



**अखिल भारतीय गेहूँ एवं जौ शोधकर्ता बैठक  
2011  
ALL INDIA WHEAT & BARLEY RESEARCH WORKER'S MEET**



**कार्यवाही, संस्तुति एवं कार्ययोजना  
Proceedings, Recommendations and Work Plan**



**गेहूँ अनुसंधान निदेशालय, कर्नाल  
DIRECTORATE OF WHEAT RESEARCH, KARNAL**

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**Proceedings, Recommendations  
&  
Plan of Work (2011-12)**

**50<sup>th</sup> All India Wheat and Barley Research Workers' Meet  
1-4 September, 2011**

**Held at**

**NASC Complex, New Delhi**

**Issued by**

**Dr. Indu Sharma  
Project Director  
Directorate of Wheat Research  
Karnal, India**

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## Foreword

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The 50<sup>th</sup> All India Wheat and Barley Research Workers' meet held at NASC, Complex New Delhi from 1-4 September, 2011 was jointly organized by Directorate of Wheat Research (DWR), Karnal and Indian Agricultural Research Institute (IARI), New Delhi. The meet was inaugurated by Sh Harish Rawat, Hon'ble Minister of State for Agriculture, Food Processing Industry & Parliamentary Affairs, while Dr S Ayyappan, Secretary DARE & DG, ICAR presided over the function. Dr Swapan K Datta, DDG (CS), ICAR and Dr. M V Rao, Former Special DG, ICAR were also present on this occasion of Golden Jubilee celebrations.

The meeting, besides reviewing the progress of preceding crop season and finalizing the plan of work for the ensuing crop season, also utilized this opportunity to conduct special sessions on "Strategies to bridge the yield gaps in wheat and barley production" and "Strategies to combat stripe rust in wheat".

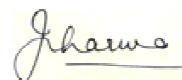
I, on behalf of entire fraternity of wheat and barley, extend my gratitude to Hon'ble Sh Harish Rawat, Minister of State for Agriculture, Food Processing Industry & Parliamentary Affairs for gracing the occasion of the workshop despite his busy schedule. He ignited in all of us, a spirit of quest, to address a series of crucial issues that limit wheat production in the country.

I also express my gratitude to Dr S Ayyappan, Secretary DARE & DG, ICAR, for presiding over the Inagural session. I also express my deep sense of gratitude to Dr Swapan K Datta, DDG (CS), ICAR and Dr. M V Rao, Former Special DG, ICAR for their guidance and support to this programme.

I am thankful to Dr. H S Gupta, Director, IARI, New Delhi for extending the help in organizing the golden jubilee event. Special thanks are due to Dr. K V Prabhu, Head, Genetics Division and his team for making necessary arrangements for the successful conduct of the event. An event of this scale would not have been possible without their unflinching support.

All the Principal Investigators and the staff associated with the preparation of workshop reports and this proceeding need special commendation. Equally, I am thankful to the chairmen and Rapporteurs of various sessions for smooth conduct and timely preparation of the proceedings. I wish to record appreciation for all the scientific, technical and administrative staff for coming out with the proceedings during the plenary session.

I wish you all a great success in your endeavors to enhance the wheat and barley production in the country. I trust that with your hard work and dedication, the wheat production targets for the coming years will be achieved.



(Indu Sharma)

## **Introduction**

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The 50<sup>th</sup> All India Wheat and Barley Research Workers' Meet held at NASC, Complex New Delhi from 1-4 September, 2011 was jointly organized by Directorate of Wheat Research (DWR), Karnal and Indian Agricultural Research Institute (IARI), New Delhi. The meet was attended by more than 400 scientists, policy makers, administrators and all those concerned with wheat and barley research and development. This meet is an annual event of All India Coordinated Wheat and Barley Improvement Project, which was organized to review the progress made in the preceding crop season 2010-11 as well as to discuss and finalize the plan of work for the ensuing crop season 2011-12. In addition, the group also utilized this opportunity to conduct two special sessions on "Strategies to bridge the yield gaps in wheat and barley production" and "Strategies to combat stripe rust in wheat".

The meet was inaugurated by Sh Harish Rawat, Hon'ble Minister of State for Agriculture, Food Processing Industry & Parliamentary Affairs while Dr S Ayyappan, Secretary DARE & DG, ICAR presided over the function. Dr Swapan K Datta, DDG (CS), ICAR and Dr. M V Rao, Former Special DG, ICAR were also present on this Golden Jubilee occasion. A galaxy of dignitaries and delegates from India and abroad also graced the function. Many delegates from CIMMYT, Mexico and ICARDA, Syria also deliberated on various issues.

The proceedings and recommendations in respect of different programmes along with the plan of work for the ensuing crop season 2011-12 were compiled and are presented herein for implementation by all the concerned.

# SESSION I

## Research Review Meeting

September 1, 2011

Chairman: Dr. Swapan K. Datta  
Rapporteur: Dr. R.K. Gupta

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### Presentation of Progress Report for 2010-11: Dr. Indu Sharma

Dr. Swapan K. Datta, DDG (CS), ICAR, New Delhi and chairman initiated the session with the remarks that India has registered a record production of 85.93 million tonnes during 2010-11 and expressed satisfaction over the progress made so far. This commendable success was possible due to hard work of scientists (ICAR & SAUs), policy makers (DoAC), and farmers of the country. He said that we have to further increase the production for political and social reasons. In addition to conventional breeding, biotechnology an important area needs to be added in the programme to strengthen work on molecular breeding including transgenics. He emphasized that holistic approach would be required to tackle biotic & abiotic stresses, resource management and quality related issues.

Dr. Indu Sharma, Project Director welcomed the scientists in the historic Golden Jubilee Meet and congratulated all for the marked achievements in wheat & barley research. She remembered the contributions made by the wheat stalwarts and former Project Directors. Wheat production in the country is upbeat, as a consequence of their hard work, and country has been attaining new heights during past three years touching 85.93 mt. production during 2010-11. Even though environment was favourable for wheat & barley production in most parts of the country, the technology developed by the coordinated programme was instrumental to make good use of it. A well defined production technology well supported by a sound seed production programme and spread of disease resistant varieties of high yield potential made a strong foundation to take advantage of the strategies related to national food security mission. During 2010-11, seven bread wheat, one durum and two barley varieties were released. Ten genetic stocks were registered with NBPGR and several new donors were identified by churning huge germplasm in the form of national and international nurseries. She lauded the efforts of FLD's, monitoring groups and survey and surveillance teams. She expressed satisfaction that donors identified for terminal heat, moisture stress, quality components and resistant genes are being utilized by various centres but also suggested to make good use of wide crossing, shuttle breeding and alien gene in wheat breeding. She expressed the opinion that molecular tools, should be applied wherever stagnation in research is being faced as a bottleneck. She acknowledged the contributions made by CIMMYT and ICARDA for sending large number of nurseries and in terms of human resource development.

Yellow rust scenario was quite different during 2010-11 as it was spotted even in December in some parts of Punjab. However, quick action by the researcher's, planners and the development agencies helped to avert any epidemic like situation. Dr. Sharma expressed satisfaction over the research efforts being laid on resource conservation technology, weed control, cropping systems and water use efficiency. Quality is getting importance in wheat breeding and the new product specific genotypes have been identified. She informed that steps are being taken to work on malnutrition and antioxidant aspects. While narrating the challenges and the research needs, she was of the firm opinion that international

linkages developed by the programme in various research fields shall help to overcome any adversary.

Like wheat, barley production was also good in the country (1.57 million tonnes) with an increase of about 16% over last year's production. A new malt barley variety (DWR UB 73) is now available for late planting in north western plains. Also, one two-row variety (UPB 1008) has been added for rainfed cultivation in the hills. The work is on to find better tillage options, weed management strategies, pest control, quality traits and dual purpose barley. She concluded her presentation with the remarks that all critical issues would be addressed in the XII plan document.

The chairman, Dr. Swapan K. Datta said in his concluding remarks that yield gaps should be minimised and varieties should be developed keeping in mind the requirements of climate change. He mentioned about the storage facility and Government policies required to give further boost to the wheat production. He stressed upon pre-breeding, allele mining for biotic & abiotic stresses, bio-fortification and molecular breeding. He was positive about the industrial demand of barley and emphasized a strong public-private partnership. He gave a call to all the wheat scientists to achieve the target of producing 100 million tonnes wheat by 2025. The session was concluded with the thanks to the chair.

## **Research Review Meetings Crop Improvement**

**September 1, 2011**

**Chairman: Dr. R R Hanchinal**  
**Co-Chairman: Dr. V Tiwari**  
**Rapporteurs: Dr. P C Mishra**  
**Dr. Satish Kumar**

In this session, research achievements and progress in Crop Improvement programme during the year 2010-11 was discussed and reviewed. In his opening remark the Chairman, Dr RR Hanchinal highlighted the historical achievements of the All India Coordinated Wheat Project and its potential for ensuring further breakthrough in yield and food security. The Chairman recalled that since last 4-5 years there is an increasing trend in wheat production which is attributed to the strong coordinated system of wheat research. The Zonal Coordinators presented the results of yield evaluation trials in their respective zones. They also pointed out the challenges and problems in the conduct of trials during 2010-11 crop season.

Dr Lakshmi Kant made the first presentation about the trials conducted in the Northern Hills Zone. Giving detailed elaboration of the trials, he pointed out the high rate of failure of trials due to one or the other reason. He also emphasized high disease score under natural conditions than that in PPSN. Project Director Dr Indu Sharma suggested sending the samples, wherever it is found, to Shimla for pathotype analysis. The inadequate testing centres cause fluctuation in performance of genotypes on year to year basis. Chairman showed his concern to increase the number of testing centres. Dr Sanjay Kumar suggested for dropping of triticale and very high altitude trials in the zone as the number of trial conducting centres was inadequate and triticale is not grown in this zone. Co-Chairman suggested that very high altitude trial should be continued with more centres in Kashmir and DWR would provide the necessary funds to centres. Dr Gulzar Singh from SKAUST-K assured that the very high altitude trials will be properly conducted in Kashmir. The Co-Chairman further remarked that the promoted triticale entries would not be evaluated in AVT of bread wheat entries as practised earlier and the triticale trial should be continued as a Special trial as there is only one triticale trial in the country.

Results of the trials conducted in North Western Plains Zone were presented by Dr VS Sohu in which success percentage of the trial conduct was about 90 per cent. He also presented the constitution of various AVTs to be conducted in the zone during 2011-12. While presenting the results, Dr Sohu pointed out that NIVT-5A was tested only under rainfed condition. This issue was raised by Dr GP Singh, that it should also be tested under restricted irrigation conditions. Concern was shown by various scientists working in NWPZ that the area under rainfed is declining; hence the testing under restricted irrigated condition was essential. Project Director also felt that this testing is essential. The Co-Chairman remarked that the NIVT-5A trial under restricted irrigation would be continued from the 2011-12 season. The Chairman reflected his concern about the large number of trials rejected at Modipuram centre.

The results of the trials conducted in North Eastern Plains Zone were presented by Dr LP Tiwari. The total number of proposed trial was 44 in AVT and all were conducted. This was a good success, however due to one or the other reason the data from only 37 centres were reported. Dr Tiwari asked for providing a vehicle to this centre for proper mobility. Dr Vinod Tiwari informed the house that new vehicles cannot be provided as the Council has not approved sanction for purchase and vehicles can however be hired as and when needed by utilizing



funds from the contingency grant. He further said that DWR shall try to seek additional allocation for providing vehicles during XII plan. Chairman suggested that provision can also be made for replacement of old vehicles. Chairman raised the point about the failure of the trials at Ranchi and emphasized some minor things like damage by birds, rats etc. can be controlled easily. Project Director pointed that trial rejection at Kanpur centre be taken seriously and should be improved.

The report on evaluation of national/international nurseries was presented by Dr S Kundu. She also informed the house about the requirement for registration of extant and newly released wheat varieties with the PPV&FRA. Dr Vinod Tiwari suggested that the breeders should take up this work on priority as the last date for registration of varieties is 1<sup>st</sup> October 2011 and all help in this regard would be provided by DWR.

Dr AN Mishra presented the results of trials conducted in Central Zone. He emphasized the excellent condition of the wheat crop in this zone during 2010-11. Dr Mishra pointed out that number of centres under rainfed and restricted irrigation conditions must be increased at NIVT level to select stable genotypes, as maximum area in this zone still exists under these conditions. He further suggested that contingency amount should be increased for voluntary test centres based on their performance.

The presentation on the trials of Peninsular Zone was made by Dr PN Rasal. He reported 94.74% conduct of the trials in the zone. The crop condition during the season was good with low incidences of rusts. In his remarks the chairman expressed his concern on the varietal mixtures, which have been reported from the zone for a long time and need to be taken care of.

The trial report of Southern Hill zone was presented by Dr J Kumar. The trial conduct was good, but a few trials were rejected because of delayed sowing due to persistent rains at sowing time. Dr Vinod Tiwari raised his concern over less number of testing centres in the zone. Chairman mentioned that this zone is best for growing *Dicoccum* wheats. This will lead to diversification in cropping patterns and also fulfill the needs of local people. He also emphasized that more area under Palni hills be brought under testing.

The results of trial on triticale entries were presented by Dr. GS Mavi. Triticale is tested in four trials and the conduct of trials at different centres was reported satisfactory. Dr. Vinod Tiwari mentioned that, only one scientist is working on this crop and he asked more centres to take up these trials. Also triticale can be taken up as a special trial in future.

The special trial on Salinity / Alkalinity was presented by Dr. Neeraj Kulshreshtra. This season the trial was conducted at nine centres. The trial conduct at all centres was satisfactory. Dr. Vinod Tiwari emphasized that plant material tested under these trials may be sent for IPPSN screening. Chairmain remarked that since there is major prevalence of black and sodic soils in Maharashtra and Karnataka, so more centres from these states should take up this trial.

The results of special trial on dicoccum were presented by Dr. SC Misra. The trial was proposed at 13 locations and conducted at 12 locations only; Out of these data was reported from 9 centres only. Chairman mentioned that major pre-breeding efforts may be taken up to improve the end use quality of dicoccum. He also emphasized the use of CIMMYT and ICARDA germplasm. Screening of dicoccum entries for yellow rust reaction at IARI-RS, Wellington was suggested by Dr. V Tiwari, PI, Crop Improvement.

The results of physiology trials were presented by Dr. Sindhu Sareen. Two multilocation trials MLHT-1 and MLHT-2 were conducted successfully during the season. The speaker also discussed the research work going on abiotic stress at

DWR Karnal. Chairman remarked that physiological aspects at heat and drought are important and thus new centres should take up this trial. Dharwad and Junagarh centres expressed the desire to take up the trial.

A special presentation on genetic resource management of wheat and barley was made by Dr OP Datta from NBPGR. The speaker gave detailed report on the mandate and major activities of NBPGR. He emphasized on taking up registration of the germplasm by various scientists. The Chairman desired that the germplasm with NBPGR may be shared with wheat centres.

Dr. Rajkumar presented the status of breeder seed production in the country during the crop year 2010-11. He informed the house that against an allocation of 27862.6q breeder seed of wheat varieties, 1777.5q breeder seed of barley varieties a total of 38469.44q breeder seed of 139 wheat varieties and 2900.18q of breeder seed of twenty eight barley varieties was produced. This breeder seed production was 10606.84q surplus in case of wheat and 1122.48q in barley over and above the allotment quantities. He stressed that indent for 2011-12 has already been circulated and specific change or incorporation will be made after the submission from concerned centres.

The session ended with a vote of thanks to the chair.

## Research Review Meetings Crop Protection

September 1, 2011

Chairman: Dr. R K Jain  
Co-Chairman: Dr. A K Sharma  
Rapporteurs: Dr. V L Majumdar  
Dr. S S Karwasra

At the onset we were fortunate to have amidst us, Dr. T P Rajendran, ADG (PP) who was with us for some time and gave words of wisdom to the house. Dr. R.K. Jain, Project Coordinator (Nematodes) also joined the session. In his opening remarks Dr. Rajendran suggested that as a Plant Protectionist we should talk about disease management in terms of cropping system. Also we should have a nematode maps for the country. Ready reckoner of recommended pesticides for wheat and barley diseases and their toxicity levels be known and validated from time to time. The SAU's should update their package of practices from time to time so that the latest Crop Protection Technology goes to the famers.

Dr. R K Jain, Head, Division of Plant Pathology, IARI, took over as the Chairman of the session. Dr. A K Sharma, PI, Crop Protection gave an overview of the Wheat Pathology Research work going on in the country, including the various disease screening nurseries such as IPPSN, PPSN, EPPSN for all the three rusts and for region specific diseases such as Loose Smut, Flag Smut, Karnal Bunt, Powdery mildew Head Scab, Hill Bunt, Foot Rot etc. He presented the list of entries resistant to these diseases and entries showing multiple disease resistance.

For the crop health programme, he informed that this year in general stripe rust was mild to severe at most of the locations surveyed. He informed that MP, Gujrat and Maharashtra were free from the Karnal Bunt disease, this year too.

Dr. A K Singh, Principal Scientist, Nematology, presented the review of nematological research work going on at various centres. He emphasized that none of the entry was found resistant against cereal cyst nematode, *Heterodera avenae*, however, a few entries showed moderately resistant reaction. The result of post harvest survey revealed that Punjab and Haryana were free from ear cockle disease, this year.

Dr. S C Bhardwaj presented information on seedling resistance test and trap plot nurseries to identify rust resistance and resistant genes, in all 189 entries of AVT-I & II were evaluated at seedling stage against different pathotypes of three rust pathogens. None of the lines showed resistance to all the rusts, however, 20 lines were resistant to black and brown rust and one of the yellow and brown rusts. Rust resistant genes were characterized in 130 lines. The most common rust resistant genes identified were, *Lr26*, *Lr23*, *Lr13*, *Lr10*, *Sr2* *Sr31*, *Sr11*, *Yr2* and *Yr9*. 43<sup>rd</sup> Wheat Disease Monitoring nursery was planted at 38 locations. Among the wheat rusts, yellow rust was common in Northern India and it appeared in early January 2011 in many wheat growing areas. Most of the entries in nursery were susceptible.

Dr. D P Singh presented an account of multiple resistant genotypes. He also listed multiple pest resistant genotypes which may be used as confirmed sources of resistance. A total of 51 such genotypes were contributed to NGSN 2010-11 and all were utilized by more than 20 breeding centres. The genotypes maintained their resistance to stripe rust during 2010-11 crop season also, inspite of the heavy incidence of disease. After these presentations, major achievements in Wheat Nematology of NWPZ centres and Wheat Pathology of CZ and PZ centres were presented. He spoke on need for focus on soil health, resistance breeding, isolines

for resistance genes, genetics of Karnal bunt resistance and laid stress on improving the genetic base for disease resistance. Dr. Sharma and others apprised the house about the present status of research and approaches adopted on these issues.

#### **Major achievements in Wheat Nematology (NWPZ):**

Dr. (Mrs) Damanjeet Kaur, Professor, PAU, Ludhiana presented the salient achievements of wheat nematology at PAU, Ludhiana. She presented the distribution map of wheat nematode in Punjab state. She explained that all the wheat varieties in AVT's were susceptible to CCN, except a few, which were moderately resistant. However, they also tried to cross with AUS 15854, W 8627 and synthetic 13-1 PBW 343 to have some genetic basis of resistance. Population dynamics of plant parasite nematodes under rice wheat and cotton wheat system were presented.

Dr. Indra Rajvanshi, Assoc Prof, presented the salient achievements at ARS, Durgapura, Jaipur. Raj MR-1 (CCNRV-1) was notified in 2011. In Ganganager and Hanumangarh districts of Rajasthan, CCN is wide spread. She also presented the population dynamics of plant parasitic nematodes under groundnut- wheat and mung- wheat system. Post harvest survey for ear cockle nematode showed that this nematode is still present in Rajasthan and genotypes resistant to CCN were developed at this centre.

Dr. R S Kanwar presented the highlights of wheat nematology at CCS, HAU, Hisar. He explained that ear cockle nematode has been eradicated from the state. Rice root knot nematode also survived on wheat crop during winter but the crop and yield were not affected. CCN (*Heterodera avenae*) is wide spread and present in 10 out of 20 districts in the state. This belongs to pathotypes H<sub>21</sub> as identified by host differentials during 2010-11 and earlier. *H. filipjevi* is another species infecting wheat but limited to some areas in Ambala/ PUNCHKULA districts. Raj MR-1 is resistant to *H.avenae* and susceptible to *H. filipjevi* . In barley, several resistant cultivars are available. The problem of CCN has become severe in cotton-wheat and bajra –wheat systems of Fatehabad, Hisar and Sirsa districts but has declined in Mahendergarh, Gurgaon and Bhiwani districts where it was earlier a serious threat.

#### **Wheat Pathology in CZ and PZ:**

Dr. A N Mishra, Head IARI, Regional Station Indore gave the insight in resistance to stem and leaf rusts of wheat. He presented the basic studies done on resistance to leaf and stem rusts. Protocols developed for evaluation of rust resistance in durum and bread wheat provided guidelines for developing varieties with stable and effective rust resistance. A large number of diverse sources of rust resistance were identified, which can be used for generating diversity and broadening of our rust resistance base. These studies have contributed to strengthening the conceptual framework of rust resistance breeding in wheat. Future research thrust areas were highlighted.

Dr B P Kurundkar, Head, Wheat Rust Station Mahabaleshwar informed that 40 pathotypes of leaf rust and 28 of stem rusts are maintained in pure form at the Mahabaleshwar centre. Mixture of inoculum of five pathotypes of stem rust viz. 11, 40A, 42, 117-6 and 122 and leaf rust namely 12-2, 77-2, 77-5 and 104-2 were supplied to 8 coordinating centres / institutes. Wheat rust pathotypes prevalent in Tamil Nadu (off season), Maharashtra, Karnataka and MP were studied. Race specific APR test of wheat genotypes from AVT –I and AVT-II was carried out in glass house against 40A and 117-6 pathotypes of stem rust.

Dr B K Honrao from Agarkar Research Institute, Pune presented results of inheritance of leaf rust resistance in durums and found that resistance to race 77-5 in Dasarkhed, Haura and Bansi 288-18 was controlled by one recessive gene. Malvi Local, A 090 and Bansi 207-3 carried one dominant gene. Resistance in Bijaga red was controlled by one dominant and one recessive gene. Durum cultivars MACS 967, MACS 2846, MACS 3125 and dicoccum wheat MACS 2971, MACS 2988, MACS 2998 and MACS5009 possessed substantial resistance to Sr31 virulence.

Dr. P C Mishra Assoc. Director Research, Powarkheda emphasized on gene pyramiding for horizontal resistance. He presented list of varieties resistant to leaf rust and black rust in the last 10 years. Dr. D A Shambharkar from Niphad reported that in AVT-II, 12 entries of aestivum, 01 of durum and in AVT-I, 29 entries of aestivum, 03 of durum and 01 of Triticale were immune to leaf and stem rust. Sixteen entries of ARS Niphad in the coordinated trials were resistant to leaf blight.

For the management of leaf and black rust, he reported that two sprays of Tilt 25EC @0.1% were effective in controlling leaf and stem rust of wheat and increasing the yield. For the chemical control of foliage feeding wheat aphids, two sprays of thiamethoxam 25WG @ 12.5g ai/ha (50g/ha) or acetamiprid 20SP@50g ai/ha (250g/ha) at an interval of 15 days are recommended as and when the incidence of aphids(10aphids/shoot/plant) is noticed.

After the presentations were over, Dr. R K Jain, Chairman, appreciated the efforts of the group in achieving the goals of the Crop Protection Programme. He informed the house that the wheat samples supplied by the Indore centre showing the Barley Yellow Dwarf Virus like symptoms were tested in IARI, New Delhi and it was found that the BYDV was not present in the samples. Dr. A K Sharma thanked Dr. Jain for this important diagnosis and emphasized that without confirmation of the disease or pest, there should not be any mention in the publications or reports as it creates problem in terms of quarantine and phytosanitary issues. Dr. Sharma also appreciated the efforts of the group and said that the disease / pest screening nurseries should be given utmost importance so that the materials/ genotypes identified as resistant should be really resistant.

The session ended with a vote of thanks to the chair.

## Research Review Meetings Resource Management

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September 01, 2011

**Chairman:** Dr AK Vyas  
**Co-Chairman:** Dr RK Sharma  
**Rapporteurs:** Dr SC Gill  
Dr Bhagat Singh

The session was chaired by Dr AK Vyas, Head, Division of Agronomy, IARI, New Delhi and Co-chaired by Dr RK Sharma, PI (RM), DWR, Karnal. Dr SC Gill and Dr Bhagat Singh were the rapporteurs of the session. At the outset, Dr RK Sharma welcomed the delegates, introduced the Chairman and requested him to conduct the proceedings on the review of work done during the year 2010-11. The Chairman after welcoming the delegates stressed the need for proper conduct of trials, in-depth analysis to arrive at valid inferences. He requested all the participants to take active part in the deliberations. Thereafter, the Chairman asked for the zone wise presentation of the results of experiments conducted during the crop year 2010-2011.

The results of coordinated trials conducted in NHZ were presented by Dr Gurdev Singh, Agronomist, CSKHPKV Regional Station, Bajaura, Kullu, Himachal Pradesh. In all, two trials were conducted in this zone for evaluation of genotypes for irrigated timely sown and rainfed conditions. In this zone two test entries TL 2969 and HS 514 were found superior to their respective best checks, TL 2942 and VL 804 in rainfed conditions trial.

The results of four varietal evaluation trials conducted in NWPZ were presented by Dr Hari Ram Saharan, Wheat Agronomist, PAU, Ludhiana. In irrigated timely sown conditions-durum wheat varieties trial, the test entry, PDW 322 was significantly superior to the best check PDW 314 with yield gain 3.2% whereas WHD 946 and HI 8703 showed only numerical superiority with yield gain of 2.6 and 1.0%, respectively. In late sown trial test entry PBW 639 was significantly superior to the best check WH 1021 with yield gain of 4.5%. In restricted irrigation trial, the test entry PBW 644 was found numerically better than timely sown irrigated conditions check PBW 550 with a yield gain of 1.1%. However, the same test entry, PBW 644 was significantly superior to the best check WH 1080 with an average yield gain of 3.5% under rainfed situation and the response to nitrogen was up to 80 kg/ha.

As there was no AVT II year trial in NEPZ, the Chairman asked Dr SPS, Tomar to present the results of the Central zone. Four experiments conducted in this zone were, date of sowing and varieties (TS-TDM), date of sowing and varieties (LS), restricted irrigation and varieties and Nitrogen verses varieties (RF). In timely sown durum trial, one test entry HI 8704 was evaluated and found numerically better than the best check MPO 1215 with an average yield gain of 2.0% and in other three trials i.e. late sown *aestivum*, restricted irrigation and rainfed conditions none of the test entry showed the superiority over their respective best checks HD 2932 and MP 3288, respectively.

The results of four experiments conducted in PZ were presented by Dr SC Tripathi as Dr BN Patil could not attend the meeting. He reported that under timely sown *aestivum-durum* trial out of three test entries, none gave significantly higher yield compared to the best durum check NIDW 295 and GW 322 (ac). In irrigated late sown trial, one test entry AKAW 4610-6 gave numerically better yield with an

average yield gain of 7.6%. In restricted irrigation and rainfed condition trial, the test entry MP 3299 was found better than the best check NI5439 with a yield gain of 15.6 and 7.1%, respectively.

Dr TP Rajendran, ADG (PP) emphasized that foliar application of nutrient needs to be explored keeping in view the scarcity of imported P and K fertilizers. He also stressed the need to improve water and nutrient use efficiency. Dr RK Sharma replied that the trials are already in progress in the coordinated set up to address the issue of efficient water and nutrient management involving foliar application of nutrients for their increased use efficiency. With regard to efficient water management, the experiments are in progress on surface residue retention and its effect on wheat productivity and water use efficiency.

The results of the special coordinated experiments on spacing, resource conservation technologies, residue management, weed management, nutrients' foliar applications, integrated nutrient management, pre and post seeding irrigation and relay cropping of wheat in cotton were presented by Dr RK Sharma and are summarized hereunder:

- The row spacing trials conducted across the zones revealed that the optimum spacing is 17.5 to 20.0 cm for timely sown irrigated conditions.
- Leaving the rice residue at the surface significantly increased the wheat yield over residue removal and the response to irrigation numbers was up to five. The water use efficiency increased with increase in surface retained residue load from 0 to 6 ton/ha.
- In weed management and spacing trial, no significant difference was found on yield at 15 and 20 cm in weed free treatment, however, yield advantage was found in 15 cm spacing than 20 cm spacing in weedy check treatment indicating the significance of smothering effect on weeds at narrow spacing.
- In nutrients' foliar application trial, all the chemicals i.e. urea, DAP,  $\text{KNO}_3$ , KCl and NPK (19:19:19) spraying twice with 2% concentration at 55 and 70 days after sowing gave significantly higher yield than control (no spraying) or water spraying.
- The results of the integrated nutrient management at Dharwad and Niphad in PZ in soybean-wheat cropping system showed that the maximum wheat yield was obtained when recommended NPK fertilizers were applied along with organic sources and the highest yield was obtained with recommended fertilizers + FYM (3.75 t/ha) + vermicompost (1.25 t/ha).
- The results of pre and post seeding irrigation trials conducted at four locations revealed that on an average basis the highest grain yield was obtained in treatment where pre-seeding irrigation followed by zero tillage seeding was done.
- In cotton-wheat relay cropping trial, cotton (conventional practice)-wheat relay (broadcasting) treatment gave significantly higher yield than other treatments.

To end the session, Dr RK Sharma, on behalf of the Directorate, and the RM group proposed a sincere vote of thanks to the Chair for smooth conduct and valuable suggestions during the proceedings.

The Resource Management and Social Sciences groups after thorough deliberations arrived at the following recommendations;

### **Technical Recommendations**

1. Surface residue retention of 4 t/ha with four irrigations should be practiced for higher wheat productivity and water use efficiency (15-20%) in North Western Plains. This is based on two years data for three locations (Karnal, Ludhiana and Pantnagar).
2. In soybean-wheat system of Peninsular India, apply Farm Yard Manure (3.75 t/ha) and vermicompost (1.25 t/ha) in addition to recommended NPK in wheat and 75% of recommended NPK and any of the organic source (FYM 7.5 t/ha or vermin-compost 2.5 t/ha or FYM 3.75 t/ha + vermicompost 1.25 t/ha) in soybean for higher system productivity. This is based on three years data of two locations (Dharwad and Niphad).
3. Dry seeding immediately followed by irrigation cannot be practiced in north western and north eastern plains and the present practice of seeding after pre-sowing irrigation under conventional or zero tillage should be followed for higher yield. This is based on two years data of 3 to 4 locations (Karnal, Ludhiana, Pantnagar and Varanasi)

### **Administrative Recommendations**

1. For greater impact of wheat and barley FLDs, there is a need to increase the number of demonstrations as well as timely release of money.
2. The group recommended that in view of the development of herbicide resistance, any new herbicide, if available, may be tested at DWR followed by multi-location trials.

At the end of the session, Dr RK Sharma, on behalf of the Directorate and IARI New Delhi, thanked all the participants for valuable suggestions.



## Research Review Meeting Quality Improvement

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**September 1, 2011**

**Chairman: Dr. B.K. Misra**  
**Co-Chairman: Dr. RK Gupta**  
**Rapporteurs: Dr. R.P. Singh**  
**Dr. Suma Biradar**

The meeting to review wheat quality work was chaired by Dr B. K. Misra, Ex.-Principal Scientist IARI, New Delhi. In total, 15 delegates attended this meeting to take an account of the progress made in wheat quality during 2010-11. Dr R K Gupta, P.I., Wheat Quality, DWR, Karnal presented an overview. He mentioned the genotypes available for good product making and other important quality parameters. The variability in quality traits and nutritional parameters was presented. The work related to use of molecular marker technology approach for the improvement of wheat quality was also presented. He also briefly touched the work done at different centres for quality improvement and stressed the need to work with more zeal by involving molecular markers in quality improvement activities.

Presentation from different centres were made on bread and durum wheat NIVT'S covering characteristics like grain appearance, test weight, grain protein content, sedimentation value, phenol reactions in *T.aestivum* and also yellow berry & yellow pigments in case of *T. Durum*. Dr. RP Singh and Dr. (Ms.) H. Kaur (NIVT1A), Dr. R.S. Saini (NIVT 1B), Dr. N Augustine (NIVT 2), Dr. Anil Kumar (NIVT 3), Dr. Shasi Madan (NIVT 5A and Salinity/ Alkalinity trials) and Dr. Suma S. Biradar (NIVT 5B & Special *T.dicoccum* trial) presented the results of respective NIVTs. Some new materials were available for all the quality parameters in each trial.

Dr. Sewa Ram reported progress made on soft textured wheat and biscuit quality. Dr. D Mohan and Dr. Anju M. Singh discussed the Quality Component Screening Nursery (QCSN). They stressed the need of better conduct, proper plot size, timely sowing and timely grain supply for quality analysis. It was suggested that some initial screening should be carried out by each centre to pick up promising ones for multi-location testing through this nursery. It was stressed that good interaction between breeders and quality persons is crucial in this endeavour.

In the final discussion, Dr. (Mrs.) Indu Sharma, Project Director also participated and some useful suggestions were given. Dr (Mrs). Indu Sharma complimented the good work done by the quality group and assured all help for further improvement and involving promising quality genotypes in the crossing block. She gave useful suggestions to devise work plan for further improvement in the conduct of QCSN. She emphasised to strengthen the work on bio-fortification and molecular breeding. A watch on global environmental changes would be required to maintain and improvise quality standards of the Indian wheat. The Chairman Dr. B.K. Misra concluded the session by showering appreciation for the good work on wheat quality. He mentioned that the peninsular zone should be declared a high protein zone. The meeting ended with a vote of thanks to the chairman.

## **Research Review Meetings Barley Network**

**September 1<sup>st</sup>, 2011**

**Chairman : Dr. S.C. Gulati**  
**Co-Chairman: Dr. R.P.S. Verma**  
**Rapporteurs: Dr. B. Sarkar**  
**Dr. P.K. Gupta**

This research review session of barley network during Golden Jubilee meet of AICW&BIP was chaired by Dr. SC Gulati, Ex-PS, IARI and eminent barley breeder. The chairman welcomed all the delegates participating in the meeting. The chairman also welcomed industry representatives, who participated in the meeting and wished that their interaction with R&D organization will help in popularizing barley cultivation in the country. The chairman requested participants to provide their valuable inputs in the discussion after the various presentations in order to achieve the goal of the program.

Dr. R.P.S. Verma, DWR, Karnal presented the progress report on the conduct of coordinated varietal yield trials including the constraints faced during 2010-11 crop season. He informed the house about the release of new barley varieties, DWRB73, two-row malt barley for cultivation under late sown conditions in North Western Plains Zone (NWPZ) and UPB1008 for rainfed timely sown conditions in Northern Hills Zones (NHZ). He pointed out in his presentation about better conduct (93% of the conducted trials being accepted for reporting) of yield trials during this crop season in different zones. He expressed his appreciation to all cooperators for better conduct of trials this year compared to last year. Dr. Verma also pointed out that the entries contributed in the yield trials by some centres are direct introductions from various international trials and nurseries. While, there is no restriction for direct introduction, but he emphasized the need for a more balanced approach in infusing materials in national system by using elite exotic material for hybridization with indigenous cultivars. This will ensure the better adaptation of the new lines to our condition as well as increase the genetic diversity in breeding material. He also mentioned about the stability in the barley area in the country during last two decades, which is facing stiff competition with wheat and other crops in winter season and emphasized the need of more contract cultivation of malt barley by the private industry to sustain or increase the barley area in the country. He informed the house that there is an increase in demand in breeder seed from the states of Rajasthan and UP, but there is the need for more breeder seed indent from U.P., M.P., Punjab and Haryana to make the availability of seed of new improved cultivars to the farmers.

The session was attended by number of representative persons from malting and brewing industry and actively involved in the discussions and emphasized the need for quick delivery of breeder seed of malting barley in large quantity on which the speaker mentioned that the request from industry should come through DAC or Seed Association of India. He also emphasized the need of full commitment from industry of lifting seed once it is produced against their indents. It was emphasized in the discussion by the chairman that contract cultivation by the industry is the only way forward for popularizing malt barley in India. It was also pointed out that policy intervention is required to have better MSP from government for malt barley to encourage farmer to go for malt barley cultivation. The chairman also emphasized the need to work together with industry for joint R&D program for making barley a profitable crop for the farmers. There was a consensus on the proposal that the "National core group on malt barley development" should be revived for such

collaboration, which can workout the possibilities of funding the malt barley R&D programme.

Dr. Selvakumar presented the progress report of experiments conducted in crop protection section. There was a concern about Bajaura centre not properly utilizing the IBDSN facility and contributing very few entries. The scientists were asked to submit more entries from their centre for getting a chance to evaluate their station trials materials at multi-locations, which will help in less rejection of the varieties during coordinated trials because of disease/pest susceptibility. The experiments on IPM, Foliar blight pathogen monitoring nursery and chemical control of aphids were concluded and the final recommendations were presented. It was discussed that rust recording should be done at least 3 times during crop cycle and final recording should be done when leaves are in green stage before attaining physiological maturity otherwise there are chances of faulty recording. There was a deep concern about screening of materials for aphid resistance by entomologists, where no entry is being recorded as tolerant. There is a need to devise a mechanism to screen against aphid by means of recording the lines susceptible based on the colonization of aphid on fresh leaves on the plant and not by merely counting the total number of aphids on plant/ shoot as the criteria for resistance/susceptibility.

Dr. AS Kharub made presentation on the results of the various agronomical experiments including the varietal evaluation, special trials on dual purpose barley, tillage options in malt and feed barley, seed rate and row spacing in malt barley and integrated nutrient management. In the presentation, varietal performance in different agronomic management was discussed. In case of dual purpose trial he pointed out that spilt of nitrogen into  $\frac{1}{2}$  (basal),  $\frac{1}{4}$  (immediately after cut) and  $\frac{1}{4}$  (after next irrigation) gave better performance in NWPZ and NEPZ, while considering the green forage and grain yield together. He also informed the house that in case of malt barley, row spacing of 18cm gave significantly higher yield than 23 cm spacing. The seed rate of 80 and 100 kg per hectare gave similar yields under 18 cm row spacing. In case of the tillage experiments, it was observed that reduced tillage was at par with the conventional, however keeping in view the economics even zero tillage may be practiced for long term benefits. The response was observed up to two irrigation levels in NWPZ and NEPZ. He informed the house that substitution of 25% of inorganic fertilizer with organic fertilizer (vermicompost) gave comparable yield to that of 100% application of inorganic fertilizer in NHZ.

Dr. Dinesh Kumar presented the results of barley quality evaluation. He informed the house that during the year quality evaluation of feed barley trials and organization of the barley quality component nursery (BQCN) were the new initiatives taken by him. The quality evaluation results were presented on malting quality of IVT/AVT entries, barley quality component nursery and quality of feed barley trials entries. In case of malting quality it was observed that friability of malt becoming consistently good and the revision of minimum values in guidelines may be considered after one more year of evaluations. It was also suggested that malting cycle standards of timely sown and late sown trials material may be examined to standardize the malting conditions of late sown barley. Dr. Kumar emphasized the need of timely supply of the sufficient quantity of properly cleaned/stored seed samples in good packing with proper labeling to DWR Karnal to facilitate the analysis work.

The last presentation was by Dr. B. Sarkar on evaluation of international trials and nurseries received from ICARDA Syria. He informed the house that during the year, 739 accessions in form of four yield trials & five observation

nurseries were evaluated in Karnal and other barley network centres. A special nursery of 315 germplasm accessions including donors for various traits along with some *H. spontaneum* accessions was grown at DWR, Karnal. Apart from these a national barley genetic stock nursery (NBGSN) and an elite international barley germplasm nursery (EIBGN) were supplied to all centers. The material from these nurseries was utilized by the breeders as direct introduction or in the hybridization program. Dr. Sarkar also informed the house about the germplasm maintenance activity and mentioned that during this year, 759 accessions were rejuvenated as regular maintenance program for conservation of germplasm in MTS at DWR, Karnal.

In his concluding remarks the chairman commended the effort made by barley workers in achieving the goal of the program. He emphasized the need of making serious effort in widening the genetic base through use of elite materials coming from national and international programme. He also commended role of ICARDA in supplying elite germplasm in the form of various yield trials & nurseries that are being used in the national program. He also emphasized the need of developing more collaboration in barley improvement for addressing the current objectives like malt, feed and fodder types. The chairman also appreciated the role of quality evaluation in barley programme for generating information on sources of specific traits which can be used by breeders.

The session ended with thanks to the Chair.

## **SESSION II**

### **Research Planning Meetings**

### **Crop Improvement**

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**September 1<sup>st</sup>, 2011**

**Organizers: Drs. V Tiwari  
R Chatrath**

Scientists from six major zones deliberated in respective zonal groups and reviewed the results of various trials. Following the set norms on yield, diseases (particularly rusts) and quality parameters, the desirable test entries were promoted from NIVTs to Advanced Varietal Trials (AVTs). The same norms were taken into account to retain the promising entries for final year test in AVTs. The scientists dealing with special trials and physiological investigations also finalized the trials.

Finally, the constitution of various trial series in NWPZ (5), NEPZ (3), CZ (4), PZ (4), NHZ (6), SHZ (2), special trials (3) and wheat physiological investigations (2) was completed with the help of collective wisdom of co-operators.

The coordinators/organizers of this group also completed the constitution of seven National Initial Varietal Trials and two Initial Varietal Trials utilizing the proposals received from different wheat breeding centres. Besides, the requirement of various international nurseries and trials was assessed for sending the indent to CIMMYT, Mexico.

#### **Finalization of work plan and Recommendations:**

The details of various wheat breeding yield trials were presented before the Crop Improvement group and were finalized for conduction during 2011-12 crop season. The details of yield trials are given here as under:

**National Initial Varietal Trial  
NIVT-1A-IR-TS-TAS, 2011-12**

**Conducting centres**

Zone	No.	Centres
NWPZ	10	Durgapura, Tabiji, Delhi, Ludhiana, Gurdaspur, Hisar, DWR-Karnal, Pantnagar, Nagina, Modipuram
NEPZ	8	Kanpur, Faizabad, Varanasi, Pusa (IARI), Ranchi, Sabour, Kalyani, Burdwan
<b>Total</b>	<b>18</b>	

**Details of trial entries**

Sr No	Contributing Centres	No. of Entries	Entries
1.	Delhi	8	HD 3104, HD 3105, HD 3106, HD 3107, HD 3108, HP 1941, HP 1942, HP1943
2.	Ludhiana	5	PBW 676, PBW 677, PBW 678, PBW 679, PBW 680
3.	Hisar	5	WH 1131, WH 1132, WH 1133, WH 1134, WH 1135
4.	Pantnagar	5	UP 2834, UP 2835, UP 2836, UP 2837, UP 2838
5.	Durgapura	5	RAJ 4285, RAJ 4286, RAJ 4287, RAJ 4288, RAJ 4289
6.	DWR-Karnal	5+1	DBW 95, DBW 96, DBW 97, DBW 98, DBW 99, DBW 112
7.	Faizabad	2+1	NW 5074, NW 5077, NW 5079
8.	Varanasi	2	HUW 660, HUW 661
9.	Kanpur	2	K 1101, K1102
10.	Modipuram	1	WCW 2009-06
11.	Chatha	1	JAUW 596
12.	Jalna, KSPL	1	Amber 28
13.	Triticale	1	TL 2984
	<b>Checks</b>	<b>4</b>	<b>PBW 343, DBW 17, K 0307, HD 2733</b>
	<b>Total entries</b>	<b>49</b>	

**Experimental details**

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	<b>Gross:</b> 6m x 1.38m (6 rows); <b>Net:</b> 6m X 0.92m (4 middle rows)
Fertilizer dose (kg/ha)	:	150:60:40 (N:P:K)
Time of sowing	:	<b>NWPZ:</b> November 10-20, <b>NEPZ:</b> November 15-25
Seed requirement	:	7.0 kg per entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**National Initial Varietal Trial**  
**NIVT-1B-IR-TS-TAS, 2011-12**

**Conducting centres**

Zone	No.	Centres
NWPZ	11	Delhi, Ludhiana, Gurdaspur, Hisar, Kaul, Pantnagar, Nagina, Modipuram, Durgapura, Tabiji, DWR-Karnal
NEPZ	8	Kanpur, Faizabad, Varanasi, Ranchi, Sabour, Pusa (IARI), Kalyani, Malda
<b>Total</b>	<b>19</b>	

**Details of trial entries**

Sr No	Contributing centres	No. of Entries	Entries
1.	Delhi	9	HD 3109, HD 3110, HD 3111, HD 3112, HD 3113, HP 1944, HP 1945, HP 1946, HP 1947
2.	Kanpur	5	K 1104, K1105, K 1106, K 1107, K1108
3.	Faizabad	5	NW 5060, NW 5062, NW 5065, NW 5072, NW 5075
4.	Varanasi	5	HUW 662, HUW 663, HUW 664, HUW 665, HUW 666
5.	Durgapura	3	RAJ 4290, RAJ 4291, RAJ 4292
6.	DWR-Karnal	6	DBW 100, DBW 101, DBW 102, DBW 103, DBW 104, DBW 105
7.	Ludhiana	3+1	PBW 681, PBW 682, PBW 683, PBW 691
8.	Hisar	3+1	WH 1136, WH 1137, WH 1138, WH 1139
9.	Pantnagar	1+2	UP 2839, UP 2840, UP 2841
10.	Sabour	1	BRW 3719
	<b>Checks</b>	<b>4</b>	<b>PBW 343, DBW 17, K 0307, HD 2733</b>
	<b>Total entries</b>	<b>49</b>	

**Experimental details**

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	<b>Gross:</b> 6m x 1.38m (6 rows); <b>Net:</b> 6m X 0.92m (4 middle rows)
Fertilizer dose (kg/ha)	:	150:60:40 (N:P:K)
Time of sowing	:	<b>NWPZ:</b> November 10-20, <b>NEPZ:</b> November 15-25
Seed requirement	:	7.0 kg per entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**National Initial Varietal Trial**  
**NIVT-2-IR-TS-TAS, 2011-12**

**Conducting centres**

Zone	No.	Centres
CZ	9	Indore, Gwalior, Powarkheda, Sagar, Junagarh, Vijapur, Kota, Udaipur, Bilaspur
PZ	5	Dharwad, Niphad, Pune, Parbhani, Akola
<b>Total</b>	<b>14</b>	

**Details of trial entries**

Sr No	Contributing Centres	No. of Entries	Entries
1.	Delhi	5	HI 1586, HI 1587, HI 1588, HD 3114, HD 3115
2.	Dharwad	4	UAS 342, UAS 343, UAS 344, UAS 345
3.	Vijapur	4	GW 438, GW 439, GW 440, GW 441
4.	Niphad	3	NIAW 1895, NIAW 1923, NIAW 1994
5.	Powarkheda	3	MP 1270, MP 1271, MP 1272
6.	Durgapura	2	RAJ 4293, RAJ 4294
7.	Pune	2	MACS 6531, MACS 6583
8.	Junagadh	1	GW 446
9.	Sagar	1	JWS 140
10.	Jabalpur	1	MP 3382
11.	Akola	1	AKAW 4721
12.	Lok Bharati	1	LOK 68
13.	Ludhiana	1	PBW 684
14.	Kanpur	1	K 1110
15.	Pantnagar	1	UP 2842
16.	DWR- Karnal	1	DBW 106
17.	Hisar	1	WH 1140
18.	Jalna, KSPL	1	KDW 2029
	<b>Checks</b>	<b>2</b>	<b>GW 322, MACS 6222</b>
	<b>Total entries</b>	<b>36</b>	

**Experimental Details**

Design	: Simple Lattice
Replication	: Two
Plot size	: <b>Gross:</b> 6m x 1.38m (6 rows); <b>Net:</b> 6m X 0.92m (4 middle rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N: P: K)
Time of sowing	: November 10-20
Seed requirement	: 7.0 kg per entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*



## National Initial Varietal Trial NIVT-3-IR-LS-TAS, 2011-12

### Conducting centres

Zone	No.	Centres
NWPZ	9	Delhi, Ludhiana, Gurdaspur, Hisar, DWR-Karnal, Pantnagar, Bulandshahr, Modipuram, Durgapura
NEPZ	6	Kanpur, Faizabad, Varanasi, IARI-Pusa, Ranchi, Sabour
CZ	6	Indore, Bilaspur, Powarkheda, Jabalpur, Junagarh, Vijapur
PZ	5	Ugar Khurd, Niphad, Pune, Parbhani, Akola
<b>Total</b>	<b>26</b>	

### Details of trial entries

Sr No	Contributing centres	No. of Entries	Entries
1.	Delhi	8	HD 3116, HD 3117, HD 3118, HD 3119, HP 1948, HP1949, HP 1950, HI 8734
2.	Ludhiana	4	PBW 685, PBW 686, PBW 687, PBW 688
3.	Pantnagar	4	UP 2843, UP 2844, UP 2845, UP 2846
4.	Durgapura	3	RAJ 4295, RAJ 4296, RAJ 4297
5.	Kanpur	3	K 1112, K 1113, K 1114
6.	Hisar	3	WH 1128, WH 1129, WH 1130
7.	DWR- Karnal	3	DBW 107, DBW 108, DBW 109
8.	Varanasi	2	HUW 667, HUW 668
9.	Powarkheda	2	MP 1273, MP 1274
10.	Vijapur	2	GW 444, GW 445
11.	Niphad	2	NIAW 1994, NIAW 1951
12.	Junagadh	1	GW 448
13.	Lok Bharati	1	LOK 69
14.	Faizabad	1	NW 5064
15.	Jabalpur	1	MP 3379
16.	Bilaspur	1	CG 1009
17.	Dharwad	1	UAS 346
18.	Akola	1	AKAW 4699
19.	Gwalior	1	MP 4153
20.	Modipuram	1	WCW 2009-07
	<b>Checks</b>	<b>4</b>	<b>PBW 590, DBW 14, MP 4010, HD 2932</b>
	<b>Total entries</b>	<b>49</b>	

### Experimental Details

Design	: Simple Lattice
Replication	: Two
Plot size	: <b>Gross:</b> 6m x 1.08m (6 rows); <b>Net:</b> 6m x 0.72m (4 middle rows)
Fertilizer dose (kg/ha)	: <b>NWPZ &amp; NEPZ:</b> 120:60:40 (N: P: K) <b>CZ &amp; PZ</b> - 90:60:40 (N: P: K)
Time of sowing	: <b>NWPZ &amp; NEPZ:</b> December 15 - 25 <b>CZ &amp; PZ:</b> December 1-10
Seed requirement	: 7.0 kg per entry

*Note: Change in test sites, date of sowing, trial entries, etc. will be invalid if not approved by the Project Director*

**National Initial Varietal Trial**  
**NIVT- 4-IR-TS-TDM, 2011-12**

**Conducting centres**

Zone	No.	Centres
NWPZ	7	Delhi, Ludhiana, Gurdaspur, Hisar, DWR-Karnal, Bulandshahr, Durgapura
CZ	9	Indore, Powarkheda, Jabalpur, Gwalior, Junagarh, Vijapur, SK Nagar, Kota, Mauranipur
PZ	4	Ugar Khurd, Niphad, Pune, Akola
<b>Total</b>	<b>20</b>	

**Details of trial entries**

Sr No	Contributing Centres	No. of Entries	Entries
1.	Delhi	7	HD 4727, HI 8735, HI 8736, HI 8737, HI 8738, HI 8739, HI 8740
2.	Vijapur	4	GW 1286, GW 1287, GW 1288, GW 1289
3.	Ludhiana	4	PDW 331, PDW 332, PDW 333, PDW 334
4.	Pune	3	MACS 3929, MACS 3895, MACS 3892
5.	DWR- Karnal	2	DDW 23, DDW 24
6.	Hisar	2	WHD 951, WHD 952
7.	Dharwad	2	UAS 443, UAS 444
8.	Kota	2	RKD 247, RKD 248
9.	Niphad	1	NIDW 706
10.	Akola	1	AKDW 4750
11.	Powarkheda	1+1	MPO 1275, MPO 1276
12.	Pantnagar	1	UPD 94
13.	Parbhani	1	PBND 6054
	<b>Checks</b>	<b>4</b>	<b>PDW 291, HI 8498, NIDW 295, DBW 17</b>
	<b>Total entries</b>	<b>36</b>	

**Experimental Details**

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	<b>Gross:</b> 6m x 1.38m (6 rows); <b>Net:</b> 6m x 0.92 (4 middle rows)
Fertilizer dose (kg/ha)	:	<b>NWPZ :</b> 150:60:40 (N: P: K); <b>CZ &amp; PZ :</b> 120:60:40 (N: P: K)
Time of sowing	:	<b>NWPZ:</b> Nov 5-15; <b>CZ:</b> Nov.10-20; <b>PZ:</b> Nov. 5-15
Seed requirement	:	7.0 kg per entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**National Initial Varietal Trial  
NIVT-5A-RF/RI -TS-TAS, 2011-12**

**Conducting centres**

Zone	Centres	Production condition		
		RI & RF	RI only	RF only
NWPZ	4	Ludhiana, Gurdaspur, Ambala, Delhi	-	-
NEPZ	5	-	-	Kanpur, Faizabad, Varanasi, Ranchi, Sabour
CZ	4	Indore, Sagar	Jabalpur	Kota
PZ	5	Niphad	-	Pune, Badnapur, Dharwad, Washim
<b>Total</b>	<b>17 RF + 8 RI</b>			

**Details of trial entries**

Sr. No.	Contributing Centres	No. of Entries	Entries
1.	Delhi	5	HD 3120, HD 3121, HD 3122, HD 3123, HP 1951
2.	Powarkheda	4	MP 1264, MP 1265, MP 1266, MP 1267
3.	Kanpur	2	K 1115, K 1116
4.	Ludhiana	2	PBW 689, PBW 690
5.	Hisar	2	WH 1141, WH 1142
6.	Pantnagar	2	UP 2847, UP 2848
7.	Pune	2	MACS 6566, MACS 6568
8.	Dharwad	2	UAS 347, UAS 348
9.	Niphad	2	NIAW 1885, NIAW 1994
10.	Faizabad	1	NW 5058
11.	Durgapura	1	RAJ 4298
12.	Jabalpur	1	MP 3392
13.	Varanasi	1	HUW 669
14.	Sabour	1	BRW 3723
15.	DWR-Karnal	1	DBW 110
16.	Sagar	1	JWS 141
17.	Bilaspur	1	CG 1008
18.	Chatha	1	JAUW 598
	<b>Checks</b>	<b>4</b>	<b>WH 1080, HI 1500, HD 2888, NI 5439</b>
	<b>Total entries</b>	<b>36</b>	

**Experimental Details**

Design	: Simple Lattice															
Replication	: Two															
Plot size	: <b>Gross:</b> 6m x 1.38m (6 rows); <b>Net:</b> 6m x 0.92 (4 middle rows)															
Fertilizer dose (kg/ha)	: <b>RF:</b> 60:30:20 (N:P:K); <b>RI:</b> 90:60:40(N:P:K)															
Time of sowing	: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Zone</th> <th>RF</th> <th>RI</th> </tr> </thead> <tbody> <tr> <td>NWPZ</td> <td>October 20 - 31</td> <td>Oct 25 - Nov 5</td> </tr> <tr> <td>NEPZ</td> <td>October 25 - Nov 10</td> <td>-</td> </tr> <tr> <td>CZ</td> <td>October 15 - 31</td> <td>Oct 25 - Nov 10</td> </tr> <tr> <td>PZ</td> <td>October 15 - 31</td> <td>Nov 1 - 10</td> </tr> </tbody> </table>	Zone	RF	RI	NWPZ	October 20 - 31	Oct 25 - Nov 5	NEPZ	October 25 - Nov 10	-	CZ	October 15 - 31	Oct 25 - Nov 10	PZ	October 15 - 31	Nov 1 - 10
Zone	RF	RI														
NWPZ	October 20 - 31	Oct 25 - Nov 5														
NEPZ	October 25 - Nov 10	-														
CZ	October 15 - 31	Oct 25 - Nov 10														
PZ	October 15 - 31	Nov 1 - 10														
Seed requirement	: 7.0 kg per entry															

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**National Initial Varietal Trial**  
**NIVT-5B-RF/RI -TS-TDM, 2011-12**

**Conducting centres**

Zone	Centres	Production condition		
		RF only	RI & RF	RI only
CZ	7	Dhandhuka, Arnej, Tancha, Sagar	Indore, Kota	Powarkheda
PZ	4	Niphad, Pune, Washim, Dharwad	-	-
<b>Total</b>	<b>10 RF + 3 RI</b>			

**Details of trial entries**

Sr No	Contributing Centres	No. of Entries	Entries
1.	Delhi	5	HI 8741, HI 8742, HI 8743, HI 8744, HI 8745
2.	Pune	3+1	MACS 3912, MACS 3914, MACS 3915, MACS 3863
3.	Vijapur	3	GW 1291, GW 1292, GW 1293
4.	Dharwad	2	UAS 446, UAS 447
5.	Powarkheda	2	MPO 1268, MPO 1269
6.	DWR- Karnal	1+1	DDW 25, DDW 26
7.	Junagadh	1	GW 1295
8.	Niphad	1	NIDW 699
9.	Kanpur	1	KD 1118
10.	Kota	1	RKD 242
	<b>Checks</b>	<b>3</b>	<b>A 9-30-1, HI 8627, AKDW 2997-16</b>
	<b>Total Entries</b>	<b>25</b>	

**Experimental Details**

Design	: Simple Lattice									
Replication	: Two									
Plot size	: Gross: <b>6m x 1.38m (6 rows); Net: 6m x 0.92 (4 middle rows)</b>									
Fertilizer dose (kg/ha)	: <b>RF – 40:20:00 (N: P: K); RI – 60:30:15 (N: P: K)</b>									
Time of sowing	: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Zone</th> <th>RF</th> <th>RI</th> </tr> </thead> <tbody> <tr> <td>CZ</td> <td>October 15-31</td> <td>Oct 25 - Nov 10</td> </tr> <tr> <td>PZ</td> <td>October 15-31</td> <td style="text-align: center;">-</td> </tr> </tbody> </table>	Zone	RF	RI	CZ	October 15-31	Oct 25 - Nov 10	PZ	October 15-31	-
Zone	RF	RI								
CZ	October 15-31	Oct 25 - Nov 10								
PZ	October 15-31	-								
Seed requirement	: 5.0 kg per entry									

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Northern Hills Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-IR-TS-TAS & AVT-RF-TS-TAS**

**Conducting centres**

State	Centres	Production condition		
		IR & RF	IR only	RF only
Himachal Pradesh	6	Shimla, Malan	Dhaulakuan	Berthin, Bajaura, Chamba (KVK)
Uttarakhand	3	Hawalbagh	-	Majhera, Ranichauri (KVK)
Jammu & Kashmir	1	Rajouri	-	-
Manipur	1	-	-	Mantripukhari
Sikkim	1	-	-	Gangtok
West Bengal	1	-	-	Kalimpong
<b>Total</b>	<b>IR: 5 &amp; RF : 12</b>			

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, RS, Shimla	2	HS 526*, HS 536
CSKHPKV, Palampur	2	HPW 349*, HPW 368
VPKAS, Almora	1	VL 950
<b>Checks</b>	<b>3</b>	<b>VL 804, VL 907, HS 507</b>
<b>Total (Entries + checks)</b>	<b>8 (5+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Six
Plot size	: <b>Gross:</b> 4m x 1.38m (6 rows); <b>Net</b> : 3m x 0.92m (4 rows)
Fertilizer dose (kg/ha)	: <b>IR-</b> 120:60:40(N:P:K); <b>RF-</b> 60:30:20(N:P:K)
Time of sowing	: <b>RF-</b> Oct, 15 – 31; <b>IR-</b> Nov, 1-15
Seed rate (kg/ha)	: 100
Seed requirement	: 12 kg per entry (including AVT-Rainfed)

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Northern Hills Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-RF-ES-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Himachal Pradesh	3	Shimla, Malan, Bajaura
Uttarakhand	2	Hawalbagh, Ranichauri
Jammu & Kashmir	1	Khudwani
West Bengal	1	Kalimpong
Sikkim	1	Gangtok
<b>Total</b>	<b>8</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, RS, Shimla	4	HS 541, HS 542, HS 556, HS 557
CSKHPKV, Palampur	3	HPW 360, HPW 376, HPW 377
VPKAS, Almora	2	VL 971, VL 972
GBPUA&T, Pantnagar	1	UP 2851
<b>Checks</b>	<b>3</b>	<b>HS 277, VL 829, HPW 251</b>
<b>Total (Entries + checks)</b>	<b>13 (10+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 3m x 1.38m (6 rows); <b>Net</b> : 2.5m x 0.92m (4 rows)
Fertilizer dose (kg/ha)	: 60:30:20 (N:P:K)
Time of sowing	: Oct, 1-10
Seed rate (kg/ha)	: 100
Seed requirement	: 5 kg per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Northern Hills Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-RI-LS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Himachal Pradesh	5	Shimla, Malan, Bajaura, Dhaulakuan, Sundernagar
Uttarakhand	2	Hawalbagh, Majhera
<b>Total</b>	<b>7</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, RS, Shimla	3	HS 559, HS 560, HS 561
CSKHPKV, Palampur	3	HPW 385, HPW 386, HPW 387
VPKAS, Almora	3	VL 973, VL 974, VL 975
GBPUA&T, Pantnagar	1	UP 2852
<b>Checks</b>	<b>3</b>	<b>HS 295, HS 490, VL 892</b>
<b>Total (Entries + checks)</b>	<b>13 (10+3)</b>	

**Experimental details**

Design	:	R.B.D.
Replications	:	Six
Plot size	:	<b>Gross:</b> 4m x 1.08m (6 rows); <b>Net</b> : 3m x 0.72m (4 rows)
Fertilizer dose (kg/ha)	:	90:60:40 (N:P:K)
Time of sowing	:	Dec, 1-15
Seed rate (kg/ha)	:	125
Seed requirement	:	7 kg. per entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Northern Hills Zone**  
**Advance Varietal Trial, Summer 2012**  
**AVT-VHA-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Himachal Pradesh	2	Dalang Maidan, Kukumseri
Jammu & Kashmir	2	Kargil, Leh
<b>Total</b>	<b>4</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, RS, Shimla	1	HS 502
CSKHPKV, Malan	2	HPW 314, HPW 318
VPKAS, Almora	1	VL 948
DWR, Karnal (Barley)	2	DWR 63*, DWR 92
<b>Checks</b>	<b>3</b>	<b>HS 375, Sonalika, BHS 352 (Barley)</b>
<b>Total (Entries + checks)</b>	<b>9 (6+3)</b>	

**Experimental details**

Design	:	R.B.D.
Replications	:	Six
Plot size	:	<b>Gross:</b> 3m x 1.38m (6 rows); <b>Net</b> : 3m x 0.92m (4 rows)
Fertilizer dose (kg/ha)	:	60:30:20 (N:P:K)
Time of sowing	:	May 2011
Seed rate (kg/ha)	:	100
Seed requirement	:	4 kg. per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*



**Northern Hills Zone**  
**Initial Varietal Trial, 2011-12**  
**IVT-IR-TS-TAS & IVT-RF-TS-TAS**

**Trial conducting centres**

State	Centres	Production condition		
		IR & RF	IR only	RF only
Himachal Pradesh	4	Dhaulakuan, Shimla, Malan	Bajaura	-
Uttarakhand	2	Hawalbagh	-	Ranichauri
Jammu & Kashmir	1	Khudwani	-	-
West Bengal	1	-	-	Kalimpong
<b>Total</b>	<b>RF : 7 &amp; IR: 6</b>			

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, RS, Shimla	7	HS 546, HS 547, HS 548, HS 549, HS 550, HS 551, HS 552
CSKHPKV, Palampur	7	HPW 378, HPW 379, HPW 380, HPW 381, HPW 382, HPW 383, HPW 384
VPKAS, Almora	6	VL 965, VL 966, VL 967, VL 968, VL 969, VL 970
GBPUA&T, Pantnagar	2	UP 2849, UP 2850
<b>Checks</b>	<b>2</b>	<b>VL 804, HS 507</b>
<b>Total (Entries + checks)</b>	<b>24 (22+2)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 4m x 1.38m (6 rows); <b>Net</b> : 3m x 0.92m (4 rows)
Fertilizer dose (kg/ha)	: <b>IR-</b> 120:60:40 (N:P:K); <b>RF-</b> 60:30:20 (N:P:K)
Time of sowing	: <b>IR-</b> Nov, 1-15 ; <b>RF-</b> Oct, 15 - 31
Seed rate (kg/ha)	: 100
Seed requirement	: 6 kg. per entry (including IVT- Irrigated)

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**North Western Plains Zone  
Advance Varietal Trial, 2011-12  
AVT-IR-TS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Punjab	5	Ludhiana, Gurdaspur, Bathinda, Kapurthala, Rauni
Haryana	7	Hisar, DWR-Karnal, Kaul, Uchani, Bawal, Faridabad, Shikopur
Uttar Pradesh	6	Modipuram, Nagina, Bulandshahr, Ujhani, Hardoi, Bareilly
Rajasthan	4	Durgapura, Sriganganagar, Tabiji, Alwar
Uttarakhand	2	Pantnagar, Kashipur
Himachal Pradesh	1	Dhaulakuan
Jammu & Kashmir	1	Chatha
Delhi	1	Delhi
<b>Total</b>	<b>27</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	4	HD 3077, HD 3080, HD 3081 <sup>Q</sup> , HD 3086
PAU, Ludhiana	3	PBW 662, PBW 665, TL 2978
CCSHAU, Hisar	2	WH 1105*, WH 1120
DWR, Karnal	1	DBW 88
<b>Checks</b>	<b>3</b>	<b>PBW 343, DBW 17, DPW 621-50</b>
<b>Total (Entries + checks)</b>	<b>13 (10+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 150:60:40 (N:P:K)
Time of sowing	: Nov, 10-20
Seed rate (kg/ha)	: 100
Seed requirement	: 30 kg per entry

\* Final year entry; Q = Entry good in quality attributes

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**North Western Plains Zone  
Advance Varietal Trial, 2011-12  
AVT-IR-TS-TDM**

**Trial conducting centres**

State	Centres	Name of the centres
Punjab	4	Ludhiana, Gurdaspur, Kapurthala, Rauni
Haryana	4	Hisar, DWR-Karnal, Kaul, Uchani
Uttar Pradesh	2	Modipuram, Bulandshahr
Rajasthan	1	Durgapura
Uttarakhand	1	Pantnagar
Jammu & Kashmir	1	Chatha
Delhi	1	Delhi
<b>Total</b>	<b>14</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	4	HD 4725, HI 8724, HI 8727, HI 8728
CCSHAU, Hisar	2	WHD 948*, WHD 950
ARI, Pune	1	MACS 3828*
MPUAT, Kota	1	RKD 219
PDKV, Akola	1	AKDW 4749
<b>Checks</b>	<b>3</b>	<b>PDW 291, PDW 314, DBW 17</b>
<b>Total (Entries + checks)</b>	<b>12 (9+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 150:60:40 (N:P:K)
Time of sowing	: Nov, 5-15
Seed rate (kg/ha)	: 100
Seed requirement	: 18 kg. per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**North Western Plains Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-IR-LS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Punjab	4	Ludhiana, Gurdaspur, Bathinda, Kapurthala
Haryana	5	Hisar, DWR-Karnal, Kaul, Uchani, Rohtak
Uttar Pradesh	6	Modipuram, Nagina, Bulandshahr, Ujhani, Hardoi, Bareilly
Rajasthan	3	Durgapura, Sriganganagar, Tabiji
Uttarakhand	2	Pantnagar, Kashipur
Jammu & Kashmir	1	Chatha
Delhi	1	Delhi
<b>Total</b>	<b>22</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	3	HD 3059*, HD 3065*, HD 3091
PAU, Ludhiana	2	PBW 658*, PBW 670
CCSHAU, Hisar	2	WH 1100*, WH 1124
DWR, Karnal	2	DBW 71*, DBW 90
<b>Checks</b>	<b>3</b>	<b>PBW 373, PBW 590, WH 1021</b>
<b>Total (Entries + checks)</b>	<b>12 (9+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.16m (12 rows); <b>Net :</b> 6m x 1.80m (10 middle rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N:P:K)
Time of sowing	: Dec, 15-25
Seed rate (kg/ha)	: 120
Seed requirement	: 25 kg per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**North Western Plains Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-RF-TS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Punjab	4	Ludhiana, Gurdaspur, Kapurthala, Balachaur
Haryana	2	Hisar, Ambala
Uttar Pradesh	1	Modipuram
Rajasthan	1	Diggi
Uttarakhand	1	Pantnagar
Himachal Pradesh	1	Dhaulakuan
Jammu & Kashmir	1	Chatha
Delhi	1	Delhi
<b>Total</b>	<b>12</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
CCSHAU, Hisar	4	WH 1097*, WH 1098*, WH 1126, WH 1127
PAU, Ludhiana	3	PBW 660*, PBW 674, PBW 675
IARI, New Delhi	1	HD 3098
DWR, Karnal	1	DBW 74*
GBPUA&T, Pantnagar	1	UP 2828
CSAUA&T, Kanpur	1	K 1016
MPKV, Niphad	1	NIAW 1846
<b>Checks</b>	<b>4</b>	<b>C306, PBW175, WH1080, PBW 644 (I)</b>
<b>Total (Entries + checks)</b>	<b>16 (12+4)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 60:30:20 (N:P:K)
Time of sowing	: Oct, 20-31
Seed rate (kg/ha)	: 100
Seed requirement	: 15 kg per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**North Western Plains Zone  
Advance Varietal Trial, 2011-12  
AVT-RI-TS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Punjab	2	Ludhiana, Bathinda
Haryana	2	Hisar, Uchani
Rajasthan	1	Diggi
Uttarakhand	1	Pantnagar
Delhi	1	Delhi
<b>Total</b>	<b>7</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	2	HD 3070*, HI 1579*
PAU, Ludhiana	1	PBW 660*
CCSHAU, Hisar	1	WH 1097*
DWR, Karnal	1	DBW 74*
MPKV, Niphad	1	NIAW 1594*
<b>Checks</b>	<b>4</b>	<b>C 306, PBW 175, WH 1080, HD 3043 (I)</b>
<b>Total (Entries + checks)</b>	<b>10 (6+4)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: Oct, 25 - Nov, 5
Seed rate (kg/ha)	: 100
Seed requirement	: 10 kg per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**North Eastern Plains Zone  
Advance Varietal Trial, 2011-12  
AVT-IR-TS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Uttar Pradesh	7	Kanpur, Faizabad, Varanasi, Barabanki, Araul, Deegh, Saini
Bihar	3	IARI-Pusa, Sabour, Patna (ICAR Complex)
Assam	1	Shillongani
West Bengal	4	Coochbehar, Kalyani, Burdhan, Malda
Jharkhand	1	Ranchi
<b>Total</b>	<b>16</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
SK RAU, Durgapura	4	Raj 4229*, Raj 4240, Raj 4245, Raj 4246 <sup>Q</sup>
CSAUA&T, Kanpur	2	K 0906*, K 1006
IARI, New Delhi	4	HD 3076, HD 3078, HD 3079, HD 3086
NDU&AT, Faizabad	2	NW 5038, NW 5054
CCSHAU, Hisar	1	WH 1120
GBPUA&T, Pantnagar	1	UP 2822
BHU, Varanasi	1	HUW 652
PAU, Ludhiana	1	PBW 661
<b>Checks</b>	<b>3</b>	<b>K 0307, HD 2733, DBW 39</b>
<b>Total (Entries + checks)</b>	<b>19 (16+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 150:60:40 (N:P:K)
Time of sowing	: Nov, 15-25
Seed rate (kg/ha)	: 100
Seed requirement	: 20 kg. per entry

\* Final year entry; Q = Entry good in quality attributes

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**North Eastern Plains Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-IR-LS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Uttar Pradesh	8	Kanpur, Faizabad, Varanasi, Barabanki, Mau, Saini, Deegh, Araul
Bihar	3	Pusa, Sabour, Patna (ICAR Complex)
West Bengal	4	Coochbehar, Kalyani, Mohitnagar, Burdwan
Assam	1	Shillongani
Jharkhand	1	Ranchi
<b>Total</b>	<b>17</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
CSAUA&T, Kanpur	1	K 0911*
IGKVV, Bilaspur	1	CG 1006
SDAU, Vijapur	1	GW 433
DWR, Karnal	1	DBW 90
JNKVV, Jabalpur	1	MP 3353
SK RAU, Durgapura	1	Raj 4250
BAU, Sabour	1	RW 3705
CCSHAU, Hisar	1	WH 1123
JAU, Junagarh	1	GW 431
<b>Checks</b>	<b>3</b>	<b>DBW 14, NW 2036, HI 1563</b>
<b>Total (Entries + checks)</b>	<b>12 (9+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.16m (12 rows); <b>Net :</b> 6m x 1.80m (10 middle rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N:P:K)
Time of sowing	: Dec, 15-25
Seed rate (kg/ha)	: 120
Seed requirement	: 22 kg per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*



**North Eastern Plains Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-RF-TS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Uttar Pradesh	5	Varanasi, Faizabad, Kanpur, Deegh, Saini
Bihar	2	IARI-Pusa, Sabour
West Bengal	2	Coochbehar, Kalyani
Jharkhand	1	Ranchi
Assam	1	Shillongani
<b>Total</b>	<b>11</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	1	HD 3070*
CSAUA&T, Kanpur	1	K 1016
DWR, Karnal	1	DBW 93
CCSHAU, Hisar	1	WH 1127
<b>Checks</b>	<b>3</b>	<b>C 306, K 8027, HD 2888</b>
<b>Total (Entries + checks)</b>	<b>7 (4+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 60:30:20 (N:P:K)
Time of sowing	: Oct, 25 - Nov, 10
Seed rate (kg/ha)	: 100
Seed requirement	: 15 kg per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Central Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-IR-TS-TAD**

**Trial conducting centres**

State	Centres	Name of the centres
Gujarat	7	Anand, Amreli, Bardoli, Junagarh, Vijapur, SK Nagar, Sanosara
Madhya Pradesh	7	Gwalior, Indore, Powarkheda, Rewa, Bhopal, Jabalpur, Sagar
Uttar Pradesh	1	Mauranipur
Chhattisgarh	2	Bilaspur, Raipur
Rajasthan	3	Banswara, Kota, Udaipur
<b>Total</b>	<b>20</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI-RS, Indore	6	HI 8713*(d), HI 8724(d), HI 8725(d), HI 8726(d), HI 8727(d), HI 8728(d)
SDAU, Vijapur	3	GW 1276(d), GW 1277(d), GW 428 <sup>Q</sup>
ARI, Pune	2	MACS 3828*(d), MACS 3817 (d)
JNKVV, Powarkheda	2	MP 1259, MPO 1262(d)
GBPUA&T, Pantnagar	1	UPD 93(d)
PAU, Ludhiana	1	PDW 327(d)
<b>Checks</b>	<b>4</b>	<b>GW 322, HI 1544, HI 8498 (d), MPO 1215 (d)</b>
<b>Total (Entries + checks)</b>	<b>19 (15+4)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N:P:K)
Time of sowing	: Nov, 10-20
Seed rate (kg/ha)	: 100
Seed requirement	: 24 kg. per entry

\* Final year entry, Q = Entry good in quality attributes

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Central Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-IR-LS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Gujarat	5	Anand, Bardoli, Junagarh, Vijapur, S.K. Nagar
Madhya Pradesh	5	Indore, Jabalpur, Gwalior, Powarkheda, Rewa
Chattisgarh	3	Bilaspur, Jagdalpur, Ambikapur
Rajasthan	3	Banswara, Udaipur, Kota
<b>Total</b>	<b>16</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
SKRAU, Durgapura	2	RAJ 4238*, RAJ 4250
JNKVV, Jabalpur	1	MP 3336*
IARI, New Delhi	1	HD 3095
GBPUA&T, Pantnagar	1	UP 2824
SDAU, Vijapur	1	GW 433
DWR, Karnal	1	DBW 90
<b>Checks</b>	<b>3</b>	<b>MP 4010, HD 2864, HD 2932</b>
<b>Total (Entries + checks)</b>	<b>10 (7+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.16m (12 rows); <b>Net</b> : 6m x 1.80m (10 middle rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: Dec, 5-15
Seed rate (kg/ha)	: 125
Seed requirement	: 18 kg. per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Central Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-RF-TS-TAD & AVT-RI-TS-TAD**

**Trial conducting centres**

State	Centres	Production condition		
		RF & RI	RF only	RI only
Gujarat	3	Arnej, Dhandhuka,	Tancha	-
Madhya Pradesh	5	Indore, Jabalpur, Sagar	Damoh	Bhopal
Rajasthan	4	Kota, Pratapgarh	-	Banswara, Bhilwara
Chhattisgarh	1	-	-	Bilaspur
<b>Total</b>	<b>RF : 9 &amp; RI: 11</b>			

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
JNKVV, Powarkheda	2	MP 1255(d), MP 1256(d)
IARI-RS, Indore	2	HI 8730(d), HI 8731(d)
IARI-RS, Pusa	1	HP 1940
SDAU, Vijapur	1	GW 1280(d)
UAS Dharwad	1	UAS 442(d)
<b>Checks</b>	<b>3</b>	<b>A-9-30-1, HI 1500, HI 8627 (d)</b>
<b>Total (Entries + checks)</b>	<b>10 (7+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: <b>RF-</b> 60:30:20 (N:P:K); <b>RI-</b> 90:60:40 (N:P:K)
Time of sowing	: <b>RF-</b> Oct, 15-31; <b>RI-</b> Oct, 25 – Nov, 10
Seed rate (kg/ha)	: 100
Seed requirement	: 30 kg. per entry (including AVT-RI)

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Peninsular Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-IR-TS-TAD**

**Trial conducting centres**

State	Centres	Name of the centres
Maharashtra	10	Niphad, Pravaranagar, Pune, Karad, K. Digraj, Akola, Parbhani, Nasik, Savalvihir, Amaravati
Karnataka	5	Dharwad, Ugar, Arbhavi, Kalloli, Mudhol
<b>Total</b>	<b>15</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
CCSHAU, Hisar	1	WHD 948*(d)
IARI-RS, Indore	4	HI 1584, HI 8724 (d), HI 8725 (d), HI 8728 (d)
UAS, Dharwad	3	UAS 334, UAS 336, UAS 439 (d)
ARI, Pune	2	MACS 6478, MACS 3817 (d)
MPKV, Niphad	1	NIAW 1773 <sup>Q</sup>
IARI, Pusa	1	HP 1939
PDKV, Akola	1	AKAW 4731
PAU, Ludhiana,	1	PDW 329 (d)
<b>Checks</b>	<b>4</b>	<b>GW 322, MACS 6222, NIDW 295(d), UAS 428 (I)</b>
<b>Total (Entries + checks)</b>	<b>18 (14+4)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N:P:K)
Time of sowing	: Nov, 5-15
Seed rate (kg/ha)	: 100
Seed requirement	: 18 kg. per entry

\* Final year entry, Q = Entry good in quality attributes

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Peninsular Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-IR-LS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Maharashtra	7	Niphad, Pravaranagar, Pune, Karad, Akola, Savalvihir, Amaravati
Karnataka	3	Dharwad, Ugar, Kalloli
<b>Total</b>	<b>10</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	3	HD 3090, HD 3093, HD 3096
GBPUA&T, Pantnagar	1	UP 2825
MPKV, Niphad	1	NIAW 1689
SDAU, Vijapur	1	GW 432
<b>Checks</b>	<b>3</b>	<b>NIAW 34, RAJ 4083, HD 2932</b>
<b>Total (Entries + checks)</b>	<b>9 (6+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.16m (12 rows); <b>Net</b> : 6m x 1.80m (10 middle rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: Dec, 1-10
Seed rate (kg/ha)	: 125
Seed requirement	: 15 kg per entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Peninsular Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-RF-TS-TAD & AVT-RI-TS-TAD**

**Trial conducting centres**

State	Centres	Production condition		
		RF & RI	RF only	RI only
Maharashtra	5	Niphad, Pune	Parbhani, Washim	Akola
Karnataka	5	Dharwad	Annigeri, Bijapur, Bagalkot	Bailhongal
<b>Total</b>	<b>RF : 8 &amp; RI: 5</b>			

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
Karnal, DWR	1	DBW 93
Vijapur, SDAU	1	GW 1280 (d)
<b>Checks</b>	<b>3</b>	<b>NI 5439, NIAW 1415, AKDW 2997-16(d)</b>
<b>Total (Entries + checks)</b>	<b>5 (2+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: <b>RF-</b> 60:30:20 (N:P:K); <b>RI-</b> 90:60:40 (N:P:K)
Time of sowing	: <b>RF-</b> Oct, 15-31; <b>RI-</b> Nov, 1-10
Seed rate (kg/ha)	: 100
Seed requirement	: 20 kg per entry (including AVT-RI)

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Southern Hills Zone**  
**Advance Varietal Trial, 2011-12**  
**AVT-RI-TS/LS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Tamil Nadu	4	Wellington (TS), Wellington (LS), Kotagiri, Paiyur
Karnataka	1	Mandya
<b>Total</b>	<b>5</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	1	HD 3075
IARI-RS, Wellington	2	HW 5216*, HW 5224
<b>Checks</b>	<b>2</b>	<b>HW 2044, CoW (W) 1</b>
<b>Total (Entries + checks)</b>	<b>5 (3+2)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Six
Plot size	: <b>Gross:</b> 6m x 1.38m (6 rows); <b>Net</b> : 6m x 0.92m (4 middle rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: <b>TS</b> : Nov, 15-Dec 15; <b>LS</b> : Dec 25 - Jan 15
Seed rate (kg/ha)	: 100
Seed requirement	: 4 kg per entry

\*Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*



**Southern Hills Zone**  
**Initial Varietal Trial, 2011-12**  
**IVT-RI-TS/LS-TAS**

**Trial conducting centres**

State	Centres	Name of the centres
Tamil Nadu	3	Wellington (TS), Wellington (LS), Paiyur
Karnataka	1	Mandya
<b>Total</b>	<b>4</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
IARI-RS, Wellington	9	HW 4013, HW 4214, HW 4205, HW 5237, HW 5235, HW 5236, HW 4042, HW 1900, HW 4213
IARI-RS, Tutikundi	3	HS 553, HS 554, HS 555
UAS, Dharwad	2	UAS 349, UAS 350
ARI, Pune	2	MACS 6530, MACS 6412
MPKV, Niphad	1	NIAW 1895
<b>Checks</b>	<b>2</b>	<b>HW 2044, CoW (W) 1</b>
<b>Total (Entries + checks)</b>	<b>19 (17+2)</b>	

**Experimental details**

Design	:	R.B.D.
Replications	:	Four
Plot size	:	<b>Gross:</b> 6m x 1.38m (6 rows); <b>Net</b> : 6m x 0.92m (4 middle rows)
Fertilizer dose (kg/ha)	:	90:60:40 (N:P:K)
Time of sowing	:	<b>TS</b> : Nov, 15-Dec 15; <b>LS</b> : Dec 25- Jan 15
Seed rate (kg/ha)	:	100
Seed requirement	:	3 kg per entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Special Trial (Triticale), 2011-12**  
**SPL-TCL-RF-TS-NHZ**

**Trial conducting centres**

State	Centres	Name of the centres
Himachal Pradesh	3	Bajaura, Malan, Dhaulakuan
Uttarakhand	1	Ranichauri
<b>Total</b>	<b>4</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
PAU, Ludhiana	4	TL 2987, TL 2988, TL 2989, TL 2990
<b>Checks</b>	<b>3</b>	<b>HS 507, TL 2942, TL 2969 (I)</b>
<b>Total (Entries + checks)</b>	<b>7(4+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 4m x 1.38m (6 rows); <b>Net</b> : 4m x 0.92m (4 middle rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: Oct, 15-31
Seed rate (kg/ha)	: 100
Seed requirement	: 3 kg per entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Special Trial (Dicoccum), 2011-12**  
**SPL-DIC-IR-TS-All Zones**

**Trial conducting centres**

State	Centres	Name of the centres
Maharashtra	3	Pune, Karad, Kolhapur
Karnataka	5	Dharwad, Arbhavi, Ugar, Kalloli, Mudhol
Gujarat	2	Junagarh, Vijapur
Tamil Nadu	2	Wellington, Paiyur
<b>Total</b>	<b>12</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
ARI, Pune	3	MACS 5012, MACS 5008, MACS 5022
UAS, Dharwad	1	DDK 1042
IARI, Wellington	1	HW 1098*
<b>Checks</b>	<b>3</b>	<b>DDK 1009, MACS 2971, MACS 2496</b>
<b>Total (Entries + checks)</b>	<b>8(5+3)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N:P:K)
Time of sowing	: Nov, 1-15
Seed rate (kg/ha)	: 100
Seed requirement	: 1.5 kg per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

**Special Trial (Salinity/ Alkalinity), 2011-12**  
**SPL-AST-IR-TS-TAS-All Zones**

**Trial conducting centres**

State	Centres	Name of the centres
UP	4	Dalipnagar, Kanpur, Faizabad, Lucknow
Rajasthan	1	Vanasthali (Durgapura)
Haryana	3	Hisar, Bawal, CSSRI-Karnal
Gujarat	1	Bharuch
<b>Total</b>	<b>9</b>	

**Details of test entries**

Contributing Centres	No. of entries	Name of entry
CSSRI, Karnal	4	KRL 283*, KRL 327, KRL 330, KRL 331
DWR, Karnal	1	DBW 111
NDUA&T, Faizabad	1	NW 5055
CCSHAU, Hisar	1	WH 1112
SKRAU, Durgapura	1	Raj 4270
CSAUA&T, Kanpur	1	KLP 402
<b>Checks</b>	<b>2</b>	<b>Kharchia 65, KRL 210</b>
<b>Total (Entries + checks)</b>	<b>11 (9+2)</b>	

**Experimental details**

Design	: R.B.D.
Replications	: Four
Plot size	: <b>Gross:</b> 6m x 2.76m (12 rows); <b>Net</b> : 6m x 2.30m (10 middle rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N:P:K) + 10 kg ZnSO <sub>4</sub>
Time of sowing	: Nov, 5-20
Seed rate (kg/ha)	: 100
Seed requirement	: 15 kg per entry

\* Final year entry

*Note: Change in test sites, date of sowing, trial entries etc. will be invalid if not approved by the Project Director*

## ALLOCATION OF BREEDER SEED PRODUCTION DURING 2011-12

The Directorate received an indent of 28959.55q breeder seed of 167 wheat and 1841.60q breeder seed of 33 barley varieties from the Department of Agriculture and Cooperation (DAC), Ministry of Agriculture, Government of India for the production during 2011-12 to meet the breeder seed demand from fifteen states for wheat varieties and from six states for barley varieties and other public corporations and private companies for the season *Rabi* 2012-2013.

A tentative allocation of this indent is made on the basis of following guidelines.

1. The allocation of breeder seed production for *Rabi* 2011-12 is made on priority basis to the coordinating centres where effective nucleus seed production programmes are existing.
2. The quantity of breeder seed to be produced is allocated in consideration with the quantity of nucleus seed produced by the centre as per their BNS-IV (Nucleus Seed Production Report).
3. Preference of allotment is given to the parent institution of the variety subjected to the fulfilment of first two requirements.
4. With a view to minimize the cost of transportation, the indent allocation is preferred to the institute relatively nearer to the indenting agency.

The tentative centre wise allocation of wheat and barley varieties is given as follows:

Variety	Year of release	Breeder seed (q)		Indenter
		DAC Indent	Allocation	
<b>ARI, Pune</b>				
HD 2189	1980	291.00	100.00	Mah(100)
MACS 2496	1991	115.00	115.00	Mah(90),SAI(25)
MACS 3125	2003	48.00	48.00	Mah(48)
MACS 6222	2010	14.00	14.00	NSC(2),Mah(5),Kar(7)
MACS 2971	2005	10.00	10.00	Mah(5),Kar(5)
MACS 6145	2005	2.00	2.00	NSC(2)
			<b>370.00</b>	
<b>BAU, Sabour, Bihar</b>				
HD 2643 (Ganga)	1997	340.00	150.00	UP(150)
HD 2733 (VSM)	2001	1686.40	150.00	SAI(150)
HD 2824 (Poorva)	2004	141.00	50.00	Bih(50)
K 0307 (Shatabdi)	2007	246.00	100.00	Bih(100)
NW 2036	2003	49.00	35.00	Bih(30),SFCI(5)
PBW 343	1996	1086.70	100.00	UP(100)
WR 544 (Pusa Gold)	2005	142.20	50.00	Bih(50)
			<b>635.00</b>	
<b>BHU, Varanasi</b>				
HUW 234	1986	103.80	33.80	NSC(25),SAI(8.8)
HUW 468	1999	127.40	27.40	SFCI(2),Jhar(20),Raj(.4), WB(5)
HUW 510	2001	215.80	15.80	SFCI(5),MP(5),SAI(.8)
			77.00	
<b>CCS HAU, Hisar</b>				
C 306	1969	52.60	26.60	Har(1.6),SAI(25)
Raj 3765	1996	921.40	41.20	NSC(25),SFCI(5),Kribhco(8.4),Har(2.8)
WH 1021	2008	93.40	93.40	NSC(2)Har(2.6),Raj(70),SAI(18.8)
WH 1025	2010	35.80	35.80	NSC(3),SFCI(2),Ch(30),Har(.8)
WH 147	1978	86.40	26.40	NSC(2),Har(4.4),UP(20)

Variety	Year of release	Breeder seed (q)		Indenter
		DAC Indent	Allocation	
WH 283	1985	30.40	30.40	SAI(30.4)
WH 542	1992	119.20	27.60	Har(2.6),HP(25)
WH 416	1990	4.00	<b>4.00</b>	SAI(4)
WH 711	2002	890.00	790.00	NSC(40),SFCI(50),Kribhco(18.2),Har(96),Raj(50),UP(200),SAI(335.8)
WH 1080	2011	5.00	5.00	Kribhco(5)
WHD 943	2011	24.00	24.00	Har(2),Kribhco(5),Pb(2),Raj(10),UP(5)
			<b>1104.40</b>	
BH 393	2002	43.10	43.10	SFCI(2),Har(4.8),SAI(36.3)
BH 902	2010	60.00	60.00	SFCI(2),AP(5),JK(1),Pb(5),Har(5),Raj(30),UP(5),SAI(7)
			<b>103.10</b>	
<b>CSAUAT, Kanpur</b>				
CBW 38	2009	297.20	100.00	UP(100)
DBW 14	2002	22.00	22.00	UP(20),WB(1),SAI(1)
HD 2733 (VSM)	2001	1686.40	850.00	UP(850)
HUW 234	1986	103.80	70.00	Bih(50),UP(20)
K 0307 (Shatabdi)	2007	246.00	96.00	NSC(10),SFCI(10),Jhar(20),UP(50),WB(4),SAI(2)
K 7903 (Halana)	2001	67.00	62.00	NSC(10),UP(30),SAI(22)
K 8434 (Prasad)	2001	120.00	120.00	UP(120)
K 9107 (Deva)	1996	39.00	39.00	WB(4),Jhar(35)
K 9162 (Gangotri)	2001	10.00	10.00	UP(10)
K 9351 (Mandakni)	2006	5.00	5.00	NSC(5)
K 9423 (Unnat Halna)	2005	416.00	416.00	NSC(8),SAI(8),UP(400)
K 9465 (Gomati)	1998	100.00	100.00	UP(100),
K 9533 (Naina)	2006	131.20	131.20	SAI(1.2),UP(130)
NW 1014	1998	12.00	10.00	UP(10)
PBW 343	1996	1086.70	100.00	UP(100)
PBW 550	2008	1931.05	650.00	UP(650)
PBW 502	2004	1274.90	150.00	UP(150)
Raj 3077	1989	354.00	34.00	NSC(20),SFCI(2),Kribhco(2),UP(10)
Raj 4120	2009	351.20	125.00	Bih(100),Jhar(25)
UP 2382	1999	48.20	28.20	NSC(5),SFCI(20),Kribhco(3.2)
			<b>3118.40</b>	
K 409 (Priti)	2001	1.00	1.00	MP(1)
K 508 (Pragati)	1998	40.00	40.00	UP(40)
K 560 (Haritima)	1998	50.00	50.00	UP(50)
K 551 (Ritambhra)	1998	55.00	55.00	SFCI(10),UP(45)
			<b>146.00</b>	
<b>CSSRI, Karnal</b>				
KRL 19	2000	22.00	22.00	SFCI(2),Raj(10),UP(10)
KRL 1-4	1990	10.00	10.00	UP(10)
			<b>32.00</b>	
<b>DSR, Mau</b>				
HD 2733 (VSM)	2001	1686.40	100.00	UP(100)
<b>DWR, Karnal</b>				
CBW 38	2009	297.20	5.00	SFCI(5)
DPW 621-50(PBW 621/DBW 50)	2011	5.00	5.00	Kribhco(5)
DBW 39	2010	51.60	51.60	NSC(2),Bih(5),Jhar(5),SFCI(4),UP(20),SAI(15.6)
DBW 17	2007	1586.00	200.00	Har(100),UP(100)
			<b>261.60</b>	
DWRUB 52	2006	15.50	15.50	SFCI(2),Pb(5),Har(5),SAI(3.5)
DWR 73 (Barley)	2011	44.00	44.00	NSC(2),SFCI(2),Kribhco(10),Pb(5),Raj(10),UP(10)
			<b>59.50</b>	
<b>GBPUAT, Pantnagar</b>				
DBW 16	2006	43.40	33.40	Kribhco(12),SAI(21.4)

Variety	Year of release	Breeder seed (q)		Indenter
		DAC Indent	Allocation	
DBW 17	2007	1586.00	500.00	UP(500)
PBW 343	1996	1086.70	40.00	NSC(40)
PBW 373	1997	683.10	280.50	UP(50),Ultra(50),SAI(180.5)
PBW 502	2004	1274.90	236.00	UP(150),Kribhco(66),Ultra(20)
PBW 550	2008	1931.05	230.00	UP(200),Ultra(30)
Raj 3765	1996	921.40	90.00	HP(70),UP(20)
Sonalika	1969	39.80	39.80	NSC(20),SFCl(2),WB(4),Pvt(13.8)
UP 2338	1995	98.20	40.00	HP(10),UP(30)
UP 2382	1999	48.20	20.00	Ultra(15),SAI(5)
UP 2425	1999	24.00	22.00	UP(20),SAI(2)
UP 2526	2007	80.00	80.00	NSC(10),SFCl(50),Ultra(20)
UP 2554	2007	22.00	22.00	NSC(5),SFCl(2),Ultra(15)
UP 2565	2006	27.00	27.00	NSC(10),SFCl(2),Ultra(15)
UP 2572	2007	64.80	64.80	NSC(10),SAI(4.80),Ultra(50)
UP 2628	2010	10.20	10.20	NSC(5),SFCl(5),SAI(.2)
VL 907	2010	36.00	16.00	NSC(2),SFCl(2),HP(10),JK(2)
VL 892	2008	57.00	7.00	NSC(2),SFCl(5)
CBW 38	2009	297.20	92.20	NSC(5),Jhar(25),SAI(62.2)
HD 2851 (Pusa Vishesh)	2005	252.20	20.00	NSC(20)
			<b>1870.90</b>	
PRB 502 (Barley)	2010	5.00	5.00	Ultra(5)
<b>HPKV, Palampur</b>				
DBW 17	2007	1586.00	130.00	HP(130)
HPW 42 (Aradhana)	1992	2.00	2.00	HP(2)
HPW 89 (Surbhi)	1998	5.00	5.00	HP(5)
HPW 147 (Palam)	2004	5.00	5.00	HP(5)
HPW 155 (Onkar)	2006	5.00	5.00	HP(5)
HPW 184 (Chandrika)	2005	10.00	10.00	HP(10)
HPW 251	2008	10.00	10.00	NSC(5),HP(5)
HS 295	1992	27.00	27.00	JK(2),Ultra(15),HP(10)
HS 240	1989	10.00	5.00	HP(5)
PBW 373	1997	683.10	35.00	HP(35)
PBW 550	2008	1931.05	58.00	HP(58)
VL 829	2003	25.00	5.00	HP(5)
			<b>297.00</b>	
HBL 276 (Harit Barley)	1999	0.80	0.80	HP(.8)
<b>IARI, Indore</b>				
DL 788-2 (Vidisha)	1997	21.00	21.00	NSC(5)MP(16)
HD 2932 (Pusa Wheat 111)	2008	622.80	105.00	MP(100),Mah(5)
HI 1418	2000	328.00	203.00	MP(50),Mah(28),SAI(125)
HI 1479 (Swarna)	2003	310.00	200.00	MP(200)
HI 1500 (Amrita)	2003	102.00	102.00	NSC(2),MP(100)
HI 1531 (Harshita)	2006	143.00	143.00	Chh(60),MP(50),UP(20),SAI(13)
HI 1563 (Pusa Prachi)	2011	79.00	79.00	NSC(2),SFCl(2),Bih(25),Jhar(20),UP(30)
HI 1544 (Purna)	2008	228.00	228.00	NSC(5),SFCl(2),Chh(110),MP(100),SAI(11)
HI 8627 (Malav Kirti)	2007	20.00	20.00	MP(20)
HI 8498 (Malav Shakti)	1999	311.00	200.00	MP(200)
HD 4672 (Malav Ratna)	2000	5.00	5.00	NSC(5)
HI 8663 (Posan)	2008	19.00	19.00	Kribhco(4),Mah(15)
HW 2004 (Amar)	1997	252.00	100.00	MP(100)
			<b>1425.00</b>	
<b>IARI, Karnal</b>				
HD 2643 (Ganga)	1997	340.00	160.00	UP(160)
HD 2733 (VSM)	2001	1686.40	50.00	SAI(50)
HD 2851 (Pusa Vishesh)	2005	252.20	205.40	Mah(5),SAI(200.4)
HD 2894 (Pusa Wheat 109)	2008	259.60	234.60	Har(4.8),SAI(229.8)
HD 2932 (Pusa Wheat 111)	2008	622.80	122.80	SAI(122.8)

Variety	Year of release	Breeder seed (q)		Indenter
		DAC Indent	Allocation	
HS 240	1989	10.00	5.00	J&K(5)
HS 277	1992	5.00	5.00	HP(5)
HS 507 (Pusa Suketi)	2011	35.00	35.00	HP(15),Jhar(5),Uttra(15)
HS 490 (Pusa Baker)	2009	17.00	17.00	HP(5),JK(5),NSC(2),Uttra(5)
HS 365	1998	22.00	22.00	J&K(2),Uttra(20)
WR 544 (Pusa Gold)	2005	142.20	50.00	Bih(50)
			<b>906.80</b>	
<b>IARI, New Delhi</b>				
HD 2781 (Aditya)		5.00	5.00	Raj(5)
HD 2733 (VSM)	2001	1686.40	5.00	SFCI(5)
HD 2851 (Pusa Vishesh)	2005	252.20	26.80	Kribhco(8),Har(18.8)
HD 2428	1989	1.20	1.20	SAI(1.2)
HD 2894 (Pusa Wheat 109)	2008	259.60	25.00	SFCI(5),Chh(20),
HD 2932 (Pusa Wheat 111)	2008	622.80	25.00	NSC(5),SFCI(20),
HD 4713	2008	18.00	18.00	SFCI(5),SAI(13)
WR 544 (Pusa Gold)	2005	142.20	42.20	NSC(10),SFCI(2),Mah(10),SAI(20.2)
			<b>148.20</b>	
BH 380 (Pusa Losar Barley)	2010	2.00	2.00	HP(1),Uttra(1)
<b>IARI, Pusa</b>				
HD 2733 (VSM)	2001	1686.40	466.40	Bih(100),UP(200)SAI(166.4)
HD 2824 (Poorva)	2004	141.00	72.00	Bih(50),UP(20),WB(2)
HD 2888 (Pusa Wheat 107)	2006	33.00	33.00	NSC(5),SFCI(2),Kribhco(4),Jhark(20),WB(2)
HP 1633 (Sonali)	1992	7.00	7.00	WB(7)
HP 1731 (Raj Laxmi)	1995	6.00	6.00	WB(6)
HW 2045 (Kaushambi)	2002	46.00	46.00	Bih(30),JK(15),WB(1)
			<b>630.40</b>	
<b>IARI, Wellington</b>				
HD 2833 (Pusa Wheat 105)	2006	40.00	40.00	NSC(5),SFCI(5),Jhar(20),Mah(10)
<b>IGKVV, Raipur</b>				
CG 5016 (Ratan)	2009	25.00	25.00	Chh(25)
GW 273	1998	1095.00	100.00	MP(100)
			<b>125.00</b>	
<b>JNKVV, Jabalpur</b>				
GW 273	1998	1095.00	264.00	MP(1014)
GW 322	2002	1126.20	535.00	NSC(25),MP(500),Mah(10)
GW 366	2007	486.20	110.00	Chh(110)
HD 2864 (Urja)	2005	418.00	418.00	NSC(10),MP(400),SAI(8)
MP(JW) 3020	2005	279.00	279.00	MP(274),NSC(5)
MP(JW) 1142 (Snehil)	2007	284.00	284.00	NSC(4),MP(280)
JWS 17 (Swapnil)	1997	61.00	61.00	MP(61)
HDR 77	1990	0.80	0.80	SAI(.8)
MP(JW) 1202	2010	300.00	300.00	MP(300)
Lok 1	1982	847.00	100.00	MP(100)
MPO(JW) 1215	2010	383.10	383.10	NSC(5),SFCI(3),MP(250),Chatt(50),Raj(50),Guj(25),SAI(.1)
MP(JW) 1203	2009	283.00	283.00	Chh(50),MP(100),NSC(3),Raj(25),SFCI(5)
MP(JW) 4010	2003	101.00	51.00	NSC(5),MP(43),SAI(3)
MPO(JW) 1106 (Sudha)	2003	244.00	244.00	MP(244)
MP(JW) 3211	2010	303.00	303.00	NSC(3),MP(300)
MP(JW) 3173	2009	300.00	300.00	MP(300)
HD 2932 (Pusa Wheat 111)	2008	622.80	170.00	Chh(70),MP(100)
HW 2004 (Amar)	1997	252.00	52.00	MP(52)
			<b>4137.90</b>	
JB 58	2005	2.00	2.00	MP(2)
<b>Lok Bharti, Sanasora</b>				
Lok 1	1982	847.00	500.00	Mah(500)



Variety	Year of release	Breeder seed (q)		Indenter
		DAC Indent	Allocation	
<b>MPKV, Niphad</b>				
HD 2189	1980	291.00	110.00	NSC(10),Mah(100)
NIDW 15 (Panchwati)	2005	1.20	1.20	Mah(1.2)
NIDW 295 (Godavari)	2007	7.00	7.00	NSC(5),SFCI(2)
NIAW 301 (Trimbak)	2002	105.40	105.40	Mah(105.4)
NIAW 1415 (Netravati)	2011	25.00	25.00	Mah(5),Kar(20)
NIAW 917 (Tapovan)	2006	23.00	23.00	Mah(23)
NIDW 34		15.20	15.20	NSC(15.2)
			<b>286.80</b>	
<b>MAF, MPUA&amp;T, Kota</b>				
C 306	1969	52.60	26.00	NSC(5),MP(21)
GW 173	1994	100.20	79.00	NSC(5),Kribhco(4),MP(70)
GW 273	1998	1095.00	350.00	MP(350)
GW 322	2002	1126.20	66.20	Raj(46.2),SAI(20)
GW 496	1990	584.60	225.40	Mah(225.4)
HI 8498 (Malav Shakti)	1999	311.00	111.00	NSC(5),Mah(33),Raj(37),SAI(36)
HI 617 (Sujata)	1982	95.00	55.00	MP(50),SAI(5)
Lok 1	1982	847.00	170.00	NSC(60),Raj(100),UP(10)
PBW 343	1996	1086.70	70.30	Kribhco(12.3),Raj(58)
PBW 502	2004	1274.90	302.00	Raj(302)
Raj 1482	1983	326.20	205.20	SAI(205.2)
Raj 3077	1989	354.00	170.00	JK(20),Raj(150)
Raj 3765	1996	921.40	463.00	Raj(463)
Raj 3777	2006	220.00	45.00	Raj(5),UP(40)
Raj 4037	2004	1101.20	565.00	Kribhco(15),Bih(100),Raj(450)
Raj 4120	2009	351.20	26.20	NSC(10),SFCI(10),Kribhco(5),SAI(1.2)
UP 2338	1995	98.20	58.20	NSC(20),SAI(38.2)
WH 147	1978	86.40	60.00	MP(10),Mah(20),SAI(30)
			<b>3047.50</b>	
<b>NDUA&amp;T, Kumarganj, Faizabad</b>				
CBW 38	2009	297.20	<b>100.00</b>	Bihar(100)
DBW 17	2007	1586.00	50.00	UP(50)
HD 2824 (Poorva)	2004	141.00	19.00	NSC(10),SAI(9)
HD 2643 (Ganga)	1997	340.00	30.00	Bih(30)
HD 2329	1985	85.00	85.00	NSC(15),UP(20),SAI(50)
K 7903 (Halana)	2001	67.00	5.00	SFCI(5)
NW 1012	1998	14.00	14.00	WB(4),UP(10),
NW 1014	1998	12.00	2.00	SFCI(2)
NW 1067	2005	5.00	5.00	NSC(5)
NW 2036	2003	49.00	14.00	UP(10),WB(4)
PBW 343	1996	1086.70	111.00	SFCI(10),Bih(100),WB(1)
PBW 154	1988	172.60	32.40	NSC(30),Kribhco(2.4)
PBW 373	1997	683.10	50.00	UP(50)
UP 2425	1999	24.00	2.00	SFCI(2)
			<b>519.40</b>	
NDB 1020 (N.Barley -3)	2002	17.00	17.00	SFCI(2),UP(15)
NDB 943 (N.Barley-5)	2009	45.00	45.00	UP(45)
NDB 940 (N.Barley -2)	2001	96.00	96.00	SFCI(2),MP(1),UP(90),SAI(3)
NDB 1173	2005	85.00	85.00	Raj(30),UP(55)
			<b>243.00</b>	
<b>PAU, Ludhiana</b>				
DBW 17	2007	1586.00	326.00	NSC(30),SFCI(50),Kribhco(50),Pun(30),SAI(166)
PBW 175	1989	20.40	20.40	Pun(0.4),J&K(20)
PBW 226	1989	22.60	22.60	SAI(22.6)
PBW 299	1993	10.00	10.00	HP(10)
PBW 343	1996	1086.70	565.40	Har(22),Pun(10),SAI(533.4)

Variety	Year of release	Breeder seed (q)		Indenter
		DAC Indent	Allocation	
PBW 373	1997	683.10	205.60	NSC(50),SFCI(20),Kribhco(8.4),Bih(100),Har(7.2),Pun(20)
PBW 396	2000	70.00	65.00	HP(30),Raj(25),UP(10)
PBW 443	2000	13.00	13.00	WB(6),SAI(7)
PBW 502	2004	1274.90	461.90	NSC(10),SFCI(5),Har(14),Pun(30),SAI(402.9)
PBW 509	2005	126.20	126.20	NSC(5),SFCI(5),Kribhco(40),JK(10),Pun(10),SAI(56.2)
PBW 527	2003	30.80	30.80	NSC(25),SFCI(5),Pun(.8)
PBW 533	2006	5.00	5.00	NSC(5)
PBW 550	2008	1931.05	913.05	NSC(50),SFCI(25),Kribhco(65),Har(47.2),Pun(100),Raj(120),SAI(505.85)
PBW 590	2009	120.20	100.20	Har(13.2),Pb(20),SFCI(5),SAI(62)
PBW 596	2009	39.80	39.80	Kar(5),Mah(5),SAI(29.8)
PDW 274	2003	0.80	0.80	Pun(.8)
PDW 314	2010	73.60	73.60	NSC(10),Pb(.4),Raj(30),Har(5),UP(10),SAI(18.2)
PDW 291	2005	7.40	7.40	NSC(5),Pun(.40),SAI(2)
WH 542	1992	119.20	91.60	SAI(91.6)
			<b>3078.35</b>	
PL 751	2007	5.20	5.20	SAI(5.2)
PL 426	1996	91.60	91.60	SFCI(5),Pb(3),Har(.45),SAI(83.15)
			<b>96.80</b>	
<b>NSP, RAU, Bikaner</b>				
PBW 590	2009	120.20	20.00	Raj(20)
Raj 1482	1983	326.20	121.00	NSC(15),SFCI(1),Raj(105)
Raj 3077	1989	354.00	150.00	SAI(150)
Raj 3765	1996	921.40	312.20	MP(150),SAI(162.2)
Raj 3777	2006	220.00	75.00	NSC(20),SFCI(5),Bih(50)
Raj 4037	2004	1101.20	536.20	NSC(20),SFCI(5),Raj(500),SAI(11.2)
Raj 4079	2011	2.00	2.00	Kribhco(2)
Raj 4083	2007	105.00	105.00	SFCI(5),Raj(100)
Raj 4120	2009	351.20	100.00	Raj(100)
Raj 6560	2005	45.00	45.00	SFCI(5),Raj(40)
			<b>1466.40</b>	
RD 2508	1997	5.00	5.00	NSC(5)
RD 2503	1997	15.00	15.00	NSC(5),Raj(10)
RD 2715	2009	31.00	31.00	NSC(1),SFCI(5),MP(10),Raj(10),UP(5)
RD 2660	2006	85.00	85.00	NSC(4),SFCI(1),Raj(80)
RD 2052	1991	103.20	103.20	SFCI(5),Raj(60),SAI(38.2)
RD 2592	2004	150.00	150.00	Raj(150)
RD 2552	2000	209.40	209.40	NSC(4),SFCI(5),Raj(200),SAI(.4)
RD 2668	2007	212.00	212.00	NSC(2),SFCI(5),Raj(200),SAI(5)
RD 2035	1994	364.80	364.80	SFCI(5),Raj(300),SAI(59.8)
			<b>1175.40</b>	
<b>RVSKVV, Gwalior</b>				
MP(JW) 1203	2009	283.00	283.00	MP(100)
GW 366	2007	486.20	100.00	MP(100)
GW 322	2002	1126.20	526.00	MP(200)
HI 617 (Sujata)	1982	95.00	40.00	MP(40)
MP(JW) 4010	2003	101.00	50.00	MP(50)
			<b>999.00</b>	
<b>SDAU, Vijapur</b>				
GW 173	1994	100.20	21.20	Raj(20),SAI(1.2)
GW 496	1990	584.60	359.20	NSC(15),Kribhco(20),Mah(300),SAI(24.2)
GW 273	1998	1095.00	381.00	NSC(10),SFCI(30),Kribhco(4),MP(300),SAI(37)
GW 322	2002	1126.20	275.00	MP(275)
GW 366	2007	486.20	276.20	NSC(10),SFCI(10),Kribhco(8),MP(170),Raj(25),SAI(6.2)

Variety	Year of release	Breeder seed (q)		Indenter
		DAC Indent	Allocation	
			<b>1312.60</b>	
<b>SFCI, New Delhi</b>				
DBW 16	2006	43.40	10.00	SFCI(10)
DBW 17	2007	1586.00	310.00	Raj(10),SAI(300)
HD 2687 (Shresth)	1999	64.20	64.20	NSC(5),Raj(49.2),UP(10)
HD 2733 (VSM)	2001	1686.40	50.00	UP(50)
HD 2932 (Pusa Wheat 111)	2008	622.80	215.00	NSC(15),SAI(200)
HI 1418	2000	328.00	125.00	SAI(125)
HI 1479 (Swarna)	2003	310.00	110.00	MP(100),Raj(10)
HUW 468	1999	127.40	100.00	UP(100)
HUW 510	2001	215.80	200.00	Bih(100),UP(100)
HW 2004 (Amar)	1997	252.00	100.00	MP(100)
K 0307 (Shatabdi)	2007	246.00	50.00	UP(50)
PBW 154	1988	172.60	142.20	Bih(100),UP(20),SAI(20.2)
PBW 343	1996	1086.70	100.00	SAI(100)
PBW 373	1997	683.10	50.00	UP(50)
PBW 502	2004	1274.90	100.00	Bih(100)
Raj 3777	2006	220.00	100.00	MP(100)
Raj 4120	2009	351.20	100.20	UP(100)
VL 804		37.00	37.00	SFCI(2),Ultra(35)
VL 892	2008	57.00	50.00	Ultra(50)
			<b>2013.60</b>	
<b>SKUA&amp;T, Jammu</b>				
DBW 17	2007	1586.00	20.00	JK(20)
PBW 373	1997	683.10	12.00	JK(12)
PBW 396	2000	70.00	5.00	JK(5)
PBW 502	2004	1274.90	25.00	JK(25)
PBW 550	2008	1931.05	30.00	JK(30)
Raj 3765	1996	921.40	15.00	JK(15)
SKW 196 (Shalimar Wheat)	2005	20.00	20.00	NSC(10),JK(10)
			<b>127.00</b>	
<b>SVPUA&amp;T, Meerut</b>				
PBW 373	1997	683.10	50.00	UP(50)
PBW 550	2008	1931.05	50.00	UP(50)
DBW 17	2007	1586.00	50.00	UP(50)
WH 711	2002	890.00	100.00	UP(100)
			<b>250.00</b>	
<b>UAS, Dharwad</b>				
DDK 1025	2006	2.00	2.00	NSC(2)
UAS 415	2009	20.00	20.00	Kar(10),Mah(10)
DDK 1029	2007	5.00	5.00	NSC(5)
DWR 162	1993	84.50	84.50	Kar(84.50)
DWR 195	1995	13.00	13.00	Kar(13)
DWR 1006	2007	2.00	2.00	SFCI(2)
GW 322	2002	1126.20	250.00	MP(250)
HD 2189	1980	291.00	81.00	SAI(81)
Lok 1	1982	847.00	77.00	SFCI(10),Kribhco(10),Kar(7),SAI(50)
			<b>534.50</b>	
<b>VPKAS, Almora</b>				
VL 738	1997	20.00	20.00	Ultra(20)
VL 616	1986	50.00	50.00	Ultra(50)
VL 802	2005	27.00	27.00	SFCI(2),Ultra(25)
VL 829	2003	25.00	20.00	Ultra(20)
VL 907	2010	36.00	20.00	Ultra(20)
			<b>137.00</b>	
VL 56 (Barley)	2005	8.00	8.00	Ultra(8)

## Wheat Physiology Programme

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### 1. Multilocation Heat Tolerance Trial:

There will be two trials: MLHT-1 and MLHT-2

**MLHT-1** will be constituted from AVT 1<sup>st</sup> year entries of irrigated timely and late sown conditions

Replications: 2

Conditions: 2 (Timely and Late)

Plot size: 3m x 0.23m (6 rows)

Design: Lattice

Centres: 11 (Faizabad, Hisar, Indore, Dharwad, Junagarh, Kanpur, Karnal, Niphad, Pantnagar, Ludhiana and Sagar)

Observations to be recorded:

Germination %

Phenology (Days to heading, anthesis and maturity)

Plant height (cm)

Biomass/m<sup>2</sup> at harvest (g)

Productive tillers/m<sup>2</sup>

Grain yield/m<sup>2</sup> (g)

1000-grain weight

Grain number/ 5 main spike

Grain weight/ 5 main spike

CTD (4 times): at anthesis, 1 week, 2 weeks and 3 weeks after anthesis

Chlorophyll fluorescence at anthesis and 15 days after anthesis

**MLHT-2** will be same as conducted during 2010-11

Plot size, design, cultural conditions: same as in previous year

Centres: 10 (Faizabad, Hisar, Dharwad, Junagarh, Kanpur, Karnal, Niphad, Pantnagar, Ludhiana and Sagar)

Observations to be recorded: Same as in MLHT-1

## Research Planning Meetings Crop Protection

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**September 1, 2011**

**Chairman:** Dr. A. K. Sharma  
**Co-Chairman:** Dr. S. C. Bhardwaj  
**Rapporteurs:** Dr. M. S. Saharan  
Dr. I. K. Kallapannawar

At the outset, Dr. A. K. Sharma, P. I., Crop Protection appreciated the co-operation for executing the programme of work (2010 – 11) in toto. The programme for the crop season 2011–12 was discussed and the needful changes in the programme were made to make it more effective. Following decisions were taken to revise the technical programme of Crop Protection for 2011-12 crop season. The experiments on Adult Plant Resistance (APR) for rusts and other diseases (IPPSN, PPSN, EPPSN), APR (race specific and slow rusting) and postulation of rust resistance genes will be continued. For APR (race specific), the group felt the use of following yellow and leaf rust pathotypes for evaluation.

**Leaf rust:** 77-5 and 104-2

**Yellow rust:** 46S119 and 78S84

**Stem rust:** 40A, 117-6

AUDPC based identification of slow rusters in AVT lines, will continue for yellow, stem and leaf rusts. IPPSN and PPSN material will be evaluated at the following new locations under natural hot spot locations for yellow rust: Jammu and Khudwani (Anantnag Kashmir). The AVT's will also be planted at Nawanshahar (Punjab) and Yamunanagar (Haryana) through the KVKs. For TPN, new locations like Khudwani and Yamunanagar will be included. In TPN, instead of HS 240, VL892 will be included. Recording of yellow rust data in PPSN in NWPZ by a team of Plant Pathologists will be done in the last week of February/first week of March. For leaf blight screening, Almora centre was dropped in NHZ. For Sabour centre, IPPSN of Leaf blight was allotted and Ranchi centre was dropped. It was emphasized that the recording should be made in double-digit scale at three growth stages, viz. Flowering, dough and hard dough stages. The trial for monitoring of seed and seedling rot problem in early sown wheat crop and its management was concluded. Biocontrol of foliar blight will be done using new biocontrol strains to be supplied by Dr. Rashmi Aggarwal, IARI, New Delhi. The programme will focus on further analysis of foliar blight samples from various locations under rice-wheat system to keep vigil on foliar blight as well as 'blast' pathogen as a part of our alertness to the new threats. Disease screening nurseries for Karnal bunt, loose smut, powdery mildew, head scab, flag smut, foot rot and hill bunt will be continued. For head scab, evaluation will also be done at Wellington. MDSN material will also be evaluated for head scab at Karnal, Dhaula Kuan, Gurdaspur and Wellington. Dr. Indu Sharma, Project Director suggested to study the role of Barberry in rust cycle. Finally responsibility was given to Dr. S. C. Bhardwaj to look into the role of Barberry.

All the centres associated with the crop protection programme will supply the information on crop health to the PI (CP), fortnightly during the crop season for compiling Wheat Crop Health Newsletter. Teams of plant protection scientists were constituted for effective monitoring of crop health with special focus on rusts (Yellow, leaf and stem rust) as well as data recording in PPSN at various centres in NWPZ.

In case of Nematology, the Project Co-ordinator Nematodes will provide collaboration in wheat nematology programme. The centres under AICRP on Nematodes, like Kanpur, Jabalpur, Palampur, Udaipur, Anand and Rahuri will be involved. PC nematodes will provide software for community analysis and other

features to decide the hotspot areas of wheat nematodes and their prevalence value. This will help in preparation of nematode distribution maps like CCN, ECN, *Pratylenchus*, etc.

Programme of work for Entomology for the coming 2011-12-crop season was also finalized. It was also proposed that a training programme on Wheat Crop protection be held during 2011-12 crop season. In short, following new initiatives have been proposed:

- IPPSN and PPSN material will be evaluated at the following new locations under hot spot locations for yellow rust: Jammu and Khudwani (Anantnag Kashmir). The AVT's will also be planted at Nawanshahar (Punjab) and Yamunanagar (Haryana) through the KVKs.
- For TPN, new locations like Khudwani and Yamunanagar will be included.
- Recording of yellow rust data in PPSN in NWPZ by a team of pathologists will be done in the last week of February/first week of March.
- Biocontrol of foliar blight will be done using new biocontrol strains.
- In case of Nematology, the Project Coordinator Nematodes will provide collaboration in wheat nematology programme. The centres under AICRP on Nematodes, like Kanpur, Jabalpur, Palampur, Udaipur, Anand and Rahuri will be involved.
- PC nematodes will provide software for community analysis and other features to decide the hotspot areas of wheat nematodes and their prevalence value. This will help in preparation of nematode distribution maps like CCN, ECN, *Pratylenchus*, etc.
- The programme will focus on further analysis of foliar blight samples from various locations under rice-wheat system to keep vigil on foliar blight as well as 'blast' pathogen as a part of our alertness to the new threats.

Based on review and discussions, the following research recommendations have been made:

### **Research Recommendations**

#### **I.Promising resistant genotypes**

#### **Multiple diseases resistant genotypes**

#### **Resistant to three rusts +**

**MR to Leaf Blight (LB) + R to Karnal bunt (KB) + Powdery mildew (Pm):** TL 2963(T), TL 2966(T)

**MR to LB +R to Flag smut (FS):** VL 907, HD 3031 and DBW 62.

**MR to LB + R to FS+ Pm:** VL 907

**R to Pm+FS:** VL 920

**R to Pm:** UAS 305

**R to KB+FS:** HPW 309, PDW 316(d) and HI 8699(d).

**R to Pm+FS+KB:** TL 2966 (T), HUW 629, HI 8690(d), HI 8692(d) and HUW 629.

**R to FS+KB:** PDW 313 (d), HI 8680(d), HI 8681(d), PDW 311(d), WH 1021, HI 8691(d), WH 1063, NW 3087, PDW 316(d) and HPW 309.

**R to FS:** HD 2987, HI 8680 (d), HI 8681 (d), HI 8682 (d), KRL 210, MACS 6273, MPO 1215 (d), PBW 612, PBW 615, PDW 311 (d), UAS 305, UAS 419, VL 907, WH 1021, UAS 419, VL 907, WH 1021,WH 1062, K 0616, HD 3013,HI 8690 (d), HI 8692 (d), HI 8696 (d), HI 8699 (d), HPW 308,HS 508, HS 522, HUW 620, K 0707, K 0803, KRL 249, KRL 250,TL 2963 (T), TL 2966 (T), UP 2771, UPD 85 (d), VL 920, VL 926, VL 934, WH 1043, WH 1076, WH 1078, HPW 297, HPW 309, HPW 315, K 0710 and WH 1052.

**R to KB:** DBW 49, WH 1061 and HD 3007.  
**Resistant to leaf and stem rusts +**  
**R to FS+ Pm+KB+ LB:** MP 1225  
**R to FS+ Pm+KB:** MACS 5009  
**R to FS+ Pm:** MACS 2998  
**R to Pm:** DDK 1038(dic.)  
**R to KB+ FS:** GW 391, MACS 6222, GW 1251(d), HI 8693(d) and HW 2551.  
**Resistant to leaf and stripe rusts+**  
**R to KB:** HS 511  
**R to KB+FS:** K0710 and WH 1052.  
**R to KB+Pm:** DDW 15 (d), MPO 1220 (d), PDW 314 (d) and VL 934.  
**Resistant to stripe rust+**  
**R to KB+FS:** DDW 12 (d) and PBW 624.

### **Multiple pests resistant genotypes**

#### **Resistant to all Three Rusts**

**+BWM:** HD 2982, HI 8680(d), HI 8681(d), WH 1021, HI 8691(d), GW 1250(d), HI 8696(d), HPW 308, TL 2963(T) and TL 2966(T).

**+FA (MR):** K0707

**+RA (MR):** HS 508, MPO 1226(d), PDW 316(d), RAJ 4176, NIAW 1395, DDW 12(d) and HD 2998

#### **Resistant to Stem and Leaf Rusts**

**+SF:** DDK 1038 (dicc.), MACS 2998 and MP 4080.

#### **Resistant to Leaf and Stripe Rusts**

**+SF:** MPO 1220 (d)

**+RA (MR):** DDW 15 (d)

#### **Resistant to Stem and Stripe Rusts**

**+SF:** VL 921, HS 521 and VL 916.

**+FA (MR):** K 0716

**+RA (MR):** DDK 1038 (dic.) and HI 8693(d).

### **Karnal bunt**

**Resistant (Av. incidence upto 5 %):** AKDW 4021, DBW 46, DBW 51, HI 977, HS 375, HS 513, KRL 213, KRL 238, MACS 3742, PDW 317, VL 616, VL 925 and WH 896.

### **Leaf blight**

**Highly resistant:** Av. score range 00-13, Highest score up to 35: VL 829, KARAWANI/4NIF/3/SOTY//NAD63/CHRIS and PBW 629.

### **Insect Pest resistance**

**(a) Shootfly (MR):** K 0343, HW 5102, MP 1153, DBW 31 and HI 8663.

**(b) Brown Wheat mite (MR):** HI 1544, HS513, HS 461, NW 3069 and VL 888.

2. The entries possessing multiple disease and insect-pest resistance be included in NGSN for utilization in the breeding programme.

3. Evaluation of AVTs material at Kenya and Ethiopia for Ug99 resistance be continued.

4. In addition to propiconazole (Tilt 25 EC), two other fungicides namely tebuconazole (Folicur 250 EC) and triademefon (Bayleton 25 WP) @ 0.1 per cent gave excellent stripe rust control at multilocation testing, hence these are also recommended.

5. For effective management of stripe rust through eco-friendly approaches (induced systemic resistance, ISR), seed treatment with *Trichoderma viride* @ 4 g / Kg seed be used alongwith the chemical control.
6. Seed treatment with thiamethoxam (Crusier 70 WS) @ 0.7 g a.i./Kg of seed was found very effective for termite control. Hence it is recommended.

#### Technical Recommendations

1. A strict vigil will be kept on stripe rust in NWPZ and NHZ. Teams have been constituted for monitoring of stripe rust in above areas during crop season and off season.
2. Efforts be made to study the role of *Berberis* in yellow rust life cycle.
3. New molecules for stripe rust management be tested.
4. Varieties recommended for other zones and susceptible to yellow rust should not be grown in the yellow rust prone areas.
5. Distribution maps of wheat nematodes like CCN, ECN will be prepared.
6. Cultivation of recently released durum varieties needs to be encouraged in CZ and PZ to enrich and diversify the rust resistance base as improved durum wheat varieties show rust resistance spectrum different from that of bread wheat.
7. A course on management of pests and diseases in wheat . be organized for KVKs' / co-operating centres scientists
8. A network on stripe rust epidemiology and management involving different centres of NHZ and NWPZ be submitted for XIIth Plan.

#### PROGRAMME OF WORK 2011-12

The programme for the crop year 2011-2012 was chalked out in the 50<sup>th</sup> All India Wheat and Barley Research Workers Meet held at NASC Complex, New Delhi during September, 1-4, 2011. The various activities to be executed at respective centres are given below:

#### PROGRAMME 1: HOST RESISTANCE: IPPSN AND PPSN

##### Adult Plant Resistance for rusts & other diseases

##### i. Initial Plant Pathological Screening Nursery (IPPSN)

###### Objectives

To evaluate breeding materials generated at various centres against rusts and foliar blights for promoting to coordinated multi-location trials. (Under artificial inoculated conditions)

##### (a) Rusts:

###### North:

**Leaf Rust:** Delhi, Hisar, Karnal, Durgapura, Ludhiana (5)

**Yellow Rust:** Gurdaspur, Dhaulakuan, Malan, Karnal, Durgapura, Ludhiana and Jammu (7)

**South:** No. of Centres, 5

**Stem Rust + Leaf Rust:** Mahabaleshwar, Wellington, Powarkheda, Niphad and Indore

##### (b) Leaf Blight: No. of centres: 6

Faizabad, Pusa (Bihar), Varanasi, Kalyani, Sabour and Coochbehar

##### ii. Plant Pathological Screening Nursery (PPSN)

###### Objectives



Promotion of entries from one stage to the other in the coordinated trials and identification of varieties after AVT level on the basis of their level of disease resistance.

**Rusts:**

**North:**

**Yellow Rust:** Dhaulakuan, Gurdaspur\*, Malan, Bajaura\*, Karnal, Ludhiana, Pantnagar, Durgapura, Jammu\*, Kudwani\* (Kashmir) (10)

AVT material will also be evaluated under natural conditions at NawanShahar (Punjab) and Yamunanagar (Haryana) for yellow rust.

\* Under natural conditions

**Leaf Rust :** Delhi, Hisar, Jammu, Kanpur, Karnal, Ludhiana, Pantnagar, Durgapura (8)

**South:** No. of Centres, 9

**Leaf and Stem Rusts:** Wellington, Mahabaleshwar, Niphad, Vijapur, Pune, Junagarh, Powarkheda, Dharwad and Indore

Note: The samples of leaves of AVT II<sup>nd</sup> year entries in PPSN and the varieties (checks) showing resistance in the past but now showing rust severity of 40S or more at any of the centres, should be sent immediately to R.S. Flowerdale, Shimla for pathotype analysis, with information to P.I. (Crop Protection).

**Monitoring of PPSN**

A team of Plant Pathologists was constituted during the work-planning meeting for effective monitoring and data recording in PPSN at various locations in NWPZ. The team consists of Dr. M. S. Saharan (DWR, Karnal), Dr. Rashmi Aggarwal (IARI, New Delhi), Dr. M. K. Pandey (SKUAST-Jammu). The team will visit the centres in NWPZ during the end of Feb, 2011. The visit will be coordinated by P.I. (Crop Protection)

**iii AUDPC based identification of slow rusters in AVT material:**

Leaf and yellow rusts - DWR, Karnal; stem and leaf rusts – Mahabaleshwar; stem rust - Indore; Yellow rust – Ludhiana.

**PROGRAMME 2: RUSTS (BROWN, YELLOW AND BLACK)**

**A. APR : Race specific and slow rusting**

i. Leaf rust : AVT entries of NWPZ, NHZ and NEPZ, alongwith the check entries of the respective zones.

Centres: New Delhi (Dr. U. D. Singh and J. B. Sharma) and Ludhiana (Dr. Indu Sharma) under field conditions and Flowerdale (under controlled conditions)

ii. Stem rust: AVT of CZ and PZ, along with the check varieties of the respective zone.

Centres: Indore, Pune, Powarkheda and Mahabaleshwar

iii. Yellow rust: AVT entries of NWPZ and NHZ alongwith the checks of the respective zones.

Centres: Ludhiana and N. Delhi (Dr. U.D. Singh) under field conditions and Flowerdale (under controlled condition),

Race inoculum to be supplied by Flowerdale with intimation to the P.I. (Crop Protection). Races should be the same for all the respective centres.

(i) Leaf rust: 77-5 and 104-2

(ii) Yellow rust: 46S119 and 78S84

(iii) Stem rust: 40A and 117-6

## **B. Seedling Resistance Tests and postulation of Rust Resistance Genes**

- i. Leaf, Stem and Yellow rusts (All races): DWR, Regional Station, Flowerdale, Shimla for AVT's (aestivum) entries. Flowerdale centre to generate data on rust resistance genes of all the AVT entries. Besides, this, identification of Rust Resistance genes to be done in selected entries of MDSN, MPSN and EPPSN.
- ii. Stem and Leaf rusts : Mahabaleshwar for SRT on AVT entries of CZ, PZ and NIVT, durum entries.

### **PROGRAMME 3: LEAF BLIGHT**

- i. **Leaf Blight Screening Nursery (LBSN):** No. of Centres : 16  
This nursery will consist of earlier identified resistant materials as well as the AVT's and special trials.  
**NWPZ:** Pantnagar, Ludhiana, Karnal, Kaul and Hisar.  
**NEPZ:** Varanasi, Faizabad, IARI Pusa, Coochbehar, Shillongani, Ranchi and Kalyani.  
**PZ:** Dharwad  
**SHZ:** Wellington  
**CZ** Gwalior
- ii **Management of foliar blight of wheat through chemicals**  
**Centres:** Faizabad, Kanpur, Varanasi, Kalyani, Pusa (Bihar), Sabour and under controlled conditions at Karnal
- iii. **Biological control of leaf blight :** Formulations will be provided by Dr. Rashmi Aggarwal, IARI, New Delhi  
**Centres:** Karnal, Coochbehar and Faizabad
- iv **Basic studies on foliar blights:** These will be undertaken at Karnal, Faizabad, Varanasi and Delhi.

### **PROGRAMME 4: KARNAL BUNT**

**Karnal Bunt Screening Nursery (KBSN):** This nursery will consist of the earlier identified resistant materials and the AVT-II year entries of 2010-2011. These evaluations will be done under artificially inoculated conditions.  
No. of Centres, 7  
Dhaulakuan, Ludhiana, Delhi, Pantnagar, Hisar, Karnal and Jammu.  
Karnal will also evaluate AVT-Ist year entries. Ludhiana and Dhaulakuan will evaluate AVT-I and NIVT entries also.

### **PROGRAMME 5: LOOSE SMUT**

**Loose smut Screening Nursery:** It will contain resistant materials identified in the past and AVT Ist year entries.  
Centres: Ludhiana, Almora, Durgapura and Hisar.

### **PROGRAMME 6: POWDERY MILDEW**

**Powdery Mildew Screening Nursery:** No. of Centres , 10  
Almora, Pantnagar, Ranichauri, Shimla, Malan, Bajaura, Dhaulakuan, Wellington and Kaul.

### **PROGRAMME 7: REGION SPECIFIC DISEASES**

Disease Screening Nurseries of the region specific diseases will include resistant materials identified during the past, along with AVT entries at the locations given below:

- i. **Head scab:** Karnal, Gurdaspur, Dhaulakuan and Wellington (AVT). At Gurdaspur and Wellington, evaluation for head scab will be done under natural conditions.
- ii. **Flag smut:** Ludhiana, Hisar and Durgapura.
- iii. **Foot rot:** Sagar and Dharwad.
- iv **Hill bunt:** Malan, Bajaura and Almora.

## **PROGRAMME 8: CROP HEALTH**

### **Crop Health Monitoring: Pre harvest surveys**

- All the centres associated with Crop Protection Programme will supply information fortnightly on crop health from the areas of their jurisdiction to P.I. Crop Protection starting from November 2011 till the harvest of crop.
- 'Wheat Crop Health Newsletter' will be issued on monthly basis from DWR, Karnal, during the crop season. Information on off season crop will also be included.

### **Monitoring of new virulences of rusts in NWPZ by specially constituted teams:**

Specially constituted teams will visit the areas as per the schedules given below for effective monitoring of crop health in general and appearance and spread of yellow rust in particular, along the areas near the western border and foothills / sub-mountainous areas in NWPZ.

**Team 1:** Last week of December 2011 (Drs Madhu Meeta, M. S. Saharan and S. K. Rana )

**Team 2:** Mid January, 2011 (Drs. U. D. Singh, S. C. Bhardwaj and Dhanbir Singh)

**Team 3:** Mid February, 2011 (Drs. S. S. Karwasara, Selva Kumar and S. K. Jain). Visits in March will be arranged as per need).

Teams will cover the following area: Ropar, Hoshiarpur, Mukerian, Pathankot, Kathua (Jammu), RS Pura, Gurdaspur, Dera Baba Nanak, Ajnala, Attari, Harike, Ferozepur, Fazilka, Abohar and Sri Ganganagar. The visit will be coordinated by P.I.(Crop Protection). The exact dates will be decided depending upon the weather conditions.

Monitoring of yellow rust in hills (Including Sirmour in HP & Uttarakhand) will be undertaken by a team of Plant Pathologists (Drs. S. S. Karwasara, S C Bhardwaj, K P Singh and S. K. Rana) in 1<sup>st</sup> week of August, 2012.

**Monitoring the pathotype distribution of rust pathogens:** It will be undertaken by DWR, Regional Station, Flowerdale, Shimla (all three rusts from all zones) and Rust Research Station, Mahabaleshwar (brown and black rust from CZ and PZ) All the cooperating centres are required to send the rust infected samples (natural infection) for pathotype analysis to the concerned centres.

**Wheat Disease Monitoring Nursery (To be co-ordinated by Flowerdale, Shimla):** The nursery will be planted at 37 locations. From this year, nursery will also be planted at Kudwani (Srinagar) and Yamunanagar (Haryana). Samples from this nursery be sent regularly to R.S. Flowerdale, Shimla for virulence analysis and information.

**Off-season Disease Monitoring Nursery (To be coordinated by DWR Reg. Station, Flowerdale):** This nursery will be planted in Dalang Maidan, Kukumseri, Sangla, Sarahan (HP) and Leh (J&K). High altitude varieties and one hulless barley variety will also be included in this nursery.

**SAARC- Nursery (To be coordinated by Flowerdale, Shimla):** Nursery will be planted at 15 Indian locations, viz., Ludhiana, Delhi, Dhaulakuan, Gurdaspur, Dera-Baba-Nanak, Abohar, Sri Ganganagar, Chattha, Kathua, Rajouri, Almora, Durgapura, Faizabad, Pantnagar and Wellington.

#### **Monitoring of Karnal bunt and blackpoint in harvested grains**

Post harvest monitoring will be undertaken by cooperating centres by analysing samples from grain *mandies* in each district of their respective states. Centres from C.Z. (Indore, Sagar, Powarkheda, Junagarh, Vijapur, Jabalpur) and PZ (Pune, Niphad and Dharwad) may also supply grain samples to DWR Karnal for analysis.

**Monitoring of Mealy bug on wheat in cotton-wheat system:** survey will also be conducted for monitoring the situation of mealy bug in wheat under cotton-wheat system.

### **PROGRAMME 9: IPM IN WHEAT**

#### **A. GENETICAL (HOST RESISTANCE)**

##### **(a) Elite Plant Pathological Screening Nursery (EPPSN) :**

**North:** No. of Centres, 8

Delhi, Karnal, Ludhiana, Pantnagar, Durgapura, Hisar and Almora

**South:** No. of Centres, 4

Wellington, Mahabaleshwar, Dharwad and Indore.

##### **(b) Multiple Disease Screening Nursery (MDSN):** It will be subjected to artificial epiphytotics as detailed below:-

###### **(i) DISEASES**

**North:** No. of Centres, 14

**Yellow rust:** Karnal, Ludhiana, Dhaulakuan, Pantnagar

**Brown rust:** Karnal, Ludhiana, Delhi

**Karnal Bunt:** Karnal, Ludhiana, Dhaulakuan

**Powdery mildew:** Dhaulakuan, Almora, Pantnagar, Kaul, Chattha

**Foliar blights:** Kaul, Faizabad, Varanasi, Coochbehar

**Loose smut:** Hisar, Durgapura, Ludhiana

**Flag smut:** Hisar, Durgapura, Ludhiana

**Head scab:** Karnal and Wellington

**South:** No. of Centres, 3

**Leaf and Stem rust:** Mahabaleshwar, Indore and Wellington

###### **(ii) Nematodes (CCN) :** Durgapura, Hisar, Ludhiana

##### **(c) Contribution to NGSN:** The resistant entries to major diseases identified after multilocation & over years of testing will be contributed to NGSN for the use of breeders in crossing programme. (Centre : Karnal)

#### **B. MANAGEMENT OF DISEASES**

##### **(a) Chemical control of Yellow Rust :** Karnal, Ludhiana, Bajoura, Pantnagar, Jammu

(b) **Chemical control of Stem rust** :Mahabaleshwar, Niphad, Powarkheda, Dharwad

## PROGRAMME 10. WHEAT ENTOMOLOGY

### (A) HOST PLANT RESISTANCE

EXPT.1. ENTOMOLOGICAL SCREENING NURSERY FOR

- (a) Shoot fly (Durgapura, Dharwad and Ludhiana).
- (b) Brown wheat mite (Durgapura, Niphad, and Ludhiana).
- (c) Wheat Aphids ( Niphad, Ludhiana, Shillongani and Jammu).
- (d) Root aphid (Entkhedi and Ludhiana).

EXPT.2 MULTIPLE PEST SCREENING NURSERY

- (a) Shootfly (Dharwad, Durgapura and Ludhiana)
- (b) Brown mite (Durgapura and Ludhiana)
- (c) Foliar aphids (Ludhiana, Karnal and Kanpur)
- (d) Root aphid (Entkhedi and Ludhiana)

### (B) CHEMICAL CONTROL

EXPT.3 Effect of insecticidal seed treatment on germination, termite damage and yield (Centres: Durgapura, Nipad, Kanpur, Ludhiana, Jammu and Vijapur).

EXPT.4 Management of termites through new molecules (Centres: Durgapura, Ludhiana, Kanpur and Vijapur) (New Trial)

EXPT.5 Eco-friendly management of termites through biorationals (Centres: Vijapur only).

EXPT.6 Chemical control of foliage feeding wheat aphids (Centres:, Niphad, Ludhiana, Pantnagar and Jammu).

EXPT.7 Biorationals for the management of foliage feeding aphids (Centres: Niphad, Ludhiana, Pantnagar).

EXPT.8 Chemical control of foliage feeding brown wheat mite on wheat crop (Durgapura only)

### INTEGRATED PEST MANAGEMENT

EXPT.9 Survey of pests infesting wheat and barley and their natural enemies (All centres)

EXPT.10 Basic studies for development of IPM strategies

- (a) Pest modeling for Foliage aphids (Niphad, Ludhiana and Pantnagar)
- (b) Brown mite ETL (Durgapura)
- (c) Root aphid (Powarkheda/Entkhedi)
- (d) Thrips (Pantnagar)
- (e) *Helicoverpa armigera* (Pantnagar)

### (C) STORED GRAIN PESTS

EXPT.11 Identification of newer sources of resistance to major stored grain insect pests (Pantnagar)

## PROGRAMME 11. WHEAT NEMATOLOGY

### 1. Monitoring of Nematodes:

- i) ***Anguina tritici***: Pusa (Bihar), Jammu, Durgapura, Varanasi, Udaipur, Jabalpur, Kanpur and Palampur,
- ii) ***Heterodera avenae***: Durgapura, Delhi, Hisar, Karnal, Ludhiana, Udaipur, Jabalpur, Kanpur and Palampur,

- iii) **Community analyses of Nematodes in wheat:** Durgapura, Delhi, Hisar, Karnal, Ludhiana, Udaipur, Jabalpur, Kanpur and Palampur,
  - iv) **Mapping of nematode population:** Durgapura, Delhi, Hisar, , Karnal, Ludhiana, Udaipur, Jabalpur, Kanpur and Palampur
  - v) **Soil borne nematodes:** Survey will be conducted in Bihar (RAU Pusa, samastipur centre), Varanasi commissionerary (BHU Centre), parts of NWPZ (Karnal centre), parts of Rajasthan (Durgapura centre), southern Haryana (Hisar centre), Chattha (Jammu centre), Delhi (western UP including Meerut, Aligarh, Gaziabad, Baghpat, , Sonipat, etc), Punjab (Ludhiana centre), parts of southern Rajasthan (Udaipur centre), parts of MP (Jabalpur centre), central UP (Kanpur centre) and Kangra (Palampur centre).
- 2. System based Research:**
- i) **Population monitoring in wheat based systems:**
    - Rice-Wheat:** Ludhiana, Karnal, Pusa (Bihar), Chattha (Jammu), Varanasai, Kangra (Palampur) and Delhi.
    - Cotton - Wheat:** Hisar and Ludhiana.
    - Maize - Wheat:** Chatha (Jammu).
    - Bajra - Wheat:** Durgapura, Hisar and Udaipur.
    - Groundnut - Wheat:** Durgapura.
    - Til - Wheat:** Pusa (Bihar)
    - Cowpea - Wheat:** Durgapura.
    - Wheat - Moong:** Durgapura
  - ii) **Diversification in existing wheat based systems for CCN management- Durgapura.**
  - iii) **Biofumigation as management tool for nematodes:** Ludhiana, Karnal, Durgapura, Hisar and Delhi.
  - iv) **Testing of advanced breeding materials generated at Durgapura and Delhi against CCN:** Durgapura, Hisar, Ludhiana and Delhi.
  - v) **Molecular characterization of *Heterodera filipjevi*:** Delhi
  - vi) **Evaluation of ecofriendly approaches in management of CCN:** Hisar, Ludhiana, Durgapura, Karnal and Delhi.
- 3. Evaluation of resistance against Nematodes parasitizing wheat:**
- I) ***Heterodera avenae*:** Hisar, Karnal, Durgapura and Delhi,
  - II) ***Heterodera filipjevi*:** Ludhiana.
  - ii) **Screening against *M graminicola* :** Pusa (Bihar), Ludhiana.
  - iii) **Biochemical/Molecular studies on *M graminicola*:** Delhi
  - iv) **Evaluation of international nurseries against CCN:** All centres (subject to availability of materials from the overseas source).

## Research Planning Meetings Resource Management

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September 1, 2011

<b>Chairman:</b>	<b>Dr RKSharma</b>
<b>Co-Chairman:</b>	<b>Dr Randhir Singh</b>
<b>Rapporteur:</b>	<b>Dr RS Chhokar</b>
	<b>Dr Hari Ram Saharan</b>

At the outset, after welcoming the participants Dr RK Sharma, PI Resource Management Programme and the Chairman of the session stressed that conducting All India Coordinated varietal evaluation trials is mandatory and all the centres must conduct the allotted trials strictly as per the technical programme.

Dr IN Dodiya from Vijapur, proposed to initiate a trial on drip irrigation in wheat. On this issue a thorough discussion was held and it was decided to continue the trial for one more season (2011-12) at two centres (Vijapur and Niphad) which they are conducting and based on the results we may start it at multi-locations in co-ordinated programme from rabi 2012. Dr Hari Ram Saharan, proposed a new trial on bio-fortification in wheat. This was discussed in length but the major hurdle in this trial raised was the correct estimation of the Zn and Fe content. Dr SC Tripathi also proposed a trial on tillage and nitrogen management in rice-wheat system. Two trials on weed management for control of broad-leaved weeds and complex weed flora were proposed by Dr R S Chhokar.

The resource management group critically reviewed the results of the coordinated and special trials and arrived at the following;

- The trials on varietal evaluation will be formulated after receiving the entries from the breeding group.
- The group decided to conclude the special trials on irrigation and residue management, integrated nutrient management in soybean-wheat system, wheat crop establishment under pre and post seeding options in rice-wheat system.

The following four special trials will continue;

- 1. Effect of row spacing on performance of wheat in different wheat growing zones.**
- 2. Evaluating the competitiveness of wheat varieties against weeds**
- 3. To evaluate the effect of foliar application of nutrients on performance of wheat under timely and late sown conditions.**
- 4. Improving productivity of cotton-wheat through relay cropping**

To address the zone-wise issues, the group also formulated following special coordinated trials, the details of which are given below;

### **1. Effect of different rice seeding methods on wheat productivity at different nitrogen levels**

#### **Treatments**

#### **Main plots: Rice establishing methods-3**

1. Transplanting
2. Dry direct seeded
3. Wet direct seeded/ZT transplanted

**Design:** strip plot

**Replications-** 3

**Sub-plots: Nitrogen levels in wheat-4**

1. No nitrogen control
2. 75 kg N/ha
3. 150 kg/ha
4. LCC based nitrogen application

**Centres:** Anantnag, Malan, Gurdaspur, Karnal, Pantnagar, Kalyani

**2. Bio-efficacy of broadleaf herbicides in wheat****Treatments**

1. 2,4-D @ 500 g a.i./ha
2. Carfentrazone @ 20 g/ha
3. Metsulfuron @ 4 g/ha
4. Metsulfuron+ Carfentrazone @ 25 g/ha
5. 2, 4-D @ 500 g/ha+ 0.2% NIS
6. Carfentrazone@ 20 g/ha +0.2% NIS
7. Metsulfuron @ 4 g/ha+ 0.2% NIS
8. Metsulfuron+ Carfentrazone @ 25 g/ha+0.2% NIS
9. Weedy Check
10. Weed Free

**Design:** RBD

**Replications-** 3

**Observations:**

1. Weed density and dry weight at 60 and 120 DAS
2. Wheat yield and yield attributes

**Centres:** Durgapura, Kota, Sabour, Udaipur, Jammu, Junagarh, Kanpur, Shillongani, Kalyani, Coochbehar

**3. Evaluation of herbicides for control of complex weed flora****Treatments:**

1. Metribuzin 210 g/ha
2. Clodinafop @ 60/ha
3. Pinoxaden 40 g/ha
4. Sulfosulfuron 25 g/ha
5. Clodinafop+ Metribuzin 60 + 210 g/ha
6. Pinoxaden+ Metribuzin 40 + 210 g/ha
7. Sulfosulfuron +Metribuzin 25 + 210 g/ha
8. Fenoxaprop+Metribuzin 100 + 210 g/ha
9. Total 40 g/ha
10. Atlantis 400 g/ha
11. Vesta 400 g/ha
12. Isoproturon+2,4-D, 1000 + 500 g/ha
13. Weedy check
14. Weed free

**Design:** RBD

**Replication:** 3

**Observations:**

1. Weed density and dry weight at 60 and 120 DAS
2. Wheat yield and yield attributes

**Centres:** Jammu, Malan, Sabour, Udaipur, Faizabad, IARI-Pusa, Kanpur, Indore, Agra, Hisar, Ludhiana, Bajaura, Pantnagar, Powarkheda, Kota, Sagar, Varanasi



#### **4. Mitigating terminal heat stress in wheat through mulching and foliar nutrition under late sown conditions.**

**Treatments:**

##### **A Mulching**

1. Mulch (6 t/ha)
2. No Mulch

##### **B. Foliar Application**

1. Foliar application  $\text{CaCl}_2$  @ 0.1% at booting
2. Foliar application  $\text{CaCl}_2$  @ 0.1% at post anthesis
3. Foliar application of KCl @ 0.2% at booting
4. Foliar application KCl @ 0.2% at post anthesis
5. Water spray
6. No spray

**Design:** RBD

**Replication:** 3

**Centre:** Durgapura, Pantnagar, Kota, Junagarh, Udaipur

#### **5. Evaluating the System of Wheat Intensification (SWI) for enhanced productivity of wheat.**

This experiment will be conducted at DWR, Karnal in NWPZ and two locations *i.e.* IARI RS Pusa and Varanasi in NEPZ

#### **6. Studies on nitrogen optimization under different moisture regimes at seeding in wheat under rainfed conditions.**

**Treatments**

**Main plots: Pre-sowing irrigation-4**

1.  $I_0$ - No irrigation
2.  $I_1$ - Irrigation on 2<sup>nd</sup> November (60 mm)
3.  $I_1$ - Irrigation on 9<sup>th</sup> November (60 mm)
4.  $I_1$ - Irrigation on 16<sup>th</sup> November (60 mm)

**Sub-plots:**

**Nitrogen levels -4** (2/3<sup>rd</sup> basal and 1/3<sup>rd</sup> top dressing around 90 days after seeding)

1.  $N_1$ - Control
2.  $N_2$ - 40 kg/ha
3.  $N_3$ - 60 kg/ha
4.  $N_4$ - 80 kg/ha

Recommended dose of  $\text{P}_2\text{O}_5$  and  $\text{K}_2\text{O}$  (40:40 kg/ha)

**Design:** Split plot

**Replications-** 3

**Variety:** VL 907

**Observations:**

1. Soil moisture content at the time of sowing and harvesting at different profiles (0-7.5 cm, 15 cm, 30 cm, 45 cm, 60 cm and 75 cm)

2. Yield and yield attributes
3. Economics

**Centres:** Bajaura and Malan

### **Work Plan of Social science**

Wheat and barley front line demonstrations allocated for 2011-12 will be conducted and coordinated as per the approval of the Ministry of Agriculture.

## Research Planning Meetings Quality Improvement

September 1, 2011

Chairman: Dr. R.K. Gupta  
Rapporteurs: Dr. Sewa Ram  
Dr. Anil Kumar

The Wheat Quality Group met on 1<sup>st</sup> September, 2011 and formulated the plan of work. The group decided to continue recording data for grain appearance score, test weight, protein content, sedimentation value and phenol test on all the entries of the three species, namely *T. aestivum*, *T. durum* and *T. diccocom* as well as triticales. Durum will also be analyzed for the incidence of yellow berry and yellow pigment in addition to the earlier mentioned traits. Yellow pigment will also be recorded on *diccocom*. The allocation of the work will be as under:

1. Ludhiana laboratory will analyze NIVT 1A samples from Ludhiana, Hisar, Durgapura, Delhi, Pantnagar, Kanpur, Pusa and Sabour.
2. The Quality laboratory at Durgapura will undertake the analytical work for NIVT 1B samples from all those centers, which have been identified for Ludhiana laboratory (NIVT 1A).
3. NIVT 2 samples will be analyzed by the laboratory at Vijapur for all the traits related to bread wheat. The centres to send the samples are Indore, Kota, Vijapur, Junagarh, Powarkheda, Dharwad, Pune and Niphad.
4. NIVT 3 work will be looked after by Pantnagar quality laboratory. The samples from Pusa, Sabour, Kanpur, Pantnagar, Hisar, Ludhiana, Durgapura, Delhi, Vijapur, Indore, Powarkheda, Junagarh, Dharwad, Niphad and Pune will be analyzed for the five quality traits related to bread wheat.
5. The samples of irrigated timely sown durum trial NIVT 4 will be analyzed by the quality laboratory at Rahuri for the traits related to durum samples from Ludhiana, Delhi, Hisar, Durgapura, Kota, Indore, Powarkheda, Junagarh, Vijapur, Pune, Dharwad and Niphad.
6. NIVT 5A entries will be analyzed at Hisar laboratory from Ludhiana, Delhi, Pusa, Kanpur, Indore, Dhandhuka, Powarkheda, Pune, Dharwad and Niphad. It will also undertake the analytical work for salinity/alkalinity trials from the centres already identified.
7. NIVT 5B durum trial samples will be analysed by the laboratory at Dharwad. The centres namely, Kota, Dhandhuka, Indore, Powarkheda, Pune, Dharwad and Niphad will send the samples to the concerned lab.
8. All diccocom samples will be analysed by Dharwad centre. The material will be from Dharwad, Pune, Arabhavi, Wellington, Vijapur and Junagarh.
9. Grain Quality Laboratory at IARI, New Delhi will analyse wheat samples of Quality Components Screening Nursery (QCSN) for grain appearance score, test weight, protein content, grain hardness index, sedimentation value, phenol test and some Promising lines for products evaluation, if grain quality is enough.
10. All the AVT samples from all those centres, which were subjected to analysis in 2010-11, will be analyzed by DWR Quality lab. All the II<sup>nd</sup> year AVT entries including checks will be analyzed for various quality parameters including baking evaluation.
11. The durum entries both from NIVT 4 and NIVT 5B will be analyzed by Pune laboratory for  $\gamma$ -gliadin 45.

12. The last dates for supplying the samples by respective centres were finalised as follows:  
NHZ & SHZ (15<sup>th</sup> June 2012), NWPZ & NEPZ (20<sup>th</sup> May 2012), CZ (10<sup>th</sup> May 2012) and PZ (30<sup>th</sup> April 2012)
13. All the wheat grain samples, duly cleaned and properly packed in polythene bags separately, enclosed in cloth bags should be sent by registered post parcel. The *T.dicoccum* samples should be sent after dehusking.
14. All the co-operators, who are analyzing the wheat samples of various NIVTs, Special Trials and QCSN, should send the data to DWR, Karnal positively by 20th July, 2012, by e-mail and also hard copy with C.D.

### **Recommendations (2011)**

1. The group recommended that breeders should make use of the genetic resources and other promising genotypes excelling in important quality parameters including end products in their crossing programme to improve the industrial quality of wheat. The scientists associated with the wheat quality programme at the respective centres would help them in this endeavour (Action: concerned breeders and quality scientists).
2. The group felt that a network project on bio-fortification should be initiated to improve the nutritional quality. For this, a centralized, high through put laboratory facility should be created at one centre (Action : DWR, Karnal).
3. It is recommended that the centres with molecular work facilities should actively utilize molecular markers available in public domain for different quality traits to enhance the screening efficiency of advancing progenies for the improvement of wheat quality. The work on molecular breeding should be strengthened (Action: Breeders, molecular scientist and quality scientist).
4. The breeders are requested to make use of the quality analysis facilities pertaining to important quality parameters available at different centres for germplasm screening and making use of the superior lines in the crossing programme (Action: concerned breeders and quality scientist).
5. The UAS, Dharwad is working on quality/ therapeutical /clinical aspects of *T.dicoccum* wheat, which needs to be strengthened (Action: Nutritionists, Biochemists, Food and Technology Scientists and Breeders at U.A.S., Dharwad).
6. The Quality Component Screening Nursery (QCSN) would continue to be conducted at 12 centres (**NHZ**: Almora; **NWPZ**: Ludhiana, Durgapura, Delhi, Pantnagar & Hisar; **NEPZ**: Kanpur & IARI Regional Centre at Pusa Bihar; **CZ**: Indore & Vijapur and **PZ**: Pune & Dharwad) and DWR will continue to organise this nursery. The wheat grain samples would be analysed for 6 quality parameters and also some of the promising entries for product quality if the grain quantity is enough. The breeders are requested to : (a) provide at least 500g, for plot size 4 lines X 2.5m length), (b) mention the parentage of the entries supplied for QCSN, (c) contribute the entries only after initial quality evaluation. The breeders are also requested to ensure proper conduct of this nursery and timely supply of requisite quantity of grains to IARI, New Delhi for quality analysis (Action: Concerned breeders and quality scientists, DWR, Karnal and IARI, Karnal).
7. As some new scientists have joined the wheat quality programme, it is proposed to organize a short duration hands-on training programme for human resource development (Action: DWR, Karnal).

## Research Planning Meetings Barley Network

September 1<sup>st</sup>, 2011

Chairman: Dr. R.P.S. Verma  
Rapporteurs: Drs. R. Selva Kumar  
P.K. Gupta

### Finalization of work plan and Recommendations

The barley scientists belonging to breeding, agronomy, quality and pathology disciplines deliberated and reviewed the results of each trial series. Following the set norms on yield, disease (rust diseases), and quality parameters, the desirable test entries were promoted / retained in different trials. Finally, the constitution of various trial series in NWPZ/ NEPZ/CZ/NHZ was completed with the collective wisdom. The details of various breeding yield trials/ agronomical experiments and plant pathological nurseries/experiments finalized for conduction during 2011-12 crop season are as given hereunder:

### A) Yield Evaluation Trials

Name of Trial	AVT-RFTS-NHZ	
<b>No. of Trial Centres</b>	13	
<b>State</b>	<b>NO.</b>	<b>Name of centres</b>
Himachal	7	Bajaura, Berthein, Kangra, Katrain, Malan, Sundernagar, Shimla
Uttarakhand	5	Almora, Ranichauri, Majhera, Gagar, Chakrauta
J&K	1	Rajauri
No. of varieties including checks	20	
<b>Contributing Centres</b>	<b>No.</b>	<b>Name of varieties</b>
IARI, RS, Shimla	6	<b>BHS398, BHS400, BHS402, BHS403, BHS404, BHS405</b>
Pantnagar	3	UPB1021, UPB1022, UPB1023
Almora	6	<b>VLB118*, VLB124, VLB128, VLB129, VLB130, VLB131</b>
Bajaura	2	HBL711, HBL712
Checks	3	HBL113, UPB1008(I), BHS352

Name of Trial	AVT ( SAL / ALK) NWPZ / NEPZ	
<b>No. of Trial Centers</b>	7	
<b>State</b>	<b>NO.</b>	<b>Name of centers</b>
U.P.	3	Dalipnagar, Faizabad (2 sets)
Haryana	2	Hisar, Bawal
Rajasthan	2	Rampura, Bhilwara
<b>No. of varieties including checks</b>	<b>18</b>	
<b>Contributing Centers</b>	<b>No.</b>	<b>Name of varieties</b>
Durgapura	6	<b>RD2794*, RD2816, RD2820, RD2839, RD2840, RD2842</b>
Hisar	4	<b>BH946, BH959, BH960, BH963</b>
Faizabad	3	NDB1536, NDB1541, NDB1544
Varanasi	2	HUB222, HUB223
Kanpur	1	K1185
Checks	2	RD2552, NDB1173

<b>Name of Trial</b>	<b>AVT-IRTS-NWPZ</b>	
<b>No. of Trial Centres</b>	<b>10</b>	
<b>State</b>	<b>NO.</b>	<b>Name of centres</b>
Haryana	3	Bawal, Hisar, Rohtak
Punjab	2	Bathinda, Ludhiana
Uttarakhand	1	Pantnagar
Rajasthan	4	Durgapura, Navgaon, Tabiji, SG Nagar
<b>No. of varieties including checks</b>	<b>8</b>	
<b>Contributing Centres</b>	<b>No.</b>	<b>Name of varieties</b>
Durgapura	2	RD2811, RD2809
Varanasi	1	HUB113
Hisar	2	<b>BH932*</b> , BH946
Checks	3	RD 2035, RD 2552, BH902

<b>Name of Trial</b>	<b>AVT –IRTS-NEPZ</b>	
<b>No. of Trial Centres</b>	<b>7</b>	
<b>State</b>	<b>NO.</b>	<b>Name of centres</b>
UP	3	Kanpur, Faizabad, Varanasi
MP	1	Rewa
Jharkhand	1	Ranchi
Bihar	2	Pusa(IARI), Sabour
<b>No. of varieties including checks</b>	<b>6</b>	
<b>Contributing Centres</b>	<b>No.</b>	<b>Name of varieties</b>
Durgapura	1	RD2811
Hisar	1	BH946
BHU Varanasi	2	HUB113, HUB114
Checks	2	RD 2552, Jyoti

<b>Name of Trial</b>	<b>AVT –IRTS- Central Zone</b>	
<b>No. of Trial Centres</b>	<b>5</b>	
<b>State</b>	<b>NO.</b>	<b>Name of centres</b>
Rajasthan	3	Kota, Udaipur, Banswara
Gujarat	2	SK Nagar, Vijapur
<b>No. of varieties including checks</b>	<b>10</b>	
<b>Contributing Centres</b>	<b>No.</b>	<b>Name of varieties</b>
Hisar	2	<b>BH933*</b> , BH947
Ludhiana	1	PL854
Durgapura	6	<b>RD2784*</b> , <b>RD2786*</b> , <b>RD2787*</b> , RD2808, RD2809, RD2811
Checks	1	PL751

<b>Name of Trial</b>	<b>AVT-IRTS-MB-NWPZ</b>	
<b>No. of Trial Centres</b>	<b>11</b>	
<b>State</b>	<b>NO.</b>	<b>Name of centres</b>
Haryana	3	Hisar, Karnal, Bawal
Punjab	2	Bathinda, Ludhiana
Rajasthan	3	Navgaon, Durgapura, SG Nagar
U.P.	2	Modipuram, Mathura
Uttrakhand	1	Pantnagar
<b>No. of varieties including checks</b>	<b>5</b>	
<b>Contributing Centres</b>	<b>No.</b>	<b>Name of varieties</b>
Karnal	2	DWR92, DWR93
Checks	3	K551, DWRUB52, BH902

<b>Name of Trial</b>	<b>AVT-IRLS-MB- NWPZ</b>	
<b>No. of Trial Centres</b>	<b>8</b>	
<b>State</b>	<b>NO.</b>	<b>Name of centres</b>
Haryana	2	Hisar, Karnal,
Punjab	2	Bhatinda, Ludhiana
Rajasthan	2	Durgapura, SG Nagar
U.P.	1	Modipuram
Uttrakhand	1	Pantnagar
<b>No. of varieties including checks</b>	<b>5</b>	
<b>Contributing Centres</b>	<b>No.</b>	<b>Name of varieties</b>
Karnal	2	<b>DWR91*</b> , DWR92
Checks	3	K551, BH902, DWRB73

<b>Name of Trial</b>	<b>AVT (Dual Purpose Barley) Rainfed Timely Sown , NH Zone</b>	
<b>No. of Trial Centers</b>	<b>5</b>	
<b>State</b>	<b>NO.</b>	<b>Name of centers</b>
H.P.	3	Shimla, Bajaura, Palampur
Uttrakhand	2	Almora, Majhera
<b>No. of varieties including checks</b>	<b>20</b>	
<b>Contributing Centers</b>	<b>No.</b>	<b>Name of varieties</b>
Shimla	6	BHS407, BHS408, BHS409, BHS410, BHS411, BHS412
Pantnagar	3	UPB1021, UPB1022, UPB1023
Bajaura	2	HBL711, HBL712
Almora	6	<b>VLB127</b> , VLB128, VLB129, VLB130, VLB131, VLB132
Checks	3	HBL276, BHS169, BHS380

Name of Trial	IVT- Malt Barley -NWPZ (Timely Sown)	
No. of Trial Centers	10	
State	NO.	Name of centers
Haryana	3	Bawal, Hisar, Karnal
Punjab	2	Ludhiana, Bathinda
Rajasthan	2	Durgapura, Navgaon
U.P.	2	Modipuram, Mathura
Uttarakhand	1	Pantnagar
No. of varieties including checks	20	
Contributing Centers	No.	Name of varieties
Hisar	4	BH963, BH964, BH965, BH966
Karnal	5	DWRB101, DWRB102, DWRB103, DWRB104, DWRB105
Durgapura	4	RD2848, RD2849, RD2850, RD2851
Ludhiana	3	PL867, PL869, PL870
Checks	4	K551, DWRUB52, RD2668, BH902

Name of Trial	IVT- Malt Barley -NWPZ (Late Sown)	
No. of Trial Centers	7	
State	NO.	Name of centres
Haryana	2	Hisar, Karnal
Punjab	2	Ludhiana, Bathinda
Rajasthan	1	Durgapura
U.P.	1	Modipuram
Uttarakhand	1	Pantnagar
No. of varieties including checks	17	
Contributing Centres	No.	Name of varieties
Hisar	3	BH967, BH968, BH969
Karnal	5	DWRB103, DWRB104, DWRB106, DWRB107, DWRB108
Durgapura	4	RD2852, RD2853, RD2854, RD2855
Ludhiana	1	PL870
Checks	4	DWRUB52, DWRB73, K551, BH902



Name of Trial	Initial Varietal Trial –IR-FB- NWPZ/ NEPZ / CZ	
No. of Trial Centers	16	
State	NO.	Name of centers
Haryana	1	Hisar
Punjab	1	Ludhiana
Rajasthan	5	Durgapura, Tabiji, Navgaon, Banswara, Udaipur
Uttarakhand	1	Pantnagar
U. P	3	Kanpur, Varanasi, Faizabad
M. P	1	Rewa
Gujarat	2	Vijapur, SK Nagar
Bihar	1	Pusa
Jharkhand	1	Ranchi
No. of varieties including checks	27	
Contributing Centers	No.	Name of varieties
Hisar	3	BH959, BH960, BH961
Varanasi	3	HUB219, HUB220, HUB221
Rewa	3	JB238, JB240, JB245
Durgapura	4	RD2830, RD2831, RD2832, RD2833
Ludhiana	3	PL864, PL865, PL866
Kanpur	3	K1184, K1185, K1186
Faizabad	1	NDB1535
Pantnagar	3	UPB1024, UPB1025, UPB1026
Checks	4	BH902, RD2552, Jyoti, PL751

Name of Trial	IVT (DP) –IRTS- NWPZ /NEPZ/CEN	
No. of Trial Centers	17	
State	NO.	Name of centers
Rajasthan	6	Bikaner, Jalore, Durgapura, Kota, Udaipur, Banswara
M.P.	2	Jabalpur, Rewa
Haryana	1	Hisar
Punjab	1	Ludhiana
UP	5	Kanpur, Faizabad, Varanasi, Jhansi, Modipuram,
Gujarat	2	Anand, Vijapur
No. of varieties & checks	20	
Contributing Centers	No.	Name of varieties
Hisar	2	BH959, BH960
Varanasi	2	HUB224, HUB225
Rewa	3	JB238, JB240, JB245
Kanpur	1	K1185
Durgapura	4	RD2834, RD2835, RD2836, RD2837
Faizabad	1	NDB1545
Ludhiana	3	PL864, PL86, PL866
Checks	4	RD2035, RD2552, AZAD, RD2715

<b>Name of Trial</b>	<b>IVT-RFTS- NEPZ</b>	
<b>No. of Trial Centers</b>	9	
<b>State</b>	<b>NO.</b>	<b>Name of centers</b>
UP	5	Kanpur, Varanasi, Faizabad, Mirzapur, Tisuihi
MP	1	Rewa
Bihar	2	Pusa, Sabour
Jharkhand	1	Ranchi
<b>No. of varieties including checks</b>	<b>16</b>	
<b>Contributing Centers</b>	<b>No.</b>	<b>Name of varieties</b>
Durgapura	4	RD2844, RD2845, RD2846, RD2847
Kanpur	3	K1181, K1182, K1183
Varanasi	2	HUB217, HUB218
Faizabad	1	NDB1526
Rewa	3	JB247, JB248, JB249
Ludhiana	1	PL865
Checks	2	K 603, Lakhan

## B) Crop Protection:

1. **Crop Health survey:** Different cooperating centres in their area of command will carry out the survey work. The infected samples of rust are to be sent to DWR, RS Flowerdale and of leaf blight to DWR, Karnal for further analysis. The new entries showing >40S rust reaction in AVT (II year) material have to be informed to DWR, Karnal and sample has to be sent to Flowerdale.
2. **Evaluation for status of host resistance in test entries:**
  - i. **Initial barley Disease screening Nursery (IBDSN):** The nursery will have **test entries** of station trial of major barley breeding centers. The entries will be screened against rusts and leaf blight at hot spot locations.
  - ii. **National Barley Disease Screening Nursery (NBDSN):** This will comprise of entries from yield trials (IVT and AVTs) which will be screened against three rusts, leaf blight, covered smut and powdery mildew.
  - iii. **Elite Barley Disease and insect pests screening nursery:** This will have resistant entries identified in NBDSN and other international nurseries for retesting at hot spot locations. The confirmed sources of resistance would later be shared with different barley breeders for their utilization.
  - iv. **Seedling Resistant Test (SRT) of NBDSN and elite entries:** The test would be conducted against different pathotypes of three rusts at Flowerdale, Shimla.
4. **Chemical control of barley leaf blight**
  - a. Seed treatment (ST) with Vitavax 3g/Kg
  - b. ST + Tilt spray @0.1%
  - c. ST+ Folicur spray @0.1%
  - d. Tilt spray @0.1% only
  - e. Folicur spray @0.1% only
  - f. Control without ST with Vitavax

**Replication= 3; Plot size: 2x2 m; Variety: RD2503**

## 5. Chemical control of leaf rust

- a. Tilt @0.1%
- b. Folicur @0.1%
- c. Bayleton @0.1%
- d. Tilt @0.05%
- e. Folicur @0.05%
- f. Bayleton @0.05%
- g. Dithane M45 @0.2%
- h. Control

**Replication 3; Plot size:** 2x2m; first spray during first week of February.

**Var.:** JYOTI

## 6. Chemical control of stripe rust

- a. Tilt @0.1%
- b. Folicur @0.1%
- c. Bayleton @0.1%
- d. Tilt @0.05%
- e. Folicur @0.05%
- f. Bayleton @0.05%
- g. Dithane M45 @0.2%
- h. Control

Replication 3; plot size 2x2m; first spray during first week of February.

**Var.:** JYOTI

## Entomology:

### 1. Screening of NBDSN against foliar aphids

The national barley aphid screening nursery (NBDSN) will be continued. It will comprise entries from coordinated trials.

## Nematology

### 1. Screening of NBDSN, Elite material against CCN:

The entries of NBDSN will be tested against CCN at Ludhiana, Durgapura and Hisar centers in sick plots/field.

## C) Agronomy Trials/ Experiments

**1. Varietal Evaluation:** The trials with AVT final year entries will be conducted in respective zones using the standard checks.

### **IR-TS-FB-NWPZ**

BH932

Checks: BH902, RD2035, RD2552

### **IR-TS-FB-Central zone**

BH933, RD2784, RD2786, RD2787

Check: PL751

### **IR-LS-MB-NWPZ**

DWR91

Checks: DWRUB52, DWRB73

### **IR-SAL- NWP & NEP Zone**

RD2794

Checks: RD2552, NDB1173

### **RFTS-NHZ**

VLB118

Checks: HBL113, UPB1008, BHS352

## 2. Special experiments on updating package of practices

### Ongoing experiments

#### 1 Standardization of seed and spacing for malt barley in NWPZ

##### Objectives

To study various options of seed and spacing for increasing productivity of malt barley.

##### Treatments

**A. Seed rate (Kg/ha) (Main Plots)** 1. 80            2. 100            3. 120

**B. Spacing (Sub-Plots)**            1. 18 cm        2. 23 cm

**C: Centres:** NWPZ (Hisar, Ludhiana, Agra, Karnal, Durgapura)

#### 2 Evaluation of dual purpose barley varieties for one irrigation condition in NHZ

**Objectives:** 1. To assess the performance of dual purpose barley varieties under irrigation in Northern Hills zone.

##### Treatments

##### A. Irrigation (Main Plots)

1. No irrigation without cut 2. No irrigation with cut

3. Irrigation without cut 4. Irrigation with cut

##### B. Varieties (Sub-Plots)

BHS 169, HBL 276, BHS380

**C. Centres:** Bajaura, Shimla, Malan, Almora

#### 3 Evaluation of barley varieties for restricted irrigation in NWPZ and NEPZ

**Objectives:** 1. To evaluate the performance of irrigated barley varieties under restricted water supply in NWPZ and NEPZ.

##### Treatments

##### A. Irrigation (Main Plots)

1. No irrigation (only pre sowing) 2. One irrigation (Jointing stage)

3. Two irrigation (Jointing & flowering stage)

4. Three irrigation (Jointing, flowering & grain filling stage)

##### B. Varieties (Sub-Plots)

RD 2552, BH902 and DWRUB 52 for NWPZ

RD 2552, K 551 and K 508 for NEPZ

**C: Centres:** NWPZ (Hisar, Karnal, Ludhiana, Agra, Durgapura)

NEPZ (Kanpur, Varanasi, Rewa, Faizabad)

#### 4 Effect of nitrogen doses and time of application for dual purpose barley in NHZ under rainfed conditions.

**Objectives:** To study the effect of nitrogen levels and scheduling on forage and grain yield.

Treatments:

##### A. N levels Kg per ha (Main Plots)

1. 40 2. 60 3. 80

##### B. N scheduling (Sub-Plots)

1.  $\frac{1}{2}$  basal+  $\frac{1}{2}$  immediate after cut (70DAS)

2.  $\frac{1}{2}$  basal+ $\frac{1}{4}$  immediate after cut (70DAS)+  $\frac{1}{4}$  tillering after cut (100DAS)

3.  $\frac{1}{2}$  basal+ $\frac{1}{3}$  immediate after cut+  $\frac{1}{3}$  tillering after cut

4.  $\frac{2}{3}$  basal+  $\frac{1}{3}$  immediate after cut (70DAS)

5. Full at basal

**C: Centres:** Bajaura, Malan, Almora            Variety: BHS380

## **5 Effect of FYM and vermicompost on barley under rainfed condition in NHZ**

### **Objectives**

To study the effect of FYM and vermicompost for enhancing barley productivity on sustainable manner

### **Treatments**

1. 100% RDF– Inorganic fertiliser
2. 100% RDF– FYM
3. 100% RDF– Vermicompost
4. 75% RDF + 25% FYM
5. 75% RDF + 25% Vermicompost
6. 50% RDF + 50% FYM
7. 50% RDF + 50% Vermicompost
8. 25% RDF + 75% FYM
9. 25% RDF + 75% Vermicompost
10. Absolute control

Design: RBD

**Centres:** Bajaura, Malan, Almora      **Variety:** HBL113

## **6 Compatibility of barley varieties for different weed management options in NEPZ**

### **Objectives**

To study the performance of different barley varieties under various weed management practices.

### **Treatments**

#### **A. weed management practices (Main Plots)**

1. Weed free – 2 manual weedings
2. Weedy check
3. Isoproturon + 2,4-D

#### **B. Varieties (Sub-Plots)**

RD 2552, K 551, NDB1173 and Jyoti

**C: Centres:** NEPZ (Kanpur, Varanasi, and Faizabad)

**New experiments :** In addition to ongoing experiments of continuing nature, resource management group planned one new experiment.

## **7 Productivity and profitability of different intercrops in feed barley**

### **Objectives:**

To identify best combination of intercrop with barley

### **Treatments**

1. Barley + mustard 6:1
2. Barley + mustard 6:2
3. Barley + mustard 6:3
4. Barley + gram 2:1
5. Barley + gram 4:2
6. Barley + gram 6:3
7. Sole barley, mustard and gram

**Centres:** NWPZ (Agra, Durgapura, Hisar)

## Recommandations (Barley)

- Reduced tillage (one harrowing + one cultivator) can be practised in NWPZ in place of conventional tillage, where as zero tillage can be adopted only in sandy loam and loamy soils in the zone.
- In dual purpose barley, in addition to the basal dose (1/2), nitrogen should be applied in two splits after green forage cut (half immediate after cut and half 30 days after cut) instead of full immediate after cut in NEPZ and NWPZ.
- The seed treatment with Vitavax Power @ 3g/kg and Gaucho @ 0.06 g a.i./kg of seed at sowing and if need arise, foliar sprays of Tilt (25 EC) @ 0.1% at the appearance of rusts and foliar blight. If required, foliar sprays of Confidor @ 20 g a.i./ ha at the appearance of foliar aphids.
- Foliar spray of new chemical, Clothianidin @ 15g ai/ha or Imidacloprid @20g ai/ha is recommended for management of aphids.

## **SESSION III**

### **Crop Year Review, 2011-12**

**September 2, 2011**

**Chairman:** Dr Swapan K Datta  
**Co-Chairmen:** Dr RP Dua  
Dr Indu Sharma  
**Rapporteurs:** Dr SC Tripathi  
Dr Rajbir Yadav

The session started with welcome note by the Chairman Dr. Swapan K Datta, DDG, Crop Science. The session was co –chaired by Dr. RP Dua, ADG(FFC), Dr. Indu Sharma, PD (Wheat). The first presentation was of Dr. Hans Braun, Director, Global wheat Programme. He emphasised on the importance of wheat crop as it is consumed by 2.5 billion people across 89 countries and the most important source of protein globally. Beside, wheat is major source of calorie for most of the European, American and African continent. He stressed on the need to increase the production of wheat as global price of wheat is likely to be increased by more than 70 per cent if there is no significant change in climatic condition but if the climatic condition changed, then it is likely to be spurred by more than 120 per cent. To remove the poverty and malnutrition, wheat productivity has to increase to the level of 5 ton/ha by 2030 which can only be achieved by joint and collaborative de novo research between international scientist and scientists among the South Asian and African countries. According to him, the gap between realised and potential yield can be bridged by Agronomy, Breeding groups and suitable policies. He targeted the technologies like sustainable wheat based cropping system with higher fertilizer and water use efficiency along with conservation agronomy; relay cropping of wheat in standing cotton crop. He also laid emphasis on physiological manipulation like reduced photorespiration, Rubisco optimisation, increased sink demand and strong stalk.

This was followed by the presentation by Principal Investigators of different sections. Dr.Vinod Tiwari presented the report for crop improvement. During the year 2011, 8 varieties of wheat were released by CVRC for different zones and production conditions. Beside these, 10 new genetic stocks for different traits including 3 for wheat quality were registered with NBPGR during the cropping year. He informed the house that in the year 2010-11, 37 series of yield trials were conducted at 381 locations and over all conductance and reporting was better than the last year. The entries promoted to the next stage were finalised in the concurrent session of the crop improvement and are appended in this report. He also informed that eight national nurseries were also conducted at number of locations to expose the germplasm to the breeders of the different centres. Besides, 19 international nurseries and trial for bread wheat, durum wheat and Triticale were conducted in which a large number of international materials from CIMMYT and ICARDA were exposed for selection to the breeders. Breeder seed production produced for different varieties and indent received were also shared with the house. In the year 2010-11, there was no major shift in the profile of the varieties for which indent was received in comparison to the previous year, however, the indent received for the year 2011-12 reflect a very healthy trend as newer varieties are now replacing the older varieties. The maximum indent received for the year 2011-12 was for the variety PBW 550 HD 2733, DBW 17 and GW322. He also shared with the house that nucleus seed production at present is carried out for 177 varieties. In physiological investigations, genotypes like HD 2864, PBW 621, HI 1563 and MP 4106 were found

to have lower heat sensitivity index and these offers good opportunities for further improvement.

Dr AK Sharma, PI, Crop Protection presented the report and shared with the delegates that we are putting major emphasis on disease surveillance, identification of resistant sources, pathotype distribution and gene postulation, beside developing integrated management strategies for the a healthy wheat crop throughout India. He emphasized that last year being exceptionally favourable for yellow rust development, there was lack of diverse material with acceptable level of yellow rust resistance for Northern Hills Zone and North Western Plains Zone and therefore more efforts are needed to develop the resistant varieties. He informed the house that the major genes for leaf rust floating in Indian wheat varieties released for different zones are *Lr* 1, 3, 10, 13, 19, 23, 24, 26, 34 and many of these are defeated by the availability of matching virulence in the pathogen and therefore some more genes from other sources are needed to be used. Similarly, for yellow only few genes like *Yr2*, *YrA*, 9, 18 and 27 are only being exploited and there is immediate need to diversify the base. He also opined that stem rust samples were used to be found in isolated cases in NHZ and NWPZ during 1990s and most of these use to be very weak race like 12-2, so there is no immediate concern of finding of few samples of black rust in Leh region.

Dr. RK Sharma, presented the report for resource management and he shared with the house that the rejection percentage of trials was very less. He also told that this year, every centre received the seeds of testing entries from the respective breeder well in time. In different agronomical trials conducted, 7 test entries were significantly better than the check. In row spacing experiment, row spacing of 17.5 and 20 cm was found significantly better than the usual 23 cm row spacing in NHZ, NWPZ and NEPZ. However, in Peninsular and Central Zone, there were no such advantages of narrow row spacing. Similarly, he shared with the house that time of sowing is of great concern in NEPZ and from the experiments conducted, it was found that 12-18 November sowing was better than the other dates in this particular zone. He also opined that relay cropping of wheat with cotton can help to overcome the yield penalty in wheat due to delayed sowing in normal case.

Dr RK Gupta, PI (Wheat Quality) presented in his report that some of the test entries like Lok 62 and HI 1571 are equally good besides the established varieties for chapati like C 306, PBW 175, HI 1563, K 8027, HD 2888, HI 2864, HI 1500. Similarly, the new genotypes like PBW 639 and Lok 62 are good for bread, HI 8703 for pasta products. For biscuit, the already released variety HS 490 was showing maximum spread factor. He presented the list of the genotypes which can be used for improving different components of quality traits like protein, wet gluten, dry gluten, gluten index, sedimentation value, grain hardness, extraction rate. For nutritional quality, he shared that the genotypes like HI 8627, MACS 1967 for iron, WHD 946, MACS 1967 and WHD 946 and many others for copper and manganese are good. He also presented the list of genotypes with protein content in the range of 14-15 per cent and loaf volume around 600cc etc., Besides, he shared with the house that DWR is working on breeding for improvement of quality traits and as a result, number of advance lines are showing good improvement in different quality parameters like protein content and sedimentation value.

The report on Barley Network was presented by Dr RPS Verma. He shared with the house that the barley production increased by about 16 per cent over last year largely due to increased area and productivity in Rajasthan. During the cropping year, 2 varieties namely DWRB73 and UPB 1008 have been released by CVRC. He



also shared with the house that a total of 15 trial series comprising 137 trial were proposed during the year out of which 134 were conducted. He shared that some of the advance entries of 2 row-type in AVT were as high yielding as six row type with the distinct advantage for malting traits. There was significant increase in indent of barley varieties in recent years largely because of increased indent from Rajasthan and the maximum indented variety was RD 2035. In yellow rust inoculums, the predominating race was *ISO*. Under resource management, it was found that yield under reduced tillage was at par with conventional tillage but both were better than zero tillage. DDG queried on reasons of barley giving higher yield narrow spacing and emphasised that more data need to be generated on this aspect.

Dr Randhir Singh presented the report on the impact of FLDs on popularisation of technologies. He shared with the house that during the cropping year, a total of 826 FLDs were conducted and showed that some of the technologies like Zero Tillage showed a gain of 5.61 per cent. Similarly, yield gain due to adoption of newer varieties over regional yield levels was reported to be as high as 73 per cent for NHZ, 34 per cent for NEPZ and 20 per cent for NWPZ. For Central and Peninsular Zones, it was found to be 44 and 33 per cent , respectively. *Phalaris minor*, motha and Bathua were found to be main constraints in production. He stressed that awareness about yellow rust, balanced fertilizer and burning of residues are some of the issues which need extensive coverage under the awareness programme. Dr J P Tandon suggested that rather than using the regional yield as a bench mark for comparison of technologies, check yield should be used. PD Wheat, Dr Indu Sharma, suggested that resource management group should start experiments on newer techniques. The session ended with vote of thanks to the Chair.

## SESSION IV

### Harnessing Science for Enhanced Wheat and Barley Productivity

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September 2, 2011

**Chairman:** Dr B Mishra  
**Co-Chairman:** Dr K V Prabhu  
**Rapporteurs:** Dr R Chatrath  
Dr Anju M Singh

In his opening remark, Dr B. Mishra emphasized that rice and wheat contribute more than 40% of food demand of the nation and are nicely placed in agenda for systematic crop improvement research. He mentioned that achievement is commendable and to be acknowledging but there should not be complacency particularly in the context of predicted adverse effects of climate change hence he felt that we should give special emphasis on harnessing science for further improvement in wheat and barley.

Paul Fox (ACIAR) stressed on data management prior to applying knowledge generated through research for integrating molecular approaches in wheat breeding. He had words of caution for applying the technologies derived from review of old and visions related to new technologies. He said that data management and field books come before allele mining and bioinformatics for functional genomics. He felt that bioinformatics can save the resources by avoiding redundant evaluation and can facilitate knowledge sharing without issues related to germplasm exchange. He said that unique internationally-agreed genealogy-based identifiers are essential for data management and sharing. By doing so we can avoid duplication of knowledge in different terms For eg. as in case of PBW343 =Attila; Australian Eagle = US eagle. Referring to the status ICAR and ACIAR collaboration, Dr Paul Fox indicated that the present collaborative research are focused on following broad aspects viz. bioinformatics, yield & diseases, water use efficiency, industrial quality, micro-nutrients and water-logging and heat stress which is Indirectly addressed. Paul fox expressed his concerns about current MAS project 2007 that he felt hugely under resourced with respect to data management. He mentioned that waterlogging and micro nutrient 2008 needs more time to identify and apply markers for wheat improvement and projects on Rust scoping and roots, shoot and WUE in progress. He felt that since its inception in September 2008, there has been excellent progress in all aspects of disciplinary research and basic marker use. Further he felt that extending these gains in bioinformatics to allele mining and functional genomics will require a longer term commitment. He also mentioned about small MAS Project for industrial quality. He also gave an over view of present strategy to achieve the objectives of ACIAR-ICAR collaboration Quality Protein Maize (QPM) which took 40 years. He mentioned that Quality Protein Wheat (QPW) will be the new challenge that can be achieved with greater pace. He suggested that Indo Australian collaboration should target QPW in India in 5 years with DNA-based markers as QPM orthologues, the Storage Protein Accumulator genes, are identified in wheat. In addition the grains can be biofortified with Fe and Zn.

Dr Vasal in his presentation entitled "Hybrid Technology: A Way Forward To Yield Revolution" gave a detailed account of key factors in the success story of Maize hybrids. He advised scientist to keep working-with conventional approach and pointed that with progress, new ideas continue to emerge and will lead us to successful hybrid programme. He emphasized need for maximizing heterosis manifestation- which is a never ending challenge. He felt that heterosis management is critical while breeders' skills and approaches will become more sophisticated with

advances in technology. He expressed his confidence that it is possible to produce hybrids in all kind of crops. He suggested giving emphasis on hybrid performance, economics of seed production, productive hybrids, stability and preparedness against biotic vulnerability. He advised that while developing hybrid technology it is necessary to stick to a set of rules/procedures and there is a need of dedicated efforts. With maize hybrid programme as a model there is necessity of a careful survey of existing germplasm for heterotic patterns which is crucial for hybrid wheat programme. He felt that to make hybrid wheat possible for various ecologies, conditions to be planned and a database of heterotic groups should be useful.

Dr Ravi Singh from CIMMYT, Mexico in his presentation entitled “Breeding Strategies for Rust Resistance in Wheat” conveyed that strategies for future should consider the fact that further advances would come largely in the form of smaller gains with hard work. He felt that better strategies will emerge from lessons learnt from a century of research on pathogen epidemiology, genetics of resistance and resistance breeding success will be determined by pathogen diversity, evolution and migration; screening methodology, environment; resistance diversity and its utilization. He gave a detailed account of strategies that can be followed to address both monogenic –Race specific (Boom and bust) and durable resistance. He said that in case of race specific approach we should prepare for boom and bust, e.g. Altar –resistance lasted for long finally broken. He felt that there is a need for a strong scientific group that searches/procures new genes, evaluates the effectiveness, incorporates in adapted wheat germplams and can devote time in validation. For race specific resistance genes deployment strategies he suggested two effective genes longer resistance; proper marker as a national strategy; selection coupled with other traits (e.g. grain yield). He indicated that the number of genes in the combination of genes will determine duration of resistance. He suggested a centralized system to ensure diverse gene combinations that can be achieved using markers for deployment in different zones. On the other hand he felt that durable resistance can give higher returns in long term. He emphasized high yielding genotypes with minor genes based on field selection in conjunction with other traits where higher focus for other traits. He said that slow rusting genes are known: not only for leaf rust but also for other rusts and pathogen; Further he mentioned that for slow rust 4-5 minor gene are maximum and disease severity is more with 1 or 2 minor genes that are inadequate and there are no perfect marker which may need more time. He gave following recommendation for AICWIP: Use seedling infection type and adult plant severity data to classify PPSN entries into APR categories. Establish which APR categories are safe for releasing varieties in different zones. Each year, identify best adapted lines with APR and distribute to breeding programs. Breeding programs increase focus in utilizing high-yielding, APR sources without mixing them with race-specific resistance sources. Conduct selection under high disease pressures in field; selection pressure to increase as generation advances. In concluding remarks he said that although both race-specific and slow-rusting resistance sources are available, the utilization of durable APR is CIMMYT’s preferred strategy. Further, he predicted that higher rates of genetic progress is expected in CIMMYT breeding program in the future because most crosses will involve high-yielding, APR parents. He added that deployment of new higher yielding, triple rust resistant CIMMYT germplasm should lead to enhanced productivity and food security.

Dr. N K Singh (NRCPB) gave presentation on “Wheat genome sequencing efforts and application opportunities”. He informed the house about the products developed through MAS in rice particularly blight resistance and submergence. He

talked about various stages of gene mining and utilization in MAS. At present process of gene discovery and allele mining is slow but he foresees that genome sequencing will enhance the process of gene discovery. He informed about India's partnership in the wheat genome sequencing project and India will be sequencing 2A chromosome of wheat. He also gave an overview about the materials and techniques to be used in the wheat genome sequencing project. He was of the opinion that whole wheat genome sequence information will be available in public domain in next 3-5 years. He stressed upon the capacity building in the field of bioinformatics and development of phenotyping facilities in network mode in India.

Dr. Michael Baum (ICARDA) presented on "Challenges and achievements in wheat & barley improvement to enhance food security in the era of climate change". He discussed about the issues and opportunities for enhancing production and production stability under climate change. He emphasized on the collaboration between ICARDA and India on exploitation and use of diverse genetic resources. More efforts should be put on wide crossing and use of synthetic wheat to transfer genes for disease resistance, heat and drought tolerance.

Dr. A.K. Joshi (CIMMYT-South Asia) gave a presentation on "Are we prepared to handle spot blotch disease of wheat in South Asia?" Leaf blight became important after green reevaluation and *B. sorokiniana* is the major pathogen. Dormancy has been observed in this pathogen and he emphasized that pathologist need to work on survival of pathogen. He also informed that several traits like erect leaf, stay green and leaf tip necrosis are associated with disease resistance. Molecular marker for *Lr34/Yr18/Pm34* can also be used for MAS for leaf blight resistance. He informed the house about various resistance sources. He also discussed about the breeding strategy for leaf blight. Newer varieties are showing resistance but search for new resistance sources and their incorporation should continue.

Chairman thanked all the speakers for their nice and informative presentation.

**SESSION V**  
**Varietal Identification Committee Meeting**  
**(Venue: NASC Complex, New Delhi)**

September 02, 2011  
6.00 PM onwards

**Chairman:** Dr. Swapan K. Datta  
**Member Secretary:** Dr. Indu Sharma

The meeting of Varietal Identification Committee of Wheat & Barley was held at NASC Complex, New Delhi on 2<sup>nd</sup> September, 2011 under the Chairmanship of Dr. Swapan K. Datta, DDG (CS). The meeting was attended by the following:

**Voting Members:**

1. Dr. Swapan K Datta, DDG (CS), ICAR, Krishi Bhavan, New Delhi -11000
2. Dr. R.P. Dua, ADG (FFC), ICAR, Krishi Bhavan, New Delhi -11000
3. Dr. Malvika Dadlani, Joint Director Research, IARI, New Delhi-110012
4. Dr. K.C. Bansal, Director, NBPGR, New Delhi - 110012
5. Dr. N. Emayavaramban, GM (Production), NSC. Beej Bhavan, New Delhi-110012
6. Dr. D.P. Singh, AGM, NSC, New Delhi -110001
7. Dr. B. Mishra, Vice-Chancellor, SKUAST-J, Jammu
8. Dr. J.P. Tandon, Former Project Director, DWR, A-72, Sector-14, Noida-201301, UP
9. Dr. G.S. Nanda, Former Director Research, PAU, Ludhiana
10. Dr. B.K. Mishra, C-5, A/163, Janakpuri, New Delhi-110058
11. Dr. Gurdev Singh, Deputy General Manager, Sriram Fertilizer & Chemicals, H.No.6, South Model Gram, Ludhiana -141002, Punjab
12. Dr. (Ms.) Indu Sharma, Project Director, DWR, Karnal

**Non-Voting Members:**

1. Dr. Vinod Tiwari, PI (CI), DWR, Karnal
2. Dr. R.K. Gupta, PI (QBS), DWR, Karnal
3. Dr. R.K. Sharma, PI (RM), DWR, Karnal
4. Dr. A. K. Sharma, PI (CP), DWR, Karnal
5. Dr. Ravish Chatrath, PI, Tech. Cell, DWR, Karnal
6. Dr. R.P.S. Verma, PI (PI) Barley Network, DWR, Karnal
7. Dr. S.C. Bhardwaj, Principal Scientist, DWR RS, Flowerdale, Shimla.

The committee considered a total of 17 proposals (14 wheat and 3 barley) submitted for identification and after detailed deliberations, made the following recommendations as indicated against each proposal

	<b>Name of Variety</b>	<b>Production conditions</b>	<b>Recommendations</b>
<b>WHEAT</b>			
<b>Northern Hills Zone (NHZ):</b> Hills of J & K (except Jammu and Kathua districts), H.P. (except Paonta Valley and Una district), Uttarakhand (excluding Tarai region), Sikkim and hills of W.B. and N.E. States.			
1	HS 514	IR-TS & RF-TS	The proposed entry was considered by the committee. Though it showed some yield advantage in irrigated conditions there was no

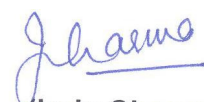
			advantage under rainfed conditions. But the entry showed susceptibility against brown rust, hence it was not identified for release.
2	TL 2969	IR-TS & RF-TS	The proposed entry was considered by the committee for both the conditions. The said entry was tested for three years under rainfed conditions where it has shown yield advantage over the check and possessed resistance to yellow and brown rust. Hence it was identified for rainfed conditions of NHZ only.
<b>North Western Plains Zone (NWPZ):</b> Punjab, Haryana, Delhi, Rajasthan (except Kota & Udaipur divisions), West U.P. (except Jhansi division), Jammu & Kathua districts of J & K, Paonta Valley & Una district of H.P., and Tarai region of Uttarakhand.			
3	PDW 322 (d)	IR-TS	The entry PDW 322 (d) was examined by the committee. The said variety did not show any yield advantage over checks and hence the entry was not identified for release.
4	WHD 946 (d)	IR-TS	The entry WHD 946 (d) did not exhibit yield superiority. The entry showed high incidence of yellow berry, hence was not identified.
5	PBW 639	IR-LS	The proposed entry PBW 639 was considered by the committee. The variety did not show yield gain and was susceptible to yellow and brown rust. Hence it was not identified for release.
6	PBW 644	RF-TS	The proposed entry PBW 644 was considered by the committee for both the conditions. It showed yield superiority and is good for creating diversity as it does not have 1B/1R translocation. It was identified for only rainfed timely sown conditions and not for restricted irrigated conditions due to high incidence of Karnal bunt.
7	PBW 644	RI-TS	
8	HD 3043	RI-TS	The proposed entry HD 3043 was considered by the committee. It had advantage in yield and genetic diversity; hence the proposal was agreed for identification.
<b>Central Zone (CZ):</b> Madhya Pradesh, Chhatisgarh, Gujarat, Kota & Udaipur divisions of Rajasthan and Jhansi division of Uttar Pradesh.			
9	HI 8704 (d)	IR-TS	The variety HI 8704 (d) was not considered for identification as the variety had no yield advantage.
10	MP 3304	IR-LS	MP 3304 was considered by the committee, however due to no yield advantage the variety was not identified for release.
11	HI 1572	RF-TS & RI-TS	The proposal was examined for both rainfed and restricted conditions. This variety did not exhibit advantage in yield, hence not identified for release.

<b>Peninsular Zone (PZ):</b> Maharashtra, Karnataka, Andhra Pradesh, Goa and plains of Tamil Nadu.			
12	UAS 428 (d)	IR-TS	The proposed entry UAS 428 was considered by the committee. The said entry exhibited yield advantage over checks along with disease resistance. Hence it was identified for release.
13	HD 3040	IR-LS	The proposal HD 3040 was considered by the committee. The proposed entry did not show any advantage in yield as well as in disease resistance, hence not identified for release.
14	MP 3299	RF-TS RI-TS	Though having yield advantage, the said entry MP 3299 has shown high susceptibility to leaf rust, hence not considered for identification.
<b>BARLEY</b>			
1	PL 830	IR-TS- NWPZ	The proposal was considered by the committee and it was observed that there is no advantage for yield or resistance in the proposed variety over the checks, hence the variety was not identified.
2	DWRUB 64	IR-LS- NWPZ	The variety had indicated the distinct advantage for grain yield over the checks and had better grain quality than six-rowed check, hence the variety was identified for release.
3	HUB 205	Soil salinity tolerance – NWPZ/ NEPZ	The proposal was considered in comparison to the checks and the committee did not find any advantage in yield and disease resistance over the checks, hence was not identified.

The Chairman, also made the following general recommendations which need to be adhered while submitting the proposal for CVRC

1. DNA fingerprinting data.
2. Four photographs showing a) a wide field view b) close up of the variety c) close up of the ear head or any distinct feature and d) picture of the seed

At the end, the member secretary proposed a formal vote of thanks to the Chairman and members of the committee.

  
(Indu Sharma)

**Project Director &  
Member Secretary**



**(Swapan K. Datta)  
Deputy Director General (Crop Sciences)  
Chairman**

## SESSION VI

### Strategies to bridge the yield gaps in wheat and barley production

September 3, 2011

Chairman: Dr JP Tandon

Co-Chairmen: Dr GS Nanda  
Dr GB Singh

Rapporteurs: Dr Randhir Singh  
Dr SK Sethi

The chairman welcomed the delegates and congratulated all the wheat and barley workers on achieving a record wheat production of 85.93 million tons. The Chairman pointed out that this session is aimed to provide an opportunity to exchange of views between state department of agriculture and researchers concerning issues related to the wheat production strategy for the forthcoming crop season. He stated that the seed chain needs to be developed and maintained in such a manner that the latest released varieties can replace the old ones within 3 years to take advantage of their resistance capabilities and also to achieve high productivity as the useful life of a variety is only around 7-8 years. He emphasized that the seed allocation to states should be finalized in this session through discussion among scientists and state Dept. Agriculture representatives as used to be done in earlier years.

He mentioned that UP is an important state with more than 9.5 million ha area and if we can increase the productivity from 30 Q/ha to the level of Haryana and Punjab, India's all food security needs can be easily met with. He also pointed out that yellow rust has appeared in an almost epidemic form during the last crop season and it should be dealt with seriously by popularizing the latest resistant and high yielding varieties.

#### **Dr GB Singh, Commissioner Agriculture, GOI**

Briefed the house about the policies of the Government of India. He mentioned that that food security law has been enacted. The per unit productivity has to be increased if second green revolution is to be realised as said by our honourable Prime Minister. About his experience in Obregon, Mexico, he mentioned that the productivity is about 7.0 ton per ha which is mainly due to low temperature (5-6°C in the corresponding period of India).

- Yellow rust was almost in epidemic form last year, the whole area was treated very quickly with greater awareness among farmers using mass media. Precautionary measures are to be taken to avoid such issues.
- Material from CIMMYT can be obtained and given to ICAR or farmers, if found appropriate
- Variety x date of planting interaction experiments are needed. Monitor temperature influence on wheat production.
- Summer moong experiments are needed to improve soil health.
- Residue burning is a critical issue and needs experimentation to develop suitable technologies.
- Relay cropping of wheat in cotton need to be studied.



- Rotavator issue has been resolved and no soil compaction with rotavator is reported. The farmers are happy with it.
- FLDs are conducted in a routine manner and it has been decided that only new technologies are to be demonstrated through this scheme.
- Seeding of wheat has to be advanced in eastern India to enhance wheat production.
- Multidisciplinary team of breeder, soil scientist, agronomy, pathology, etc have to work together to solve the existing issues.
- He mentioned that the issue of subsidy to go the directorate has to be discussed at a higher level.

#### **Dr GS Sandhu, ADG (Seeds)**

In his presentation he reported the salient findings of a study on seed. He mentioned that the Seed Replacement Rate (SRR) of wheat which was 13% in 2005-06 has increased to over 30 percent in 2010-11. Breeder seed production has also increased which helped in increasing the SRR. Seed replacement target fixed as 25 percent for self pollinated crops and 35 percent for open pollinated crops need to be revised to 35 & 50 percent, respectively. UP is having the highest SRR (39%) in India followed by Punjab, Haryana, Uttarakhand and Chhatisgarh. Breeder seed is being produced to the tune of 38000 quintal can achieve the SRR 60-65 percent. Seed indent is received from 13-15 states and other states need to give indents. Five states producing 75% breeder seed, led by MP. In Bihar and Maharashtra, breeder seed should be produced locally.

He emphasized

- varietal replacement of wheat which was 58 percent of new varieties in 2009-10 should be raised to 75 percent in 2011-12.
- Bridge the yield gap : Potential and actual yield of cultivars
- Similar strategy should be followed for barley crop in which the seed replacement needs to be improved.

Dr SS Singh raised an issue that yellow rust is a potential disease and needs immediate attention. The potential of new varieties has to be converted into production. The average yield of wheat should be enhanced from 2.9 tons per ha to 3.5 tons. He also brought to the knowledge of the house that the seed of a variety is available in the market even before it is released therefore, the standard of seed chain should be relaxed.

**Dr RP Dua, ADG (FFC)** mentioned that the seed plan should be prepared for five years in collaboration with universities and seed replacement target should be fixed.

**Dr Swapan Kumar Datta, DDG (CS)** mentioned that such a strategy will give some indications and should be consulted for the new varieties.

#### **Haryana : Dr. Ashok Yadav, DG (Agriculture)**

He reported that Haryana got the Best Krishi Karman Award for highest wheat productivity during 2009-10. Haryana is also the third highest producer of wheat in India and next to Punjab in contribution to central grain pool. In Haryana, there is 100 percent seed treatment, 34% seed replacement targeted to increase to 37 percent. There is adequate seed of the improved varieties.

He mentioned that almost all the wheat varieties were affected badly by yellow rust and a strategy should be formulated by the ICAR to replace seed within 2 years.

They followed the following strategies to increase wheat production in Haryana.

Campaign for timely sown, entire cost of fungicide to be borne by govt, demonstrations on agronomic practice, use of potassic fertilizers, 11 lakh soil health cards issued, suggest dose of fertilizers on the basis of soil testing and soil health card available online, seed minikit of improved varieties, krishi samwaid in villages, management of yellow rust, training, FFS, wide use of printed and electronic media, SMS alert of weather forecast.

Water supply assured, sprinkler irrigation and UGPL on subsidy, laser land leveller, promote zero tillage area to increase, area to increase from 5 lakh ha to 6 lakh ha, happy seeder to be promoted to conserve the natural resources.

Summer moong has replaced sathi rice in Haryana.

About barley he mentioned that contract farming of two-row barley is encouraged through HAFED. Certified seed of barley, contract farming for two row barley, zinc deficiency to address,

### **Issues to be addressed**

Yellow rust resistant and terminal heat tolerant varieties

All districts under NFSM for wheat production

Subsidy on certified seed from Rs 500 to Rs 700 per quintal

Rotavator vs zero tillage to be solved

Dr Jag Shoran suggested that there are measures to control yellow rust, we should follow those in letter and spirit. Ravi Singh, CIMMYT mentioned that we should learn from our mistakes, favourable condition for better wheat production is also conducive for pathogens, if right strategy is followed, we can avoid yellow rust.

### **Uttar Pradesh: Mr. Gautam, Director Agriculture**

He mentioned that the wheat production in Uttar Pradesh is planned to increase by one ton per ha and can move India as UP accounts for 9.5 million ha area producing more than 30 million tons annually. He needed directions from the ICAR to implement varieties released by the CVRC.

### **Issues**

*Phalaris minor* and wild oat are major weeds, Soils deficient in iron, boron, yellow rust problem,

Delayed sowing due to optimum temperature (22°C) at sowing comes in second fortnight of November.

### **Strategies**

Broadcasting to be replaced by line sowing, quality seed, high yielding varieties, advance sowing by 30 Nov, line sowing, zero till or seed drill, herbicide for 37.97 lakh area, safeguard against yellow rust in tarai region, tie up with CIMMYT, balanced use of fertilizers, efficient water management, more area under sprinkler or drip irrigation in Bundelkhand, more demonstrations, conservation agriculture, timely availability of phosphatic fertilizers, PSB required

Dr JS Sandhu suggested that line sowing in Mau area is to be popularized with proper irrigation facilities. Dr AK Joshi informed that in Chandoli district, zero tillage has been widely adopted by the farmers which increased productivity to 2.8 tone per ha. The reasons of its success in that area need to be studied and replicate the same in other areas.

Dr Tandon suggested that laser land levelling, conduct more demonstrations, subsidize zero tillage machines to advance sowing time by 15 December and encourage line sowing.

Dr Kulshreshta suggested KRL 210 and KRL 213 varieties for the salt affected area.

**Gujarat: Vadhvaniya, HK, DDA**

He reported that wheat is grown in 8 major districts of Gujarat covering about 10.8 lakh ha area under wheat. Seed replacement is 27.78%.

**Constraints**

Irrigation facilities, irregular supply of electricity, wilt disease, termite, grass hopper, stem borer,

**Strategy**

Minikit (20 kg), increase SRR, seed treatment, soil health management, efficient use of created irrigation potential, better mass media, timely quality input, electricity under Jyotigram, cropping intensity strategies, large scale mechanization under RKVY, pumpsets, & pipeline sites for irrigation, schematic support to farmers, timely sowing, zero till sowing, balanced use of fertilizer, seed treatment, efficient usage of irrigation water through sprinklers and light irrigation, frequent irrigation in case of abrupt rise in temperature, replacement of most popular varieties, (GW 495 (45% area), Lok 1 (34%) area to be replaced by latest varieties.

Rotavator, laser land leveller to be introduced in large area,

Dr RM Singh suggested encouraging sprinkler irrigation to save water; replace the old varieties and more varietal diversification for better productivity. Dr Tandon suggested salt tolerant varieties.

**Maharashtra, Prabhakar Deshmukh, Commissioner Agriculture, Maharashtra State**

The wheat productivity was 1730 kg/ha in 2010-11.

Reasons of low wheat productivity:

Delayed sowing in soybean, bajra and sugarcane based crop rotations. SRR low, low and imbalanced use of fertilizers, temperature rise during grain formation period, deficiency of micro and secondary nutrients, soil degradation and loss of fertility, poor efficiency of irrigation water, escalating cost of inputs

**Strategies**

SRR increase, productivity increase, timely sowing upto end of November, INM, seed treatment, water use efficiency, weed control, disease control, demonstrations under NFSM & ICDP, Seed distribution, sprinkler irrigation, soil ameliorants like gypsum, use of micro nutrient in deficit areas, promotion of mechanization under NFSM

Dr Mishra suggested use of MACS 6222 variety for better production instead of GW 366 and GW 322. Dr Tandon also suggested varieties developed by UAS Dharwad suitable for your areas.

**Bihar, Deputy Director Agriculture**

There is 24 lakh ha area under wheat crop in Bihar and consistent for the last few years with productivity of 2001 kg per ha 2010-11 which was less than the previous year .

**Issues**

Heat tolerance cultivars, resistant varieties to rust, short duration with high yield potential, promotional scheme for barley cultivation, ensure procurement, handy/power driven dibbler.

**Interventions**

Introduction of System of Wheat Intensification (SWI) which yielded 8-9 tons per ha will be adopted in 2.4 lakh ha in 2011-12.

Line sowing, weedicide, areas specific cultivars, zero tillage machines, timely sowing, and irrigation were the other interventions in the state.

About SWI, Dr Gurbachan Singh desired that data should be generated on this technology to be adopted at a large scale. Mr Gautam suggested that if the farmers

intend to adopt this technology, they should feel free to do so. Dr GB Singh as well the chairman agreed on that.

Dr AN Mishra suggested HI 1563 for Bihar area as it is a short duration variety and produces 4.0 ton per ha.

#### **MAJOR RECOMENDATIONS**

- DAC should ensure that the varieties released by the CVRC are immediately included in the recommendations of the concerned State Department of Agriculture package of practices without any further experimentation.
- To overcome the threat of yellow rust epidemic, varieties like PBW621-50 and HD2967 should be popularised on a large scale on priority basis. There is need for immediate appropriate action to notify HD2967 which has been recommended by the last wheat workshop.
- Zero tillage seeding technology should be extensively popularized in the eastern parts of the country particularly UP and Bihar to resolve some of the existing problems related to delayed sowing and broadcast seeding.
- Yield stagnation in productivity in Punjab and Haryana, can be overcome to some extent through more appropriate natural resource conservation measures, introduction of summer moong cultivation on an extensive scale using moong varieties like Pusa Vishal which matures in 60-65 day and recycling the biomass by avoid burning the crop residue.
- ICAR, DAC & CIMMYT need to discuss issues related to supply of genetic materials directly to agencies other than the existing ICAR system.
- System of Wheat Intensification (SWI) being propagated in Bihar needs scientific data for scientific support if any to this technology. The Directorate of Wheat Research, Karnal may generate appropriate information through scientific experimentation during the coming crop season.
- The existing system of storage of wheat should be studied in depth by the scientists.
- Propiconazole may be used as a contingency measure to control yellow rust.
- Laser land leveller may be used to increase water productivity.
- First irrigation is as important as timely sowing of wheat to increase production.

In the concluding remarks Dr JP Tandon, Chairman thanked all the speakers, participants in the discussion, organizers and the delegates present in the session.

## SESSION VII

### Strategies to Combat Stripe Rust in Wheat

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September 3, 2011

Chairman:

Dr MV Rao

Co-Chairmen:

Dr H S Gupta

Rapporteurs:

Dr A N Mishra

Dr M S Saharan

At the outset, Dr. M. V. Rao, Chairman congratulated all the wheat researchers, farmers, policy planners for record wheat production of 85.93 million tons during 2010-11 crop season. Dr. Indu Sharma, Project Director, DWR, Karnal presented a very comprehensive account of stripe rust status and its management. She informed that higher incidence and severity of stripe rust in NWPZ during 2010-11 crop season was due to cooler temperature and frequent rains during February, 2011. Environmental conditions were particularly congenial for the stripe rust pathotype 78S84, virulent on PBW 343, PBW 502 and PBW 550. Yellow rust appeared in severe form and caused significant yield losses in many neighboring countries during 2010-11 but India averted the epidemics and harvested a record production. Due to timely intervention by the ICAR, DAC, SAUs' and extension personnel, loss of 3-4 million tones could be avoided.

Dr. Sharma emphasized on the monitoring of wheat crop from December onwards at regular intervals of 20-25 days. Awareness campaigns must be strengthened further to educate farmers regarding choice of wheat varieties, avoid early sowing under shade, symptoms of stripe rust, importance of time to time field visit, detection of disease and timely fungicide spray etc. She also spoke on planting of Trap and SAARC nurseries, exploring areas of inoculum survival, identifying pathogen variability, avoid sowing of highly susceptible varieties, possibility of raising ACI limits to identify APR and slow rusting resistance, use of known gene parents in crossing programme, promoting varieties for early release and need to collect & study Barberis plants from different locations.

Dr. S.S. Singh, former Project Director, DWR, Karnal gave a presentation on wheat rust at high altitude in India. He gave an account of survey carried out by him in ten villages in Leh (Laddakh) district on both sides of the river Indus during August, 2011. He informed that incidence of stripe rust severity up to 80S in the surveyed area in Leh and at some places, incidence of stem rust was observed with severity up to 60S. He suggested that we should know pathotype(s) of stripe rust/stem rust in Laddakh and role of alternate / collateral hosts in rust cycle.

Dr. J. Kumar, Head, IARI Regional Station, Wellington made presentation on "Revisiting wheat yellow rust epidemiology in India". He informed that yellow rust races come from the western countries and yellow rust dissemination is guided by 'Katabatic' winds. Hindukush ranges seem to play focus of infection in addition to Nepal Himalayas. Commonality between northern and Nilgiris flora exist. Intensive survey of Himalayan / Nilgiris *Berberis* spp. needs to be done for their role in India as alternate host. In this era of gene pyramiding 'integrated wheat – rust management'- is the key word. Utilization of Yr 5, 10, 15 and Anza resistance should be done.

Dr. S. C. Bhardwaj, Head, DWR Regional Station, Flowerdale, Shimla spoke on implications of pathogenic / molecular variability in *P. striiformes* in resistance breeding. He informed that simple races prevailed up to 1969, but with the cultivation of diverse genotypes carrying resistance the pathogen also evolved. Hence, more complex pathotypes became predominant subsequently. At present the pt. 78S84 is most predominant. Multi- pronged strategy is required to tackle yellow rust:

- Immediate measures  
Emergency chemical spray & resistant varieties
- Long term measures  
Revisiting the epidemiology, fresh look at the role of collateral host,  
Need for exchange of information between Asian countries and go for early warning. Sequencing the genome of *P.striiformis*  
Incorporation of *Yr 36* a durable resistant gene.

Dr. N. S. Bains, PAU, Ludhiana presented a talk on “Incorporating stripe rust resistance in wheat”. He informed that research on yellow rust in India has received less attention than the other two rusts. He listed many unresolved issues:

- Why did the race 78S84 lay low for 7 years?
- What happened to resistance of DBW 17 and PBW 550?
- What is the shape & size of the green bridge?
- What proportion of inoculum flows back to source from plains?
- Which factors favored PBW 343 in NWPZ region for 13 long years?

He made following observations and hunches:

- Genes *Yr 2*, *Yr 9*, *Yr 27* monuments hit by migration of new races.
- Local evolution becomes potent only after a primary breakdown.
- Judicious chemical control may check inoculum load and pathogen evolution.
- Sourcing new genes and their MAS- based incorporation.
- Pyramiding of *Lr 24*, *Lr 28*, *Yr10* and *Yr 15* in PBW 343.
- Mopping up residual resistance and crosses for gene pyramiding through doubled haploids.
- Large numbers of QTLs can be mobilized

Dr. T. R. Sharma, Principal Scientist, NRCPB, New Delhi delivered talk on genome sequencing efforts in *Puccinia spp.* He spoke on decoding *P. triticina* genome using “whole genome shotgun approach” and a large part of leaf rust race 77 genome is repetitive which may explain the rapidly evolving pathotypes of this race.

During the discussion, Dr. T. P. Rajendran, ADG (PP) asked the need for therapeutic support for host resistance. Dr. A K Sharma PI (CP), DWR, Karnal replied that we need Integrated Disease Management. Dr. Ravi Singh, CIMMYT, Mexico told that at present fungicides are required but when new lines with additional resistance are developed, we may not need fungicides any more. Dr. Indu Sharma suggested the need to revive the SAARC Nursery on priority. Dr. S M S Tomar raised the issue that how new mutants of stripe rust are evolving simultaneously in North and in the Nilgiris. Dr. M. Prashar informed that race in Ladakh is a primitive one and has not moved out due to geographical barriers. Dr. Sharma, Palampur suggested that there is need to collect more samples from the Leh for reaching a conclusion on prevailing pathotypes. Dr. A N Mishra asked whether the genome of leaf rust race 106 has been sequenced, which has ‘0’ designation as it is avirulent on *Lr* genes’ background parent ‘Thatcher’ and most other bread wheat genotypes. Dr. T. R. Sharma replied that its genome has not been sequenced as project started only 8 months back. Comparison of “repetitive” part of the genome of race 106, when sequenced, with that of race 77, may explain the evolution of the pathogen. Dr. M. V. Rao, Chairman congratulated all the speakers for excellent presentations. He emphasized on the International collaboration and nurseries as these are very important for the rust management as the rust pathogens do not respect international borders. The meeting ended with vote of thanks to the Chair.

## SESSION IX

### Progress of Wheat Research in NEPZ: A Review

September 4, 2011

**Chairman:** Dr. GS Nanda  
**Co-chairman:** Dr. RP Dua  
**Rapporters:** Dr. SC Misra  
Dr. Gyanendra Singh

Welcoming the delegates in his opening remarks, Chairman appreciated the system of Zonal Review System in Wheat Crop. This review enhances the understanding of wheat research workers about the activities of other zones. In all, nine presentations were made from different centres namely, CSAUA&T-Kanpur, BHU-Varanasi, NDUAT-Faizabad, IARI-Pusa, BAU-Ranchi, UBKV-Coochbehar, BCKV-Kalyani, BAU-Sabour and AAU-Shillongani. All the speakers briefly discussed the achievements in different disciplines, conduction of coordinated trials, breeding materials developed along with the basic/applied research undertaken at their respective centres. Highlights of research done at these centres are given below.

#### **CSAUA&T-Kanpur: Dr LP Tiwari**

Dr Tiwari while presenting progress highlighted that CSAUA&T Kanpur has developed a large number of varieties of wheat out of which 17 are still popular for timely sown irrigated conditions, late sown conditions, very late sown conditions and terminal heat tolerant, rainfed and for saline-alkaline conditions. Centre has developed 38 wheat varieties since its inception in 1970 for general cultivation under different agro-climatic conditions. During 2010-11 UP State recorded all time high wheat production i.e. 30 million metric tonnes from an area of 9.63 million ha with enhance productivity of 31.13q/ha.

Dr. GS Nanda, Chairman, said that attempting 100 crosses per year is very less number looking at the scientific and financial support to this centre from AICW&BIP. He further emphasised the need of attempting more crosses for meeting the targeted objectives of different programmes /traits. Dr. Dua enquired about existing facilities available for drought tolerance studies at Kanpur centre and assured to strengthen few promising centres to initiate drought and heat tolerance research work with more facilities during 12<sup>th</sup> Plan at Kanpur centre. Dr Dua also requested the Project Director to write letter to university authorities about poor performance of the centre.

#### **BHU Varanasi: Dr Ram Dhari**

BHU Varanasi has released 11 varieties till date which have become popular and occupying substantial area in neighbouring country. Out of these, HUW 206 & HUW 468 (for timely sowing) and HUW 234 & HUW 510 (for late sowing) are successful varieties in North Eastern Plains Zone (NEPZ). Centre is working on development of improved high yielding wheat varieties for rice wheat cropping systems, extra early varieties for January sowing, temperature tolerance and thermo insensitive lines, varieties with greater biomass, grain boldness and high protein content. Centre is also focussing in identification of resistant sources against foliar blight of wheat. Chairman enquired about no of crosses made during the previous years and asked to re-look and strengthen this activity. Dr Dua enquired about developing and testing of breeding material against Ug99 by these centres in NEPZ. Dr Ram Dhari also informed that how new wheat varieties and Zero Tillage Technology are helping farmers to increase the productivity through Front Line Demonstrations. Demonstrations in problematic soils have also shown that right choice of variety and production technology can improve wheat yields more than 35 percent. Dr. Dua asked reasons for poor performance as there is no variety from BHU, Varanasi centre during last five years.

**NDUAT- Faizabad: Dr B N Singh**

Dr Singh highlighted the constraints for lower productivity in Eastern part of UP and informed that highest productivity of 28.8 q/ha has been recorded in eastern UP. He gave details of work carried out under AICW&BIP during the past years. Chairman and Co-chairman showed serious concern over the number of crosses being made by the centre and asked to improve its hybridisation programme so that centre can increase its performance in AVT and varietal release. Chairman also enquired about different fertiliser doses being used in agronomy and breeding trials and suggested to make the identical doses for both trials. Dr Singh appraised the house regarding work done on various projects on “water logging salinity and element toxicities in wheat”, multilocation evaluation of wheat germplasm, wheat improvement for abiotic stresses, improvement for salt tolerance, development of thermo-tolerant wheat lines for different agro-climatic zones of UP. This centre has so far developed five wheat varieties which are popular among farmers. Dr. Dua asked that number of crosses for different traits should be enhanced as centre has many research projects to support research activities. Dr. GS Nanda and Dr RP Dua also requested PI (Crop Improvement) to resolve the issue of fertilizer dose in consultation with PI (Resource management).

**IARI-PUSA: Dr IS Solanki**

Dr Solanki gave a brief presentation on the performance of voluntary centre IARI Pusa which has shown satisfactory performance in past 5 years. Dr Solanki agreed that variety development work at this centre became poor due to non-availability of wheat breeder for reasonable time but assured that now we have got a breeder and therefore breeding activities will be strengthened and programme will improve.

**BAU, Ranchi: Dr (Ms.) Ashisan Tuti**

This centre has so far developed and released only two wheat varieties Birsa Gehun 2 and Birsa Gehun 3 that too through SVRC. Efforts have been made to provide latest production technology through conduct of Front Line Demonstrations, Radio, TV, Kisan Mela and lectures which has resulted in about 25% additional area under wheat cultivation during past four years. Chairman was concerned over very limited number of crosses made at centre during past five years and no promotion of material in AVT'S of the zone even. Co-Chairman Dr. Dua suggested that PD should call a meeting with station staff to discuss for improvement of centre.

**UBKV Pundibari, Coochbehar: Dr Saikat Das**

Dr Saikat Das presented the performance of wheat in state that area in West Bengal is decreasing during past decade and productivity in the state is 26.80 q/ha. He mentioned the reasons for low productivity including limited choice of promising varieties, favourable conditions for foliar blight diseases and lack of better management practices. Accordingly centre is concentrating on location specific short duration varieties under timely sown and late sown conditions with special attention to foliar blight and acidic soils. Dr Dua asked till now there is no contribution in terms of genotypes from this centre to even NIVTs and this situation must improve being funded centre and having a breeder posted in the project.

**BCKV, Kalyani, Nadia: Dr SK Mukhopadhyay**

Dr Mukhopadhyay made presentation and highlighted the work done primarily as test centre as there is no breeder in AICW&BIP at Kalyani. However, the work on testing of material under breeding, agronomy and even pathological trials has been very good. This centre is working on residue management in wheat through various options. Also, the results of agronomical trials have revealed that keeping 18 cm spacing between rows is better than 23 cm as presently recommend for trials and thus it may be emphasized in package of practices for this area. Dr Mukhopadhyay asked for more



financial support and also a post of wheat breeder at BCKVV, Kalyani to initiate breeding work, keeping in view the potential.

**BAU, Sabour, Bhagalpur: Dr Nitish De**

Dr Nitish De made presentation on work done at BAU, Sabour during past five years. The staff position at this centre is sufficient and contribution of genotypes to different NIVTs is increasing. However, promotion of genotypes from NIVTs to AVTs is not satisfactory thus need improvement. Dr Dua asked that Sabour centre has infrastructure and therefore should take breeder seed production programme on large scale thereby involving all improved and potential varieties of the zone and not just restricting to your own varieties.

**Shillongani: Dr TP Saikia / Dr (Mrs) Yasmin Das**

Dr Yasmin Das, wheat breeder from AAU Shillongani presented progress of wheat research at this centre and highlighted some of the typical area specific problems like pre-harvest sprouting, excess moisture during and after harvest, problem of storage of even breeding material and thus overall slow progress in terms of breeding programme. The wheat area of about 65000 ha in the state of Assam alone, indicate good potential for breeding activities to address niche specific problems locally. Also, it was suggested that breeders from other centres in NEPZ and may be even from other zones should share breeding material as done by DWR under shuttle breeding approach. It was discussed that breeding activities at Shillongani centre must improve as we have a breeder posted under AICW&BIP and also good financial support to give desired results.

Chairman suggested that Zonal Coordinator should take more responsibility and see that trials are conducted and reported properly and timely. Dr. V. Tiwari (DWR Karnal) will arrange to send segregating material to centres like Shillongani, Coochbehar, Sabour, Kalyani etc. for strengthening their wheat breeding programmes. Dr JP Tandon, Ex Project Director and Ex ADG (FFC) emphasised on the need of improvement in the performance of centres in this Zone which is the 2<sup>nd</sup> most important zone in India. Centres like Kanpur, BHU and Pusa should optimise to provide better results. Centre of excellence should be set up for which more state support is required along with new look from ICAR to see that centres don't work like testing centres only. Dr Dua suggested establishing few centres of excellence during 12<sup>th</sup> plan and also take advantage of having a ICAR Research Complex for Eastern Region located in the zone at Patna. In all, the progress of centres located in NEPZ is of concern to all of us and to address these problems, concerted efforts are needed to strengthen research component in this mega wheat growing zone of the country.

The session ended with vote of thanks to the Chair.

## Session X Plenary Session

September 4, 2011

Chairman: Dr. Swapan K Datta  
Co-chairmen: Dr. RP Dua  
Dr. Indu Sharma  
Rapporters: Dr. D Mohan &  
Dr. B S Tyagi

At start of the session the Chairman Dr. Swapan Datta, DDG (CS), complimented the wheat and barley research workers for the cordial atmosphere and fruitful deliberations during the Golden Jubilee Meet and invited different Principal Investigators' for work plan and recommendations.

### **CROP IMPROVEMENT**

Dr. Vinod Tiwari, PI Crop Improvement, presented the overall work plan and insisted that indents for international materials should be channelized through DWR only. He informed that registration of extant varieties with PPV&FRA will be taken on priority basis and cooperating centres should send related information to DWR. He also proposed fingerprinting of test entries at IPPSN stage. He informed the house that two entries proposed by Krishi Dhan Seeds Pvt. Ltd have been included in NIVT's and consent was obtained from the DDG for this testing.

Major recommendations of the group were i) coding of trial test entries, ii) separate trial for triticale, iii) additional test sites from Kashmir region in the very high altitude summer sown trial, iv) conduct of NIVT 5A under restricted irrigation in NWPZ, v) recording of yellow rust incidence in *dicoccum* trial at Wellington, vi) inter-zonal shuttle breeding among co-operators and vii) sharing of pre-breeding material developed at Ludhiana, Pune Indore, Hissar and Dharwad which will be organized by DWR.

Long discussion followed regarding procedure to code test entries, raising of ACI limit in trial promotion, role of DWR in varietal development. In the end, the chairman summarized that the coding would be controlled by the Project Director and insisted to develop more trust in the existing system. He remarked that DWR will continue research efforts in development of new varieties Proposal to raise ACI bar of rust incidence in varietal promotion was not conceded.

### **CROP PROTECTION**

Dr. AK Sharma, PI (Crop Protection) presented work plan, recommendations and strategies for different zones. He gave brief account of different nurseries, chemical control experiments, survey and surveillance programme and appraised about the genetic resources carrying multiple resistance which shall be included in the NGSN for the breeders. He informed that the programme is gearing up to accept new challenges of yellow rust and the new initiatives include new test sites namely Jammu and Khudwani (Anantnag, Kashmir) for IPPSN & PPSN; and recording of yellow rust in NWPZ in the last week of February/ 1<sup>st</sup> week of March. Simultaneously, new molecules for stripe rust management will also be tested and role of *Berberis* in life cycle of this disease will be studied. Dr Bhardawaj said that the Flowerdale centre will extend helping hand in examining promising materials of NHZ and NWPZ against yellow rust. In the discussion, it was suggested that location-wise IPPSN data should also be provided on web site.

New locations like Khudwani and Yamunagar were also proposed for TPN. He informed that bio control of foliar blight will be done using new bio control strains and the programme will analyse foliar blight samples from rice-wheat system for blast pathogen as well. He mentioned that Project Coordinator Nematodes will provide

collaboration in wheat nematology programme and five centres will be involved namely Kanpur, Palampur, Udaipur, Anand and Rahuri. The team will help in preparing nematode distribution maps like CCN, ECN, *Pratylenchus*. His recommendations included a course on management of pests and diseases and a net-work project on stripe rust epidemiology and management. He urged that cultivation of newly released durum varieties in CZ and PZ will help to diversify the rust resistance base.

New molecules recommended for chemical control of yellow rust were tebuconazole (Folicur 250 EC) and triademefon (Bayleton 25WP) @ 0.1%. Eco-friendly approaches for yellow rust included i) induced systemic resistance (ISR) and ii) seed treatment with *Trichoderma viride* @ 0.7g ai/kg seed.

### **RESOURCE MANAGEMENT & SOCIAL SCIENCES**

Dr. RK Sharma, PI (Resource Management) informed that five new experiments would be conducted during 2011-12 along with five on-going coordinated trials. The new studies relate to i) effect of different rice seeding methods on wheat productivity at different nitrogen levels, ii) bio efficacy of broadleaf herbicides, iii) evaluation of herbicides for control of complex weed flora, iv) mitigating terminal heat stress in wheat through mulching and foliar nutrition under late sown conditions and v) evaluating the system of wheat intensification (SWI) for enhanced productivity of wheat by DWR at few important locations in Bihar. Since development of herbicide resistance is getting importance, any new herbicide tested by DWR should also be followed by multilocation testing. The group felt that dry seeding followed by irrigation cannot be practised in Indo-Gangetic Plains. Based upon 2-3 years experiments, the group recommended surface residue retention of 4t/ha with four irrigations for higher productivity and improved water-use efficiency. To increase productivity of soybean-wheat system in PZ, the group highlighted application of FYM (3.75t/ha) and vermicompost (1.25t/ha) in addition to recommended NPK in wheat and 75% of recommended NPK and any organic source (FYM: 7.5t/ha or vermicompost: 2.5t/ha or FYM: 3.75t/ha + vermicompost: 1.25t/ha) in soybean. The chairman suggested that help from existing programmes under Ministry of Agriculture should also be explored and recommended some research on drip irrigation as well.

### **QUALITY**

Dr. RK Gupta, PI (Quality) assured the house that wheat quality is fast acquiring importance in varietal identification and promotions. He made a strong call to make good use of the facilities provided by the Council and suggested team approach, especially in combination with wheat breeders. He highlighted that concerted efforts have helped to enrich genetic resource for quality improvement and suggested the breeders to make its use in their breeding programme. Dr Gupta urged better conduct of QCSN and utilization of molecular tools in quality improvement and proposed that a net-work project on bio-fortification should be initiated. Under human resource development, he suggested a hands-on training programme for the new researchers.

### **BARLEY**

Dr. RPS Verma, PI (Barley Network) highlighted the work plan related to breeding, agronomy and pathology along with major recommendations. Special trials on updating package and practices on dual purpose barley and new tillage options in malt barley will be continued. He informed to adopt coding for trial entries and crop health surveys as to be adopted by the wheat group. To strength efforts in quality, the barley quality component screening nursery will now be conducted at eight locations instead of four. He informed that a new experiment has been planned on intercropping with mustard and gram. The barley group recommended that i) reduced tillage (one harrowing with one cultivator) can be practised in NWPZ, ii) zero tillage in NWPZ can

only be adopted in sandy loam and loamy soils, iii) nitrogen application in dual purpose barley under NEPZ and NWPZ can be splitted into three doses (half basal, one-fourth immediately after forage cut remaining one-fourth at 30 days after cut), iv) foliar spray of clothianidin @ imidacloprid @ 20g ai/ha to control aphids and v) seed treatment with vitavax @ 3g/kg and Gaucho @0.06g ai/kg of seed. He also advocated foliar spary of Tilt (25 EC) @ 0.1% at rust appearance and if need be, foliar spray of Confidor @ 20g ai/ha at appearance of aphids.

#### **REPORT OF THE SPECIAL COMMITTEE ON VARIETAL IDENTIFICATION**

Dr. Indu Shrama, Project Director, presented recommendations of the Special Committee on Varietal Identification of Wheat and Barley held on September 02, 2011 under the chairmanship of Dr. Swapan K Datta, DDG (CS). In total, fourteen proposals were received and the committee accepted the following five for identification:

Entry	Crop	Zone	Production condition
TL 2969	Triticale	NHZ	Rainfed, Timely sown
PBW 644	Bread wheat	NWPZ	Rainfed, Timely sown
HD 3043	Bread wheat	NWPZ	Restricted irrigation, Timely sown
UAS 428	Durum wheat	PZ	Irrigated, Timely sown
DWR UB 64	6R Malt Barley	NWPZ	Irrigated, Timely sown

#### **FELICITATION OF SUPERANNUATING SCIENTISTS**

Five superannuating scientists were honoured with a shawl and memento in plenary session of the Golden Jubilee Meet. Dr Swapan Datta and Dr JP Tandon did the honours to Dr. Vijaylakshi Majumdar from Durgapura, Dr. SN Tiwari from Kanpur, Dr. RS Rawat from Pantnagar and Dr. JK Shrivastava from Kanpur. Dr Sheikh from Burdhan was not available in person due to ill health.

#### **PROPOSAL FOR VENUE OF 2012 WHEAT WORKSHOP**

Durgapura centre expressed its willingness to organise 51<sup>st</sup> All India Wheat and Barley research Workers Meet at its station and the house greeted this offer made by Dr Shrimali, Incharge- Wheat Programme.

#### **CONCLUDING REMARKS OF THE CHAIRMAN**

The Chairman Dr. Swapan Datta, DDG (CS), ICAR lauded the efforts made by the wheat and barley research workers for the national cause and wished them good progress in this endeavour. He assured all help from the Council and urged the scientists to ensure proper utilization of the allotted money. He highlighted the need to widen genetic diversity, strengthen pre breeding and vitalize hybrid wheat programme. He envisaged transgenic approach in bio-fortification, genomic research, science based storage protection and diversification of wheat and barley based food basket. Realising need of strengthening wheat research in NEPZ, he informed that a separate meeting of eminent scientists will be called to streamline wheat research in this region. He opined that demand of barley and oats may trigger in future and launching pad for these crops should be prepared in north-eastern hills as well. At the ends of his enlightening remarks, he thanked to all and wished a fruitful ensuing crop season.

The session ended with a formal vote of thanks by to the Chair and participants.

## ANNEXURE-I

### List of Final Year Entries and Check Varieties (2011-12)

Trial	Final year entries	Checks
<b>1. Northern Hills Zone</b>		
I AVT-RF-ES-TAS	HS 541, HS 542, HPW 360	HS 277, VL 829, HPW 251
II AVT-IR-TS-TAS	HS 526, HPW 349	VL 804, VL 907, HS 507
III AVT-RF-TS-TAS	HS 526, HPW 349	VL 804, VL 907, HS 507
<b>2. North Western Plains Zone</b>		
I AVT-IR-TS-TAS	WH 1105	PBW 343, DBW 17, DPW 621-50
II AVT-IR-TS-TDM	WHD 948, MACS 3828	PDW 291, PDW 314, DBW 17
III AVT-IR-LS-TAS	DBW 71, HD 3059, HD 3065, PBW 658, WH 1100	PBW 373, PBW 590, WH 1021
IV AVT-RF-TS-TAS	DBW 74, PBW 660, WH 1097, WH 1098	C 306, PBW 175, WH 1080, PBW 644 (I)
V AVT-RI-TS-TAS	DBW 74, HD 3070, HI 1579, PBW 660, WH 1097	C 306, PBW 175, WH 1080, HD 3043 (I)
<b>3. North Eastern Plains Zone</b>		
I AVT-IR-TS-TAS	Raj 4229, K 0906	K 0307, HD 2733, DBW 39
II AVT-IR-LS-TAS	K 0911	DBW 14, NW 2036, HI 1563
III AVT-RF-TS-TAS	HD 3070	C 306, K 8027, HD 2888
<b>4. Central Zone</b>		
I AVT-IR-TS-TAD	HI 8713(d), MACS 3828(d)	GW 322, HI 1544, HI 8498 (d), MPO 1215 (d)
II AVT-IR-LS-TAS	Raj 4238, MP 3336	MP 4010, HD 2864, HD 2932
<b>5. Peninsular Zone</b>		
AVT-IR-TS-TAD	WHD 948	GW 322, MACS 6222, NIDW 295(d), UAS 428 (I)
<b>6. Southern Hills Zone</b>		
AVT-RI-TS/LS-TAS	HW 5216	HW 2044, CoW (W) 1