutting management (S)	Nutrient management (M)
S <sub>1</sub> - Cutting of rice stubble at ground level	M <sub>1</sub> - 100% NPK through RDF
S <sub>2</sub> - Cutting of rice stubble at 30 cm height	M <sub>2</sub> - 50% N through FYM + 50 % NPK of RDF
S <sub>3</sub> - Normal Cultivation	M <sub>3</sub> - 25% N through FYM + 50 % NPK of RDF + Biofertilizer ( <i>Azotobacter</i> + PSB) + GM
	M <sub>4</sub> - 50 % of N - FYM+ GM + Biofertilizer ( <i>Azotobacter</i> + PSB)

**Table- 1(a): Effect of stubble management and INM on grain and straw yield of rice in NE zone**

Treatments	Rice					
	Grain Yield (q/ha)			Straw Yield (q/ha)		
	Jorhat	Bhubaneswar	Mean	Jorhat	Bhubaneswar	Mean
<b>Cutting Management (S)</b>						
S <sub>1</sub>	42.4	47.9	45.1	46.5	60.0	53.2
S <sub>2</sub>	41.7	49.0	45.4	47.8	52.3	50.1
S <sub>3</sub>	41.1	48.6	44.9	47.9	56.0	52.0
S.Em±	0.21	1.35	-	0.145	0.80	-
CD at 5%	NS	5.32	-	0.46	3.12	-
<b>Integrated Nutrient Management (M)</b>						
M <sub>1</sub>	38.7	45.9	42.3	46.0	53.5	49.7
M <sub>2</sub>	41.0	48.7	44.8	47.2	57.1	52.1
M <sub>3</sub>	43.9	51.9	47.9	47.7	57.6	52.7
M <sub>4</sub>	43.5	47.4	45.4	48.7	56.1	52.4
S.Em±	0.18	1.60	-	0.169	1.89	-
CD at 5%	0.56	4.75	-	0.509	5.63	-
CV %		9.89			10.14	-
<b>Interaction (SXM)</b>						
S.Em±	0.56	3.18	-	0.50	3.41	-
CD at 5%	1.85	10.18	-	NS	10.36	-

**Table- 1(b): Effect of stubble management and INM on yields of oat in rice- oat system in NE zone**

Treatments	Oat					
	GFY (q/ha)			DMY (q/ha)		
	Jorhat	Bhubaneswar	Mean	Jorhat	Bhubaneswar	Mean
<b>Cutting Management (S)</b>						
S <sub>1</sub>	166.7	307.8	237.2	36.7	66.0	51.3
S <sub>2</sub>	244.7	219.1	231.9	53.8	54.6	54.2
S <sub>3</sub>	269.6	254.8	262.2	59.3	58.6	59.0
S.Em±	1.492	5.03	-	0.328	1.04	-
CD at 5%	4.762	19.73	-	1.047	4.10	-
<b>Integrated Nutrient Management (M)</b>						
M <sub>1</sub>	209.6	229.9	219.7	46.1	55.8	51.0
M <sub>2</sub>	232.4	305.4	268.9	51.1	66.5	58.8
M <sub>3</sub>	233.7	322.2	277.9	51.4	67.7	59.6
M <sub>4</sub>	232.2	184.7	208.5	51.1	49.0	50.0
S.Em±	1.167	5.15	-	0.256	1.05	-
CD at 5%	3.518	15.31	-	0.773	3.11	-
CV %		5.93	-		5.25	-
<b>Interaction (SXM)</b>						
SEm	3.50	10.64	-	0.770	1.81	-
CD at 5%	NS	34.64	-	NS	5.39	-

**Table-1(c): Effect of stubble management and INM on green forage equivalent yield, CPY and net income in rice- oat system in NE zone**

Treatments	Green Forage Equivalent Yield (q/ ha/ yr)			Crude Protein Yield of Oat (q/ha)			Net Income (Rs/ha/yr)		
	Jor-hat	Bhuban-eswar	Mean	Jor-hat	Bhuban-eswar	Mean	Jor-hat	Bhuban-eswar	Mean
<b>Cutting Management (S)</b>									
S <sub>1</sub>	601.1	846.2	723.6	2.7	6.4	4.6	42560	84620	63590
S <sub>2</sub>	595.3	761.4	678.4	4.1	5.5	4.8	49356	76135	62746
S <sub>3</sub>	589.3	796.8	693.1	4.8	5.8	5.3	48653	79680	64167
S. Em <sub>+</sub>	2.109	16.71	-	0.026	0.08	-	293.67	1670	-
CD at 5%	NS	65.58	-	0.083	0.32	-	937.35	6558	-
<b>Integrated Nutrient Management (M)</b>									
M <sub>1</sub>	563.8	742.7	653.2	3.5	5.6	4.5	42073	74273	58173
M <sub>2</sub>	587.2	849.5	718.4	4.0	6.4	5.2	46661	84953	65807
M <sub>3</sub>	616.8	899.1	758.0	4.0	6.8	5.4	49630	89913	69772
M <sub>4</sub>	613.1	714.4	663.8	4.0	4.8	4.4	49062	71440	60251
S EM <sub>+</sub>	1.826	801.5	-	0.019	0.12	-	164.76	1900	-
CD at 5%	5.500	19.00	-	0.059	0.37	-	496.3	5645	-
CV %		56.45	-		6.30	-	3.2	7.11	-
<b>Interaction (TXN)</b>									
S. Em	5.48	38.15	-	0.059	0.23	-	494.3	3814	-
CD at 5%	16.28	122.65	-	NS	0.73	-	9.5	12264	-

## 2. R-12-AST-1: Performance of dual purpose forage crops under different cutting management system

[Table Reference: 2(a) to 2(r)]

### Locations:

<b>Hill zone</b>	: Palampur, Srinagar, Almora
<b>NWZ</b>	: Ludhiana, Hisar, Bikaner
<b>NEZ</b>	: Jorhat, Bhubaneswar
<b>CZ</b>	: Jabalpur, Raipur, Rahuri, Anand, Urulikanchan

The experiment was started in *Rabi* 2011-12 to study the effect of cutting management on forage and grain potential of forage crops. Twelve treatment combinations consisting of three forage crops *viz.*, oat, barley and wheat (in main plot) and four cutting management practices (in sub-plot) were laid out in split plot design with three replications. Based on the results of exploratory trial, it was conducted at thirteen locations under HZ, NWZ, NEZ and CZ of the country. The data of third year experimentation has been given zone wise below.

### Hill zone: Palampur, Almora and Srinagar

At Palampur and Almora, the cutting schedule for forage were no cut and one cut at 70, 80 and 90 days after sowing (DAS), whereas at Srinagar due to slow growth of the crops during winter, the green fodder cuttings were taken at 120, 130 and 140 DAS. The mean data indicated that at maturity, barley crop had less height than oat and wheat. The oat recorded maximum height at all centres.

The mean data indicated that oat crop produced significantly higher GFY (138.1 q/ha), which was 95.3% and 133.3% more than barley and wheat, respectively. The respective increase in DMY was 75.7 and 148.1%. Contrary to GFY, reverse trend was observed with respect to grain yield. Srinagar centre recorded maximum green and dry biomass yield in the zone. Highest mean grain yield was recorded in wheat (33.8 q/ha) followed by barley (24.5 q/ha) and oat (22.9 q/ha). At Palampur in terms of oat green forage equivalent yield (OGFEY), oat resulted in significantly higher OGFEY (531.6 q/ha), which was at par with wheat (530.7). Barley recorded significantly lower OGFEY (406.5 q/ha). Wheat and oat crop also demonstrated higher net return (Rs. 60309 and 59247/ha) and B:C ratio (3.1 and 2.9) than barley crops (Rs 41287/ha and 2.1, respectively).

Herbage yield increased with delay in harvesting of crop at first cut. The mean data indicated that harvesting for fodder at 90 DAS produced 135.1q/ha GFY, which reflected in increase of 45.0 and 61.7% in comparison to cutting at 80 and 70 DAS, respectively. The respective increase in dry fodder yield was 43.1 and 62.4%. Delay in harvesting of crops for fodder significantly decreased the growth parameters of the crops at all the locations at maturity.

At Palampur, crop left for seed production after taking one cut at 70 DAS produced significantly higher seed yield, but the straw yield was lower because of restricted vegetative growth. However, at other two locations, no cutting of crops for fodder resulted in higher seed production. No cut system resulted in the production of higher straw yield at all the locations. The data of Palampur location indicated that in terms of oat green fodder equivalent yield (575.7 q/ha) and economic return (net returns of Rs. 66917 /ha and B:C of 3.4), one cut of the crops at 70 DAS appeared suitable preposition to obtain dual benefit from the crops during winter months in the hills followed by no cut.

### **North West Zone: Ludhiana, Hisar and Bikaner**

On location mean basis, oat produced highest GFY and DMY (191.6 & 34.0 q/ha) over barley (146.4 & 30.9 q/ha) and wheat (94.1 & 17.6 q/ha) crops. It recorded 30.9 and 103.6 % more green fodder over barley and wheat crops, respectively. Contrary to GFY, wheat crop recorded highest grain yield (54.8 q/ha) on mean basis. Oat crop proved superior in terms of net monetary return (Rs 53302/ha) and benefit cost ratio at Bikaner.

With respect to cutting management practices, on mean basis, cutting of forage crops at 70 DAS recorded highest GFY (202.5 q/ha) and DMY (42.2 q/ha) as compared to cutting at 50 DAS (100.7 q/ha GFY and 22.7 q/ha DMY) and 60 DAS (164.7 q/ha GFY and 32.7 q/ha DMY). The respective treatments (cutting at 70 DAS) recorded 82.9 and 22.9% more GFY over cutting at 50 DAS and 60 DAS, respectively; whereas, no cutting of forage crops attained highest grain (36.3 q/ha) and grain equivalent yield (52.4 q/ha) over rest of the cutting management practices. The percent reduction in grain yield under cutting at 50 DAS, 60 DAS and 70 DAS over no cutting was 21.8, 40.7 and 97.3, respectively. At Bikaner, cutting at 60 DAS of forages fetched highest net monetary return (Rs 45451/ha).

### **North East Zone: Jorhat and Bhubaneswar**

On location mean basis, oat crop produced higher GFY (187.6 q/ha) and DMY (40.4 q/ha) than barley (109.2 q/ha GFY and 26.2q/ha DMY) and wheat crop (90.8 q/ha GFY and 21.9 q/ha). The grain yield did not exhibit remarkable difference due to crop factor. The highest grain yield was recorded under oat (16.6 q/ha) followed by wheat (15.5 q/ha) and barley (15.4 q/ha). On zonal mean basis, oat recorded highest green fodder equivalent yield (579.8 q/ha) and fetched highest net monetary return (Rs. 45749/ha) followed by barley (Rs. 33093/ha).

The herbage yield increased consistently with delay in harvesting for green fodder. Harvesting of dual purpose crop(s) at 70 DAS produced 192.1 q/ha green fodder with increase of 27.1 and 10.5% over cutting at 50 and 60 DAS, respectively on mean basis. The respective increase in DMY was 27.6 and 10.9 %. Grain and straw yield decreased with delay in harvesting for green fodder. Cutting for GFY at 50 DAS did not cause remarkable reduction in grain yield. Uncut crops recorded highest grain yield (21.1 q/ha) and it decreased to the tune of 17.1, 13.6 and 11.6 % with cutting at 50, 60 and 70 DAS over no cut system. Cutting of crop(s) for green fodder as well as grain at 50 DAS fetched highest net monetary return (Rs 40841/ha) and B:C ratio (3.7) in comparison to no cut, (NMR- Rs. 38283/ha and B:C ratio 3.2), cutting at 60 or 70 DAS.

### **Central zone: Jabalpur, Anand, Urulikanchan and Raipur**

On location mean basis, oat crop recorded highest GFY (373.8 q/ha), DMY (65.1 q/ha) and CPY (5.6 q/ha). It recorded 64.3 and 45.5% more GFY over barley and wheat crops, respectively. Wheat crop recorded highest grain yield (28.0 q/ha); whereas, higher straw yield was recorded in oat (76.9 q/ha). Among four locations, highest yield was recorded at Urulikanchan centre. Oat crop fetched highest net monetary return (Rs 49674/ha) and benefit cost ratio (2.4) over wheat (NMR-Rs. 42672/ha, B:C ratio 2.2) and barley (NMR-Rs. 20433/ha, B:C ratio 1.7) crops. The maximum grain yield of wheat (42.5 q/ha) was recorded at Jabalpur followed by Rahuri (31.5 q/ha).

The herbage yield of dual purpose forage crops increased consistently with delay in harvesting for green fodder. The harvesting of forages at 70 DAS recorded highest GFY (285.6 q/ha) and CPY (4.7 q/ha), which was 29.6 and 13.4 % more GFY over 50 and 60 DAS cutting, respectively. Cutting at 50 DAS recorded higher L:S ratio (1.5) on zonal mean basis over 60 and 70 DAS. The grain and straw yields of forages decreased with delay in harvesting for green fodder. The uncut crops recorded highest grain and straw yield (31.1 and 78.1 q/ha) and it decreased by 34.6, 74.7 and 144.9 % with cutting at 50, 60 and 70 days after sowing, respectively over no cut system. Cutting of dual purpose crops at 50 DAS for GFY and left for grain production fetched maximum net monetary return (Rs 39023/ha) and B: C ratio (2.2) followed by cutting at 60 DAS. Significant interaction effect of cutting management and dual purpose crops were also observed at Anand and Urulikanchan for GFY and grain yield.

**Table- 2(a): Effect of cutting management on growth of Rabi crops (Hill zone)**

Treatments	Plant Height (cm)				Tiller number (per m row length)			L:S ratio		
	Palampur	Almora	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur	Srinagar	Mean
<b>Crop</b>										
Oat	138.2	160.0	97.4	131.9	263	142	202	0.6	0.4	0.5
Barley	98.6	97.3	72.8	89.6	245	114	180	0.6	0.5	0.6
Wheat	110.3	120.4	81.5	104.1	241	108	175	0.6	0.4	0.5
SEm±	1.32	1.61	1.75	-	3.75	3.60	-	0.01	0.02	-
CD at 5%	5.23	4.47	6.23	-	15.15	12.8	-	NS	NS	-
<b>Cutting Management</b>										
No cut	122.0	135.5	115.5	124.3	-	156	156	-	0.5	0.5
Cutting at 70 DAS	117.8	116.6	78.2	104.2	234	121	177	0.6	0.4	0.5
Cutting at 80 DAS	113.4	124.1	72.6	103.4	239	105	172	0.6	0.4	0.5
Cutting at 90 DAS	109.7	127.4	69.0	102.0	276	103	190	0.5	0.4	0.5
SEm±	1.56	1.93	2.37	-	2.90	4.86	-	0.01	0.03	-
CD at 5%	4.68	4.07	7.08	-	9.04	14.5	-	0.02	NS	-

**Table- 2(b): Effect of cutting management on forage yield of Rabi crops (Hill zone)**

Treatments	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
	Palampur	Almora	Srinagar	Mean	Palampur	Almora	Srinagar	Mean
<b>Crop</b>								
Oat	95.7	122.4	196.3	138.1	20.6	31.0	46.0	32.5
Barley	60.5	32.0	119.5	70.7	12.8	13.6	29.1	18.5
Wheat	43.4	35.7	98.5	59.2	7.7	8.1	23.5	13.1
SEm±	0.83	4.23	4.10	-	0.57	0.50	1.14	-
CD at 5%	3.35	11.7	12.24	-	2.30	1.39	3.37	-
<b>Cutting Management</b>								
No cut	-	-	-	-	-	-	-	-
70 DAS Cutting	38.4	39.8	104.4	60.8	6.6	12.2	21.5	13.4
80 DAS Cutting	59.5	62.3	128.2	83.4	11.5	16.8	30.0	19.4
90 DAS Cutting	101.7	122.4	181.4	135.1	22.7	23.8	46.8	31.1
SEm±	1.35	3.73	5.26	-	0.62	0.569	1.45	-
CD at 5%	4.23	8.12	15.69	-	1.95	1.24	4.32	-
Interaction	Sig.	-	Sig.	-	Sig.	-	Sig.	-

**Table- 2(c): Effect of cutting management on grain and straw yields and economics of Rabi crops (Hill zone)**

Treatments	Grain yield (q/ha)				Straw yield (q/ha)			Oat GFEY (q/ha)	NMR (Rs./ha)	B:C
	Palampur	Almora	Srinagar	Mean	Palampur	Srinagar	Mean	Palampur		
<b>Crop</b>										
Oat	24.7	26.8	17.2	22.9	70.7	48.2	59.5	531.6	59247	2.9
Barley	27.4	26.3	19.8	24.5	61.3	41.2	51.3	406.5	41287	2.1
Wheat	37.4	39.4	24.6	33.8	65.9	37.3	51.6	530.7	60309	3.1
SEm±	0.57	1.76	0.46	-	1.42	1.85	-	8.51	1277	0.06
CD at 5%	2.30	4.89	1.40	-	5.76	5.50	-	34.31	5148	0.26
<b>Cutting Management</b>										
No cut	32.1	33.9	29.7	31.9	82.0	74.6	78.3	477.1	53198	2.9
70 DAS Cut	37.1	32.8	20.8	30.2	79.2	42.0	60.6	575.7	66917	3.4
80 DAS Cut	29.3	29.8	17.2	25.4	55.8	31.4	43.6	472.5	50754	2.5
90 DAS Cut	20.8	26.8	13.9	20.5	47.0	24.5	35.8	433.1	43588	2.0
SEm±	0.73	1.91	0.62	-	1.23	2.36	-	7.61	1142	0.06
CD at 5%	2.20	4.02	1.80	-	3.70	7.05	-	22.79	3419	0.17
Interaction	Sig.	-	Sig.	-	Sig.	Sig.	-	Sig.	Sig.	Sig.

**GFEY=Green fodder equivalent yield**

**Table- 2(d): Effect of treatments on soil properties after harvest (Hill zone- Palampur)**

Treatments	Soil properties						
	N (kg/ha)	P (kg/ha)	K (kg/ha)	OC (%)	CEC C mol (P <sup>+</sup> ) kg <sup>-1</sup>	Soil biomass carbon (mg Kg <sup>-1</sup> )	pH
<b>Crop</b>							
Oat	225	12	239	0.55	11	38	5.5
Barley	226	12	239	0.54	12	38	5.6
Wheat	221	11	238	0.55	11	35	5.5
<b>Cutting Management</b>							
No cut	223	11	238	0.54	11	35	5.6
Cutting at 70 DAS	224	13	242	0.53	11	39	5.5
Cutting at 80 DAS	221	12	237	0.55	12	37	5.6
Cutting at 90 DAS	229	13	237	0.54	12	37	5.5
<b>Initial</b>	<b>216</b>	<b>16</b>	<b>220</b>	<b>0.52</b>	<b>12</b>	<b>34</b>	<b>5.5</b>

**Table- 2(e): Effect of cutting management and dual purpose crops on green fodder yield**

Treatment	Green fodder yield (q/ha)						
	North West zone				North East zone		
	Ludhiana	Hisar	Bikaner	Mean	Bhubaneswar	Jorhat	Mean
<b>Crops</b>							
Oat	271.0	154.7	149.1	191.6	185.3	189.8	187.6
Barley	164.3	98.4	176.5	146.4	162.2	56.1	109.2
Wheat	89.0	106.6	86.8	94.1	137.9	43.6	90.8
SEm.+_	21.67	30.0	7.38	-	4.20	-	-
CD at 5%	5.38	9.7	25.54	-	16.48	-	-
<b>Cutting management</b>							
No cutting	-	-	-	-	-	-	-
Cutting at 50 DAS	113.8	61.6	156.6	110.7	182.9	119.4	151.2
Cutting at 60 DAS	192.0	105.1	197.1	164.7	216.9	130.7	173.8
Cutting at 70 DAS	218.5	192.9	196.1	202.5	248.3	135.8	192.1
SEm+	18.97	30.21	5.43	-	3.219	-	-
CD at 5%	6.09	9.7	15.75	-	9.562	-	-
<b>Interaction: C x CM</b>							
SEm+	35.57	-	14.76	-	7.389	-	-
CD at 5%	9.31	-	42.83	-	24.988	-	-
CV (%)	-	-	-	-	5.96	-	-

**Table- 2(f): Effect of cutting management and dual purpose crops on green fodder yield**

Treatment	Green fodder yield (q/ha)					
	Central zone					
	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Mean
<b>Crops</b>						
Oat	451.0	300.1	337.3	483.8	297.0	373.8
Barley	252.4	224.8	185.8	293.1	181.2	227.5
Wheat	130.6	126.9	132.7	247.5	144.1	156.4
SEm.+_	6.82	2.32	6.24	5.75	38.18	-
CD at 5%	26.75	5.63	24.52	22.45	-	-
<b>Cutting management</b>						
No cutting	-	-	-	-	-	-
Cutting at 50 DAS	243.0	184.5	122.7	254.1	297.0	220.3
Cutting at 60 DAS	268.1	210.9	223.9	375.3	181.2	251.9
Cutting at 70 DAS	323.3	256.4	309.3	395.0	144.1	285.6
SEm+	3.90	2.24	7.94	5.32	35.64	-
CD at 5%	12.02	7.64	24.46	15.82	-	-
<b>Interaction: C x CM</b>						
SEm+	6.75	2.6	13.75	11.50	-	-
CD at 5%	NS	7.62	43.99	30.34	-	-
CV (%)	8.77	7.32	10.89	-	-	-

**Table- 2(g): Interaction effect of cutting management and dual purpose crops on green fodder yield**

Crops	Anand					Urulikanchan				
	No cutting	50 DAS	60 DAS	70 DAS	Mean	No cutting	50 DAS	60 DAS	70 DAS	Mean
Oat	0.0	162.5	357.8	491.7	337.3	0	342.4	511.7	597.3	483.8
Barley	0.0	129.7	187.2	240.6	185.8	0	251.2	342.0	286.1	293.1
Wheat	0.0	75.8	126.7	195.6	132.7	0	168.6	272.2	301.6	247.5
Mean	0.0	122.7	223.9	309.3		0	254.1	375.3	395.0	
	<b>Crop</b>	<b>CM</b>	<b>C X CM</b>			<b>Crop</b>	<b>CM</b>	<b>C X CM</b>		
SEm±	6.24	7.94	13.75			5.75	5.32	11.50		
CD at 5%	24.52	24.46	43.99			22.45	15.82	30.34		
CV%	8.57	10.89	10.89							

**Table- 2(h): Interaction effect of cutting management and dual purpose crops on grain yield**

Crops	Anand					Urulikanchan				
	Cutting interval (DAS)					Cutting interval (DAS)				
	No cut	50	60	70	Mean	No cut	50	60	70	Mean
Oat	22.9	19.6	19.2	6.8	17.1	46.2	24.9	21.5	17.0	27.4
Barley	22.9	16.0	6.3	3.9	12.3	43.3	12.8	3.9	1.9	15.5
Wheat	31.4	24.7	17.4	10.6	21.0	44.1	39.3	29.9	12.7	31.5
Mean	25.7	20.1	14.3	7.1		44.5	25.7	18.4	10.6	
	<b>Crop</b>	<b>CM</b>	<b>C X CM</b>			<b>Crop</b>	<b>CM</b>	<b>C X CM</b>		
SEm±	0.62	0.77	1.34			0.69	0.72	1.39		
CD at 5%	2.42	2.30	3.99			2.73	2.14	4.06		
CV%	12.69	13.83	13.83							

**Table- 2(i): Effect of cutting management and dual purpose crops on dry matter yield**

Treatment	North West zone				North East zone		
	Ludhiana	Hissar	Bikaner	Mean	Bhubaneswar	Jorhat	Mean
<b>Crops</b>							
Oat	26.1	24.6	51.3	34.0	40.9	39.9	40.4
Barley	17.6	16.3	58.7	30.9	40.6	11.8	26.2
Wheat	9.2	17.4	26.3	17.6	34.5	9.2	21.9
SEm±	1.41	-	2.50	-	1.05	-	-
CD at 5%	0.35	1.3	8.64	-	4.13	-	-
<b>Cutting management</b>							
No cutting	-	-	-	-	-	-	-
Cutting at 50 DAS	9.9	8.4	49.8	22.7	43.6	25.1	34.4
Cutting at 60 DAS	19.4	16.0	62.7	32.7	51.8	27.4	39.6
Cutting at 70 DAS	23.5	33.9	69.3	42.2	59.2	28.5	43.9
SEm±	1.88	4.07	1.89	-	0.79	-	-
CD at 5%	0.60	1.3	5.48	-	2.34	-	-
<b>C. Interaction: C X CM</b>							
SEm±	3.39	-	5.0	-	1.83	-	-
CD at 5%	0.61	-	14.5	-	6.20	-	-

**Table- 2(j): Effect of cutting management and dual purpose crops on dry matter yield CPY**

Treatment	dry matter yield (q/ha)						Crude Protein Yield (q/ha)		
	Central zone						North East zone		
	Rah- uri	Jabal- pur	Ana- nd	Urulika- nchan	Rai- pur	Mean	Bhuba- neswar	Jor- hat	Mean
<b>Crops</b>									
Oat	76.0	64.2	45.6	71.5	68.3	65.1	3.7	2.8	3.2
Barley	51.5	47.9	30.2	49.7	48.0	45.5	3.7	0.9	2.3
Wheat	27.6	25.8	24.1	38.8	42.2	31.7	3.1	0.7	1.9
SEm±	1.54	1.06	0.87	0.77	8.91	-	0.12	-	-
CD at 5%	6.06	4.81	3.43	2.26	-	-	0.47	-	-
<b>Cutting management</b>									
No cutting	-	-	-	-	-	-	-	-	-
Cutting at 50 DAS	45.4	37.9	36.5	33.2	50.9	40.8	3.9	1.8	2.9
Cutting at 60 DAS	52.0	44.6	49.1	58.4	51.9	51.2	4.7	2.0	3.3
Cutting at 70 DAS	58.0	55.4	14.3	68.5	55.7	50.4	5.3	2.1	3.7
SEm±	0.86	1.04	1.05	0.89	7.92	-	0.10	-	-
CD at 5%	2.66	4.58	3.25	2.62	-	-	0.29	-	-
<b>Interaction: C X CM</b>									
SEm±	1.50	2.11	1.83	1.54	-	-	0.217	-	-
CD at 5%	NS	5.11	5.84	4.54	-	-	0.729	-	-
CV (%)	1.97	3.63	9.50	-	-	-	8.32	-	-

**Table- 2(k): Effect of cutting management and dual purpose crops on the Crude protein yield, CP (%) and leaf stem ratio**

Treatment	Central zone											North East zone	
	Crude Protein Yield (q/ha)						CP (%)	Leaf stem ratio				CP (%)	L:S ratio
	Rah- uri	Jaba- lpur	Ana- nd	Uruli kanchan	Rai- pur	Mean	Rah- uri	Rah- uri	Jabal- pur	Rai- pur	Mean	Jor- hat	Bhuba- neswar
<b>Crops</b>													
Oat	8.1	5.3	9.1	7.5	5.6	7.1	11.0	1.7	0.9	0.9	1.2	5.2	0.8
Barley	5.9	3.8	4.9	6.3	4.4	5.1	11.5	1.7	0.8	0.8	1.1	5.7	0.7
Wheat	3.4	2.0	3.9	6.1	3.3	3.7	12.4	4.3	0.8	0.7	1.9	5.9	0.6
SEm <sub>+</sub>	0.20	0.21	0.17	0.11	0.72	-	0.16	0.12	0.01	0.04	-	-	0.01
CD at 5%	0.78	0.60	0.66	0.46	-	-	0.65	0.45	0.06	-	-	-	0.07
<b>Cutting management</b>													
Uncut	-	-	-	-	-	-	-	-	-	-	-	-	0.0
Cutting at 50 DAS	4.7	3.0	3.0	4.2	4.3	3.8	10.8	2.9	0.9	0.7	1.5	7.3	0.9
Cutting at 60 DAS	6.3	3.6	7.2	7.6	4.4	5.8	12.2	2.5	0.9	0.8	1.4	7.5	0.1
Cutting at 70 DAS	6.5	4.4	7.8	8.1	4.7	6.3	11.4	2.3	0.8	0.9	1.3	7.6	0.1
SEm <sub>+</sub>	0.21	0.62	0.20	0.11	0.62	-	0.30	0.08	0.01	0.03	-	-	0.02
CD at 5%	0.64	NS	0.61	0.33	-	-	0.91	0.25	0.03	0.09	-	-	0.05
<b>Interaction: C X CM</b>													
SEm <sub>±</sub>	0.36	0.82	0.34	0.23	-	-	0.51	0.14	0.02	-	-	-	0.04
CD at 5%	NS	NS	1.06	0.63	-	-	NS	0.43	0.06	-	-	-	0.12
CV (%)	0.35	2.54	9.93		-	-	0.45	0.16	2.54	-	-	-	7.05

**Table- 2(l): Effect of cutting management and dual purpose crops on plant height (l cut) and no. of tillers**

Treatment	Plant height (cm)						No. of tillers/m row length					
	North West zone			North East zone			North West zone			North East zone		
	Ludhiana	Bikaner	Mean	Bhubaneswar	Jorhat	Mean	Ludhiana	Bikaner	Mean	Bhubaneswar	Jorhat	Mean
<b>Crops</b>												
Oat	47.9	63.8	55.9	83.8	124.2	104.0	99.4	157.3	128.3	94.4	133.7	114.0
Barley	40.7	47.8	44.3	57.3	85.2	71.3	73.5	136.9	105.2	93.1	94.8	94.0
Wheat	18.1	76.6	47.4	56.4	73.1	64.8	107.5	147.9	127.7	94.4	48.7	71.5
SEm <sub>±</sub>	1.53	1.33	-	0.439	-	-	1.54	3.60	-	0.671	1.732	-
CD at 5%	6.18	4.61	-	1.723	-	-	6.19	12.46	-	2.634	5.243	-
<b>Cutting management</b>												
No cutting	-	69.7	69.7	-	112.5	112.5	-	179.8	179.8	93.0	119.3	106.2
Cutting at 50 DAS	22.8	64.9	43.9	75.3	105.2	90.3	84.6	149.0	116.8	93.6	91.7	92.6
Cutting at 60 DAS	37.7	62.4	50.1	92.1	83.4	87.8	99.5	140.8	120.2	93.1	83.0	88.1
Cutting at 70 DAS	46.2	53.9	50.1	96.0	75.5	85.8	96.3	119.9	108.1	96.2	75.6	85.9
SEm <sub>±</sub>	1.74	1.04	-	0.64	-	-	2.30	4.01	-	0.654	1.62	-
CD at 5%	5.41	3.03	-	1.89	-	-	7.17	11.62	-	1.944	4.92	-
<b>Interaction: C X CM</b>												
SEm <sub>±</sub>	2.66	2.66	-	1.21	-	-	2.66	7.20	-	1.37	2.813	-
CD at 5%	NS	7.73	-	3.80	-	-	NA	20.89	-	4.49	8.527	-
CV (%)	-	-	-	2.90	-	-	-	-	-	2.09	-	-

**Table- 2(m): Effect of cutting management and dual purpose crops on growth parameters at harvest**

Treatment	Central zone								
	Plant height (cm)					Number of tillers/ m row length			
	Rahuri	Jabalpur	Anand	Raipur	Mean	Rahuri	Jabalpur	Anand	Mean
<b>Crops</b>									
Oat	80.0	115.9	101.6	128.7	106.6	127	105	66	99
Barley	76.0	80.5	71.7	63.9	73.0	105	100	56	87
Wheat	66.0	78.9	85.1	72.2	75.6	124	83	59	89
SEm+ <sub>-</sub>	1.39	1.0	1.24	5.29		4.84	0.4	1.45	-
CD at 5%	5.48	3.1	4.88	-		19.01	1.2	5.70	-
<b>Cutting management</b>									
Uncut	88.0	98.6	102.3	103.5	98.1	122	100	79	100
Cutting at 50 DAS	57.0	94.8	89.1	73.4	78.6	114	97	58	90
Cutting at 60 DAS	66.0	88.2	78.8	84.1	79.3	116	94	52	87
Cutting at 70 DAS	84.0	85.4	74.2	92.1	83.9	122	92.5	52	89
SEm+ <sub>-</sub>	0.75	1.4	1.47	4.86	-	1.52	3.5	1.80	-
CD at 5%	2.23	4.2	4.37	-	-	4.52	5.3	5.36	-
<b>Interaction: C X CM</b>									
SEm+ <sub>-</sub>	1.30	1.3	2.54	-	-	2.63	1.5	3.13	-
CD at 5%	3.86	3.2	7.56	-	-	7.83	3.4	9.29	-
CV (%)	6.37	7.3	5.12	-	-	5.35	7.8	8.97	-

**Table- 2(n): Effect of cutting management and dual purpose crops on grain yield**

Treatment	North West zone					North East zone					
	Grain yield (q/ha)				GEY	Grain yield (q/ha)			Green fodder equivalent yield (q/ha)		
	Ludh-iana	His-ar	Bika-ner	Mean	Ludh-iana	Bhub-aneswar	Jor-hat	Mean	Bhuba-neswar	Jor-hat	Mean
<b>Crops</b>											
Oat	28.4	19.7	23.0	23.7	44.7	21.2	12.1	16.6	564.1	595.5	579.8
Barley	24.3	35.1	22.3	27.2	34.0	23.8	6.9	15.4	586.4	409.1	497.8
Wheat	41.6	31.7	22.0	31.8	54.8	22.6	8.5	15.5	542.6	387.3	465.0
SEm+ <sub>-</sub>	1.18	-	0.50	-	0.94	0.63	0.10	-	14.50	11.38	-
CD at 5%	4.75	1.8	NS	-	3.79	2.46	0.31	-	56.91	34.44	-
<b>Cutting management</b>											
No cutting	44.9	36.5	27.6	36.3	52.4	28.1	14.0	21.1	503.8	541.1	522.5
Cutting at 50 DAS	32.5	34.1	22.9	29.8	45.0	24.6	9.6	17.1	621.6	496.7	559.1
Cutting at 60 DAS	26.5	26.9	23.9	25.8	42.2	20.0	7.1	13.6	574.8	426.6	500.7
Cutting at 70 DAS	21.9	17.8	15.4	18.4	38.3	17.3	5.8	11.6	557.3	391.5	474.4
SEm+ <sub>-</sub>	1.45	-	0.50	-	1.49	0.547	0.14	-	12.18	14.22	-
CD at 5%	4.34	2.0	1.45	-	4.45	1.624	0.41	-	36.18	43.04	-
<b>Interaction: C X CM</b>											
SEm+ <sub>-</sub>	2.36	-	1.0	-	-	1.192	0.24	-	26.93	24.63	-
CD at 5%	NS	-	2.89	-	-	3.960	0.7	-	89.93	74.65	-
CV (%)		-		-	-	7.29		-	6.47		-

**GEY: Grain equivalent yield (q/ha)**

**Table- 2(o): Effect of cutting management and dual purpose crops on grain yield**

Treatment	Grain yield (q/ha)					
	Central zone					
	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Mean
<b>Crops</b>						
Oat	13.8	30.6	17.1	27.4	14.3	20.6
Barley	12.5	16.0	12.3	15.5	17.2	14.7
Wheat	29.2	42.5	21.0	31.5	15.5	28.0
SEm <sub>±</sub>	1.15	1.1	0.62	0.69	0.41	-
CD at 5%	4.51	4.2	2.42	2.73	1.66	-
<b>Cutting management</b>						
Uncut	25.1	36.3	25.7	44.5	24.0	31.1
Cutting at 50 DAS	21.3	31.5	20.1	25.7	16.7	23.1
Cutting at 60 DAS	14.7	27.3	14.3	18.4	12.5	17.4
Cutting at 70 DAS	12.9	23.8	7.1	10.6	9.4	12.7
SEm <sub>±</sub>	0.62	1.4	0.77	0.72	-	-
CD at 5%	1.85	3.5	2.30	2.14	-	-
<b>Interaction: C X CM</b>						
SEm <sub>±</sub>	1.06	1.0	1.34	1.39	-	-
CD at 5%	3.20	3.1	3.99	4.06	-	-
CV (%)	10.08	9.52	13.83		-	-

**Table- 2(p): Effect of cutting management and dual purpose crops on the benefit cost ratio**

Treatment	Benefit cost ratio								
	NWZ		NEZ	Central zone					Over all Mean
	His- ar	Bika- ner	Bhuban- eswar	Rah- uri	Jabal pur	Ana- nd	Urulikan chan	Rai- pur	
<b>Crops</b>									
Oat	1.8	1.9	3.4	2.7	2.8	1.9	2.9	1.6	2.4
Barley	2.2	1.0	3.5	1.8	1.6	0.70	1.8	1.2	1.7
Wheat	1.7	1.3	3.2	2.6	3.5	1.70	2.3	0.8	2.2
SEm <sub>±</sub>	0.03	0.05	0.086	0.11	-	-	0.04	-	-
CD at 5%	0.10	0.17	0.338	0.45	-	-	0.17	-	-
<b>Cutting management</b>									
Uncut	2.2	2.1	3.2	2.4	2.6	1.3	2.4	0.9	2.1
Cutting at 50 DAS	2.0	1.4	3.7	2.7	2.8	1.2	2.4	1.5	2.2
Cutting at 60 DAS	1.8	1.4	3.4	2.2	2.6	1.2	2.5	1.3	2.0
Cutting at 70 DAS	1.6	0.9	3.3	2.2	2.6	1.0	2.1	1.2	1.9
SEm <sub>±</sub>	0.04	0.05	0.072	0.06	-	-	0.04	-	-
CD at 5%	0.12	0.13	0.214	0.16	-	-	0.12	-	-
<b>Interaction: C X CM</b>									
SEm <sub>±</sub>	-	0.1	0.159	0.10	-	-	0.09	-	-
CD at 5%	-	0.29	0.533	0.29	-	-	0.24	-	-
CV (%)	-			7.00	-	-		-	-

**Table- 2(q): Effect of cutting management and dual purpose crops on straw yield**

Treatment	Straw yield (q/ha)										
	NWZ				NEZ		Central zone				
	Hissar	Ludhiana	Bikaner	Mean	Bhubaneswar	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Mean
<b>Crops</b>											
Oat	47.9	100.4	38.4	62.2	18.69	135.8	62.7	87.0	71.9	27.1	76.9
Barley	46.1	65.6	31.9	47.9	19.71	40.8	43.8	48.6	22.2	22.7	35.6
Wheat	38.5	68.6	46.7	51.3	21.15	82.2	71.3	60.1	38.9	20.3	54.5
SEm.±	0.92	2.45	1.08	-	0.450	5.35	1.2	2.31	2.43	2.35	
CD at 5%	3.7	9.86	3.73	-	1.767	21.02	4.2	9.07	9.49	-	
<b>Cutting management</b>											
No cutting	53.9	83.6	48.0	61.8	25.47	116.2	65.1	83.3	88.5	37.5	78.1
Cutting at 50 DAS	49.2	72.8	43.1	55.0	20.81	92.3	60.5	75.5	40.3	24.6	58.6
Cutting at 60 DAS	42.0	62.1	33.4	45.8	17.89	75.7	57.9	64.8	30.1	18.2	49.3
Cutting at 70 DAS	31.6	94.2	31.5	52.4	15.22	60.7	53.5	37.3	18.6	13.1	36.6
SEm±	1.40	1.64	0.88	-	0.607	2.73	2.3	2.86	1.58	4.09	-
CD at 5%	4.2	4.90	2.55	-	1.804	8.10	6.8	8.49	4.70	-	-
<b>Interaction: C X CM</b>											
SEm±	-	4.89	2.15	-	1.173	4.72	2.1	4.95	4.86	-	-
CD at 5%	-	9.96	6.25	-	3.705	14.02	6.3	14.71	9.46	-	-
CV (%)	-	-	-	-	9.18	9.48	7.8	13.15	-	-	-

**Table- 2(r): Effect of cutting management and dual purpose crops on net monetary return**

Treatment	Net return (Rs/ha)									
	NWZ	North East zone			Central zone					
	Bikaner	Bhubaneswar	Jorhat	Mean	Rahuri	Jabalpur	Anand	Urulikanchan	Raipur	Mean
<b>Crops</b>										
Oat	53302	39663	44283	45749	46348	44299	41085	89066	24246	49674
Barley	31750	41888	25642	33093	20123	14122	16293	33248	18068	20433
Wheat	34651	37512	23458	31874	42835	61395	35701	57444	16147	42672
SEm.±	1460	1449	1138	-	3036	-	-	2083	-	-
CD at 5%	5051	5690	11169	-	11920	-	-	8135	-	-
<b>Cutting management</b>										
Uncut	41624	34383	38841	38283	37207	35446	26030	60800	15412	34422
Cutting at 50 DAS	42966	45159	34397	40841	46142	44322	26395	60795	24578	39023
Cutting at 60 DAS	45451	40483	27390	37775	32062	40546	27006	66143	19797	38373
Cutting at 70 DAS	29562	38727	23883	30724	31531	39442	22824	51940	18162	33092
SEm±	1178	1217	1422	-	1469	-	-	1879	-	-
CD at 5%	3417	3617	9574	-	4364	-	-	5584	-	-
<b>Interaction: C X CM</b>										
SEm±	2919	2692	2463	-	2544	-	-	4167	-	-
CD at 5%	8470	8992	10451	-	7559	-	-	10746	-	-
CV (%)		9.2	-	-	11.99	-	-		-	-

### 3. R-12-AST-2: Effect of weed management on forage and seed yield of berseem (*Trifolium alexandrinum*)

[Table Reference: 3(a) to 3(n)]

#### Locations: Ludhiana, Pantnagar, Ranchi, Rahuri, Jabalpur, Urulikanchan and Raipur

A field experiment was conducted at seven locations to assess the impact of weed management and effect of herbicides in controlling of weeds in berseem. During Rabi 2011-12, it was conducted as exploratory trial and on the basis of importance of study and results; it was taken as coordinated trial at seven locations for three year duration. The data of third year study is given zone wise below.

#### North West Zone: Ludhiana and Pantnagar

On zonal mean basis, practicing of weed management T<sub>6</sub> treatment (imazethapyr @ 0.1 kg a.i./ha immediate after harvest of I and II cut) in berseem recorded significantly higher GFY (618.4 q/ha), DMY (68.1 q/ha), seed yield (5.1 q/ha), stover yield (62.1 q/ha), net monetary return (Rs 146101/ha) and B:C ratio (4.9). This was followed by application of Pendimethalin @ 0.30 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha which recorded 492.1 q green and 58.3 q dry matter /ha) and remained superior to rest of the treatments. Oxyflourfen @ 0.100 kg a. i./ha recorded the lowest green, dry as well as seed yield (292.6, 34.5 and 0.8 q/ha, respectively).

#### North East Zone: Ranchi

The application of pendimethalin @ 0.40 kg a.i. /ha (T<sub>3</sub>) in berseem recorded significantly highest GFY, (536.25 q/ha) over rest of the treatments. This was followed by Pendimethalin @ 0.30 kg a.i. /ha + Imazethapyr @ 0.10 kg a.i. /ha (immediately after harvest of 1<sup>st</sup> cut) recording (476.8 q green fodder /ha). However, in case of dry matter and crude protein yields, both the treatments remained at par with each other (82.7 and 81.1 q q/ha, respectively). Application of Pendimethalin @ 0.3 kg a.i./ha (T<sub>2</sub>) recorded higher seed yield (1.5 q/ha). Weed management in berseem through application of pendimethalin @ 0.30 kg a.i./ha also fetched significantly highest net monetary return (Rs 167767/ha) and benefit cost ratio (6.8) followed by Pendimethalin @ 0.30 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha.

#### Central Zone: Raipur, Jabalpur, Rahuri and Urulikanchan

On location mean basis, this year application of Imazethapyr @ 0.10 kg a. i./ha (immediately after harvest of 1<sup>st</sup> & 2<sup>nd</sup> cut) in berseem resulted in highest GFY (441.8 q/ha), DMY (59.6 q/ha), seed yield (3.20 q/ha), stover yield (33.7 q/ha) and net monetary return (Rs 94393/ha). The treatment T<sub>6</sub> exhibited 38.3, 18.8, 27.1, 24.7 and 17.7% increase in green forage yields over T<sub>1</sub>, T<sub>2</sub>, T<sub>4</sub>, T<sub>5</sub> and T<sub>7</sub>, respectively. In case of CP yields, T<sub>6</sub> remained at par with T<sub>8</sub>. Whereas T<sub>2</sub>, T<sub>3</sub>, T<sub>6</sub> and T<sub>8</sub> recorded almost equal B:C Ratio. T<sub>6</sub> and T<sub>7</sub> recorded maximum plant population (100.11/m row length). The LS ratio was highest (1.3) in T<sub>2</sub>, T<sub>5</sub> and T<sub>7</sub>. The treatment T<sub>7</sub> achieved maximum weed control efficiency (70.0%) followed by Pendimethalin @ 0.40 kg a.i. + Imazethapyr @ 0.100 kg a.i./ha (64.1%) and lowest being with pendimethalin @ 0.50 kg a.i./ha (45.4%) as compared to weedy check on mean basis. At Jabalpur, T<sub>9</sub> (Pendimethalin @ 0.40 kg a.i.+ Imazethapyr @ 0.10 kg a. i./ha in berseem effectively controlled weed population and recorded lowest weed count (20/m<sup>2</sup>) and dry weight of weeds (26.8 g/m<sup>2</sup>) over rest of the treatments. Whereas, at Urulikanchan, T<sub>6</sub> (Imazethapyr @ 0.10 kg a.i./ha immediate after harvest of 1<sup>st</sup> & 2<sup>nd</sup> cut) recorded lowest weed count (51/m<sup>2</sup>) and biomass (0.52 q/ha) over rest of the treatments. Soil fertility in terms of available N, P and K was observed lower as compared to initial level of soil fertility at Urulikanchan.

T <sub>1</sub> – Weedy check (Control)	T <sub>6</sub> – Imazethapyr @ 0.10 kg a. i./ha (Immediate after harvest of 1 <sup>st</sup> & 2 <sup>nd</sup> cut)
T <sub>2</sub> – Pendimethalin @ 0.3 kg a. i./ha	T <sub>7</sub> – Oxyflourfen @ 0.10 kg a. i./ha + Imazethapyr @ 0.10 kg a. i./ha
T <sub>3</sub> – Pendimethalin @ 0.4 kg a. i./ha	T <sub>8</sub> – Pendimethalin @ 0.30 kg a. i./ha + Imazethapyr @ 0.10 kg a. i./ha
T <sub>4</sub> – Pendimethalin @ 0.5 kg a. i./ha	T <sub>9</sub> – Pendimethalin @ 0.40 kg a. i./ha + Imazethapyr @ 0.10 kg a. i./ha
T <sub>5</sub> – Oxyflourfen @ 0.100 kg a. i./ha	T <sub>10</sub> – Pendimethalin @ 0.500 kg a. i./ha + Imazethapyr @ 0.100 kg a. i./ha

**Table-3(a): Effect of integrated weed management on GFY of berseem**

Treatment	Green fodder yield (q/ha)									Over all mean
	NWZ			NEZ	Central zone					
	Ludhiana	Pantnagar	Mean	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T <sub>1</sub>	676.1	403.0	539.5	344.37	195.6	265.8	125.4	225.4	203.0	319.4
T <sub>2</sub>	456.5	459.8	458.2	433.06	274.1	487.5	221.4	269.5	313.1	371.7
T <sub>3</sub>	395.1	438.0	416.6	536.25	262.3	504.7	181.3	285.7	308.5	371.9
T <sub>4</sub>	331.0	388.8	359.9	441.48	250.8	563.5	156.8	299.9	317.8	347.5
T <sub>5</sub>	193.7	391.6	292.6	434.18	294.0	596.5	228.7	341.0	365.1	354.2
T <sub>6</sub>	794.5	442.3	618.4	384.91	437.3	529.2	188.7	315.9	367.8	441.8
T <sub>7</sub>	197.7	426.2	312.0	359.90	328.0	608.8	303.9	403.4	411.0	375.4
T <sub>8</sub>	509.6	474.5	492.1	476.75	312.5	521.8	270.4	361.5	366.5	418.1
T <sub>9</sub>	370.4	426.0	398.2	434.18	310.5	543.9	223.8	377.5	363.9	383.7
T <sub>10</sub>	330.6	437.4	384.0	415.90	305.0	596.5	196.9	386.5	371.2	381.3
SEm ±	20.58	13	-	7.77	16.56	21.33	7.96	7.95	-	-
CD (5%)	61.61	48	-	23.26	49.20	61.52	23.85	23.57	-	-
CV %	8.38	-	-	3.15	9.66	14.63	6.58	-	-	-

**Table-3(b): Effect of integrated weed management on DMY of berseem**

Treatment	Dry matter yield (q/ha)									Over all mean
	NWZ			NEZ	Central zone					
	Ludhiana	Pantnagar	Mean	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T <sub>1</sub>	74.7	48.6	61.7	74.8	26.9	32.7	16.1	40.3	29.0	44.9
T <sub>2</sub>	48.5	59.2	53.9	73.7	41.1	64.2	29.1	45.5	45.0	51.6
T <sub>3</sub>	42.9	52.3	47.6	82.7	38.6	66.6	23.8	48.4	44.3	50.8
T <sub>4</sub>	36.5	48.6	42.6	71.6	37.1	76.0	20.3	48.8	45.5	48.4
T <sub>5</sub>	21.9	47.0	34.5	65.1	45.3	80.8	28.1	55.9	52.5	49.2
T <sub>6</sub>	80.9	55.3	68.1	65.7	68.7	70.5	24.1	52.4	53.9	59.6
T <sub>7</sub>	21.4	51.8	36.6	61.8	49.3	83.8	40.7	70.3	61.0	54.2
T <sub>8</sub>	55.2	61.3	58.3	81.1	46.1	69.4	37.2	57.8	52.6	58.3
T <sub>9</sub>	39.8	53.8	46.8	56.0	44.2	72.8	30.4	61.0	52.1	51.1
T <sub>10</sub>	35.3	54.8	45.1	58.8	40.2	81.4	24.5	65.4	52.9	51.5
SEm ±	2.22	1.6	-	1.97	3.30	4.2	1.05	1.59	-	-
CD at 5%	6.64	4.8	-	5.91	9.81	12.4	3.14	4.76	-	-
CV %	8.48	-	-	4.94	13.07	7.5	6.63	-	-	-

**Table-3(c): Effect of integrated weed management on seed yield of berseem**

Treatment	Seed yield (q/ha)									Over all mean
	NWZ			NEZ	Central zone					
	Ludhiana	Pantnagar	Mean	Ranchi	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean	
T <sub>1</sub>	6.3	0.6	3.4	1.3	1.3	1.4	2.2	0.9	1.4	2.0
T <sub>2</sub>	7.2	1.1	4.1	1.5	1.3	3.3	3.4	0.9	2.3	2.7
T <sub>3</sub>	5.7	0.6	3.2	1.4	1.3	3.7	3.4	1.1	2.4	2.5
T <sub>4</sub>	4.0	0.5	2.3	1.2	1.3	4.4	3.1	1.3	2.5	2.3
T <sub>5</sub>	1.1	0.6	0.8	1.0	1.5	4.6	3.9	1.5	2.9	2.0
T <sub>6</sub>	9.5	0.7	5.1	1.2	1.6	4.0	3.4	1.9	2.7	3.2
T <sub>7</sub>	1.1	0.7	0.9	1.0	1.6	5.7	4.5	2.1	3.5	2.4
T <sub>8</sub>	7.0	1.3	4.2	0.9	1.5	3.9	4.0	1.6	2.8	2.9
T <sub>9</sub>	5.7	0.9	3.3	0.9	1.5	4.2	3.6	1.7	2.7	2.6
T <sub>10</sub>	4.4	0.8	2.6	0.8	1.4	5.4	3.5	1.8	3.0	2.6
SEm ±	0.43	0.06	-	1.97	0.05	0.63	0.12	0.51	-	-
CD at 5%	1.28	0.18*	-	5.91	0.15	1.18	0.38	0.16	-	-
CV %	13.77	-	-	4.94	6.08	4.2	6.36	-	-	-

**Table-3(d): Effect of integrated weed management on stover yield of berseem**

Treatment	Stover yield (q/ha)									Over all mean
	NWZ			NEZ	Central zone					
	Ludhi ana	Pant nagar	Mean	Ran-chi	Rah- uri	Jabal pur	Uruli kanchan	Rai- pur	Mean	
T <sub>1</sub>	59.3	39.2	49.3	4.2	3.5	26.9	32.8	7.2	17.6	24.7
T <sub>2</sub>	70.3	41.2	55.8	4.1	6.2	46.5	47.2	13.7	28.4	32.7
T <sub>3</sub>	58.0	39.6	48.8	4.6	4.1	43.2	42.3	11.6	25.3	29.0
T <sub>4</sub>	54.2	39.0	46.6	4.0	3.9	52.1	38.5	7.8	25.6	28.5
T <sub>5</sub>	27.5	43.0	35.3	3.6	10.2	53.9	49.9	9.0	30.8	28.2
T <sub>6</sub>	83.2	40.9	62.1	3.6	11.1	49.0	38.5	9.7	27.1	33.7
T <sub>7</sub>	26.5	37.2	31.8	3.4	10.2	54.2	59.6	10.7	33.7	28.8
T <sub>8</sub>	67.3	44.9	56.1	4.5	8.2	46.9	53.3	10.4	29.7	33.6
T <sub>9</sub>	67.3	41.1	54.2	3.1	7.6	49.3	50.0	12.5	29.9	33.0
T <sub>10</sub>	59.0	40.8	49.9	3.3	7.5	50.6	44.2	10.1	28.1	30.8
SEm ±	2.39	1.49	-	0.11	0.46	1.5	1.94	-	-	-
CD at 5 %	7.15	4.42 ns	-	0.33	1.37	3.7	5.82	1.53	-	-
CV %	7.08	-	-	4.94	10.98	5.2	7.38	-	-	-

**Table-3(e): Effect of integrated weed management on crude protein yield of berseem**

Treatment	Crude protein yield (q/ha)						Over all mean
	NEZ	Central zone					
	Ranchi	Rahuri	Urulikanchan	Raipur	Jabalpur	Mean	
T <sub>1</sub>	13.7	4.9	2.9	5.8	4.5	4.5	6.4
T <sub>2</sub>	14.2	7.5	5.3	6.6	9.6	7.3	8.7
T <sub>3</sub>	15.7	7.3	4.5	7.0	10.0	7.2	8.9
T <sub>4</sub>	13.5	6.9	3.7	7.1	11.6	7.3	8.5
T <sub>5</sub>	12.1	8.5	5.2	8.1	12.2	8.5	9.2
T <sub>6</sub>	12.8	12.5	4.5	7.6	10.7	8.8	9.6
T <sub>7</sub>	11.6	9.3	7.3	10.2	12.8	9.9	10.2
T <sub>8</sub>	15.5	8.6	6.8	8.4	10.6	8.6	10.0
T <sub>9</sub>	10.7	7.9	5.6	8.8	11.1	8.3	8.8
T <sub>10</sub>	11.7	7.5	4.5	9.5	12.2	8.4	9.1
SEm ±	0.38	0.59	0.19	0.43	0.72	-	-
CD at 5 %	1.13	1.74	0.57	0.69	1.14	-	-
CV %	4.99	12.54	6.59	-	4.5	-	-

**Table-3(f): Effect of integrated weed management on crude protein content and plant height of berseem (*Trifolium alexandrinum* L.)**

Treatment	Crude protein (%)					Plant height (cm)								Over all mean
	NEZ	Central zone			Over all mean	NWZ			Central zone					
	Ran-chi	Rah- uri	Urulikan- chan	Mean		Ludh- iana	Pant- nagar	Mean	Rah- uri	Jabal- pur	Urulikan- chan	Rai- pur	Mean	
T <sub>1</sub>	17.3	18.1	18.2	18.1	17.9	45.5	59.0	52.3	56.0	34.6	49.7	52.2	48.1	49.5
T <sub>2</sub>	18.3	18.4	18.2	18.3	18.3	46.6	55.0	50.8	56.0	40.3	57.2	84.6	59.5	56.6
T <sub>3</sub>	18.0	18.8	18.9	18.8	18.5	46.3	51.0	48.7	56.0	40.4	53.2	78.4	57.0	54.2
T <sub>4</sub>	17.8	18.5	18.1	18.3	18.2	45.5	49.0	47.3	52.0	44.5	53.6	59.8	52.5	50.7
T <sub>5</sub>	17.6	18.8	18.3	18.6	18.3	47.0	58.0	52.5	55.0	45.5	50.8	74.9	56.5	55.2
T <sub>6</sub>	18.4	18.2	18.9	18.5	18.5	51.8	54.0	52.9	55.0	40.4	55.9	72.4	55.9	54.9
T <sub>7</sub>	17.7	18.9	17.8	18.4	18.2	45.5	53.0	49.3	54.0	49.4	57.0	77.2	59.4	56.0
T <sub>8</sub>	18.1	18.6	18.2	18.4	18.3	45.4	52.0	48.7	56.0	42.2	57.3	63.5	54.8	52.7
T <sub>9</sub>	18.0	17.8	18.3	18.0	18.0	45.9	55.0	50.5	52.0	44.8	50.7	82.7	57.5	55.2
T <sub>10</sub>	18.8	18.8	18.6	18.7	18.7	46.0	54.0	50.0	50.0	47.6	50.2	68.1	54.0	52.7
SEm ±	0.28	0.31	-	-	-	1.02	1.86	-	2.05	1.0	2.1	5.15	-	-
CD at 5 %	NS	NS	-	-	-	3.05	5.52*	-	NS	3.1	6.4	15.67	-	-
CV %	2.67	2.92	-	-	-	3.79	-	-	6.56	4.85	7.1	-	-	-

**Table-3(g): Effect of integrated weed management on leaf stem ratio of berseem (*Trifolium alexandrinum* L.)**

Treatment	Leaf stem ratio								Plant population/ m row length					
	NEZ	NWZ	Central zone					Over all mean	NEZ	Central zone				Over all mean
	Ranchi	Pantnagar	Rahuri	Jabalpur	Urulikanchan	Raipur	Mean		Ranchi	Rahuri	Jabalpur	Urulikanchan	Mean	
T <sub>1</sub>	1.8	2.6	0.7	0.5	0.6	0.6	0.6	1.1	48.7	79.0	133.0	132.7	114.9	98.3
T <sub>2</sub>	1.8	2.7	0.9	0.6	0.7	0.9	0.8	1.3	47.7	86.0	134.8	143.2	121.3	102.9
T <sub>3</sub>	1.7	2.5	0.7	0.5	0.6	0.8	0.7	1.1	49.0	81.0	138.8	129.8	116.5	99.7
T <sub>4</sub>	1.5	2.4	0.8	0.6	0.7	0.6	0.7	1.1	47.7	82.0	138.7	117.3	112.7	96.4
T <sub>5</sub>	1.8	3.0	0.8	0.7	0.8	0.8	0.8	1.3	48.3	104.0	137.6	136.2	125.9	106.5
T <sub>6</sub>	1.5	2.9	0.8	0.6	0.6	0.7	0.7	1.2	48.3	119.0	139.0	138.0	132.0	111.1
T <sub>7</sub>	1.6	2.8	0.7	0.8	0.9	0.9	0.8	1.3	49.0	109.0	139.0	148.3	132.1	111.3
T <sub>8</sub>	1.6	2.7	0.7	0.6	0.6	0.7	0.6	1.1	47.0	92.0	135.9	142.3	123.4	104.3
T <sub>9</sub>	1.7	2.4	0.7	0.6	0.7	0.9	0.7	1.2	48.0	89.0	135.6	152.5	125.7	106.3
T <sub>10</sub>	1.5	3.0	0.9	0.7	0.7	0.7	0.7	1.2	47.3	88.0	136.3	118.3	114.2	97.5
SEm ±	0.07	0.15	0.04	0.02	-	0.12	-	-	0.66	4.82	-	-	-	-
CD at 5 %	0.21	NS	0.12	0.06	-	0.04	-	-	-	14.32	-	-	-	-
CV %	7.45	-	9.82	5.5	-	-	-	-	2.40	9.00	-	-	-	-

**Table-3(h): Effect of integrated weed management on weed control efficiency in berseem**

Treatment	Weed control efficiency (%)				
	Central zone				NWZ
	Rahuri	Jabalpur	Urulikanchan	Mean	Ludhiana
T <sub>1</sub>	0.0	0.0	0.0	0.0	0.0
T <sub>2</sub>	19.3	80.8	39.1	46.4	33.4
T <sub>3</sub>	24.1	75.6	50.0	49.9	57.2
T <sub>4</sub>	30.6	53.6	51.9	45.4	52.4
T <sub>5</sub>	37.9	59.4	60.6	52.6	100.0
T <sub>6</sub>	71.9	59.9	54.9	62.2	11.1
T <sub>7</sub>	63.5	68.2	78.3	70.0	100.0
T <sub>8</sub>	44.3	61.4	52.3	52.7	47.6
T <sub>9</sub>	55.0	79.3	58.1	64.1	47.6
T <sub>10</sub>	60.2	67.2	58.2	61.9	38.1
SEm ±	2.63	-	2.12	-	-
CD at 5 %	7.81	-	6.35	-	-
CV %	11.19	-	7.30	-	-

**Table-3(i): Effect of integrated weed management on equivalent yield and weed index of yield of berseem**

Treatment	Raipur			Jabalpur		Urulikanchan
	Weed index of seed yield (%)	Weed index of green fodder yield of berseem (%)	Dry matter of weed/m <sup>2</sup>	Weed index of green fodder yield of berseem (%)	Weed index of seed yield (%)	Maize fodder equivalent yield (q/ha)
T <sub>1</sub>	42.56	42.56	125.30	58.13	70.86	182.83
T <sub>2</sub>	35.23	35.23	89.93	-	-	469.69
T <sub>3</sub>	30.94	30.94	89.30	3.80	2.25	408.87
T <sub>4</sub>	30.37	30.37	70.44	16.62	11.27	341.21
T <sub>5</sub>	20.61	20.61	62.06	14.72	6.20	494.75
T <sub>6</sub>	25.28	25.28	63.34	10.13	4.51	366.36
T <sub>7</sub>	0.00	0.00	25.88	5.91	3.38	645.15
T <sub>8</sub>	17.78	17.78	62.28	12.61	4.51	570.98
T <sub>9</sub>	13.13	13.13	66.64	2.09	1.69	459.82
T <sub>10</sub>	6.94	6.94	44.30	9.74	4.32	411.28
SEm ±	2.04	2.04	7.61	-	-	20.37
CD at 5 %	6.27	6.27	22.79	-	-	61.00
CV %				-	-	8.11

**Table-3(j): Effect of integrated weed management on species wise weeds count and dry weight of weed in berseem at Jabalpur**

Treatment	Species wise weed count/ m <sup>2</sup>					Dry weight (gm) of weed/m <sup>2</sup>				
	Chicory	Medicago	Corono	Others	Total	Chicory	Medicago	Corono	Others	Total
T <sub>1</sub>	70.33	53.33	41.66	61.66	227	30.16	27.62	29.01	43	129.3
T <sub>2</sub>	9.33	8.66	9.33	12.66	40	6.45	5.61	5.72	7	24.8
T <sub>3</sub>	14.66	13.0	10.66	13.66	52	7.35	5.86	6.97	6	26.6
T <sub>4</sub>	22.66	21.66	15.33	17.66	77	15.11	13.94	14.29	17	60.0
T <sub>5</sub>	19.66	17.0	15.33	14.66	67	12.86	12.92	13.00	14	52.4
T <sub>6</sub>	15.33	12.33	9.00	12.66	49	12.69	12.57	12.68	12	50.0
T <sub>7</sub>	11.66	9.00	6.66	11.00	38	11.05	9.99	10.18	11	42.4
T <sub>8</sub>	9.33	10.66	9.00	17.33	46	10.49	10.03	10.07	11	41.1
T <sub>9</sub>	5.66	4.66	3.66	6.00	20	6.90	6.62	6.54	7	26.8
T <sub>10</sub>	25.00	17.66	15.33	21.00	79	13.94	12.26	12.72	13	51.9
SEm ±	5.5	3.2	1.5	3.50		0.85	0.92	0.91	1.23	
CD at 5 %	8.63	7.6	7.3	9.64		1.36	1.74	1.8	4.41	
CV %	3.4	4.6	3.4	6.2		3.4	3.2	4.1	5.2	

**Chicory: *Cichorium intybus*      Medicago: *Medicago denticulata*      Corono: *Coronopus didymus***

**Table-3(k): Effect of integrated weed management on species wise weed count, dry matter of weed and soil fertility status in berseem (*Trifolium alexandrinum* L.) at Urulikanchan**

Treatment	Weed count	Weed dry matter (q/ha)	OC (%)	EC (dSm <sup>-1</sup> )	pH	Avail. N (kg/ha)	Avail. P (kg/ha)	Avail. K (kg/ha)
T <sub>1</sub>	142	2.405	0.33	0.22	8.07	131.33	32.00	269.33
T <sub>2</sub>	74	1.447	0.36	0.26	8.14	130.00	33.00	241.33
T <sub>3</sub>	68	1.198	0.33	0.21	8.03	128.33	32.67	269.33
T <sub>4</sub>	70	1.153	0.32	0.24	8.06	125.00	31.67	245.00
T <sub>5</sub>	67	0.942	0.35	0.26	8.09	126.00	32.67	212.33
T <sub>6</sub>	106	1.079	0.35	0.25	7.94	128.00	30.67	214.67
T <sub>7</sub>	51	0.516	0.36	0.25	7.97	128.67	31.33	231.33
T <sub>8</sub>	74	1.137	0.35	0.27	8.01	130.00	30.33	199.67
T <sub>9</sub>	92	0.995	0.35	0.20	8.09	127.33	29.67	212.67
T <sub>10</sub>	114	0.993	0.33	0.22	8.13	126.67	31.67	248.33
Initial			0.52	0.59	7.29	147.00	43.00	195.00

**Weed count: Species wise weed count/ m<sup>2</sup> (Monocot + Dicot)**

**Table-3(l): Effect of integrated weed management on species wise weed count, dry matter of weed and soil fertility status in berseem at Rahuri**

Treatment	Weed count	OC (%)	EC (dSm <sup>-1</sup> )	pH	Avail. N (kg/ha)	Avail. P (kg/ha)	Avail. K (kg/ha)
T <sub>1</sub>	87	0.43	0.18	8.27	184	17.18	337.33
T <sub>2</sub>	74	0.48	0.21	8.16	237	20.54	399.67
T <sub>3</sub>	69	0.43	0.22	8.23	248	18.87	351.33
T <sub>4</sub>	61	0.47	0.21	8.38	262	22.45	374.33
T <sub>5</sub>	49	0.44	0.22	8.32	234	18.88	406.33
T <sub>6</sub>	20	0.45	0.18	8.26	249	19.35	385.33
T <sub>7</sub>	28	0.45	0.17	8.30	220	21.11	404.33
T <sub>8</sub>	46	0.49	0.20	8.11	234	21.60	368.33
T <sub>9</sub>	35	0.43	0.23	8.20	199	20.40	392.33
T <sub>10</sub>	30	0.44	0.24	8.09	225	20.25	364.67
SEm ±	1.85	0.009	0.007	0.01	2.87	0.68	3.37
CD at 5 %	5.50	0.025	0.021	0.03	8.52	2.02	10.00
CV %	6.44	3.29	5.97	0.24	2.17	5.87	3.54

**Table-3(m): Effect of integrated weed management on net monetary return of berseem**

Treatment	Net monetary return (Rs/ha)									Over all mean
	NWZ			NEZ	Central zone					
	Ludhi ana	Pant nagar	Mean	Ranchi	Rahuri	Jabalpur	Uruli kanchan	Raipur	Mean	
T <sub>1</sub>	128933	81788	105361	109278	21968	31065	34738	-246	21881	58218
T <sub>2</sub>	130527	93464	111996	140501	34326	93199	89242	2569	54834	83404
T <sub>3</sub>	95480	88250	91865	167767	31760	101420	77686	4866	53933	81033
T <sub>4</sub>	56418	77966	67192	135440	28943	118854	64829	8327	55238	70111
T <sub>5</sub>	-14277	80423	33073	129446	40153	122847	94002	12393	67349	66427
T <sub>6</sub>	202383	89819	146101	117490	62132	104222	69609	15098	62765	94393
T <sub>7</sub>	-14528	85108	35290	106409	43551	140948	122578	21485	82141	72222
T <sub>8</sub>	128629	96862	112746	140120	39291	101497	108486	14439	65928	89903
T <sub>9</sub>	92589	85996	89293	125757	38402	110020	87366	16181	62992	79473
T <sub>10</sub>	63595	88078	75837	119087	35586	136277	78143	17733	66935	76928
SEm ±	8377	2824	-	3025	2814	-	3871	-	-	-
CD at 5 %	26711	8390	-	9059	8360	-	11590	-	-	-
CV %	17.91	-	-	4.06	12.96	-	8.11	-	-	-

**Table-3(n): Effect of integrated weed management on benefit cost ratio in berseem (*Trifolium alexandrinum* L.)**

Treatment	Benefit cost ratio								Over all mean
	NWZ			NEZ	Central zone				
	Ludhi ana	Pant nagar	Mean	Ranchi	Jabalpur	Uruli kanchan	Raipur	Mean	
T <sub>1</sub>	2.6	5.6	4.1	4.4	2.0	1.7	0.0	1.2	2.7
T <sub>2</sub>	2.6	6.2	4.4	5.7	3.9	3.0	0.1	2.3	3.6
T <sub>3</sub>	1.9	5.8	3.8	6.8	4.1	2.8	0.2	2.4	3.6
T <sub>4</sub>	1.1	5.1	3.1	5.5	4.5	2.5	0.4	2.5	3.2
T <sub>5</sub>	-0.3	5.3	2.5	5.2	4.3	2.9	0.6	2.6	3.0
T <sub>6</sub>	3.9	6.0	4.9	4.7	3.8	2.3	0.8	2.3	3.6
T <sub>7</sub>	-0.3	5.5	2.6	4.3	4.7	3.2	1.1	3.0	3.1
T <sub>8</sub>	2.4	6.1	4.2	5.7	3.7	3.2	0.7	2.5	3.6
T <sub>9</sub>	1.8	5.5	3.6	5.1	4.0	2.8	0.8	2.5	3.3
T <sub>10</sub>	1.2	5.6	3.4	4.8	4.7	2.6	0.9	2.7	3.3
SEm ±	0.16	0.19	-	0.12	-	0.07	-	-	-
CD at 5 %	0.52	0.55	-	0.36	-	0.23	-	-	-
CV %	17.89	-	-	4.06	-	5.01	-	-	-

#### 4. R-12-AST-3: Effect of integrated nutrient management on yield and quality of oat

Location: Kalyani and Imphal

[Table Reference: 4(a) - 4(b)]

The experiment was initiated during *Rabi* 2012-13 on location specific mode at BCKV, Kalyani and CAU, Imphal, to assess the effect of nitrogen and FYM level on productivity, quality and economics of forage oat. The total ten treatments viz., T<sub>1</sub>- RDF (80:40 N: P), T<sub>2</sub>- N@60 kg/ha+FYM@5 t/ha, T<sub>3</sub>- N@60 kg/ha+FYM@7.5 t/ha, T<sub>4</sub>- N@60 kg/ha+FYM@10 t/ha, T<sub>5</sub> - N@100 kg/ha+FYM@5 t/ha, T<sub>6</sub> - N@100 kg/ha+FYM@7.5 t/ha, T<sub>7</sub>- N@100 kg/ha+FYM@10 t/ha, T<sub>8</sub> - N@120 kg/ha+FYM@5 t/ha, T<sub>9</sub> - N@120 kg/ha+FYM@7.5 t/ha and T<sub>10</sub> - N@120 kg/ha+FYM@10 t/ha was laid out in RBD with three replications. The data of second year (2014-15) of experimentation has been presented below.

The maximum plant height was recorded with T<sub>6</sub>-N@100 kg/ha+FYM@7.5 t/ha (152.1 cm), whereas, T<sub>4</sub>, T<sub>5</sub>, T<sub>7</sub> and T<sub>9</sub> recorded higher leaf stem ratio (0.69). Among the two centres, higher green, dry matter and crude protein yield were noticed at Imphal. On locational mean basis, application of N@120 kg/ha+FYM@7.5 t/ha (T<sub>9</sub>) recorded highest green fodder yield (435.3 q/ha), which was at par with T<sub>8</sub>- N@120 kg/ha+FYM@5 t/ha, (434.3 q/ha) and T<sub>3</sub>- N@60 kg/ha+FYM@7.5 t/ha, (433.5 q/ha) followed by T<sub>7</sub> and T<sub>6</sub>. In terms of dry matter and crude protein yields, T<sub>3</sub>- N@60 kg/ha+FYM@7.5 t/ha recorded highest (103.9 and 7.9 q/ha, respectively) followed by T<sub>9</sub>. Highest net monetary return of Rs. 25040/- was found in the treatment T<sub>6</sub>- N@60 kg/ha+FYM@7.5 t/ha. Whereas, T<sub>9</sub>-N@120 kg/ha+FYM@7.5 t/ha recorded significantly higher gross monetary return of Rs. 47328/ha at Kalyani.

**Table-4(a): Effect of integrated nutrient management on yield and quality of oat (sc) at Imphal and Kalyani in NE zone**

Treatment	Plant height (cm)			Leaf Stem ratio			Green Fodder Yield (q/ha)			Dry Matter Yield (q/ha)			Crude Protein Yield (q/ha)		
	Kal-yani	Imp-hal	Mean	Kal-yani	Imp-hal	Mean	Kal-yani	Imp-hal	Mean	Kal-yani	Imp-hal	Mean	Kal-yani	Imp-hal	Mean
T <sub>1</sub>	152.2	136.2	144.2	0.51	0.25	0.38	351.1	346.0	348.5	40.2	84.8	62.5	3.4	4.3	3.8
T <sub>2</sub>	141.6	134.6	138.1	0.53	0.22	0.38	306.6	352.8	329.7	36.2	117.3	76.8	3.3	6.4	4.8
T <sub>3</sub>	154.1	141.2	147.6	0.59	0.21	0.40	375.5	491.4	433.5	48.0	159.7	103.9	5.2	10.5	7.9
T <sub>4</sub>	153.1	107.2	130.1	0.63	0.28	0.46	333.3	381.3	357.3	46.4	89.4	67.9	2.9	5.6	4.3
T <sub>5</sub>	153.3	120.4	136.9	0.53	0.37	0.45	364.4	386.4	375.4	47.6	79.5	63.5	3.5	4.8	4.2
T <sub>6</sub>	155.4	135.3	145.4	0.64	0.31	0.48	397.7	433.8	415.7	44.9	104.2	74.5	3.8	6.2	5.0
T <sub>7</sub>	157.2	146.9	152.1	0.66	0.27	0.47	404.4	440.2	422.3	48.5	118.1	83.3	4.2	6.9	5.6
T <sub>8</sub>	153.2	123.8	138.5	0.53	0.24	0.39	428.9	439.8	434.3	49.4	107.0	78.2	5.2	6.2	5.7
T <sub>9</sub>	154.2	129.7	141.9	0.68	0.20	0.44	473.3	397.3	435.3	55.7	120.4	88.0	4.3	6.6	5.5
T <sub>10</sub>	149.3	132.4	140.9	0.70	0.36	0.53	420.0	375.7	397.8	46.2	84.1	65.2	4.6	5.3	5.0
SEm±	1.921	3.39	-	-	0.02	-	4.86	11.01	-	0.77	4.05	-	0.06	0.36	-
CD at 5%	5.709	10.06	-	-	0.05	-	14.44	32.71	-	2.31	12.02	-	0.19	1.06	-
CV%	2.18	4.49	-	-	10.17	-	2.18	4.71	-	2.92	6.58	-	2.80	9.83	-

**Table-4(b): Effect of integrated nutrient management on economics of oat (sc) at Imphal and Kalyani in NE zone**

Treatment	Cost of cultivation (Rs./ha)	Gross monetary return (Rs./ha)	Net monetary return (Rs./ha)		
	Kalyani	Kalyani	Kalyani	Imphal	Mean
T <sub>1</sub>	25000	35107	10107	35247	22677
T <sub>2</sub>	26000	30663	4663	32995	18829
T <sub>3</sub>	28000	37551	9551	51914	30733
T <sub>4</sub>	29500	33330	3830	33520	18675
T <sub>5</sub>	29440	36440	7440	37082	22261
T <sub>6</sub>	32000	39773	7773	42307	25040
T <sub>7</sub>	36000	40440	4440	41400	22920
T <sub>8</sub>	31000	42884	11884	44621	28253
T <sub>9</sub>	35000	47328	12328	36365	24347
T <sub>10</sub>	37000	41995	4995	31252	18124
SEm±	-	486.25	486.25	1651.52	-
CD at 5%	-	1444.23	1444.73	4906.87	-
CV%	-	2.18	10.94	7.40	-

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

Location: Urulikanchan, Anand, Rahuri and Bikaner

[Table Reference: 5(a) to 5(b)]

The experiment was conducted to find out suitable models for year round green fodder production at four locations (Anand, Rahuri, Urulikanchan and Bikaner). The study was started during *khari* 2013 with planting of perennial BNH (CO-3) at border and seasonal (*Khari*, *Rabi* & *Zaid*) fodder crops in between plot as per treatments. The treatments consisted of T<sub>1</sub>- Maize +cowpea- oat + berseem- Bajra + cowpea, T<sub>2</sub>- sorghum + cowpea- maize + berseem – Bajra + cowpea, T<sub>3</sub>- BN hybrid + cowpea-berseem- cowpea, T<sub>4</sub>- BN hybrid + lucerne and T<sub>5</sub>- 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<sub>3</sub>- Bajra napier hybrid + cowpea - BN hybrid + berseem- BN hybrid + cowpea recorded highest GFY (975.61 q/ha/yr), DMY (201.55 q/ha/yr) and CPY (207.16 q/ha/yr) over rest of the treatments. The above treatment (T<sub>3</sub>) recorded 27.2, 28.9 and 12.9 % more GFY and 43.8, 52.1 and 15.9% more dry matter over T<sub>1</sub>, T<sub>2</sub> and T<sub>5</sub> treatments, respectively. However, planting of BN hybrid + lucerne round the year green fodder production system fetched highest net monetary returns (Rs 82308/ha/yr) and B:C ratio (2.66) followed by T<sub>2</sub> (Rs. 78439/ha/yr).

**Table- 5(a): GFY and DMY of forages as influenced by different models for year round green fodder production under irrigated condition**

Treatment	Total GFY (q/ha/yr)					Total DMY (q/ha/yr)				
	Ana-nd	Rah-uri	Uruli-kan- chan	Bika- ner	Mean	Ana-nd	Rah- uri	Uruli kan- chan	Bika- ner	Mean
T <sub>1</sub>	1180.1	511.6	849.6	526.1	766.8	221.45	76.06	134.27	128.75	140.13
T <sub>2</sub>	1277.7	447.7	789.6	512.8	757.0	196.24	70.71	135.88	127.21	132.51
T <sub>3</sub>	1353.5	1311.0	663.3	574.6	975.6	269.55	301.85	89.99	144.80	201.55
T <sub>4</sub>	1064.0	1336.2	687.3	722.9	952.6	222.42	328.16	86.02	192.05	207.16
T <sub>5</sub>	1187.1	1207.3	459.7	521.9	844.0	189.49	314.55	64.49	146.38	178.73
SEm±	32.66	35.00	11.63	14.53		6.95	7.48	4.15	7.02	
CD at 5 %	100.63	100.38	35.39	44.77		21.40	21.45	12.63	2.164	

**Table- 5(b): CPY and economics of forages as influenced by different models for year round green fodder production under irrigated condition**

Treatment	Net monetary returns (Rs/ha/yr)				Benefit cost ratio				Total CPY (q/ha/yr)				
	Ana-nd	Bika- ner	Urulikan- chan	Me- an	Ana-nd	Bika- ner	Urulikan- chan	Me- an	Ana-nd	Rah- uri	Urulikan chan	Bika- ner	Me- an
T <sub>1</sub>	71124	48916	111634	77225	1.37	1.63	2.10	1.70	21.3	9.22	12.80	14.42	14.44
T <sub>2</sub>	87945	46922	100449	78439	1.74	1.56	2.02	1.77	18.1	8.65	11.11	18.15	14.00
T <sub>3</sub>	82186	58192	69004	69794	1.29	2.08	1.78	1.72	22.4	31.67	11.68	22.32	22.02
T <sub>4</sub>	80410	83430	83084	82308	2.60	3.34	2.04	2.66	18.3	36.93	11.32	25.35	22.98
T <sub>5</sub>	99534	53289	34207	62343	3.55	2.13	1.57	2.42	22.6	34.39	7.05	16.10	20.04
SEm +		2179	2724			0.08	0.03		0.55	1.08	0.47	0.89	
CD at 5 %		6715	8285			0.25	0.10		1.69	2.98	1.45	2.73	

**6. 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

[Table Reference: 6(a) to 6(c)]

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 yield. Planting of perennial fodder sorghum at 60 cm row recorded higher values of plant height (155.08 cm) and no. of tillers/m row (70.12 cm) followed by 45 cm row planting. The green and dry fodder yield was highest with 45 cm row spacing (1374.85 and 331.07 q/ha, respectively) followed by 30 cm row planting. The crude protein content was highest with 60 cm row planting (10.26 %) while the crude protein yield was highest with 45 cm row planting (87.85 q/ha) followed by 30 cm row planting (82.32 q/ha). The cutting interval of 90 days recorded the higher plant height 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 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- 6(a): Influence of planting geometry and cutting intervals on biomass yields of perennial fodder sorghum (Cv. COFS 29)**

Treatment	Green fodder yield (q/ha)				Dry matter yield (q/ha)			
	Dharwad	Raipur	Bikaner	Mean	Dharwad	Raipur	Bikaner	Mean
<b>Spacing</b>								
30 cm	1994.00	959.5	1000.33	1317.94	433.00	220.8	279.62	311.14
45 cm	2229.00	905.5	990.05	1374.85	492.00	208.3	292.90	331.07
60 cm	1636.00	780.8	814.11	1076.97	368.00	179.7	233.99	260.56
SEm±	18.20	10.83	18.13	-	4.10	10.28	5.62	-
CD at 5%	53.30	31.74	53.18	-	11.90	30.11	16.47	-
<b>Cutting interval</b>								
Cutting at 45 DAS	1949.00	974.3	768.41	1230.57	414.00	224.2	10.55	216.25
Cutting at 60 DAS	2132.00	906.3	708.08	1248.79	471.00	208.5	10.31	229.94
Cutting at 75 DAS	2017.00	857.0	685.81	1186.60	449.00	197.2	11.00	219.07
Cutting at 90 DAS	1714.00	790.3	642.20	1048.83	391.00	181.8	11.07	194.62
SEm±	21.00	8.12	20.94	-	4.70	1.91	0.06	-
CD at 5%	61.60	23.59	61.41	-	13.70	5.57	0.16	-
<b>Interaction: C X CM</b>								
SEm±	-	-	-	-	-	-	-	-
CD at 5%	-	-	-	-	-	-	-	-
CV (%)	-	-	8.96	-	-	-	9.65	-

**Table- 6(b): Influence of planting geometry and cutting intervals on crude protein content and yield of perennial fodder sorghum (Cv. COFS 29)**

Treatment	Crude protein yield (q/ha)				Crude protein content (%)			
	Dharwad	Raipur	Bikaner	Mean	Dharwad	Raipur	Bikaner	Mean
<b>Spacing</b>								
30 cm	121.00	21.6	104.35	82.32	6.00	9.70	13.93	9.88
45 cm	136.00	20.5	107.06	87.85	6.10	9.80	14.41	10.10
60 cm	101.00	18.0	88.93	69.31	6.20	10.00	14.59	10.26
SEm±	1.00	-	2.05	-	0.02	-	0.05	-
CD at 5%	3.00	3.07	6.02	-	0.04	0.14	0.14	-
<b>Cutting interval</b>								
Cutting at 45 DAS	116.00	23.60	81.22	73.61	6.00	10.50	10.55	9.02
Cutting at 60 DAS	130.00	21.20	72.97	74.72	6.10	10.20	10.31	8.87
Cutting at 75 DAS	124.00	18.60	75.32	72.64	6.20	9.50	11.00	8.90
Cutting at 90 DAS	106.00	16.80	70.83	64.54	6.20	9.30	11.07	8.86
SEm±	1.20	0.17	2.37	-	0.02	0.04	0.06	-
CD at 5%	3.50	0.51	6.95	-	0.05	0.11	0.16	-
<b>Interaction: C X CM</b>								
SEm±	-	-	-	-	-	-	-	-
CD at 5%	-	-	-	-	-	-	-	-
CV (%)	-	-	-	-	-	-	-	-

**Table- 6(c): Influence of planting geometry and cutting intervals on plant height and number of tillers of perennial fodder sorghum (cv. COFS 29)**

Treatment	Plant height (cm)				Number of tillers m <sup>2</sup> row length			
	Dharwad	Raipur	Bikaner	Mean	Dharwad	Raipur	Bikaner	Mean
<b>Spacing</b>								
30 cm	181.6	166.1	84.95	144.22	92.2	16.7	78.81	62.57
45 cm	182.4	170.9	93.93	149.08	97.0	19.3	86.67	67.66
60 cm	187.9	186.5	90.83	155.08	99.8	21.9	88.67	70.12
SEm±	1.25	3.45	0.47		1.07	0.16	0.79	
CD at 5%	3.68	10.07	1.39		3.13	0.48	2.33	
<b>Cutting interval</b>								
Cutting at 45 DAS	153.6	118.6	56.82	109.67	79.3	18.6	56.07	51.32
Cutting at 60 DAS	173.8	143.0	65.04	127.28	90.8	18.9	69.04	59.58
Cutting at 75 DAS	197.2	155.1	72.99	141.76	103.4	19.6	70.41	64.47
Cutting at 90 DAS	211.3	174.5	74.86	153.55	111.7	20.1	58.63	63.48
SEm±	1.45	3.25	0.55		1.23	0.11	0.92	
CD at 5%	4.25	9.54	1.60		3.62	0.32	2.69	
<b>Interaction: C X CM</b>								
SEm±	-	-	-	-	-	-	-	-
CD at 5%	-	-	NS	-	-	-	NS	-
CV (%)	-	-	-	-	-	-	-	-

### **7. PS-14-AST-3: Response of congo-signal grass (*Brachiaria ruziziensis* (var. DBRS 1) to planting geometry and N levels under variable soil moisture conditions**

**Location: Palampur and Srinagar**

A new trial was formulated with the objective to evaluate the performance of *Brachiaria ruziziensis* (Var. DBRS 1) under planting geometry and nitrogen nutrition. Kharif 2014 was considered as establishment year. Therefore data will be reported in kharif 2015.

### **8. 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**

**Location: Palampur and Srinagar**

A new trial was formulated with the objective to evaluate the productivity, quality and compatibility of tall fescue grass + white clover mixture and estimate soil NPK and soil organic carbon (SOC) storage under different treatments. Rabi 2014-15 was considered as establishment year. Therefore data will be reported in Rabi 2015-16.

### **9. CS-13-AST-2: Evaluation of fodder crops under different rice fallow system**

**Location: Ranchi, Jabalpur and Bhubaneswar**

**[Table Reference: 9(a) to 9(c)]**

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<sub>1</sub>**), SRI raised bed (**M<sub>2</sub>**), SRI flat bed (**M<sub>3</sub>**), and Aerobic (**M<sub>4</sub>**) 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. Nonetheless, forage crops grown after conventional planting of rice establishment recorded highest GFY (338.14 q/ha) and lowest being with aerobic method (328.73q/ha). However sowing of forages after SRI flat bed method of rice attained highest DMY and CPY (60.88 & 8.47 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. 131276, 53156/ha and 2.56, respectively).

Among fodder crops, growing of berseem recorded highest GFY and CP yields (447.18 and 11.94 q/ha, respectively) and lowest being with lathyrus (234.55 GFY q/ha) on mean basis. Berseem recorded 10.7 and 90.2 % more GFY over oat and lathyrus, respectively, whereas, highest DMY (83.23 q/ha) was recorded under oat crop. Oat crop recorded 20.1 and 196.8 % 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 106823/ha) and benefit cost ratio (2.65).

**Table- 9(a): Effect of rice establishment methods and forage crops on GFY and DMY of forages under rice fallow system**

Treatments	Green fodder Yield(q/h)				Dry matter Yield (q/ha)			
	Ranchi	Jabalpur	Bhubaneswar	Mean	Ranchi	Jabalpur	Bhubaneswar	Mean
<b>Rice establishment methods(M)</b>								
Conventional (M <sub>1</sub> )	283.56	622.6	108.27	338.14	47.15	112.5	21.88	60.51
SRI raised bed (M <sub>2</sub> )	260.89	614.3	114.63	329.94	45.49	110.6	23.18	59.76
SRI flat bed (M <sub>3</sub> )	263.56	633.1	111.87	336.18	44.99	114.8	22.85	60.88
Aerobic (M <sub>4</sub> )	243.11	626.0	117.07	328.73	41.85	113.5	23.67	59.67
S. Em <sub>+</sub>	4.05	0.53	2.05		0.76	0.33	0.50	
CD at 5%	13.98	1.52	7.10		2.64	0.95	1.74	
<b>Forage crops(C)</b>								
Oat (C <sub>1</sub> )	333.58	707.0	176.35	405.64	56.55	152.3	40.83	83.23
Berseem (C <sub>2</sub> )	353.68	913.0	74.85	447.18	56.24	139.3	12.35	69.30
Lathyrus (C <sub>3</sub> )	363.86	252.1	87.68	234.55	21.83	46.8	15.50	28.04
SEm <sub>+</sub>	3.53	12.36	2.26		0.63	1.23	0.51	
CD at 5%	10.59	36.52	6.59		1.86	4.52	1.48	
CV %	4.66	14.52	6.92		4.82	8.6	7.67	
<b>Interaction(MXC)</b>								
SEm <sub>+</sub>	7.01	3.6	4.22		1.32	0.36	0.97	
CD at 5%	NS	9.65	12.85		NS	0.96	2.97	

**Table- 9(b): Effect of rice establishment methods and forage crops on economics of forages under rice fallow system.**

Treatments	Gross monetary returns (Rs/ha)				Net monetary returns (Rs/ha)			
	Ran-chi	Jabal-pur	Bhuba neswar	Mean	Ran-chi	Jabal-pur	Bhuba neswar	Mean
<b>Rice establishment methods (M)</b>								
Conventional (M <sub>1</sub> )	116288	174266	59173	116576	78621	122496	31450	77522
SRI raised bed (M <sub>2</sub> )	108075	175241	60513	114610	70408	126101	33290	76600
SRI flat bed (M <sub>3</sub> )	122931	210564	60332	131276	85265	160094	34108	93156
Aerobic (M <sub>4</sub> )	10081	197891	57779	88584	62515	148795	34235	81848
S. Em <sub>+</sub>	1334	-	-	-	1334	-	-	-
CD at 5%	4605	-	-	-	4605	-	-	-
<b>Forage crops (C)</b>								
Oat (C <sub>1</sub> )	120925	178137	63355	120806	82925	129792	36680	83132
Berseem (C <sub>2</sub> )	144338	244846	56727	148637	104838	184950	30682	106823
Lathyrus (C <sub>3</sub> )	70343	145489	58266	91366	34843	103372	32451	56889
S. Em <sub>+</sub>	9.76	-	-	-	9.76	-	-	-
CD at 5%	29.67	-	-	-	29.67	-	-	-
CV %	3.78	-	-	-	1.44	-	-	-

**Table- 9(c): Effect of rice establishment methods and forage crops on crude protein yield and B: C ratio of forages under rice fallow system.**

Treatments	Crude Protein Yield (q/ha)			B: C Ratio			
	Jabal-pur	Bhuba neswar	Mean	Ran-chi	Jabal-pur	Bhuban-eswar	Mean
<b>Rice establishment methods(M)</b>							
Conventional (M <sub>1</sub> )	13.55	3.03	8.29	2.06	2.32	2.10	2.16
SRI raised bed (M <sub>2</sub> )	13.31	3.14	8.23	1.84	2.52	2.22	2.19
SRI flat bed (M <sub>3</sub> )	13.83	3.10	8.47	2.23	3.13	2.31	2.56
Aerobic (M <sub>4</sub> )	13.68	3.17	8.43	1.63	2.98	2.53	2.38
S. Em <sub>+</sub>	0.01	0.07	-	0.04	-	0.05	-
CD at 5%	0.03	0.24	-	0.12	-	0.16	-
<b>Forage crops(C)</b>							
Oat (C <sub>1</sub> )	12.28	4.19	8.24	2.18	2.68	2.40	2.42
Berseem (C <sub>2</sub> )	21.15	2.73	11.94	2.65	3.09	2.21	2.65
Lathyrus (C <sub>3</sub> )	7.35	2.41	4.88	0.98	2.45	2.32	1.92
S. Em <sub>+</sub>	1.23	0.07	-	0.02	-	0.03	-
CD at 5%	3.35	0.19	-	0.07	-	0.08	-
CV %	8.63	7.33	-	5.15	-	4.15	-
<b>Interaction(MXC)</b>							
S.Em <sub>+</sub>	0.63	0.13		0.06	-	0.06	-
CD at 5%	1.18	0.39		NS	-	0.20	-

**10. 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**

[Table Reference: 10(a) to 10(b)]

**Location: Jorhat and Raipur**

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 (3 at Jorhat) namely Mahateora, Prateek, Nirmal and Rattan in main plots and four sowing methods *viz.*, recommended practices with 125 % more seed rate (M<sub>1</sub>), recommended practices with 150% more seed rate (M<sub>2</sub>), zero seed drill with 125 % more seed rate (M<sub>3</sub>) and zero seed drill with 150 % more seed rate (M<sub>4</sub>) in sub-plots were laid out in split plot design and replicated three times.

The results of second year experimentation indicated that Prateek variety recorded highest green, dry and CP yields (99.10, 19.69 and 1.76 q/ha, respectively) which was 03.1 and 10.2% more GFY over Nirmal and Mahateora, respectively. The Prateek also exhibited higher plant height as well as leaf stem ratio. The respective increase for DMY was 2.8 and 10.2%. Under different sowing methods, highest GFY (107.87 q/ha), DMY (21.47 q/ha) and CP yield (1.94 q/ha) were recorded in M<sub>2</sub> - recommended practices with 150% more seed rate (Planting 20 x 10), followed by the Zero seed drill with 150% more seed rate (Planting 20 x 10) (M<sub>4</sub>) with 95.40 and 19.02 q GFY and DMY per hectare, respectively. The M<sub>2</sub> also exhibited higher plant height as well as leaf stem ratio. Economic indices indicated that at Jorhat, the highest gross return (Rs. 21924/ha) and net return (Rs 15525/ha) was recorded in variety Nirmal and among sowing methods the highest net return was recorded in treatment M<sub>2</sub> - recommended practices with 150% more seed rate (Planting 20 x 10) (Rs. 21504 /ha).

M <sub>1</sub> – Recommended practices with 125% more seed rate	M <sub>2</sub> - Recommended practices with 150% more seed rate (Planting 20 x 10)
M <sub>3</sub> – Zero seed drill with 125% more seed rate	M <sub>4</sub> - Zero seed drill with 150% more seed rate (Planting 20 x 10)

**Table- 10(a): Effect of varieties and sowing methods on yield of grass pea under rice based cropping system**

Treatments	GFY of Lathyrus (q/ha)			DMY of Lathyrus (q/ha)			CPY of Lathyrus (q/ha)		
	Jorhat	Raipur	Mean	Jorhat	Raipur	Mean	Jorhat	Raipur	Mean
<b>Sowing methods (M)</b>									
M <sub>1</sub>	98.49	85.68	92.09	20.68	15.88	18.28	0.88	2.33	1.62
M <sub>2</sub>	107.52	108.2	107.87	22.58	20.35	21.47	0.89	2.99	1.94
M <sub>3</sub>	102.03	69.05	85.54	21.43	12.61	17.02	0.91	1.85	1.38
M <sub>4</sub>	110.88	79.92	95.40	23.29	14.75	19.02	0.92	2.17	1.55
SEm <sub>+</sub>	0.8	1.10		0.17	-		0.02	0.51	
CD at 5%	2.44	3.28		0.51	1.05		NS	0.15	
<b>Variety (V)</b>									
V <sub>1</sub>	100.55	79.27	89.91	21.12	14.63	17.88	0.89	2.04	1.47
V <sub>2</sub>	104.2	93.99	99.10	21.84	17.53	19.69	0.89	2.62	1.76
V <sub>3</sub>	109.62	82.61	96.12	23.02	15.28	19.15	0.92	2.27	1.60
V <sub>4</sub>	-	86.99		-	16.14			2.4	-
SEm <sub>+</sub>	1.37	0.96		0.29	-		0.45	0.03	-
CD at 5%	4.14	2.85		0.87	0.58		NS	0.09	-
CV %	0.04	-		4.51	-			-	-
<b>Interaction (VXM)</b>									
SEm <sub>+</sub>	1.40	-		0.29	-		0.02	-	-
CD at 5%	4.23	-		0.89	-		NS	-	-

**Table- 10(b): Effect of varieties and sowing methods on growth parameters and economics of grass pea under rice based cropping system**

Treatments	Gross Income (Rs/ha)	Net Income (Rs/ha)	Plant Height (cm)			Leaf Stem Ratio		
	Jorhat	Jorhat	Jorhat	Raipur	Mean	Jorhat	Raipur	Mean
<b>Sowing methods (M)</b>								
M1	19698	13505	77.02	69.14	73.08	0.83	0.84	0.84
M2	21504	15037	83.82	75.13	79.48	0.85	0.91	0.88
M3	20405	15527	80.24	65.25	72.75	0.88	0.80	0.84
M4	22176	15606	87.12	61.00	74.06	0.87	0.76	0.82
SEm+	161.38	828.73	3.18	1.08	-	0.005	-	-
CD at 5%	NS		NS	3.22	-	0.016	0.03	-
<b>Variety (V)</b>								
V1	20111	14333	80.72	54.34	67.53	0.83	0.76	0.80
V2	20804	14899	83.13	76.28	79.71	0.87	0.87	0.87
V3	21924	15525	82.32	65.96	74.14	0.88	0.82	0.85
V4			-	73.94	-	-	0.85	-
SEm+	1048.14	7481.67	3.23	-	-	0.43	-	-
CD at 5%	NS	NS	NS	2.72	-	NS	0.02	-
CV %			13.83	-	-		-	-
<b>Interaction (VXM)</b>								
SEm+	279.53	1435.41	5.50	-	-	0.009	-	-
CD at 5%	NS	NS	NS	-	-	0.026	-	-

M <sub>1</sub> – Recommended practices with 125% more seed rate	M <sub>2</sub> - Recommended practices with 150% more seed rate (Planting 20x10)
M <sub>3</sub> – Zero seed drill with 125% more seed rate	M <sub>4</sub> - Zero seed drill with 150% more seed rate (Planting 20 x 10)
V <sub>1</sub> – Mahateora	V <sub>2</sub> - Prateek
V <sub>3</sub> – Nirmal	V <sub>4</sub> - Ratan

## B. NEW COORDINATED

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

Location: Srinagar & Palampur

[Table Reference: 11(a) to 11(c)]

The experiment was started in *Rabi* 2014 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 rye grass genotypes and four different ratios of rye grass: berseem plus sole stand of berseem laid out in randomized block design with three replications. This was the first year of the experiment. The results revealed that the performance of the treatment was better at Palampur than Srinagar. Among the different crops and their seed rate combinations, T9- ATMA Ryegrass: berseem (100:0) showed maximum green fodder (514.5q/ha at par with T-10) and dry matter yield (113.45nq/ha). It was also observed that both crude protein content and crude protein yield showed increasing trend with increasing berseem ratios among all the rye grass genotypes whereas biomass yields showed inverse trend. The highest crude protein content was recorded in sole berseem (T13); whereas, crude protein yield was highest in T11 followed by T12 treatment. At Palampur T9- ATMA Ryegrass: berseem (100:0) indicated maximum gross and net returns/ha (Rs. 130158 and 84757/ha, respectively). The highest B:C ratio was observed in sole Punjab Ryegrass-1 (T1).

Code	Treatment	Code	Treatment
T1	PRG:B (100:0)	T8	KRG:B (25:75)
T2	PRG:B (75:25)	T9	ARG:B (100:0)
T3	PRG:B (50:50)	T10	ARG:B (75:25)
T4	PRG:B (25:75)	T11	ARG:B (50:50)
T5	KRG:B (100:0)	T12	ARG:B (25:75)
T6	KRG:B (75:25)	T13	Sole Berseem
T7	KRG:B (50:50)		
	PRG- Punjab Rye Grass-1		KRG- Kashmir collection
	ARG- ATMA (HP) rye grass		B- berseem

Table 11(a): Effect of annual rye grass with berseem mixed cropping on growth and yield

Treatment	Plant height (cm)	Plant population / m length	Green fodder yield (q/ha)			Dry fodder yield (q/ha)		
			Srinagar	Palampur	Mean	Srinagar	Palampur	Mean
T1	121.5	170.50	348.50	593.69	471.1	83.55	124.68	104.12
T2	133.2	165.33	360.0	607.81	483.9	79.20	120.35	99.78
T3	122.3	135.25	312.25	567.07	439.7	62.40	108.31	85.36
T4	121.0	123.20	270.60	492.83	381.7	54.0	92.65	73.33
T5	110.6	165.42	330.25	492.16	411.2	78.56	113.20	95.88
T6	126.3	180.25	342.80	449.67	396.2	71.82	98.93	85.38
T7	125.0	140.53	331.56	419.47	375.5	66.20	89.56	77.88
T8	136.85	128.50	284.40	406.70	345.6	54.96	77.68	66.32
T9	128.25	179.58	378.20	650.79	514.5	88.92	137.97	113.45
T10	135.45	158.50	367.45	622.62	495.0	80.74	130.75	105.75
T11	143.20	143.56	342.60	615.31	479.0	67.40	116.91	92.16
T12	152.0	142.58	302.52	517.17	409.8	57.38	96.71	77.05
T13	78.40	92.50	208.35	405.19	306.8	37.40	70.91	54.16
<b>SEm±</b>	2.19	2.58	4.19	7.78		1.61	1.56	
<b>CD at 5%</b>	6.40	7.53	12.24	22.86		4.72	4.59	

**Table 11(b): Effect of annual rye grass with berseem mixed cropping on quality**

Treatment Code	Crude protein content (%)			Crude protein yield (q/ha)		
	Srinagar	Palampur	Mean	Srinagar	Palampur	Mean
T1	6.85	11.66	9.26	5.70	14.55	10.13
T2	8.93	13.41	11.17	7.12	16.13	11.63
T3	11.25	15.29	13.27	6.97	16.55	11.76
T4	16.42	18.08	17.25	8.86	16.73	12.80
T5	6.30	11.37	8.84	4.93	12.87	8.90
T6	9.25	12.54	10.90	6.56	12.39	9.48
T7	10.58	14.87	12.73	6.98	13.32	10.15
T8	16.54	16.62	16.58	8.93	12.90	10.92
T9	7.10	13.41	10.26	6.24	18.51	12.38
T10	9.56	14.29	11.93	7.64	18.69	13.17
T11	13.57	16.33	14.95	9.10	19.08	14.09
T12	17.20	18.08	17.64	9.80	17.49	13.65
T13	19.85	19.83	19.84	7.34	14.06	10.70
<b>SEm±</b>	-	0.26		0.38		
<b>CD at 5%</b>	-	0.78		1.12		

**Table 11(c): Effect of annual rye grass with berseem mixed cropping on economics**

Treatment Code	Palampur		
	Gross Return Rs./ha	Net Return Rs./ha	B:C ratio
T1	118739	78205	1.93
T2	121561	76711	1.71
T3	113415	69721	1.60
T4	98566	57367	1.39
T5	98432	59376	1.52
T6	89933	52108	1.38
T7	83894	46806	1.26
T8	81339	44291	1.20
T9	130158	84757	1.87
T10	124523	79780	1.78
T11	123062	78140	1.74
T12	103433	61966	1.49
T13	81038	43579	1.16

code	Treatment	code	Treatment
T1	PRG:B (100:0)	T8	KRG:B (25:75)
T2	PRG:B (75:25)	T9	ARG:B (100:0)
T3	PRG:B (50:50)	T10	ARG:B (75:25)
T4	PRG:B (25:75)	T11	ARG:B (50:50)
T5	KRG:B (100:0)	T12	ARG:B (25:75)
T6	KRG:B (75:25)	T13	Sole Berseem
T7	KRG:B (50:50)		
PRG- Punjab Rye Grass-1		KRG- Kashmir collection	
ARG- ATMA (HP) rye grass		B- berseem	

## C. ON GOING LOCATION SPECIFIC TRIALS

### 12. PS-12-AST-2: Performance of Bajra Napier hybrid grass as influenced by micro-nutrients under irrigated conditions

Location: Coimbatore

[Table Reference: 12]

The experiment was initiated during *Kharif* 2013 in location specific mode with a view to study the effect of conjoint application of organic manure, inorganic fertilizers and micronutrients on forage yield and economics of BN hybrid grass. The treatment consisted of nine micronutrient levels (T<sub>1</sub>- NPK alone, T<sub>2</sub>- NPK+FeSO<sub>4</sub> @ 50 kg/ha, T<sub>3</sub>- NPK+FeSO<sub>4</sub> @ 100 kg/ha, T<sub>4</sub>- NPK+ZnSO<sub>4</sub> @ 25 kg/ha, T<sub>5</sub>- NPK+ZnSO<sub>4</sub> @ 50 kg/ha, T<sub>6</sub>- NPK+FeSO<sub>4</sub> @ 50 kg/ha + ZnSO<sub>4</sub> @ 25 kg/ha, T<sub>7</sub>- NPK+FeSO<sub>4</sub> @ 100 kg/ha + ZnSO<sub>4</sub> @ 25 kg/ha, T<sub>8</sub>- NPK+FeSO<sub>4</sub> @ 50 kg/ha + ZnSO<sub>4</sub> @ 50 kg/ha and T<sub>9</sub>- NPK+FeSO<sub>4</sub> @ 100 kg/ha + ZnSO<sub>4</sub> @ 50 kg/ha) laid out in randomized block design and replicated three times. The application of nitrogen was made as basal and split as per recommendation, P&K as basal, micro-nutrient as basal and split application and FYM @ 25 t/ha as basal was applied to the crop.

The results revealed that application of NPK + Fe SO<sub>4</sub> @ 50 kg/ha + Zn SO<sub>4</sub>@ 25 kg/ha to Bajra Napier hybrid recorded significantly highest GFY (3695 q/ha), DMY (735 q/ha) CPY (81.6 q/ha) and crude protein content (11%) over rest of the treatments. The respective treatments also fetched highest net monetary returns (Rs. 422656/ ha/yr) and benefit cost ratio (4.21) over rest of the treatments and lowest being with NPK alone (Rs. 328856/ ha/yr) and 3.59, respectively.

**Table-12: Yield, quality and economics of BN hybrids as influenced by micronutrients under irrigated conditions**

Treatment	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Crude Protein (%)	Plant height (cm)	LS ratio	Cost of cultivation (Rs/ha)	Net return (Rs. /ha)	B:C
T <sub>1</sub>	3038.0	464.3	37.2	8.0	169.0	0.35	126844	328856	3.6
T <sub>2</sub>	3367.0	553.7	50.0	9.0	176.1	0.36	130344	374706	3.9
T <sub>3</sub>	3317.7	540.0	48.0	8.9	174.1	0.35	133844	363806	3.7
T <sub>4</sub>	3379.5	574.2	54.5	9.5	180.7	0.37	128144	378781	4.0
T <sub>5</sub>	3375.3	567.1	51.6	9.0	176.3	0.36	129444	376856	3.9
T <sub>6</sub>	3695.3	735.4	81.6	11.0	198.8	0.44	131644	422656	4.2
T <sub>7</sub>	3503.7	636.3	63.9	10.0	186.6	0.39	135144	390406	3.9
T <sub>8</sub>	3622.7	683.1	70.3	10.2	189.3	0.41	132944	410456	4.1
T <sub>9</sub>	3482.5	612.0	59.4	9.7	185.2	0.38	136444	385937	3.8
SEm±	23.5	10.4	1.6	0.3	2.5	0.01	-	-	-
CD (0.05)	70.5	31.1	4.9	0.1	7.5	0.02	-	-	-
CV (%)	1.2	3.0	4.9	4.6	2.4	2.57	-	-	-

T <sub>1</sub> - NPK alone	T <sub>2</sub> - NPK+FeSO <sub>4</sub> @ 50 kg/ha	T <sub>3</sub> - NPK+FeSO <sub>4</sub> @ 100 kg/ha
T <sub>4</sub> - NPK+ZnSO <sub>4</sub> @ 25 kg/ha	T <sub>5</sub> - NPK+ZnSO <sub>4</sub> @ 50 kg/ha	T <sub>6</sub> - NPK+FeSO <sub>4</sub> @ 50 kg/ha + ZnSO <sub>4</sub> @ 25 kg/ha
T <sub>7</sub> - NPK+FeSO <sub>4</sub> @ 100 kg/ha + ZnSO <sub>4</sub> @ 25 kg/ha	T <sub>8</sub> - NPK+FeSO <sub>4</sub> @ 50 kg/ha + ZnSO <sub>4</sub> @ 50 kg/ha	T <sub>9</sub> - NPK+FeSO <sub>4</sub> @ 100 kg/ha + ZnSO <sub>4</sub> @ 50 kg/ha

### 13. R-12-AST-4: Effect of sowing time and Zn & thiourea spray on seed yield of dual purpose oat

Location: Bikaner

[Table Reference: 13(a)-13 (b)]

The experiment was conducted to observe the effect of sowing time, Zn and thiourea application on productivity of dual purpose oat on sandy soil at SKRAU, Bikaner, during *Rabi* season of 2014-15. The soil is poor in organic carbon content (0.06%) and low in available nitrogen (80 kg/ha), phosphorus (18 kg/ha), potash (220 kg/ha), low Zn (0.45 ppm) with EC (0.22 dS/m) and pH 8.21. The trial comprised of combinations of three sowing dates and five treatments of Zn & Thio Urea application schedule as per table below. The experiment was laid out in split plot design, keeping dates of sowing in the main plot and Zn & TU application in sub-plot and replicated four times. The sowing of oat (Kent) was done as per treatment on 01, 15 & 30 November, 2014. Green fodder cutting was done at 60 DAS followed by ZnSO<sub>4</sub> & thiourea sprays as per treatments on re-growth foliage i.e, first 10 days after cutting and second 10 days after cutting. Thereafter the crop was finally harvested for grain at field maturity during 10-15 April, 2015.

Sowing time significantly influenced growth characters, fodder and grain, straw yields of dual purpose oat. Oat sown at D<sub>2</sub> recorded significantly highest plant height, fodder yield, grain yield, straw yield, net returns and B: C ratio as compared to D<sub>1</sub> and D<sub>3</sub>. Timely sowing resulted in significantly higher plant height by 10.3 & 11.17%, GFY by 46.8 & 10.4%, DMY by 42.2& 62.2%, grain yield by 22.6 & 8.4%, straw yield by 17.8 & 44.7%, net returns by Rs.22807 & Rs.27858 per hectare, and B: C ratio by 40.4 & 54.1%, as compared to D<sub>1</sub> and D<sub>3</sub>, respectively. Tillers per meter row was maximum (244.1) in D<sub>1</sub> crop which was significantly higher by 32.7&52.2 over D<sub>2</sub> and D<sub>3</sub> respectively. T<sub>2</sub> recorded maximum plant height (62.9 cm) and grain yield (19.8 q/ha) which were significantly higher by 6.6 & 8.8% %, respectively over control. Among Zn and thiourea treatment, non significant variation in growth, fodder yield and grain yield and straw yield and net return were noted which showed positive edge over control. T<sub>3</sub> being at par to T<sub>2</sub> application recorded significantly higher grain yield, and straw yield over control. Significant interaction effect for plant height, tiller/m row, GFY and grain was noted.

**Table-13(a): Effect of sowing time and Zn & thiourea application on growth parameters, yield and economics of dual purpose oat at Bikaner**

Treatment	PH (cm)	Tillers/meter row length	GFY (q/ha)	DMY (q/ha)	Grain (q/ha)	Straw yield (q/ha)	Net Return (Rs/ha)	B : C ratio
<b>A. Date of sowing</b>								
D <sub>1</sub>	58.1	244.1	165.6	21.1	16.8	52.8	56719	2.7
D <sub>2</sub>	64.1	184.0	243.2	30.0	20.6	62.2	79526	3.8
D <sub>3</sub>	57.4	160.4	119.2	18.5	19.0	43.1	51668	2.5
S. Em.±	0.79	5.50	5.79	0.77	0.44	1.40	1543	0.07
C. D at 5%.	2.73	19.05	20.03	2.67	1.53	4.85	5339	0.25
<b>B. Zn and Thiourea application</b>								
T <sub>1</sub>	59.0	187.8	182.7	23.1	18.2	52.3	63199	3.2
T <sub>2</sub>	62.9	190.3	172.4	24.7	19.8	53.8	63880	3.0
T <sub>3</sub>	58.6	196.0	173.5	22.9	19.2	53.0	63172	3.0
T <sub>4</sub>	58.8	203.1	180.9	23.2	18.7	53.0	62609	2.9
T <sub>5</sub>	59.8	203.6	170.5	22.1	18.3	51.4	60328	2.9
SEm.±	0.90	4.64	3.68	0.64	0.38	1.19	1294	0.06
C. D at 5%.	2.59	NS	NS	NS	1.09	NS	3711	0.18
C.V. (%)	5.22	8.20	7.25	9.49	7.00	7.83	7.16	7.12

**Table-13(b): Date of sowing X Zn and Thiourea application interaction table**

Treatment	D1	D2	D3	Treatment	D1	D2	D3
T1	162.6	248.7	136.8	T1	17.7	19.2	17.8
T2	160.0	246.1	111.1	T2	17.4	22.2	19.7
T3	148.3	251.0	121.1	T3	17.8	20.2	19.5
T4	183.8	238.2	120.6	T4	15.4	20.5	20.1
T5	173.1	231.9	106.4	T5	15.9	20.9	18.0
SEm.±	12.94			SEm±		0.98	
C. D at 5%.	36.9			CD at 5%		2.84	

Date of sowing	D <sub>1</sub> - November 01	D <sub>2</sub> - November 15	D <sub>3</sub> - November 30
Zn and Thiourea application	T <sub>1</sub> - Control	T <sub>2</sub> - 25 kg ZnSO <sub>4</sub> /ha basal,	
	T <sub>3</sub> - 12.5 ZnSO <sub>4</sub> /ha kg basal + 0.5% ZnSO <sub>4</sub> foliar spray	T <sub>4</sub> -12.5 ZnSO <sub>4</sub> /ha kg basal + 0.5% ZnSO <sub>4</sub> + 0.05% TU foliar spray	T <sub>5</sub> -12.5 ZnSO <sub>4</sub> /ha kg basal + 0.05% TU foliar spray

#### 14. R-13-AST-1: Yield potential of cereals with forage legumes under pure stand and mixtures

Location: Srinagar

[Table Reference: 14]

The experiment was initiated during *Rabi* 2013-14, to evaluate fodder yield potential and quality of cereals and legumes in mono as well as in mixed cropping system. The treatments consisted of five sole and six intercrops (T<sub>1</sub> - sole oat, T<sub>2</sub> - sole barley, T<sub>3</sub> - sole ryegrass, T<sub>4</sub> - sole vetch (*Vicia sativa*), T<sub>5</sub> - sole field pea, T<sub>6</sub> - oat+ vetch (1:1), T<sub>7</sub> - oat + field pea (1:1), T<sub>8</sub> - barley + vetch (1:1), T<sub>9</sub> - barley + field pea (1:1), T<sub>10</sub> - ryegrass + vetch (1:1) and T<sub>11</sub> - ryegrass + field pea (1:1), laid out in randomized block design with three replications. This was the second year of the experiment.

The results revealed that, in pure stand, sole cereal crops produced higher fresh biomass than sole legumes and the highest green fodder yield (359.20 q/ha) was attained by oat, whereas, in mixtures, intercropping with vetch gave maximum fresh biomass than field pea in all the cereal crops tested. Similar trend was exhibited in case of dry matter yield, where maximum dry matter yield was obtained in oat crop followed by oat + field pea and the lowest in sole vetch (43.80q/ha). It was also observed that sole vetch had maximum crude protein yield (9.28 q/ha) followed by sole field pea (8.82 q/ha) and the minimum was found in sole ryegrass (3.62 q/ha), thus indicating that cereal-legume intercropping showed maximum crude protein yield compared to sole cropping of cereals.

**Table-14: Effect of cereals with different legumes mixture on forages at Srinagar**

Code	Treatment	Plant height (cm)	L:S	GFY (q/ha)	DMY (q/ha)	CP content (%)	CPY (q/ha)
T <sub>1</sub>	Sole oat	120.5	0.46	359.2	75.4	8.1	6.1
T <sub>2</sub>	Sole barley	92.5	0.44	271.4	58.8	11.5	6.8
T <sub>3</sub>	Sole ryegrass	76.3	1.80	235.3	54.0	6.7	3.6
T <sub>4</sub>	Sole vetch	76.2	0.70	210.0	43.8	21.2	9.3
T <sub>5</sub>	Sole field pea	67.4	0.52	195.8	48.8	18.1	8.8
T <sub>6</sub>	Oat + Vetch	139.3	0.64	328.6	63.0	13.5	8.5
T <sub>7</sub>	Oat + Field pea	118.6	0.58	312.3	64.4	11.6	7.5
T <sub>8</sub>	Barley + Vetch	98.3	0.48	228.0	57.0	15.1	8.6
T <sub>9</sub>	Barley + Field pea	88.5	0.44	240.0	55.2	12.8	7.1
T <sub>10</sub>	Ryegrass + Vetch	86.4	1.62	215.0	45.1	10.8	4.9
T <sub>11</sub>	Ryegrass + Field pea	80.3	1.38	200.0	46.2	9.6	4.5
	SEm±	2.25	0.01	3.71	1.22	-	0.27
	CD at 5%	6.58	0.04	10.85	3.58	-	0.80

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

Location: Raipur

[Table Reference: 15]

The perennial grasses based experiment was initiated during *kharif*-2014 at Raipur with the objective to identify appropriate cropping system for maximum fodder production, nutrient use and water use efficiency. The treatments consisted of eight cropping systems *viz.*, BN Hybrid + Lucerne, Setaria + Lucerne, BN Hybrid + Cowpea (summer) / Lucerne (winter), Setaria + Cowpea (summer)/ Lucerne (winter), BN Hybrid + Berseem (winter), Setaria + Berseem (winter), BN Hybrid + Cowpea (summer)/ Berseem (winter) and Setaria + Cowpea (summer)/ 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 (692.9, 148.9 q, Rs. 14647/ha and 0.73, respectively) followed by BN hybrid + Cowpea/ Berseem and BN hybrid + Lucerne. The cropping system BN hybrid +Cowpea/ Berseem recorded maximum crude protein yield (19.8 q/ha) followed by BN hybrid+ Cowpea/ Lucerne among all the cropping system.

**Table-15: Performance of intensive fodder cropping systems for yield maximization**

Code	Treatment	Yields (q/ha)			NMR (Rs./ha)	B:C ratio
		GFY	DMY	CPY		
T <sub>1</sub>	BN hybrid + Lucerne	655.2	132.7	14.4	12758	0.64
T <sub>2</sub>	Setaria + Lucerne	506.0	109.6	12.7	5299	0.26
T <sub>3</sub>	BN hybrid+ Cowpea/ Lucerne	653.4	129.3	18.2	10672	0.49
T <sub>4</sub>	Setaria + Cowpea/ Lucerne	611.9	120.9	16.0	8597	0.39
T <sub>5</sub>	BN hybrid + Berseem	692.9	148.9	15.7	14647	0.73
T <sub>6</sub>	Setaria + Berseem	542.6	115.0	13.0	7131	0.36
T <sub>7</sub>	BN hybrid +Cowpea/ Berseem	670.5	142.7	19.8	11527	0.52
T <sub>8</sub>	Setaria + Cowpea/ Berseem	609.3	121.9	15.7	8464	0.38
	CD (0.05%)	<b>13.25</b>	<b>13.85</b>	<b>1.60</b>	<b>662.8</b>	

## 16. PS-14-AST-2- Impact of Mg and B on nutrient uptake, quality and yield of bajra Napier hybrid

**Location: Vellayani**

**[Table Reference: 16(a)-16(c)]**

The experiment was initiated during *kharif*-2014 at Vellayani with the objective to assess the influence of Mg and B nutrition on the performance of bajra napier hybrid. The treatments included two growing environment *i.e.*, 1. Open situation 2. Coconut garden and five nutrients levels namely, recommended package of practices-1. POP (200:50:50 kg NPK/ha and 25 t/ha of Farm yard manure) + MgSO<sub>4</sub> 80 kg/ha+ Borax 10 kg/ha, 2. POP + MgSO<sub>4</sub>@80kg/ha, 3. POP +Borax@10 kg/ha, 4. POP alone and 5. POP without FYM (200:50:50 kg NPK/ha). The treatments were replicated thrice in Randomized Block Design.

Different treatments could not exert any significant effect on plant height and leaf stem ratio during any of the crop growth stages. The impact of treatments was significant on tiller number during all the cuts except fourth cut. During all stages, plots in open situation had significant superiority over shaded plots. During first three cuts, T<sub>2</sub> showed highest number of tillers and was at par with T<sub>3</sub> during first and third cuts. During fifth cut, T<sub>1</sub> recorded significantly superior tiller number.

Shade levels and nutrient levels had significant effect on green fodder yield of hybrid napier grass during first, fourth and fifth harvests. During first and fifth harvests, T<sub>2</sub> recorded highest green fodder yield and was at par with T<sub>1</sub> during first harvest. During fourth cut, T<sub>4</sub> recorded significantly superior yield than all other treatments. Treatments exerted significant effect on dry fodder yield during second, third and fourth harvests. T<sub>1</sub> recorded highest dry fodder yield during second and third harvests and was at par with T<sub>4</sub> during second harvest. During fourth harvest, T<sub>4</sub> recorded highest value and was at par with T<sub>5</sub>.

**Table-16(a): Effect of Mg and B on plant height (cm) in different cuts of NB hybrid**

Treatment	I cut	II cut	III cut	IV cut	V cut
T <sub>1</sub> Open situation + POP + MgSO <sub>4</sub> 80 kg/ha+ Borax 10 kg/ha	185.33	150.33	205.33	205.66	214.33
T <sub>2</sub> Open situation + POP + MgSO <sub>4</sub> @80kg/ha	178.00	177.00	222.67	221.33	209.00
T <sub>3</sub> Open situation +POP + Borax@10 kg/ha	171.33	154.00	208.00	224.33	183.33
T <sub>4</sub> Open situation + POP alone	183.00	127.33	209.67	227.00	205.33
T <sub>5</sub> Open situation + POP without FYM	167.33	160.00	216.33	214.00	215.00
T <sub>6</sub> Coconut garden + POP + MgSO <sub>4</sub> 80 kg/ha+ Borax 10 kg/ha	208.66	172.33	158.67	174.33	155.66
T <sub>7</sub> Coconut garden + POP + MgSO <sub>4</sub> @80kg/ha	163.66	160.33	156.33	205.00	144.00
T <sub>8</sub> Coconut garden +POP +Borax@10 kg/ha	170.66	154.33	153.00	187.00	167.33
T <sub>9</sub> Coconut garden + POP alone	172.66	176.00	155.33	205.00	163.33
T <sub>10</sub> Coconut garden + POP without FYM	159.33	155.00	154.00	191.00	120.00
CD (0.05%)	NS	NS	NS	NS	NS

**Table-16(b): Effect of Mg and B on number of tillers and L: S ratio in different cuts of NB hybrid**

Treatment	No. of tillers/tussock					Leaf stem ratio				
	I cut	II cut	III cut	IV cut	V cut	I cut	II cut	III cut	IV cut	V cut
T <sub>1</sub>	13.33	17.00	16.67	37.000	34.67	0.85	1.09	1.22	1.10	1.26
T <sub>2</sub>	21.33	39.33	50.67	36.333	22.00	0.89	1.03	0.89	0.98	0.98
T <sub>3</sub>	20.33	30.67	44.67	34.667	10.00	1.02	1.08	0.96	0.93	1.35
T <sub>4</sub>	13.67	30.67	35.00	24.000	20.33	0.80	0.98	0.94	0.84	1.20
T <sub>5</sub>	14.67	26.33	35.33	27.667	17.67	0.95	1.19	1.01	1.01	0.95
T <sub>6</sub>	8.33	18.67	16.00	18.333	7.33	0.90	1.62	1.60	1.74	1.73
T <sub>7</sub>	9.33	20.67	27.67	33.000	8.33	1.14	1.03	1.67	1.35	1.63
T <sub>8</sub>	8.33	22.00	23.33	27.667	13.00	1.11	1.43	1.62	1.42	1.52
T <sub>9</sub>	8.00	16.67	24.33	30.333	11.67	0.83	1.06	1.70	1.22	1.22
T <sub>10</sub>	7.33	19.00	23.00	31.000	11.67	1.22	1.81	1.61	1.24	1.66
CD (0.05%)	1.826	3.899	4.215	NS	2.127	NS	NS	NS	NS	NS

**Table-16(c): Effect of Mg and B on biomass yield in different cuts of NB hybrid**

Treatment	Green fodder yield (q ha <sup>-1</sup> )					Dry fodder yield (q ha <sup>-1</sup> )				
	I cut	II cut	III cut	IV cut	V cut	I cut	II cut	III cut	IV cut	V cut
T <sub>1</sub>	431.25	291.67	431.25	562.50	435.40	127.48	80.92	127.48	177.31	105.38
T <sub>2</sub>	447.93	338.67	447.92	610.42	514.67	103.28	74.06	103.27	141.31	121.03
T <sub>3</sub>	392.18	264.58	403.42	572.92	383.40	106.56	71.26	106.70	153.73	142.44
T <sub>4</sub>	422.92	279.17	422.92	703.85	378.87	117.29	77.13	117.29	197.55	98.17
T <sub>5</sub>	389.58	227.08	389.58	639.67	427.07	120.54	69.50	119.54	195.50	113.97
T <sub>6</sub>	198.58	145.83	174.92	314.58	205.75	37.67	37.63	37.67	83.29	63.92
T <sub>7</sub>	156.25	242.58	157.90	373.00	197.92	38.27	68.16	38.17	73.54	77.11
T <sub>8</sub>	141.67	161.08	141.75	441.67	220.67	33.34	32.39	33.15	151.44	81.40
T <sub>9</sub>	204.25	183.27	202.07	460.42	285.42	52.42	50.04	52.44	128.20	44.70
T <sub>10</sub>	121.60	87.73	125.00	422.92	220.83	46.17	32.92	46.17	164.44	57.80
CD (0.05%)	22.772	NS	NS	22.77	47.92	NS	5.027	7.020	12.810	NS

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

Location: Raipur

[Table Reference: 17]

The experiment was initiated during *kharif*-2014 at Raipur with the objective to find out appropriate annual cropping system for maximum fodder production, nutrient use and water use efficiency. The treatments consisted of eight cropping systems *viz.*, Sorghum multi cut + Cowpea (2:1) – Lucerne, Maize + Cowpea (2:1) – Lucerne, Pearl millet multi cut + Cowpea (2:1) – Lucerne, Maize + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1), Maize + Rice bean (2:1) – Oat multi cut - Sorghum multi cut + Cowpea (2:1), Pearl millet multi cut + Rice bean (2:1) –Oat multi cut – Maize + Cowpea (2:1), Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1) and 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 indicated that Maize + rice bean (2:1) – oat (multi cut) - sorghum (multi cut) + cowpea (2:1) recorded maximum green fodder, dry matter and net return/ha (1095, 242.62 q and Rs. 9769/ ha, respectively). The cropping system maize + rice bean (2:1) – berseem – sorghum multi cut + cowpea (2:1) was at par with above in terms of green fodder and recorded significantly higher crude protein yield among all the systems. The cropping system maize + cowpea (2:1) – lucerne recorded highest B:C ratio.

**Table-17: Total Green Fodder Yield (q/ha) of different forage cropping system**

	Yield (q/ha)			Net returns Rs./ha	B:C ratio
	Green Fodder	Dry Matter	Crude Protein		
T <sub>1</sub>	742.83	149.92	20.72	7142	0.24
T <sub>2</sub>	787.10	173.39	23.82	9355	0.31
T <sub>3</sub>	728.86	152.16	21.12	6443	0.21
T <sub>4</sub>	1078.65	226.98	30.67	8933	0.20
T <sub>5</sub>	1095.37	242.62	28.41	9769	0.22
T <sub>6</sub>	1044.74	229.80	26.85	7237	0.16
T <sub>7</sub>	1025.80	214.38	28.58	6290	0.14
T <sub>8</sub>	967.90	193.48	25.86	3395	0.08
CD at 5%	33.83	10.94	1.36	1691	

Code	Treatment
T <sub>1</sub>	Sorghum multi cut + Cowpea (2:1) – Lucerne
T <sub>2</sub>	Maize + Cowpea (2:1) – Lucerne
T <sub>3</sub>	Pearl millet multi cut + Cowpea (2:1) – Lucerne
T <sub>4</sub>	Maize + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)
T <sub>5</sub>	Maize + Rice bean (2:1) – Oat multi cut - Sorghum multi cut + Cowpea (2:1)
T <sub>6</sub>	Pearl millet multi cut + Rice bean (2:1) –Oat multi cut – Maize + Cowpea (2:1)
T <sub>7</sub>	Pearl millet multi cut + Rice bean (2:1) – Berseem – Maize + Cowpea (2:1),
T <sub>8</sub>	Pearl millet multi cut + Rice bean (2:1) – Berseem – Sorghum multi cut + Cowpea (2:1)

## 18. R-14-AST-2: Effect of Integrated Nutrient Management on yield and quality of oat

Location: Imphal

[Table Reference: 18]

This experiment was started during *Rabi* season of 2014-2015, to evaluate oat for different purpose, viz. grain, fodder, both grain and fodder under three cutting management practices viz., C<sub>1</sub>: No cutting (Seed), C<sub>2</sub>: Single cut (60 DAS) + Seed and C<sub>3</sub>: Three cut (60, 90 & 120 DAS) and four nutrients levels namely; N<sub>1</sub>: RDF (N, P<sub>2</sub>O<sub>5</sub> & K<sub>2</sub>O @ 80:40:40), N<sub>2</sub>: 75% NPK of RDF + 5 t FYM/ha, N<sub>3</sub>: 50% NPK of RDF + 7.5t FYM/ha, N<sub>4</sub>: 25% NPK of RDF + 10t FYM/ha. The experiment was laid out in FRBD and with three replications. Crop grown for seed purpose only i.e. C<sub>1</sub> recorded higher seed yield (19.93 q/ha) followed by C<sub>2</sub> single cut + seed (19.18 q/ha). Crop grown for green fodder i.e. C<sub>3</sub> was found to good for green fodder (509.99 q/ha) and dry matter yield (58.70 q/ha). But dual purpose treatment i.e. C<sub>2</sub> was found to be the best in terms of quality and economics. 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 was an increase in green fodder, dry matter, seed and crude protein yields, crude protein content and plant height. In terms of economics, net monetary return and benefit cost ratio also followed the same trend.

The combined effect of three cuts 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 (551.00 q/ha) and seed yield (22.38 q/ha) respectively, but found non-significant. But 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. 89067/ ha) and benefit cost ratio.

**Table-18: Effect of integrated nutrient management on yield; quality and economics of oat at Imphal**

Treatment	Plant height (cm)	Yield (q/ha)					(Rs/ha)			
		Green fodder	Dry matter	Crude protein	Seed	Crude protein (%)	Leaf stem ratio	Gross return	Net monetary return	B:C ratio
C <sub>1</sub>	52.87	-	-	-	19.93	-	-	99635	56986	2.34
C <sub>2</sub>	51.50	221.39	29.05	3.22	19.18	11.51	0.21	127636	77955	2.57
C <sub>3</sub>	47.52	509.99	81.88	8.29	-	10.18	0.76	76498	24379	1.47
S.Em. (±)	2.02	11.03	1.65	0.26	0.46	0.46	0.03	1757	1757	0.04
CD (0.05)	NS	33.45	5.00	0.79	NS	1.40	0.08	5153	5153	0.11
N <sub>1</sub>	56.4	352.2	57.34	5.18	18.03	10.13	0.53	93342	49467	2.19
N <sub>2</sub>	49.6	343.0	50.85	5.92	20.25	11.62	0.46	101800	51950	2.05
N <sub>3</sub>	48.4	394.7	58.70	6.64	21.76	11.68	0.50	111972	62397	2.27
N <sub>4</sub>	48.0	372.9	54.98	5.28	18.19	9.95	0.46	97911	48611	2.00
S.Em. (±)	1.75	7.80	1.16	0.18	0.33	0.33	0.02	1522	1522	0.03
CD (0.05)	5.14	23.66	3.53	0.56	0.99	0.99	NS	4463	4463	0.09
<b>Interaction - Cutting x Nutrient</b>										
S.Em. (±)	3.51	15.60	2.33	0.37	0.65	0.65	0.04	3043		0.06
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	9231		0.19

Cutting management practices	C <sub>1</sub> : No cutting (Seed)	C <sub>2</sub> : Single cut (60 DAS) + Seed	C <sub>3</sub> : Three cut (60, 90 & 120 DAS)
nutrients levels	N <sub>1</sub> : RDF (N, P <sub>2</sub> O <sub>5</sub> & K <sub>2</sub> O @ 80:40:40)	N <sub>2</sub> : 75% NPK of RDF + 5 t FYM/ha	N <sub>3</sub> : 50% NPK of RDF + 7.5t FYM/ha
		N <sub>4</sub> : 25% NPK of RDF + 10t FYM/ha	

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

Location: Vellayani

[Table Reference: 19]

One year 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 alongwith 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 guinea grass with addition of 2 percent urea (silage additive) recorded higher dry matter content. The silage from all treatment was palatable and similar in colour.

**Table-19: Effect of additives on silage yield and quality**

Treatment	Fresh silage/pit	Dry matter content (%)
Hybrid Napier + Urea 1%	22.400	30.333
Hybrid Napier + Urea 2%	27.533	38.333
Hybrid Napier + Urea 1%+ Jaggery 1%	23.100	33.833
Hybrid Napier + Tapioca flour 1%	21.966	38.166
Hybrid Napier + Jaggery 2%	21.000	35.000
Guinea Grass + Urea 1%	27.966	42.833
Guinea Grass + Urea 2%	27.300	48.966
Guinea Grass + Urea 1%+ Jaggery 1%	29.133	43.333
Guinea Grass + Tapioca flour 1%	28.833	43.500
Guinea Grass + Jaggery 2%	28.233	42.000
<b>CD (0.05)</b>	2.697	6.036

## D. 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:** Jorhat, Ranchi, Kalyani

**Central Zone:** Jhansi, Jabalpur

**South Zone:** Coimbatore, Mandya

In Oat (Single cut), nine 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), JHO-822 (CZ) and JHO-2000-4 (SZ) were evaluated at 12 locations across the five zones in the country. For GFY and CPY, entries RSO-59 (330.2q/ha) were at par with OL-1760 (326.4 q/ha) and SKO-90 (HZ), but superior (5.7% higher) to best national check Kent (312.5q/ha). Entry SKO-190 exhibited highest dry matter (66.1 q/ha) followed by zonal check (HZ) SKO-90 (64.2 q/ha). The increase was to the tune of 7.7 and 18.4% over zonal check and best national check *i.e.*, Kent, respectively. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (339.1 q green and 67.0 q dry matter /ha) which was 20.3 and 5.3% higher over 40 and 80kg n/ha, respectively in terms of green fodder. The interaction effect for green fodder and dry matter was significant at both the testing locations.

In North West zone, for GFY and DMY, entry OS-405 (521.7 and 79.8 q/ha, respectively) was superior to other entries. OS-405 recorded 2.01, 3.67 and 3.72% higher green fodder yield over Kent (NC), SKO-190 and UPO-12-1 respectively. Entry SKO-190 demonstrated highest CPY followed by Kent (NC), OS-405 and JHO-2012-1. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (522.1 q green and 79.2 q dry matter /ha) which was 17.9 and 6.2 % higher over 40 and 80kg n/ha, respectively in terms of green fodder. The interaction effect for dry matter was significant at Ludhiana.

In North East zone, for GFY, entry JHO-2012-2 (384.6q/ha) was superior over other entries. Entry JHO-2012-2 recorded 4.76 and 7.22% higher green fodder yield over OS-405, UPO-12-1 respectively. Zonal check, JHO-99-2 (NEZ) recorded maximum dry matter which was 6.28 and 7.09 % higher over RSO-59 and OS-405. OS-405, RSO-59 and JHO-99-2 (NEZ) demonstrated highest CPY followed by UPO-12-1 and RSO-60. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (394.4 q green and 94.4 q dry matter /ha) which was 34.9 and 12.8 % higher over 40 and 80kg n/ha, respectively in terms of green fodder. The interaction effect for dry matter was significant at Ranchi and Kalyani.

In Central Zone, for GFY and DMY, entry OS-405 (362.2 and 76.6 q/ha, respectively) was superior to other entries. OS-405 recorded 4.7, 4.8 and 5.0% higher GFY over JHO-2012-2, JO-04-14 and UPO-12-1 respectively. OS-6 (NC) produced minimum green fodder (277.0 q/ha). The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (365.3 q green and 75.7 q dry matter /ha) which was 37.22 and 7.0 % higher over 40 and 80kg n/ha, respectively in terms of green fodder. The interaction effect for dry matter was significant at Jabalpur.

In South Zone, for GFY and DMY, entry OL-1760 (338.3 and 74.3 q/ha, respectively) was superior to other entries. It was followed by SKO-190 and Kent (NC). OL-1760 recorded 5.88 and 8.91 % higher GFY over respective entries. RSO-60 could produce minimum green fodder per hectare (191.7 q/ha). The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (318.3 q green and 76.2 q dry matter/ha) which was 32.5 and 12.8 % 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, OL-125 produced better GFY, whereas, JHO-99-2 ranked first in terms of dry matter productivity. Among the entries, OS-405 produced maximum green and dry matter productivity (378.2 and 76.2 q/ha, respectively). The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (399.6 q green and 79.9q dry matter/ha).

**Table-20(a): Effect of nitrogen levels on green fodder yield of promising entries of Oat (AVTO-2-SC)**

Entries	Green fodder yield (q/ha)										
	Hill zone			North West zone				North East zone			
	Palam-pur	Sri-nagar	Mean	His-ar	Pant-nagar	Ludh-iana	Mean	Jor-hat	Ran-chi	Kal-yani	Mean
RSO-60	273.8	373.8	323.8	639.8	252.4	538.7	477.0	328.3	302.9	305.6	312.3
RSO-59	252.7	407.6	330.2	582.6	261.2	649.8	497.9	331.0	359.7	359.3	350.0
SKO-190	274.3	372.8	323.5	690.9	254.4	564.2	503.2	344.3	214.1	354.8	304.4
UPO-12-1	273.0	357.7	315.4	622.6	352.7	532.0	502.4	382.6	322.9	370.7	358.7
OS-405	238.4	388.3	313.4	696.5	251.4	617.1	521.7	382.6	336.4	382.2	367.1
JHO-2012-1	275.3	348.6	312.0	624.9	267.1	529.4	473.8	339.6	289.3	358.2	329.0
OL-1760	277.2	375.5	326.4	662.8	244.6	548.1	485.2	351.6	276.8	451.9	360.1
JO-04-14	222.3	361.4	291.9	660.8	247.6	528.5	479.0	343.1	291.8	407.4	347.4
JHO-2012-2	255.7	356.0	305.9	601.1	259.0	540.2	466.8	369.9	305.9	478.2	384.6
SKO-90 (HZ)	279.8	380.2	330.0	-	-	-	-	-	-	-	-
JHO-99-2 (NEZ)	-	-	-	-	-	-	-	339.9	376.1	344.4	353.5
OL-125 (NWZ)	-	-	-	633.1	249.3	547.4	476.6	-	-	-	-
JHO-822 (CZ)	-	-	-	-	-	-	-	-	-	-	-
JHO-2000-4 (SZ)	-	-	-	-	-	-	-	-	-	-	-
OS-6 (NC)	210.4	363.2	286.8	542.0	246.2	514.6	434.3	352.9	309.8	410.4	357.7
Kent (NC)	242.4	382.7	312.5	633.9	248.4	651.8	511.4	287.4	297.7	373.3	319.5
SEm+	8.02	4.31	-	18.32	5.1	13.5	-	36.83	9.68	4.19	-
CD at 5%	23.67	12.6	-	53.88	15.0	39.7	-	107.83	28.57	12.23	-
<b>Nitrogen level (Kg/ha)</b>											
40	219.1	344.6	281.9	552.2	241.0	535.2	442.8	330.8	246.3	300.0	292.3
80	265.5	378.4	322.0	646.1	262.9	565.2	491.4	344.9	302.5	400.6	349.3
120	284.2	394.0	339.1	699.5	281.0	585.7	522.1	362.6	372.1	448.5	394.4
SEm+	3.27	2.80	-	7.10	3.65	2.0	-	29.8	4.45	2.41	-
C D at 5%	9.31	8.2	-	26.94	13.84	5.7	-	87.3	12.69	6.86	-
<b>Interaction: Entry X N levels</b>											
SEm+	-	6.78	-	-	-	-	-	309.81	16.77	8.34	-
CD at 5%	-	19.8	-	-	-	-	-	NS	44.53	23.76	-

**Table-20(b): Effect of nitrogen levels on green fodder yield of promising entries of Oat (AVTO-2-SC)**

Entries	Green fodder yield (q/ha)						Over all mean
	Central zone			South zone			
	Jhansi	Jabalpur	Mean	Mandya	Coimbatore	Mean	
RSO-60	258.3	339.2	298.8	192.6	190.8	191.7	333.0
RSO-59	204.6	427.7	316.2	248.2	260.2	254.2	362.1
SKO-190	246.3	345.1	295.7	260.8	378.7	319.8	358.4
UPO-12-1	250.0	441.5	345.8	259.3	319.5	289.4	373.7
OS-405	238.9	485.5	362.2	311.6	263.9	287.8	382.7
JHO-2012-1	245.4	397.4	321.4	223.9	299.1	261.5	349.9
OL-1760	230.6	442.1	336.3	352.5	324.1	338.3	378.2
JO-04-14	256.5	436.8	346.6	255.7	294.4	275.1	358.9
JHO-2012-2	254.6	438.7	346.7	213.4	354.6	284.0	368.9
SKO-90 (HZ)	-	-	-	-	-	-	330.0
JHO-99-2 (NEZ)	-	-	-	-	-	-	353.5
OL-125 (NWZ)	-	-	-	-	-	-	476.6
JHO-822 (CZ)	223.2	385.1	304.1	-	-	-	304.2
JHO-2000-4 (SZ)	-	-	-	223.9	308.3	266.1	266.1
OS-6 (NC)	200.9	353.1	277.0	256.7	313.89	285.3	339.5
Kent (NC)	250.0	431.3	340.7	324.0	297.2	310.6	368.3
SEm+	15.43	4.46	-	8.50	8.41	-	11.4
CD at 5%	45.26	12.63	-	24.94	24.66	-	33.4
<b>Nitrogen level (Kg/ha)</b>							
40	202.1	330.3	266.2	214.9	265.7	240.3	315.2
80	246.5	436.2	341.4	263.7	300.9	282.3	367.8
120	266.2	464.4	365.3	302.0	334.5	318.3	399.6
SEm+	6.39	5.32	-	3.01	3.18	-	-
C D at 5%	18.21	15.52	-	8.56	9.02	-	-
<b>Interaction: Entry X N levels</b>							
SEm+	41.18	5.46	-	10.44	12.30	-	-
CD at 5%	NS	15.63	-	29.66	35.49	-	-

**Table-20(c): Interaction effects of nitrogen levels and promising entries on green fodder yield (q/ha) of oat (AVTO-2 -SC) at Palampur and Srinagar**

Entries	Palampur				Srinagar				Jabalpur			
	N levels (kg/ha)				N levels (kg/ha)							
	40	80	120	Mean	40	80	120	Mean	40	80	120	Mean
RSO-60	228.4	280.6	312.3	273.8	348.5	378.0	395.0	373.8	272.4	355.0	390.1	339.2
RSO-59	193.4	272.4	292.2	252.7	375.3	412.5	435.0	407.6	349.7	448.3	485.2	427.7
SKO-190	234.6	275.7	312.7	274.3	345.5	375.0	398.0	372.8	273.7	374.6	387.0	345.1
UPO-12-1	233.3	262.1	323.4	273.0	325.5	362.8	384.9	357.7	360.8	478.1	485.7	441.5
OS-405	197.5	274.1	243.6	238.4	368.0	396.5	400.5	388.3	391.5	520.8	544.3	485.5
JHO-2012-1	254.3	325.1	246.5	275.3	322.7	348.6	374.5	348.6	320.4	416.3	455.4	397.4
OL-1760	271.6	299.2	260.9	277.2	353.8	378.0	394.7	375.5	351.5	471.4	503.4	442.1
JO-04-14	204.1	218.1	244.8	222.3	329.4	376.5	378.2	361.4	350.1	467.9	492.3	436.8
JHO-2012-2	202.9	245.3	318.9	255.7	325.6	368.5	374.0	356.0	349.7	477.2	489.2	438.7
SKO-90 (HZ)	234.6	275.7	329.2	279.8	347.7	390.5	402.5	380.2	309.3	392.3	453.7	385.1
OS-6 (NC)	187.2	211.9	232.1	210.4	332.5	367.0	390.2	363.2	290.1	361.7	407.5	353.1
Kent (NC)	187.6	245.7	293.8	242.4	360.5	387.0	400.5	382.7	344.4	470.5	479.0	431.3
Mean	219.1	265.5	284.2	-	344.6	378.4	394.0	-	330.3	436.2	464.4	
		<b>SEm±</b>	<b>CD at 5%</b>			<b>Entry</b>	<b>Nitrogen</b>	<b>E x N</b>	<b>Entry</b>	<b>Nitrogen</b>	<b>E x N</b>	
For comparison of two N levels at same level of entries		13.89	32.75		SEm±	4.31	2.80	6.78	4.46	5.32	5.46	
For comparison of two entries at same or different levels of N		12.23	35.41		CD at 5%	12.6	8.2	19.8	12.63	15.52	15.63	

**Table-20(d): Effect of nitrogen levels on dry matter yield of promising entries of Oat (AVTO-2 -SC)**

Entries	Dry matter yield (q/ha)										
	Hill zone			North West zone				North East zone			
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Ludhiana	Mean	Jorhat	Ranchi	Kalyani	Mean
RSO-60	54.0	72.3	63.2	95.7	47.1	71.8	71.5	72.2	127.2	54.7	84.7
RSO-59	48.6	81.1	61.3	87.3	58.9	85.6	77.3	72.8	151.1	53.1	92.3
SKO-190	51.1	73.7	66.1	99.0	53.6	77.6	76.7	75.8	79.2	49.3	68.1
UPO-12-1	52.8	70.3	63.3	92.3	70.6	65.5	76.1	84.2	119.5	52.6	85.4
OS-405	45.4	75.0	57.9	103.0	52.7	83.8	79.8	84.2	124.5	66.1	91.6
JHO-2012-1	52.7	69.6	61.2	91.5	51.3	72.3	71.7	74.7	85.3	52.0	70.7
OL-1760	54.1	71.2	62.7	98.1	49.0	74.7	73.9	77.3	54.5	60.9	64.2
JO-04-14	41.6	69.7	55.7	96.0	46.7	69.6	70.8	75.5	90.3	57.7	74.5
JHO-2012-2	48.9	68.3	58.6	85.3	50.0	72.4	69.2	81.4	94.1	66.8	80.7
SKO-90 (HZ)	54.9	73.4	64.2	-	-	-	-	-	-	-	-
JHO-99-2 (NEZ)				-	-	-	-	74.8	158.0	61.4	98.1
OL-125 (NWZ)	-	-	-	92.9	48.8	70.4	70.7	-	-	-	-
JHO-822 (CZ)	-	-	-	-	-	-	-	-	-	-	-
JHO-2000-4 (SZ)	-	-	-	-	-	-	-	-	-	-	-
OS-6 (NC)	40.6	71.1	55.9	79.9	43.7	67.6	63.7	77.6	96.0	64.3	79.3
Kent (NC)	46.6	73.9	46.6	94.2	52.5	84.6	77.1	63.2	110.2	67.7	80.4
SEm±	1.56	1.47	-	-	5.90	1.89	3.9	8.10	5.37	0.77	-
CD at 5%	4.61	4.3	-	7.49	11.02	5.53	8.0	23.72	15.85	2.26	-
<b>Nitrogen level (Kg/ha)</b>											
40	41.3	65.0	53.2	83.2	47.0	69.4	66.5	72.8	87.7	47.4	69.3
80	51.4	73.5	62.5	94.3	52.3	75.6	74.1	75.9	108.3	60.0	81.4
120	55.1	78.9	67.0	101.3	57.1	79.2	79.2	79.8	134.3	69.2	94.4
SEm±	0.75	0.96	-	2.18	2.91	0.53	-	6.55	1.62	0.42	-
C D at 5%	2.15	2.8	-	3.75	5.01	1.49	-	19.19	4.63	1.10	-
<b>Interaction: Entry X N levels</b>											
SEm±	-	-	-	-	-	3.27	-	68.14	9.30	-	-
CD at 5%	-	-	-	-	-	5.49	-	NS	16.37	-	-

**Table-20(e): Effect of nitrogen levels on dry matter yield of promising entries of Oat (AVTO-2 -SC)**

Entries	Dry matter yield (q/ha)						Over all mean
	Central zone			South zone			
	Jhansi	Jabalpur	Mean	Mandya	Coimbatore	Mean	
RSO-60	43.9	73.7	58.8	48.4	44.5	46.4	67.1
RSO-59	34.8	96.1	65.5	48.5	66.0	57.2	73.7
SKO-190	41.9	78.6	60.3	61.5	83.7	72.6	68.8
UPO-12-1	42.5	101.8	72.2	62.4	76.4	69.4	74.2
OS-405	40.6	112.6	76.6	70.2	56.1	63.2	76.2
JHO-2012-1	41.7	89.0	65.4	56.0	64.3	60.1	66.7
OL-1760	39.2	99.8	69.5	76.9	71.8	74.3	69.0
JO-04-14	43.6	99.9	71.8	61.4	67.0	64.2	68.3
JHO-2012-2	43.3	98.8	71.1	55.1	86.0	70.6	70.9
SKO-90 (HZ)	-	-	-	-	-	-	64.2
JHO-99-2 (NEZ)	-	-	-	-	-	-	98.1
OL-125 (NWZ)	-	-	-	-	-	-	70.7
JHO-822 (CZ)	37.9	87.0	62.5	-	-	-	62.5
JHO-2000-4 (SZ)	-	-	-	57.2	69.6	63.4	63.4
OS-6 (NC)	34.2	77.3	55.8	59.3	80.9	70.1	66.0
Kent (NC)	42.5	96.4	69.5	78.1	68.3	73.2	73.2
SEm±	2.65	3.21	-	2.3	2.60	-	
CD at 5%	7.69	8.32	-	6.7	7.62	-	
<b>Nitrogen level (Kg/ha)</b>							
40	34.4	72.3	53.4	51.3	58.3	54.8	60.8
80	41.9	99.3	70.6	60.9	69.5	65.2	71.9
120	45.3	106.1	75.7	71.6	80.9	76.2	79.9
SEm±	1.08	3.21	-	1.07	0.94	-	-
CD at 5%	3.09	9.32	-	3.04	2.68	-	-
<b>Interaction: Entry X N levels</b>							
SEm±	2.17	2.54	-	3.70	3.73	-	-
CD at 5%	NS	6.55	-	10.51	10.76	-	-

**Table-20(f): Interaction effects of nitrogen levels and promising entries on dry matter yield (q/ha) of oat (AVTO-2 -SC)**

Entries	Srinagar				Jabalpur			
	N levels (kg/ha)				N levels (kg/ha)			
	40	80	120	Mean	40	80	120	Mean
RSO-60	65.7	72.8	78.5	72.3	58.6	77.3	85.1	73.7
RSO-59	70.1	82.4	91.0	81.1	76.1	101.9	110.2	96.1
SKO-190	67.1	74.3	79.6	73.7	59.2	84.3	92.2	78.6
UPO-12-1	65.1	68.9	77.0	70.3	79.6	112.1	113.6	101.8
OS-405	66.6	78.3	80.1	75.0	86.2	123.1	128.5	112.6
JHO-2012-1	64.5	69.2	74.9	69.6	70.0	94.1	103.0	89.0
OL-1760	63.8	70.8	78.9	71.2	77.9	107.2	114.4	99.8
JO-04-14	62.9	72.5	73.6	69.7	78.2	107.8	113.6	99.9
JHO-2012-2	62.1	70.0	72.8	68.3	77.5	108.0	110.9	98.8
SKO-90 (HZ)	62.5	75.2	82.5	73.4	-	-	-	-
JHO-822 (CZ)	-	-	-	-	67.2	89.8	103.8	87.0
OS-6 (NC)	61.5	73.7	78.0	71.1	61.3	80.3	90.4	77.3
Kent (NC)	68.1	73.5	80.1	73.9	75.9	105.7	107.8	96.4
<b>Mean</b>	65.0	73.5	78.9	-	68.1	72.3	99.3	106.1
	<b>E</b>	<b>N</b>	<b>E x N</b>		<b>SEm±</b>	<b>CD</b>		
SEm±	1.47	0.96	2.33		E	3.21	8.32	
CD at 5%	4.3	2.8	6.8		N	3.21	9.32	
					<b>Ex N</b>	2.54	6.55	

Table-20(g): Effect of nitrogen levels on crude protein yield of promising entries of Oat (AVTO-2 -SC)

	Crude Protein Yield (q/ha)														Overall mean
	Hill zone			North West zone			CZ	North East zone				South zone			
	Palampur	Srinagar	Mean	Pantnagar	Ludhiana	Mean	Jabalpur	Ranchi	Kalyani	Jorhat	Mean	Mandya	Coimbatore	Mean	
<b>A. Entries</b>															
RSO-60	5.2	5.6	5.4	8.8	6.0	7.4	5.9	10.7	4.5	4.9	6.7	7.3	3.8	5.6	6.3
RSO-59	4.9	6.5	5.7	8.2	6.2	7.2	6.4	13.9	4.8	4.8	7.8	6.6	7.4	7.0	7.0
SKO-190	5.1	6.0	5.6	9.3	6.3	7.8	-	7.5	4.1	5.7	5.8	6.1	10.4	8.3	6.7
UPO-12-1	5.3	5.7	5.5	9.0	4.7	6.9	-	12.2	4.1	6.8	7.7	6.4	6.5	6.5	6.7
OS-405	4.2	5.7	5.0	9.0	5.7	7.4	-	11.5	5.2	6.8	7.8	5.8	6.5	6.2	6.7
JHO-2012-1	5.1	5.5	5.3	9.0	5.7	7.4	7.9	7.8	5.0	5.8	6.2	4.7	5.4	5.1	6.2
OL-1760	5.1	5.4	5.3	8.2	5.8	7.0	7.1	7.8	4.5	5.3	5.9	5.5	8.5	7.0	6.3
JO-04-14	4.2	5.7	5.0	8.2	5.4	6.8	8.1	7.7	4.2	6.1	6.0	5.3	6.5	5.9	6.1
JHO-2012-2	4.7	5.3	5.0	8.5	5.6	7.1	-	8.7	4.8	5.5	6.3	4.5	8.9	6.7	6.3
SKO-90 (HZ)	5.2	5.7	5.4	-	-	-	8.0	-	-	-	-	-	-	-	6.3
JHO-99-2 (NEZ)	-	-	-	-	-	-	7.8	13.8	4.8	4.7	7.8	-	-	-	7.8
OL-125 (NWZ)	-	-	-	9.0	5.4	7.2	8.3	-	-	-	-	-	-	-	7.6
JHO-822 (CZ)	-	-	-	-	-	-	7.0	-	-	-	-	-	-	-	7.0
JHO-2000-4 (SZ)	-	-	-	-	-	-	6.2	-	-	-	-	4.9	8.2	6.6	6.4
OS-6 (NC)	4.2	5.7	5.0	8.7	5.3	7.0	8.1	8.4	5.1	4.9	6.1	5.2	7.9	6.6	6.4
Kent (NC)	4.6	6.0	5.3	8.5	6.7	7.6	9.3	10.1	4.9	4.6	6.5	5.4	7.8	6.6	6.8
SEm <sub>+</sub>	0.20	0.17		0.05	0.14		0.21	0.48	0.06	0.5	-	0.09	0.68	-	-
CD at 5%	0.59	0.5		0.15	0.42		0.06	1.42	0.17	1.6	-	0.27	1.41	-	-
<b>B. Nitrogen level (Kg/ha)</b>															
40	3.6	5.0	4.3	8.1	4.9	6.5	5.8	8.0	3.2	5.1	5.4	5.0	6.3	5.7	5.5
80	4.9	5.8	5.4	8.7	5.9	7.3	8.1	9.9	4.5	5.4	6.6	5.7	7.3	6.5	6.6
120	5.8	6.4	6.1	9.3	6.7	8.0	8.7	12.2	6.3	5.9	8.1	6.2	8.4	7.3	7.6
SEm <sub>+</sub>	0.08	0.11		0.02	0.04		0.63	0.15	0.03	0.5	-	0.06	0.25	-	-
CD at 5%	0.24	0.3		0.06	0.12		1.18	0.43	0.09	1.4	-	0.18	0.51	-	-
<b>C. Interaction: Entry X N levels</b>															
SEm <sub>+</sub>	-	-	-	-	0.25		0.32	0.83	-	4.9	-	0.22	0.99	-	-
CD at 5%	-	-	-	-	0.42		0.95	1.51	-	NS	-	0.63	2.02	-	-

**Table-20(h): Interaction effects of nitrogen levels and promising entries on crude protein yield (q/ha) of oat (AVTO-2 -SC)**

Entries	Jabalpur				Jorhat			
	N levels (kg/ha)				N levels (kg/ha)			
	40	80	120	Mean	40	80	120	Mean
RSO-60	4.7	6.3	6.9	5.9	4.1	5.3	5.3	4.9
RSO-59	6.1	8.4	9.1	7.8	4.6	4.8	5.0	4.8
SKO-190	4.8	6.9	7.5	6.4	4.5	5.9	6.9	5.7
UPO-12-1	6.4	9.2	9.3	8.3	7.1	6.4	6.8	6.8
OS-405	7.0	10.2	10.6	9.3	7.1	6.4	6.8	6.8
JHO-2012-1	5.6	7.6	8.3	7.1	5.7	5.9	5.7	5.8
OL-1760	6.3	8.7	9.4	8.1	5.7	4.8	5.3	5.3
JO-04-14	6.3	8.7	9.2	8.1	5.2	6.3	6.9	6.1
JHO-2012-2	6.3	8.8	9.0	8.0	4.9	5.6	5.9	5.5
JHO-99-2 (NEZ)	-	-	-	-	4.3	4.7	5.0	4.7
JHO-822 (CZ)	5.4	7.2	8.4	7.0				
OS-6 (NC)	4.9	6.4	7.3	6.2	4.3	5.0	5.5	4.9
Kent (NC)	6.1	8.7	8.9	7.9	3.6	4.3	5.9	4.6
<b>Mean</b>	5.8	8.1	8.7		5.1	5.4	5.9	5.5
	<b>SEm±</b>	<b>CD</b>				<b>SEm±</b>	<b>CD</b>	
<b>V</b>	0.21	0.06			<b>V</b>	0.5	1.6	
<b>N</b>	0.63	1.18			<b>N</b>	0.5	1.4	
<b>V x N</b>	0.32	0.95			<b>V X N</b>	4.9	NS	

**Table-20(i): Interaction effects of nitrogen levels and promising entries on crude protein yield of oat (AVTO-2 -SC) at Mandya**

Varieties	Crude Protein Yield (q/ha)			Mean
	40	80	120	
RSO-60	7.10	7.23	7.50	7.28
RSO-59	6.13	6.80	6.83	6.59
SKO-190	5.63	5.97	6.77	6.12
UPO-12-1	5.90	6.28	7.10	6.42
OS-405	5.30	5.90	6.17	5.79
JHO-2012-1	4.20	4.63	5.20	4.68
OL-1760	4.33	5.77	6.37	5.49
JO-04-14	4.57	5.37	5.87	5.28
JHO-2012-2	3.67	4.63	5.27	4.52
JHO-2000-4 (SZ)	4.20	5.13	5.43	4.92
OS-6 (NC)	4.50	5.30	5.93	5.24
Kent (NC)	4.37	5.17	6.53	5.36
<b>Mean</b>	4.99	5.68	6.25	
	<b>S.E m±</b>	<b>CD (P=0.05)</b>		
<b>Varieties</b>	0.092	0.271		
<b>Nitrogen level</b>	0.064	0.181		
<b>Interaction (M X S)</b>	0.220	0.626		
<b>(S X M)</b>	0.202	0.575		

**Table-20(j): Effect of nitrogen levels on crude protein content and number of tillers/m row length of promising entries of (AVTO-2 -SC)**

Entries	Crude Protein (%)						Number of tillers/m row length								
	Srinagar	Pantnagar	Jorhat	Ranchi	Coimbatore	Mean	Palampur	Hisar	Pantnagar	Ludhiana	Jorhat	Coimbatore	Jhansi	Mean	Overall mean
RSO-60	7.7	8.8	6.8	8.5	8.5	8.0	101.6	96.2	58.0	55.0	104.1	64.6	79.2	79.8	79.8
RSO-59	8.0	8.2	6.6	9.2	11.2	8.6	106.0	96.7	59.0	61.3	111.6	66.6	79.6	83.0	83.0
SKO-190	8.1	9.3	7.5	9.5	12.4	9.4	94.8	110.7	48.0	60.6	115.7	80.6	75.0	83.6	83.6
UPO-12-1	8.1	9.0	8.0	10.2	8.6	8.8	105.2	86.2	52.0	65.9	112.1	70.2	71.9	80.5	80.5
OS-405	7.6	9.0	8.0	9.3	11.7	9.1	100.7	97.9	55.0	57.6	112.1	62.3	82.4	81.1	81.1
JHO-2012-1	7.8	9.0	7.7	9.1	8.3	8.4	107.8	88.7	47.0	63.4	107.4	67.6	60.7	77.5	77.5
OL-1760	7.6	8.2	6.8	9.2	11.7	8.7	99.8	90.0	49.0	61.4	103.4	81.3	72.9	79.7	79.7
JO-04-14	8.1	8.2	8.1	8.5	10.1	8.6	96.6	98.8	66.0	57.1	111.7	74.2	68.0	81.8	81.8
JHO-2012-2	7.8	8.5	6.8	9.2	10.4	8.5	100.9	92.9	48.0	62.7	118.7	80.6	63.6	81.1	81.1
SKO-90 (HZ)	7.7	-	-	-	-	7.7	104.8	-	-	-	-	-	-	104.8	104.8
JHO-99-2 (NEZ)	-	-	6.2	8.7	-	7.5	-	-	-	-	97.2	-	-	97.2	97.2
OL-125 (NWZ)	-	9.0	-	-	-	9.0	-	90.9	52.0	60.3	-	-	-	67.7	67.7
JHO-822 (CZ)	-	-	-	-	-	-	-	-	-	-	-	-	69.2	69.2	69.2
JHO-2000-4 (SZ)	-	-	-	-	11.8	11.8	-	-	-	-	-	71.2	-	71.2	71.2
OS-6 (NC)	8.1	8.7	6.3	8.7	9.7	8.3	95.8	92.2	53.0	63.2	105.1	77.9	80.4	81.1	81.1
Kent (NC)	8.1	8.5	7.2	9.1	11.5	8.9	98.6	95.1	50.0	61.7	124.6	67.8	66.0	80.5	80.5
SEm±	-	0.05	0.771	0.001	0.49	-	1.93	-	3.27	2.14	23.42	1.93	5.65	-	-
CD at 5%	-	0.15*	2.259	0.003	1.44	-	5.71	7.32	9.59	NS	68.56	5.67	16.59	-	-
<b>Nitrogen level (Kg/ha)</b>															
40	7.7	8.1	6.9	9.1	10.7	8.5	88.6	90.2	50.0	60.1	104.3	67.9	70.9	78.7	76.3
80	7.9	8.7	7.2	9.1	10.5	8.7	102.4	96.0	54.0	61.3	109.7	71.5	72.4	84.3	81.5
120	8.1	9.3	7.4	9.1	10.3	8.8	112.0	97.8	57.0	62.3	116.9	76.8	73.9	89.1	85.7
SEm±	-	0.02	0.615	0.003	0.24	-	1.02	1.28	1.16	0.81	78.76	1.21	2.17	-	-
CD at 5%	-	0.06	1.801	0.001	0.69	-	2.92	3.66	3.30	NS	NS	2.36	NS	-	-
<b>Interaction: Entry X N levels</b>															
SEm±	-	-	6.394	0.002	0.84	-	-	-	5.68	3.70	136.42	3.03	14.5	-	-
CD at 5%	-	-	NS	0.003	2.42	-	-	-	11.43	NS	NS	NS	NS	-	-

**Table-20(k): Effect of nitrogen levels on plant height of promising entries of Oat (AVTO-2 -SC)**

Entries	Plant height (cm)										
	Hill zone			North West zone				North East zone			
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Ludhiana	Mean	Jorhat	Ranchi	Kalyani	Mean
RSO-60	118.5	114.0	116.2	106.4	157.0	116.6	126.7	142.1	149.3	142.2	144.5
RSO-59	122.8	125.4	124.1	116.6	155.0	118.0	129.9	145.0	90.8	141.2	125.7
SKO-190	110.2	113.2	111.7	98.8	147.0	117.3	121.0	133.8	89.6	85.1	102.8
UPO-12-1	127.2	110.4	118.8	124.2	171.0	106.2	133.8	133.7	89.6	133.6	118.9
OS-405	131.1	117.3	124.2	130.4	174.0	142.3	148.9	133.7	153.5	140.7	142.6
JHO-2012-1	117.5	106.6	112.0	118.1	157.0	126.0	133.7	126.7	137.7	135.1	133.2
OL-1760	125.7	114.0	119.9	123.2	163.0	115.6	133.9	116.0	123.4	139.9	126.4
JO-04-14	120.5	112.9	116.7	129.9	166.0	129.9	141.9	137.8	134.1	141.6	137.8
JHO-2012-2	131.7	109.2	120.5	128.4	171.0	120.1	139.8	144.1	137.8	144.2	142.0
SKO-90 (HZ)	131.0	119.3	125.2	-	-	-	-	-	-	-	-
JHO-99-2 (NEZ)	-	-	-	-	-	-	-	140.7	149.0	144.4	144.7
OL-125 (NWZ)	-	-	-	121.9	172.0	127.3	140.4	-	-	-	-
JHO-822 (CZ)	-	-	-	-	-	-	-	-	-	-	-
JHO-2000-4 (SZ)	-	-	-	-	-	-	-	-	-	-	-
OS-6 (NC)	125.9	116.7	121.3	124.8	171.0	116.4	137.4	137.7	112.2	148.7	132.9
Kent (NC)	127.9	119.2	123.6	120.2	159.0	126.3	135.2	133.4	137.0	141.0	137.1
SEm+	3.17	2.13	-	-	3.85	4.0	-	16.21	1.18	1.077	-
CD at 5%	9.35	6.2	-	5.86	11.29	11.9	-	47.47	3.47	3.160	-
<b>Nitrogen level (Kg/ha)</b>											
40	110.9	101.9	106.4	113.3	161.0	115.9	130.1	129.6	117.0	129.4	125.3
80	124.8	117.2	121.0	121.6	163.0	122.5	135.7	136.6	125.2	140.6	134.1
120	136.8	125.5	131.2	125.8	166.0	124.3	138.7	140.0	133.7	139.5	137.7
SEm+	0.94	1.38	-	0.77	1.19	1.7	-	11.68	0.53	0.545	-
CD at 5%	2.70	4.0	-	2.93	4.51	4.9	-	34.22	1.51	1.549	-
<b>Interaction: Entry X N levels</b>											
SEm+	-	3.37	-	-	-	7.0	-	121.48	2.04	-	-
CD at 5%	NS	9.8	-	-	-	NS	-	NS	5.30	-	-

**Table-20(I): Effect of nitrogen levels on plant height of promising entries of Oat (AVTO-2 -SC)**

Entries	Plant height (cm)						Over all mean
	Central zone			South zone			
	Jhansi	Jabalpur	Mean	Mandya	Coimbatore	Mean	
RSO-60	111.9	106.4	109.2	66.3	87.7	77.0	118.2
RSO-59	110.9	102.7	106.8	76.4	92.1	84.2	116.4
SKO-190	102.6	104.7	103.7	85.4	88.5	87.0	106.4
UPO-12-1	108.2	96.6	102.4	85.0	92.9	89.0	114.9
OS-405	108.3	126.6	117.5	112.8	95.2	104.0	130.5
JHO-2012-1	106.6	110.4	108.5	83.7	97.2	90.4	118.6
OL-1760	114.5	112.8	113.7	90.5	96.1	93.3	119.6
JO-04-14	116.2	93.9	105.1	86.9	96.3	91.6	122.2
JHO-2012-2	118.7	104.2	111.5	80.6	98.5	89.5	124.0
SKO-90 (HZ)	-	-	-	-	-	-	125.2
JHO-99-2 (NEZ)	-	-	-	-	-	-	144.7
OL-125 (NWZ)	-	-	-	-	-	-	140.4
JHO-822 (CZ)	104.3	103.6	104.0	-	-	-	104.0
JHO-2000-4 (SZ)	-	-	-	89.9	94.4	92.1	92.2
OS-6 (NC)	114.1	107.7	110.9	96.4	95.7	96.1	122.3
Kent (NC)	110.6	119.6	115.1	72.9	92.9	82.9	121.7
SEm±	3.71	1.5		4.15	1.70	-	-
CD at 5%	10.9	4.3		12.18	4.97	-	-
<b>Nitrogen level (Kg/ha)</b>							
40	70.9	95.6	83.3	80.1	92.3	86.2	109.8
80	72.4	113.4	92.9	87.0	93.8	90.4	118.2
120	73.9	113.3	93.6	89.6	95.8	92.7	122.0
SEm±	2.17	1.2		1.69	0.52	-	-
CD at 5%	NS	4.5		4.81	1.49	-	-
<b>Interaction: Entry X N levels</b>							
SEm±	14.49	4.2		5.87	2.26	-	-
CD at 5%	NS	12.36		16.66	NS	-	-

Table-20(m): Effect of nitrogen levels on leaf stem ratio of promising entries of Oat (AVTO-2 -SC)

Entries	Leaf stem ratio													Over all mean
	Hill zone			North West zone			NEZ	Central zone			South zone			
	Palampur	Srinagar	Mean	Hisar	Pantnagar	Mean	Kalyani	Jhansi	Jabalpur	Mean	Mandya	Coimbatore	Mean	
RSO-60	0.44	0.43	0.44	0.42	1.19	0.81	0.73	0.58	0.70	0.64	0.63	0.40	0.52	0.61
RSO-59	0.36	0.45	0.41	0.40	1.23	0.82	0.83	0.55	0.70	0.63	0.44	0.34	0.39	0.59
SKO-190	0.34	0.43	0.39	0.43	1.15	0.79	0.60	0.49	0.64	0.57	0.51	0.57	0.54	0.57
UPO-12-1	0.43	0.42	0.43	0.45	1.30	0.88	0.56	0.51	0.60	0.56	0.40	0.48	0.44	0.57
OS-405	0.42	0.46	0.44	0.44	1.37	0.91	0.57	0.51	0.78	0.65	0.60	0.36	0.48	0.61
JHO-2012-1	0.39	0.41	0.40	0.41	1.31	0.86	0.63	0.53	0.63	0.58	0.50	0.38	0.44	0.58
OL-1760	0.45	0.44	0.45	0.45	1.21	0.83	0.76	0.54	0.60	0.57	0.35	0.44	0.40	0.58
JO-04-14	0.55	0.42	0.49	0.43	1.50	0.97	0.76	0.54	0.58	0.56	0.44	0.33	0.39	0.62
JHO-2012-2	0.43	0.42	0.43	0.41	1.14	0.78	0.65	0.55	0.59	0.57	0.34	0.34	0.34	0.54
SKO-90 (HZ)	0.41	0.44	0.43				-	-	-	-	-	-	-	0.43
JHO-99-2 (NEZ)							0.50	-	-	-	-	-	-	0.50
OL-125 (NWZ)				0.44	1.11	0.78		-	-	-	-	-	-	0.78
JHO-822 (CZ)	-	-					-	0.50	0.57	0.54				0.54
JHO-2000-4 (SZ)	-						-				0.33	0.42	0.38	0.38
OS-6 (NC)	0.43	0.42	0.43	0.39	1.04	0.72	0.63	0.53	0.61	0.57	0.43	0.33	0.38	0.53
Kent (NC)	0.38	0.44	0.41	0.40	1.24	0.82	0.66	0.45	0.71	0.58	0.52	0.35	0.44	0.57
SEm+	0.01	0.01		0.01	0.01			0.02	0.03		0.01	0.01		
CD at 5%	0.03	0.03		0.03	0.03			0.07	0.08		0.04	0.03		
<b>Nitrogen level (Kg/ha)</b>														
40	0.38	0.41	0.40	0.41	0.39	0.40	0.61	0.52	0.58	0.55	0.37	0.35	0.36	0.45
80	0.41	0.44	0.43	0.43	0.41	0.42	0.65	0.52	0.66	0.59	0.45	0.40	0.43	0.49
120	0.46	0.45	0.46	0.43	0.43	0.43	0.71	0.53	0.68	0.61	0.56	0.44	0.50	0.52
SEm+	0.01	0.01		0.01	0.01	-		0.02	0.01	-	0.01	0.00	-	-
CD at 5%	0.02	0.02		0.03	0.03	-		NS	0.03	-	0.03	0.01	-	-
<b>Interaction: Entry X N levels</b>														
SEm+	-			-	-	-		0.03	0.01	-	0.02	0.01	-	-
CD at 5%	-	0.04		-	-	-		NS	0.03	-	0.06	0.05	-	-

## 21. R-14-AST -5: Effect of N levels on forage yield of promising entries of oat (AVT-2 MC)

Locations: Jhansi, Anand, Jabalpur, Rahuri and Urulikanchan

[Table Reference: 21(a)-20(c)]

In Oat (Multicut) three entries (JO-04-315, HFO-488, PLP-14) along with three national checks (Kent, UPO-212 and RO-19) were evaluated at five centers located in Central zone. For GFY, entry PLP-14 proved better and recorded maximum green fodder yield (628.3q/ha) which was at par with HFO-488. The increase was to the tune of 14.2 and 16.95 over best national check (RO-19 (NC) and entry JO-04-315. However, in terms of dry matter, it ranked third. The RO-19 (NC) recorded maximum DMY and CPY (74.9 and 7.5 q/ha, respectively) followed by HFO-488 (70.9 q/ha). The UPO-212 (NC) recorded tallest plants. The growth performance and yields of all the entries improved consistently with increase in level of nitrogen up to 120 kg/ha (643.2 q green and 79.7 q dry matter/ha) which was 32.5 and 12.8 % higher over 40 and 80kg N/ha.

**Table-21(a): Effect of nitrogen levels on green fodder yield of promising entries of Oat (AVTO-2-MC) in Central Zone**

Entries	Green fodder yield (q/ha)						Dry matter yield (q/ha)					
	Ana-nd	Jha-nsi	Rah-uri	Urulik-anchan	Jaba-lpur	Mean	Ana-nd	Jha-nsi	Rah-uri	Urulika-nchan	Jaba-lpur	Mean
HFO-488	285.0	308.6	402.0	542.2	622.2	432.0	42.7	50.3	71.8	53.5	136.0	70.9
PLP-14	293.0	331.5	395.0	466.2	628.3	422.8	39.7	52.5	67.9	48.7	138.1	69.4
JO-04-315	280.0	333.4	366.0	549.6	537.4	413.3	41.2	51.4	69.3	58.8	116.4	67.4
UPO-212 (NC)	308.0	334.0	418.0	559.6	549.6	433.8	44.1	54.3	73.9	55.0	119.1	69.3
RO-19 (NC)	341.0	342.7	471.0	621.9	550.4	465.4	50.2	48.9	80.7	75.0	119.7	74.9
Kent (NC)	268.0	312.0	380.0	431.2	470.6	372.3	35.6	51.6	69.6	53.4	101.0	62.2
SEm±	13.91	8.28	23.88	19.64	18.36	-	1.95	1.91	5.70	1.96	6.23	-
CD at 5%	44.51	26.09	NS	61.87	48.36	-	6.24	NS	NS	6.17	5.32	-
<b>Nitrogen level (Kg/ha)</b>												
40	266.0	280.7	357.0	411.3	440.8	351.1	38.8	42.5	62.2	46.8	95.0	57.0
80	296.0	329.7	396.0	532.0	595.2	429.8	42.7	52.5	70.5	55.8	129.6	70.2
120	325.0	370.6	464.0	642.1	643.2	489.0	45.2	59.5	83.9	69.6	140.5	79.7
SEm±	7.57	7.34	9.11	9.99	16.23	-	1.09	1.41	1.99	1.07	5.32	-
CD at 5%	24.22	21.42	26.58	29.18	54.60	-	3.48	4.13	5.81	3.14	15.45	-
<b>Interaction: Entry X N levels</b>												
SEm±	18.55	29.19	22.30	34.03	15.41	-	2.67	5.93	4.88	3.39	4.52	-
CD at 5%	NS	NS	NS	74.25	45.36	-	8.53	NS	NS	7.97	12.63	-
CV%	10.86	9.52	-		14.12	-	10.93	11.66	-	-	6.23	-

**Table-21(b): Effect of nitrogen levels on green fodder yield of promising entries of Oat (AVTO-2-MC) in Central Zone**

Entries	Plant height (cm)					No. of tillers / meter row length				
	Anand	Jhansi	Rahuri	Jabalpur	Mean	Anand	Jhansi	Rahuri	Jabalpur	Mean
HFO-488	104.4	92.6	69.0	87.2	88.3	81.0	75.8	117.0	80.7	88.6
PLP-14	98.4	90.7	63.0	93.6	86.4	80.0	85.9	115.0	81.7	90.7
JO-04-315	105.7	95.3	65.0	78.5	86.1	81.0	84.1	115.0	82.0	90.5
UPO-212 (NC)	104.8	98.8	67.0	83.6	88.6	83.0	88.1	107.0	86.9	91.2
RO-19 (NC)	108.5	99.5	69.0	81.7	89.7	69.0	81.6	111.0	79.6	85.3
Kent (NC)	101.6	92.0	64.0	81.6	84.8	80.0	82.1	117.0	80.6	89.9
SEm+	2.94	2.34	1.76	2.64	-	2.38	2.99	1.30	2.36	-
C D at 5%	NS	NS	NS	5.62	-	7.61	9.41	4.11	6.35	-
<b>Nitrogen level (Kg/ha)</b>										
40	101.5	87.8	63.0	76.0	82.1	75.0	74.8	102.0	80.9	83.2
80	103.7	95.4	66.0	86.7	87.9	79.0	82.5	115.0	83.0	89.9
120	106.5	101.3	69.0	90.5	91.8	83.0	91.5	124.0	81.9	95.1
SEm+	1.18	1.17	0.87	2.34	-	1.52	1.78	1.00	3.36	-
C D at 5%	3.77	3.43	2.55	6.21	-	4.87	5.2	2.91	NS	-
<b>Interaction: Entry X N levels</b>										
SEm+	2.89	5.74	2.14	2.36	-	3.73	8.06	2.44	2.54	-
C D at 5%	NS	NS	NS	5.84	-	NS	NS	7.13	6.52	-
CV%	4.82	5.25	-	6.3	-	8.19	9.11	-	11.25	-

**Table-21(c): Effect of nitrogen levels on green fodder yield of promising entries of Oat (AVTO-2-MC) in Central Zone**

Entries	Crude Protein Yield (g/ha)					Leaf: stem ratio				
	Anand	Rahuri	Urulikanchan	Jabalpur	Mean	Jhansi	Rahuri	Jabalpur	Mean	
HFO-488	4.7	6.0	5.2	11.0	6.7	0.98	1.91	0.65	1.18	
PLP-14	6.0	5.6	4.7	11.2	6.9	1.09	1.61	0.69	1.13	
JO-04-315	5.3	6.0	5.5	9.1	6.5	0.87	1.78	0.58	1.08	
UPO-212 (NC)	4.9	6.0	5.0	9.3	6.3	0.79	1.58	0.56	0.98	
RO-19 (NC)	6.4	6.7	7.5	9.3	7.5	0.89	1.41	0.59	0.96	
Kent (NC)	4.7	5.7	5.3	7.8	5.9	0.89	1.88	0.59	1.12	
SEm+	0.25	0.05	0.18	0.96	-	0.03	0.10	0.02	-	
CD at 5%	0.80	NS	0.58	2.61	-	0.09	0.33	0.06	-	
<b>Nitrogen level (Kg/ha)</b>										
40	5.0	5.0	4.4	7.4	5.5	0.95	1.40	0.54	0.96	
80	5.3	5.8	5.4	10.3	6.7	0.92	1.76	0.63	1.10	
120	5.7	7.2	6.8	11.2	7.7	0.88	1.92	0.66	1.15	
SEm+	0.14	0.17	0.10	0.84	-	0.04	0.05	0.01	-	
CD at 5%	0.44	0.49	0.32	2.51	-	NS	0.15	0.04	-	
<b>Interaction: Entry X N levels</b>										
SEm+	0.34	0.41	0.32	0.75	-	0.14	0.13	0.02	-	
CD at 5%	1.08	NS	0.77	2.31	-	NS	0.37	0.06	-	
CV%	10.96	-	-	3.31	-	10.16	-	3.5	-	

## 22. R-14-AST-6: Effect of P levels on forage yield of promising entries of berseem (AVT-SC)

Location: Jhansi, Jabalpur, Rahuri, Urulikanchan, Hisar and Ludhiana

[Table Reference: 22(a)-22(e)]

Four berseem entries along with two national checks (Wardan and Mescavi) and one zonal check (BB-2) were evaluated at 6 centers located in two zones. All the testing entries surpassed the best checks at zonal as well as national level for GFY and DMY. Entry JBSC-4 recorded highest green, dry and crude protein yields. It was to the tune of 42.7% in NW zone, 31.35 in the central zone and 35.75% on national level over the best check. The application of graded level of phosphorus brought consistent improvement in GFY, DMY recording maximum with 100 kg P<sub>2</sub>O<sub>5</sub> kg/ha (217.7 and 27.4 q/ha). The corresponding increase in GFY and DFY with 100 kg P<sub>2</sub>O<sub>5</sub> was 19.8 and 6.98/ over 60 and 80 kg/ha on national mean basis. The interaction was also significant between the two factors. Higher yields were recorded at Hisar in the western zone and at Jabalpur in central zone. For plant height JBSC-4 registered superiority in NW Zone and JBSC-2 in Central Zone. New entries were superior over checks in terms of L:S ratio but remained at par with each other. Wardan (NC) remained lowest in NW, central zone and national level in all yield parameters.

**Table-22(a): Effect of phosphorus levels on GFY (q/ha) of promising entries of berseem (AVTSC-2)**

Entries	Green Fodder Yield (q/ha)								
	North West Zone			Central Zone				Zonal Mean	Overall mean
	Ludhiana	Hisar	Mean	Jhansi	Jabalpur	Rahuri	Urulikanchan		
JBSC-1	176.1	398.0	287.1	171.3	306.6	181.6	119.3	194.7	225.5
JBSC-2	131.8	420.3	276.1	194.4	368.3	148.0	248.9	239.9	252.0
JBSC-3	129.1	402.6	265.8	147.2	394.1	124.4	173.6	209.8	228.5
JBSC-4	145.3	425.9	285.6	142.6	368.7	202.0	177.6	222.7	243.7
BB-2 (ZC)	74.4	327.9	201.2	113.0	315.4	114.6	132.8	169.0	179.7
Mescavi (NC)	74.7	282.3	178.5	115.7	335.0	63.1	104.4	154.6	162.5
Wardan (NC)	23.8	177.8	100.8	85.2	325.7	41.8	25.5	119.6	113.3
SEm±	1.87	12.14	-	8.51	5.4	4.26	7.94	-	-
CD at 5%	5.37	34.87	-	24.33	14.98	12.17	22.71	-	-
<b>Phosphorus levels (P<sub>2</sub>O<sub>5</sub> kg/ha)</b>									
60	97.4	302.3	199.9	114.7	292.5	109.9	169.5	171.7	181.1
80	106.1	360.3	233.2	144.1	358.2	126.1	126.4	188.7	203.5
100	120.2	380.9	250.5	156.8	383.8	139.2	125.0	201.2	217.7
SEm±	1.23	7.98	-	5.57	4.5	2.79	5.20	-	-
CD at 5%	3.52	22.83	-	15.93	14.59	7.97	14.86	-	-
<b>Interaction: Entry x Phosphorus level</b>									
SEm±	3.25	-	-	14.74	3.2	7.38	13.75	-	-
CD at 5%	9.31	-	-	NS	10.28	NS	39.33	-	-
CV%	-	-	-	15.81	-	-	-	-	-

**Table-22(b): Interaction effect of phosphorus levels and entries on green and dry matter yield (q/ha) of berseem (AVTL-2) at Ludhiana**

Entry/ P levels	Ludhiana							
	Green Fodder Yield (q/ha)				Dry Matter Yield (q/ha)			
	60	80	100	Mean	60	80	100	Mean
JBSC-1	152.5	171.1	204.6	176.1	12.6	13.7	17.4	14.6
JBSC-2	123.2	131.0	141.3	131.8	9.6	10.8	11.7	10.7
JBSC-3	117.9	131.6	138.0	129.1	9.7	11.4	11.5	10.9
JBSC-4	132.7	138.2	165.0	145.3	11.4	11.6	13.6	12.2
BB-2 (ZC)	67.7	72.7	82.8	74.4	5.1	5.5	6.0	5.5
Mescavi (NC)	68.3	73.9	81.9	74.7	5.3	5.9	6.2	5.8
Wardan (NC)	19.5	24.0	27.9	23.8	1.3	1.6	1.8	1.6
<b>Mean</b>	97.4	106.1	120.2		7.9	8.6	9.7	
	<b>SEm±</b>	<b>CD %</b>			<b>SEm±</b>	<b>CD %</b>		
<b>Entry</b>	1.87	5.37			0.18	0.51		
<b>P levels</b>	1.23	3.52			0.12	0.33		
<b>Entry X P level</b>	3.25	9.31			0.31	0.88		

Table -22(c): Effect of phosphorus levels on dry matter yield (q/ha) of promising entries of berseem (AVTSC-2)

	Dry Matter Yield (q/ha)									Crude Protein Yield (q/ha)							
	North West Zone			Central Zone						Overall mean	NW Zone		Central Zone				Overall mean
	Ludh-iana	His-ar	Mean	Jha-nsi	Jabal-pur	Rah-uri	Urulika nchan	Zonal Mean	Ludh-iana		Jabal-pur	Rah-uri	Urulika nchan	Zonal Mean			
<b>A. Entries</b>																	
JBSC-1	14.6	35.7	25.2	21.8	46.8	30.7	16.7	29.0	27.7	2.8	6.8	4.9	3.1	4.9	4.4		
JBSC-2	10.7	38.1	24.4	24.8	56.6	25.5	30.7	34.4	31.1	2.2	8.3	4.3	5.3	6.0	5.0		
JBSC-3	10.9	36.4	23.6	18.6	61.5	20.2	21.4	30.4	28.2	2.2	9.1	3.3	3.3	5.2	4.5		
JBSC-4	12.2	38.5	25.4	19.1	56.6	33.8	24.7	33.5	30.8	2.5	8.2	5.8	4.4	6.1	5.2		
BB-2 (ZC)	5.5	29.7	17.6	14.9	47.9	20.3	18.0	25.3	22.7	1.1	6.9	3.4	3.3	4.5	3.7		
Mescavi (NC)	5.8	25.6	15.7	14.8	51.3	10.9	13.8	22.7	20.4	1.2	7.5	2.0	2.2	3.9	3.2		
Wardan (NC)	1.6	15.9	8.8	10.8	51.0	7.3	3.4	18.1	15.0	0.3	7.4	1.3	0.6	3.1	2.4		
SEm+	0.18	1.03	-	1.13	0.60	0.82	1.02	-	-	0.05	0.06	0.18	0.17	-	-		
CD at 5%	0.51	2.92	-	3.24	1.18	2.35	2.92	-	-	0.10	0.05	0.53	0.50	-	-		
<b>B. Phosphorus levels (P<sub>2</sub>O<sub>5</sub> kg/ha)</b>																	
60	7.9	27.44	17.7	14.44	45.1	18.0	22.79	25.1	22.6	1.5	6.6	2.9	4.0	4.5	3.8		
80	8.6	32.50	20.6	18.56	55.1	21.4	15.89	27.7	25.3	1.8	8.0	3.6	2.6	4.7	4.0		
100	9.7	34.26	22.0	20.42	59.1	24.3	16.44	30.1	27.4	2.0	8.6	4.3	2.9	5.3	4.5		
SEm+	0.12	0.69	-	0.74	0.81	0.54	0.67	-	-	0.03	0.02	0.12	0.11	-	-		
CD at 5%	0.33	1.91	-	2.12	2.21	1.54	1.91	-	-	0.07	0.16	0.35	0.32	-	-		
<b>C. Interaction: Entry x Phosphorus level</b>																	
SEm±	0.31	-	-	1.97	1.25	1.43	1.77	-	-	0.09	0.02	0.32	0.30	-	-		
CD at 5%	0.88	-	-	NS	3.56	NS	5.07	-	-	0.18	0.64	NS	0.86	-	-		
CV%	-	-	-	16.39	-	-	-	-	-	-	-	-	-	-	-		

**Table -22(d): Effect of phosphorus levels on plant height of promising entries of berseem (AVTSC-2)**

Entries	Plant height (cm)								Leaf: Stem ratio					
	North West Zone			Central Zone					NW Zone	Central Zone				Over all mean
	Ludhiana	Hisar	Mean	Jhansi	Jabalpur	Rahuri	Zonal Mean	Overall mean	Hisar	Jhansi	Jabalpur	Rahuri	Zonal Mean	
JBSC-1	44.9	75.6	60.2	51.8	42.8	55.0	49.9	54.0	0.56	0.65	0.63	0.97	0.75	0.70
JBSC-2	42.7	84.9	63.8	54.8	47.0	55.0	52.3	56.9	0.58	0.66	0.67	1.09	0.81	0.74
JBSC-3	37.0	77.8	57.4	57.7	53.8	57.0	56.2	56.7	0.57	0.59	0.67	1.10	0.79	0.77
JBSC-4	40.5	82.1	61.3	52.2	43.3	65.0	53.5	56.6	0.58	0.59	0.57	1.25	0.80	0.75
BB-2 (ZC)	29.4	73.4	51.4	41.9	44.5	56.0	47.5	49.0	0.54	0.57	0.58	0.95	0.70	0.66
Mescavi (NC)	29.4	70.1	49.8	36.8	47.4	54.0	46.1	47.5	0.54	0.59	0.63	1.37	0.86	0.68
Wardan (NC)	23.5	52.7	38.1	28.7	44.8	53.0	42.2	40.5	0.68	0.74	0.59	1.03	0.79	0.76
SEm±	1.12	1.83	-	1.93	0.32	1.37	-	-	-	0.05	0.01	0.03	-	-
CD at 5%	3.22	5.27	-	5.51	1.15	3.93	-	-	0.03	NS	0.04	0.09	-	-
<b>Phosphorus levels (P<sub>2</sub>O<sub>5</sub> kg/ha)</b>														
60	33.5	68.0	50.8	40.9	42.6	53.0	45.5	47.6	0.54	0.64	0.56	0.97	0.72	0.68
80	35.6	75.4	55.5	47.5	47.0	56.0	50.2	52.3	0.59	0.65	0.62	1.12	0.80	0.75
100	37.5	78.0	57.8	50.5	49.2	59.0	52.9	54.8	0.61	0.59	0.68	1.23	0.83	0.78
SEm±	0.74	1.20	-	1.26	0.81	0.90	-	-	-	0.03	0.01	0.02	-	-
CD at 5%	2.11	3.45	-	3.61	1.18	2.57	-	-	0.02	NS	0.03	0.06	-	-
<b>Interaction: Entry x Phosphorus level</b>														
SEm±	1.94	-	-	3.34	0.55	2.38	-	-	0.08	0.01	0.05	-	-	-
CD at 5%	NS	-	-	NS	1.16	NS	-	-	NS	0.03	0.16	-	-	-

**Table-22(e): Effect of phosphorus levels on plant population of promising entries of berseem (AVTSC-2)**

Entries	Plant population m <sup>2</sup>									
	North West Zone			Central Zone						
	Ludhiana	Hisar	Mean	Jhansi	Jabalpur	Rahuri	Zonal Mean	Over all mean		
JBSC-1	104.5	55.3	79.9	62.7	138.4	116.6	105.9	95.5		
JBSC-2	104.3	56.8	80.6	72.8	139.6	101.7	104.7	95.0		
JBSC-3	98.9	54.0	76.5	62.0	137.9	65.8	88.6	83.7		
JBSC-4	102.4	59.1	80.8	65.8	137.1	80.3	108.7	94.7		
BB-2 (ZC)	126.2	52.1	89.2	69.0	139.9	131.0	113.3	103.6		
Mescavi (NC)	122.1	51.0	86.6	78.4	138.4	113.2	110.0	100.6		
Wardan (NC)	52.3	20.6	36.5	45.0	137.8	40.1	74.3	59.2		
SEm±	5.2	2.08	-	3.91	0.89	1.85	-	-		
CD at 5%	14.9	5.98	-	11.19	NS	5.30	-	-		
<b>Phosphorus levels (P<sub>2</sub>O<sub>5</sub> kg/ha)</b>										
60	98.8	44.8	71.8	61.62	138.1	81.8	93.8	95.8		
80	101.7	51.2	76.5	65.29	138.5	94.1	99.3	100.3		
100	104.1	53.5	78.8	68.38	138.8	102.1	103.1	103.5		
SEm±	3.4	1.36	-	2.56	1.25	1.21	-	-		
CD at 5%	NS	3.91	-	NS	NS	3.47	-	-		
<b>Interaction: Entry x Phosphorus level</b>										
SEm±	35.9	-	-	6.78	0.96	3.21	-	-		
CD at 5%	NS	-	-	19.39	NS	9.17	-	-		
CV%	-	-	-	15.48	-	-	-	-		

## **E. Miscellaneous Trials**

### **23. PS-14-AST-1: Effect of straw mulch on the water requirement, weeds and productivity of BN hybrid**

**Location: Ludhiana, Hisar, Bikaner and Raipur**

The above trial was conducted at the locations mention against the trial. The data will be reported in the Kharif-2015

### **24. PS-12-AST-3: Enhancing the production potential of various forage crops in coconut gardens through nutrient management**

**Location: Mandya**

The above trial was conducted at the location mention against the trial. The data will be reported in the Kharif-2015

### **25. CS-13-AST-4: Residual effect of P applied to wheat on the succeeding summer fodders in sorghum-wheat-summer fodders cropping system**

**Location: Ludhiana**

The above trial was conducted at the location mention against the trial. The data will be reported in the Kharif-2015



## Forage Crop Protection *Rabi-2014-15*

During the report period (*Rabi-2014-15*) forage crop protection trials were conducted in three major forages *i.e.* berseem, lucerne and oats focusing on pest occurrence, evaluation of advance/improved breeding materials for resistance to major pests and pathogens and pest management aspects. Major emphasis was on prevalence/occurrence of diseases and pests in different *Rabi* crops under different agro-climatic conditions and strengthening of pest management technologies to minimising the losses incurred by pest and diseases. These trials were conducted at seven centres *viz.* Bhubaneswar, Hyderabad, Jhansi, Ludhiana, Palampur and Rahuri and Dharwad.

### PPT-1: MONITORING OF INSECT-PESTS AND DISEASES ASSOCIATED WITH BERSEEM, LUCERNE AND OAT ECO SYSTEM

**Locations:** Bhubaneswar, Dharwad, Hyderabad, Jhansi, Ludhiana, Palampur and Rahuri

The objective of this study was to record the occurrence and abundance of major insect pests and diseases in berseem, lucerne and oat at different agro climatic zones of the country and to determine their relationship with weather parameters. The crop-wise monitoring of insect pest and diseases at different centres was recorded and summarized as follows:

#### 1. Berseem

**Jhansi:** Incidences of stem rot (*Sclerotinia trifoliorum*) started from first week of January and continued to increase (35%) up to first week of February. Disease development was favoured by low temperature (< 15°C) and high humidity (>85%). The root rot (*Rhizoctonia solani*) appeared in the last week of March and continued to increase (40%) up to last harvest.

**Rahuri:** In berseem crop, aphid, *Myzus persicae* was noticed for the first time during the rabi 14-15. The population was noticed on berseem during 4<sup>th</sup> week of January 2015 (7.67 aphids/tiller) and it reached at its peak (24.33 aphids/tiller) during 1<sup>st</sup> week of February 2015. Thereafter population showed decreasing trend and was found nil during 3<sup>rd</sup> week of February 2015.

**Bhubaneswar:** Berseem suffered from leaf spots and root rot. Root rot incidence was recorded to be 12.0 per cent during harvesting. The infestation of leaf defoliators started from 1<sup>st</sup> week of January and it reached at maximum 60 days of sowing (2.6 number/10 plants).

**Palampur:** In berseem low incidence of root rot (7%) and moderate to high intensity of leaf spot disease (25 %) and defoliating beetles (35 %) was observed.

**Ludhiana:** At Ludhiana centre lepidopteron insect pests (*Thysanoplusia orichalcea* and *Helicoverpa armigera*) appeared on berseem. The population of green semilooper (*T. orichalcea*) as well as gram caterpillar (*H. armigera*) started appearing on the berseem genotypes in the first week of April. The population of green semilooper (*T. orichalcea*) was recorded maximum in 3<sup>rd</sup> week of April (4.66 larvae/ m row) and then its infestation was reduced. In the end of May, 2015, the pest disappeared. Similarly, the population of *H. armigera* continued to be present on berseem crop till the IV week of May, with its highest peak (11.66 larvae/ m row) in variety BL-42, during last week of April 2015.

#### 2. Lucerne

**Jhansi:** Rust (*Uromyces striatus*) appeared in the last week of March and its intensity was very low (10%) up to second week of April. Alfalfa weevil infestations were severe (60%) during first and second week of February.

**Rahuri:** The population of pea aphid (*Acyrtosiphon pisum*) was noticed on lucerne during 2<sup>nd</sup> week of December 2014 (6.33 aphids/tiller) and increased up to the 1<sup>st</sup> week of February, 2015 (83.00 aphids/tiller). Thereafter, the decreasing trend of pea aphid population was noticed up to 4<sup>th</sup> week of February, 2015 (9.67 aphids/tiller). After that the population of pea aphid disappeared from the crop.

The cowpea aphid (*Aphis craccivora*) started build up on Lucerne during 2<sup>nd</sup> week of December, 2014 (12.67 /tiller) and showed increasing trend up to 3<sup>rd</sup> week of January, 2015 with highest population (30.00 aphids/tiller). Thereafter, population started declining and recorded nil population during 1<sup>st</sup> week of February. The spotted aphid (*Therioaphis maculata*) is predominant species in western Maharashtra, it started appearing on crop during 2<sup>nd</sup> week of January, 2015 with 6.67 aphids/tiller and it showed increasing trend up to 1<sup>st</sup> week of February, 2015 (27.33 aphids/tiller). Afterwards, population started declining and showed nil population during 3<sup>rd</sup> week of February 2015. During the aphid infestation, population of predatory lady bird beetles was observed at moderate to high level. (2.00 to 4.00 grubs/tiller).

Though the *Spodoptera litura* become a major and regular pest on lucerne during summer season, but this year the population of *S. litura* was not observed on lucerne throughout the crop period. The population of *H. armigera* was noticed on lucerne seed crop during last week of March 2015 (0.33 larva/m<sup>2</sup>) and showed increasing trend up to 4<sup>th</sup> week of April 2015 with highest population of 5.67 larvae/m<sup>2</sup>. After that population declined and showed minimum population during 2<sup>nd</sup> week of May 2015.

**Bhubaneswar:** Lucerne did not suffer from major diseases at this centre, only leaf blight was recorded which was maximum at the time of harvest (2.4 %). Infestation of leaf defoliators was recorded an average of 1.8 adults /10 plants at the time of harvesting.

**Palampur:** Defoliating beetles was the main pest (40%) of lucerne crop at this zone, whereas minor incidences of leaf spots (10 %) were also recorded.

**Ludhiana:** Weevils (*Hypera postica*) and pod borers (*Helicoverpa armigera*) are major constraint of lucerne cultivation in Ludhiana and adjoining areas. Lucerne var. LLC-5 was infested with lucerne weevil and pod borers from 1<sup>st</sup> week of February to mid March, 2015; during which highest peak (4.66 and 3.66 larvae/plant, respectively) were observed.

**Hyderabad:** At Hyderabad, spotted alfalfa aphid, leaf miner, leaf folder and rust are the major pests and pathogens of lucerne. During the Rabi 2014-15 season, lucerne crop was free of rust disease up to February first week but suddenly the rust disease appeared and its severity increased by third week of February. Similarly, spotted alfalfa aphid's incidence also appeared in 1<sup>st</sup> week of February and gradually increased till the first week of March and afterwards decreased abruptly which may be due to the rainfall received during March 2015. Leaf miner and leaf folder incidence was observed from the initial crop growth stages and continued up to 50 days old crop.

**Dharwad:** Insect and disease incidence at 15 days interval revealed that aphid population started building from January onwards and reached its peak during second fortnight of February (180 aphids / stem) and started declining after second fortnight of April and reached nil in May month. Among diseases, rust was the major one and 44% of disease severity was seen during first fortnight of March. Disease intensity was almost nil during month of May.

### 3. Oat

**Jhansi:** Minor incidences (10%) of leaf blight (*Helminthosporium avenae*) were recorded during February and March. Aphid infestation (*Aphis craccivora*) were low (<10%) in the oat crop grown for seed purpose during March and April.

**Rahuri:** In Oat crop, aphids, *Rhopalosiphum padi* was noticed during 4<sup>th</sup> week of January, 2015 (4.67 aphids/tiller) and it reached at maximum level (45.67 aphids/ tiller) during 4<sup>th</sup> week of January 2015. Thereafter it started declining and recorded nil population on oat during the 2<sup>nd</sup> week of February 2015. During the infestation of aphids, Chrysopa, grubs of predatory lady bird beetles and syrphid fly observed on crop in the range of 0.67 to 1.67, 1.00 to 3.33 and 0.0 to 0.67 larvae per tiller, respectively.

**Bhubaneswar:** Leaf blight, leaf spots and leaf defoliators were recorded from this Centre. Severity of leaf blight during 1<sup>st</sup> week of January was recorded to be 6.8 % and at the time of harvesting its incidence was 14.0 %. Severity of leaf spot of oat was recorded to be 4.6% at the time of harvesting (1<sup>st</sup> week of February). Infestation of leaf defoliators starts from 1<sup>st</sup> week of January and it was maximum at the time of harvesting (2.0 number /10 plants).

**Palampur:** In the *rabi* 2014-15 season, oat crop was severely affected by powdery mildew (90% severity) followed by leaf blights (22%), loose smut (5%) and sucking pest (15%).

**Ludhiana:** The population of oat aphid was comparatively lower as compared to previous years. Maximum population (9.66 aphids/tiller) of oat aphid was observed during the last week of February and decreased thereafter.

**PPT- 2A: FIELD SCREENING OF RABI BREEDING MATERIALS FOR RESISTANCE TO INSECT- PEST AND DISEASES**

**Locations: Ludhiana, Jhansi, Palampur, Bhubaneswar, Rahuri and Hyderabad**

**A. Lucerne (ANNUAL-2014) – IVT**

At Rahuri, in all the entries, presence of aphid population was observed in the range of 22.40-38.21 aphid/tiller with least population being in RL-88 (22.40 aphid/tiller) and highest population in Anand-26 (38.21 aphid/tiller). At Ludhiana, only AL-140004 showed moderately resistant reaction. At Jhansi AL-140004 and AL-140003 showed moderately resistance reaction (less than 10% incidence) to rust (*Uromyces* sp.) disease (Table PPT 2A1).

**Table PPT 2A 1: Reaction of IVT annual Lucerne entries against Insect-pests and diseases**

Entries	Aphid/tiller	Rust	
	(Rahuri)	Ludhiana	Jhansi
AL-140002	26.65	S	12.5
AL-140001	35.15	S	14.0
Anand-26	38.21	HS	27.0
Anand-2	23.99	S	24.1
AL-140004	23.14	MR	8.7
AL-140003	24.35	S	7.1
RL-88	22.40	MS	20.3

**B. Oat (Single cut)**

In IVT, entries OS-424 and OL-1802-1 were found resistant to leaf blight at Jhansi centre, whereas at Palampur only Kent showed resistant reactions to Powdery mildew. At Ludhiana all the entries showed susceptible to highly susceptible reactions. At Rahuri, entry OL-1766-1 showed less numbers of aphids (17.37 aphids/tiller), which was significantly lower in comparison to other entries, except OL-1769-1 (19.87), OS-424 (20.10) and OS 432 (21.92). These entries were at par with each other. (Table PPT 2A 2)

**Table PPT 2A 2. Reaction of IVT entries of Oats (single cut) to diseases and pests**

Entries	Powdery mildew	Aphids/tiller	Leaf blight	
	Palampur	Rahuri	Jhansi	Ludhiana
Kent	R	57.92	MR	HS
SKO-228	MR	19.87	MR	HS
OL-1769-1	S	20.10	MR	HS
OS-424	S	39.70	R	HS
OL-1802-1	S	24.98	R	S
JHO-99-2	S	21.92	MR	S
OS-432	S	44.45	MR	HS
JO-04-19	S	31.65	MR	HS
UPO-10-3	S	33.00	MR	HS
OS-6	S	26.70	MR	HS
SKO-90	S	53.68	MR	HS
OL-125	S	35.02	MR	HS
JHO-822	S	24.38	MR	HS
JHO-2000-4	S	17.37	MR	HS
OL-1766-1	S	24.07	MR	HS
SKO-225	S	57.92	MR	HS

Scored on 1-5 scale: 1=Highly resistant (No symptom); 2=Resistant (Up to 10% disease incidence); 3=Moderately resistant (11-25%); 4=Susceptible (26-50%); 5=Highly susceptible (> 50%), DF- Disease free

In AVTO SC-1 at Jhansi SKO-196, SKO-199, RSO-8, OL-1804 and JHO-2000-4 showed resistant reaction to leaf blight disease. However, at Ludhiana all the entries showed susceptible to highly susceptible reactions against blight. At Palampur centre, no entry showed resistant reaction against powdery mildew. At Rahuri, entry RO-11-1 showed least aphid infestation (25.87aphids/tiller) followed by JO-04-18 (28.27), NDO-952 (29.80), JHO-822 (35.50), SKO-198 (35.60), JHO-99-2 (35.90), RSO-08 (37.13) and JHO-2000-4 (40.53). Highest infestation of aphids was noticed on variety Kent (75.03 aphids/tiller) (Table PPT 2A3).

**Table PPT 2A 3: Reaction of AVT (SC-1) entries of Oats (single cut) to pests and diseases**

Entries	Powdery mildew	Aphids/tiller	Leaf blight	
	Palampur	Rahuri	Jhansi	Ludhiana
JHO-13-5	S	58.30	MR	HS
OL-1689	S	70.97	MR	HS
SKO-196	S	62.20	R	S
OS-406	S	54.70	MR	HS
OL-125	S	75.03	MR	HS
Kent	S	28.27	MR	HS
JO-04-18	S	35.50	MR	HS
RO-11-1	S	25.87	MR	S
NDO-952	S	29.80	MR	HS
SKO-198	S	35.60	MR	HS
JHO-99-2	S	35.90	MR	HS
OS-6	S	50.83	MR	HS
SKO-199	S	53.70	R	HS
RSO-8	S	37.13	R	S
OL-1804	S	53.27	R	HS
JHO-2000-4	S	40.53	R	HS

Scored on 1-5 scale: 1=Highly resistant (No symptom); 2=Resistant (Up to 10% disease incidence); 3=Moderately resistant (11-25%); 4=Susceptible (26-50%); 5=Highly susceptible (> 50%).

In AVTO (SC-2), at Palampur centre, none of the entries showed resistant reaction against powdery mildew. At Jhansi, UPO-12-1 and RSO-60 showed resistant reaction. At Rahuri, entry RSO-60 recorded 12.93 aphids per tiller and it was significantly lower than the other entries, except 5 entries which were at par [OS-06 (14.20), OS - 405 (14.50), JHO-212-1 (15.00), JHO-99-2 (19.13) and SKO-190 (19.77)]. At Ludhiana all the entries showed susceptible to highly susceptible reactions (Table PPT 2A4).

**Table PPT 2A 4: Reaction of AVT (SC-2) entries of Oats to diseases and pests**

Entries	Aphids/tiller	Powdery mildew	Leaf blight	
	Rahuri	Palampur	Jhansi	Ludhiana
UPO-12-1	21.60	S	R	HS
RSO-60	12.93	S	R	S
JHO-2012-1	15.00	S	MR	HS
OS-6	14.20	S	MR	S
SKO-90	23.37	S	S	HS
JHO-99-2	19.13	S	S	HS
JHO-2000-4	25.83	S	S	HS
JHO-2012-2	19.77	S	MR	HS
SKO-190	21.23	S	MR	HS
JO-04-14	25.63	S	MR	HS
RSO-59	14.50	S	MR	HS
OS-405	32.07	S	MR	HS
OL-1760	40.90	S	MR	HS
Kent	21.60	S	MR	S

In AVTO (SC-2) seed, at Palampur centre, none of the entries showed resistant reactions against powdery mildew. At Jhansi, all the entries showed resistant reaction. At Rahuri, entry UPO-12-1 (13.33) showed significantly lower number of aphids per tiller, this was at par with 4 entries [JO-04-14 (14.50), OS-6 (14.50), SKO-90 (15.10) and JHO-2012-1 (15.60)]. At Ludhiana, all the entries showed susceptible to highly susceptible reactions (Table PPT 2A 5).

**Table PPT 2A 5: Reaction of AVT (SC-2) seed entries of Oats to diseases and pests**

Entries	Aphids/tiller	Powdery mildew	Leaf blight	
	Rahuri	Palampur	Jhansi	Ludhiana
UPO-12-1	13.33	S	R	HS
RSO-60	22.30	S	R	HS
JHO-2012-1	15.60	S	R	HS
OS-6	-	S	R	HS
SKO-90	-	S	R	HS
JHO-99-2	-	S	R	HS
JHO-2000-4	-	S	-	HS
JHO-2012-2	20.37	S	R	HS
SKO-190	-	-	-	HS
JO-04-14	14.50	S	R	S
RSO-59	32.87	S	R	HS
OS-405	30.70	S	R	HS
OL-1760	26.83	S	R	HS
Kent	24.27	S	R	S

#### Oat (dual)

In IVT (dual) trial, all the entries were resistant to moderately resistant to leaf blight at Jhansi. However, at Ludhiana and Palampur centres all the entries showed susceptible to highly susceptible reactions. At Rahuri, RSO-15 recorded least number of aphids per tiller (9.93 aphids/ tiller) followed by RO-19 (12.03), JO-09-508 (13.87) and UPO-212 (14.80). At Bhubaneswar, minimum leaf blight severity was observed in entry RO-19 (4.7 %) and maximum in entry RSO-15 (7.5%). Similar trend was observed in second cut also where minimum leaf blight severity was observed in entry RO-19 (10.6 %) while it was maximum in entry RSO-15 (20.5%) (Table PPT 2A-6).

**Table PPT 2A 6: Reaction of IVT entries of Oat (dual) to diseases and pest**

Entries	Aphids/tiller	Powdery mildew	Leaf blight		
	Rahuri	Palampur	Jhansi	Ludhiana	Bhubaneswar
OL-10	19.10	S	R	HS	HS
JO-09-508	13.87	S	MR	HS	HS
RSO-15	9.93	S	MR	HS	MS
UPO-212	14.80	S	MR	HS	HS
HO-822	25.73	S	MR	HS	HS
OS-409	29.00	S	MR	HS	HS
PLP-14	22.53	S	MR	HS	HS
RO-19	12.03	S	MR	HS	HS

#### OAT (Multi cut)

In IVT oat (MC), all the entries showed resistant to moderately resistant to leaf blight disease at Jhansi centre. All the entries showed susceptible to highly susceptible reaction to leaf blight at Ludhiana and Palampur centre except RSO-68 & UPO-212. At Rahuri, entry OL-1845 showed significantly lesser (10.93) number of aphids per tiller. However, entries RSO-69 (11.20), UPO-212 (11.70), PLP-18 (12.17), OL-10 (12.33), OS-414 (12.83) and RSO-9 (13.50) were found at par with it (Table PPT 2A-7).

**Table PPT 2A 7: Reaction of IVT entries of Oat (MC) to diseases and pest**

Entries	Aphids/tiller	Powdery mildew	Leaf blight	
	Rahuri	Palampur	Jhansi	Ludhiana
OS-414	12.83	S	R	HS
OL-1845	10.93	S	R	HS
RSO-9	13.50	S	R	HS
JO-04-319	29.53	S	R	HS
RO-19	22.80	S	MR	HS
Kent	14.47	S	MR	HS
OL-10	12.33	S	MR	S
OL-1843	17.50	S	MR	HS
RSO-68	18.07	MR	MR	S
UPO-212	11.70	MR	MR	S
PLP-18	12.17	S	MR	S
RSO-69	11.20	S	MR	S

Scored on a 1-5 scale: 1= Highly resistant (No symptom), 2= Resistant (Up to 10 % disease incidence) 3= Moderately resistant (11-25%), 4= Susceptible (26-50%), 5=Highly susceptible (> 50%).

In AVT -1 oat (MC), all the entries were found highly susceptible to leaf blight at Ludhiana centre. At Jhansi, entries JHO-13-4 and Kent were found resistant while at Palampur, none of the entries showed resistant reaction to Powdery mildew. At Bhubaneswar, Leaf blight severity was observed minimum in entry RO -19 (8.0 %) while it was maximum in entry RSO-60 (10.6 %). At Rahuri centre, entry OL-1802 recorded least (9.67) aphids per tiller followed by UPO-212 (11.80), RO-19 (11.83) and JO-4-317 (12.87). These entries were found less susceptible to aphids (Table PPT2A-8).

**Table PPT 2A 8: Reaction of AVTO-1 (MC) to diseases and pest**

Entries	Aphids/tiller	Powdery mildew	Leaf blight		
	Rahuri	Palampur	Jhansi	Bhubaneswar	Ludhiana
JO-4-317	12.87	S	MR	S	HS
JHO-13-4	24.77	S	R	S	HS
Kent	29.93	S	R	S	HS
UPO-212	11.80	S	MR	S	HS
RO-19	11.83	S	MR	R	HS
OS-385	25.07	S	MR	S	HS
RSO-60	36.37	S	MR	S	HS
OL-1802	9.67	S	MR	S	HS

In AVTO-2 oat (MC), all the entries were found susceptible to highly susceptible to leaf blight and powdery mildew at Ludhiana and Palampur centre respectively. At Rahuri centre, entry PLP-14 recorded 8.78 aphids per tiller and it was significantly lower than the others, except JO-04-315 (9.28) RO-19 (11.38) and HFO-488 (11.83) which was found at par with it. These entries were found less susceptible to aphids. At Jhansi, all the entries were found moderately resistant to leaf blight. At Bhubaneswar centre, minimum leaf blight severity was observed in entry PLP-14 (4.4 %) while it was highest in entry RO-19 (6.2 %) (Table PPT2A-9).

**Table PPT 2A 9: Reaction of AVTO-2 (MC) to diseases and pest**

Entries	Aphids/tiller	Powdery mildew	Leaf blight		
	Rahuri	Palampur	Jhansi	Bhubaneswar	Ludhiana
PLP-14	8.78	S	MR	MR	HS
JO-4-315	9.28	S	MR	MR	HS
Kent	16.65	S	MR	MR	HS
HFO-488	11.83	S	MR	MR	HS
RO-19	11.38	S	MR	MR	HS
UPO-212	29.48	S	MR	MR	S

In AVT seed oat (MC), all the entries were found susceptible to highly susceptible to leaf blight at Ludhiana. At Rahuri, JO-04-315 recorded significantly lower number of aphids (10.78) per tiller and it was at par with PLP-14 (11.28), UPO-212 (11.88) and HFO-488 (13.45). At Jhansi, entries JO-04-315 and UPO-212 were found resistant while at Palampur, none of the entries showed resistant reaction to Powdery mildew (table PPT2A-10).

**Table PPT 2A 10: Reaction of AVTO-2 (MC) seed to diseases and pest**

Entries	Aphids/tiller	Powdery mildew	Leaf blight	
	Rahuri	Palampur	Jhansi	Ludhiana
HFO-488	11.28	S	MR	HS
RO-19	10.78	S	MR	HS
Kent	18.28	S	MR	HS
PLP-14	13.45	S	MR	S
JO-04-315	11.88	S	R	HS
UPO-212	31.10	S	R	HS

No insects and diseases were observed in IVTOSC, AVTOSC-1, AVTOSC-2, AVTOSC-2 (Seed), IVT Lucerne (annual) at Hyderabad centre.

**PPT-2B: EVALUATION OF BERSEEM ENTRIES FOR RESISTANCE TO ROOT AND STEM ROT DISEASES UNDER SICK PLOT**

**Locations: Ludhiana, Jhansi, Palampur, Bhubaneswar, Rahuri and Hyderabad**

Berseem frequently suffers heavy damages due to various kinds of rot diseases caused by a complex of fungal pathogens viz. *Rhizoctonia solani*, *Fusarium semitactum*, *Sclerotium rolfsii* and *Sclerotonia trifoliorum* or in association with a nematode, *Tylenchorhynchus vulgaris*.

**IVT Berseem**

IVT Berseem entries were tested for these diseases in the permanent stem rot and root rot sick plots. Single cut entries were susceptible to moderately resistant to root and stem rot diseases at Jhansi centre. Incidence of root rot of berseem was very low during the season at Palampur. Wardan showed least (2.78 aphids/tiller) number of aphids followed by Mescavi (3.00), BB-2 (3.78), JBSC-2 (4.33) and Wardan (5.45). These entries were at par with each other at Rahuri. In Bhubaneswar, minimum root rot severity was observed in JB-4-21 (1.6 %) while maximum severity was recorded in entry HFB-63 (8.6 %) (Table PPT2B 1).

**Table PPT 2B 1. Reaction of Berseem entries in IVT to diseases**

Entries	Stem rot incidence (1-5 scale)		Root rot		Aphids/tiller
	Ludhiana	Jhansi	Jhansi	Bhubaneswar	Rahuri
JB-04-23	5	2	4	2.8	4.33
HFB-63	3	2	4	8.6	5.45
BL-22	-	-	2	-	3.00
PC-75	3	2	2	5.0	3.78
JB-4-21	5	1	2	1.6	2.78
Bundel Berseem-2	-	2	2	-	15.78
HFB-51	4	4	2	6.2	7.78
Wardan	4	4	2	2.6	11.89
Mescavi	4	4	2	8.0	4.33

Scored on a 1-5 scale: 1= Highly resistant (No symptom), 2= Resistant (Up to 10 % disease incidence), 3= Moderately resistant (11-25%), 4= Susceptible (26-50%), 5=Highly susceptible (> 50%).

**AVT-2 Berseem**

All the entries were resistant to moderately resistant to root rot and stem rot diseases at Jhansi. However at Ludhiana none of the entries showed resistant reaction. In berseem crop, for the first time aphid *Myzus persicae* was noticed on crop during the Rabi 14-15. At Rahuri, Bundel Berseem-2 recorded significantly lower (3.78/tiller) number of aphids per tiller, which was it was at par with entries JBSC-1, Mescavi, Wardan and JBSC-3. All these three entries showed 5.11, 5.11, 7.00 and 7.45 aphids per tiller, respectively (Table PPT 2B.2A)

**Table PPT 2B 2A. Reaction of Berseem entries in AVT-2 to diseases and pests**

Entries	Stem rot incidence		Root rot	Aphids/tiller
	Ludhiana	Jhansi	Jhansi	Rahuri
JBSC-1	S	R	MR	15.22
Wardan	MS	R	MR	7.00
Mescavi	MS	MR	MR	7.45
Bundel Berseem-2	HS	R	MR	5.11
JBSC-1	S	MR	MR	3.78
JBSC-4	MS	MR	MR	5.11
JBSC-3	S	MR	MR	12.56

**AVT-2 seed Berseem**

All the entries showed susceptibility to stem rot disease at Ludhiana. In Jhansi, test entries JBSC-1,-2,-3 and -4 showed various degree of resistance to stem and root rot diseases. At Rahuri, entries JBSC-2, BB-2, Wardan and Mescavi recorded 4.00, 4.11, 4.22 and 4.22 aphids per tiller. These entries were at par with each other. However, highest infestation (10.56 aphids / tiller) was noticed on JBSC-3 (Table PPT 2B.2A).

**Table PPT 2B 2B (Seed). Reaction of Berseem entries in AVT-2 seed to diseases and pests**

Entry Name	Stem rot incidence		Root rot	Aphids/tiller
	Ludhiana	Jhansi	Jhansi	Rahuri
JBSC-3	S	MR	MR	10.56
BB-2	MS	R	MR	4.11
JBSC-4	S	MR	MR	7.33
JBSC-1	S	R	MR	7.45
JBSC-2	S	MR	S	4.00
Wardan	S	S	S	4.22
Mescavi	MS	S	S	4.22

**PPT-12: INTEGRATED DISEASE MANAGEMENT IN WHITE CLOVER**

**Location: Palampur**

The experiment was conducted to manage the 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 severity (2.5%) and clover rot incidence (1.2%) with maximum seed yield (1.2 q/ha) as compared to control (55.0 % powdery mildew and (11.6 % clover rot with 1.2 q/ha seed yield

**Table PPT 12. Effect of seed treatment and foliar sprays on disease incidence and seed yield of white clover**

Treatments		Disease incidence (%)		Seed yield (q/ha)
		Powdery mildew	Clover rot	
T <sub>1</sub>	Seed treatment (ST) with carbendazim	29.3	2.1	1.3
T <sub>2</sub>	<i>Trichoderma viride</i> (ST)	38.8	6.4	1.6
T <sub>3</sub>	T <sub>1</sub> + foliar spray of carbendazim	15.5	2.0	1.7
T <sub>4</sub>	T <sub>2</sub> + foliar spray of carbendazim	25.5	5.6	1.9
T <sub>5</sub>	T <sub>1</sub> + foliar spray of hexaconazole	4.6	1.7	1.9
T <sub>6</sub>	T <sub>2</sub> + foliar spray of hexaconazole	3.6	5.7	1.4
T <sub>7</sub>	T <sub>1</sub> + foliar spray of carbendazim followed by hexaconazole	2.6	1.6	1.9
T <sub>8</sub>	T <sub>2</sub> + foliar spray of carbendazim followed by hexaconazole	4.2	5.8	2.0
T <sub>9</sub>	T <sub>1</sub> + T <sub>2</sub> + foliar spray of carbendazim followed by hexaconazole	2.5	1.2	2.1
T <sub>10</sub>	Untreated control	55.0	11.6	1.2
	CD 5%	1.9	1.04	1.69

**PPT 17: TO STUDY THE PATHOGENIC VARIABILITY OF *BLUMERIA GRAMINIS* (SYN. *ERYSIPHE GRAMINS*) F. SP. *AVENAE* ON OAT**

**Location: Palampur**

During 2014-15 seasons, two isolates of oat powdery mildew *i.e.* Chuantra (Mandi) and Gagal (Kangra) were collected and 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 stereo zoom microscope on 10 differential line of oat as given in table 17 A. The differential 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.

**Table 17 A. Reactions of 7 isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew on the differential set of oats**

Pathotypes	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 (Mandi)	2	4	1	4	2	1	4	2	3	2
PMO-9	Gagal (Kangra)	2	2	2	3	2	2	2	2	2	2

**Table 17 B. Virulence pattern of isolates of *Blumeria graminis* f. sp. *avenae* causing powdery mildew of oats on differential set**

Patho types	Isolate	Infection types on differential lines										Virulence frequency (R:S)
		OL-260	OAT-H 38	IG-03-248	UPO-229	OAT-TRS-RKC	IG-03-252	EC-6058	OAT-902	HF O-224	OAT-OS-222	
PMP-1	Agronomy	R	R	R	R	R	R	R	R	R	R	10:0
PMP-2	Tanda, Kangra	S	S	S	S	S	S	S	S	S	R	1:9
PMP-3	Nagrota Gagal	R	R	R	S	R	R	S	R	R	R	8:2
PMP-4	Rajpur, Fodder Farm	R	R	R	S	R	R	S	R	S	S	6:4
PMP-5	Plant Pathology Farm	S	R	S	S	S	S	R	S	S	S	2:8
PMP-6	Chuantra (Mandi)	R	S	R	S	R	R	S	R	S	R	6:4

**b. Pathogenic variability:**

The virulence pattern of the 9 isolates (during 2012-13, 2013-14 and 2014-15) of *Blumeria graminis* f. sp. *avenae* on differential set (10 lines) is given in Table 4. On the basis of reaction of 20 differentials, the 7 isolates were grouped into 6 different pathotypes (Table 2). Of the 7 isolates, 1 isolate were placed in pathotypes PMO-1, two in pathotypes PMO-2, one in pathotypes PMO-3, two in pathotypes PMO-4, one in pathotype PMO-5 and one in pathotype PMO-6.

**PPT 18: EVALUATION OF ENTAMOPATHOGENIC FUNGI ON INSECT PESTS OF LUCERNE**

**Locations: Rahuri, Hyderabad, Jhansi and Dharwad**

**Jhansi**

The trial comprised of 11 treatments. Aphid population was present in the experimental block and the difference in incidence was not significant between the treatments before the start of experiment. Entomopathogenic fungi viz., *Verticillium lecanii* @ 4x10<sup>6</sup> cfu/ml (2g/l) and *Metarhizium anisopliae* @ 4x10<sup>6</sup> cfu/ml (2g/l) and half dose of each were at par with each other and they were more effective than any other entomopathogenic fungi in controlling the aphids. However, alfalfa weevil infestation was less. There was no significant difference in the number of sprays. Higher green forage yield was recorded in *Metarhizium* sole spray. All the entomopathogens are absolutely safe and did not affect adversely on natural enemies especially predators of aphids as well as on pollinators of lucerne (Table PPT 18A).

**Table PPT 18A. Evaluation of entomopathogenic fungi for the management of aphids in lucerne after foliar application**

Tr. No	Treatment foliar application	Pre count of aphids	Post count after 7 DAS	GFY (q/ha)
T <sub>1</sub>	<i>Verticillium lecanii</i> @ 4x10 <sup>6</sup> cfu/ml (2g/l)	104.33	21.66	210
T <sub>2</sub>	<i>Beauveria bassiana</i> @ 4x10 <sup>6</sup> cfu/ml (2g/l)	88.66	20.66	200
T <sub>3</sub>	<i>Metarhizium anisopliae</i> @ 4x10 <sup>6</sup> cfu/ml (2g/l)	102.33	45.33	233
T <sub>4</sub>	<i>Nomuraea releyi</i> @ 4x10 <sup>6</sup> cfu/ml (2g/l)	98.33	56.66	203
T <sub>5</sub>	T <sub>1</sub> + T <sub>2</sub> (half dose of each)	101.00	19.33	220
T <sub>6</sub>	T <sub>1</sub> + T <sub>3</sub> (half dose of each)	95.00	18.66	213
T <sub>7</sub>	T <sub>1</sub> + T <sub>4</sub> (half dose of each)	88.00	30.33	203
T <sub>8</sub>	T <sub>2</sub> + T <sub>3</sub> (half dose of each)	95.33	30.66	205
T <sub>9</sub>	T <sub>2</sub> + T <sub>4</sub> (half dose of each)	98.66	34.33	203
T <sub>10</sub>	T <sub>3</sub> + T <sub>4</sub> (half dose of each)	89.33	44.33	213
T <sub>11</sub>	Untreated control	100.66	64.66	200

**Hyderabad**

Among the six biopesticides tested against spotted alfalfa aphid on lucerne, *Beauveria bassiana* was found to be better with 31.1% reduction over control at 3 DAS, 60.23% reduction over control at 7 DAS and 81.68% reduction over control at 12 DAS (Table PPT 18B).

Tr. No	Treatment foliar application
T <sub>1</sub>	Foliar application of <i>Nomuraea releyi</i> @ 1x10 <sup>8</sup> cfu/ml (5g/l)
T <sub>2</sub>	Foliar application of <i>Verticillium lecanii</i> @ 1x10 <sup>8</sup> cfu/ml (5g/l)
T <sub>3</sub>	Foliar application of <i>Beauveria bassiana</i> @ 1x10 <sup>8</sup> cfu/ml (5g/l)
T <sub>4</sub>	Foliar application of <i>Metarhizium anisopliae</i> @ 1x10 <sup>8</sup> cfu/ml (5g/l)
T <sub>5</sub>	Foliar application of <i>Bacillus thuringiensis</i> @ 2.5 g/l
T <sub>6</sub>	Foliar application of neem 1500 ppm@3ml/l
T <sub>7</sub>	Untreated control

**Table PPT 18B. Evaluation of entomopathogenic fungi for the management of aphids in lucerne after foliar application**

Treatments	Pre count	3 DAS		7 DAS		12 DAS		Mean no. of lady bird beetles/tiller
		Mean no. SAA/tiller	% reduction over control	Mean no. SAA/tiller	% reduction over control	Mean no. SAA/tiller	% reduction over control	
T <sub>1</sub>	45.4(6.77)	40.6(6.4)	16.20	29.13(5.44)	36.35	1.07(1.25)	67.09	3.27(1.94)
T <sub>2</sub>	45.73(6.8)	33.6(5.83)	31.12	18.27(4.31)	60.23	0.60(1.04)	81.68	3.33(1.96)
T <sub>3</sub>	46.6(6.85)	41.0(6.43)	17.52	32.53(5.73)	30.52	1.93(1.53)	42.17	3.27(1.94)
T <sub>4</sub>	38.47(6.23)	34.8(5.93)	15.20	30.20(5.5)	21.86	0.53(1.01)	80.76	2.80(1.82)
T <sub>5</sub>	38.8(6.22)	35.47(5.95)	14.30	31.47(5.58)	19.27	1.13(1.23)	59.33	2.53(1.74)
T <sub>6</sub>	43.67(6.64)	38.87(6.27)	16.56	34.20(5.89)	22.05	1.53(1.42)	51.08	2.80(1.82)
T <sub>7</sub>	42.87(6.58)	45.73(6.8)	--	43.07(6.6)	--	3.07(1.88)	--	3.13(1.90)
CD	NS	NS		0.95		0.39		NS

## Rahuri

At Rahuri, among the treatments *V. lecanii* and *M. anisopliae* alone and in combination with each other showed excellent control of aphids and recorded 7.60, 8.20 and 5.97 aphid per tiller respectively. Highest population of lady bird beetle grubs (3.41 grubs/tiller) was noticed on untreated control. However, all the entomopathogenic treatments did not show adverse effect on natural enemies. Treatment combination of *B. bassiana* and *N. releyi* was found significantly superior treatment for the control of *H. armigera*. It showed 1.07 larvae/m<sup>2</sup> on Lucerne. However, it was at par with *N. releyi* (1.40 larvae/ m<sup>2</sup>) and *B. bassiana* (1.66 larvae/ m<sup>2</sup>). The highest GFY was noticed in treatment combination of *V. lecanii* and *M. anisopliae* (144.29 q/ha). Nevertheless, it was at par with *V. lecanii* (141.15 q/ha) and *M. anisopliae* (140.17 q/ha). Similar trend of result was observed in DMY. Treatment combination of *V. lecanii* and *M. anisopliae* and *V. lecanii* and *M. anisopliae* alone recorded 23.09, 22.58 and 22.48 q/ha DMY and these treatment were at par with each other. The maximum ICBR recorded in treatment combination of *B. bassiana* and *N. releyi* (1:5.53).

Tr. No	Treatment foliar application	Tr. No	Treatment foliar application
T <sub>1</sub>	<i>Verticillium lecani</i> @ 1x10 <sup>8</sup> cfu/ml (5g/l)	T <sub>7</sub>	T <sub>1</sub> + T <sub>4</sub> (half dose of each)
T <sub>2</sub>	<i>Beauveria bassiana</i> @ 1x10 <sup>8</sup> cfu/ml (5g/l)	T <sub>8</sub>	T <sub>2</sub> + T <sub>3</sub> (half dose of each)
T <sub>3</sub>	<i>Metarhizium anisopliae</i> @ 1x10 <sup>8</sup> cfu/ml (5g/l)	T <sub>9</sub>	T <sub>2</sub> + T <sub>4</sub> (half dose of each)
T <sub>4</sub>	<i>Nomuraea releyi</i> @ 1x10 <sup>8</sup> cfu/ml (5g/l)	T <sub>10</sub>	T <sub>3</sub> + T <sub>4</sub> (half dose of each)
T <sub>5</sub>	T <sub>1</sub> + T <sub>2</sub> (half dose of each)	T <sub>11</sub>	Untreated control
T <sub>6</sub>	T <sub>1</sub> + T <sub>3</sub> (half dose of each)		

**Table PPT 18C: Influence of different entomopathogenic fungi on pest population, honey bees, yield and economics**

Treatment	No. of aphids/tiller		LBB /tiller	No. <i>H. armigera</i> larvae /m <sup>2</sup>		No. of honey bees & visits/ plot/ min		Yield (q/ha)			ICBR
	Pre count	7 DAS	7DAS	Pre count	7DAS	Visits	Bees	GFY	DMY	Seed	
T <sub>1</sub>	35.06 <b>5.96</b>	7.60 <b>2.84</b>	2.98 <b>1.86</b>	4.75 <b>2.29</b>	6.42 <b>2.63</b>	30.67	3.67	141.15	22.58	1.11	1:1.00
T <sub>2</sub>	33.33 <b>5.82</b>	19.57 <b>4.48</b>	1.62 <b>1.46</b>	5.18 <b>2.38</b>	1.66 <b>1.47</b>	29.67	3.67	127.87	20.46	1.44	1:4.57
T <sub>3</sub>	35.29 <b>5.98</b>	8.20 <b>2.95</b>	2.27 <b>1.66</b>	4.58 <b>2.25</b>	2.80 <b>1.81</b>	33.00	4.33	140.17	22.43	1.17	1:1.71
T <sub>4</sub>	34.25 <b>5.89</b>	20.27 <b>4.56</b>	2.28 <b>1.67</b>	5.20 <b>2.38</b>	1.40 <b>1.36</b>	30.33	4.67	132.24	21.16	1.46	1:5.13
T <sub>5</sub>	34.76 <b>5.94</b>	9.15 <b>3.10</b>	2.14 <b>1.62</b>	5.36 <b>2.41</b>	2.03 <b>1.59</b>	32.33	4.00	140.50	22.48	1.35	1:2.67
T <sub>6</sub>	32.30 <b>5.73</b>	5.97 <b>2.54</b>	2.18 <b>1.64</b>	5.39 <b>2.41</b>	3.65 <b>2.03</b>	31.33	3.67	144.29	23.09	1.12	1:0.71
T <sub>7</sub>	35.47 <b>6.00</b>	10.19 <b>3.27</b>	2.42 <b>1.71</b>	5.86 <b>2.52</b>	2.01 <b>1.58</b>	28.33	4.00	139.26	22.28	1.42	1:3.31
T <sub>8</sub>	33.10 <b>5.80</b>	11.38 <b>3.44</b>	1.84 <b>1.53</b>	6.18 <b>2.57</b>	2.01 <b>1.58</b>	27.67	3.33	139.17	22.27	1.40	1:3.09
T <sub>9</sub>	32.15 <b>5.71</b>	19.74 <b>4.50</b>	1.65 <b>1.46</b>	5.62 <b>2.47</b>	1.07 <b>1.25</b>	34.67	5.00	133.37	21.34	1.68	1:5.53
T <sub>10</sub>	37.18 <b>6.14</b>	9.57 <b>3.17</b>	2.34 <b>1.69</b>	6.00 <b>2.53</b>	1.98 <b>1.57</b>	24.33	3.33	139.05	22.25	1.42	1:3.27
T <sub>11</sub>	37.14 <b>6.14</b>	52.67 <b>7.29</b>	3.41 <b>1.98</b>	6.35 <b>2.62</b>	8.35 <b>2.97</b>	31.00	3.67	119.12	19.06	1.04	-
SE±	<b>0.17</b>	<b>0.10</b>	<b>0.03</b>	<b>0.14</b>	<b>0.08</b>	<b>3.27</b>	<b>0.46</b>	<b>1.8</b>	<b>0.29</b>	<b>0.06</b>	
CD 5%	<b>N.S.</b>	<b>0.29</b>	<b>0.09</b>	<b>N.S.</b>	<b>0.22</b>	<b>N.S.</b>	<b>N.S.</b>	<b>5.19</b>	<b>0.83</b>	<b>0.17</b>	

**Bold figures indicate transformed values of  $\sqrt{n+0.5}$**

T<sub>1</sub> = Foliar application of *V. lecanii* @ 4x10<sup>6</sup> cfu/ml (2g/l)

T<sub>2</sub> = Foliar application of *B. bassiana* @ 4x10<sup>6</sup> cfu/ml (2g/l)

T<sub>3</sub> = Foliar application of *M. anisopliae* 4x10<sup>6</sup> cfu/ml (2g/l)

T<sub>4</sub> = Foliar application of *N. releyi* 4x10<sup>6</sup> cfu/ml ( 2g/l)

**Table PPT 18 D: Incremental cost benefit ratio (ICBR) over control (T11)**

Treatment	Increased GFY over Control	Increased Seed yield over control	Value of GFY (Rs./ha)	Value of seed (Rs.)	Total cost of GFY & seed	Treat cost Rs	Net profit	ICBR
T <sub>1</sub>	22.03	0.07	4296.44	3500.00	7796.43	3900.00	3896.43	1.00
T <sub>2</sub>	8.75	0.40	1706.51	20000.00	21706.51	3900.00	17806.51	4.57
T <sub>3</sub>	21.06	0.13	4106.42	6475.00	10581.42	3900.00	6681.42	1.71
T <sub>4</sub>	13.13	0.43	2559.38	21333.33	23892.71	3900.00	19992.71	5.13
T <sub>5</sub>	21.39	0.31	4170.51	15666.67	19837.18	5400.00	14437.18	2.67
T <sub>6</sub>	25.18	0.09	4909.55	4333.33	9242.88	5400.00	3842.88	0.71
T <sub>7</sub>	20.14	0.39	3927.41	19333.33	23260.75	5400.00	17860.75	3.31
T <sub>8</sub>	20.05	0.36	3910.69	18166.67	22077.36	5400.00	16677.36	3.09
T <sub>9</sub>	14.26	0.65	2780.42	32500.00	35280.42	5400.00	29880.42	5.53
T <sub>10</sub>	19.94	0.38	3888.04	19166.67	23054.71	5400.00	17654.71	3.27

Green forage Rs. 195/ quintal

Seed Rs. 50000/quintal

**Table PPT 18 E: Cost of applications (in Rs)**

Treatment	Qty /spray	For 4 spray	Cost (Rs.)	Labour charges	Total cost
T <sub>1</sub>	2500 g	10.0 kg	1500	2400	3900
T <sub>2</sub>	2500 g	10.0 kg	1500	2400	3900
T <sub>3</sub>	2500 g	10.0 kg	1500	2400	3900
T <sub>4</sub>	2500 g	10.0 kg	1500	2400	3900
T <sub>5</sub>	2500+2500 g	10.0+10.0 kg	3000	2400	5400
T <sub>6</sub>	2500+2500 g	10.0+10.0 kg	3000	2400	5400
T <sub>7</sub>	2500+2500 g	10.0+10.0 kg	3000	2400	5400
T <sub>8</sub>	2500+2500 g	10.0+10.0 kg	3000	2400	5400
T <sub>9</sub>	2500+2500 g	10.0+10.0 kg	3000	2400	5400
T <sub>10</sub>	2500+2500 g	10.0+10.0 kg	3000	2400	5400
T <sub>11</sub>	-	-	-	-	-

Cost of all entomopathogenic fungi: Rs. 150/ kg

Labour + spray pump charges : Rs. 600/ha per spray

#### Dharwad

Incidence of aphid was noticed in the experimental block and before the start of an experiment the incidence was non-significant between the treatments. However, all the treatments significantly influenced the aphid incidence. Entomopathogenic fungi namely *Verticillium lecanii* @ 4x10<sup>6</sup> cfu/ml (2g/l) and *Beauveria bassiana* @ 4x10<sup>6</sup> cfu/ml (2g/l) and half dose of each were at par with each other and they were more effective than other entomopathogenic fungi in controlling the aphids (Table PPT 18E). However, treatments with *V.lecanii* or *B.bassiana* combined with *M.anisopliae* or *N.rileyi* also controlled the aphids. In this case, mortality of aphids was purely due to *V. lecanii* or *B. bassiana* and not due to either *M. anisoplea* or *N. rileyii*. This was evident in the sole treatment of *M.anisopliae* or *N. rileyii*. Both the fungi namely *M.anisopliae* or *N. rileyii* were not causing any mortality to aphids, however, these fungi can be used against beetle pests and lepidopteron pests respectively. Aphid incidence significantly influenced the green forage yield, dry matter yield and seed yield in lucerne. Highest green forage yield, dry matter yield and seed yield were recorded in *V.lecanii* and *B. bassiana* treated plots either sole or in combination. All the entomopathogens are absolutely safe and did not affect adversely on natural enemies especially predators of aphids as well as on pollinators of lucerne.

**Table PPT 18F. Evaluation of entomopathogenic fungi for the management of aphids in lucerne after foliar application**

Tr. No	Treatment foliar application	Pre count of aphids	Post count after 7 DAS	GFY (q/ha)	DMY (q/ha)	Seed yield (q/ha)
T <sub>1</sub>	<i>V. lecanii</i> @ 4x10 <sup>6</sup> cfu/ml (2g/l)	96.33	50.66	390.33	82.00	2.20
T <sub>2</sub>	<i>B. bassiana</i> @ 4x10 <sup>6</sup> cfu/ml (2g/l)	92.33	53.33	380.00	80.00	2.14
T <sub>3</sub>	<i>M. anisopliae</i> 4x10 <sup>6</sup> cfu/ml (2g/l)	98.00	82.00	322.33	78.66	1.80
T <sub>4</sub>	<i>N. releyi</i> 4x10 <sup>6</sup> cfu/ml (2g/l)	94.33	84.66	348.33	79.33	1.70
T <sub>5</sub>	T <sub>1</sub> + T <sub>2</sub> (half dose of each)	98.00	53.33	385.00	84.00	2.17
T <sub>6</sub>	T <sub>1</sub> + T <sub>3</sub> (half dose of each)	92.00	64.66	383.66	82.00	1.65
T <sub>7</sub>	T <sub>1</sub> + T <sub>4</sub> (half dose of each)	94.00	61.33	380.00	85.66	1.60
T <sub>8</sub>	T <sub>2</sub> + T <sub>3</sub> (half dose of each)	97.33	63.66	378.00	81.00	1.70
T <sub>9</sub>	T <sub>2</sub> + T <sub>4</sub> (half dose of each)	99.66	82.00	386.33	83.00	1.65
T <sub>10</sub>	T <sub>3</sub> + T <sub>4</sub> (half dose of each)	97.33	88.00	336.66	76.66	1.50
T <sub>11</sub>	Untreated control	95.00	92.66	333.33	64.00	1.40
CV		8.20	5.10	4.30	7.2	0.50
CD at 5%		NS	5.40	13.20	7.1	0.12

T<sub>1</sub> = Foliar application of *V. lecanii* @ 4x10<sup>6</sup> cfu/ml (2g/l)

T<sub>2</sub> = Foliar application of *B. bassiana* @ 4x10<sup>6</sup> cfu/ml (2g/l)

T<sub>3</sub> = Foliar application of *M. anisopliae* 4x10<sup>6</sup> cfu/ml (2g/l)

T<sub>4</sub> = Foliar application of *N. releyi* 4x10<sup>6</sup> cfu/ml (2g/l)

**Table PPT18G. Effect of entomopathogenic fungi on the predators of lucerne aphids**

Treatment	After first application		After second application	
	Pre count of predators	Post count of predators after 7 DAT	Pre count of predators	Post count of predators after 7 DAT
1	8.00	8.33	5.33	6.00
2	8.33	8.00	5.00	6.00
3	8.66	8.66	4.66	5.66
4	9.00	8.33	5.00	5.33
5	8.33	8.33	4.33	5.66
6	7.33	8.66	5.33	6.00
7	8.00	8.33	6.33	6.66
8	7.66	7.66	5.66	6.33
9	8.66	7.33	6.33	6.33
10	8.00	8.00	5.33	6.00
11	8.00	8.33	5.00	6.00
CV	6.70	5.60	6.10	5.45
CD at 5%	NS	NS	NS	NS
SEM±	2.35	1.80	1.65	1.50

**Table PPT18 H. Effect of entomopathogenic fungi on the pollinators (Lady bird grub/ tiller) of lucerne**

Tr. No	After first application		After second application	
	Pre count of pollinators	Post count of pollinators after 7 DAT	Pre count of pollinators	Post count of pollinators after 7 DAT
1	7.66	7.66	7.66	7.00
2	7.00	7.33	7.33	7.33
3	7.66	7.66	7.00	7.66
4	7.66	8.00	7.00	8.00
5	8.33	8.00	7.66	8.00
6	7.33	8.33	7.00	8.00
7	7.66	8.00	7.00	7.66
8	8.33	6.66	6.66	7.00
9	7.66	7.66	6.66	7.33
10	7.66	8.00	6.66	7.66
11	7.33	7.66	8.00	7.33
CV	6.50	6.20	6.70	6.20
CD at 5%	NS	NS	NS	NS
SEM±	1.40	1.80	1.70	1.50

**PPT 19: Management of soil borne diseases in clover seed crops**

**Locations: Ludhiana**

The experiment was conducted to manage soil borne diseases in the clover seed crop. Treatments are viz., T<sub>1</sub>: soil application of *Trichoderma* (5kg/ ha), T<sub>2</sub>: soil application of *Pseudomonas fluorescens* (5kg/ ha), T<sub>3</sub>: seed treatment with carbendazim (2 g/kg seed), T<sub>4</sub>: FYM (60 kg/ha), T<sub>5</sub>: neem seed powder (50 kg/ha), T<sub>6</sub>: spray of NSK (5 %) before disease appearance, T<sub>7</sub>: spray of carbendazim (0.1%), T<sub>8</sub>:untreated control. Results revealed that spray with carbendazim @ 1.0kg/ha gave the minimum stem rot incidence of 10.0 % followed by spray with NSKE@ 5% before disease appearance and application of neem seed powder @ 50kg/ha respectively with per cent incidence of 10.0 per cent in each treatment as compared to check with incidence of 20.0 % under natural conditions. Per cent incidence was at par in all the treatments. The increase in yield was also observed in these treatments.

**Table PPT19: Effect of soil, seed treatment, foliar spray on disease incidence & GFY on clover seed crop**

Treatments	Stem rot incidence (%)	Fodder yield (q/ha)
T <sub>1</sub> Soil application of <i>Trichoderma</i> (5kg/ ha)	11.67	840.04
T <sub>2</sub> Soil application of <i>Pseudomonas fluorescens</i> (5kg/ ha)	11.67	834.33
T <sub>3</sub> Seed treatment with carbendazim (2 g/kg seed)	15.00	821.77
T <sub>4</sub> FYM (60 kg/ha)	13.33	823.67
T <sub>5</sub> Neem seed powder (50 kg/ha)	10.00	857.18
T <sub>6</sub> Spray of NSK( 5 %) before disease appearance	10.00	875.46
T <sub>7</sub> Spray of carbendazim (0.1%)	10.00	896.02
T <sub>8</sub> Untreated control	20.00	807.68
<b>CD (P=0.05)</b>	<b>4.48</b>	<b>NS</b>

\*Due to severe attack of root rot in April, we could not get seed from the treated plots. More over seed yield was negligible.

**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. Treatments are viz., T<sub>1</sub> seed treatment with *Trichoderma* (5g/kg seed), T<sub>2</sub> :Seed treatment with carbendazim (2 g/kg seed), T<sub>3</sub> :T<sub>1</sub>+ Three foliar spray of *Trichoderma* (0.5%) , T<sub>4</sub>:T<sub>2</sub> + Three foliar spray of *Trichoderma* (0.5%), T<sub>5</sub>:T<sub>1</sub> + Three foliar spray of wettable sulphur (0.3%), T<sub>6</sub> :T<sub>2</sub> + Three foliar spray of wettable sulphur (0.3%), T<sub>7</sub> :T<sub>1</sub> + Three foliar spray of hexaconazole (0.1 %), T<sub>8</sub> :T<sub>2</sub> + Three foliar spray of hexaconazole (0.1 %), T<sub>9</sub> :T<sub>1</sub> + One spray each of *Trichoderma*, wettable sulphur and hexaconazole, T<sub>10</sub> :T<sub>2</sub> + One spray each of *Trichoderma*, wettable sulphur and hexaconazole, T<sub>11</sub> :Control. 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 (2.6%) and 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 (2.4%), however both the treatment gave with maximum seed yield (1.7 q/ha) as compared to control (60.5%) powdery mildew and (12.9%) soil borne diseases with (1.1 q/ha) seed yield.

**TABLE PPT 20: Effect of stem rot /root rot and powdery mildew in red clover seed crop**

Treatment		% severity or incidence		Yield (q/ha)
		Powdery mildew	Root rot/ stem rot	
T <sub>1</sub>	<i>Trichoderma</i> seed treatment (ST)	60.1	8.0	1.3
T <sub>2</sub>	carbendazim (ST)	52.5	4.7	1.4
T <sub>3</sub>	T <sub>1</sub> + Three foliar spray of <i>Trichoderma</i>	43.4	7.1	1.3
T <sub>4</sub>	T <sub>2</sub> + Three foliar spray of <i>Trichoderma</i>	38.9	4.3	1.5
T <sub>5</sub>	T <sub>1</sub> + Three foliar spray of wettable sulphur	19.6	6.8	1.5
T <sub>6</sub>	T <sub>2</sub> + Three foliar spray of wettable sulphur	17.4	3.3	1.5
T <sub>7</sub>	T <sub>1</sub> + Three foliar spray of hexaconazole	2.8	7.3	1.6
T <sub>8</sub>	T <sub>2</sub> + Three foliar spray of hexaconazole	2.6	3.0	1.7
T <sub>9</sub>	T <sub>1</sub> + One spray each of <i>Trichoderma</i> , wettable sulphur and hexaconazole	7.0	6.1	1.6
T <sub>10</sub>	T <sub>2</sub> + One spray each of <i>Trichoderma</i> , wettable sulphur and hexaconazole	6.6	2.4	1.7
T <sub>11</sub>	Untreated control	60.5	12.9	1.1
	CD (5%)	3.3	1.24	1.47

**PPT 21: MANAGEMENT OF FOLIAR DISEASES OF OAT**

**Locations:** Jhansi and Ludhiana

**Jhansi**

The trial comprised of 8 treatments viz., T<sub>1</sub>: Seed Treatment with Carbendazim 50 WP @ 2.0 g /kg of seed, T<sub>2</sub>: Seed Treatment with *Trichoderma viride* (CFU 10<sup>6</sup> / gm of formulation) 5 g /kg of seed, T<sub>3</sub>: Seed Treatment with *T. viride* (CFU 10<sup>6</sup> / gm of formulation) 5 g /kg of seed + foliar sprays of *T. viride* @ 0.5% at 21 DAS, T<sub>4</sub>: T<sub>1</sub> + Foliar application of Carbendazim 12 % + Mancozeb 63 % WP @ 1 g / lit after 21 DAS, T<sub>5</sub>: T<sub>2</sub> + Foliar application of Carbendazim 12 % + Mancozeb 63 % WP @ 1 g / lit after 21 DAS, T<sub>6</sub>: T<sub>1</sub> + Foliar application of Propiconazole 25 EC @ 1 ml / lit after 21 DAS, T<sub>7</sub>: T<sub>2</sub> + Foliar application of Propiconazole 25 EC @ 1 ml / lit after 21 DAS, T<sub>8</sub>: Untreated control. The results revealed that the disease was not so prone in all the treatments because of heavy rain in throughout the season.

Minimum (11.33 %) blight incidence due to *Helminthosporium avenae* was observed in T<sub>7</sub> (Seed treatment with *Trichoderma viride* + Foliar application of Propiconazole 25 EC after 21 DAS) as compared to untreated control (24.66%). Increase in both fodder and seed yield were also observed in these treatments.

**TABLE PPT21: Effect of foliar spray on leaf blight and Green fodder yield of Oat**

Treatments		Blight incidence (%)		Green fodder yield (q/ha)	
		Jhansi	Ludhiana	Jhansi	Ludhiana
T <sub>1</sub>	Seed treatment with Carbendazim	20.66	44.00	480	173.33
T <sub>2</sub>	Seed treatment with <i>Trichoderma viride</i>	18.33	45.33	470	163.33
T <sub>3</sub>	Seed treatment with <i>T. viride</i> + foliar sprays of <i>T. viride</i> at 21 DAS	21.33	42.33	450	178.33
T <sub>4</sub>	T <sub>1</sub> + Foliar application of Carbendazim 12 % + Mancozeb 63 % WP @ 1 g / lit after 21 DAS	22.33	38.00	500	191.67
T <sub>5</sub>	T <sub>2</sub> + Foliar application of Carbendazim 12 % + Mancozeb 63 % WP @ 1 g / lit after 21 DAS	19.23	40.00	490	181.67
T <sub>6</sub>	T <sub>1</sub> + Foliar application of Propiconazole 25 EC @ 1 ml / lit after 21 DAS	12.65	24.67	486	211.67
T <sub>7</sub>	T <sub>2</sub> + Foliar application of Propiconazole 25 EC @ 1 ml / lit after 21 DAS	11.33	27.33	516	205.00
T <sub>8</sub>	Untreated control	24.66	55.67	446	161.67

### Ludhiana

Minimum (24.67 %) blight severity was observed in T6 (Seed treatment with carbendazim 50WP@ 2.0) followed by T7 (Seed treatment with *Trichoderma viride* + Foliar application of Propiconazole 25 EC after 21 DAS) with severity of 27.33 per cent than check with per cent severity of 55.67. Both the treatments were at par with each other. Increase in both fodder and seed yield were also observed in these treatments.

## PPT 22: STUDIES ON BIOLOGICAL MANAGEMENT OF *SPODOPTERA LITURA* IN RELATION WITH DIFFERENT TIME OF APPLICATION ON LUCERNE UNDER FIELD CONDITIONS.

**Locations:** Rahuri and Hyderabad

The experiment was planned to study the effectiveness of entomopathogenic fungi in combination with SINPV against *S. litura* at different time of applications on lucerne crop. The experiment was conducted at two centres.

### Rahuri

During the crop period (Rabi-14-15 and summer-15) infestation of *S. litura* was not observed on the farm of AICRP on Forage Crops. Therefore, the spray treatments were not imposed to the crop. As and when the pests appear on crop, the spray treatments will be given and data of the same will be submitted

### Hyderabad

The experiment was conducted but due to *Spodoptera litura* incidence was not observed in the trial, data could not be recorded.

## PPT -23: Biological control of *Helicoverpa armigera* on Lucerne/ berseem seed crop.

**Locations:** Rahuri, Ludhiana and Hyderabad

### Rahuri

During the Rabi 2014, an experiment was initiated with 2 entomopathogenic fungi viz., *B. bassiana* and *N. releyi* and *Ha NPV* alone and in combination with each other for the control of *H. armigera* on Lucerne seed crop.

**H. armigera:** Among the different treatments the combination of *B. bassiana* and *N. releyi* and *HaNPV* ( $T_1+T_2+T_3$ ) recorded significantly lower number of larvae per square meter at 5 (1.60) and 7 (0.00) days after treatment. Next promising treatments in order to their merits were *N. releyi* + *HaNPV* (0.45 larva/m<sup>2</sup>) and *B. bassiana* + *HaNPV* (0.55 larva/m<sup>2</sup>).

**Effect of biopesticides on honey bees:** All the biopesticides were found safe to honey bees it does not affect the activities of bees on Lucerne seed crop. The results in respect of number of honey bees and bee visit per minute were found non significant.

**Seed yield:** The highest seed yield (1.87 q/ha) was recorded in treatment combination of *B. bassiana* and *N. releyi* and *HaNPV* ( $T_1+T_2+T_3$ ) except treatment combination of *N. releyi* and *HaNPV* (1.78 q/ha) which were at par with each other.

**Economics:** The maximum ICBR recorded due to treatment combination of *N. releyi* (T2) and *HaNPV* (T3). The ICBR due to this combination was 1:9.89.

### Ludhiana

The results revealed that the number of *H. armigera* larvae before spray varied non-significantly in all the treatments (Table 23). Among the biopesticides evaluated, treatments  $T_2$  and  $T_3$  recorded lower mean number of *H. armigera* larvae per m row length at 5 and 7 days after spray (DAS). However, treatment  $T_7$  (indoxacarb 15.8 EC @ 500 ml/ha) recorded lowest mean number of *H. armigera* larvae per m row length. The number of honeybees per plot before as well as after 18h of treatment varied non-significantly in all the treatments. Among the biopesticide treatments,  $T_6$  recorded the highest seed yield.

**Table PPT 23. Bioefficacy of microbial biopesticides against *H. armigera* on berseem seed crop**

Treatment	Number of <i>H. armigera</i> larvae per m row length			Number of honeybees per plot		Seed yield (kg/ha)
	Before spray	5 DAS	7 DAS	Before spray	18h after spray	
T <sub>1</sub>	10.33	8.66 (3.10)	8.33 (3.05)	7.33	7.00	211
T <sub>2</sub>	10.33	9.00 (3.16)	7.66 (2.94)	7.66	7.33	207
T <sub>3</sub>	10.00	8.66 (3.10)	7.66 (2.94)	8.33	7.66	218
T <sub>4</sub>	10.66	9.00 (3.16)	8.66 (3.10)	8.33	8.00	209
T <sub>5</sub>	10.00	8.66 (3.10)	8.00 (3.00)	8.66	8.00	207
T <sub>6</sub>	11.66	8.33 (3.05)	8.66 (3.10)	7.66	7.33	223
T <sub>7</sub>	11.33	0.33 (1.13)	0.66 (1.27)	8.00	8.00	240
T <sub>8</sub>	10.66	14.44 (3.91)	14.66 (3.95)	9.33	9.33	164
CD (5%)	NS	(0.24)	(0.19)	NS	NS	6

Figures in parentheses are the transformed  $\sqrt{n+1}$  values

T <sub>1</sub>	Foliar application of <i>B. bassiana</i> @ 1X10 <sup>8</sup> CFU/g (5 g/lit)
T <sub>2</sub>	Foliar application of <i>N. releyi</i> @ 1X10 <sup>8</sup> CFU/g (5 g/lit)
T <sub>3</sub>	Foliar application of <i>HaNPV</i> @ 1ml/lit
T <sub>4</sub>	T <sub>1</sub> +T <sub>3</sub> ( <i>B. bassiana</i> @ 1X10 <sup>8</sup> CFU/g (5 g/lit) + <i>HaNPV</i> @ 1ml/lit)
T <sub>5</sub>	T <sub>2</sub> +T <sub>3</sub> ( <i>N. releyi</i> @ 1X10 <sup>8</sup> CFU/g (5 g/lit) + <i>HaNPV</i> @ 1ml/lit)
T <sub>6</sub>	T <sub>1</sub> +T <sub>2</sub> +T <sub>3</sub> ( <i>B. bassiana</i> @ 1X10 <sup>8</sup> CFU/g (5 g/lit) + <i>N. releyi</i> @ 1X10 <sup>8</sup> CFU/g (5 g/lit) + <i>HaNPV</i> @ 1ml/lit)
T <sub>7</sub>	Indoxacarb 15.8 EC @ 500 ml/ha (standard check)
T <sub>8</sub>	Untreated control

### Hyderabad

*Helicoverpa armigera* incidence was not observed in the trial.

## Breeder Seed Production in Forage Crops (Rabi-2014-15)

In Rabi 2014-15, the indent for Breeder Seed Production was received from DAC, GOI for 25 varieties in three forage crops viz., Oat (10), Berseem (12) and Lucerne (3). The quantity allocated was 328.28 q and it was assigned to ten Breeder Seed producing centres of the different SAUs/ NGO/ ICAR institutes. Among quantity indented for different forage crops, the maximum was for Oat (282.65 q) followed by Berseem (41.25 q) and Lucerne (4.4 q).

The final Breeder Seed Production Report (BSP-IV) received from different seed producing centres revealed that in crops such as Berseem, Oat and Lucerne, the overall breeder seed production was less than the allocated quantity due to intermittent rain during flowering (IGFRI, Jhansi), at maturity (GBPUA&T, Pantnagar) and crop lodged by heavy rain and high wind velocity.

Crop wise scenario reveals that as compared to allocation in the Berseem, the production was 40.94 q (0.16 q deficit). In Oat, the production was 216.15 q (66.5 q deficit) against the allocation of 282.65 q. Similarly in Lucerne, there were 2.75 q deficit in production with respect to 4.4 q allocation. The overall breeder seed production was 69.54 q (21.18 per cent) less as evident from seed production of 258.74 q against the indent for 328.28 q (Table BSP 1 & 2). Some of the reasons for less production of breeder seed in certain varieties were due to damage of crops due to intermittent rains at flowering and attack of insect-pests (Table BSP 2).

**Table BSP 1: Centre-wise Breeder Seed Production (q) Rabi-2014-15**

S. N.	Location	Crop	Variety	Year of notification	DAC Indent	Allocation (BSP-1) target	Actual production (BSP IV)	Production Surplus/ Deficit
1	PAU, Ludhiana	Berseem	BL-42	2007	11.78	11.78	12.0	(+) 0.22
			BL-180	2006	2.0	2.0	2.0	-
			BL-10	1985	13.4	13.4	13.5	(+) 0.1
			BL-1	1978	4.0	4.0	4.5	(+) 0.5
		Oat	OL-10	2014	1.0	1.0	1.0	-
			Kent	1975	197.9	51.0	52.0	(+) 1.0
2	MPKV, Rahuri	Oat	RO-19	2007	5.0	5.0	4.4*****	(-) 0.6
		Lucerne	RL-88	1996	0.1	0.1	-	-
3	BAIF, Urulikanchan	Oat	Kent	1975	197.9	20.0	22.5	(+) 2.5
4	AAU, Anand	Lucerne	AL-3	1995	0.7	0.7	0.15**	(-) 0.55
			Anand-2	1984	3.6	3.6	1.5**	(-) 2.1
		Oat	Kent	1975	197.9	15.0	15.0	-
5	GBPUAT, Pantnagar	Oat	UPO-212	1990	3.75	3.75	2.5*****	(-) 1.25
6	IGFRI, Jhansi	Berseem	BB-3	2001	4.5	4.5	0.3**	(-) 4.2
			BB-2	1997	1.0	1.0	0.12**	(-) 0.88
			Wardan	1982	1.3	1.3	0.34**	(-) 0.97
		Oat	JHO-2000-4	2006	20.0	20.0	3.0***	(-) 17.0
			JHO-99-2	2005	12.0	12.0	14.5	(+) 2.5
			JHO-882	1989	12.0	12.0	18.7	(+) 6.7
			Kent	1975	197.9	111.9	47.25***	(-) 64.65
7	CCS HAU, Hisar	Berseem	HB-2	2014	1.0	1.0	3.18	(+) 2.18
			Mescavi	1975	0.15	-	-*	-
		Oat	OS-6	1982	20.0	20.0	22.0	(+) 2.0
			HJ-8	1998	8.0	8.0	8.3	(+) 0.3
8	JNKVV, Jabalpur	Berseem	JB-5	2005	1.0	1.0	1.0	-
			JB-1	1982	1.0	1.0	4.0	(+) 3.0
9	IARI,RRS, Karnal	Berseem	Pusa Giant	1975	0.10	0.10	Nil****	(-) 0.10
10	SKUAST, Srinagar	Oat	Sabzaar	2005	3.0	3.0	5.0	(+) 2.0
<b>Total</b>					<b>328.28</b>	<b>328.28</b>	<b>258.74</b>	<b>(-) 69.54</b>

\* Carry over, \*\*Delay sowing due to weather & intermittent rain fall at flowering, \*\*\*Delay sowing due to weather, \*\*\*\*Nucleus Seed not available, \*\*\*\*\*lodging of the crops, \*\*\*\*\*Attack of insect pest and flash rains at maturity

**Table BSP 2: Variety-wise Breeder Seed Production (q) Rabi 2014-15**

S. N.	Name of Variety	Year	DAC Indent	Allocation (BSP-1) target	Actual production (BSP IV)	Production Surplus/ Deficit
1	<b>Berseem</b>					
	BL-42	2007	11.8	11.8	12.0	(+) 0.22
	BL-180	2006	2.0	2.0	2.0	-
	BL-10	1985	13.4	13.4	13.5	(+) 0.1
	BL-1	1978	4.0	4.0	4.5	(+) 0.5
	BB-3	2001	4.5	4.5	0.3	(-) 4.2
	BB-2	1997	1.0	1.0	0.12	(-) 0.88
	Wardan	1982	1.3	1.3	0.34	(-) 0.97
	HB-2	2014	1.0	1.0	3.18	(+) 2.18
	Mescavi	1975	0.15	-	-	-
	JB-5	2005	1.0	1.0	1.0	-
	JB-1	1982	1.0	1.0	4.0	(+) 3.0
	Pusa Giant	1975	0.1	0.1	Nil	(-) 0.10
	<b>Total</b>		<b>41.25</b>	<b>41.1</b>	<b>40.94</b>	<b>(-) 0.16</b>
2	<b>Oat</b>					
	OL-10	2014	1.0	1.0	1.0	-
	Kent	1975	197.9	197.9	136.75	(-) 61.15
	RO-19	2007	5.00	5.0	4.4	(-) 0.6
	UPO-212	1990	3.75	3.75	2.5	(-) 1.25
	JHO-2000-4	2006	20.0	20.0	3.0	(-) 17.0
	JHO-99-2	2005	12.0	12.0	14.5	(+) 2.5
	JHO-882	1989	12.0	12.0	18.7	(+) 6.7
	OS-6	1982	20.0	20.0	22.0	(+) 2.0
	HJ-8	1998	8.0	8.0	8.3	(+) 0.3
	Sabzaar	2005	3.00	3.00	5.0	(+) 2.0
	<b>Total</b>		<b>282.65</b>	<b>282.65</b>	<b>216.15</b>	<b>(-) 66.5</b>
3	<b>Lucerne</b>					
	RL-88	1996	0.10	0.10	-	-
	AL-3	1995	0.70	0.70	0.15	(-) 0.55
	Anand-2	1984	3.6	3.6	1.5	(-) 2.1
	<b>Total</b>		<b>4.4</b>	<b>4.4</b>	<b>1.65</b>	<b>(-) 2.75</b>

## Forage In-house Breeding Activities-Rabi-2014-15

### AICRP FC&U, AAU, Anand

#### New collections during last six months

SN	Crop	Total numbers	Source
1	Sorghum	4	NAU, Navsari
2	Maize	18	AAU, Godhra
3	<i>Clitoria</i>	13	Anand & Kheda district

#### Maintenance of germplasm: Lucerne – 205

#### Lucerne: Contribution of entry in AICRP trial:

SN	Crop	Entry	AICRP trial
1	Lucerne	Anand-26	IVTLA-2014
2	Lucerne	Anand-25	IVTLP-2013

#### New crosses made: 12

SN	Cross combination	SN	Cross combination
1	Anand-2 x AL-3	7	AL-3 x BAIF-1
2	Anand-2 x AL-4	8	AL-3 x Alamdar
3	Anand-2 x RL-88	9	AL-3 x AL-4
4	Anand-2 x Alamdar	10	RL-88 x Alamdar
5	Anand-2 x SS-627	11	RL-88 x AL-3
6	Anand-2 x BAIF-1	12	RL-88 x AL-4

**New poly cross programme started using five genotypes:** AL-3; AL-4; RL-88; Alamdar-51 and Anand-2. Polycross seed harvested (25 plants) and will be grown during Rabi 2015-16.

#### Segregating materials

- Ten F<sub>2</sub> plant progenies were grown, selfed after selection (25 plants) and seed harvested for next generation.
- Ten F<sub>3</sub> plant progenies were grown and thirty plants were selected and seed harvested for next generation.
- Seventeen plants (from 25 best progenies) were evaluated and superior high yielding progenies were selected.

**Maize: New crosses (17)** were made for desirable traits including high forage yield with quality

SN	Cross combination	SN	Cross combination
1	GWC-27 x I-07-66-1-1	10	African Tall x GWC-0320
2	I-07-66-1-1 x GWQPM-68-3	11	African Tall x GWC-0803
3	GWC-0807 x GWC-0609	12	African Tall x GWC-0609
4	GWC-0609 x GWC-0608	13	African Tall x GWC-0608
5	GWC-0608 x GWC-0511	14	African Tall x GWC-0511
6	GWC-0511 x GWC-0324	15	African Tall x GWC-0324
7	African Tall x GWC-27	16	African Tall x GWC-0400
8	African Tall x I-07-66-1-1	17	African Tall x Local Godhra
9	African Tall x GWQPM-68-3		

#### Segregating materials

- Ten F<sub>1</sub> were grown, selfed and harvested for next generation
- Twenty F<sub>3</sub> plant progenies were raised and 31 plants were selected for next generation.

#### Breeder seed production (Quintal)

- Oat var Kent : 25 {15 (ICAR) + 10 (State)}
- Lucerne var Anand-2 : 2 AL-3: 0.4

## AICRP FC&U, SKRAU, BIKANER

Main breeding work at Bikaner centre is during *Kharif* season for range grasses and pearl millet. In Rabi season, Lucerne has been assigned as mandate crop for Bikaner centre in the 12<sup>th</sup> Plan.

- **Variety development:** One Lucerne variety RRB-07-1 (Krishna) developed from Bikaner centre was identified for release for North West zone of the country in 2014. National Identity Number IC 612177 has been obtained from NBPGR, New Delhi for this variety.
- **Breeding work:** Seeds obtained from poly crosses made during Rabi-2013-14 were evaluated during Rabi-2014-15. Superior plants were selected to make better composite population. New poly crosses were made among seven selected entries of Lucerne. Seed harvested from such crosses will be evaluated in Rabi-2015-16. 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 multiplied to take its seed production on a large isolated area in future for distribution to farmers.

## AICRP FC&U, GBPUA&T, Pantnagar

**OAT (*Avena sativa* L.)**

**Germplasm Evaluation:** Three hundred five oat germplasm lines comprising indigenous, exotic and improved genetic stocks have been evaluated during the season.

**Hybridization Nursery:** To achieve the target set out as per the oat breeding objectives, a crossing nursery comprising selected genetic donors/parents identified during the previous season was raised and the following new crosses were made:

**New F<sub>1</sub> crosses:**

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 Suian)-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 246122
10. EC 246207 x EC 246190

**Multiplication of Promising Lines:** Nine promising advanced breeding lines and the entries already in the National Coordinated and other State trials were multiplied.

**Nucleus and Breeder Seed Production:** Nucleus seed of twelve advance generation promising oat lines viz., UPO-06-1, UPO -06-2, UPO-09-1, UPO -09-2, UPO-09-3, UPO-05-1, UPO-10-1, UPO-10-2, UPO-10-3 AND UPO-11-1 including the released oat varieties UPO 212 and UPO 94 were produced during Rabi 2014-15. Breeder seed production of multi cut oat variety UPO 212 (2.50 q) was also under taken as per the BSP-I indent.

## AICRP FC&U, BAU, Ranchi

**Lathyrus:** Local germplasm (8) were collected from different villages of Jharkhand and maintained

**Oat:** Maintenance of F<sub>1</sub> Generation in oat

**Station Trial**

- One Lathyrus Trial-7 entries were evaluated against 2 checks Mahotora and Nirmal.
- One Oat Trial-8 Entries were evaluated against 2 check Kent and Os-6

**Multiplication of seeds:** Oat, Berseem & Lathyrus

## AICRP FC&U, SKAUST, Srinagar

### Oats:

**Evaluation of segregating generation:** F<sub>4</sub> families of following crosses were evaluated and selections were made among families for further evaluation.

SN	Cross Combinations
1	SKO-208 x SKO-204
2	SKO-211 x SKO-205
3	SKO-211 x SKO-204
4	SKO-211 x SKO-210
5	SKO-207 x Sabzaar
6	SKO-212 x SKO-209
7	SKO-207 x SKO-205
8	SKO-212 x SKO-204
9	SKO-210 x SKO-207
10	SKO-205 x SKO-204
11	SKO-207 x SKO-204
12	SKO-208 x SKO-205

### Selections from segregating generations:

S. N.	Segregating generations	No. of individual plant selected
1	F <sub>6</sub> (6 crosses)	19 families
2	F <sub>7</sub> (4 crosses)	9 families

### Barley

- Five advanced breeding lines were selected from 12 dual purpose (fodder and grain) barley lines on the basis of fodder yield, grain yield and reaction to Yellow Rust evaluated at three locations during rabi 2014-15. These will be evaluated again during rabi 2015-16 on bigger plot sizes (300sq. metres each) to confirm their yield potential and reaction to diseases.

### Alfalfa

- Alfalfa (*Medicago falcata*) accessions collected from Drass area of Ladakh gave a satisfactory forage yield performance at MLRI-Manasbal and opened opportunities of cultivating *M. falcata* under temperate climatic conditions of Kashmir valley. In view of success of *M. falcata* under valley conditions, more germplasm collections were to be made from Drass area of Ladakh during 2014, but due to devastating floods in the valley during September 2014 the collection programme could not be undertaken and will be taken up during August 2015, for initiating a population improvement programme.

## AICRP FC&U, IGKV, Raipur

### Germplasm collection:

**Oat:** Sixteen lines collected from different parts of the country.

**Cowpea:** Twenty six lines collected from Durg, Dongargarh, Korla, Rajnandgaon, Kanker Kondagaon, Jagdalpur, of Chhatisgarh and other parts of India.

**Crosses Attempted During Rabi 2014:** Four cross combinations were attempted

- IOC 2014 6 1 x IOC 2014 6 4
- IOC 2014 6 4 x IOC 2014 - 14
- IOC 2014 6 4 x IOC 2014 - 12
- IOC 2014 6 4 x IOC 2014 6 8

## AICRP FC&U, Mandya

### Cowpea:

- Out of 40 F<sub>2</sub> Populations, 24 lines were selected and advanced for F<sub>3</sub> generation.
- Sixteen advanced breeding lines of cowpea seeds were multiplied.

### Maize:

- 98 advanced breeding lines of fodder Maize were advanced to S-8 cycle.
- Under High Oil corn Maize project, eight lines of Maize genotypes were received from NBPGR, New Delhi and multiplied and some of the crosses were attempted.

1	DMHCOC4
2	High oil population line
3	QPMC13BBB66BB
4	HKItalar
5	ICRISAT high oil-279
6	O2POOL33C23
7	SHD-IER6
8	TEM TROP high oil QPM

Cross combinations attempted during *Rabi* and will be evaluated during *Kharif* for desired attributes.

1	DMSC-16 X Madhuri	11	HKI- 193-1 X HOP
2	DMSC-16 X HOP	12	HKI- 193-1 X DMSC-16
3	HKI-162 X DMSC-16	13	HKI PC-413 X HKI PC-7
4	HKI-162 X HOP	14	HKI-209 X HKI-577
5	HKI-1040-5 X DMSC-16	15	HKI-209X DMSC-16
6	HKI-164 X Madhuri	16	HKI-485 X Madhuri
7	HKI-164 X HRI 193-1	17	DMHOC-15 X DMSC-16
8	HKI-193-1 X Madhuri	18	HKItalar X DMSC-16
9	HKI-193-1 X KRI-577	19	HOP X DMSC-16 (Reciprocating)
10	HKI- 193-1 X KRI-164		

## AICRP FC&U, NDU&T, Faizabad

Germplasm collection, evaluation & maintenance

SN	Crop	New collections	Sources of collection	Total collections
1.	Oat	10	Local collections from Barabanki, Ghazipur, Raebareli & Sultanpur Distt.	180
2.	Berseem	04	Local collections from Barabanki, Ghazipur, Raebareli & Sultanpur Distt	38

### Breeding Programme in oat

Sixteen new crosses were made during *Rabi* 2014-15 (Oat):

S.N.	Cross combinations	S.N.	Cross combinations
1	NDO1 x <i>A. sterilis</i>	9	Sabzaar x <i>A. sterilis</i>
2	NDO1 x LC-6	10	Sabzaar x LC-6
3	NDO1 x LC-7	11	Sabzaar x LC-7
4	NDO2 x <i>A. sterilis</i>	12	JHO851 x <i>A. sterilis</i>
5	NDO2 x LC-6	13	JHO851 x LC-6
6	NDO2 x LC-7	14	JHO851 x LC-7
7	NDO10 x <i>A. sterilis</i>	15	RO-19 x <i>A. sterilis</i>
8	NDO10 x LC-6	16	RO-19 x LC-6

Segregating generations: F<sub>1</sub>: 16; F<sub>2</sub>: 11; F<sub>3</sub>: 14; F<sub>4</sub>: 16; F<sub>5</sub>: 10; F<sub>6</sub>: 7; **Advance lines: 10**

## AICRP FC&U, MPKV, Rahuri

**Polycross programme of Lucerne:** The poly cross programme was initiated from *Rabi*-2011-12 onwards. The details of parental lines included in the programme are as follow:

Code No.	Contributing centre	Entry
A	Anand	Anand-24
B	Anand	AL-3
C	Coimbatore	TNFD-118
D	Urlikanchan	BAIF- Lucerne-1
E	Rahuri	RLG-08-01

### Lucerne Poly cross programme:

**During summer 2014,** The promising plants in selected progenies were allowed to random mate by open pollination. The OP seed of selected promising plants (40-50) was harvested individually.

**During Rabi 2014-15,** The OP seed of 25 IPS were sown in a single row of 3m length spaced at 30 cm for progeny test (December, 2014). The 25 progenies will be evaluated for GFY, DMY and pest/disease resistance.

### Crossing programme in oat:

In Rabi 2014-15,  $F_1$  of the crosses made in Rabi 2013-14 [Kent X RO-2013-1 and Kent X RO-2013-2] were grown and harvested in bulk

### Hybridization: Sorghum X Sudan Grass

Female (Sorghum)	Male (Sudan)	
1. Ruchira	1. IS-3323	4. IS 3201
2. Phule Amruta	2. IS 3225	5. IS 3261
3. Phule Godhan	3. IS-3309	6. IS 3277

**Hybridization:** During Rabi 2014-15, crosses were attempted in following combinations: Ruchira X IS 3277; Ruchira X IS 3225 ; Ruchira X IS 3261; Ruchira X IS 3309 ; P. Amruta X IS 3277; P. Amruta X IS 3225 ;P. Amruta X IS 3261; P. Amruta X IS 3309; P. Godhan X IS 3277; P. Godhan X IS 3225; P. Godhan X IS 3261; P. Godhan X IS 3309.

### Evaluation of Lucerne germplasm:

During summer, 2014, total 33 local germplasm (RLG-2014-1 to RLG-2014-33) was collected from farmer's field. The germplasm were sown on 12.12.14 along with check in augmented block design. Plot size- 3.00 x 1.20 m, Spacing- 30 cm, Fertilizer- N (20 kg),  $P_2O_5$  (80 kg). Five cuts were taken on 20.3.15, 16.04.15, 16.05.15, 06.06.15 and 26.06.15. The green fodder yield from a total of five cuts varied from 333.2 to 665.3 qt/ha.

## AICRP FC&U, AAU, Jorhat

**Seed multiplication of Maize composites:** The work on development of forage composite maize variety is in progress. During *Rabi* 2014-15 seed multiplication of selected plants was done.

**Ricebean germplasm:** Seventy one rice bean germplasm were evaluated and 10 entries were found better than check entries in respect of GFY, DMY and CP (%). These entries were found suitable for *rabi* season.

**Lathyrus germplasm:** Eighteen newly collected germplasm were evaluated along with 15 existing germplasm. Promising entries were selected on the basis of GFY, DMY, plant height, CP (%).

## AICRP FC&U, OUAT, Bhubaneswar

**Hybridization:** Thirteen crosses developed in rice bean were evaluated for their performance in F<sub>2</sub> generation in *Kharif*-2011. Thirty five single plants selected on the basis of observation on the different fodder traits were grown in F<sub>3</sub> generation in *Kharif*-2012. Single plants were selected from F<sub>3</sub> generation in *Kharif*-2012. The F<sub>4</sub> generation was grown in *Kharif*-2013 and F<sub>5</sub> in *Kharif*-2014. F<sub>6</sub> generation will be grown in *Kharif*-2015.

## AICRP FC&U, KAU, Vellyani

### Guinea grass

**Plant height: Genotypic variation was observed** in second and fifth cuts. In second cut, GG culture (T<sub>3</sub>) recorded higher plant height (117.05 cm) followed by the culture GG-08-04 (T<sub>1</sub>). In the fifth harvest, GG-08-04 (T<sub>1</sub>) recorded a higher plant height of 174 cm.

**Number of tillers:** Variation was observed in fourth and fifth cuts. In the fourth cut, GG culture (T<sub>3</sub>) recorded highest number of tillers (37) which was at par with GG-08-04 (T<sub>1</sub>), GG-08-01 (T<sub>2</sub>) and Harithasree (T<sub>4</sub>). In the fifth cut also GG- culture (T<sub>3</sub>) recorded higher number of tillers (36) which was at par with GG-08-04 (T<sub>1</sub>) and Harithasree (T<sub>4</sub>).

**Green fodder yield:** Significantly higher green fodder yield was recorded by GG-08-04 in fourth (235.93 q ha<sup>-1</sup>) and fifth cut (192.64 q ha<sup>-1</sup>).

**Induced mutation for delayed flowering and high tillering in guinea grass:** The evaluations of 39 accessions have been completed and the data is being analyzed statistically.

### Hybrid Napier

**Plant height:** Significantly higher plant height (167.07 cm and 215.33 cm) was recorded by NB-08-11 (T<sub>1</sub>) in first and fourth cut respectively and it was at par with NB-09-08 (T<sub>2</sub>) in the first cut.

**Number of tillers:** Cultures had no significant influence on number of tillers in all harvests.

**Green fodder yield:** Significantly higher green fodder yield was recorded by the culture NB-08-11 (T<sub>1</sub>) in all the cuts and was at par with NB-08-02 (T<sub>3</sub>) and NDFB-17x FD-479 (T<sub>6</sub>) in the fourth cut.

### Cowpea

#### Evaluation of F<sub>1</sub> generation of cowpea crosses for yield and late flowering

The evaluation of 11 crosses is going on.

## AICRP FC&U, Coimbatore

**Poly cross breeding programme in Lucerne:** Based on the green fodder yield data recorded for six harvests over 62 progenies, 41 most promising individual plants were identified, tagged, numbered and allowed for seed production during summer 2014. The green fodder yield potential of progenies ranged from 49.16 t/ha in BAP-5 and BBP-3 to 65 t/ha in BLP-2 with a mean of 54.2 t/ha.

The OP seed of selected promising plants (41) were harvested individually and were sown during *Rabi* 2014-15 in a single row of 3 m length spaced at 30 cm for progeny test.

**Future plan of work:** On the basis of green fodder and dry matter yield, pest / disease resistance data, best progenies will be selected out of 41 progenies during August-September 2015. The mother plants of those selected progenies will be vegetative 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 Fodder cowpea and Lucerne

**Seed multiplication of advanced cultures viz., TNFC 0924 and TNFC 0926** have been taken up during summer 2015 further promotion.

## AICRP FC&U, CSKHPKV, Palampur

### Germplasm collected during the period

Crop	Source of collection	Number
White Clover	Different parts of Kangra District	10

### Germplasm Holding

Crop	No. of collections
Tall Fescue Grass ( <i>Festuca arundinacea</i> )	58
Rye Grass ( <i>Lolium perenne</i> )	8
Red Clover ( <i>Trifolium pratense</i> )	9
White Clover ( <i>Trifolium repens</i> )	38
Oat ( <i>Avena</i> spp.)	135

One hundred and thirty five genotypes of oat were evaluated for forage yield and powdery mildew resistance. Genotypes JPO 46, EC 528865, EC 528883 and EC 528898 were found superior for forage yield and related traits.

### Generation of breeding material

#### Oat

- 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 400 breeding lines have been selected. Promising entries developed through hybridization programme were evaluated in the multi locational station trials. Entry PLP 14 is under evaluation in coordinated trials in AVT-II in Central Zone.
- Mapping populations have been developed to identify molecular markers linked to powdery mildew resistance. Resistant and susceptible parents were screened for polymorphic survey.

#### Tall Fescue Grass

- Poly cross progenies are under evaluation.
- Mean performance of 32 elite genotypes against checks revealed that genotypes Hima-3 and EC-178181 were superior for most of the traits. Genetic diversity on the basis of D<sup>2</sup> statistic, RAPD and SSR markers revealed genetic polymorphism among 50% genotypes. Maximum diversity was observed for genotypes Hima-4, Sel.-8, Hima-1, Sel.-49, Sel.-85, Sel.-88, EC-178181, Hima-3 and Sel.-48. These genotypes can 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. Three entries will be contributed in coordinated programme.

#### White clover

- Three populations namely, PWC-3, PWC-22 and PWC- 25 are under evaluation.

#### Red clover

- Restricted Recurrent Phenotypic Selection has been taken up for developing superior populations.

## AICRP FC&U, CCS HAU, Hisar

### Varieties released and notified:

- **Forage sorghum variety HJ-541** 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 has exhibited 12.8% and 5.2% increase over the checks HC 308 for green and dry fodder yield, respectively.
- **Berseem Variety HB-2** has been released and notified by Central Sub-committee 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). GFY 6 750-800q/ha.
- **Oat variety OS-377** has been released and notified by Central sub-committee for Central Zone (UP, Maharashtra, Gujarat, Chhattisgarh and MP) vide SO 268 (E) dated **28.1.2015**. It is suitable for timely sown, irrigated and single cut system. Green and fodder production potential is 537q/ha and 122q/ha respectively. It has better nutritional qualities and is moderately resistant to Leaf Blight disease. It is also bold seeded with yield of 25q/ha.

### Variety Identified:

- New Variety **CENTRAL OATS OS-403** of Fodder Oats has been identified for North East and South zones of the country in the Varietal Identification Committee meeting held at PJSTAU, Hyderabad from April 17-18, **2015** for cultivation in the North East (Assam, Manipur, Odhisha, West Bengal, Eastern UP, Bihar, Jharkhand) and South zone (Telengana, Andhra Pradesh, Karnataka and Tamil Nadu) under irrigated conditions during *rabi* season.

**Research projects submitted:** Development of oat (*Avena sp.*) genotypes with higher yield and nutritive value [PI: Dr. Yogesh Jindal, Co-PI: Dr. U.N. Joshi]. Concept Note approved by Ministry of Agriculture, DAC, Govt. of India under National Food Security Mission. Revised project submitted.

### Berseem:

**Collection, maintenance and evaluation of germplasm:** Germplasm holding 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 *viz.*, Large Scale Trial (LST), Small Scale Trial (SST), Progeny Row Trial (PRT) on berseem were conducted with 8,8, and 16 genotypes respectively with four checks *viz.*, Wardan, Mescavi, HB-1 and HB-2.

**Mutation breeding in berseem** - creation of genetic variability using chemical mutagen EMS.

**M<sub>1</sub> generation:** Three doses of EMS (0.1%, 0.3% and 0.5%) were given to dry seeds of HB 1, HB 2 and Mescavi. Treated and untreated seeds (100 in each treatment) were sown immediately in the field to raise the M<sub>1</sub> generation.

**Selection of superior plant progenies in different generations:** On three cut basis, 22 superior progenies were selected from M<sub>2</sub> generation of different treatments for evaluation in M<sub>3</sub>

### Nucleus and Breeder Seed Production

In 2014-15, 60 Kg of Nucleus seed (HB 1- 20 Kg.; Mescavi -20 Kg. and HB 2 - 20Kg.) was produced. National Indent of 0.15 qtls of Mescavi; 1.0 qtls. Of berseem variety HB 2; 20 qtls. Of Oats OS 6 and 8 qtls. Of Oats variety HJ 8 breeder seed production is achieved.

**OFT and FLD:** 25 FTDs were conducted in Berseem and 30 in Oats variety OS-346 and HJ-8 at KVK Yamuna nagar, Karnal, Sadalpur, Bawal and Kaithal districts of Haryana. Results are awaited.

### RESEARCH-OATS

**Collection, maintenance and evaluation of Oats germplasm:** 580 lines were grown for maintenance and evaluation of yield and some ancillary characters.

**Hybridization:** 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:** Three station trials *viz.*, LST, SST and PRT on oats (Single cut, Multi cut and Dual) were conducted

## AICRP FC&U, PJTSAU, Hyderabad

### Germplasm Holding:

S. N.	Crop	Collections	Source
1.	Fodder Cowpea ( <i>Vigna unguiculata</i> )	40	1. NBPGR, Regional Station, Hyderabad 2. RARS, ANGRAU, Tirupathi 3. Local collections
2.	Fodder Maize ( <i>Zea mays</i> )	45	Maize Research centre, ANGRAU,
3.	Fodder Bajra <i>Pennisetum glaucum</i> <i>Pennisetum oriental</i>	30 22 8	ICRISAT, Hyderabad.
4.	Napier ( <i>Pennisetum purpureum</i> )	16	TNAU, Coimbatore.
5.	Lucerne ( <i>Medicago sativa</i> )	5	--
6.	Hedge Lucerne	4	Local Collections

- 20 fodder cowpea germplasm lines were collected and multiplied during *Rabi* 2014-15. Further lines will be evaluated for fodder parameters during *Kharif* 2015.
- 10 fodder Bajra germplasm lines were obtained from ICRISAT Hyderabad.
- 19 fodder maize germplasm lines were collected and evaluated during *Rabi* 2014-15.

### Fodder Cowpea:

- Fodder cowpea culture APFC-10-1 release proposal was submitted for state variety release committee during March, 2015. The seed multiplication of proposed entry was taken up during *Rabi* 2014-15. It is a selection from local collection TPTC-1 with GFY of 300.2 q/ha and 15% CP content. It is erect growing, hence suitable for inter cropping, early in 50% flowering (54 days), Good plant height (140.5 cm) with high leaf stem ratio (0.72). Seed production potential is 8 q/ha.

The following crosses in F<sub>5</sub> generation were advanced to F<sub>6</sub> generation.

S. N.	Cross	S. N.	Cross
1.	CO5 X UPC 5286	6.	B.L X selection local
2.	CO4 X SK-5	7.	CO4 X SK-57
3.	CO2 X CS-88	8.	CO4 X SK-55
4.	NDFC-6 X B.L	9.	CO4 X B.L
5.	CN 8076 X B.L	10.	CO4 X TPTC-1

### Fodder Maize

- F<sub>5</sub> population of G1 group (African Tall) was sown during *Rabi*-2014-15. Individual plants for desirable characters were selected and allowed for random mating. Seeds harvested from selected plants were bulked to take up further cycles of selection and random mating.
- **Development of Inbreds:** During *Kharif* 2014 initiated inbreeding programme for development of inbred lines using African tall as source population. Second cycle of selfing and sib mating was done in the selected plants of African tall during *Rabi* 2014-15.

### Multi cut Bajra

- **The fodder bajra culture APFB 09-1** release proposal as a multicut was submitted to State Variety Release Committee during March 2015. It is an improved heterozygous and homogenous population, developed from a poly cross half sib population of APFB-2 by random mating and selection. Tall growing (220.0), high tillering (5 no $\phi$ s) with high leaf stem ratio (0.40), early in flowering, (50 days to 50 per cent flowering), GFY of 474.2 q/ha and DFY 87.7 q/ha, Crude protein content 9.6 per cent. Most suitable for summer season with minimum irrigations and with four cuts. 1<sup>st</sup> cut: 10 t/ac; 2<sup>nd</sup> cut: 14 t/ac; 3<sup>rd</sup> cut: 8t/ac; 4<sup>th</sup> cut: 6 t/ac
- **The F<sub>5</sub> generation** of following cross combinations of Multi cut bajra genotypes are being advanced during *Rabi* 2014-15. MRB 8 x ICMV 05 555, Giant bajra x MRB-8, Giant bajra x Jakarana , ICMV 05 555 x Giant bajra, Rijco bajra x Giant bajra.

**Bajra Napier hybrids:** Among the 54 cross combinations obtained from TNAU, Coimbatore and established during *Rabi*, 2012-13, 15 were found promising with high tillering, long plant height, long, broad & soft leaves, glabrous at the nodes.

## AICRP FC&U, JNKVV, Jabalpur

**Germplasm holding:** Oat ó 121; Berseem - 129

### Berseem

- To create variability, poly cross nursery programme has been started taking five diverse parents viz., Wardan, BL-42, Mescavi, UPB-110, and JB-1. Tripping has been done to ensure cross pollination in all possible combination. Selections shall be made in all for fodder traits in coming generation.
- Variety JB-1 has been treated with different doses (six) of gamma rays. Single plant selection and row bulks were done, treatment wise to raise the M<sub>6</sub> 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 first filial generation.
- Forty six advanced lines were evaluated for different fodder traits.
- Number of crosses made: 7
- Segregating material advanced/ handled: 34 (F<sub>2</sub> onwards)
- Advance breeding lines: 59

## AICRP FC&U, BAIF, Urulikanchan Germplasm

### Lucerne

**Germplasm collection:** Explorations were made to collect the perennial type of Lucerne from the traditional Lucerne growing area in Maharashtra. Seeds of identical population of Lucerne (8 collections) were collected by the centre from Ahmednagar district.

**Evaluation of Germplasm:** Accessions of Lucerne (37 No.) collected during last season from Lucerne dominated areas of Maharashtra & Gujarat states were sown in small plots and evaluated for growth parameters, forage yield, quality and perenniality. The data for three cut was recorded for yield and growth characters.

**Polycross Programme:** New cycle was initiated from *Rabi* 2011-12. The crossed seed (F<sub>1</sub>) obtained from 22 plants was shared with participating centers *i.e.* Anand, Rahuri & Coimbatore. Similarly the center received crossed seed (F<sub>1</sub>) of 75 plants from these three centers. Progeny of 97 F<sub>1</sub>♂ was sown during *Rabi* 2012-13 in single row of 4 m length at 30 cm along with parental lines in an augmented block design. The progenies were evaluated for GFY, DMY, CPY and perenniality. Total of twenty two cuts were obtained from the progenies. Among the progenies, 76 are surviving in third year of growth and three progenies performed superior over all the parental lines.

### Maize

**Germplasm Evaluation:** Fifty four accessions collected from farmer's field were grown in paired rows for evaluation and inbred development and evaluated for growth parameters, grain characters, fodder quality etc.

**National breeding programme:** Under the population improvement programme, F<sub>8</sub> progeny of seed of eleven IPS done from F<sub>7</sub> population of G-I lot (crosses with African Tall) was grown in isolation. Tall, green thick stem with broad leaves and teaseling at 50-55 days were the desired characters. Undesirable plants were removed at vegetative and teaseling stage. The bulk seed was obtained from desired plants for further progeny cultivation and station trial.

**Evaluation of Maize hybrids:** A station trial was established with four hybrids namely BAIF 299 x BAIF 295, BAIF 296 x African Tall, BAIF 297 x African Tall and BAIF 302 x African Tall along with six parents to study the performance for forage yield and quality traits. Hybrid BAIF 297 x African Tall performed superior over the rest of hybrids and parents for GFY, DMY and CPY. This hybrid will be used in further breeding programme.

## AICRP FC&U, PAU, Ludhiana

A total of ten local/station trials were conducted in different fodder crops *viz.*, Oats (7), Berseem (1), Lucerne (1) and Ryegrass (1). The details of these trials are given below:

SN	Trial	Promising entries
1.	Multi location fodder trial in Oats-multi cut	OL 1769-1, OL 1760, OL 1802
2.	Main fodder trial in Oats-multi cut	OL 1842, OL 1844, OL 1847, OL 1835
3.	Small Scale fodder trial Oats-1-multi cut	OL 1861, OL 1854, OL 1862
4.	Small Scale fodder trial Oats-2-multi cut	OL 1866, OL 1867, OL 1869, OL 1871
5.	Small Scale fodder trial Oats-3- single cut	OL 1844, OL 1847, OL 1802, OL 1766, OL 1760
6.	Dual Purpose Trial in Oats	OL 1760, OL 1802, OL 1804, OL 1847
7.	Germplasm evaluation ó Oat- dual Purpose	Data is being analyzed
8.	Local Fodder Trial-Berseem	Data is being analyzed

### Oat:

- One multi location trial comprising of twelve entries including checks was conducted at three locations *viz.*, Ludhiana, Gurdaspur and Kapurthala to evaluate for high green fodder and dry matter yield along with other quality attributes under multi cut conditions.
- A total of one hundred and fifty crosses have been attempted involving promising genotypes.
- Breeding material handled following standard breeding methods and procedures:
- F<sub>1</sub>-70; F<sub>2</sub>-66 ; F<sub>3</sub>- 348; F<sub>4</sub>- 149, F<sub>5</sub>- 400; F<sub>6</sub>- 34; F<sub>7</sub> -22

**Inter generic hybrids-** Attempts were made to make oat x maize crosses using embryo culture protocol to develop plants through embryo rescue/ovary culture under the project entitled "Introgression in oat by developing oat-maize addition (OMA) lines" sanctioned by UGC, New Delhi during 2013.

Maintenance breeding was continued in crops *viz.*, Lucerne and Ryegrass.

### Germplasm maintained

S. N.	Crops	Germplasm
1	Oats	300
2	Berseem	522
3	Lucerne	20
4	Ryegrass	12

**Nucleus seed production:** Nucleus seed production was taken in five fodder crops. In Oat var. Kent (5.0 q); OL-9 (1.0 q); OL-10 (4.0 q), in Berseem var. BL-10 (0.75 q); BL-42 (0.60 q); BL-1 (0.50 q); BL-22 (0.40 q); BL-180 (0.30 q), in Rye grass var. PBRG-1 (0.80 q), in Metha var. ML-150 (0.10 q), in Lucerne var. LLC-5 (0.10 q), in Senji var. Senji Safed-76 (0.08 q); YSL-106 (0.05 q) and in Shaftal var. SH-69 (0.08 q) nucleus seed were produced during *Rabi*-2014-15.

**Breeder seed production:** During *Rabi*-2014-15, breeder seed was produced in Oat var. OL-10 (1.0 q); Kent (52.0 q), in Berseem var. BL-10 (13.50 q); BL-42 (12.0 q); BL-1 (4.5 q) and in Ryegrass var. PBRG-1 (0.50 q).

**Foundation seed production:** foundation seed was produced in Oat (Kent) and Berseem (BL-10 & BL-42).

**Other Activities Rabi-2014-15****AICRP FC&U, PJTSAU, HYDERABAD****Awards and Honours**

- **Dr. M. Shanti, Scientist (SSAC) and Dr. Susheela, Scientist (Agronomy)** received outstanding woman scientist awards during National conference on RAINFED-2015 during May 3-4<sup>th</sup>, 2015 held at University Auditorium, PJTSAU, Hyderabad.

**Research Papers**

- Shashikala T, Rai KN, Naik RB, Shanti M, Chandrika V and Reddy KL (2014). Forage resources of Andhra Pradesh and Research Technology of Forage Crops. *International Journal of Bio-resources and stress management*, 5 (1):
- Shanti M, Naik RB, Suneeta KB, Devi, Reddy, JR and Chiranjeevi C (2014). Studies on utilization of Biogas poultry manure in crop production. *Progressive Agriculture*, 13 (1): 102-109.
- Shanti M, Naik RB, Suneeta KB, Reddy JR and Chiranjeevi C (2014). Effect of Biogas poultry manure on soil fertility in cereal-legume based cropping system. *International Journal of Bio-resource and Stress Management* (Communicated)
- Srinivas B, Shanti M, Chandrika V and Babu PS (2014). Performance of forage crops raised through sewage water under varied nutrient levels. *Journal of Agricultural Research*, 42 (1).
- Raghavendra BM, Susheela R, Rao VP and Madhavi A (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.
- Raghavendra BM, Susheela R, Madhavi A, Rao VP and Sudhakara TM (2014). Influence of high efficacy herbicides on yield and economics of direct wet seeded rice sown through drum seeder. *Progressive Research*, 9: 598-600.

**Book chapters etc.**

- Shasikala, T. *et al.* (2015). Forage resources of Telangana and Andhra Pradesh and agrotechnology for enhancing forage production In: Souvenir (AICRP on Forage Crops & Utilization, NGM-Kharif-2015), PJTSAU, Hyderabad.
- Shanti, M. *et al.* (2015). Tree fodders- a sustainable alternative for dairy farmers of Telangana and A.P- A review In: Souvenir (AICRP on Forage Crops & Utilization, NGM-Kharif-2015), PJTSAU, Hyderabad.
- Susheela, R. *et al.* (2015). Technologies for enhancing fodder production and utilization in India In: Souvenir (AICRP on Forage Crops & Utilization, NGM-Kharif-2015), PJTSAU, Hyderabad.
- Anuradha, M. *et al.* (2015). A low cost alternative for concentrates-Azolla. In: Souvenir (AICRP on Forage Crops & Utilization, NGM-Kharif-2015), PJTSAU, Hyderabad.
- Susheela, R. *et al.* (2015). Hydroponic fodder production-an emerging technology for year round fodder production. In: Souvenir (AICRP on Forage Crops & Utilization, NGM-Kharif-2015), PJTSAU, Hyderabad.

**Seminars attended/ paper presented/ abstract published**

- National symposium on ËCMö technology for safe, secure and profitable food production held during 10.10.14 to 11.10.14 - Dr. R. Susheela, Dr. M. Shanti, Dr. T. Shashikala, Dr. M. Anuradha
- National Symposium on climate resilient forage production & utilisation held at BCKV, Kalyani during 13.11.14 to 14.11.14- Dr. R. Susheela, Dr. M. Shanti, Dr. T. Shashikala, Dr. M. Anuradha
- Annual convention of Indian Society of Soil Science at PJTSAU, Hyderabad during 24.11.14 to 27.11.14 - Dr. M. Shanti, Dr. R. Susheela, Dr. T. Shashikala, M. Anuradha

- Emerging Challenges and Opportunities for Biotic and Abiotic stress Management held at DRR, Hyderabad during 13.12.14 to 14.12.14 - Dr. R. Susheela, Dr. M. Shanti, Dr. T. Shashikala, Dr. M. Anuradha
- 2<sup>nd</sup> International Conference on Bio resource and Stress Management held at PJTSAU, Hyderabad during 7.1.15 to 10.1.15- Dr. R. Susheela, Dr. M. Shanti, Dr. T. Shashikala, Dr. M. Anuradha
- National conference on Reinvigorating Agricultural Innovations for Farmers Empowerment and Development (RAINFED 2015) held during 3.5.15 to 4.5.15- Dr. R. Susheela, Dr. M. Shanti, Dr. T. Shashikala, Dr. M. Anuradha

#### Books published (Telugu):

- Chetla Pasugrasalu
- Pasugrasa pantalu-sagu vivaralu

#### Important persons visited to AICRP-FC centre

- QRT team comprising of Dr Panjab Singh, Dr JP Yadavendra, Dr KS Ramachandra, Dr. KK Datta, Dr Sunil Kumar, visited during 20<sup>th</sup> to 21<sup>st</sup> February, 2015.
- About 200 delegates of AICRP-FC&U centres from all over the country participated in the National Group Meet Kharif 2015 during 17-18<sup>th</sup> April, 2015 organized at PJTSAU which included Dr I. S. Solanki, ADG (FFC), ICAR; Dr. Tirupattiah, Additional Director, Department of Animal Husbandry; Dr. P. K. Ghosh, Director, IGFRI, Jhansi; Dr. V. Praveen Rao, Special Officer & Registrar, PJTSAU, Hyderabad; Dr. D. Raji Reddy, Director of Research, PJTSAU, Hyderabad.

**FTDs conducted:** 40 (Oat & Lucerne)

**TSP activities:** Distributed sheep/goat along with fodder seed to 20 tribal families of Chinnagunturupalli and Sarangapalli villages in Mulugu mandal of Warangal district

**HRD for the AICRP-FC&U staff:** Dr. Susheela attended training on crop modeling-DSSAT and in crop models during 22<sup>nd</sup> March, 15 to 27<sup>th</sup> March 2015 at ACRC, ARI, Rajendranagar, Hyderabad.

#### TV/Radio talk delivered by AICRP-FC staff/ extension activities:

Radio talks:				
1	Dr. R. Susheela	Sukhamaya jeevanaaniki girijana upa pranalika	3.12.14	
2	Dr. T. Shashikala	Pasugrasa koratha nivarana ku soochanalu nirvahana		
3	Dr M. Anuradha	Chetla pasurasalu-subabul sagu	14.3.15	
TV Programmes:				
1	Dr. T. Shashikala	Chalikalamulo Telangana rashtramlo pandinchutaku anuvaina pasugrasa pantalu-Oats	12.11.14	Express TV
2	Dr. T. Shashikala	Chalikalamulo Telangana rashtramlo pandinchutaku anuvaina pasugrasa pantalu-Lucerne	17.11.14	Express TV
3	Dr. M. Shanti	Vesavilo talethe pasugrasasamasyalanu edurukuneduku rythulu elanti charyalu tesukovali	2.2.15	CVR News
4	Dr. M. Shanti	Rythu nesthamolive phone in	27.2.15	Yadagiri TV
5	Dr. T. Shashikala	Pachimetha koratha-nivarana live-in phone	3.4.15	TV-5

#### Seed/planting material sold

S N	Forage crops	Foundation seed (kg)/ rooted slip (numbers)
1.	Maize-African Tall	633
2.	Sorghum-CoFS 29	20
3.	APBN-1	<b>74000 (Nos.)</b>
4.	Co-4	<b>24000 (Nos.)</b>

## AICRP FC&U, PAU, LUDHIANA

### Awards and Honours:

- Fellowship Award by Society for Scientific Development in Agriculture and Technology during the National Conference on Emerging challenges and opportunities in biotic and abiotic stress management held at Directorate of Rice Research, Hyderabad on December 13-14, 2014. (Dr. U. S. Tiwana)

### Publications:

#### Research papers

- Bharadwaj R, Sohu RS, Singh J, Kapoor R, Singh DP, Rathore P, Bajaj RK and Srivastava M (2014). PHB 2884: A new high yielding Pearl Millet (grain) hybrid. *J Res (PAU)*
- Chauhan SK, Singh A, Sika SS, Tiwana US, Sharma R and Sarlach HS (2014). Yield and quality assessment of annual and perennial fodder intercrops in *Leucaena* alley farming system. *Range Mgmt. & Agroforestry* 35 (2): 230-235.
- Goyal M, Tiwana US, Bhullar MS (2015). Nutritional Evaluation of Sugar Beet (*Beta vulgaris* L.) Genotypes as Forage. *Indian J Anim Nutr.* (in press).
- Kapoor R and Batra C (2014). Genetic variability and association studies in maize (*Zea mays* L.) for green fodder yield and quality traits. *Electronic J Plant Breeding* 5 (2): 294-99.
- Kapoor R, Bajaj RK, Sohu RS, Singh DP and Bhardwaj R (2015). OL 10: A new high yielding variety of fodder oat (*Avena sativa* L.). *Agric Res J.* 52 (2): 214-15.
- Kumar B, Tiwana US, Singh A and Hari Ram (2014). Productivity and quality of intercropped maize (*Zea mays* L.) + cowpea (*Vigna unguiculata* (L) Walp.) fodder as influenced by nitrogen and phosphorus levels. *Range Mgmt. & Agroforestry* 35 (2): 263-267.
- Sandeep Kumar and Tiwana US (2014). Fodder productivity of hybrid pearl millet (*Pennisetum glaucum*) in relation to cutting management and nitrogen management. *Progressive Research* 9 (1): 303-306.
- Singh P, Kapoor R and Batra C (2014). Heterosis and combining ability in forage pearl millet under stress and non-stress environment. *Applied Biological Research* 16 (2): 214-222.
- Tiwana US, Bhullar MS and Singh A (2014). Management of *Trianthema portulacastrum* Weed in berseem fodder. *Progressive Research* 9 (1): 195-198.
- Tiwana US, Kantwa SR and Chaudhary DP (2014). Effect of integrated nutrient management on productivity and economics of food-forage cropping system. *Range Mgmt. & Agroforestry* 35 (1): 73-77.

#### Other publications

- Gill PK, Brar AS, Singh S, Tiwana US and Buttar GS (2014). Effect of scheduling of irrigation and level of straw mulch on green fodder yield and water use in Napier-Bajra hybrid. Paper presented in National Symposium on "Agricultural Diversification for Sustainable Livelihood and Environmental Security" held at PAU Ludhiana from November 18-20 2014 (Pp 742-743).
- Goyal M (2014). Nutritional and anti nutritional components in forage crops. In Souvenir of National Group Meet of All India Coordinated Research project on Forage Crops on August 26-27 2014 held at Punjab Agricultural University Ludhiana. Pp 42-47.
- Goyal M and Tiwana US (2014). Green forage production and nutritional quality of hydroponically grown forage crops. Proc. National Symposium on "Crop improvement for inclusive sustainable development" held at PAU Ludhiana from November 7-9 2014 (Pp. 775).
- Goyal M, Tiwana US, Rani U, Kapoor R (2014). Preservation of surplus fodder. In Souvenir of National Group Meet of All India Coordinated Research project on Forage Crops on August 26-27 2014 held at Punjab Agricultural University Ludhiana. Pp 48-50
- Kapoor R (2014). Combining ability analysis for green fodder yield and its components in top cross hybrids of forage pearl millet [*Pennisetum glaucum* (L.) R. Br.]. In: Proc. Nat. Symp. on Crop Improvement For Inclusive Sustainable Development. November 7-9 2014 Ludhiana India: Pp. 439-441.

- Kapoor R and Batra C (2014). Genetic divergence in parental genotypes and its relation with heterosis  $F_1$  performance and general combining ability in oats (*Avena sativa* L.) In: Proc. Nat. Symp. on Crop Improvement For Inclusive Sustainable Development. November 7-9 2014 Ludhiana India: pp. 423-425.
- Kapoor R, Batra C and Mohan A (2014). Variation and association studies for green fodder yield and related traits in fodder oats (*Avena sativa* L.). In: Proc. Nat. Symp. on Crop Improvement For Inclusive Sustainable Development. November 7-9 2014 Ludhiana India: Pp. 441-443.
- Kapoor R, Chawla JS and Goyal M (2014). Genetic analysis of maize hybrids for fodder yield and silage quality. In: Proc. Nat. Symposium on Crop Improvement For Inclusive Sustainable Development. November 7-9 2014 Ludhiana India: Pp. 805-807.
- Kaur R, Goyal M and Tiwana US (2014). Influence of nitrogen fertilization on biochemical parameters of Napier-bajra hybrid. Proc. National Symposium on Crop improvement for inclusive sustainable development held at PAU Ludhiana from November 7-9 2014 (Pp. 477-478).
- Rani M, Singh S, Tiwana US and Sarlach RS (2014). Seed yield and quality of berseem (*Trifolium alexandrinum* L.) as influenced by plant growth regulators. Paper presented in National Symposium on Agricultural Diversification for Sustainable Livelihood and Environmental Security held at PAU Ludhiana from November 18-20 2014 (Pp 236-237).
- Rani U, Kaur G and Tiwana US (2014). Prevalence of sorghum diseases in Punjab. Proc. National Symposium on Crop improvement for inclusive sustainable development held at PAU Ludhiana from November 7-9 2014 (Pp. 275-276).
- Singh C, Singh DP, Rani U and Tiwana US (2014). Studies on heterosis for forage characters in cowpea (*Vigna unguiculata* L.). Proc. National Symposium on Crop improvement for inclusive sustainable development held at PAU Ludhiana from November 7-9 2014. (Pp 271-272).
- Singh S, Rani U, Singh DP and Tiwana US (2014). Growth of *Fusarium solani* causin wilt in guar (*Cyamopsis tetragonoloba* L.). Proc. National Symposium on Crop improvement for inclusive sustainable development held at PAU Ludhiana from November 7-9 2014 (Pp 258-260).
- Tiwana US (2014). Forages for biotic and abiotic stress management in Indian agriculture. Paper presented in National Conference on Emerging challenges and opportunities in biotic and abiotic stress management held at Directorate of Rice Research Hyderabad on December 13-14 2014.
- Tiwana US and Singh S (2014). Forage production potential of multi cut sorghum (*Sorghum bicolor*) with forage legumes under varying seed rates of intercrops. Proc. National Symposium on Agricultural Diversification for Sustainable Livelihood and Environmental Security held at PAU Ludhiana from November 18-20 2014 (Pp 53-54).
- Tiwana US Singh S and Goyal M (2014). Fodder yield and quality of multi cut Oats as influenced by nitrogen management. Proc. National Symposium on Crop improvement for inclusive sustainable development held at PAU Ludhiana from November 7-9 2014 (Pp 850-51).
- Tiwana US, Rani U, Goyal M and Kapoor R (2015). Livestock and fodder scenario in Punjab-strategies for enhancement of feed and fodder production for sustainable livestock production. In Souvenir National Group Meet of All India Coordinated Research project on Forage Crops-Kharif 2015 on April 17-18 2015 held at PJTSAU Hyderabad Pp 36-46.
- Tiwana US, Rani U, Goyal M and Kapoor R (2015). Livestock and fodder scenario in Punjab-strategies for enhancement of feed and fodder production for sustainable livestock production. In Souvenir National Group Meet of All India Coordinated Research project on Forage Crops-Kharif 2015 on April 17-18 2015 held at PJTSAU Hyderabad. Pp 36-46.
- Tiwana US, Rani U, Kapoor R, Singh S and Goyal M (2014). Feed and fodder scenario in Punjab. In Souvenir of National Group Meet of All India Coordinated Research project on Forage Crops on August 26-27 2014 held at Punjab Agricultural University Ludhiana. Pp 14-19
- Tiwana US, Sohu RS, Rani U, Kapoor R, Bhardwaj R, Taggar GK, Singh DP and Goyal M (2015). Research Accomplishments of Forage and Millet Section Department of Plant Breeding and Genetics PAU Ludhiana to be published in PJTSAU Hyderabad Telangana at National Group Meet AICRP on forage crops-Kharif 2015 on April 17-18 2015.
- Goyal M and Tiwana US (2015). Poshtik chare di prapti lai buniyadi jankari. *Vigyanic Pashu Palan* 8 (8): 9-10.

**Students guided: M. Sc. (Ag.): 7**

**FTDs conducted: 130**

**TV/Radio talks: TV (3) and Radio (2)**

**Details of seed/Planting material sold to farmers:**

Crop	Variety	TL (q)
Berseem	BL 10	19.90
	BL 42	36.25
Oats	OL 10	9.50
Rye grass	PBRG 1	2.87

**External funded Projects: 2**

- Developing guidelines for conduct of DUS test for oat, cowpea and guinea grass. CSS-74 (PC 6115) funded by PPV and FRA - Dr. Rahul Kapoor (PI) Ludhiana as co nodal centre
- Alien genes introgression in oat by developing oat maize addition lines funded by UGC Dr. Rahul Kapoor (PI), Dr. Ajinder Kaur (Co PI)

### **AICRP FC&U, CAU, IMPHAL, MANIPUR**

**Publications: 3 bulletins**

**Important persons visited to AICRP-FC&U centre:**

- Dr. M. Premjit Singh, Vice-Chancellor, CAU, Imphal
- Md. Abdul Nasir, Hon'ble Agriculture Minister, Manipur
- Preshow Shimray, Deputy Speaker, Manipur Legislative Assembly

**Student(s) guided: M.Sc. (Ag.) in Agronomy: 1**

**FTDs conducted: 10**

**Training conducted for farmers/NGO/Govt. officials: 2**

**TV/ Radio talk delivered by AICRP-FC staff/extension activities: 1**

**Interaction with farmers, NGO and Govt. staff:**

- Interaction programme with dairy farmers on round the year fodder production.
- Interaction with Manipur Milk Producers Co-operative Union Ltd.
- Interaction with dairy farmers of Bishnupur district, Manipur.

**Forage crops seed production (2014-15)**

S N	Forage crops	TFL seed (Kg)
1.	Fodder oat var. JHO-822	700
2.	Single Cut fodder Oat var. Kent	100
<b>Grand Total</b>		<b>800</b>

**Perennial fodder production details (2014-15)**

S. N.	Perennial fodder	Total quantity (Nos.)	
		No. of cuttings	Total
1.	Napier hybrid CO-1	1000	1000
2.	Napier hybrid CO-2	1000	1000
3.	Napier hybrid CO-3	1000	1000
<b>Grand Total</b>		<b>3000</b>	<b>3000</b>

## AICRP FC&U, VC FARM, MANDYA

### Presentations in Conferences/Symposium/Seminars/other fora: 01

Krishnappa MR, Lohithaswa HC, Shekara BG, Chikkarugi NM and Manasa N (2015). Livestock & Fodder Scenario-Strategies for Enhancement of feed & Fodder production for Sustainable livestock productivity in Karnataka. *National Group Meet, Kharif, 2015* by PJTSAU, Hyderabad & by AICRP on Forage Crops & Utilization, IGFRI, Jhansi on 17<sup>th</sup> & 18<sup>th</sup> April 2015: 74-77.

### Important persons visited to AICRP-FC&U Centre:

- Dr. Shivanna, Vice Chancellor, UAS, Bangalore.
- Dr. M. A. Shankar, Director of Research, UAS, Bangalore
- Dr. N. Nagaraj, Director of Extension, UAS, Bangalore.
- Shri. Puttanaiah, MLA, Pandavapur, Mandya

**Student (s) guided:** M.Sc. (Agri.) in Agronomy: 1

**FTDs conducted:** 20

**Training/Field days conducted for farmers:** 6

S N	Particulars	Date	Venue	No. of farmers participated
1	Fodder maize variety African Tall	15/09/2014	Tandasanahalli, Mandya Taluk	100
2	Multicut fodder sorghum Variety COFS-29	16/09/2014	Menagara, Pandavapura Taluk	114
3	Hybrid NB Variety CO-3	05/11/2014	Hulikere, Mandya Taluk	104
4	Hybrid NB Variety CO-3	21/11/2014	Kannur, Kollegal Taluk	105
5	Fodder production technologies	17/12/2014	KVK, Chamarajanagar	85
6	Fodder production technologies	09/02/2015	Machahalli, Mandya Taluk	94

### TV/Radio talk delivered by AICRP-FC staff/ extension activities: 1

- Production Technologies in Fodder Crops at AIR, Mysuru.

### Forage crops seed production details (2014-15)

S. N.	Forage crops	Variety	Kind of Seeds	Quantity (Kg)
1.	Fodder maize	African Tall	TL	489
2		African Tall	BS	1200
3	Fodder Cowpea	KBC-2	NS	8
4		MFC-08-14	BS	128
5		MFC-09-1	BS	8
6		KBC-2	BS	625

### Quantity of planting material supplied (2014-15)

S. N.	Crop	Planting material (Nos.) Supplied to farmers
1.	Hybrid Napier Bajra (CO-3)	75,000
2.	Guinea grass (JHGG-08-1)	25,000
3.	Signal grass	10,000
4.	Rhodes	5,000

### Externally funded projects: 4

#### GOK Projects

- Development of High oil corn (*Zea mays*) hybrids for high quality feeds.
- Maintenance breeding of Fodder crop varieties (Maize African Tall and cowpea, 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).
- Enhancing quality seed production in important fodder crops and demonstration of production technologies and low cost forage equipments to accelerate fodder production in Karnataka.

## AICRP FC&U, BAIF, URULIKANCHAN

### Important persons visited

1. Dr. Kodela Siva Prasad Rao, Hon. Speaker of Legislative Assembly, Andhra Pradesh,
2. Mr. P. Pulla Rao, Hon. Minister for Agriculture and Animal Husbandry, Hyderabad.
3. Mr Yalla D Babu, Chairman, Andhra Pradesh Livestock Development Agency(APLDA)
4. Dr. P. D. Kondala Rao, Chief Executive Officer, APLDA, Hyderabad.
5. Mr. D. P. Pande, Director, Animal Husbandry & Vet. Services, Govt. of Odisha,
6. Dr. K V K Patnaik, CEO, Odisha Livestock Resource Development Society, Bhubaneswar

### FTDs conducted

- Twenty FTDs of oat (10), lucerne (5) and berseem (5).

### TSP activities

- Goat improvement programme was implemented in Kakarda village of Nandurbar district of Maharashtra. Good quality bucks of improved breed and medicine kit for preventive health, vaccination, deworming etc. were supplied to women of Tribal communities.

### Training conducted for farmers/NGO/Govt. officials:

- Twenty four training programmes on "Livestock Development programme" were organised by BAIF during the season and 691 individuals participated in the training programme. Lectures on Fodder production technologies, seed production of fodder crops, silvipasture etc. were delivered by the scientists working in AICRP on Forage Crops and Utilisation.
- As resource person for training programme on "Modern Dairy farm Management" organised by Sakal International Learning Center (SILC), Pune.

### TV/Radio talk delivered by AICRP-FC staff/extension activities:

- Participated in two meetings of Agricultural Advisory Committee for Krishidarshan Programme of Doordarshan Kendra, Pune being a member of committee. A success story of women self help group (SHG) member on goat rearing and fodder cultivation was narrow casted on Doordarshan, Pune (Maharashtra).

### Seed/planting material sold:

- Involved in providing technical inputs and monitoring of the participatory seed production programme of forage crops organised at farmer's field by BAIF in its operational area of Maharashtra.

## AICRP FC&U, IGKV, RAIPUR

### Teaching

- **UG Courses:** Seed Production Technology (APP-422)
- **PG Courses:** Principles of Cytogenetics (GP-502)
- **Ph. D. (Ag.) Courses:** Advances in Breeding of major field crops (GP-608) and Crop Evaluation (GP-606)

### Involved in other activity:

- Co-Organizing Secretary in National Science Day-2015, 17<sup>th</sup> March at CoA, Raipur 2015.
- Ph. D. (Ag.) supervisor.
- Participate in State level Alsi Diwas & Prashikhan Sah Sangosthi on March 11, 2015.
- Member in C. G. Plain Zone-1 Inter college sports tournament held at CoA, Raipur November, 21-24, 2014.
- Member in State level Inter Zonal sports tournament at CoA, Raipur February 11-13, 2015.
- Member of Judgment committee in "Biotech Debate Competition-2015" for "National Science Day Celebration Programme" on 12 March, 2015 during Annual function 2013-14.

## AICRP FC&U, BCKV, KALYANI

### Research papers 8:

- Basu B, Kundu M, Md Hedayetullah, Kundu CK, Bandyopadhyay P, Bhattacharya K and Sarkar S (2014). Mitigation of arsenic in rice through deficit irrigation in field and use of filtered water in kitchen. ISSN 1735-1472. *Int. J. Environ. Sci. Technol.* DOI 10.1007/s13762-014-0568-1 (Springer).
- Gunri SK, Biswas T, Mandal GS, Nath R and Kundu CK (2014). Effect of biofertilizers on productivity of groundnut (*Arachis hypogaea* L.) In red and laterite zone of West Bengal. *Karnataka J. Agric. Sci.* 27 (2): 230-231.
- Kundu CK, Pramanics B, Bera PS, Bandopadhyay P and Brahmachari K (2014). Bio-efficacy of Different Herbicides for weed Management in transplanted *Kharif* Rice. *J. Interacad* 18(1): 44-48. (ISSN 0971-9016).
- Mandal I, Satyanarayana G, Reddy, Kundu C K and Bandyopadhyay P (2014). Performance of summer fodder maize towards irrigation and nitrogen in new alluvial zone of West Bengal. *J. Interacad* 18 (2): 178-184. (ISSN 0971-9016).
- Jana K, Mallick GK, Kundu CK, Gunri SK and Puste AM (2015). Effect of nutrient management on grain yield of aerobic rice under irrigated condition during pre-*Kharif* season. *International Journal of Environmental & Agricultural Research* 1 (1): 31-34.
- Jana K, Mallick GK, Ghosh S and Sardar G (2015). Study on yield potentiality and spatial requirement of rice varieties (*Oryza sativa* L.) in system of rice intensification (SRI) under red and laterite zone of West Bengal India. *Journal of Applied and Natural Science* 7 (1): 3536357.
- Sardar G, Jana K, Ghosh S and Mallick GK (2015). Effect of different sources of organic matter on the yield of rice and soil health in red and laterite zone of West Bengal India. *Journal of Applied and Natural Science* 7 (1): 2266228.
- Jana K, Das SK and Puste AM (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.

### Important persons visited:

1. Dr. N. Samanta, Deputy Director of Agriculture, (Seed Certification), Govt. of WB.
2. Managing Director, WBSSC, Govt. of WB.
3. Mr. D. C. Roy, Assistant Professor and Students of WBUAFS, Kolkata, West Bengal.

### Student (s) guided:

- M. Sc. (Ag.) in Agronomy: 2
- Ph. D. (Ag.) in Agronomy: 4

### Courses taught in Department of Agronomy:

- Course No. 509, Agronomy of fodder and forage crops and other courses

### FTDs conducted: 60 units

### Breeder Seed production:

- Rice bean (Bidhan Ricebean-1): 2.80 q.
- Rice bean (Bidhan Ricebean-2): 3.15 q.
- Jobø Tear/ Coix - (Bidhan Coix-1): 0.35 q.

### Training conducted for farmers/NGO/Govt. officials: 7 (Seven)

**Participated in Agricultural Fair:**

- AICRP on FC&U participated in ‘*Krishi mela*’, organized by KVK, Nadia of BCKV at Gayeshpur, Nadia, West Bengal for dissemination of forage technology.

**Externally Funded Project:** 3 (Private Companies)

**Seminar organized:**

- National symposium on ‘Climate resilient forage production and its utilization’ on November 13-14, 2014 by Range Management Society of India and AICRP on FC & U, Kalyani centre, BCKV.

**Participated in seminar:**

1. National symposium on ‘Food and nutrition: Need for the future’ Institute of Agricultural Science, University of Calcutta, Kolkata, 25-27<sup>th</sup> February, 2015 organized by The Agricultural Society of India, Kolkata.
2. Seminar on Food legumes (ICARDA Project) and visit the farmers’ field (lentil plot) organized by BCKV, Nadia, West Bengal.
3. Participated in Annual review & planning meeting of India- Morocco food legumes initiative (IMFLI) OCPE-ICARDA Project on 23.06.2015 organized by BCKV.

**Awareness development on ‘Seed Production of Forage Crops’:**

- Seed production of oats by farmers for their own uses as seed for the next year.

**Transfer of technology:**

- The centre is also conducting on-farm trials/demonstration on forage production along with rice introducing the *Coix aquatica* and the model is acceptable to the farmers as they are getting forage in the low lying areas and coastal areas of WB
- Distribution of Rice bean seeds to the Horticultural faculty for popularizing as an under canopy legume crop in nutrient enrichment and fodder production in the Orchards.
- Through different Farmers’ Fair in state and national level
- The scientists of AICRP on Forage Crops, Kalyani Centre has given trainings to the SMS of different KVKs of West Bengal
- Participated in Agricultural Fair (*Krishi Mela*) conducted by KVKs (Hooghly, Nadia & Howrah) under BCKV for dissemination of forage technology.

## AICRP FC&U, AAU, ANAND

**Publications****Research Paper**

Patel PM, Patel MR, Mistry GJ, Shroff JC and Parmar HP (2014). Effect of irrigation and nitrogen management on seed production of forage oats (*Avena sativa* L.). ***Green Farming*, 5 (6):** 1009-1011.

**Student guided:**

- Plant Breeding :1      Agronomy :2

**FTDs conducted:**

- Lucerne :20      Oat: 10

**Seed /planting materials sold farmers/others**

- Hybrid Napier                      :      84490 No.
- Oat    :      2250 kg.
- Bajra GFB-1                              :      110 kg.
- Sorghum - CoFS-29, GAFS-11, S-1049: 662 kg.

**Externally funded project: One**

- Evaluation of Performance of Makkhan grass hybrid (UPL Ltd.)

## AICRP-FC&U, CSK HPKV, PALAMPUR

### Publications

#### Research papers

- Chaudhary L, Sood VK and Hussain W (2013) Genetic analysis for grain and forage yield and its component traits in genus *Avena* under North western Himalayas. *Range Mgmt. & Agroforestry* 35 (2) : 204-209, 2014
- Kumar Naveen, Chander Navell and Kumar Sunil (2014) Production efficiency and profitability of forage based cropping systems under mid hills of north-western Himalays. *Himachal J. of Agricultural Research* 40(2):126-131
- Katoch Rajan and Kumar Naveen (2014). Productivity and quality attributes of maize varieties (*Zea mays* L.). *Range Mgmt. & Agroforestry*. 35 : 32-37
- Shweta and Katoch R (2014). Comparison of Nutritional Composition of *Vigna* spp. Prevalent in the Mid-Hill Region of Himachal Pradesh. *Indian J. of Agricultural Biochemistry*, 27 (2), 202-207.

#### Symposia/conferences

- Sharma Aditi, Sood VK, Hussain Waseem and Sapkal DR. (2014). Superior genotypes identified in *Setaria* grass based upon their mean performance. Conference on Exploring Basic and Applied Sciences for Next Generation Frontiers. November 14-15, 2014. School of Agriculture, School of Biotechnology & Biosciences and School of Physical Sciences. LPU, Jalandhar P. 138
- Bhar R, Kumar Naveen, Singh B, Mal G and Saikia P (2015). Nutritional management of oak toxicity in hill ruminants with special reference to *Quercus leucotrichophora* leaves. Lead paper in National Symposium on "Livestock Production Practices for Small Farms of Marginalized Groups and Communities in India" & XXII Annual Convention of Indian Society of Animal Production and Management at COVS & AH, CAU, Aizawl, Mizoram, 28- 30 January, 2015.
- Badiyala Dinesh, Bindra AD and Kumar Naveen (2014). Diversification-issues and opportunities with special reference to Himachal Pradesh. Lead Paper in National Symposium on "Agricultural Diversification for sustainable livelihood and environmental security" of ISA at Ludhiana, 18-20 November, 2014
- Kumar Naveen, Sood VK, Kantwa SR and Kumar Sunil 2014. Performance of improved *Setaria* grass (*Setaria anceps* Stapf.) genotypes at varying levels of nitrogen under mid hill of North-Western Himalayas. In: *National Symposium on Agricultural Diversification for sustainable livelihood and environment security Nov. 18-20,2014. Ind. Soc. of Agronomy and ICAR, Extended summaries of voluntary papers. 255*

#### Book Chapter

- Naveen Kumar, Sood BR and Gupta SK (2014). Management of forage resources in north-western Himalayas. In: *Livestock health & production with emphasis in hilly areas*. Ed. S K Gupta, R K Sharma, M A Malik and Arvind Kumar. Notion Press Chennai, Pp 181-192

#### Others

- Katoch Rajan, Kumar Naveen, Sood VK and Banyal DK (2015). Fodder Trees: A potential source of mitigate fodder deficiency in hills of north western Himalayas. National group meet *Kharif* 2015 held at PJTSAU, Hyderabad, April 17-18, 2015

#### Courses taught

**LPM 121** (Fodder Production and Grassland Management), **Agron 510** (Agrostology and Agroforestry), **PI Path 511** (Chemicals in Plant Disease Management), **PI Path 591** (Master's seminars), **PI Path 691** (Doctoral seminars), **GP 605** (Advanced Plant Breeding Systems), **GP 607** (Breeding Designer Crops), **Biochem 602** (Advance Molecular Biology), **Biochem 504** (Human Biochemistry)

**Students guidance:** 9 (as major advisor) ; 22 (Member advisory committee)

**Forage technology demonstrations:** Oats - 25; Tall Fescue grass- 5; White clover - 3

**Lectures delivered to farmers and development officers – 12**

**Banners displaying forage production technologies (in Hindi) : 4**

- Improved varieties of forage for Himachal Pradesh
- Pastures and grassland Management
- Round the year fodder production
- Diseases of forage crops and their management

**Pamphlet (in Hindi) = 4      Popular article = 2;      Radio talk = 1**

**Tribal Sub plan:**

- 50 tribal families were selected. Input viz. Tall fesue grass seedling, white clovers seed, glyphosate herbicide and hoeing tools were supplied to the farmers. The improved grass and legumes spp. have been planted by the farmers.

**Organised QRT** meeting of Palampur, Ludhiana and Hisar centres at CSK HPKV Palampur on 6 - 9<sup>th</sup> May, 2015

**Linkage with NGO:** CORD Chinmaya Organisation of Rural Development, Tapovan, Dharamshala, for the dissemination of production technologies in particular of Setaria grass and Napier Bajra Hybrid

## **AICRP FC&U, JNKVV, JABALPUR**

**Awards and Honours**

- **Best Oral Presentation Award:** National seminar on Challenges and opportunities for agriculture crop productivity under climate change September 21-22, 2014

**Publications**

Nair R, Mehta AK, Singh KP and Sharma SK (2014). Mutagenic effectiveness and efficiency in cowpea. *Advances in Applied Research* 6 (1): 78-85.

Dubey N, Mehta AK, Avinash HA and Kumar V (2014). Variability studies for qualitative and quantitative traits in advanced lines of oat (*Avena sativa* L.). *Journal of Soils and Crops* 24 (2): 247-254.

Jha AK, Shrivastva A and Raguvanshi NS (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.

Sinodiya P and Jha AK (2014). Effect of weed management control practices on nutrient uptake in fodder maize. *JNKVV Research Journal* 47 (2): 27630.

**Important Persons visited:**

- Board Members of VishwaVidyalaya.
- Dr. P. M. Gaur, International Scientist, ICRISAT, Hyderabad.
- Dr. Y. Jindal, Scientist (Hisar) and Dr. P. B. Patel (Anand) visit our centre.
- Dr. Raj Gupta, Director, BISA.
- Dr Sapan Kumar Dutta, DDG, Crop Science, ICAR, New Delhi.
- Dr. A. K. Singh, Vice-chancellor, RVSKVV, Gwalior.

**Students guided: M. Sc. (Ag.): 1**

**FTDs conducted: 35**

**TSP activity:** 21 demonstration of different fodder crops at tribal block of Dindori (M.P.) And organised Kisan Sangosthi on 19<sup>th</sup> March, 2015.

**TV/Radio talks:** Radio talks: 3

## AICRP-FC&U, AAU, JORHAT

### Publications

#### Seminar/symposium

Sharma KK, Sutradhar P and Neog SB (2014). Effect of Nitrogen levels on productivity of perennial grasses with and without tree shade. National Symposium on Climate resilient forage production and utilisation, November 13-14, 2014, BCKV, Kalyani

Neog SB, Barua IC and Sharma KK (2014). Exploration of rice-bean germplasm of eastern and north eastern India for commercial cultivation. National Symposium on Climate resilient forage production and utilisation, November 13-14, 2014, BCKV, Kalyani

#### Others

Sharma KK and Neog SB (2015). Prospect and management of forage crops in Assam. Souvenir, National Group meet, Kharif, 2015, AICRP on Forage Crops and Utilization held at PJTSAU, Hyderabad, April 17-18, 2015

#### Bulletin

- Sharma KK and Neog SB (2014), Food-forage cropping systems In Assam, AICRP on FCU, AAU, Jorhat, No FCU/DR-1

#### Extension leaflet

- Production technology of perennial forage crops in Assam (in Assamese)
- Production technology of annual forage crops in Assam (in Assamese)
- Feeding dairy animals in flood affected areas of Assam (in Assamese)

#### Important persons visited to AICRP-FC&U centre - QRT team comprising of

- Dr. Panjab Singh, Ex DG, ICAR, Chairman, QRT;
- Dr. C. L. Acharya, Ex Director, IISR, Bhopal
- Dr. K. S. Ramachandra, Head, Animal Nutrition Division
- Dr. J. P. Yadavendra, Ex Professor (Forage Breeding)
- Dr. S. K. Tiwari, Head, C. P. Division, IGFRI

**Student(s) guided:** M.Sc. (Ag.) in 2 in PBG and in Agronomy-2; Ph. D. (Ag.) in Agronomy-1

**FTDs conducted:** 40

**TSP activities:** Adopted 4 villages in two TSP districts viz., Dhemaji and Karbi Anglong

**Training conducted for farmers/ NGO/ Govt. officials:** 6

**TV/Radio talk delivered by AICRP-FC staff/extension activities:** 4

#### Forage crops seed/planting materials supplied (2014-15)

S. N.	Forage crops	Total quantity (kg)		
		Total Slips	Foundation seed	TFL seed
1.	Hybrid Napier CO-3, CO-4	1.5 lakh		
2.	Setaria Kazungula, PSS-1	1.4 lakh	-	
3.	Rice bean Var. Shyamalima		30 kg	
4.	Oat Var. Kent and JHO 822			2.00 q
<b>Grand Total</b>		<b>2.90 lakh</b>	<b>30.00 Kg</b>	<b>2.00 q</b>

## AICRP-FC&U, CCS HAU, HISAR

### Varieties released at central or state level (During last three years)

Crop	variety	Status
Sorghum	HJ 541	Released for Haryana State in 2013
Berseem	HB 2	Released for Haryana State in 2013
Oats	OS 377	Released for Central Zone in 2015
	OS 403	Identified in 2015 for North East and South Zones of India

### Courses taught

GP 403 - Heterosis Breeding in Crop Plants; Agron. 602 - Crop Ecology; Agron. 509- Agronomy of Fodder & Forage Crops; Biochem 604 - Advanced Techniques in Biochemistry; GP 514 - Breeding for quality Characters

### Research papers: 7

Jindal Y, Singh G, Dahiya and Phogat DS (2014). Evaluation of genetic variability in berseem after mutagenesis. *Forage Research* 39 (4): 201-204.

Jat MK, Chaudhary OP, Kaushik HD, Jindal Y and Tatarwal AS (2013). Diversity and abundance of different floral visitors on Egyptian clover *Trifolium alexandrinum*. *Forage Research* 38 (4): 225-229.

Wadhwa N, Joshi UN and Gandhi SK (2013). Copper and manganese increase resistance of Cluster bean to root rot caused by *Rhizoctonia*. *J. Phytopathol* 161: 172-179).

Kumar S, Joshi UN, Sangwan S, Yadav R, Singh JV and Saini ML (2014). Biomolecular characterization of guar (*Cyamopsis tetragonoloba*) genotypes along with wild species *C. serrata* and *C. senegalensis*. *Plant Syst Evol.* DOI 10.1007/s00606-014-1148-z. (Springer-Verlag Wien 2014).

Mishra P, Arora RN, Joshi UN and Chhabra AK (2014). Heterosis and combining ability for quality traits in intervarietal and interspecific hybrids in oats. *Forage Research* 40 (2): 86-90.

### Others

Jindal Y, Phogat DS, Joshi UN and Mall AK (2014). Forage maize genotypes performance for fodder yield and its attributes with quality parameters at Hisar and All-India level. In: National Symposium on "Climate Resilient Fodder Production and its Utilization" from 13-14 November 2014 held at BCKVV Kalyani. Abstract Pp. 46.

Ravish AS Godara Yogesh Jindal Satyawan Arya and Pummy Kumari (2015). रबी चारा फसल का बीज उत्पादन In: उत्तम बीज उत्पादन तकनीक संग्रह पुस्तक) Editors: Rajesh Kumar Arya Suresh Kumar Arvind Singh Anil Kumar Godara and Krishan Kumar Dahiya. Chapter 13: 40-43.

### Technical Bulletins (3)

Jindal Y, Pahuja SK, Singh SP, Midha LK and Godara AS (2014). सर्दियों का बेहतरीन हरा चारा बरसीम Tech. Bull. Forage Section CCS HAU Hisar.

Phogat DS, Pahuja SK, Singh SP, Midha LK and Jindal Y (2014). जई-सर्दियों का बढ़िया हरा चारा Tech. Bull. Forage Section CCS HAU Hisar.

Pannu RK, Walia RK and Jindal Y (2014). Significant Achievements COA for the year 2013-14. Published by College of Agriculture CCS HAU Hisar

Student(s) guided-M.Sc. (Ag.): 3; Ph. D. (Ag.): 1

FTDs conducted: 15

### Extension activities

- *kisan mela*, farm darshan, T & V training system on monthly basis and farmers visits

### Forage crops seed sale (2014)

- Fodder Oats Variety HJ 8 - 20 Quintals
- Berseem Mescavi & HB 1 - 10 Quintals

## AICRP FC&U, MPKV, RAHURI

### Research papers

Damame SV, Naik RM, Dalvi US and Munjal SV (2014). Effect of PEG induced osmotic stress on osmolytes and antioxidative enzymes in sorghum seedlings. *Indian J Plant Physiol.* 19 (2): 165-173.

Damame SV, Lokhande PK, Kale AA and Munjal SV (2014). Effect of PEG induced osmotic stress on peroxidase and superoxide Dismutase isozymes in sorghum seedlings. *Vegetos* 27 (2): 272-278.

Kharage SA, Damame SV and Lokhande PK (2014). Effect of plant growth stages on nutritional composition of promising Lucerne (*Medicago sativa* L.) genotypes. *Range Mgmt. & Agroforestry* 35: 38-42.

### Others

Pathan SH, Damame SV, Gavit MG and Pardeshi HP (2014). Advances in forage production for livestock development in Maharashtra. In: Souvenir AICRP on Forage Crops National Group Meet-Kharif-2014 Pp. 55-63.

**Popular articles:** 5

### Student Guided:

- M.Sc. (Ag.): Plant Breeding: 1; Entomology: 1; Biochemistry: 1 and Agronomy: 1

**FTDs conducted:** 30

**TSP activities:** Number of beneficiaries 640. Interventions - Supply of Cycle hoe (40 nos.), Rooted slips of Hy. Napier (P. Jaywant) (32,000 nos.), Stylo P. Kranti seed (16 kg), Krishi darshani diary (40 nos.)

**Radio talk:** 2

**Lectures to farmers in training programme:** 5

### Seed/planting materials sold

#### Seed Production (Rabi-2014-15) (Tentative)

S. N.	Crop	Breeder Seed (q)	Truthful Seed (q)	Nucleus Seed (q)
1.	Oat Phule Harita	7.00	4.00	2.00
2.	Lucerne	-	0.30	-
3.	Sorghum (Ruchira)	0.80	-	0.20
4.	Brseem (Vardan)	0.25	0.80	-

### Visits of farmers and Govt. Staff of Agricultural Department of Maharashtra State

- No. of Farmers visited to farm during rabi-14: 210
- No. of Govt. officers/staff visited to farm during rabi-14: 10

**Externally funded project:** 2 (Product testing)

## AICRP FC&U, SKAUST, SRINAGAR

### Research paper: 3

Ahmad M, Zaffar G, Mir SD, Dar ZA, Iqbal S and Habib M (2014). Genetic analysis for fodder yield and its important traits in oats (*Avena sativa* L.). *Indian Journal of Genetics and Plant Breeding* 74 (1): 1-3.

Ahmad M and Zaffar G (2014). Stability analysis for forage yield and its contributing traits in Oats (*Avena sativa* L.). *Trends in Bioscience* (Accepted).

Ahmad M and Zaffar G (2014). Study of heterosis inter-relationship and path analysis of green fodder yield and its contributing traits in oats (*Avena sativa* L.). *Research Journal of Agriculture Sciences* (Accepted).

### Student's guided: 1

Studies in Relation to Genetic Variability in Temperate Sub-Populations of Alfalfa (*Medicago* spp.) in Ladakh [Shahida Iqbal (2010-230-D) Ph. D. Student ]

### FTD's Conducted: 40

S. N.	Crop	Variety	FTD's
1	Oats	Sabzaar	10
2		SKO-20 (Shalimar fodder oats-1)	10
3		SKO-90(Shalimar fodder oats-2)	10
4		SKO-96(Shalimar fodder oats-3)	10

### TSP activities:

- Beneficiaries - 50 farmers, 25 each at district Ganderbal and Bandipora, work was carried out in collaboration with concerned KVKs to uplift the socio-economic condition of tribal farmers under adopted villages during 2014-15. The centre also distributed Oats seed, seed bins and farm implements to 50 Tribal farmers of Yarnuqam, Gangbal and Alusa villages of Ganderbal and Bandipora Districts under Tribal Sub Plan scheme in the month of November, 2014.
- Organized Forage day for Tribal farmers of district Ganderbal and Bandipora through concerned KVKs in the month of May-2015 under TSP programme.

### Interaction/extension:

- Interaction programme with officials from the Department of Agriculture, Government of J&K on *Rabi* fodder crop production technology.
- Interaction programme with officials from the Department of Veterinary & Animal Husbandry, Government of J&K on perennial cultivation of fodder crops.

### Trainings conducted for farmers/NGO/Govt. Officials: 5

### TV/Radio talk delivered by AICRP-FC&U staff/extension activities: 3

### Seed/Plant material sold (2014-15):

S. N.	Crop	Variety	Total quantity sold (Quintals)
1	Oats	Sabzaar	8.0
2		SKO-20 (Shalimar fodder oats-1)	5.0
3		SKO-90(Shalimar fodder oats-2)	15.0
4		SKO-96(Shalimar fodder oats-3)	5.0
<b>Total quantity of seed supplied in quintals</b>			<b>33.0 quintals</b>

## AICRP FC&U, KAU, VELLAYANI

### Publications

#### Research Papers

Anita, M. R. and Lakshmi, S. (2015). Nutrient uptake of fodder cowpea varieties as influenced by soil moisture status levels. *Trends in Biosciences*, 8 (10):

#### Conference papers

Anita, M. R. and Lakshmi, R. (2015). Chlorophyll and protein content of fodder cowpea varieties as influenced by soil moisture stress levels. National workshop on climate change and sustainable development. 11<sup>th</sup> Kerala Environment Congress, Kottayam, Kerala

#### Extension Leaflets- 2 (Malayalam)

- Silage
- Fodder varieties released from AICRP on forage Crops, Vellayani

#### Student(s) guided

- M. Sc. (Ag.) in Plant Breeding and Genetics: 2;
- Ph. D (Ag.) in Plant Breeding and Genetics: 1;
- M.Sc. (Ag.) in Agronomy: 2

#### Teaching-Courses Handled

- B. Sc. (Ag.) Courses-PBGN 3105- Breeding of crops and intellectual property rights,
- PBGN 1101- Morphology and systematic of crop plants
- **PG Courses-** Principles of genetics, Genomics in crop improvement, Biodiversity
- B. Sc. (Ag.) Courses; Irrigation and water management (Agro1203); Agricultural Meteorology (Agmt 1101) and Field Crops-1(Agro 2205)
- **PG Course-** Agrostology and Agroforestry

#### FTDs conducted: 20

#### TSP activities

- The beneficiaries (scheduled tribe) were identified. One kid goat and planting material of BN Hybrid variety Suguna (1 cent) was given to each beneficiary. Farmers benefitted: 22  
Location: Mundela, Uriakode, Vellanad

#### HRD for the AICRP-FC&U staff

#### Dr. Usha C Thomas had attended

- International symposium on phyto-chemistry, Organised by Kerala Academy of Sciences on April 25, 2015
- Agronomist Meet held at Trivandrum on May 10-11, 2015
- Kerala Environment Congress 2015 at Kottayam, Kerala from 6<sup>th</sup> to 8<sup>th</sup> May 2015

#### Sale of seeds/planting material

- Slips and cuttings of Guinea grass and Hybrid napier sold for a total of Rs. 23,311/-.

## AICRP FC&U, TNAU, COIMBATORE

### Research papers

Dhasarathan M., Babu C and Iyanar K (2015). Genetic analysis for fodder yield and component traits in maize (*Zea mays* L.). *Electron J Plant Breed.* 6 (1): 43-53.

Dhasarathan M, Babu C and Iyanar K (2015). Combining ability and gene action studies for yield and quality traits in Baby corn (*Zea mays* L.). *SABRAO J Breeding and Genetics* 47 (1): 60-69.

Iyanar K, Babu C, Kumaravadivel N, Kalamani A, Velayudham K and Sathia Bama K (2015). A high yielding multi cut fodder Sorghum CO-31. *Electron J Plant Breed* 6 (1): 54-57.

### Others

Babu C and Kalamani A (2015). Forage crops for Prosperity. In: TNSCST sponsored -Creation of Awareness Programme for Farmers at Kongunadu Arts and Science College Coimbatore-29 2015. Pp. 10-19.

Babu C and Velayutham A (2015). Role of forage crops in mitigating the effects of climate change. In: Souvenir: National Group Meet *Kharif-2015* of AICRP on Forage Crops & Utilization held at PJTSAU Hyderabad Pp 43646.

Babu C, Iyanar K and Kalamani A (2015). High yielding forage grass varieties for sustainable livestock productivity. In: Souvenir: National Group Meet *Kharif-2015* of AICRP on Forage Crops & Utilization held at PJTSAU Hyderabad Pp. 85688.

### Important persons visited to AICRP-FC&U centre:

- Shri. Jignesh Shah, Director, Pushpak Pvt. Ltd., Mumbai.
- K. Sridaran, Vice President, T. Stanes and Company Limited, Coimbatore
- Dr. Jhon Hendry Neizen, Animal Nutritionist, Hutsun Agro Products Ltd.

**Student (s) guided:** M.Sc. (Ag.) in PBG61; Ph. D. (Ag.) in PBG: 1

**FTDs conducted:** 20

**Training conducted for farmers/NGO/Govt. officials:** 5

**TV/Radio talk delivered by AICRP-FC staff/ extension activities:** 4

### Forage crops seed production details (2014-15)

S. N.	Forage crops	Total quantity (kg)			
		Breeder seed	Foundation seed	TFL seed	Total
1.	Multicut Sorghum CO (FS) 29	275	1164	1611.13	3050.13
2.	Multicut Sorghum CO 31	-	-	94.03	94.03
3.	Fodder maize-African tall	-	8946	1897.5	10843.5
4.	Fodder cowpea CO (FC) 8	-	548.95	148	696.95
5.	Lucerne CO 2	-	-	7.145	7.145
6.	Hedge Lucerne	-	-	543.4	543.4
7.	Subabul	-	-	17.8	17.8
8.	Agathi	-	-	226.8	226.8
<b>Grand Total</b>		<b>275</b>	<b>10658.95</b>	<b>4545.805</b>	<b>15479.755</b>

### Quantity of planting material produced and supplied (2014-15)

S. N.	Crop	Planting material (Nos.)
1.	BN hybrid CO (CN) 4	8,92,964
2.	BN hybrid CO (BN) 5	6,82,472
2.	Guinea grass CO (GG) 3	59,195

**Externally funded projects:** 2

## AICRP FC&U, OUAT, BHUBANESWAR

**FTDs conducted: 10**

**Workshops, summer courses, symposia, training programmes attended**

- Dr. S. Tripathy attended national symposium on "Management options for enhancing farm productivity and livelihood security under changing climate" October, 29-31, 2014.
- Dr. S. Tripathy attended Global social science conference on "Management of sustainable livelihood system" February 14-17, 2015.
- Dr. S. Tripathy attended National conference of Plant Physiology on "Frontiers of Plant Physiology Research: Food Security and Environmental Challenges" February 24-26, 2015.

**Research Publications**

Tripathy SK, Dash GB and *et al* (2014). Seed Storage Protein Profiling: A method for study of Bio Chemical basis of Genetic Diversity in Pigeon Pea. *Asian Journal of Bio Chemical and Pharmaceutical Research* 3 (4): 245-257.

Tripathy SK, Dash GB and *et al* (2014). Morphological Diversity of Early Duration Land Races and Popular Upland Varieties of Rice. *Asian Journal of Bio Chemical and Pharmaceutical Research* 4 (4): 132-144.

Bastia DK, Tripathy S and Pradhan S (2014). Carbon sequestration opportunities in organic agriculture. *Journal of Crop and Weed* 10 (2): 252-267.

**Research papers presented at seminar/symposia:**

Tripathy S, Bastia DK, Awasthi DP and Panda NK (2014). Effect of moisture conservation practices on production of perennial grasses. **In** "National symposium on "Management options for enhancing farm productivity and livelihood security under changing climate" 29<sup>th</sup>-31<sup>st</sup> October Bhubaneswar. Pp. 118-121.

Awasthi DP, Dash B, Dash GB, Tripathy S and Panda NK (2014). Time of occurrence and impact of different insect pest and diseases of forage cowpea under SE coastal zone of Odisha. **In** "National symposium on "Management options for enhancing farm productivity and livelihood security under changing climate" 29<sup>th</sup>-31<sup>st</sup> October Bhubaneswar. Pp 219-220.

Pradhan S, Bastia DK and Tripathy S (2014). Soil organic carbon health and yield sustainability under organically managed rice-rice sequence. **In** "National symposium on "Management options for enhancing farm productivity and livelihood security under changing climate" 29<sup>th</sup>-31<sup>st</sup> October Bhubaneswar. Pp. 238-240.

Bastia DK, Pradhan S, Garnayak LM and Tripathy S (2014). Obligations and opportunities of carbon sequestration in coeval agricultural milieu. **In** "National symposium on "Management options for enhancing farm productivity and livelihood security under changing climate" 29<sup>th</sup>-31<sup>st</sup> October Bhubaneswar. Pp. 112-115.

Sahoo SK, Bastia DK, Tripathy S and Sahoo KC (2014). Effect of plant population and age of seedling on growth and yield of rice under flat and bed method of cultivation. **In** "National symposium on "Management options for enhancing farm productivity and livelihood security under changing climate" 29<sup>th</sup>-31<sup>st</sup> October Bhubaneswar. Pp. 240-241.

Tripathy S, Bastia DK and Panda MR (2015). Productivity and economics of maize+vegetable inter cropping system in rainfed upland. **In** "Global social science conference on "Management of sustainable livelihood system" 14<sup>th</sup> -17<sup>th</sup> February, 2015, Bhubaneswar. Pp 113.

## AICRP FC&U, SKRAU, BIKANER

### Popular articles/ book chapters/ Extension Folder

Shekhawat SS (2014). Successful cultivation of guinea grass in arid region of Rajasthan.

*Indian Farming*, 64 (8): 24-25.

Shekhawat SS and Kumawat SM (2015). Forage management for sustainable livestock in Rajasthan. In:

Souvenir (AICRP on FC & U, NGM-Kharif-2015), PJTSAU, Hyderabad: 114-117.

Shekhawat SS and Kumawat SM Paschimi Rajasthan me charagah sthapana ki unnat taknik

### Student (s) guided and teaching work:

- Dr. SS Shekhawat guided two M. Sc. (Ag.) and one Ph. D. (Ag.) students as Major Adviser for their thesis work and taught one PG course on Heterosis Breeding.
- Dr. SM Kumawat: Teaching (2 courses), Guiding (2) One M.Sc. (Ag.) & One Ph. D. (Ag.)

### FTDs conducted: 25

### Training conducted for farmers/NGO/Govt. Officials

1. Farmers were given training for green fodder production during Rabi season on 03-11-2014.
2. Training lectures were given to dairy officers of Rajasthan Cooperative Dairy Federation Ltd. on February 26, 2015 about improved technology of fodder seed production. The training was organised by Seed Processing plant of Rajasthan Cooperative Dairy Federation Ltd, Lalgarh, Bikaner. Field visit of the dairy officers was also organised at AICRP on Forage Crops field.
3. 30 farmers of Barmer district of Rajasthan visited the field of AICRP on Forage Crops on March 13, 2015. The visit was organised by BAIF unit located at Barmer.

### Seed/ planting material sold:

- Green fodder and dry fodder produced from the experiments sold worth approx. Rs. 15000/-.

### Externally funded project

- RKVY project on augmenting sewan grass seed production
- RKVY project on increasing green fodder production under limited water availability

### Other assignments

- Dr. SS Shekhawat worked as Zonal Magistrate in Panchayat Elections 2015 of Rajasthan during January 29, 2015 to February 2, 2015.

## WEATHER REPORT FOR RABI-2014-15

The weather report of the AICRP-FC coordinating centres and Head quarter across the different zones during *Rabi* 2014-15 have been presented in this section. The weather parameters prevalent during the season from 40<sup>th</sup> Standard Meteorological Week (October 01-07, 2014) to 21<sup>st</sup> Standard Meteorological Week (May 21-27, 2015) were taken into consideration, which covers the *Rabi* season, 2014-15 season for all the testing locations for trial conduction (tables M1 to M11). During the reporting period, weather variations are clearly visible in maximum and minimum temperature, Relative humidity, rainfall, rainy days and sunshine hours in different agro-climatic zones, which had varied impact on establishment, growth, yield and quality of different annual and perennial forage crops and their varieties and also having close correlation with the incidence and surveillance of insect-pest and diseases of forage crops.

**Temperature**

In Hill zone, Srinagar was the coolest location recording  $-5.9^{\circ}\text{C}$  during 52<sup>nd</sup> SMW. Maximum temperature was recorded at Palampur ( $32.3^{\circ}\text{C}$ ) during 21<sup>st</sup> SMW. The average minimum temperature over the season was recorded lowest at Srinagar. In North-East zone, Ranchi recorded the lowest minimum temperature ( $2.4^{\circ}\text{C}$ ) during 52<sup>nd</sup> SMW whereas maximum temperature was recorded at Kalyani ( $39.1^{\circ}\text{C}$ ) during 21<sup>st</sup> SMW. Minimum variation for maximum temperature over the season was observed at Jorhat. In North-West zone, Hisar recorded lowest minimum temperature ( $3.9^{\circ}\text{C}$ ) during 52<sup>nd</sup> SMW, whereas, maximum temperature was recorded at Bikaner ( $42.9^{\circ}\text{C}$ ) during 18<sup>th</sup> SMW. In Central zone, Rahuri recorded the lowest minimum temperature ( $6.9^{\circ}\text{C}$ ) during 3<sup>rd</sup> SMW whereas the maximum temperature was recorded at Anand ( $42.5^{\circ}\text{C}$ ) during 20<sup>th</sup> SMW. In South zone, the lowest minimum temperature was recorded at Hyderabad ( $5.4^{\circ}\text{C}$ ) during 2<sup>nd</sup> and 3<sup>rd</sup> SMW ( $9.1^{\circ}\text{C}$ ). The maximum temperature was recorded at Hyderabad ( $42.3^{\circ}\text{C}$ ) during 21<sup>st</sup> 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 M11). In Hill zone, Srinagar received higher rainfall (980.0 mm) as compared to Palampur (692.9 mm). In North-East zone, Jorhat received highest rainfall (469.6 mm) followed by Imphal (373.3 mm) and lowest being with Ranchi (207.1 mm). The maximum number of rainy days was recorded at Jorhat (52 days). In North-West zone, Ludhiana received highest rainfall (425.3 mm) in 29 rainy days followed by Hisar (270.1 mm). Bikaner received lowest rainfall (188.7 mm) in 9 rainy days. In Central zone, maximum rainfall and maximum number of rainy days (291.3 mm, 21 days) was recorded at Jabalpur followed by Rahuri (249.1 mm, 15 days) and lowest being with Anand (54 mm, 4 days). In South zone, Coimbatore received maximum rainfall (618.2 mm) in 32 rainy days followed by Vellayani (515.4 mm in 44 days).

**Relative Humidity**

In Hill zone, the morning, afternoon and average RH was recorded higher at Srinagar compared to Palampur through at the season and it indicated that Srinagar is more humid than Palampur. In North-East zone, maximum average RH of 93.3% was recorded at Jorhat during morning hours followed by 86.2 % at Kalyani. The average minimum RH during morning and afternoon hours was recorded at Jorhat (60.2%) and Kalyani (54.8%) respectively. In North-West zone, maximum average RH of the season was recorded at Ludhiana and Pantnagar (87%) in morning hours and 53.4 and 50.5 %, respectively in afternoon. The lowest RH during morning as well as evening hours was recorded at Bikaner (67 and 33% respectively). In Central zone, maximum RH in morning (86.5 %) and evening hours (42.7 & 40.3%) was recorded at Jabalpur and Anand. The lowest average RH of the season (57.0 & 32.8%) in morning and evening hours was recorded at Rahuri. In South zone, maximum average RH of the season in morning and evening hours (90.4 and 74.1%) was recorded at Vellayani. The lowest average RH of the season (73.9 & 37.6%) 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 Palampur (6.9) followed by Srinagar (4.3) during the crop season. This indicates the persistence of cloudy weather at Srinagar. In North-West zone, higher average sunshine hours were recorded at Bikaner (8.1) followed by Hisar (6.8) during the crop season. Lowest average sunshine hours were recorded at Bikaner (6.4). In North-East zone, maximum average sunshine hours were recorded at Ranchi (7.9) followed by Kalyani (6.9) during the crop season. Lowest higher average sunshine hours were recorded at Jorhat (5.8). In Central zone, maximum average sunshine hours were recorded at Anand (9.0) followed by Jabalpur (8.1) during the crop season. Lowest higher average sunshine hours were recorded at Raipur (7.6). In South zone, maximum average sunshine hours were recorded at Hyderabad (7.8) followed by Coimbatore and Mandya (6.4) during the crop season.

Std. Week No.	Period	Std. Week No.	Period
40	01-07 Oct, 2014	05	29-04 Feb, 2015
41	08-14 Oct, 2014	06	05-11 Feb, 2015
42	15-21 Oct, 2014	07	12-18 Feb, 2015
43	22-28 Oct, 2014	08	19-25 Feb, 2015
44	29-04 Nov, 2014	09	26-04 March, 2015
45	05-11 Nov, 2014	10	05-11 March, 2015
46	12-18 Nov, 2014	11	12-18 March, 2015
47	19-25 Nov, 2014	12	19-25 March, 2015
48	26-02 Dec, 2014	13	26-01 April, 2015
49	03-09 Dec, 2014	14	02-08 April, 2015
50	10-16 Dec, 2014	15	09-15 April, 2015
51	17-23 Dec, 2014	16	16-22 April, 2015
52	24-31 Dec, 2014	17	23-29 April, 2015
01	01-06 Jan, 2015	18	30-06 May, 2015
02	07-14 Jan, 2015	19	07-13 May, 2015
03	15-21 Jan, 2015	20	14-20 May, 2015
04	22-28 Jan, 2015	21	21-27 May, 2015

**Table M 1: Meteorological data in Hill zone during crop growth period of Rabi 2014-15**

Std. Week No.	PALAMPUR						SRINAGAR					
	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2		
40	25.6	15.4	88.3	80.4	11.0	4.6	27.71	10.57	93.57	50.85	0	7.18
41	24.9	14.5	73.7	58.9	19.0	8.6	20.01	5.74	90.71	72.43	17.40	4.60
42	24.3	13.5	78.7	59.4	0.0	8.1	20.21	6.09	93.14	70.00	5.60	6.14
43	23.2	12.6	78.0	62.1	1.6	8.1	18.59	5.07	92.71	74.57	0.00	4.90
44	22.5	11.8	58.1	45.9	0.0	8.1	16.50	2.64	86.43	69.57	0.40	4.04
45	21.3	10.8	76.1	56.4	5.0	6.0	14.54	3.17	90.00	71.14	19.60	3.67
46	20.7	9.9	71.6	49.9	0.0	9.1	14.50	-1.50	90.43	58.01	0.00	4.10
47	19.5	8.9	62.7	42.7	0.0	8.9	13.36	-2.57	91.71	74.57	0.00	2.23
48	18.1	7.5	64.4	40.0	0.0	8.6	10.86	-0.31	92.29	79.57	0.00	0.43
49	17.5	6.8	61.3	39.3	0.0	9.0	11.71	-3.29	91.00	72.14	0.00	0.56
50	16.8	6.5	78.4	63.4	58.8	4.3	10.07	-3.77	89.14	55.71	0.00	2.43
51	16.1	6.1	69.0	55.4	0.0	6.6	8.71	-4.16	90.29	60.57	0.00	1.83
52	14.6	5.1	75.0	44.3	0.0	8.3	9.31	-5.88	94.25	62.88	0.00	3.18
01	14.2	4.9	73.0	61.1	11.0	6.8	10.50	-2.63	89.14	60.29	0.00	3.94
02	14.6	5.1	71.6	50.1	14.0	7.2	11.14	-3.31	89.86	56.43	3.00	3.74
03	14.5	4.9	73.1	49.1	2.4	7.9	11.53	-3.57	90.86	49.29	0.00	5.07
04	14.4	5.2	87.0	67.6	83.0	3.9	9.07	-1.87	88.43	60.00	4.30	3.87
05	15.0	5.4	80.0	62.7	42.8	4.5	6.23	-2.09	90.14	68.29	61.60	2.81
06	15.5	5.7	68.0	48.1	0.0	7.6	10.16	-1.97	88.57	56.57	6.60	4.46
07	16.2	6.4	77.9	56.4	9.8	6.7	11.80	-1.01	89.86	59.43	32.20	3.87
08	16.8	6.7	74.0	61.0	54.0	3.9	8.57	2.41	92.14	76.86	128.20	0.17
09	17.9	7.8	78.6	70.1	134.4	1.4	7.50	0.24	90.29	75.29	134.50	2.33
10	19.0	9.0	62.9	51.3	39.0	5.9	7.93	-0.29	91.29	68.14	127.80	2.20
11	19.6	9.6	70.4	56.1	47.4	4.6	9.87	0.60	88.86	69.00	103.20	2.89
12	20.1	10.2	64.0	50.3	0.2	9.8	18.94	3.29	86.29	42.29	10.60	7.64
13	21.8	11.5	68.4	57.4	18.0	5.7	12.93	5.46	90.00	78.86	97.80	1.89
14	23.4	12.4	79.9	72.9	59.7	2.2	15.29	6.04	87.14	57.43	56.40	3.63
15	24.5	13.8	72.7	62.3	0.0	8.9	23.07	5.29	69.57	37.29	0.00	8.90
16	26.3	15.4	72.0	61.3	33.8	6.4	19.64	8.00	84.14	63.57	75.80	5.31
17	27.7	16.4	70.1	62.4	0.0	8.7	21.86	7.36	78.14	42.86	49.20	7.40
18	28.0	16.8	67.3	64.9	3.4	9.3	23.29	6.56	69.00	46.00	0.00	9.13
19	30.1	17.6	74.7	71.9	25.8	6.6	23.79	10.30	76.43	64.14	18.60	5.36
20	28.5	16.8	71.4	66.7	11.6	8.1	23.50	10.36	87.71	62.67	27.20	7.03
21	32.3	17.9	85.1	81.5	7.2	10.1	21.20	8.72	76.00	48.10	0.00	8.80

**Table M 2: Meteorological data in North West zone during crop growth period of Rabi 2014-15**

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	37.0	21.7	76.3	31.6	0.0	9.5	35.6	23.2	65.9	35.3	0.0	0.0	10.1
41	34.6	18.9	79.7	38.6	20.3	9.0	36.9	25.1	57.2	29.2	0.0	0.0	9.9
42	29.8	15.3	89.7	38.0	0.0	8.0	34.1	20.0	57.6	31.5	0.0	0.0	9.1
43	32.4	19.0	85.3	47.1	0.0	7.0	35.6	19.1	59.0	28.4	0.0	0.0	8.7
44	30.7	14.6	88.1	34.9	1.0	6.4	32.6	19.9	66.4	44.1	0.0	0.0	5.4
45	29.9	14.3	87.1	36.3	0.0	6.7	31.8	18.6	64.1	29.3	0.0	0.0	6.7
46	27.1	7.7	79.3	28.3	0.0	7.1	29.3	12.0	54.6	14.4	0.0	0.0	9.4
47	26.6	6.9	87.7	28.9	0.0	7.8	31.0	11.6	52.0	21.4	0.0	0.0	9.4
48	28.1	9.9	81.3	32.3	0.0	7.7	31.3	11.5	53.3	12.4	0.0	0.0	8.9
49	26.9	7.9	91.4	35.0	0.0	7.8	29.0	10.3	56.7	19.5	0.0	0.0	8.8
50	20.5	6.8	94.3	56.4	9.0	5.2	23.9	7.1	79.4	25.0	0.0	0.0	5.0
51	13.8	5.0	100	88	0.0	1.6	20.9	5.2	81.4	40.4	0.0	0.0	6.5
52	15.0	3.9	100	71	0.0	4.0	19.2	4.9	79.9	29.1	0.0	0.0	7.0
01	16.1	7.6	97	81	2.6	1.8	23.6	5.4	77.4	33.6	0.0	0.0	6.8
02	14.9	6.3	98	77	4.0	2.8	26.2	5.4	82.7	16.6	0.0	0.0	8.2
03	18.6	4.8	99	62	2.8	5.9	24.7	6.4	78.9	33.4	0.0	0.0	6.1
04	14.7	7.2	98	83	6.0	0.8	20.0	4.6	86.7	49.9	0.0	0.0	3.1
05	18.8	6.0	88	59	8.5	5.6	23.9	8.3	67.3	33.1	0.0	0.0	7.5
06	21.9	6.2	92	46	0.0	8.2	25.3	7.3	70.7	33.7	0.0	0.0	9.5
07	24.3	9.5	90	53	0.0	6.6	29.9	11.4	65.7	35.0	0.0	0.0	8.9
08	25.9	14.4	97	63	3.7	4.5	30.0	16.9	77.6	34.6	0.0	0.0	5.7
09	22.4	9.2	87	57	40.4	6.0	24.0	9.7	72.4	20.5	2	38.1	5.7
10	23.5	8.3	93	58	17.5	8.2	23.9	11.4	74.7	31.7	1	11.3	7.3
11	24.8	11.8	94	57	49.0	6.0	26.5	14.1	74.1	43.4	2	17.3	7.2
12	29.4	13.9	92	43	0.0	9.1	36.1	19.0	82.0	52.6	0	0.0	10.0
13	32.4	17.5	88	45	14.2	7.4	36.0	20.0	63.6	46.4	0	0.0	7.9
14	29.9	17.2	88	45	68.1	8.0	32.6	18.1	69.5	60.6	2	61.6	8.4
15	32.1	17.9	79	40	5.5	8.5	35.6	19.2	64.0	39.7	0	0.0	8.7
16	36.0	20.0	67	30	11.5	9.5	41.4	23.7	63.9	34.4	0	0.0	9.8
17	38.0	21.6	56	27	6.0	9.8	41.4	23.1	49.4	18.0	0	0.0	10.7
18	39.2	20.9	63	20	0.0	9.6	41.7	22.5	42.1	22.7	0	0.0	11.0
19	40.5	24.3	58	29	0.0	8.6	37.5	25.8	60.9	43.8	1	18.4	9.0
20	38.2	22.8	66	32	0.0	8.3	40.5	25.9	66.4	39.8	1	42.0	10.6
21	42.6	22.9	44	18	0.0	9.6	42.9	27.6	71.8	37.5	0	0.0	9.1

**Table M 3: Meteorological data in North West zone during crop growth period of Rabi 2014-15**

Std. Week No.	LUDHIANA							PANTNAGAR				
	Temperature (C)		Humidity (%)		No. of Rainy Days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		Rainfall (mm)
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2	
40	33.3	23.4	87	57	0.0	0.0	9.5	32.2	22.6	90	60	5.6
41	34.1	24.1	89	55	1.0	4.8	2.9	31.4	17.9	87	55	39.8
42	30.1	15.7	89	40	0.0	0.0	8.7	29.1	15.5	91	51	0
43	30.4	17.9	87	50	1.0	2.5	3.3	29.3	16.6	88	55	0
44	29.1	14.1	90	38	0.0	0.0	7.2	28.5	13.5	91	46	0
45	28.7	14.2	90	37	0.0	0.0	5.7	29.2	12.8	91	46	0
46	26.1	8.9	90	31	0.0	0.0	8.1	27.7	9.5	94	34	0
47	25.4	8.3	94	33	0.0	0.0	7.7	26.1	8.6	92	38	0
48	26.2	9.8	91	47	0.0	0.0	7.4	26.0	8.7	92	40	0
49	25.1	7.7	93	42	0.0	0.0	7.9	24.2	9.9	94	49	0
50	18.6	7.2	92	60	1.0	42.2	4.0	20.2	8.2	91	57	40.1
51	12.5	6.9	95	81	0.0	0.0	1.4	16.6	7.4	96	78	0
52	13.3	5.2	97	82	0.0	0.0	1.8	19.1	5.5	96	57	0
01	16.2	8.2	97	74	0	0.4	0.9	18.0	11.2	93	77	21.9
02	13.3	7.3	95	80	1.0	4.6	0.3	15.5	8.4	95	75	0
03	17.4	6.2	97	69	1.0	6.2	5.7	16.2	8.1	94	71	0
04	14.7	7.7	97	77	1.0	14.6	3.1	17.2	8.6	95	75	11.0
05	18.6	7.1	92	61	2.0	11.6	5.9	20.2	8.1	89	62	0
06	20.9	7.2	95	59	0.0	0.0	7.4	22.3	7.4	94	54	0
07	23.9	11.2	93	62	2.0	8.4	5.8	23.7	9.8	88	51	0
08	23.5	14.5	94	77	3.0	19.0	3.7	27.1	13.4	90	55	7.0
09	20.3	10.6	93	67	2.0	204.8	8.3	22.8	13.0	92	61	61.1
10	22.5	9.2	94	61	1.0	8.2	8.2	25.8	10.2	89	45	0
11	24.1	12.5	93	63	3.0	36.2	6.1	26.8	12.7	90	51	1.2
12	29.0	15.2	96	53	0.0	0.0	10.2	30.4	13.7	88	45	0
13	30.2	17.7	87	52	2.0	15.8	6.8	30.9	17.7	86	44	26.2
14	27.1	17.3	85	60	1.0	3.4	6.7	29.4	15.8	89	45	18.9
15	32.6	18.1	79	49	1.0	17.6	9.5	31.9	16.6	82	36	0
16	34.7	20.3	80	45	1.0	8.0	9.0	35.3	18.5	74	35	0
17	36.6	21.7	56	25	0.0	0.0	10.4	33.7	19.2	65	34	1.2
18	37.9	20.6	53	20	0.0	0.0	10.3	36.1	18.3	70	29	18.4
19	39.3	24.8	51	25	3.0	10.8	6.9	37.4	24.5	69	39	10.8
20	37.5	23.6	66	31	1.0	6.2	9.6	37.3	22.5	70	37	0
21								41.3	22.5	67	31	0.8

**Table M 4: Meteorological data in Central zone during crop growth period of Rabi 2014-15**

Std. Week No.	URULIKANCHAN						JHANSI						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sun shine (hours)
	Max.	Min.	RH1	RH2			Max.	Min.	RH1	RH2			
40	32.2	20.9	99.9	61.9	1	6.0	36.7	20.7	84	41	0	0.0	9.6
41	33.4	21.2	98.0	61.4	0	0	34.5	19.2	87	44	0	1.6	8.7
42	25.1	33.2	96.0	58.7	0	0	31.9	16.4	84	40	0	1.0	8.8
43	33.1	15.3	99.7	39.1	1	8.6	33.3	15.0	87	32	0	0.0	8.9
44	31.3	16.4	99.3	44.3	0	0	32.5	15.7	85	32	0	0.0	7.7
45	31.3	14.4	97.6	27.7	0	0	28.6	15.2	87	33	0	0.0	8.0
46	30.7	13.5	99.0	25.4	1	24.2	28.6	11.4	88	35	0	0.0	4.7
47	29.1	11.5	92.4	29.4	0	0	29.1	8.3	87	27	0	0.0	8.8
48	30.2	17.5	91.6	37.7	0	0	29.7	10.0	86	30	0	0.0	8.4
49	30.6	12.9	93.9	26.1	0	0	27.7	8.8	84	34	0	0.0	8.8
50	28.9	16.9	70.1	28.6	0	0	22.8	8.3	89	54	0	26.2	4.1
51	23.5	20.4	37.1	29.4	0	0	18.0	4.4	93	70	1	0.0	5.7
52	24.6	22.2	34.1	27.7	0	0	17.9	3.5	93	64	0	0.0	5.9
01	30.4	15.7	79.9	30.2	0	0	19.3	9.4	92	69	0	11.2	3.8
02	26.5	7.7	84.4	22.7	0	0	18.6	4.9	92	64	3	0.0	6.3
03	28.6	6.9	95.9	26.6	0	0	15.1	6.9	92	83	0	0.8	2.0
04	29.4	11.5	95.0	30.6	0	0	16.1	8.2	94	85	0	22.2	3.3
05	29.4	10.9	89.1	27.3	0	0	22.1	6.5	90	47	0	0.0	8.6
06	30.4	9.0	85.3	22.6	0	0	21.4	8.8	92	63	0	15.0	7.0
07	32.1	10.2	90.1	22.0	0	0	26.4	10.4	89	44	2	1.0	8.7
08	33.9	11.5	84.1	20.1	0	0	30.3	13.3	85	45	0	0.0	8.9
09	34.8	8.8	96.1	37.0	2	40.0	25.9	13.5	88	64	0	14.8	5.8
10	33.9	8.2	88.1	17.7	0	0	27.1	10.9	85	47	2	0.0	10.2
11	36.0	11.8	69.7	16.0	0	0	27.7	13.9	90	53	0	22.0	6.1
12	37.3	13.8	64.1	14.6	0	0	31.5	14.6	84	34	2	0.0	10.6
13	37.9	15.4	74.0	16.4	2	5.8	34.6	18.0	84	36	0	15.6	8.4
14	38.7	17.0	77.0	17.7	0	0	33.2	17.5	81	41	1	4.2	8.9
15	39.3	18.1	93.4	17.7	1	15.8	33.2	17.3	77	47	1	2.4	7.8
16	37.4	19.0	86.1	24.3	0	0	38.3	20.4	71	29	1	0.0	8.6
17	39.6	17.8	65.7	16.1	0	0	40.4	20.5	59	27	0	0.0	10.3
18	38.4	18.9	78.7	19.4	0	0	41.4	21.1	58	19	0	0.0	10.3
19	36.7	22.7	80.0	23.9	0	0	43.0	23.9	47	24	0	0.0	9.9
20	38.9	21.6	74.7	16.7	0	0	42.2	23.1	62	22	0	2.4	9.3
21	37.9	23.6	74.4	22.0	0	0	45.0	27.3	46	19	1	0.0	9.7

**Table M 5: Meteorological data in Central zone during crop growth period of Rabi 2014-15**

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	36.9	24.1	86	46	0.0	0.8	9.2	34.1	22.2	70	40	2	5.00
41	37.3	21.4	93	39	0.0	0.0	9.4	34.0	19.6	64	33	0	00.0
42	37.0	19.2	100	40	0.0	0.0	9.6	33.7	20.9	72	43	1	07.4
43	36.0	18.8	89	43	0.0	0.0	7.4	29.4	16.1	72	57	2	13.4
44	35.9	19.4	88	37	0.0	0.0	7.2	32.0	14.0	56	36	0	01.1
45	35.0	17.7	86	38	0.0	0.0	9.2	31.8	15.9	57	33	0	0.00
46	34.4	22.6	87	52	1.0	3.6	6.5	29.7	20.1	81	63	2	95.6
47	33.5	16.5	93	36	0.0	0.0	9.1	29.8	15.2	69	41	0	0.00
48	32.6	15.6	97	40	0.0	0.0	9.0	29.6	12.1	57	29	0	0.00
49	31.2	14.6	84	42	0.0	0.0	9.2	29.1	10.9	55	32	0	0.00
50	28.6	12.3	89	69	0.0	0.0	8.3	29.2	14.6	67	47	0	0.00
51	26.3	10.3	94	49	0.0	0.0	7.7	25.2	7.5	52	34	0	0.00
52	23.8	8.6	75	31	0.0	0.0	8.0	27.2	8.2	56	37	0	0.00
01	26.3	12.1	96	50	0.0	0.8	7.5	24.9	12.7	74	55	0	01.2
02	29.8	9.2	99	36	0.0	0.0	9.2	27.2	6.8	48	26	0	0.00
03	26.9	11.9	88	58	0.0	0.0	8.8	28.6	10.5	54	33	0	0.00
04	25.7	12.6	93	53	0.0	1.0	4.8	29.4	14.0	62	37	0	0.00
05	28.2	10.5	92	39	0.0	0.0	9.8	30.1	12.9	52	35	0	0.00
06	29.4	13.4	85	44	0.0	0.0	9.3	31.3	12.3	51	24	0	0.00
07	31.8	12.7	90	36	0.0	0.0	9.9	33.0	13.0	53	23	0	0.00
08	35.3	16.3	87	36	0.0	0.0	9.7	33.2	14.7	54	23	0	0.00
09	27.8	14.0	89	50	1.0	25.4	8.1	28.9	13.0	65	37	2	42.2
10	32.2	16.0	82	34	0.0	0.0	9.7	31.9	14.8	52	37	3	65.2
11	32.8	16.8	82	42	1.0	3.6	9.0	31.0	16.8	67	39	2	11.0
12	38.3	19.0	72	23	0.0	0.0	10.3	35.3	19.2	45	23	0	0.00
13	38.7	21.6	77	34	0.0	0.0	8.3	36.4	19.4	54	20	0	0.00
14	36.2	21.5	82	43	0.0	0.0	8.7	35.8	16.1	51	20	0	0.00
15	36.0	21.8	90	45	1.0	18.8	9.2	33.9	19.5	65	37	1	07.2
16	40.1	23.4	74	24	0.0	0.0	10.2	37.2	21.5	48	22	0	0.00
17	39.4	23.1	84	30	0.0	0.0	10.7	39.1	20.5	40	14	0	0.00
18	41.1	24.9	86	35	0.0	0.0	10.4	40.4	21.0	36	16	0	0.00
19	40.6	26.2	68	29	0.0	0.0	10.6	39.6	24.4	41	19	0	0.00
20	42.5	26.7	66.3	26.7	0.0	0.0	11.2	38.6	23.5	48	28	0	0.00
21	40.8	27.8	79.6	40.3	0.0	0.0	10.8	41.1	23.6	49	22	0	0.00

**Table M 6: Meteorological data in Central zone during crop growth period of Rabi 2014-15**

Std. Week No.	JABALPUR							RAIPUR						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfal l (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfal l (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	33.4	21	86	53	0	2.3	9.4	33.2	24.0	91	57	0	0.0	8.3
41	32.4	20.4	88	55	0	0	8.4	30.4	23.6	89	66	2	52.2	4.9
42	32.5	18.8	91	44	0	0	7.9	31.5	22.5	91	56	0	1.2	8.4
43	31.6	16.6	89	41	0	0	8.8	29.1	19.4	92	52	1	5.4	5.9
44	27.9	14.4	87	29	0	0	8.6	30.1	16.9	94	37	0	0.0	8.0
45	28.2	13.9	87	29	0	0	8.2	30.7	17.6	88	44	0	0.0	7.8
46	28.6	14.4	83	26	0	0	6	31.4	19.3	84	35	0	0.0	6.8
47	27.9	8.9	82	20	0	0	8.6	29.3	11.9	91	28	0	0.0	8.5
48	28.4	10.2	85	24	0	0	8.6	30.2	12.5	90	26	0	0.0	8.6
49	28.7	8	88	24	0	0	8.7	28.9	10.8	90	28	0	0.0	9.0
50	29	11.8	89	52	1	3.2	6.2	28.6	15.8	89	49	0	0.0	3.0
51	25.3	5.6	86	32	0	0	7.6	25.0	8.3	89	31	0	0.0	7.8
52	23.8	4.8	87	32	0	0	8.5	26.0	9.9	86	34	0	0.0	8.3
01	20.5	11.7	90	61	3	37.7	6.5	25.0	14.8	95	52	2	9.4	4.5
02	22.1	5.3	87	38	0	0.0	8.5	25.8	8.0	90	29	0	0.0	9.2
03	22.2	5.3	91	37	0	0.0	8.3	26.0	8.3	90	29	0	0.0	8.3
04	21.0	12.1	89	75	2	10.2	3.7	28.9	13.5	88	37	0	0.0	7.4
05	22.5	8.7	85	44	2	10.8	9.8	28.3	11.7	88	29	0	0.0	7.6
06	24.2	10.2	88	52	1	14.4	7.1	29.9	14.0	83	36	0	0.0	5.7
07	26.8	10.4	88	40	1	6.2	9.1	29.3	13.6	88	39	0	2.2	8.2
08	30.6	12.0	86	33	0	0.0	9.7	33.5	15.7	84	28	0	0.0	9.8
09	26.7	14.5	85	54	3	64.8	6.8	30.8	18.5	83	49	2	19.2	6.7
10	28.0	12.0	85	39	0	0.0	9.5	31.3	16.6	81	34	0	0.0	8.1
11	29.0	14.5	85	54	3	64.8	6.8	34.1	19.9	76	33	0	0.1	7.6
12	28.0	12.0	85	39	0	0.0	9.5	35.1	18.7	66	22	0	0.0	9.0
13	26.7	14.5	85	54	3	64.8	6.8	37.3	21.5	66	31	0	0.0	7.2
14	28.0	12.0	85	39	0	0.0	9.5	39.1	22.8	65	26	0	0.0	8.2
15	29.0	14.5	88	66	2	12.1	6.8	33.7	20.8	83	49	3	21.6	5.4
16	30.1	14.5	84	40	0	0.0	9.5	38.0	24.6	71	33	2	14.2	9.4
17	32.1	15.1	82	34	0	0.0	9.5	38.1	24.1	74	34	1	15.6	9.0
18	33.1	14.5	88	66	0	0.0	6.8	39.6	25.4	73	36	1	12.4	7.7
19	31.3	14.5	85	39	0	0.0	8.9	40.2	26.2	65	36	0	0.0	7.3
20								39.8	27.2	63	31	0	1.0	7.8
21														

**Table M 7: Meteorological data in North East zone during crop growth period of Rabi 2014-15**

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	28.32	23.65	96.87	85.00	5	65.54	4.5	30.4	19.9	80.9	71.7	0	0.0	8.8
41	29.76	23.11	93.77	81.65	4	32.43	4.3	29.7	20.1	81.4	71.4	2	36.3	6.3
42	29.98	21.23	90.39	67.76	5	42.12	3.0	26.5	15.2	81.1	70.9	0	0.0	8.3
43	29.64	19.87	91.65	63.12	0	0	8.3	27.9	14.9	81.1	68.9	1	3.1	4.7
44	29.61	17.87	92.13	62.32	0	0	8.7	27.7	13.2	81.6	57.6	0	0.0	8.6
45	28.84	17.12	93.24	63.66	0	0	8.7	26.4	11.7	81.4	69.1	0	0.0	9.3
46	28.56	14.32	92.43	59.14	3	12.12	5.8	26.0	10.5	82.0	70.7	0	0.0	9.4
47	28.34	14.34	92.15	57.53	0	0	6.4	24.0	4.7	83.0	63.0	0	0.0	8.6
48	25.32	13.60	93.44	62.53	0	0	5.5	25.0	5.8	81.4	69.3	0	0.0	8.8
49	25.45	13.77	93.76	64.98	0	0	5.4	25.8	5.7	80.9	68.3	0	0.0	8.2
50	23.49	12.70	96.53	75.00	0	0	6.2	24.6	6.0	84.3	68.3	0	0.0	6.3
51	22.11	11.74	96.86	65.86	0	0	8.7	18.0	2.7	82.1	69.1	0	0.0	5.6
52	21.76	05.67	95.65	59.87	0	0	7.3	17.3	2.4	81.5	70.0	0	0.0	9.8
01	22.12	08.54	97.71	58.43	0	0	3.8	6.9	5.6	82.6	71.7	1	22.2	2.5
02	20.23	06.73	97.76	61.34	0	0	2.2	9.8	8.4	82.4	70.6	0	0.0	8.5
03	22.34	09.14	95.76	58.45	1	5.54	3.7	10.8	9.5	82.6	71.1	0	0	8.3
04	24.41	08.61	95.76	47.00	0	0	5.0	11.8	10.5	82.7	71.0	0	0	7.5
05	24.98	08.91	92.65	43.49	0	0	8.0	12.1	10.7	82.7	70.4	0	0	8.6
06	25.54	11.86	92.54	45.58	0	0	6.8	14.7	12.9	82.0	67.3	0	0.0	7.3
07	26.56	12.56	93.00	50.45	0	0	7.5	15.8	14.1	83.9	66.3	0	0.0	8.2
08	28.07	11.73	88.65	42.54	0	0	8.1	13.7	12.2	83.9	64.7	0	0.0	9.4
09	30.97	13.64	87.13	43.76	0	0	9.0	14.5	12.8	82.4	66.7	2	12.2	5.3
10	30.24	16.54	87.71	45.43	0	0	9.4	15.2	13.4	82.9	64.1	0	0.0	9.4
11	29.17	18.56	89.65	49.14	0	0	9.7	19.3	17.0	82.7	58.9	0	0.0	8.6
12	27.11	18.04	92.65	58.34	0	0	8.0	21.9	19.1	81.6	60.7	0	0.0	9.5
13	26.98	19.34	91.64	61.47	0	0	1.6	20.1	17.7	83.9	67.4	0	0.0	8.1
14	27.48	19.24	94.49	57.23	5	43.23	1.7	18.8	16.5	82.1	70.0	0	0.0	9.8
15	27.56	19.65	94.43	63.73	6	65.87	3.6	32.0	20.2	82.6	68.9	1	24.7	7.5
16	27.45	19.76	94.34	69.79	5	43.54	4.8	34.3	22.4	82.0	68.0	0	0.0	7.8
17	29.46	20.32	92.54	62.71	6	87.65	2.4	31.8	19.1	82.7	66.6	3	34.8	6.7
18	29.76	22.04	94.53	71.00	5	21.43	4.3	35.9	22.9	83.4	63.0	1	10.2	8.5
19	29.43	22.81	93.32	67.54	0	0	5.5	37.3	25.2	84.0	55.3	0	2.0	7.9
20	28.19	22.19	94.65	73.78	2	6.54	5.3	35.5	24.1	82.7	63.6	2	31.7	7.0
21	30.45	23.51	93.43	68.29	5	43.65	3.0	40.0	25.3	79.1	38.6	0	0.0	9.9

**Table M 8: Meteorological data in North East zone during crop growth period of Rabi 2014-15**

Std. Week No.	IMPHAL						KALYANI						
	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	30.3	18.4	91.3	59.4	0.0	8.3	36.05	25.08	88.28	67.14	1	7.0	7.82
41	30.5	18.4	88.9	65.4	11.3	6.6	33.70	25.28	92.28	77.42	3	69.6	5.11
42	29.3	19.8	92.0	66.7	3.8	5.7	33.72	22.17	87.28	62.85	1	4.3	8.97
43	29.4	13.2	90.7	53.6	0.0	8.6	31.8	21.45	83.71	69.00	0	1.0	5.80
44	26.7	15.9	90.3	70.9	13.9	5.2	32.44	19.75	83.71	59.71	0	00	8.00
45	29.3	15.9	88.1	58.1	0.0	6.8	33.47	19.71	81.28	56.57	0	00	6.87
46	28.8	12.2	79.7	54.1	0.0	8.8	32.54	15.77	77.28	47.14	0	00	7.62
47	28.2	9.7	83.9	50.6	0.0	8.4	31.34	31.04	78.00	45.85	0	00	7.72
48	25.4	7.5	89.6	51.1	0.0	7.7	30.65	12.42	82.71	49.28	0	00	5.44
49	24.3	6.7	89.6	52.6	0.0	8.3	28.51	13.71	85.57	60.28	0	0.0	5.85
50	23.3	7.2	89.3	60.0	0.0	6.2	26.31	13.85	88.28	59.85	0	0.0	3.82
51	23.5	6.1	87.4	58.3	0.0	7.0	26.31	10.52	82.71	51.42	0	0.0	7.32
52	23.0	4.4	91.3	54.1	0.0	8.9	24.62	9.85	87.75	59.37	0	0.0	5.36
01	23.9	10.4	89.0	57.7	0.0	4.2	27.02	16.02	89.42	65.85	1	2.5	3.4
02	20.8	8.2	85.6	54.9	27.0	6.8	24.84	9.64	85.00	58.42	0	0.0	6.1
03	22.6	7.2	86.4	50.0	19.2	7.9	25.61	9.84	85.42	58.71	0	0.0	7.22
04	22.8	5.4	89.3	48.3	0.4	9.0	29.18	11.02	76.42	49.57	0	0.0	8.01
05	23.5	5.3	85.7	46.0	0.0	8.5	28.14	10.88	80.28	49.00	0	0.0	6.78
06	24.2	4.2	88.0	41.1	0.0	8.3	28.78	12.65	78.14	43.57	0	0.0	6.44
07	23.4	5.2	82.0	42.9	0.0	6.6	31.08	15.51	85.14	51.42	1	8.3	5.44
08	24.3	7.0	86.4	53.1	15.2	6.9	34.18	19.67	85.85	50.14	1	5.3	7.21
09	28.2	11.3	85.9	35.9	1.8	5.6	35.17	20.22	86.14	46.28	1	5.8	7.92
10	25.9	10.0	77.0	47.3	0.2	7.9	33.68	15.90	77.42	43.00	0	2.3	9.62
11	29.4	8.5	77.9	34.7	0.0	8.4	36.15	18.25	78.14	34.28	0	0.0	9.21
12	29.9	11.1	75.7	31.4	0.4	8.7	37.28	18.91	80.42	33.85	0	0.0	9.32
13	28.8	12.6	79.6	48.4	19.8	3.9	35.65	24.14	92.28	49.85	1	13.3	6.28
14	25.9	15.1	80.6	68.0	50.6	3.4	36.11	24.08	91.14	59.85	3	20.1	7.00
15	27.0	16.0	84.9	58.0	53.0	5.0	36.80	24.25	88.57	50.57	1	23.8	6.68
16	28.3	17.4	85.1	54.6	21.8	3.1	32.27	25.50	85.71	52.42	1	4.3	7.02
17	25.1	16.5	91.0	71.9	59.0	1.3	33.17	21.91	91.57	65.00	5	84.1	6.71
18	26.4	16.1	88.7	67.1	29.9	5.1	36.61	25.21	89.71	59.28	0	2.4	8.31
19	28.9	16.5	84.3	62.0	0.3	6.5	36.74	27.75	90.71	61.28	0	0.1	5.34
20	27.9	19.5	91.7	57.6	24.7	2.9	36.92	25.77	91.71	62.57	3	27.6	7.28
21	29.9	19.3	83.9	62.1	20.8	6.8	39.11	28.45	87.57	57.00	0	2.0	8.50

**Table M 9: Meteorological data in North East zone during crop growth period of Rabi 2014-15**

Std. Week No.	BHUBANESHWAR						
	Temperature (C)		Humidity (%)		Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2			
40	33.8	23.1	93	63	3	23.1	26.1
41	31.2	23.7	92	74	3	23.7	84.4
42	32.5	22.2	96	62	3	22.2	51.6
43	30.6	20.5	94	62	1	20.5	1.0
44	30.4	19.4	90	51	0	0	6.3
45	31.1	20.4	84	52	0	0	6.2
46	31.8	20.3	90	47	0	0	6.6
47	30.1	14.9	90	36	0	0	8.0
48	30.6	14.7	95	36	0	0	8.6
49	29.7	14.3	95	48	0	0	7.5
50	28.2	16.4	88	49	0	0	3.2
51	26.4	11.9	87	40	0	0	7.2
52	25.8	12.9	79	46	0	0	5.9
01	26.2	17.6	96	62	2	21.5	3.0
02	27.4	12.9	90	37	0	0	7.8
03	27.1	11.8	86	32	0	0	7.6
04	29.6	13.5	94	41	0	0	7.6
05	29.1	14.5	90	41	0	0	7.5
06	31.3	15.2	93	36	0	0	7.3
07	31.8	17.4	94	48	1	18.4	7.8
08	35.2	19.3	94	35	0	0	8.8
09	32.8	20.4	91	38	1	2.8	3.4
10	34.7	19.8	90	33	0	0	8.2
11	36.6	21.1	89	35	0	0	8.1
12	36.3	23.2	95	43	1	19.4	8.5
13	36.1	22.9	91	49	1	2.6	6.9
14	37.5	25.1	90	57	1	26.2	7.2
15	35.9	23.3	88	46	1	3.2	5.4
16	38.4	24.7	85	46	1	3.8	8.0
17	36.8	23.4	89	50	3	82.6	8.5
18	36.6	25.3	89	58	0	0	8.1

**Table M 10: Meteorological data in South zone during crop growth period of Rabi 2014-15**

Std. Week No.	HYDERABAD							VELLAYANI					
	Temperature (C)		Humidity (%)		No. of Rainy dDays	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2		
40	34.1	21.9	80	45	1	40.2	7.6	30.7	23.9	95.4	73.6	1	9.0
41	32.4	20.3	78	49	0	0.8	4.3	30.7	24.2	73.6	85.9	1	20.6
42	32.8	19.2	85	47	1	6.2	8.2	30.3	23.7	82.4	92.4	6	163.0
43	28.3	19.0	89	68	1	22.0	4.0	30.2	23.5	80.9	93.6	4	35.6
44	30.4	18.4	80	24	0	0.0	8.3	30.5	23.5	86.1	85.1	2	24.0
45	30.9	16.4	76	42	0	0.0	6.8	30.7	23.1	93.1	73.4	0	1.0
46	30.0	19.7	81	61	1	10.6	5.5	31.2	23.7	90.4	74.3	1	4.4
47	30.6	16.4	87	42	0	0.0	7.6	29.4	23.4	95.9	79.1	3	9.4
48	30.6	12.1	73	30	0	0.0	8.5	29.1	23.1	93.6	84.1	2	8.3
49	30.5	12.0	81	42	0	0.0	8.8	30.6	22.6	90.1	67.9	1	5.1
50	28.2	15.9	89	68	0	0.0	3.4	29.9	23.3	89.6	77.0	2	24.3
51	27.1	9.3	71	41	0	0.0	7.7	30.6	23.4	93.6	78.9	1	4.9
52	27.1	11.4	69	47	0	0.0	8.1	29.9	23.8	90.9	75.4	1	6.0
01	29.2	17.9	79	49	0	0.0	5.7	30.5	21.3	95.1	67.7	1	4.0
02	27.1	5.4	66	23	0	0.0	9.8	30.4	21.2	91.1	63.9	0	0
03	28.2	9.1	75	32	0	0.0	9.2	30.8	21.8	95.4	64.6	0	0
04	29.4	10.6	79	30	0	0.0	9.1	30.5	21.6	92.6	65.0	1	4
05	28.8	13.3	86	36	0	0.0	9.3	32.0	22.4	92.1	64.3	0	0
06	30.7	13.4	74	26	0	0.0	9.9	31.6	23.2	94.4	60.7	0	0
07	33.1	15.0	66	18	0	0.0	10.2	31.1	22.5	93.0	61.9	0	0
08	33.3	16.9	63	21	0	0.0	9.8	31.2	21.0	90.3	70.1	0	0
09	32.7	17.7	73	32	1	8.0	7.8	32.1	23.3	88.7	66.6	0	1.0
10	31.1	19.2	73	48	2	21.6	5.5	32.1	23.3	88.6	66.3	0	0
11	34.0	18.6	64	22	0	0.0	9.5	32.1	23.6	91.4	69.3	3	15.2
12	36.6	20.2	55	26	0	0.0	8.3	32.7	23.3	90.7	67.9	0	0
13	30.0	18.7	57	29	1	12.0	6.6	33.0	24.7	90.7	67.0	1	9.4
14	37.8	24.6	72	25	0	0.0	8.8	33.1	25.2	91.9	70.0	0	2.3
15	31.3	20.3	86	53	4	112.3	5.8	32.6	24.3	91.4	68.6	1	4.8
16	34.8	21.5	76	44	0	0.0	9.8	32.9	24.3	89.7	76.5	2	40.4
17	36.4	24.4	74	36	1	5.2	9.4	32.5	23.8	89.6	77.3	2	35.5
18	38.7	25.4	66	29	0	0.0	9.1	33.2	25.2	85.1	75.9	0	0
19	38.1	25.6	69	32	0	0.0	6.9	32.5	25.2	91.4	83.6	2	34.4
20	37.1	26.7	70	42	1	8.8	7.1	30.4	24.3	94.0	89.1	4	29.3
21	42.3	28.9	52	21	0	0.0	10.2	32.3	26.1	92.1	82.7	2	19.5

**Table M 11: Meteorological data in South Zone during crop growth period of Rabi 2014-15**

Std. Week No.	COIMBATORE							MANDYA						
	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs	Temperature (C)		Humidity (%)		No. of Rainy days	Rainfall (mm)	Sunshine hrs
	Max.	Min.	RH1	RH2				Max.	Min.	RH1	RH2			
40	31.7	23.1	92	59	2	74.6	7.0							
41	31.0	22.6	92	62	2	27.2	5.7							
42	29.1	22.3	94	81	5	154.7	4.2							
43	28.7	22.4	94	70	4	70.0	4.6							
44	29.1	22.1	92	66	2	25.6	3.3							
45	20.2	31.4	92	51	0	0	6.2	29.6	16.1	91.3	50.6	0	0	7.24
46	22.1	29.8	89	62	0	2.2	5.3	28.9	17.9	91.2	48.4	1	10	5.69
47	22.0	29.1	89	57	0	1.2	4.3	29.2	17.1	88.1	51.6	0	0	7.88
48	20.5	27.6	84	55	0	0.2	1.5	27.9	15.9	85.2	50.6	0	0	4.68
49	19.2	29.3	90	69	0	0	6.7	29.2	17.6	89.7	50.4	0	0	9.13
50	22.5	28.7	91	66	2	10.6	3.4	29.2	16.4	90.7	54.4	1	24	5.42
51	21.5	28.3	87	62	0	1.9	4.2	27.2	16.2	91.3	55.2	0	0	3.94
52	20.7	29.0	90	57	1	3.6	3.5	28.3	13.9	91.1	51.5	0	0	3.69
01	19.8	30.9	90	47	0	0	7.5	29.7	15.1	92.0	46.3	0	0	7.08
02	18.1	29.8	87	43	0	0	7.9	28.7	13.2	94.6	44.6	0	0	8.43
03	19.1	29.8	83	48	0	0	7.8	28.4	13.8	88.4	46.4	0	0	7.88
04	20.1	30.1	85	48	0	0	8.2	29.2	13.9	87.5	49.7	0	0	8.36
05	20.5	29.9	86	45	0	0	5.9	29.3	15.5	82.8	44.5	0	0	7.86
06	19.5	31.0	81	40	0	0	8.2	30.2	12.8	87.2	38.6	0	0	8.92
07	20.2	33.0	79	33	0	0	8.8	31.4	14.1	75.9	46.1	0	0	8.84
08	18.3	33.0	76	24	0	0	10.4	31.9	12.7	74.9	48.3	0	0	8.41
09	23.1	33.7	83	44	0	0	7.4	32.6	18.2	80.7	43.4	0	1.8	7.42
10	22.9	33.7	81	39	0	1.6	8.2	32.4	17.7	80.7	44.0	0	0	8.04
11	23.2	33.2	79	37	0	0.5	8.3	33.1	15.6	78.7	41.4	0	0	8.26
12	22.3	36.1	78	27	0	0	10.0	34.8	17.7	82.8	35.1	0	0	6.54
13	24.6	35.2	80	33	0	0	8.5	34.6	18.4	82.6	39.0	1	8.8	5.94
14	25.5	36.2	80	40	0	0	7.6	35.0	17.9	77.7	38.8	0	0	7.04
15	24.1	34.2	81	46	1	6.6	6.3	32.7	21.1	81.0	27.3	1	6.8	6.86
16	23.4	33.3	89	52	2	39.2	6.3	33.4	19.6	78.6	36.2	1	6	6.39
17	22.9	33.5	88	49	3	16.9	7.9	34.0	20.1	78.2	30.1	0	1.6	5.67
18	24.0	34.9	84	54	1	22.6	8.5	34.3	19.9	82.2	29.1	1	7	3.36
19	23.5	32.2	92	64	4	53.8	4.2	33.1	19.9	86.1	34.7	0	0	2.19
20	23.1	30.2	94	72	3	105.2	2.9	31.7	19.1	92.6	35.5	3	88.8	1.51
21	23.7	33.9	90	53	0	0	8.0	33.0	20.3	84.6	34.4	1	8.6	2.88

**APPENDIX-IV: FORAGE CROP BREEDING TRIALS AT A GLANCE: (Rabi-2014-15)**

Zone	Location	Tr.-1	Tr.-2	Tr.-3	Tr.-4	Tr.-5	Tr.-6	Tr.-7	Tr.-8	Tr.-9	Tr. 10	Tr. -11	Tr.-12	Tr.-13	Tr.-14	Tr.-15	Total DR/Allotted	
		Berseem			Oat										Lathyrus	Lucerne		
		IVTB	AVTB (SC-1)	AVTB (SC-2) (Seed)	IVTO (SC)	AVTO(SC-1)	AVTO(SC-2)	AVTO(SC-2) (Seed)	IVTO (MC)	AVTO-1 (MC)	AVTO-2 (MC)	AVTO-2 (Seed) (MC)	IVTO (Dual)	IVT (Lathyrus)	IVT Lucerne (Annual- 2014)	VT Lucerne (Pere.) 2 <sup>nd</sup> year		
1 (HZ)	Palampur	DR			DR		DR	DR	DR	DR			DR				7/7	
2	Srinagar	TF			DR		DR	DR	DR	DR			DR				6/7	
3	Almora							DR	DR								2/2	
4 (NWZ)	Bikaner	DR	DR		DR	DR	DR						DR		DR	DR	8/8	
5	Jalore	DR			DR	DR	DR		DR	DR			DR				7/7	
6	Hisar	DR	DR	DR	DR	DR	DR	DR	DR	DR			DR			DR	11/11	
7	Ludhiana	DR	DR	DR	DR	DR	DR		DR	DR			DR		DR	DR	11/11	
8	Pantnagar	TF			DR	DR	DR	DR	TF	TF			TF				4/8	
9	Udaipur	DR			DR	DR	DR		DR	DR			DR		DR		8/8	
10	Meerut	DR			DR	DR	DR										4/4	
11 (CZ)	Jhansi	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR			13/13	
12	Rahuri	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR		DR	DR	14/14	
13	Urulikanchan	DR	DR	DR	DR	DR	DR		DR	DR	DR	DR	DR		DR	DR	13/13	
14	Karjat	DR	DR				DR						DR				4/4	
15	Kanpur	DR			DR	DR	DR							DR			5/5	
16	Anand				DR	DR	DR		DR	DR	DR	DR	DR		DR	DR	10/10	
17	Jabalpur	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR	DR			13/13	
18	Raipur	DR			DR	DR	DR						DR	DR	DR		7/7	
19	Palgarh				DR	DR											2/2	
20 (NEZ)	Jorhat				DR	DR	DR	DR	DR	DR			DR	DR			8/8	
21	Kalyani	DR			DR	DR	DR							DR			5/5	
22	Bhubaneswar	DR			DR	DR	DR		DR	DR			DR	DR			8/8	
23	Ranchi	DR			DR	DR	DR	DR	DR	DR			DR	DR			9/9	
24	Pusa	DR			DR	DR	DR		DR	DR				DR			7/7	
25	Faizabad	DR			DR	DR	DR		DR	DR			DR				7/7	
26	CAU Imphal				DR	DR	DR		DR	DR							5/5	
27 (SZ)	Hyderabad				DR	DR	DR	DR							DR	DR	6/6	
28	Mandya				DR	DR	DR	DR							DR	DNR	5/6	
29	Coimbatore				DR	DR	DR									DR	4/4	
30	Karaikal				DR												1/1	
31	Mattupetty				DR												1/1	
32	Raichur				DR										DR		2/2	
	Total Location	19/21	8/8	6/6	30/30	25/25	27/27	11/11	18/19	18/19	5/5	5/5	18/19	9/9	10/10	8/9	217/223	

Abbreviations: DR= Data Reported; DNR= Data not Reported; TF=Trials failed; Data Reporting (%) =217/223 =97.3

**APPENDIX- V: FORAGE CROP PRODUCTION TRIALS AT A GLANCE: (Rabi-2014-15)**

Location	CS-12-AST-1	R-12-AST-1	R-12-AST-2	R-12-AST-3	CS-13-AST-1	PS-13-AST-2	CS-13-AST-2	CS-13-AST-3	PS-14-AST-1	PS-12-AST-2	PS-12-AST-3	R-12-AST-4	CS-13-AST-4	R-13-AST-1	PS-13-AST-1	CS-14-AST-1	PS-14-AST-2	CS-14-AST-2	PS-14-AST-3	PS-14-AST-4	R-14-AST-1	R-14-AST-2	R-14-AST-3	R-14-AST-4 (AVT O-2 SC)	R-14-AST-5 (AVT O-2 MC)	R-14-AST-6 (AVTB -2 SC)	Total allotted	Total DR &TC/ allotted	
<b>Hill Zone</b>																													
Almora		DR																									1	1/1	
Palampur		DR																	TC	TC	DR			DR			5	5/5	
Srinagar		DR												DR						TC	TC	DR			DR		6	6/6	
<b>North West Zone</b>																													
Hisar		DR							TC																DR	DR	4	4/4	
Pantnagar			DR																						DR		2	2/2	
Bikaner		DR			DR	DR			TC			DR															5	5/5	
Ludhiana		DR	DR						TC				TC		TC										DR	DR	7	7/7	
<b>North East Zone</b>																													
Faizabad																											0	0/0	
Ranchi			DR				DR																		DR		3	3/3	
Kalyani				DR																					DR		2	2/2	
Bhubaneswar	DR	DR					DR																				3	3/3	
Jorhat	DR	DR						DR																	DR		4	4/4	
Imphal				DR																			DR				2	2/2	
<b>Central Zone</b>																													
Jabalpur		DR	DR			DR	DR																		DR	DR	DR	7	7/7
Rahuri		DR	DR		DR																				DR	DR	5	5/5	
Urulikanchan		DR	DR		DR																				DR	DR	5	5/5	
Anand		DR			DR																				DR		3	3/3	
Jhansi																								DR	DR	DR	3	3/3	
Raipur		DR	DR			DR		DR	TC							DR		DR									7	7/7	
<b>South Zone</b>																													
Hyderabad																											0	0/0	
Mandya											TC														DR		2	2/2	
Coimbatore										DR															DR		2	2/2	
Vellayani																DR								DR			2	2/2	
Dharwad						DR																					1	1/1	
<b>Total (DR &amp; TC)</b>	2	13	7	2	4	4	3	2	4	1	1	1	1	1	1	1	1	1	1	2	2	2	1	1	12	5	6	81	81/81

DR- Data reported; TC- Trial conducted; **Success (%) of data reporting/trial conducted - 81/81= 100%**

**APPENDIX –VI: FORAGE CROP PROTECTION TRIALS AT A GLANCE (Rabi: 2014-15)**

Locations/Trials	PPT-1	PPT-2A	PPT-2B	PPT-12	PPT-17	PPT-18	PPT-19	PPT-20	PPT-21	PPT-22	PPT-23	Total
Bhubaneswar	DR	DR	-	-	-	-	-	-	NR	-	-	2/3
Dharwad	DR	-	-	-	-	DR	-	-	-	-	-	2/2
Hyderabad	DR	DR	-	-	-	DR	-	-	-	DR	DR	5/5
Jhansi	DR	DR	DR	-	-	DR	-	-	DR	-	-	5/5
Ludhiana	DR	DR	DR	-	-	-	DR	-	DR	-	DR	6/6
Palampur	DR	DR	-	DR	DR	-	-	DR	-	-	-	5/5
Rahuri	DR	DR	-	-	-	DR	-	-	-	DR	DR	5/5
<b>Total</b>	7/7	6/6	2/2	1/1	1/1	4/4	1/1	1/1	2/3	2/2	3/3	30/31

**Abbreviations:** DR = Data Reported; NR =Not reported; **Data Reporting (%) = 30/31=96.7**

**APPENDIX VII: DIRECTORY OF SCIENTIFIC STAFF: AICRP ON FORAGE CROPS & UTILIZATION CENTERS**

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
<b>University of Agricultural Sciences (Bengaluru) Zonal Agril. Res. Station, VC Farm, Mandya-571405 (Karnataka)</b>					
Dr. M. R. Krishnappa	Sr. Sci. Gen., (PB) & OIC	08232-277921	09448980286	08232-277392	krishnappa_93@yahoo.co.in
Dr. B. G. Shekara	Scientist (Agronomy)	08232-277921	09900618898		shekara_gundanaik@rediffmail.com
Dr. T. A. Sriramashetty	ADR	08232-277147	09449866917		adrzarsmandya@gmail.com
Dr. M. A. Shankar	Director (Research)	080-23330206	09449866903	080-23330206	dr@uasbangalore.edu.in
<b>Orissa University of Agriculture &amp; Technology, Bhubaneswar-751003 (Odisha)</b>					
Dr. G. B. Dash	Breeder (PBG) & OIC	0674-2391692	09437133180	0674-2397091	gokulbdash@gmail.com
Dr. Suchismita Tripathy	Senior Agronomist	0674-2391692	09437284876		suchiouat@gmail.com
Dr. S. S. Nanda	Dean, Research	0674-2397692			deanresearch_03@hotmail.com
<b>Anand Agricultural University, Anand Campus, Anand-388 110 (Gujrat)</b>					
Dr. H. P. Parmar	Research Scientist (FC)	02692-264179/ 225861	09879196905	02692-261520/ 261526	rsfcand@yahoo.com forageanand@gmail.com
Dr. P. M. Patel	Scientist (Agronomy)	02692-264179	09925711200		piyus5@yahoo.co.in
Dr. D. H. Desai	Scientist (Bio Chem.)	02692-264179	08511185960		devdasdesai@yahoo.in
Dr. Jagruti C. Shroff	Associate Research Scientist (Agronomy)	02692-264179	08511186683		shroff1jagruti@yahoo.com jagrutishroff@gmail.com
Dr. M. R. Saiyed	Associate Research Scientist (PB)	02692-264179	09374175387		mahiyyuddinr_saiyed@yahoo.com
Dr. K. B. Kathiria	Director (Research)	02692-263600	02692-262159 09998009961	02692-263600	dr@aau.in
<b>BAIF Development Research Foundation, Urulikanchan, Pune-412 202 (Maharashtra)</b>					
Mr. P.S. Takawale	Forage Breeder (PBG) & OIC	020-26926248 020-26926265	09881369750	020-26926347	takawalep@gmail.com
Mr. S. D. Patil	Sr. Scientist (Agronomy)	020-26926448 020-26926265	08888414856 09421108349	020 -26926347	santosh86patil@gmail.com
Dr. A. B. Pande	Sr. Vice President, Animal Genetics & Breeding	020-26926248 020-26926265	09325010213	020-26926347	ashokbpande@gmail.com
<b>C.S.K. Himachal Pradesh Krishi Vishwavidyalaya, Palampur-176 062 (Himachal Pradesh)</b>					
Dr. Naveen Kumar	Principal Scientist (Agronomy) & OIC	01894-230392	09418149173	01894-230511	nkumarhp@gmail.com nkumar@hillagric.ac.in
Dr. V. K. Sood	Principal Scientist (PB)	01894-230391	09459845413		vkspbg23@rediffmail.com
Dr. D. K. Banyal	Principal Scientist (PP)	01894-230326	09418111480		dkbanyal@gmail.com
Dr. Rajan Katoch	Asstt. Biochemist	01894-230391	09418121870		rajankatoch@yahoo.com
Dr. N. K. Pathania	Director (Research)	01894-230406	09418079274(M)	01894-320406	drtech@hillagric.ac.in
<b>G.B. Pant University of Agriculture &amp; Technology, Pantnagar-263 145 (Uttarakhand)</b>					
Dr. M. S. Pal	Professor Agronomy	05944-234448	9457407465		drmspal1@gmail.com
Dr. Birendra Prasad	Sr. Scientist (Plant Breeding)		09411398516		prasadsbst@gmail.com
Dr. J. S. Verma	Professor, GPB		05944234407 09720895558	05944-233473 05944-233257	jsverma21@yahoo.in drshankar54@gmail.com
Prof. J. P. Singh	Director Research	05944-233363	07500241418	05944-233473	des@gbpuat.ernet.in

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
<b>Jawahar Lal Nehru Krishi Vishwavidyala, Jabalpur-482 004 (Madhya Pradesh)</b>					
Dr. A. K. Mehta	Pr. Scientist (PB) & OIC	2681773 PBX-308	0761-2343854 09424307262	0761-2681074	anoop.mehta@yahoo.co.in
Dr. Amit Jha	Scientist (Agronomy)		09425469854		amitagcrewa@rediffmail.com
Dr. S. K. Biliaya	Principal Scientist (PB)		09425165543		
Dr. S. S. Tomar	Director (Research)	0761-2681200 0761-2681074	0761-2681614	0761-2681074	tomarssindore@yahoo.com
<b>Birsa Agricultural University, Kanke, Ranchi-834 006 (Jharkhand)</b>					
Dr. Mrs. Ashisan Tuti	Plant Breeder & OIC	0651-2450625	09431192029		ashisantuti@gmail.com
Mr. Birendra Kumar	Jr. Agronomist		09835503195		kbirendra70@rocketmail.com
Dr. D. K. Singh Dron	Director (Research)	0651-2450610	0674-2397692	0651-2451011	dksinghdron@bauranchi.org
<b>S.K. Rajasthan Agricultural University, Bikaner-334 006 (Rajasthan)</b>					
Dr. S. S. Shekhawat	Prof. (PBG) & OIC	0151-2111406	0151-2205740 09828282082	0151-2250576 0151-2250570	srn_shekhawat@yahoo.co.in surendrashekhawat884@gmail.com
Dr. S. M. Kumawat	Prof. (Agronomy)	0151-2111406	09413937447	0151-2250570	smkumawatrau@rediffmail.com sagarskrau@gmail.com
Dr. Govind Singh	Director Research	0151-2250199 0151-2250576	09414429766	0151-2250576	dor@raubikaner.org
<b>Kerala Agricultural University, College of Agriculture, Vellayani-665 522 Thiruvananthapuram (Kerala)</b>					
Dr. Mareen Abraham	Associate Professor (PB)	0471-2381002	9995213650		abrahammareen@yahoo.in
Dr. Usha C. Thomas	Assistant Professor (Agronomy)		9496301170		ushathomas@gmail.com
Dr. S. Devanesan	Assoc. Director of Research	0471-2381002	9400185001		adr@kau.in
Dr. I. Johnkutty	Prof. & Director of Research	0487-2371302	9446518326	0481-24370442	dr@kau.in
<b>Professor Jayashankar Telangana State Agricultural University (PJ TSAU) Rajendranagar, Hyderabad-500 030 (Telangana)</b>					
Dr. T. Shashikala	Principal Scientist (PB)	040-24001706	09849152482	040-24001706	tshashikala69@gmail.com forage_hyd@yahoo.com
Dr. M. Anuradha	Senior Scientist (Entomology)		09440488602		kasuanu@yahoo.co.in
Dr. R. Susheela	Senior Scientist (Agronomy)		040-23834316 09440208081		susheelachandram@yahoo.co.in
Dr. M. Shanti	Senior Scientist (SSAC)		040-27224229 09848940225		shantigoka@yahoo.com
Dr. D. Raji Reddy	Director of Research	040-24015078	09989625220	040-24017453	dr.pjtsau@yahoo.com
Dr. A. Srinivas	Associate Director of Research	08540-228646	08008311779	08540-221177	adrpalem@gmail.com

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
<b>Bidhan Chandra Krishi Vishwavidyalaya, Kalyani-741 235, Distt. Nadia (West Bengal)</b>					
Dr. C. K. Kundu	Officer In Charge	033-25828407	09433252351	033-25828407	champakbckv@gmail.com
Dr. Kalyan Jana	Agronomist	033-25828407	09932250618	033-25828407	foragebckv@gmail.com kjanarrs@gmail.com
Prof. A. K. Maiti	Director of Research	033-25828407	09477466003	033-25828407	bckvdr@gmail.com
<b>Tamil Nadu Agricultural University, Coimbatore-641 003 (Tamil Nadu)</b>					
Dr. C. Babu	Professor (PGB)	0422-6611228	09443669045		forage@tnau.ac.in babutnau@gmail.com
Dr. V. Vasuki	Assistant Prof. (Agronomy)	0422-6611228	098429 80537	0422-6611415	vasukimani@gmail.com
Dr. M. Maheswaran	Director (Research)	0422-6611447	9489033000(M)	0422-6611454	drres@tnau.ac.in
<b>C.C.S. Haryana Agricultural University, Hisar-125 004 (Haryana)</b>					
Dr. Yogesh Jindal	Assistant Scientist (PB)	01662-255270	09416290774		yjindalhau@gmail.com yjindal@hau.ernet.in
Dr. R. S. Sheoran	Assistant Scientist (Agronomy)	01662-255270	9416397677		sheoranrs@gmail.com
Dr. D. S. Phogat	Assistant Scientist (PB)	01662-255270	09254437796		forages@hau.ernet.in
Dr. U. N. Joshi	Sr. Scientist (Biochemistry)	01662-289270	09466131019		unjoshi2007@rediffmail.com forages@hau.ernet.in
Dr. S. S. Siwach	Director of Research	01662-255210	05354312724	01662-284340	dr@hau.ernet.in
<b>N.D. University of Agriculture &amp; Technology, Kumarganj, Faizabad-224 221 (Uttar Pradesh)</b>					
Dr. Ramesh Singh Yadav	Jr. Scientist (Agronomy)	05270-262051	09415890200	05270-262051	dr.ramesh1959@gmail.com
Dr. Bhagwan Singh	Director (Research)	05270-262072	05270-262031 09415380448	05270-262097	director_research07@yahoo.co.in
<b>Punjab Agricultural University, Ludhiana-140 004 (Punjab)</b>					
Dr. U. S. Tiwana	Senior Agronomist & OIC I/C Forage & Millet Section	0161-2401960 Ext. 443	09814702076 09501111448	0161-2400945 0161-2409891	inchargeforages@pau.edu utiwana@yahoo.co.in ustiwana@pau.edu
Dr. Rahul Kapoor	Asstt. Forage Breeder	0161-2401960 Ext. 443	09815585599		rahulkapoor@pau.edu
Dr. Upasana Rani	Asstt. Plant Pathologist	0161-2401960 Ext. 443	09463753509		upasana.rani@gmail.com
Dr. Meenakshi Goyal	Asstt. Biochemist		09216176800		meenakshigoyal@pau.edu
Dr. A. K. Khokhar	Asstt. Agronomist	0161-2401960 Ext. 443	09478842947		anilkhokhar@pau.edu
Dr. Balwinder Singh	I/C Director (Research)	0161-2401221	0161-2404433	0161-2407309	drpau@pau.edu

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
<b>Assam Agricultural University, Jorhat-785013 (Assam)</b>					
Dr. K. K. Sharma	Principal Scientist (Agronomy) & OIC	0376-2340044	09435352157	0376-2310831	kksharma6@yahoo.com
Dr. S. Bora Neog	Principal scientist (PB)	0376-2340044	09435091670		seujiboraneog@yahoo.com
Dr. G. N. Hazarika	Director (Research)	0376-2340044	09435096186	0376-2310831	dr_agri@aau.ac.in
<b>Mahatma Phule Krishi Vidyapeeth, Rahuri-413722 (Maharashtra)</b>					
Prof. A. H. Sonone	Forage Breeder & OIC	-	09422727814 07588695304	02426-243223	ajitsonone@gmail.com
Dr. A. B. Tambe	Scientist-1 (Entomology)	-	07588695375 02426-243123	02426-243223	abtambe@gmail.com
Dr. S. V. Damame	Scientist-1 (Biochemistry)	-	08275592262	02426-243223	shivajidamame@gmail.com
Dr. B. T. Sinare	Scientist (Agronomy)	-	09404115448 09423732876	02426-243223	sinarebt69@gmail.com
Dr. R. S. Patil	Director (Research)	02426-243261	0 9423164967	02426-243223	dormpkv@rediffmail.com
<b>S.K. University of Agriculture Science &amp; Technology, Srinagar-190 121, Kashmir (J &amp; K)</b>					
Dr. Ansar-ul-Haq	Agronomist	09797901312	09797901312		ansarulhaqs2@gmail.com
Dr. Noorul Saleem Khuroo	Asst. Prof. (PB)		09596769713		skhuroo0909@gmail.com
Dr. S. A. Wani	Director (Research)	09419085998	0194-2400561	0194-2462160	director.research@skuastkashmir.ac.in
<b>Central Agricultural University, Post Box No.23, Imphal-795 004 (Manipur)</b>					
Mr. R. Joseph Koireng	Junior Agronomist & OIC	0385-2410427	09612976457		josephkoireng@rediffmail.com
Dr. Premjit Singh I/C	Director of Research	0385-2410415		0385-2410415	drcau@yahoo.co.in dorcau@gmail.com
<b>Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chattisgarh)-492 006</b>					
Dr. S. K. Jha	Scientist (Agronomy)	07804966571	09926113737		skjha_igau@yahoo.co.in
Dr. Mayuri Sahu	Scientist (PB)		09406318642		mayuri_pbg@rediffmail.com
Dr. J. S. Urkurkar	Director (Research)	0771-2443035	09406318642	0771-2442131 0771-2443035	drs_igkvr@yahoo.com
<b>Rajendra Agricultural University, Pusa, Samastipur, 848 125 (Bihar)</b>					
Dr. S. K. Choudhary	Sr. Scientist (Agronomy)	09431834082	06274- 2430394	06274-240255	skcrau@gmail.com

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
<b>Dr. Balasaheb Sawant Konkan Krishi Vidvapeeth, Dapoli, Ratnagiri-415 712 (Maharashtra)</b>					
Dr. R. B. Ulemale	Jr. Agronomist & OIC Forage	0724-258200/ 2258467	0724-2451631		
<b>Chandra Shakhaz Azad University of Agriculture &amp; Technology, Kanpur-208 002 (Uttar Pradesh)</b>					
Dr. K. C. Arya	Incharge Sorghum & Forage, Deptt. of Genetics & PB		09415161749		kshvarya302@gmail.com
<b>Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut-250 110 (U.P.)</b>					
Dr. S. A. Kerkhi	Prof. (PB)	0121-2888518	09319820296	0121-2411505	sakerkhi@gmail.com
<b>Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora 263 601 (Uttarakhand)</b>					
Dr. J. K. Bisht	Pl. Sci. (Agron.) & OIC Forage Research	05962-230208/ 230060	05962-230130	05962-231539	vpkas@nic.in bishtjk@hotmail.com
Mr. T. Mondal	Jr. Scientist (Agric. Chemistry)	05962-241008	08938999197	25962-231539	mondalt.vpkas2013@gmail.com
<b>S.K. University of Agril. Sciences &amp; Technology, Regional Research Station, Rajouri B.P.O. Tandwal 185 131 (Jammu)</b>					
Dr. A. K. Sharma	Assoc. Director (Res.)	09162-263202 0191-2434883	01962-2466015 09419145510	01962-263202/264277	aswanikumar_sharna@rediffmail.com
Dr. S. B. Singh	Jr. Scientist (PB)		09419289916		singhsb1971@rediffmail.com
<b>Central Arid Zone Research Institute, Jodhpur-342 003 (Rajasthan)</b>					
Dr. M. P. Rajora	Sr. Sci. (Plant Breeding)	0291-27 86483	0291-2727063	0291-2788706 09461269336	mprajora1@gmail.com
Dr. R. K. Bhatt			0291-2786584	0291-2788706	director.cazri@icar.gov.in
<b>Regional Research Station, CAZRI, Pali-Marwar, Rajasthan-306 401</b>					
Dr. A. K. Shukla	Head	02932-256098	09460926148		anil.shukla@icar.gov.in
Dr. B. L. Jangid	Pr. Scientist (Agric. Ext.)	02932-256098/ 258578	09413784608	02932-256098	jangidbl@yahoo.co.in
Dr. Vikas Khandelwal	Sr. Scientist (PB)	02932-256098/ 258578	09414328872		vikasnau@gmail.com
<b>Regional Research Centre CAZRI Jaisalmer, (Rajasthan)</b>					
Dr. J. P. Singh	Head	02992 252412	09929273918		
<b>S.K. Rajasthan Agriculture University, Agricultural Research Station, Keshwana Jalor/Fatehpur Shekhawati-Sikar-343001</b>					
Dr. S. D. Ratnoo	Zonal Director Research	02973-265915	09414269366		sdtratnooars@gmail.com arsjalore@gmail.com

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
<b>ICAR Research Complex for NEH Region, Umroi Road (Umiam) Barapni-793 103 (Meghalaya)</b>					
Dr. S. B. Ngchan	Director	0364-2570257	0364-2570302	0364-2570288/ 2570501/	director@icameh.ernet.in
Dr. A. S. Panwar	Pr. Scientist (Agron.)	0364-2570306	09436731850		draspanwar@gmail.com
<b>Directorate of Seed Research, P. B. No. 11, Village : Kushmaur (P.O. Kaithauli, Mau-275 101 (U.P.)</b>					
Dr. S. Rajendra Prashad	Director	0547-2530326	0547-2530325		pd_dsr2005@yahoo.co.in
Dr. S. Natrajan	Sr. Scientist (Seed Tech.)		09415412587		
<b>National Dairy Development Board, Anand-388 001 (Gujarat)</b>					
Dr. A. K. Garg	Sr. Manager (PS-AH)	02692-226246 (O)	02692-226517(R)	09426389619	akgarg@nddb.coop
<b>Main Agricultural Research Station, University of Agricultural Sciences, P. B. No. 24, Raichur-548 101 (Karnataka)</b>					
Dr. S. A. Biradar	Scientist (Agronomy) In-charge Forage Section	08532-220193	09241743148	08532-220193	sabiradar1@rediffmail.com
<b>Directorate of Maize Research, IARI, New Delhi-110 012</b>					
Dr. O. P. Yadav	Director	011-5841805		011-25848195	pdmaize@gmail.com
<b>Directorate of Maize Research, Regional Maize Research and Seed Production Centre, Begusarai (Bihar)</b>					
Dr. V. K. Yadav	Sr. Scientist I/c Station	06243-215254			
<b>Maharana Pratap University of Agriculture &amp; Technology, Udaipur 313 001 (Rajasthan)</b>					
Dr. N. S. Solanki	Prof. (Agrometeorology)		09414809895		solanki.narayan@rediffmail.com
Dr. R. B. Dubey	Senior Maize Breeder		09694383617		dubey_rb2006@yahoo.co.in
Dr. P. L. Maliwal	Director Research	0294-2417334	9414162568	0294-24220447	dr@mapuat.ac.in
<b>Pandit Jawahar Lal Nehru College of Agril. &amp; Research Institute, Karaikal – 609 603 (Pondicherry)</b>					
Dr. S. Mala	Asstt. Prof. (Agronomy)	04368-261372 (O)	09487820451		mala_ap@yahoo.co.in
<b>IARI Regional Research Station, Karnal-132 001 (Haryana)</b>					
Dr. S. S. Atwal	Head	0184-2267169	0184-2267365	0184-2266672	ssatwal.iari@gmail.com
<b>Directorate of Wheat Research, P.B. No. 158, Karnal-132 001 (Haryana)</b>					
Dr. Indu Sharma	Project Director	0184-2267490	0184-2267559 09416800857	0184-2267390	indu.dwr@icar.org.in
Dr. R. P. S. Verma	PS & PI, Barley Network	0184-2267490/ 2265632/2267495	09416468414	0184-2267390	rpsverma.dwr@icar.org.in
<b>All India Coordinated Research Project on Plant Parasitic Nematode, Div. of Nematology, IARI, New Delhi-110 012</b>					
Dr. R. K. Jain	Project Coordinator	011-25846400	011-27550355	011-25846400	rameshjain1952@yhoo.co.in rkjain-nem@iari.res.in
<b>National Bureau of Plant Genetic Resources, New Delhi-110 012</b>					
Prof. K. C. Bansal	Director	011-25843697 09999105667	011-25841177	011-25842495	director@nbpgr.emet.in
Dr. Anjali Kak	Network Coordinator	011-25841835		011-25841835	anjali@nbpgr.ernet.in
<b>Directorate of Sorghum Research, Rajendranagar, Hyderabad-500 030, (A.P.)</b>					
Dr. T. G. Nageshwara Rao	Acting Director		040 - 2459 9301	040 - 2459 9304	millets.icar@nic.in director.millets@icar.gov.in

Name	Designation & Discipline	Tel. Office	Tel. Residence	Fax	E-mail
<b>Agriculture Research Station, Mahim Road, Palghar, District- Palghar (Maharashtra)-401 404</b>					
Dr. U.S. Kudtarkar	Jr. Agrostologist	02525-241048	08390982994		umeshb4u59@rediffmail.com
Dr. U. V. Mahadkar	Director Research				dorbskkv@rediffmail.com
<b>Regional Agricultural Research Station, Karjat, Raigad-410 201 (Maharashtra)</b>					
Dr. Mahendra Gawai	Jr. Rice Breeder				mahendra_gawai@yahoo.com
<b>Grassland Research Station Junagadh Agricultural University, Dhari (Distt. Amreli), Gujarat</b>					
Mr. V. V. Ansodariya	I/C Assoc. Research Scientist,	02797-221117	09824156656		grsdhari@jau.in
<b>Pearl Millet Research Station Junagadh Agricultural University, Junagadh, Jamnagar-361 006</b>					
Dr. P. R. Padhar	Research Scientist (Pearl Millet)	0288-2711793			
<b>Indian Grassland and Fodder Research Institute. Jhansi-284 003 (U.P.)</b>					
Dr. P. K. Ghosh	Director	0510-2730666	0510-2730333	0510-2730833	igfri.director@gmail.com
Dr. B. G. Shivakumar	Principal Scientist IGFRI- SRRS, Dharwad - 580005, Karnataka	0836-2447150	0836-2776551 09731924228	0836-2743459	bgs Kumar@yahoo.com
Dr. Pradeep Saxena	Pr. Scientist (Plant Pathology)	0510-2730029	09415506157 (M)	0510-2730029	pradeepsax@yahoo.com
Dr. S. S. Meena	Pr. Sci & OIC, IGFRI RRS, Avikanagar		09461642052 (M)		ssmeena123@yahoo.com
<b>AICRP on Forage Crops and Utilization, Project Coordinating Unit, IGFRI, Jhansi 284 003 (U.P.)</b>					
Dr. A. K. Roy	Project Coordinator	0510-2730029	0510-2730639 09415412144	0510-2730029/ 2730833	pcforage@gmail.com
Dr. R. K. Agrawal	Pr. Scientist (Agronomy)	0510-2730029	09415179141	0510-2730029	rajiv68@gmail.com
Dr. A. K. Mall	Sr. Scientist (Plant Breeding)	0510-2730029	08765709289	0510-2730029	ashutoshkumarmall@gmail.com Ashutosh.Mall@icar.gov.in
<b>ICAR HQ, New Delhi</b>					
Dr. J. S. Sandhu	Deputy Director General (CS)	011-25842068 /23382545	011-25842508 0124-246166	011-23097003	ddgcs.icar@nic.in
Dr. I. S. Solanki	Asstt. Director General (FFC)	011-23381753		011-23381753	solanki255@rediffmail.com