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PROCEEDINGS

(Research Review, Recommendations & Plan of Work 2013-14)

Of the

52nd All India Wheat & Barley Research Workers' Meet

Held at

**Chandra Shekhar Azad University of Agriculture and Technology,
Kanpur - 208 002, Uttar Pradesh**

From

September 01-04, 2013

By

**Chandra Shekhar Azad University of Agriculture and
Technology, Kanpur, Uttar Pradesh**

And

**Directorate of Wheat Research, Karnal-132 001, Haryana
(Indian Council of Agricultural Research)**

Issued by

**Dr (Mrs) Indu Sharma
Project Director
Directorate of Wheat Research
Karnal, India**

Foreword

The 52nd All India Wheat and Barley Research Workers' meet held at the Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh from 01-04 September, 2013 was jointly organized by the Directorate of Wheat Research (DWR), Karnal and Chandra Shekhar Azad University of Agriculture and Technology (CSAUA&T), Kanpur. The meet was inaugurated by Dr MS Swaminathan, Emeritus Chairman and Chief Mentor, MS Swaminathan Research Foundation, Chennai, while Sri Anand Singh, Minister of Agriculture, Government of UP was the Guest of Honour. Dr. Swapan K Datta, DDG (CS), ICAR was the special guest while Prof. Ashok Kumar, Vice Chancellor, CSAUA&T, Kanpur chaired the inaugural session.

The meeting reviewed the results of previous year experiments and based on the deliberations, the programme for ensuing crop season 2013-14 was finalized. Apart from this, emerging issues in wheat production were also discussed by eminent speakers during various special sessions.

On behalf of the wheat and barley fraternity, I express sincere gratitude to Dr MS Swaminathan, Emeritus Chairman and Chief Mentor, MS Swaminathan Research Foundation, Chennai for kind acceptance to grace the occasion as chief guest and Sri Anand Singh, Minister of Agriculture, Government of UP as Guest of honour despite busy schedules.


I express my deep sense of gratitude to Dr S Ayyappan, Secretary DARE and DG, ICAR for guidance and continuous support. I also express gratitude to Dr Swapan K Datta, DDG (CS), ICAR for guidance and encouragements.

I also place on record my sincere thanks to Prof Ashok Kumar, Vice Chancellor CSAUA&T, Kanpur for his unfailing help and dedicated support. Suggestions provided by eminent personality like Dr RR Hanchinal, Dr Thomas R Lumpkin, Dr JP Tandon, Dr AK Joshi, Dr RP Dua, Dr Etienne Duveiller, Dr M Baum, Dr RPS Verma, Dr Ian King, Dr Martin Broadley, Dr Mahesh Shrimali, **Dr JS Sandhu** and zonal coordinators for fine tuning the programme are gratefully acknowledged.

I would also take this opportunity to thanks Dr LP Tiwari, Director Research and all the members of the organizing committee of CSAUA&T, Kanpur for all the hard work they have done in making this programme a grand success.

I would also commend all the Principal Investigators and staff for timely preparation of Annual Progress reports and this proceeding. Thanks to the chairmen and rapporteurs of various technical sessions for smooth conduct and recording of proceedings. I appreciate the efforts made by scientific, technical and administrative staff for coming out with the summary proceedings during plenary session.

I wish all the best for the ensuing season.


(Indu Sharma)

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Introduction

The 52nd All India Wheat and Barley Research Workers' meet held at Chandra Shekhar Azad University of Agriculture and Technology (CSAUA&T), Kanpur from 01-04 September, 2013 was jointly organized by the Directorate of Wheat Research (DWR), Karnal and Chandra Shekhar Azad University of Agriculture and Technology (CSAUA&T), Kanpur.

The meet was attended by the wheat and barley researchers from the national and international organizations (CIMMYT, ICARDA and BISA *etc.*), officials of Department of Agriculture and Co-operation, PPV&FRA, different state agricultural department and policy makers. The meet is an annual event of the All India Coordinated Wheat and Barley Improvement Project and provides a platform to discuss emerging issues related to wheat and barley production in the country. Based on deliberations and discussions during various technical sessions, plan of research for the ensuing crop season 2013-14 was finalized.

A special sessions on “Advances in Wheat and Barley Research”, “Global efforts in enhancing wheat and barley production” and ‘Developmental Issues in Wheat and Barley’ were also organized, in which, eminent scientists and officers involved in developmental activities shared their experiences and views.

The meet was inaugurated by Dr MS Swaminathan, Emeritus Chairman and Chief Mentor, MS Swaminathan Research Foundation while Hon'ble Minister of Agriculture, Govt. of UP, was the Guest of Honour. Dr Swapan K Datta, DDG (CS), ICAR was the Special Guest and Prof. Ashok Kumar, Vice Chancellor, CSAUA&T, Kanpur chaired the Inaugural Session. Several national and international dignitaries also graced the function. Many directors from various ICAR institutes also deliberated on various issues.

The proceedings and recommendations in respect of different technical sessions along with the plan of work were finalized for implementation during ensuing crop season 2013-14. The compiled information is being presented herein for information and record by all concerned.

Inaugural Session

September 02, 2013 Chief Guest: Dr MS Swaminathan,
Emeritus Chairman and Chief Mentor,
MS Swaminathan Research Foundation, Chennai
Guest of honour: Sri Anand Singh, Minister of Agriculture (Govt. of UP)
Special Guest: Dr Swapan K Datta, DDG (Crop Science), ICAR
Chairman: Prof. Ashok Kumar, VC, CSAUA&T, Kanpur

Dr LP Tiwari, Director Research, CSAUA&T, Kanpur welcomed the dignitaries, authorities and the participants and thanked the authorities to have chosen CSAUA&T, Kanpur to host the wheat & barley research workers' meeting. This was followed by lightening of the lamp by chief guest and dignitaries and Saraswati Vandana by group of students. Dr (Mrs) Indu Sharma, Project Director, DWR presented the highlights of Research for 2012-13. She appreciated the efforts of scientists from various ICAR institutions, agricultural universities, state agricultural departments, government organizations and above all farmers for maintaining the high productivity despite adverse weather conditions during maturity stage of wheat. She informed the house that in addition to releasing wheat and barley varieties, several genetic stocks possessing special traits like drought, resistance to diseases were registered with NBPGR. Several initiatives taken to strengthen the pre-breeding, bio-fortification, mitigating the climatic change effects, fast breeding for generation advancement, double haploid, seed production and quality programmes at national level were also enumerated. Management of stripe rust in high production zone was also instrumental for achieving high productivity levels of wheat and barley. However, gene pyramiding and gene deployment are the long range strategies for combating stripe rust. Moreover, the trials namely row spacing, weed management, nutrient foliar application, micro-irrigation system and hydrogel were taken up for the fine tuning of production technology. She shared the information that product specific varieties are available but need to develop linkages with industries, which can go for contract farming with farmers. PCR based marker for identification of low molecular weight glutenin and study of anti-oxidant property were taken up under quality programme. She informed the house that barley is an important crop for marginal area as well as for feed, malt and health-drink industry. Technology is available with Directorate for taking higher production in barley. To bridge the yield gap, FLDS were conducted and late sowing and non-availability of inputs in time (fertilizer, irrigation) were found to be major constraints in wheat production system.

Dr Swapan K Datta, DDG, Crop Science in his opening remarks congratulated the wheat fraternity for their efforts to realise the quantum jump in wheat production during last five years due to adoption of proper management strategies including varietal replacement. He informed the house that AICRIP on wheat is best among the entire AICRIP programme in the country. He said that biggest challenge ahead is to increase the yield potential to meet the growing food demands since one Australia is added to the Indian population every year. This requires huge investment to realize higher productivity and it must be done immediately since the results are visible only after about 10 years in agriculture sector. This can be achievable by inclusion of genomic base science in the programme coupled with efficient management of resources. For improvement of wheat and barley He stressed the need to use of molecular tools to improve the source-sink relationship, genomic based gene sequencing, phenotyping and genomic mapping etc. He urged upon the scientists to make wheat production sustainable through science and technology based interventions to realize the dream of Honourable Dr Swaminathan to move from Green Revolution to ever Green Revolution. After the address of the DDG, a number of publications were also released on this occasion.

Dr Ashok Kumar, Vice Chancellor, CSAUA&T, Kanpur highlighted the significant contributions made by his university in the development of high yielding varieties of wheat and barley crops. He informed the house that Kanpur is one of the oldest location involved in agricultural research since the experiments on various wheat based cropping sequences and site specific

nutrient management were initiated at Kanpur during 1883 as well as during the past 107 years the University released 40 wheat and 34 barley varieties which has significantly contributed for enhancement of productivity in UP in particular and country in general. He stressed the need for plant breeders and biotechnologist to work together. In addition agronomic management is a must to address the new challenges of abiotic stresses due to high temperature, drought, alkalinity, salinity, acidity and biotic stresses due to weeds.

Shri Anand Singh, Hon'ble Minister of Agriculture, Government of UP thanked the organizer for inviting him on this occasion. In his address he appreciated the scientists for their significant contribution in the national food security. In the present context he impressed upon scientist to develop varieties and management practices suitable for limited resources such as less water, less fertilizer and shorter duration, in the face of climate change, with high productivity.

Dr MS Swaminathan innumrated the historical perspective of the system of multilocation research and said that Punjab and Haryana has reached a productivity of about 5 t/ha and the other states must follow to ensure the food security to the ever growing population. Incorporation of durable resitance involving minor genes was a significant milestone to reach the present right to food from the Bengal famine. We have reached a stage to ensure legal right to food, which cannot be implemented without the farm families, and the Government is ready with the food security bill. We must adopt climate smart ariculture and nutricereals for ensure the nutritional security. Various state Governments have brought in the bills on food as well as nutritional security. To ensure this we must minimize the post harvest storage and management losses which are roughly one third of the production global as per the FAO estimates. We must develop appropriate storage and post harvest handling mechanism to ensure national food and nutritional security. Many people are talking that rice need not be grown in NWPZ but these two crops are important components of the food security bill. We must think and work for making the rice-wheat cropping sequence more sustainable by employing the a multipronged approach like appropriate varieties of wheat and rice by employing marker assisted selection, diversification, using climate smart management practices like no tillage, residue management and efficient water management practices *etc.* Moreover, climate change, shrinking land and water resources are other issues of concern. He congratulated the wheat and barley workers for their impressive achievement and hoped that the wheat and barley fraternity will meet the future challenges as well.

She Satish Nigam, local MLA thanked the wheat and barley worker for doing good work for the UP state. He impressed upon to develop high yielding varieties for various conditions, especially, drought and heat stress of areas like Bundelkhand in UP and the state of Rajasthan.

The session ended with the vote of thanks proposed by Dr NB Singh (Co-organizing Secretary), CSAU&T Kanpur.

Welcome and Presentation of Progress Report

September 1, 2013

Chairman: Dr MP Yadav
Co-Chairman : Dr LP Tiwari
Rapporteur: Dr RK Gupta

Presentation of Progress Report for 2012-13: Dr Indu Sharma

Dr MP Yadav, Dean, College of Agriculture, CSAUA&T, Kanpur and chairman welcomed the delegates. Dr. Indu Sharma, Project Director welcomed the scientist in the 52nd All India Wheat & Barley Research Workers' Meet and congratulated them for the marked achievements in wheat & barley research. Wheat production in the country is upbeat, as a consequence of the hard work, and country is attaining new heights during past three years touching 92.46 mt. (fourth estimate) wheat production during 2012-13. She attributed this success to the hard work of scientists of ICAR & SAU, policy level decisions of DoAC, international cooperation with CIMMYT, ICARDA and farmers faith in new production technology. She stressed to take it further for political and social reasons. She opined that in addition to conventional breeding, biotechnology tool must be applied to strengthen molecular breeding including transgenic. She emphasized to adopt holistic approach to checkmate biotic & abiotic stresses, resource management constraints and quality related issues.

She informed the house that 4 bread wheat, 1 durum, 1 triticale and 4 barley varieties were released during 2012-23. Besides, two 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; and also suggested to make their good use in wide crossing, shuttle breeding and transferring 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. Yellow rust scenario was quite different during 2012-13. Quick action by the researchers', planners and the developing agencies helped to keep the incidence under control. Dr Sharma expressed satisfaction over the research efforts being laid on resource conservation technology, weed control, cropping systems and water use efficiency. She expressed satisfaction that quality is getting importance in wheat breeding and the new genotypes have registered marked improvement even under NWPZ. 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. As in wheat, barley production was also upbeat in the country. A new malt variety is now available for late planting in north western plains. One two row variety has also been added for rainfed cultivation in the hills. The work is on to find better tillage options, weed management strategies, pest control and dual purpose barley. She concluded her presentation with the remarks that all critical issues would be addressed in the XII plan document.

Dr RR Hanchinal, chairman of PPV&FRA stressed the need to protect their varieties and other useful breeding materials in the era of intellectual property regime and urged them to register such good material with the authority. He informed that PPV&FRA have already issued certificate to some varieties and involved few institutions in DUS testing. He appraised the scientists about different options available while protecting their materials under PPV&FRA and gave detail of varieties already under protection in different crops. He urged that immediately after notification, application should be filed. While concluding the session, the chairmen emphasised that yield gaps should be minimised and varieties should be developed keeping in mind changes occurring in the climate. He stressed about the storage facility and government policies required to give further boost in wheat production. He stressed upon pre-breeding, allele mining for biotic & abiotic stresses, bio-fortification and molecular breeding. He was optimistic about the industrial demand of barley and emphasized a strong public-private partnership.

The session was concluded with the than thanks to the chair.

SESSION - I

Research Review Meetings - Crop Improvement

September 01, 2013

Chairman: Dr LP Tiwari
Co-Chairman: Dr V Tiwari, PI (CI)
Rapporteurs: Drs AS Redhu & CN Mishra

In this session, research achievements and progress in Crop Improvement programme during the year 2012-13 were discussed and reviewed. A total of 13 presentations were made in this session. In his opening remark the Chairman, Dr LP Tiwari highlighted the importance of the All India Coordinated Wheat & Barley Improvement Project and its potential for ensuring further breakthrough in yield to ensure food security. Dr V Tiwari presented an overview of the activities and achievements of the year. He stressed the importance of undertaking zonal monitoring more stringently. He also elaborated on the issues which needed deliberation during workshop.

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 2012-13 crop season.

Dr Lakshmi Kant made presentation about the trials conducted in the Northern Hills Zone. He informed that though 98.11% of proposed trials were conducted, yet only 69.23% trials were reported due to various reasons. He suggested the use of more efficient experimental designs may be deliberated. In addition to the above he highlighted other problems like communication gap regarding release of funds to voluntary centres and also stressed upon increasing the number of testing centres. He also opined that time of zonal monitoring should be 15 days earlier in NHZ. The Co-Chairman was of the opinion that early sown and rainfed trial should be merged considering only a small gap in the sowing dates of both the two trials. However, a number of scientists from NHZ wanted that the early-sown (ES) rainfed trial may be continued with more number of testing centres. He also emphasized that early sown trial may be discontinued at Kalingpong and Gangtok. He also emphasized that all centres should follow the same plot size as in the work plan.

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 83 per cent.. He also highlighted the problems faced in the conduct of trials such as, risks associated with layout problem at few centers, improper labeling of plots, variable agronomic practices, inadequate support to voluntary centres. He also presented a tentative proposal of trials constitution.

The results of the trials conducted in North Eastern Plains Zone were presented by Dr NB Singh. He informed that all the proposed trials were conducted and 84% of trials were reported. He presented the probable constitution of various AVTs to be conducted in the zone during 2013-14. He also mentioned cutworm problem faced by at Shillongani. Chairman stressed upon the need for replacement of old varieties with new varieties. He also suggested to include Bagdora centre in evaluation. He also deliberated that monitoring of the zone should start in mid March in view of early maturity in West Bengal and Assam.

Dr AN Mishra presented the results of trials conducted in Central Zone. He informed that 96 % proposed trials were conducted but only 78% of trials were reported and the rest were rejected on the basis of low site mean and other reasons. He also presented the probable constitution of various AVTs to be conducted in the zone during 2013-14. He suggested that there is a need for delinking of performance of test entries under RF and RI trials to facilitate their promotion and identification and also suggested to increase the test centres under RI condition.

The presentation on the trials of Peninsular Zone was made by Dr PN Rasal. He informed that all the proposed trials were conducted and there was 80% reporting of the conducted trials. He also informed about the incidence of shoot fly at Dharwad centre. He also deliberated that Badnapur centre may be discontinued and Ambajogai center added instead.

Dr J Kumar presented the trial report of Southern Hill zone. He informed that 89% of the proposed trials were conducted with 62% reporting. He also informed that area under wheat in zone is increasing. Co-chairman Dr Tiwari appreciated the efforts of zonal coordinator for finding more locations in the zone.

The special trial on Salinity/Alkalinity was presented by Dr Neeraj Kulshreshtra. He informed that all the proposed trials were conducted and the data from one centre was not reported due to high CV. The Co-chairman Dr Tiwari suggested that the number of testing sites may be increased for better results.

The result of special trial on dicocum was presented by Dr SC Mishra. He informed that all the trials proposed were conducted, however trial from four centres were not reported due to various reasons. Dr S Acharya was of the view that as there is no cultivable area in Gujrat under dicocum trials may not be proposed for the state.

The report on evaluation of national/international nurseries was presented by Dr Arun Gupta. He presented a detailed account of superior entries for different traits in case of different national and international nurseries and trials and informed the house that scientists can submit their indents for suitable germplasm as per their need. He asked the breeders to submit proposals of wheat varieties for registration with PPV&FRA. Dr Tiwari appealed to all the breeders to make request for new germplasm for specific traits for acquisition through NBPGR. He also asked breeders to submit the sets of RIL or NIL component lines for storage in GRU unit at DWR Karnal. He appraised that the seeds of RILs or NILs would be shared only after obtaining clearance from developing scientists

The results of physiology experiments were presented by Dr Sindhu Sareen. Two multilocation trials MLHT-1 and MLHT-2 were conducted successfully during the season. Co-Chairman informed the house that the physiology group was being associated to determine the heat tolerance of AVT entries which would be provided for being incorporated in the varietal identification proposals. He also requested for association of IARI New Delhi for understanding physiological experiments.

Dr Rajkumar presented the status of breeder seed production in the country during the crop year 2012-13, a total of 27501.69 q breeder seed of 154 wheat varieties was produced against DAC indent of 21027.4 q for wheat. There was a surplus production of 6959.9q. Co-Chairman was of the opinion that surplus production of old varieties should be discouraged and appealed to breeders to take the production of breeder seed of new varieties with right earnest.

The status of off-season facilities available at Dalang Maidan and participation by different centres was presented by Dr Rajender Singh. He said that this year a total of 36229 lines of wheat and barley have been planted for different purposes. Chairman suggested that this facility should be well utilized by different centres as the location is very good for screening of yellow rust and powdery mildew.

The Chairman LP Tiwari summarized the whole session and thanked all the speakers for their presentations. The sessions ended with vote of thanks proposed by the Co-Chairman.

Research Review Meeting - Resource Management

1st Sept, 2013

11.15 AM to 3.15 PM

Chairman : Dr MP Yadav

Co-Chairman : Dr RK Sharma

Rapporteurs : Dr SC Tripathi & Dr Hari Ram Saharan

The Research Review Meeting of the Resource Management group was held under the Chairmanship of Dr MP Yadav, Head Agronomy, CSAUA&T, Kanpur with Dr RK Sharma, PI, Resource Management, as the Co-chairman of the session. At the outset, Dr RK Sharma welcomed the Chairman and introduced to the delegates and requested the chairman to conduct the session. The Chairman welcomed the agronomists coming from different parts of the country and exhorted them to work for the development of technologies that are helpful in reducing the cost of production as well as in enhancing the productivity of the wheat crop in the country.

After the opening remarks, the different wheat workers presented the results of the coordinated experiments conducted during the year 2012-13. The report of the varietal evaluation trials conducted to assess the performance of newly developed genotypes under various growing conditions were presented by Dr Gurdev Singh for the NHZ, Dr HR Saharan for the NWPZ, Dr RK Singh for NEPZ, Dr SPS Tomar for the Central Zone, Dr RS Chhokar for the PZ and SHZ and Dr. RK Sharma presented the special coordinated trials to update the package of practices.

In Northern Hills Zone, three experiments were conducted to evaluate the performance of new genotypes HS 536 and HS 542 against standard checks under irrigated timely sown and rainfed conditions. Under irrigated conditions, test entry HS 536 was at par with the best check VL 804. Under rainfed condition, only the nitrogen effect was significant and HS 542 was numerically better than checks under early sown condition.

In NWPZ, five trials namely timely sown (aestivum and durum), late sown, restricted irrigation and rainfed, involving total number of 15 entries, were conducted at different locations. In North Western Plains Zone, the new genotype, HD 3070, the only bread wheat entry under restricted irrigation conditions was significantly better than the checks. Under irrigated late sown condition, three test entries WH 1124, HD 3091 and DBW 90 were numerically better than checks. In timely sown irrigated conditions, the test entry DBW 88 was at par with the best check DBW 17.

In North Eastern Plains Zone, three trials were conducted under irrigated timely sown, irrigated late sown and rainfed conditions and one entry WH 1127 was significantly superior than checks under rainfed condition. Two entries namely NW 5054 under timely sown and Raj 4250 under late sown were numerically superior to the respective checks.

In Central Zone, four trials namely timely sown, late sown, restricted irrigation and rainfed were conducted and none of entries were better than respective checks.

In Peninsular Zone, four trials namely timely sown, late sown, restricted irrigation and rainfed were conducted and entries HD 3093 and GW 432 under late sown conditions were numerically superior to the respective checks.

In Southern Hills Zone, one trial was conducted and test entry HW 5224 was not better than the best check CoW (W) 1.

Dr KN Tiwari from IFFCO made a presentation in this session on the topic entitled "Soil health management for sustainable agriculture". He emphasized the role of integrated nutrient management in improving and sustaining the crop productivities. Dr Kaushik Mazumdar, from IPNI, South Asia programme from CIMMYT presented a talk on Nutrient Expert System and highlighted the importance of site specific nutrient management.

The results of the special coordinated experiments on sowing time, row spacing, resource conservation technologies, yield maximisation, residue management, weed management,

nutrients' foliar applications, system of wheat intensification, integrated nutrient management and hydrogel applications presented by Dr RK Sharma are summarized here as under:

- In CZ, significantly higher yield was obtained in 12-18th November sowing time compared to earlier as well as later sowing time where as in PZ significantly higher yield was recorded when sown between 29th October to 4th November.
- The row spacing trials were conducted in peninsular zone with 100 kg/ha seed rate and four spacings (15, 17.5, 20 and 22.5 cm). There was non-significant effect of row spacing on yield although highest yield was recorded at 20 cm spacing.
- In North Western Plains, the highest productivity of wheat was recorded after dry direct seeded rice followed by puddle transplanted and the lowest productivity was after ZT transplanted conditions. Among nitrogen treatments, 150 kg N/ha gave the highest productivity (49.97 q/ha) which was significantly superior to other treatments.
- In NHZ, on average basis, the wheat grain yield was at par when sown from 25th October to 15th November with an average yield of 38.76 to 39.61 q/ha. In NWPZ, wheat grain yield was at par when sown during 5th November to 15th November with an average yield of 52.80 to 53.39 q/ha.
- Among herbicide treatments, application of metsulfuron+ carfentrazone (Ready mix) +0.2% NIS at 25 g a.i./ha effectively controlled broadleaf weeds and produced maximum grain yield in NWPZ, NEPZ and CZ. The ready mixture was better than the sole application of herbicides.
- In NHZ and NWPZ, application of Clodinafop+ Metribuzin @ 60+210 g a.i./ha recorded highest grain yield (47.21 q/ha) whereas in NEPZ application of Pinoxaden+Metribuzin recorded next highest grain yield (46.56 q/ha) and in CZ application of Vesta (Clodinafop+Metsulfuron), Atlantis and Total recorded at par yield but significantly higher than other herbicides.
- The effect of tillage options and row spacing was non-significant but the effect of the nutrients levels was significant. Application of 125% recommended NPK+FYM @ 15 t/ha produced significantly higher yield (50.09 q/ha) than recommended NPK (48.11q/ha).
- In NWPZ and CZ, mulching produced significantly higher grain yield than no mulching conditions and application of KCl spray @ 0.2% at booting/post anthesis recorded the highest grain yield.
- System of wheat intensification (SWI) had no advantage over conventional practice of drill sowing in NEPZ.
- In NHZ, the highest mean grain yield (50.90 q/ha) was recorded with 120 kg/ha nitrogen which was significantly higher than other treatments.
- Recommended NPK fertilization with 5.0 kg/ha hydrogel application produced higher grain yield in NWPZ, CZ and PZ where as only 2.5 kg hydrogel application along with NPK produced maximum yield in NEPZ.

During the discussion that followed the presentations, Dr RK Sharma, PI, Resource Management exhorted the wheat workers to be more careful in conducting the experiments as well as in the reporting the results of the experiments. Dr Indu Sharma, Project Director, while interacting with the scientists of the resource management group, asked the agronomists to highlight the specific issues of their respective regions so that the problems faced by the wheat farmers of the country can be addressed. She also desired that the complete package of practice for wheat cultivation in the problematic areas can be developed at the earliest time. She also desired that some experiments on nutrient-tillage and residue interactions, genotype x management, micro irrigation system and precision agriculture may be designed.

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 as well as all the wheat workers for their valuable contributions.

Research Review Meetings - Crop Protection

September 1st , 2013

Chairman : Dr Rajendra Prasad
Co-Chairman : Dr MS Saharan
Rapporteurs : Dr R SelvaKumar & Dr Beant Singh

The research review session of Crop Protection was chaired by Dr Rajendra Prasad, Head (Plant Pathology), CSUA&T, Kanpur. Dr MS Saharan , PI (CP), DWR and Co-chairman welcomed the Chairman and cooperators from various centres. Dr. Saharan presented an overview of work done in Wheat Pathology during 2012-13. He highlighted the major thrust areas of crop protection viz., crop health monitoring (including grain health), host resistance, distribution of rust pathotypes, rust resistance gene postulation and pest management. Many survey teams visited all zones during 2012-13 crop season to monitor the appearance of rusts and in higher hills during off season. 380 survey records were loaded on online survey tool box. The trap nurseries were conducted at 38 locations. Incidence of stripe rust disease was less in most of the areas. SAARC Disease Trap Nursery was planted across SAARC countries and at 14 locations in India. Stripe rust was managed very well through awareness programmes by way of trainings to officers' of Department of Agriculture, farmers, distribution of literature, sending SMS's and issuing advisories as per need. Various disease screening nurseries viz., IPPSN, PPSN, KBSN, LSSN, LBSN and EPPSN were conducted well at various locations and the results were presented. Chemical experiments on stripe rust, leaf rust and stem rust were conducted at various locations during 2012-13. Indian wheat advance lines (230) were evaluated at Kenya and Ethiopia for resistance against Ug99 during off season.

Dr SC Bhardwaj, Head, DWR Regional Station, Flowerdale, Shimla presented rusts pathotypes distribution and postulation of rust resistance genes. He presented predominant pathotypes of *Puccinia* species on wheat. Based on SRT analysis, he presented the list of entries resistance to rusts and the rust resistance genes in AVTs lines. He pointed that wheat disease monitoring nursery is very useful tool and the cooperators are requested to send leaf samples for race analysis which is very useful in anticipatory breeding.

Dr IK Kalappanavar, UAS, Dharwad presented wheat rust status in peninsular zone. The prevalence of *Puccinia triticina* pathotypes in Karnataka during the previous seasons was recorded through wheat surveys. Grouping of *P. triticina* isolates was done based on genetic dissimilarity clusters. The prevalence, frequency and per cent distribution of *Puccinia triticina* pathotypes in Maharashtra over the seasons was also presented. In large scale chemical control of leaf rust experiment, two sprays of Propiconazole @0.1% gave good control and higher yield than control. The leaf rust severity in Wheat Disease Trap Plot Nursery over the years was also presented. During 2012-13, leaf rust was very severe in Karnataka due to rainfall during the month of Nov and Dec., growing of local wheat varieties, and maximum temperature of more than 30⁰ C from Dec-March and minimum temperature was more than 14.5⁰ C from Nov-March. The new problem of shoot fly caused by *Atherigona* spp. was also highlighted.

Dr J Kumar, Head, IARI Regional station, Wellington and Zonal Co-ordinator, Southern Hill Zone presented wheat rust status in Southern Hill Zone. He presented that 77 brown rust group pathotypes, and 40 stem rust group pathotypes were dominant during 2009-10. During 2010-11, 77 leaf rust groups was dominant. To know the occurrence of wheat rusts on *Berberis* in the Nilgiri hills, frequent surveys were carried out. He presented the list of rust resistance genes deployed in India, so far and due to vicious boom and bust phenomenon, genes gradually loose strength. Therefore regular monitoring of gene efficiency is required. He also presented field resistance status of Indian wheat cultivars. The quick set of wheat lines for Ug99 detection has been planted at Wellington and the reactions to Wellington isolates at seedling stage were presented and confirmed the absence of Ug 99 in India.

Dr AN Mishra, Head, IARI Regional station, Indore and Zonal Coordinator, Central Zone presented race specific APR for stem and leaf rusts. Race specific genes for APR to leaf rust viz., *Lr12*, *Lr13*, *Lr22a*, *Lr22b*, *Lr35*, *Lr37*, *Lr48* and *Lr49* and race non-specific genes are *Lr34*, *Lr46*, *Lr67* and *Lr68*. In addition, the genes *Lr11*, *Lr14a*, *Lr17*, and *Lr21* have been reported exhibiting race-specific APR to selected Indian leaf rust pathotypes. The varieties JWS 17 (*Lr13+Lr34+*) and Raj 3765 (*Lr13+Lr10+*) showed APR to all the three pathotypes. The varieties GW 322 (*Lr13+*) and NIAW 34 (*Lr13+Lr34+*) showed APR to all the three leaf rust pathotypes. A total of seven diverse dominant resistance genes were identified for race-specific APR to stem rust pathotype 117-6

among these genotypes, He stressed that the genotypes apparently carrying race-specific APR to the respective rust pathotypes need to be studied further for confirmation.

Dr R Selva Kumar, Senior Scientist-Plant Pathology, DWR, Karnal presented status of leaf blight resistance. He presented the status of leaf blight associated pathogens and the list of stable sources of resistance and results of management of leaf blight using fungicidal seed treatment. There were 227 entries comprising AVT I & II year entries screened for leaf blight resistance.

Dr Rashmi Aggarwal, National Fellow, IARI, New Delhi presented advance researches in wheat spot blotch. SCAR marker for *Bipolaris sorokiniana* diagnosis has been developed. Bipolaoxin toxin has been purified and characterized. Research on in planta analysis of wheat genotypes using qPCR is continued She also presented the studies on cellular and molecular interaction of wheat and *Bipolaris sorokiniana* to unravel mechanism of resistance during host-pathogen interaction. The work on molecular cloning of MAP Kinase genes, their expression and *in-silico* analysis to understand pathogenesis of *B. sorokiniana* infecting wheat was also highlighted.

Dr SK Rana, Senior Pathologist, CSKHPKV, Malan presented status of powdery mildew resistance in India. He reviewed the powdery mildew pathogen and disease status and effectiveness of genes to powdery mildew flora of India in detail. The resistance genes present in wheat genotypes were discussed. He stressed that monitoring the virulence of *B. graminis tritici* using all the 41 loci with more than 60 genes/ alleles catalogued so far for PM resistance is essential and the use of molecular markers to pyramid effective *Pm* genes seems promising.

Mr Ananth Murthy, DRRW South Asia presented on SAARC surveillance tool box. The tool box enables real time data sharing among the Wheat Scientist Community for Rust monitoring. Web and Mobile based Application developed enables online data entry and sharing the data. The GPS Enabled Android Tablet touch screen based navigation tested on the field and validated. It works on a SIM card/ Wi-Fi and works even on an off line mode. Data is hosted on server at DWR. Dr Damanjeet Kaur, Senior Nematologist, PAU, Ludhiana presented the research achievements on different aspects in Nematology under AICW&BIP. The response of CCNSN (AVT entries) against CCN, MDSN (CCN) were also discussed. It was reported that rotation of pea with wheat reduces the CCN population. The results of CCN management trial was also highlighted.

Dr Beant Singh, Entomologist, PAU, Ludhiana discussed multiple pest screening nursery (MPSN), host plant resistance, IPM and chemical control experiments on brown wheat mite, shootfly and aphids under AICW&BIP in detail. The identified insect resistant entries were highlighted. It was felt that shootfly is emerging in Dharwad, cutworm in Shillongani and wheat aphids in some parts of Punjab and therefore the need based research has to be initiated.

The project director also participated in the session and appreciated the role of all pathologists, entomologists and nematologists under AICW&BIP in development of disease and insect pest resistant varieties. She stressed that trap plot nursery is very very important and the appearance of rust pustule should be reported immediately to DWR, Karnal and Shimla as and when observed. There should be 2 rows of each entry instead of only one row so that there may not be any escape from the disease. The trap nursery should be sown in advance than main crop so that the rust can appear earlier than the farmers fields. The Plant Pathological Nurseries should be grown on well managed, fertile land with all agronomic practices. Labelling of lines should be done properly so that in the absence of the concerned scientist, the other scientist / monitoring team can make the disease scorings. There should be infector rows around the nurseries of IPPSN and PPSN. The chemical control experiments should be conducted using the susceptible varieties only. Local polythene structures shall be made for creation of rusts if there is no polyhouse. The action plan to revive the Mahabaleshwar centre was discussed due to its strategic role for rust management. Dr. Bhardwaj and Dr, Saharan will take actions for proper functioning of Mahabaleshwar centre. A training programme should be organized for young scientists who joined the wheat group recently. The Project Director also advised that young scientists should learn the science from their senior scientists who have long experience in the field.

The meeting ended with vote of thanks to the chair.

Research Review Meetings-Wheat Quality

September 1, 2013

Chairman : Dr Mukesh Mohan
Co-Chairman : Dr RK Gupta
Rapporteurs : Dr D Mohan & Dr Sneh Narwal

The meeting to review wheat quality work was chaired by Dr Mukesh Mohan, Head, Biochemistry. In total 25 delegates attended this meeting to take an account of the progress made in wheat quality during 2012-13. Dr R K Gupta, PI, 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. New initiative for wheat export (analysis of FCI wheat grain samples) was also presented by him.

Presentations 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* and *T dicoccum*. Dr (Ms) Satinder Kaur Uppal (NIVT1A), Dr. N Augustine (NIVT 2), Dr. Anil Kumar (NIVT 3), Dr RS Gaikwad (NIVT 4), Dr. Shashi 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 on the progress made on soft textured wheat and biscuit quality. Dr D Mohan discussed the Quality Component Screening Nursery (QCSN) and stressed the need of better field 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 (Ms) Indu Sharma, Project Director also participated and some useful suggestions were given by the experts. Dr (Ms) 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 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. She emphasized that the good work done by quality group should reach to the industry and every effort should be made to strengthening the public-private interactions. The Chairman, Dr Mukesh Mohan suggested to avoid any discrepancy in data reporting, the analysis should include some already known checks and methods should be devised to bring uniformity in data reporting. He concluded the session by showering appreciation for the good work on wheat quality.

The meeting ended with a vote of thanks to the chairman.

Research Review Meetings – Barley Network

September 1st, 2013	Chairman :	Dr Mahesh Shrimali
11.15 AM-3.15PM	Co-Chairman :	Dr AS Kharub
	Rapporteurs :	Dr PK Gupta & Dr Dinesh Kumar

The research review session of barley network during 52nd AICW&BIP was chaired by Dr Mahesh Shrimali, Ex-Head, Wheat & Barley Programme, SKRAU, Durgapura and eminent barley breeder. The meeting was also attended by Dr RPS Verma from ICARDA, Morocco. The chairman welcomed, Dr Verma and 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 AS Kharub, DWR, Karnal presented the progress report on the conduct of coordinated varietal yield trials including the constraints faced during 2012-13 crop season. He informed the house about the release of four new barley varieties, DWRB 91 malt barley for cultivation under late sown conditions in North Western Plain Zone (NWPZ) and RD 2786, RD 2794 & VLB 118 for feed barley in CZ, NWPZ/NEPZ & rainfed timely sown conditions in Northern Hill Zones (NHZ), respectively. He also said that this year barley production in the country had increased despite stabilized area since last few years. He requested all the co-operators to further improve the data reporting along with sending the soft copy of data to increase the efficiency of programme. He also suggested that some of the centres in Central Zone need to be reviewed due to low site mean and the centres getting full contingency should conduct all the allotted trials. He also suggested that in case of fodder purpose barley, forage quality can be included as an additional parameter.

During the session Project Director, Dr Indu Sharma also participated actively and emphasized that the cultivation of barley needs to be expanded in the country through FLDs, fixing MSP comparable to wheat etc. The participants from private companies discussed about the availability of quality seed through public private partnership. Varieties for dual purpose barley need to be developed as there is only one variety RD 2715 at present for plains. Proportion of direct introductions is increasing therefore there is need to further strengthen the breeding efforts. For this crossing with international and NBGSN genotypes should be speeded up. For feed and fodder purpose barley breeding, linkage should be established with animal science institutes. Lodging is the major concern for high input malt barley and malt barley improvement programme should emphasize on better plant type. Representative from industry suggested that higher diastatic power can also be considered as nowadays enzyme free brewing is preferred. Further malt friability needs to be increased in improved varieties. Health benefits of consuming barley should be popularized and barley based food products need to be developed. Work should be strengthened to identify superior genotypes with better nutritional quality. Attention should be paid on high altitude barley improvement. For this hill zone centres should play more active role. Work on rainfed barley and for problematic soils needs to be further strengthened.

Dr AS Kharub made presentation on the results of the various agronomical experiments including the varietal evaluation and special trials. He informed the house that the effect of sprinkler irrigation on malt quality could not be detected for Durgapura location. In the special trial on Sulphur application, effect of sulphur on grain test weight and protein content was observed. The response of sulphur application was observed at 20 kg/ha. Regarding dual purpose barley, he suggested that sowing should preferably be done by 10th of November to get advantage of cool temperature in inducing tillering and finally higher grain yield. After one year experimentation during 2012-13 it was exhibited that, in NWPZ, the optimum date of sowing was between 1-15 Nov., while in NEPZ and NHZ the results were better till 25 of Nov.

Dr Selvakumar presented the progress report of experiments conducted in crop protection section. These included screening done under IBDSN, NBDSN, EBDSN and screening of

more than 300 germplasm lines for stripe rust and leaf blight. The results of NBDSN and EBDSN seedling resistance test data was also presented. The breeders were requested to utilize the identified resistant sources in breeding programme. Dr. Verma suggested that research on covered smut and Fusarium head blight shall also be taken up as they are very serious in other parts of the world. The maintenance of sick plot for screening of covered smut is very important and method of inoculation has to be standardized for proper disease development. It was suggested to include latest fungicides in chemical control experiments for management of blights and rusts.

Dr Dinesh Kumar made the presentation on quality evaluation. He told that evaluation was done for malt barley, barley quality screening nursery and feed barley samples received from different places. A total of around 1800 samples were analysed for different traits and promising entries identified for each group. He informed the house that this year malt friability and hot water extract was in general lower as compared to last year and this observation was also vetted by the representative from industry. During the discussion it was come out that due to shorter grain filling period in Indian sub-tropical climatic conditions, all the grain or malt traits cannot be compared with the values obtained in temperate climatic conditions, where the grain filling period is pretty long.

In continuation of the session, Dr Vishnu Kumar made the presentation on evaluation of national nurseries namely NBGSN and EIBGN. The national barley genetic stock nursery (NBGSN) with 30 entries was supplied to all centers, while an elite international barley germplasm nursery (EIBGN) was constituted with 45 entries and 6 checks and was also supplied to all centers. The material from these nurseries was utilized by the breeders as direct introduction or in the hybridization program. Dr Vishnu Kumar also informed the house about the germplasm maintenance activity and mentioned that during the year 955 accessions were rejuvenated as regular maintenance program for conservation of germplasm at MTS at DWR, Karnal.

In the last the breeder seed indent/ production and nucleus seed production scenario for the season was also discussed by Dr Vishnu Kumar. He informed that a total of 698.25 q breeder seed production of 27 varieties was reported during 2012-13. This deficit seed production was reported due to curtailed indent from RSCCL before sowing owing to availability of carry over seeds. The nucleus seed production was in surplus, and the net production of 71.27 q of nucleus seed for 26 varieties was also reported. Dr Vishnu Kumar also informed the house about the indents for season 2013-14, from DAC. He discussed that the breeder seed indent is very drastically reduced from UP state and is remaining merely 10% in comparison of previous years. He requested to different cooperating centres for timely supply of seed production data well in time. The session was attended by persons from malting and brewing industry who actively involved in the discussions and emphasized the need for quick delivery of breeder seeds of malting barley in large quantity.

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 diversity through use of elite materials coming from national and international programme. He also commended ICARDA for supplying elite germplasm in the form of various yield trials & nurseries which are being used in the national program and he emphasized the need of developing more collaboration in barley improvement addressing the current objectives like malting, 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 Meeting-Crop Improvement

September 1 & 3, 2013

Organizer: Dr V Tiwari

The Crop Improvement group scientists from six wheat growing zones deliberated and reviewed the results of various wheat varietal evaluation trials, genetic resources, physiological investigations and status of seed production during the crop season 2012-13. The promising entries in Advanced Varietal Trials (AVT) were retained for final year evaluation in AVTs on the basis of set norms for yield, rust disease incidence and quality parameters. The same norms were taken into account for promotion of test entries from NIVTs to AVTs. The entries and locations for special trials and physiological investigations were also finalized.

The constitution of various trial series in NWPZ (5), NEPZ (3), CZ (4), PZ (4), NHZ (7), SHZ (2), special trials (3) were decided in the meeting chaired by the ADG (FFC). The constitution of seven National Initial Varietal Trials and two Initial Varietal Trials from the proposals received from different wheat breeding centres was also finalized during the meeting. The wheat physiological investigations (2) and programme for breeder seed production during 2013-14 crop season were also finalized.

Finalization of work plan and Recommendations

The details of various wheat breeding yield trials, wheat physiological investigations and breeder seed production by the Crop Improvement group for conduction during 2013-14 crop season is given here as under:

**National Initial Varietal Trial
NIVT-1A-IR-TS-TAS, 2013-14**

Conducting centres

Zone	No.	Centres
NWPZ	10	Durgapura, Delhi, Ludhiana, Gurdaspur, Hisar, DWR-Karnal, Jammu, Pantnagar, Modipuram, Bulandshahr
NEPZ	7	Kanpur, Faizabad, Varanasi, Pusa (IARI), Sabour, Ranchi, Kalyani
Total	17	

Details of trial entries

Sr No	Contributing Centres	No. of Entries	Entries
1.	Delhi	8	HD 3151, HD 3152, HD 3153, HD 3154, HD 3155, HD 3156, HD 3157, HD 3158
2.	Ludhiana	5	PBW 707, PBW 708, PBW 709, PBW 710, PBW 711
3.	Hisar	5	WH 1168, WH 1169, WH 1170, WH 1171, WH 1172
4.	Pantnagar	5	UP 2873, UP 2874, UP 2875, UP 2876, UP 2877
5.	Durgapura	5	RAJ 4373, RAJ 4374, RAJ 4375, RAJ 4376, RAJ 4377
6.	DWR-Karnal	6+1	DBW 134, DBW 135, DBW 136, DBW 137, DBW 138, DBW 139, DBW 140
7.	Faizabad	2	NW 6029, NW 6036
8.	Varanasi	2	HUW 680, HUW 681
9.	Kanpur	2	K 1301, K 1302
11.	Sabour	2	BRW 3742, BRW 3750
12.	Ranchi	2	JKW 193, JKW 203
	Checks	4	HD 2967, WH 1105, K 0307, HD 2733
	Total entries	49 (45+4)	

Experimental details

Design	: Simple Lattice
Replication	: Two
Plot size	: Gross: 6 m x 1.20 m (6 rows); Net: 6 m x 0.80 m (4 middle rows)
Fertilizer dose (kg/ha)	: 150:60:40 (N:P:K)
Time of sowing	: NWPZ: November 10-20, NEPZ: 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, 2013-14

Conducting centres

Zone	No.	Centres
NWPZ	9	Delhi, Jammu, Ludhiana, Gurdaspur, Hisar, DWR-Karnal, Pantnagar, Modipuram, Durgapura
NEPZ	11	Kanpur, Faizabad, Varanasi, Ranchi, Sabour, Pusa (IARI), Kalyani, Malda, Burdwan, Coochbehar, Shilongani
Total	20	

Details of trial entries

Sr No	Contributing centres	No. of Entries	Entries
1.	Delhi	8	HD 3159, HD 3160, HD 3161, HD 3162, HP 1956, HP 1957 HI 1599, HI 1606
2.	Kanpur	5	K 1304, K 1305, K 1306, K 1307, K 1308
3.	Faizabad	5	NW 6023, NW 6025, NW 6028, NW 6031, NW 6033
4.	Varanasi	5	HUW 682, HUW 683, HUW 684, HUW 685, HUW 686
5.	Durgapura	3	RAJ 4378, RAJ 4379, RAJ 4380
6.	Ludhiana	3	PBW 712, PBW 713, PBW 714
7.	Hisar	3	WH 1173, WH 1174, WH 1175
8.	Pantnagar	3	UP 2878, UP 2879, UP 2880
9.	DWR-Karnal	5	DBW 141, DBW 142, DBW 143, DBW 144, DBW 145
10.	Sabour	3	BRW 3743, BRW 3747, BRW 3748
11.	KSPL, Jalna	1	KDW 2010
11.	Ankur Seeds	1	Ankur BW 249
	Checks	4	HD 2967, WH 1105, K 0307, HD 2733
	Total entries	49 (45+4)	

Experimental details

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	Gross: 6m x 1.20m (6 rows); Net: 6m x 0.80m (4 middle rows)
Fertilizer dose (kg/ha)	:	150:60:40 (N: P: K)
Time of sowing	:	NWPZ: November 10-20, NEPZ: 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, 2013-14

Conducting centres

Zone	No.	Centres
CZ	10	Indore, Powarkheda, Jabalpur, Sagar, Gwalior, Bilaspur, Junagadh, Vijapur, Kota, Udaipur
PZ	4	Niphad, Pune, Akola, Dharwad
Total	14	

Details of trial entries

Sr No	Contributing Centres	No. of Entries	Entries
1.	Delhi	5	HD 3164, HI 1600, HI 1601, HI 1602, HI 1603
2.	Dharwad	4	UAS 360, UAS 361, UAS 362, UAS 363
3.	Vijapur	4	GW 458, GW 459, GW 460, GW 461
4.	Niphad	2	NIAW 2313, NIAW 2345
5.	Powarkheda	3	MP 1296, MP 1297, MP 1298
6.	Durgapura	2	RAJ 4381, RAJ 4382
7.	Pune	2	MACS 6632, MACS 6640
8.	Junagadh	1	GW 463
9.	Jabalpur	1	MP 3421
10.	Akola	1	AKAW 4730
11.	Lok Bharati	1	LOK 72
12.	Ludhiana	1	PBW 715
13.	Kanpur	1	K 1310
14.	Pantnagar	1	UP 2881
15.	DWR- Karnal	1	DBW 146
16.	Hisar	1	WH 1176
17.	Bilaspur	1	CG 1014
18.	Gwalior	1	RVW 4205
19.	Sagar	1	JWS 530
	Checks	2	GW 322, MACS 6222
Total entries		36 (34+2)	

Experimental Details

Design	: Simple Lattice
Replication	: Two
Plot size	: Gross: 6m x 1.20m (6 rows); Net: 6m x 0.80m (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, 2013-14

Conducting centres

Zone	No.	Centres
NWPZ	9	Delhi, Durgapura, Ludhiana, Gurdaspur, Jammu, Hisar, DWR-Karnal, Pantnagar, Modipuram,
NEPZ	9	Kanpur, Faizabad, Varanasi, IARI-Pusa, Ranchi, Sabour, Coochbehar, Kalyani, Shillongani
CZ	7	Indore, Bilaspur, Gwalior, Powarkheda, Jabalpur, Junagarh, Vijapur
PZ	5	Dharwad, Niphad, Pune, Parbhani, Akola
Total	30	

Details of trial entries

Sr No	Contributing centres	No. of Entries	Entries
1.	Delhi	8	HD 3165, HD 3166, HD 3167, HD 3168, HD 3169, HD 3170, HI 1604, HI 8756 (d)
2.	Ludhiana	4	PBW 716, PBW 717, PBW 718, PBW 719
3.	Pantnagar	4	UP 2882, UP 2883, UP 2884, UP 2885
4.	Durgapura	3	RAJ 4383, RAJ 4384, RAJ 4385
5.	DWR- Karnal	3+2	DBW 147, DBW 148, DBW 149, DBW 150, DBW 151
6.	Hisar	3	WH 1177, WH 1178, WH 1179
7.	Varanasi	2	HUW 687, HUW 688
8.	Kanpur	3	K 1312, K 1313, K 1314
9.	Faizabad	1	NW 6024
10.	Sabour	1	BRW 967
11.	Powarkheda	2	MP 1299, MP 1300
12.	Vijapur	2	GW 465, GW 466
13.	Niphad	1	NIAW 2304
14.	Junagadh	1	GW 467
15.	Jabalpur	1	MP 3420
16.	Bilaspur	1	CG 1015
17.	Dharwad	1	UAS 364
18.	Akola	1	AKAW 4843
19.	Gwalior	1	RVW 4204
	Checks	4	WH 1021, HI 1563, MP 3336, HD 2932
	Total entries	49 (45+4)	

Experimental Details

Design	: Simple Lattice
Replication	: Two
Plot size	: Gross: 6m x 1.08m (6 rows); Net: 6m x 0.72m (4 middle rows)
Fertilizer dose (kg/ha)	: NWPZ & NEPZ: 120:60:40 (N: P: K) CZ & PZ: 90:60:40 (N: P: K)
Time of sowing	: NWPZ & NEPZ: December 15 - 25 CZ: December 5-15 ; PZ: 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, 2013-14

Conducting centres

Zone	No.	Centres
NWPZ	6	Delhi, Ludhiana, Gurdaspur, Hisar, DWR-Karnal, Durgapura
CZ	6	Indore, Powarkheda, Junagarh, Vijapur, SK Nagar, Kota
PZ	4	Dharwad, Niphad, Pune, Akola
Total	16	

Details of trial entries

Sr No	Contributing Centres	No. of Entries	Entries
1.	Delhi	7	HD 4731, HD 4732, HI 8757, HI 8758, HI 8759, HI 8760, HI 8761
2.	Vijapur	4	GW 1308, GW 1309, GW 1310, GW 1311
3.	Ludhiana	4	PDW 339, PDW 340, PDW 341, PDW 342
4.	Pune	3	MACS 3949, MACS 4023, MACS 4024
5.	DWR- Karnal	2	DDW 31, DDW 32
6.	Hisar	2	WHD 955, WHD 956
7.	Dharwad	2	UAS 452, UAS 453
8.	Kota	2	RKD 279, RKD 280
9.	Niphad	1+1	NIDW 841, NIDW 842
10.	Powarkheda	1+1	MPO 1301, MPO 1302
11.	Pantnagar	1	UPD 96
12.	Parbhani	1	PBND 5128
	Checks	4	PDW 314, HI 8498, NIDW 295, HD 2967
	Total entries	36(32+4)	

Experimental Details

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	Gross: 6m x 1.20m (6 rows); Net: 6m x 0.80(4 middle rows)
Fertilizer dose (kg/ha)	:	NWPZ : 150:60:40 (N: P: K); CZ & PZ : 120:60:40 (N: P: K)
Time of sowing	:	NWPZ: Nov 5-15; CZ: Nov.10-20; PZ: 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, 2013-14

Conducting centres

State	Centres	Production condition	
		RF	RI
NWPZ	3RF & 7RI	Jammu, Balachaur, Gurdaspur	Jammu, Balachaur, Gurdaspur Ludhiana, Hisar, Ambala, Delhi
NEPZ	7RF	Faizabad, Ranchi, Kalyani, Coochbehar, Sabour, Kanpur, IARI- Pusa	-
CZ	3RF & 5RI	Sagar, Kota, Indore	Sagar, Kota, Indore, Jabalpur, Bilaspur,
PZ	4RF & 5RI	Dharwad, Annegiri, Ambejogai, Washim	Dharwad, Bailhongal, Niphad, Pune, Akola
Total	RF: 17 & RI: 17		

Details of trial entries

Sr. No.	Contributing Centres	No. of Entries	Entries
.	Delhi	5	HD 3171, HD 3172, HD 3173, HD 3174, HI 1605
.	Powarkheda	4	MP 1290, MP 1291, MP 1292, MP 1293
.	Kanpur	2+1	K 1315, K 1316, K 1317
.	Ludhiana	2	PBW 720, PBW 721
.	Hisar	2	WH 1166, WH 1167
.	Pantnagar	2	UP 2886, UP 2887
.	Pune	2	MACS 6607, MACS 6648
.	Dharwad	1	UAS 365
.	Niphad	1	NIAW 2325
0.	Faizabad	1	NW 6035
1.	Durgapura	1	RAJ 4386
2.	Jabalpur	1	MP 3424
3.	Varanasi	1	HUW 689
4.	Sabour	1	BRW 3753
5.	Jammu	1	JAUW 621
6.	Bilaspur	1	CG 1012
7.	Sagar	1	JWS 712
8.	DWR-Karnal	1+1	DBW 152, DBW 153
	Checks	4	WH 1080, MP 3288, HD 2888, NI 5439
	Total entries	36 (32+4)	

Experimental Details

Design	: Simple Lattice															
Replication	: Two															
Plot size	: Gross: 6m x 1. 20m (6 rows); Net: 6m x 0.80(4 middle rows)															
Fertilizer dose (kg/ha)	: RF: 60:30:20 (N:P:K); RI: 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 style="text-align: center;">-</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, 2013-14

Conducting centres

State	Centres	Production condition		
		RF only	RI only	RI & RF
CZ	7	Dhandhuka, Arnej, Tanchha, Sagar	Powarkheda, Indore	Kota
PZ	5	Dharwad, Annegiri	Niphad, Pune, Akola	
Total	7 RF & 6 RI			

Details of trial entries

Sr No	Contributing Centres	No. of Entries	Entries
1.	Delhi	5	HI 8762, HI 8763, HI 8764, HI 8765, HI 8766
2.	Pune	3	MACS 3970, MACS 3972, MACS 4020
3.	Vijapur	3+1	GW 1314, GW 1315, GW 1316, GW 1317
4.	Dharwad	2	UAS 454, UA 455
5.	Powarkheda	2	MPO 1294, MPO 1295
6.	DWR- Karnal	2	DDW 33, DDW 34
7.	Junagadh	1	GW 1313
8.	Niphad	1	NIDW 765
9.	Kanpur	1	KD 1318
10.	Kota	1+1	RKD 268, RKD 270
	Checks	2	HI 8627, AKDW 2997-16
	Total Entries	25 (23+2)	

Experimental Details

Design	:	Simple Lattice									
Replication	:	Two									
Plot size	:	Gross: 6m x 1.20m (6 rows); Net: 6m x 0.80(4 middle rows)									
Fertilizer dose (kg/ha)	:	RF – 60:30:20 (N:P:K); RI – 90:60:40 (N:P:K)									
Time of sowing	:										
		<table border="1"> <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>-</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, 2013-14
AVT-RF-TS-TAS & AVT-IR-TS-TAS

Trial conducting centres

State	Centres	Production condition		
		RF only	RF & IR	IR only
Himachal Pradesh	7	Bajaura, Chamba (KVK), Berthin, Akrot	Shimla, Malan	Dhaulak uan
Uttarakhand	3	Majhera, Ranichauri	Almora	-
Jammu & Kashmir	3	Khudwani, Wadura	Rajouri	-
Manipur	1	Lamphelpet (Imphal)	-	-
Total	RF : 13 & IR: 5			

Details of test entries

Contributing Centres	No. of entries	Name of entry
VPKAS, Almora	1	VL 967*
Checks	4	VL 804, VL 907, HS 507, HPW 349
Total (Entries + checks)	5 (1+4)	

Experimental details

Design	: R.B.D.
Replications	: Six
Plot size	: Gross: 4m x 1.20m (6 rows); Net : 4m x 0.80m (4 rows)
Fertilizer dose (kg/ha)	: RF- 60:30:20(N:P:K); IR- 120:60:40(N:P:K)
Time of sowing	: RF- Oct, 15 – 31; IR- 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, 2013-14
AVT-RF-ES-TAS

Trial conducting centres

State	Centres	Name of the centres
Himachal Pradesh	3	Shimla, Malan, Bajaura
Uttarakhand	2	Almora, Ranichauri
Total	5	

Details of test entries

Contributing Centres	No. of entries	Name of entry
CSKHPKV, Palampur	3	HPW 376*, HPW 400, HPW 401
IARI RS Shimla	4	HS 575, HS 590, HS 591, HS 595
VPKAS Almora	2	VL 1003, VL 1004
GBPUAT Pantnagar	1	UP 2890
Checks	4	HS 277, VL 829, HPW 251, HS 542 (I)
Total (Entries + checks)	14(10+4)	

Experimental details

Design	: R.B.D.
Replications	: Six
Plot size	: Gross: 4m x 1.20m (6 rows); Net : 4m x 0.80m (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, 2013-14
AVT-RI-LS-TAS

Trial conducting centres

State	Centres	Name of the centres
Himachal Pradesh	5	Shimla, Malan, Bajaura, Dhaulakuan, Sundernagar
Uttarakhand	2	Almora, Majhera
W. Bengal	1	Kalimpong
Sikkim	1	Gangtok
Manipur	1	Lamphelpet (West Imphal)
Total	10	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI RS Shimla	4	HS 577, HS 592, HS 593, HS 594
CSKHPKV Malan	3	HPW 410, HPW 411, HPW 412
VPKAS Almora	4	VL 3002, VL 3004, VL 3005, VL 3006
GBPUAT, Pantnagar	1	UP 2891
Checks	2	VL 892, HS 490
Total (Entries + checks)	14(12+2)	

Experimental details

Design	:	R.B.D.
Replications	:	Six
Plot size	:	Gross: 4m x 1.08m (6 rows); Net : 4m 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 2013
AVT-VHA-TAS

Trial conducting centres

State	Centres	Name of the centres
Himachal Pradesh	2	Dalang Maidan, Kukumseri
Jammu & Kashmir	4	Kargil, Leh (2), Wadura
Total	6	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, RS Shimla	2	HS 547, HS 558
CSKHPKV, Malan	1	HPW 373
VPKAS, Almora	2	VL 976, VL 977
Checks	2	HS 375, HS 490
Total (Entries + checks)	7 (5+2)	

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	Gross: 3m x 1.38m (6 rows); Net : 3m x 0.92m (4 rows)
Fertilizer dose (kg/ha)	:	60:30:20 (N:P:K)
Time of sowing	:	May 2012
Seed rate (kg/ha)	:	100
Seed requirement	:	4 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
Initial Varietal Trial, 2013-14
IVT-RF-TS-TAS & IVT-IR-TS-TAS

Trial conducting centres

State	Centres	Production condition		
		IR & RF	IR only	RF only
Himachal Pradesh	4	Dhaulakuan, Shimla, Malan	Bajaura	-
Uttarakhand	2	Almora	-	Ranichauri
Jammu & Kashmir	1	-	-	Wadura
Total	RF : 7 & IR: 5			

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, RS Shimla	7	HS 581, HS 582, HS 583, HS 584, HS 585, HS 586, HS 587
CSKHPKV, Palampur	7	HPW 403, HPW 404, HPW 405, HPW 406, HPW 407, HPW 408, HPW 409
VPKAS, Almora	6	VL 2007, VL 2008, VL 2009, VL 2010, VL 2011, VL 2012
GBPUA&T, Pantnagar	2	UP 2888, UP 2889
Checks	2	VL 907, HS 507
Total (Entries + checks)	24 (22+2)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 4m x 1.20m (6 rows); Net : 3m x 0.80m (4 rows)
Fertilizer dose (kg/ha)	: IR- 120:60:40 (N:P:K); RF- 60:30:20 (N:P:K)
Time of sowing	: IR- Nov, 1-15 ; RF- 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, 2013-14
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, Uchani, Bawal, Faridabad, Shikohpur, Rohtak
Uttar Pradesh	5	Modipuram, Nagina, Bulandshahr, Ujhani, Bareilly
Rajasthan	4	Durgapura, Sriganganagar, Tabiji, Alwar
Uttarakhand	2	Pantnagar, Kashipur
Himachal Pradesh	1	Dhaulakuan
Jammu & Kashmir	1	Jammu
Delhi	1	Delhi
Total	26	

Details of test entries

Contributing Centres	No. of entries	Name of entry
PAU, Ludhiana	7	PBW 681*, PBW 677, PBW 692, PBW 695, PBW 697, PBW 698, TL 2995
CCSHAU, Hisar	4	WH 1138*, WH 1154, WH 1156, WH 1157
BHU, Varanasi	2	HUW 666*, HUW 675
IARI Delhi	3	HD 3128, HD 3132, HD 3133
DWR, Karnal	1	DBW 95
CSAUA&T, Kanpur	1	K 1204
Checks	5	DPW 621-50, HD 2967, WH 1105, DBW 88(I), HD 3086(I)
Total (Entries +checks)	23(18+5)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross : 6m x 2.40m (12 rows); Net : 6m x 2.00m (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

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, 2013-14
AVT-IR-TS-TDM**

Trial conducting centres

State	Centres	Name of the centres
Punjab	3	Ludhiana, Gurdaspur, Kapurthala,
Haryana	2	Hisar, DWR-Karnal
Uttar Pradesh	1	Modipuram
Delhi	1	Delhi
Uttarakhand	1	Pantnagar
Rajasthan	1	Durgapura
J & K	1	Jammu
Total	10	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	1	HD 4730
Checks	4	PDW 233, PDW 291, PDW 314, HD 2967(Aest.)
Total (Entries + checks)	5 (1+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (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

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, 2013-14
AVT-IR-LS-TAS

Trial conducting centres

State	Centres	Name of the centres
Punjab	4	Ludhiana, Gurdaspur, Bathinda, Kapurthala
Haryana	4	Hisar, DWR-Karnal, Kaul, Rohtak
Uttar Pradesh	4	Modipuram, Nagina, Bulandshahr, Bareilly
Rajasthan	4	Durgapura, Sriganganagar, Tabiji, Alwar
Uttarakhand	2	Pantnagar, Kashipur
Jammu & Kashmir	1	Jammu
Delhi	1	Delhi
Total	20	

Details of test entries

Contributing Centres	No. of entries	Name of entry
CCSHAU, Hisar	1	WH 1129*
PAU, Ludhiana	2	PBW 702, PBW 703
IARI, New Delhi	1	HD 3139
DWR, Karnal	1	DBW 128
Checks	5	PBW 590, WH 1021, HD 3059, DBW 90(I), WH 1124(I)
Total (Entries + checks)	10 (5+5)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.16m (12 rows); Net : 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	: 26 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, 2013-14
AVT-RF-TS-TAS

Trial conducting centres

State	Centres	Name of the Centres
Punjab	4	Ludhiana, Gurdaspur, Kapurthala, Balachaur
Haryana	2	Ambala, Hisar
Uttar Pradesh	1	Modipuram
Rajasthan	1	Diggi
J&K	1	Jammu
Delhi	1	Delhi
Total	10	

Details of test entries

Contributing Centres	No. of entries	Name of entry
PAU, Ludhiana	1	PBW 706
CCSHAU, Hisar	1	WH 1164
Checks	3	PBW 644, WH 1080, PBW 660 (I)
Total (Entries + checks)	5 (2+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (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	: 13 kg per 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, 2013-14
AVT- RI-TS-TAS

Trial conducting centres

State	Centres	Production condition
Punjab	4	Ludhiana, Gurdaspur, Kapurthala, Balachaur
Haryana	3	Hisar, Ambala, Uchani
Uttar Pradesh	2	Modipuram, Bulandshahr
Uttarakhand	1	Pantnagar
Rajasthan	2	Sriganganagar, Diggi
J&K	1	Jammu
Delhi	1	Delhi
Total	14	

Details of test entries

Contributing Centres	No. of entries	Name of entry
CCSHAU, Hisar	1	WH 1142*
PAU, Ludhiana	1	PBW 706
JNKVV, Powarkheda	1	MP 1277
DWR, Karnal	1	DBW 129
UAS, Dharwad	1	UAS 356
Checks	3	PBW 644, WH 1080, HD 3043
Total (Entries + checks)	8 (5+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (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	: 17 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, 2013-14
AVT-IR-TS-TAS**

Trial conducting centres

State	Centres	Name of the centres
Uttar Pradesh	5	Kanpur, Faizabad, Varanasi, Barabanki, Araul
Bihar	4	IARI-Pusa, Sabour, Patna (ICAR Complex), Jalalgarh
Assam	1	Shillongani
West Bengal	4	Coochbehar, Kalyani, Burdhan, Malda
Jharkhand	1	Ranchi
Total	15	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	2	HD 3127, HD 3128
PAU, Ludhiana	2	PBW 677, PBW 693
CCSHAU, Hisar	1	WH 1132
BHU, Varanasi	1	HUW 661
DWR, Karnal	1	DBW 98
GBPUA&T, Pantnagar	1	UP 2855
Checks	5	K 0307, DBW 39, HD 2733, NW 5054 (I), K 1006 (I)
Total (Entries + checks)	13 (8+5)	

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (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	:	18 kg. per 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, 2013-14
AVT-IR-LS-TAS**

Trial conducting centres

State	Centres	Name of the centres
Uttar Pradesh	6	Kanpur, Faizabad, Varanasi, Mau, Barabanki, Araul
Bihar	4	Pusa, Sabour, Patna (ICAR Complex), Jalalgarh
West Bengal	5	Coochbehar, Kalyani, Mohitnagar, Burdwan, Kharibari (UBKV)
Assam	1	Shillongani
Jharkhand	1	Ranchi
Total	17	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	2	HD 3118*, HD 3139
DWR, Karnal	2	DBW 107*, DBW 126
CSAUA&T, Kanpur	1	K 1114*
PAU Ludhiana	3	PBW 701, PBW 702, PBW 704
BHU, Varanasi	1	HUW 677
Checks	4	NW 2036, DBW 14, HD 2985, HI 1563
Total (Entries + checks)	13(9+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.16m (12 rows); Net : 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)	: 125
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, 2013-14
AVT-RF-TS-TAS**

Trial conducting centres

State	Centres	Name of the centres
Uttar Pradesh	4	Varanasi, Faizabad, Kanpur, Deegh
Bihar	2	IARI-Pusa, Sabour
West Bengal	3	Coochbehar, Kalyani, Kharibari (UBKV)
Jharkhand	1	Ranchi
Assam	1	Shillongani
Total	11	

Details of test entries

Contributing Centres	No. of entries	Name of entry
BAU, Sabour	1	BRW 3723*
BHU, Varanasi	1	HUW 679
UAS, Dharwad	1	UAS 356
Checks	3	C 306, K8027, HD 2888
Total (Entries + checks)	6(3+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (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	: 13 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, 2013-14
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, Sagar, Jabalpur, Rewa, Powarkheda, Bhopal, Indore
Chhattisgarh	2	Bilaspur, Raipur
Rajasthan	3	Kota, Udaipur, Banswara
Total	19	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, Indore	3	HI 8736* (d), HI 8737*(d), HI 8750 (d)
JNKVV-Jabalpur	1	MP 3382*
CERW-Vijapur	1	GW 451
ARI -Pune	1	MACS 6604
IARI, New Delhi	2	HD 4728 (d), HD 4730 (d)
Checks	4	GW 322, HI 1544, HI 8498(d), MPO 1215(d)
Total (Entries + checks)	12 (8+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (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

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, 2013-14
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, Gwalior, Jabalpur, Powarkheda, Rewa
Chattisgarh	3	Bilaspur, Jagdalpur, Ambikapur
Rajasthan	3	Banswara, Udaipur, Kota
Total	16	

Details of test entries

Contributing Centres	No. of entries	Name of entry
JAU, Junagarh	1	GW 455
Checks	4	MP 4010, HD 2864, HD 2932, MP 3336
Total (Entries + checks)	5 (1+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.16m (12 rows); Net : 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	: 22 kg. per 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, 2013-14
AVT-RF-TS-TAD

Trial conducting centres

State	Centres	Name of the centre
Gujarat	3	Arnej, Dhandhuka, Tanchha
Madhya Pradesh	3	Indore, Jabalpur, Sagar
Rajasthan	2	Kota, Pratapgarh
Chhattisgarh	1	Bilaspur
Total	9	

Details of test entries

Contributing Centres	No. of entries	Name of entry
MPKV, Niphad	2	NIAW 1885*, NIAW 2030
PAU-Ludhiana	1	PBW 689*
CCSHAU, Hisar	1	WH 1142*
IARI, Indore	1	HI 8755(d)
JNKVV, Powarkheda	1	MP 1279
CSAUA&T, Kanpur	2	K 1215, K 1217
IGKVV, Bilaspur	1	CG 1010
ARI, Pune	2	MACS 3916 (d), MACS 3927 (d)
UAS, Dharwad	1	UAS 451 (d)
DWR, Karnal	1	DDW 30 (d)
Checks	4	HI 1500, MP 3288, HI 8627 (d), A 9-30-1(d)
Total (Entries + checks)	17 (13+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (10 middle rows)
Fertilizer dose (kg/ha)	: 60:30:20 (N:P:K)
Time of sowing	: Oct, 15-31
Seed rate (kg/ha)	: 100
Seed requirement	: 12 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, 2013-14
AVT-RI-TS-TAD

Trial conducting centres

State	Centres	Name of the centre
Gujarat	2	Arnej, Dhandhuka
Madhya Pradesh	5	Indore, Jabalpur, Sagar, Powarkheda, Bhopal
Rajasthan	3	Kota, Pratapgarh, Udaipur
Chhattisgarh	2	Bilaspur, Ambikapur
Total	12	

Details of test entries

Contributing Centres	No. of entries	Name of entry
DWR, Karnal	1	DBW 110*
IARI, New Delhi	1	HD 3146
Checks	3	HI 1500, MP 3288, HI 8627 (d)
Total (Entries + checks)	5 (2+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (10 middle rows)
Fertilizer dose (kg/ha)	: 90:60:40 (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

Peninsular Zone
Advance Varietal Trial, 2013-14
AVT-IR-TS-TAD

Trial conducting centres

State	Centres	Name of the centres
Maharashtra	10	Niphad, Pravaranagar, Pune, Akola, Parbhani, Nasik, Savalvihir, Amaravati, Karad, K'Digranj
Karnataka	5	Dharwad, Ugar Khurd, Arbhavi, Kaloli, Mudhol
Total	15	

Details of test entries

Contributing Centres	No. of entries	Name of entry
ARI, Pune	1	MACS 6604
IARI, Indore	1	HI 8750 (d)
DWR, Karnal	1	DDW 27 (d)
Checks	4	MACS 6222, NIDW 295(d), UAS 428(d), MACS 6478 (I)
Total (Entries + checks)	7 (3+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (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

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, 2013-14
AVT-IR-LS-TAS**

Trial conducting centres

State	Centres	Name of the centres
Maharashtra	8	Niphad, Pravaranagar, Pune, Akola, Savalvihir, Amaravati, Nasik, Karad
Karnataka	3	Dharwad, Ugar Khurd, Kalloli
Total	11	

Details of test entries

Contributing Centres	No. of entries	Name of entry
BHU, Varanasi	1	HUW 677
GBPUAT, Pantnagar	1	UP 2864
CSAUA&T, Kanpur	1	K 1213
Checks	3	HD 2932, Raj 4083, HD 3090 (I)
Total (Entries + checks)	6 (3+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.16m (12 rows); Net : 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	: 16 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, 2013-14
AVT-RF-TS-TAD

Trial conducting centres

State	Centres	Name of Centres
Karnataka	4	Dharwad, Annigeri, Bijapur, Bagalkot
Maharashtra	2	Ambejagai, Washim
Total	6	

Details of test entries

Contributing Centres	No. of entries	Name of entry
UAS, Dharwad	2	UAS 347*, UAS 446*(d)
MPKV, Niphad	2	NIAW 1994*, NIAW 2030
IARI, Indore	2	HI 8751(d), HI 8754 (d)
ARI, Pune	1	MACS 3927(d)
Checks	3	NI 5439, NIAW 1415, AKDW 2997-16(d)
Total (Entries + checks)	10 (7+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (10 middle rows)
Fertilizer dose (kg/ha)	: 60:30:20 (N:P:K)
Time of sowing	: Oct, 15-31
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

Southern Hills Zone
Advance Varietal Trial, 2013-14
AVT-RI-TS/LS-TAS

Trial conducting centres

State	Centres	Name of the centres
Tamil Nadu	6	Wellington (TS), Wellington (LS), Paiyur, Kodaikanal, Yercaud, CSWCRTI Ooty
Karnataka	1	Mandya
Total	7	

Details of test entries

Contributing Centres	No. of entries	Name of entry
UAS, Dharwad	1	UAS 358
ARI, Pune	1	MACS 6507
Checks	3	CoW(W) 1, HW 2044, HW 5216
Total (Entries + checks)	5 (2+3)	

Experimental details

Design	: R.B.D.
Replications	: Six
Plot size	: Gross: 6m x 1.20m (6 rows); Net : 6m x 0.80m (4 middle rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: TS : Nov, 15-Dec 15; LS : Dec 25 - Jan 15
Seed rate (kg/ha)	: 100
Seed requirement	: 6 kg per 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, 2013-14
IVT-RI-TS/LS-TAS**

Trial conducting centres

State	Centres	Name of the centres
Tamil Nadu	6	Wellington (TS), Wellington (LS), Paiyur, Kodaikanal, Yercaud, CSWCRTI Ooty
Karnataka	1	Mandya
Total	7	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, Wellington	11	HW 3607, HW 3608, HW 3620, HW 3627, HW 3906, HW 4215-1, HW 5047, HW 5048, HW 5049, HW 5801, HW 5802
IARI, Shimla	1	HS 589
UAS, Dharwad	2	UAS 367, UAS 368
Checks	3	HW 2044, CoW (W) 1, HW 5216
Total (Entries + checks)	17 (14+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 1.20m (6 rows); Net : 6m x 0.80m (4 middle rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: TS : Nov, 15-Dec 15; LS : 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), 2013-14
SPL-TCL-RF-TS-NHZ & SPL-TCL-IR-TS-NWPZ

Trial conducting centres

State	Centres	Name of the centres	
		NHZ (Rainfed)	NWPZ (Irrigated)
Himachal Pradesh	3	Bajaura, Malan, Dhaulakuan	-
Uttarakhand	1	Ranichauri	-
Punjab	2	-	Ludhiana, Gurdaspur
Haryana	1	-	Hisar
Delhi	1	-	Delhi
Total	8		

Details of test entries

Contributing Centres	No. of entries	Name of entry
PAU, Ludhiana	5	TL 2996, TL 2997, TL 2998, TL 2999, TL 3000
Checks	3	TL 2942, TL 2969, HS 507 (in NHZ) / HD 2967 (in NWPZ)
Total (Entries + checks)	8 (5+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: NHZ: Gross: 4m x 1.20m (6 rows); Net : 4m x 0.80m (4 middle rows) NWPZ: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.0m (10 middle rows)
Fertilizer dose (kg/ha)	: NHZ: 60:30:20 (N:P:K); NWPZ: 150:60:40 (N:P:K)
Time of sowing	: NHZ: Oct, 15-31; NWPZ: Nov, 5-15
Seed rate (kg/ha)	: 100
Seed requirement	: 9 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), 2013-14
SPL-DIC-IR-TS-All Zones

Trial conducting centres

State	Centres	Name of the centres
Maharashtra	3	Pune, Karad, Kolhapur
Karnataka	6	Dharwad, Arbhavi, Ugar, Kalloli, Mudhol, Mandya
Tamil Nadu	1	Wellington,
Total	10	

Details of test entries

Contributing Centres	No. of entries	Name of entry
ARI, Pune	3	MACS 5022*, MACS 5031, MACS 5040
UAS, Dharwad	4	DDK 1042*, DDK 1044, DDK 1046
IARI, Wellington	1	HW 1099
Checks	4	DDK 1029, MACS 2971, MACS 2496 (aest.), HW 1098 (I)
Total (Entries + checks)	11 (7+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net : 6m x 2.00m (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	: 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

Special Trial (Salinity/ Alkalinity), 2013-14
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
Total	9	

Details of test entries

Contributing Centres	No. of entries	Name of entry
CSSRI, Karnal	1	KRL 349
DWR, Karnal	2	DBW 154, DBW 155
CCSHAU, Hisar	1	WH 1301
Checks	3	KRL 210, Kharchia 65, KRL-19
Total (Entries + checks)	7 (4+3)	

Experimental details

Design	: R.B.D.
Replications	: Six
Plot size	: Gross: 4m x 2.40m (12 rows); Net : 4m x 2.00m (10 middle rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N:P:K) + 10 kg ZnSO ₄
Time of sowing	: Nov, 5-20
Seed rate (kg/ha)	: 100
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

Special Trial (MABB/NIL Entries), 2013-14
SPL-MABB/NIL-IR-TS-NWPZ

Trial conducting centres

State	Centres	Name of the centres
Delhi	1	Delhi
Haryana	1	Karnal
Punjab	1	Ludhiana
Himachal Pradesh	1	Dhaulakuan
Uttarakhand	1	Pantnagar
Jammu & Kashmir	1	Jammu
Total	6	

Details of test entries

Contributing Centres	No. of entries	Name of entry
PAU, Ludhiana	2	PBW 722 (PBW 343 + (Lr57/Yr40 + Lr37/ Yr17)) PBW 723 (PBW 343 + (Lr57/Yr40 + Yr15))
DWR, Karnal	1	KB 2012-03 (PBW 343 *6/KBRL 22)
Checks	4	PBW 343, HD 2967, DPW 621-50, WH 1105
Total (Entries + checks)	7 (3+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2.40m (12 rows); Net: 6m x 2.0m (10 rows)
Fertilizer dose (kg/ha)	: 150:60:40 (N:P:K)
Time of sowing	: Nov, 10-20
Seed rate (kg/ha)	: 100
Seed requirement	: 7.5 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 (MABB/NIL Entries), 2013-14
SPL-MABB/NIL-IR-LS-NEPZ

Trial conducting centres

State	Centres	Name of the centres
Uttar Pradesh	3	Kanpur, Faizabad, Varanasi
Bihar	1	Pusa
West Bengal	1	Coochbehar
Total	5	

Details of test entries

Contributing Centres	No. of entries	Name of entry
DWR, Karnal	1	MMBL-283 (HUW234+ Lr35+Lr37)
Checks	4	HUW 234, HI 1563, HD 2985, DBW 14
Total (Entries + checks)	5(1+4)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2..16m (12 rows); Net: 6m x 1.8m (10 rows)
Fertilizer dose (kg/ha)	: 120:60:40 (N:P:K)
Time of sowing	: December, 15-25
Seed rate (kg/ha)	: 125
Seed requirement	: 6.5 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 (MABB/NIL Entries), 2013-14
SPL-MABB/NIL-IR-LS-CZ/PZ

Trial conducting centres

State	Centres	Name of the centres
Madhya Pradesh	3	Jabalpur, Powarkheda, Indore
Chhattisgarh	1	Bilaspur
Gujarat	1	Vijapur
Maharashtra	3	Akola , Pune, Niphad
Karnataka	2	Dharwad, Ugar khurd
Total	10	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	2	HD 2932 + <i>Lr19/Sr25</i> HD 2932 + <i>Sr26</i>
Checks	3	HD2932, Raj 4083, HD 2864
Total (Entries + checks)	5(2+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 2..16m (12 rows); Net: 6m x 1.8m (10 rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: CZ: December, 5-15; PZ: December, 1-10.
Seed rate (kg/ha)	: 125
Seed requirement	: 11.5 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 (Wheat Biofortification), 2013-14
SPL-WB-TS-NWPZ-NEPZ-PZ

Trial conducting centres

State	Centres	Name of the centres
Punjab	1	Ludhiana
Haryana	2	Hisar, DWR-Karnal
Delhi	1	Delhi
Rajasthan	1	Durgapura
Uttar Pradesh	2	Kanpur, Varanasi
Maharashtra	1	Niphad
Total	8	

Details of test entries

Contributing Centres	No. of entries	Name of entry
IARI, New Delhi	5	HD 3175, HD 3176, HD 3177, HD 3178, HD 3179
PAU, Ludhiana	6	HPBW01, HPBW 02, HPBW 03, HPBW 04, HPBW 05, HPBW 06
BHU, Varanasi	3	HUW 694, HUW 695, HUW 696
Entries from 3 rd HPYT	5	WB 1 (HPYT 414), WB 2 (HPYT 415), WB 3 (HPYT 422), WB 4 (HPYT 423) WB 5 (HPYT 429)
Checks	3	DPW 621-50, K 0307, MACS 6222
Total (Entries + checks)	22(19+3)	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: Gross: 6m x 1.20m (6 rows); Net : 6m x 0.80m (4 middle rows)
Fertilizer dose (kg/ha)	: NWPZ & NEPZ 150:60:40 (N:P:K); PZ: 120:60:40 (N: P: K)
Time of sowing	: NWPZ & PZ: November 10-20, NEPZ: November 15-25
Seed rate (kg/ha)	: 100
Seed requirement	: 5 kg. per entry

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

Investigations in Wheat Physiology

Work Plan, 2013-14

I. DHTSN

No. of entries: 36

Replications: 2

Conditions: 2 (Irrigated and Drought)

Plot size: 2m x 0.20m (2rows)

Design: Alpha lattice

Centres: 12 (Akola, Bardoli, Coochbehar, Dharwad, Hisar, Indore, Kanpur, Karnal, Kota, Pune, Ranchi, Sagar)

Observations to be recorded:

Germination%, Days to heading, Days to maturity, Plant height,
Productive tillers/m, Test wt (g), Grain wt (g)/plot,
Excised leaf water retention %

II. Multilocation Heat Tolerance Trial

There will be two trials: MLHT1 and MLHT2

1. **MLHT- 1** : will be constituted from the entries from 1st year AVT entries of irrigated timely and late sown conditions

Replications: 2

Conditions: Timely and Late

Plot size: 3m. x 0.20m (6 rows)

Design: Lattice

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

Observations to be recorded:

Germination %, Days to heading, Days to anthesis, Days to maturity,
Plant height, Biomass/m² at harvest (g), Productive tillers/m²,
Grain yield/m² (g), 1000- grains weight, Grain number/5 main spike,
Grain weight/5 main spike
CTD (at anthesis, 1 week, 2 weeks and 3weeks after anthesis),
Chlorophyll fluorescence at anthesis and 15 days after anthesis,
Chlorophyll content at anthesis and 15 days after anthesis

2. **MLHT- 2**: Retesting of entries of MLHT-1 as conducted during 2012-13

Plot size, Design, Conditions: same as MLHT-1

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

Observations to be recorded: Same as in MLHT1

52nd All India Wheat & Barley Research Workers' Meet
Work Planning Meeting
(Breeder Seed Production allocation 2013-14)

Production Center	Variety	Notification Year	Nucleus seed (q)	Indent (q)	Allocation (q)
ARI, Pune	MACS 2496	1991	4.00	20.00	20.00
	MACS 3125	2003	1.40	18.00	18.00
	MACS 6222	2010	5.20	34.00	34.00
	MACS 2971	2009	0.00	4.00	4.00
	HD 2189	1980		209.20	88.00
	Lok 1	1982	25.55	729.30	71.00
					235.00
BISA, Pusa	HD 2733 ^(VSM)	2001		250.70	97.10
	HD 2967	2011		1313.88	177.00
					274.10
BISA, Jabalpur	GW 273	1998		750.00	195.00
	GW 322	2002		1162.20	346.00
	GW 366	2007		833.95	383.95
					924.95
BHU, Varanasi	HUW 234	1986	2.00	73.80	20.00
	HUW 468	1999	3.00	5.00	5.00
	HUW 510	2001	2.00	55.00	55.00
					80.00
CCS HAU, Hisar	WH 283	1985	0.50	18.80	18.80
	WH 542	1992	1.00	21.53	8.93
	WH 711	2002	8.00	199.20	60.00
	WH 1021	2008	4.00	69.60	29.60
	WH 1025	2010	2.50	23.00	23.00
	WH 1080	2011	3.00	62.80	60.00
	WH 1105	2013	5.00	39.00	39.00
	WHD 943	2011	1.50	102.20	48.00
					287.33
CSAUAT, Kanpur	DBW 14	2002	1.80	62.00	54.00
	DBW 39	2010	0.00	200.20	30.20
	HUW 234	1986	5.00	73.80	53.80
	K 0307 ^(Shatabdi)	2007	6.40	374.00	300.00
	K 0402 ^(Mahi)	2013	0.00	7.00	7.00
	K 7903 ^(Halana)	2001	1.20	20.00	12.00
	K 8027	1986	0.00	31.00	31.00
	K 8962	1996	0.00	15.00	15.00
	K 9107 ^(Deva)	1996	7.70	84.00	84.00
	K 9162 ^(Gangotri)	2001	0.00	2.00	2.00
	K 9351 ^(Mandakni)	2006	1.00	42.00	30.00
	K 9423 ^(Unnat Haina)	2005	1.80	37.00	37.00
	K 9465 ^(Gomti)	1998	0.00	2.00	2.00
	K 9533 ^(Naina)	2006	4.50	22.40	22.40
	PBW 343	1996	12.00	367.40	100.00
	PBW 550	2008	10.60	757.30	194.00
	PBW 502	2004	2.00	326.90	40.00
WH 147	1978	0.60	164.30	10.00	
DBW 17	2007	1.80	1010.98	38.28	
					1062.68
CSSRI, Karnal	KRL 210	2012	0.40	10.40	10.40
	KRL 213	2012	0.40	19.40	19.40
					29.80
DSR, Mau	HD 2733 ^(VSM)	2001	1.00	250.70	30.00
	HI 1563 ^(Pusa Prachi)	2011	1.00	195.00	82.00
					112.00
DWR, Karnal	CBW 38	2009	1.00	185.00	25.00
	DBW 14	2002	1.09	62.00	8.00

Production Center	Variety	Notification Year	Nucleus seed (g)	Indent (g)	Allocation (g)
	DBW 17	2007	1.50	1010.98	30.00
	DBW 39	2010	4.94	200.20	100.00
	DPW 621-50	2011	7.92	621.37	67.00
	DBW 71	2013	0.00	42.00	42.00
					372.00
GBPUAT, Pantnagar	CBW 38	2009	4.20	185.00	160.00
	DBW 16	2006	4.80	46.20	36.20
	DBW 17	2007	12.20	1010.98	152.70
	DPW 621-50	2011	12.20	621.37	241.80
	HD 2851 (Pusa Vishesh)	2005	3.00	428.40	150.00
	HD 2894 (Pusa Wheat 109)	2008	6.60	121.10	86.10
	HD 2932 (Pusa Wheat 111)	2008	5.40	350.10	57.00
	HD 2967	2011	14.00	1313.88	107.98
	HD 3043	2012	2.40	689.60	100.00
	PBW 154	1988	5.40	83.00	38.40
	PBW 226	1989	3.60	23.40	21.40
	PBW 343	1996	14.60	367.40	100.00
	PBW 373	1997	7.20	246.00	81.20
	PBW 502	2004	10.60	326.90	70.00
	PBW 550	2008	11.60	757.30	200.00
	UP 262	1978	1.80	37.70	37.70
	UP 2338	1995	5.80	17.60	17.60
	UP 2526	2007	3.80	25.80	25.80
	UP 2554	2007	1.00	30.80	30.80
	UP 2565	2006	6.80	26.28	26.28
	UP 2572	2007	0.00	30.52	30.52
	UP 2628	2010	5.60	26.01	26.01
	WH 711	2002	6.00	199.20	87.20
	WH 1021	2008	6.60	69.60	40.00
					1924.69
HPKVV, Palampur	HS 507	2011	0.43	40.00	10.00
	WH 1080	2011	0.10	62.80	2.80
					12.80
IARI, Indore	HD 2987 (Pusa Bahar)	2011	2.50	224.80	46.80
	HI 1418	2000	15.00	64.00	64.00
	HI 1479 (Swarna)	2003	7.50	136.50	136.50
	HI 1500 (Amrita)	2003	0.00	345.00	150.00
	HI 1531 (Harshita)	2006	11.50	168.00	168.00
	HI 1544	2008		270.20	170.20
	HI 8498 (Malav Shakti)	1999	23.00	301.80	200.00
	HI 8627 (Malav Kirti)	2007	4.00	54.00	54.00
	HI 8663 (Posan)	2008	12.50	162.00	162.00
	HI 8713	2013	14.00	30.00	30.00
					1011.30
IARI, Karnal	HD 2851 (Pusa Vishesh)	2005	7.50	428.40	278.40
	HD 2894 (Pusa Wheat 109)	2008	6.68	121.10	35.00
	HD 2932 (Pusa Wheat 111)	2008	9.41	350.10	243.10
	HD 2967	2011	7.40	1313.88	245.00
	HD 2985 (Pusa Basant)	2011	0.00	96.60	96.60
	HS 295	1992			6.08
	HS 365	1998	0.00	9.00	9.00
	HS 375	2003		10.00	10.00
	HS 490 (Pusa Baker)	2009	3.43	11.20	11.20
	HS 507 (Pusa Suketi)	2011	3.70		30.00
	WR 544 (Pusa Gold)	2005	0.00	133.00	133.00
					1152.78
IARI, New Delhi	HD 2967	2011	0.00	1313.88	150.00
	HD 2987 (Pusa Bahar)	2012	0.00	224.80	178.00

Production Center	Variety	Notification Year	Nucleus seed (g)	Indent (g)	Allocation (g)
	HD 3043	2012	0.00	689.60	150.00
	HD 3059	2013	0.00	35.00	35.00
	HD 4713	2008	0.00	1.00	1.00
					514.00
IARI, Pusa	HP 1633 ^(Sonali)	1995	0.60	7.00	7.00
	HD 2733 ^(VSM)	2001	9.00	250.70	123.60
	HD 2824 ^(Poorva)	2004	4.00	120.00	120.00
	HD 2888 ^(Pusa Wheat 107)	2006	0.80	5.00	5.00
	HI 1563 ^(Pusa Prachi)	2011	2.00	195.00	113.00
	HP 1731 ^(Raj Laxmi)	1992	0.60	6.00	6.00
	HW 2045 ^(Kaushambi)	2002	0.60	33.00	33.00
					407.60
IARI, Wellington	HD 2833 ^(Pusa Wheat 105)	2006	0.50	3.00	3.00
IGKV, Raipur	GW 273	1998	4.80	750.00	54.00
	GW 322	2002	0.00	1162.20	200.00
	HW 2004 ^(Amar)	1997	1.20	36.00	20.00
	CG 5016 ^(Ratan)	2009		19.00	19.00
	HI 617 ^(Sujata)	1982	2.80	35.00	35.00
					328.00
JNKVV, Jabalpur	GW 273	1998	34.60	750.00	200.00
	GW 322	2002	30.00	1162.20	112.00
	GW 366	2007	30.20	833.95	150.00
	HD 2932 ^(Pusa Wheat 111)	2008	4.80	350.10	50.00
	Lok 1	1982	12.80	729.30	174.50
	MP(JW) 1142 ^(Snehi)	2007	3.40	90.00	90.00
	MP(JW) 1202	2010	8.50	92.00	92.00
	MP(JW) 1203	2009	10.20	180.00	80.00
	MP(JW) 3020	2005	8.70	180.00	180.00
	MP(JW) 3173	2009	4.60	120.00	120.00
	MP(JW) 3211	2010	17.40	87.00	87.00
	MP(JW) 3288	2011	30.00	29.00	29.00
	MP 3336	2013	2.80	16.00	16.00
	MPO(JW) 1106 ^(Sudha)	2003	2.50	27.00	27.00
	MPO(JW) 1215	2010	25.50	104.00	104.00
	HD 2864 ^(Urja)	2005	8.80	243.90	243.90
					1755.40
MPKV, Niphad	HD 2189	1980	8.38	209.20	46.20
	NIAW 301 ^(Trimbak)	2002	5.46	93.00	93.00
	NIAW 917 ^(Tapovan)	2006	2.98	12.00	12.00
	NIAW 1415 ^(Netravati)	2011	1.48	5.00	5.00
	NIDW 295 ^(Godavari)	2007	0.74	10.00	10.00
					166.20
MPUA&T, Kota	C 306	1969	0.60	206.20	18.00
	GW 273	1998	12.50	750.00	157.00
	GW 322	2002	12.00	1162.20	46.00
	GW 496	1990	12.55	310.40	48.00
	HI 1544 ^(Purma)	2008	0.55	270.20	10.00
	HW 2004 ^(Amar)	1997	0.60	36.00	16.00
	Lok 1	1982	18.92	729.30	383.80
	PBW 343	1996	8.65	367.40	30.00
	PBW 502	2004	8.40	326.90	49.80
	Raj 1482	1983	10.60	235.70	91.70
	Raj 3077	1989	12.55	247.40	174.40
	Raj 4083	2007	8.00	201.20	100.00
	Raj 3765	1996	16.85	334.40	150.00
	Raj 3777	2006	0.50	178.20	10.00
	Raj 4037	2004	15.36	648.00	360.00
	Raj 4120	2009	13.05	557.60	200.00
	Raj 6560	2005	0.55	1.60	1.60

Production Center	Variety	Notification Year	Nucleus seed (g)	Indent (g)	Allocation (g)
	WH 147	1978	0.45	164.30	14.00
					1860.30
NDUA&T, Faizabad	K 7903 (Halana)	2001	0.40	20.00	8.00
	NW 1012	1998	0.40	1.00	1.00
	NW 1014	1998	0.00	3.00	3.00
	Sonalika	1969		6.50	6.50
	NW 1067	2005	0.00	8.00	8.00
	NW 2036	2003	2.20	54.00	54.00
	PBW 154	1988	4.00	83.00	44.60
	PBW 343	1996	6.00	367.40	39.00
	PBW 373	1997	1.50	246.00	30.00
					194.10
PAU, Ludhiana	DBW 17	2007	17.25	1010.98	645.00
	DPW 621-50	2011	27.00	621.37	212.57
	HD 2967	2011	19.00	1313.88	463.90
	PBW 175	1989	1.50	20.00	20.00
	PBW 299	1993	1.35	0.40	0.40
	PBW 343	1996	27.00	367.40	98.40
	PBW 373	1997	14.75	246.00	100.00
	PBW 396	2000	1.25	10.00	10.00
	PBW 443	2000	2.25	8.50	8.50
	PBW 502	2004	17.00	326.90	124.00
	PBW 509	2006	3.00	63.20	63.20
	PBW 527	2007	1.75	10.00	10.00
	PBW 533	2006	1.80	21.20	21.20
	PBW 550	2008	46.50	757.30	221.70
	PBW 590	2009	2.25	290.00	126.00
	PBW 596	2009	2.00	1.00	1.00
	PBW 644	2012	5.20	123.80	123.80
	PDW 291	2005	1.00	1.40	1.40
	PDW 314	2010	1.00	1.00	1.00
	WH 542	1992	2.25	21.53	12.60
	WHD 943	2011	0.40	102.20	9.20
					2273.87
PDKV, Akola	HD 2189	1980	2.19	209.20	25.00
	AKAW 4627	2012	1.44	5.00	5.00
	AKW 1071 (PURNA)	1995	0.19	4.00	4.00
	WSM 1472	2012	0.00	5.00	5.00
					39.00
RAU, Bikaner	Raj Molya Rodhak-1	2011	1.65	5.00	5.00
	Raj 1482	1983	11.35	235.70	144.00
	Raj 3077	1989	4.50	247.40	73.00
	Raj 3765	1996	19.48	334.40	174.40
	Raj 3777	2006	11.36	178.20	168.20
	Raj 4037	2004	7.44	648.00	288.00
	Raj 4079	2011	25.34	177.00	177.00
	Raj 4083	2007	8.62	201.20	101.20
	Raj 4120	2009	15.60	557.60	357.60
	Raj 6560	2005	1.40	1.60	1.60
					1490.00
RVSKVV, Gwalior	GW 322	1998	1.80	1162.20	58.20
	GW 366	2002	14.40	833.95	200.00
	MP(JW) 1203	1009	20.00	180.00	100.00
	MP(JW) 4010	2003	12.00	356.00	356.00
	Lok 1	1982	22.50	729.30	100.00
	RVW 4106	2012	24.55	26.20	26.20
					840.40
SDAU, Vijapur	GW 173		4.80	750.00	45.00
	GW 273	1998	19.45	750.00	144.00

Production Center	Variety	Notification Year	Nucleus seed (g)	Indent (g)	Allocation (g)
	GW 322	2002	29.12	1162.20	400.00
	GW 496	1990	49.50	310.40	262.40
					851.40
SFCI, New Delhi	DBW 17	2007		1010.98	200.00
	DBW 39	2010		200.20	50.00
	DPW 621-50	2011		621.37	100.00
	HD 2967	2011		1313.88	170.00
	HD 3043	2012		689.60	150.00
	Raj 3777	2006		178.20	100.00
	Raj 4037	2004		648.00	100.00
	PBW 550	2008		757.30	250.00
	HI 1500 ^(Amrita)	2003		345.00	235.00
	HI 1544	2008		270.20	100.00
					1455.00
GAU, Junagarh	GW 366	2002	10.88	833.95	100.00
SVPUA&T, Meerut	DBW 16	2006	0.45	46.20	10.00
	DBW 17	2007	2.50	1010.98	45.00
	PBW 226	1989	1.50	23.40	2.00
	PBW 373	1997	1.85	246.00	34.80
	PBW 502	2004	1.59	326.90	43.00
	PBW 550	2008	3.15	757.30	141.60
	PBW 590	2009	1.85	290.00	100.00
	WH 711	2002	2.55	199.20	52.00
	WH 1021	2008	1.00	69.60	11.60
	Raj 3765	1996	0.90	334.40	10.00
					450.00
UAS, Dharwad	DDK 1025	2006	1.00	2.00	2.00
	UAS 428	2012	2.00	2.00	2.00
	UAS 415	2009	5.00	4.50	4.50
	UAS 304	2013	5.00	12.00	12.00
	DDK 1029	2007	1.00	5.00	5.00
	DWR 162	1993	5.00	35.00	35.00
	DWR 195	1995	1.00	3.00	3.00
					63.50
VPKAS, Almora	VL 616	1986	1.00	7.20	7.20
	VL 738	1997	1.00	9.28	9.28
	VL 802	2005	0.00	6.40	6.40
	VL 804	2002	2.20	10.49	10.49
	VL 829	2003	2.00	23.40	23.40
	VL 892	2008	0.00	27.80	27.80
	VL 907	2010	1.00	19.40	19.40
					103.97

Remarks:

1. The breeder seed production of varieties HD 2285, HD 2329, HD 2687, HS 240, HUW 12, UP 2003, UP 2382, UP 2425 indent was not accepted by the production centres.
2. Partial allotment breeder seed indent of wheat varieties C 306, DBW 39, GW 173, HD 2189, HD 3043, HI 8498, HS 507, K 307, K 93511, PBW 590, WH 147 & WH 943 was done due to in-sufficient nucleus seed availability.
3. The nucleus seed for the production of breeder seed of varieties allotted to SFCI, New Delhi will be provided by the respective breeder of the variety.

Work Planning Meeting - Resource Management

September 01, 2013
3.30 PM – 5.30 PM

Chairman : Dr RKSharma
Co-Chairman : Dr Randhir Singh
Rapporteur : Dr RS Chhokar & Dr RK Singh

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. He emphasized that date of sowing trial should be within the specified week and every centre must inform the sowing of trial immediately by email. During discussions, Dr ML Jat from CIMMYT stressed the need to involve the statistician in the programme formulation and also to work out the interaction of location with genotypes and sowing dates. The scientists from CZ and PZ requested to formulate separate trials for aestivum and durum which presently is a combined trial as IR-TS-TAD-DOS. The group discussed at length the CV limits as well as the minimum mean yield levels of the trial under different growing conditions and there was a consensus to continue with the present practice.

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, sowing time effect on wheat productivity in CZ and PZ, effect of row spacing on wheat productivity in PZ, evaluating the herbicides and herbicides mixtures against weeds, effect of foliar application of nutrients on wheat in mitigating the terminal heat stress, system of wheat intensification and hydrogel performance across wheat growing zones.

The following five special trials will be continued;

1. Sowing time effect on wheat productivity in Peninsular Zone
2. Rice seeding methods effect on wheat productivity under ZT at different nitrogen levels
3. Wheat yield maximization under different tillage options
4. Sowing time effect on wheat productivity in NHZ and NWPZ
5. Wheat yield maximization under different tillage options.

The following new special trials were formulated;

1. Precision Nutrient Management in timely and late sown wheat systems

Main Plots-Tillage: 02

1. Zero tillage
2. Conventional tillage

Sub plots-Nutrient management: 04

1. Current recommendation (150:60:40 kg NPK/ha)- Top dressing after irrigation
2. Current recommendation (150:60:40 kg NPK/ha)- Top dressing before irrigation
3. SSNM based on Nutrient Expert
4. SSNM based on Nutrient Expert (full PK and 70% N) + remaining N as guided by GreenSeeker

Replications: 03

Varieties: NHZ-HPW 349, NWPZ- DPW 621-50, NEPZ-HD 2733, CZ- GW 366

2. Efficient water management – Micro-irrigation

Main Plots-Planting options: 02

1. Conventional
2. Bed Planting

Sub plots-Irrigation scheduling: 04

1. IW/CPE- 1.00
2. IW/CPE - 0.80
3. IW/CPE - 0.60
4. IW/CPE - 0.40

Replication: 03

3. Improving productivity of cotton-wheat system through relay cropping.

Main Plots-Relay options: 03

1. Cotton-wheat (Conventional practice)- wheat sowing after cotton harvest
2. Cotton (Conventional practice)-Wheat relay (Broadcasting) in first week of Nov.
3. Cotton (Conventional practice)-Wheat relay (Broadcasting) in first week of Dec.

Sub-plots: Genotypes

NWPZ: (1) DPW 621-50 (2) PBW 550 (3) HD 2967 (4) WH 1105

Replications: 03

Work Plan of Social science

Wheat and barley front line demonstrations allocated for 2013-14 will be conducted and coordinated as per the approval of the Ministry of Agriculture.

At the end of the session, Dr RK Sharma on behalf of the Directorate and CSAUA&T, Kanpur thanked all the participants for valuable suggestions.

Research Planning Meeting - Crop Protection

September 1, 2013

Chairman: Dr SC Bhardwaj

Co-Chairman: Dr MS Saharan

Rapporteurs: Dr IS Kanwar & Dr OP Gangwar

Dr Indu Sharma, Project Director, DWR, Karnal gave valuable suggestions for planning of the programme for 2013-14. She emphasized to make wheat disease monitoring nursery more meaningful by reporting its data regularly. She also impressed upon the role of border rows in creating artificial epiphytotics and suggested an action plan to activate Mahableshtar center. Dr SC Bhardwaj, Chairman and Head DWR, Regional Research Station, Shimla appreciated the co-operators for executing the programme of work (2012-13) *in toto*. Dr. M. S. Saharan, PI, Crop Protection suggested for constitution of PPSN monitoring for NWPZ/NHZ and PZ. Dr. Swapan K Datta, DDG (CS) gave valuable suggestions for developing durable rust resistant varieties and emphasized on farmers' awareness for managing wheat rusts. He also stressed on judicious use of rust resistance genes, rapid transmission of information on any disease threat, breakdown of resistance and active participation in gene stewardship. Keeping in view the valuable suggestions, the needful changes in the programme were made to make it more effective. With the coding of entries, it becomes difficult to compare, identify the changes in disease score and susceptibility of resistant lines. Therefore, the Crop Protection group felt that there should not be coding of PPSN material from 2013-14 crop season. Most of the ongoing experiments would be continued in 2013-14. 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 stripe, leaf and stem rust pathotypes for evaluation.

Leaf rust: 77-5 and 104-2

Yellow rust: 46S119 and 78S84

Stem rust: 40A and 117-6

AUDPC based identification of slow rusters in AVT lines, will continue for yellow (Karnal, Ludhiana), stem and brown rusts (Indore and Mahableshtar). The AVT's will also be planted at Nawanshahar (Punjab) and Yamunanagar (Haryana) through the KVKs. For Wheat Disease Monitoring Nursery (WDMN), each entry will be planted in two rows at all locations. Recording of rusts data in PPSN in NWPZ, NHZ and PZ by a team of Plant Pathologists will be done in the last week of February/first week of March. It was emphasized that the leaf blight recording should be made in double-digit scale at three growth stages, *viz.*, flowering, dough and hard dough stages. Bio-control of foliar blight will be repeated by using new bio-control 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, Dhaulakuan, Gurdaspur and Wellington. All the centers associated with the crop protection programme will supply the information on crop health to the PI (CP) and Head, DWR Regional Research Station, Flowerdale, Shimla, fortnightly during the crop season for compiling Wheat Crop Health Newsletter / Mehtaensis and issuing periodic advisories. Programme of work for Nematology and Entomology for the coming 2013-14-crop season was also finalized.

PROGRAMME OF WORK 2013-2014

The programme for the crop year 2013-2014 was chalked out in the 52nd All India Wheat and Barley Research Workers Meet held at CSAUA&T, Kanpur during Sept., 1-4, 2013. 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, Ranchi 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 Nawan Shahar (Punjab) and Yamunanagar (Haryana) for yellow rust.

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 IInd 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 the Head, DWR Regional Station 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, Dhanbir Singh (DhauLaKuan), Dr. R. K. Bansal (Durgapura) and will monitor PPSN at Ludhiana, Karnal, Hisar, Dhaulakuan and Delhi. Dr. S. K. Jain and Dr. Deep Shikha will monitor PPSN at Pantnagar. Dr. S. K. Rana, Dr. R. Devlash and Dr. Selva Kumar will monitor PPSN in Bajoura, Malan, Jammu and Khudwani. Dr. I. K. Kalappanavar, Dr. D. A. Shambharkar, Dr B K Honrao and Parmod Parsad (Shimla) will monitor PPSN in PZ. Dr. A. N. Mishra, Dr. K. K. Mishra and Dr. O. P. Gangwar will monitor PPSN in CZ. Breeders will also join the teams.

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 and Ludhiana 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 under field conditions and Flowerdale (under controlled condition),

Race inoculum to be supplied by Flowerdale: 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 2013-2014. 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: 9

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. Evaluation at Gurdaspur will be done by Ludhiana centre.
- ii. **Flag smut:** Ludhiana, Hisar, Karnaland Durgapura
- iii. **Foot rot:** Sagar and Dharwad
- iv. **Hill bunt:** Malan, Bajaura and Almora

PROGRAMME 8: CROP HEALTH

i 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 2013 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-mountaneous areas in NWPZ. Entomologists will also accompany the teams.

Team 1: Last week of December 2013 (Drs O. P. Gangwar, R Selvakumar and R. Devlash)

Team 2: Mid January, 2013 (Drs. M. S. Saharan, S. K. Rana and Ritu Bala)

Team 3: 1st week of February, 2013 (Drs. Madhu Meeta, Sudhir Kasnia and V. K. Singh).

Team 4: Last week of Feb. (Dr. S. S. Karwasara, R. K. Jaiman and Parmod Parsad)

Visits in March will be arranged as per need).

Teams will cover the yellow rust prone areas in Punjab, Haryana, HP and J & K. Monitoring of yellow rust in hills in HP, J & K and Uttarakhand will be undertaken by a team of Plant Pathologists during off season (May-August, 2014).

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 38 locations including Kudwani (Srinagar), Varanasi and Yamunanagar (Haryana). Samples from this nursery should be sent regularly to R.S. Flowerdale, Shimla for virulence analysis and information. Information on rust appearance to be provided at monthly intervals, starting from end of December to the P.I. (Crop Protection).

Reconstitution of Wheat Disease Monitoring Nursery (WDMN): Keeping into account the changed varietal situation, the zone specific varieties of NWPZ and NEPZ were recasted. The detailed constituents of WDMN from 2013 onwards would be as given below:

Common set of varieties of wheat disease monitoring nursery

WL 711, HD 2329, Agra Local, HD 2160, Lal Bahadur, WL 1562, HW 2021(*Sr26/Sr24*), HD 2204, C 306, WH 147, HW 2008 (*Sr24/Lr24*), Kharchia mutant, HP 1633, DL 784-3 and *Lr24*.

Zone specific varieties

NWPZ: DBW17, WH 542, PBW 343, DPW 621-50 and WH 896

NEPZ: K 8804, HD 2402, HP 1102, HUW 468 and NW 1014
CZ: HI 8381, DL 803-3, Lok -1, GW273 and GW322
PZ and SHZ: MACS 2496, Bijaga Yellow, HW 971, HD 2501 and HW 2022 (Sr24/Lr24)
NHZ and High Altitude Zone: HPW 251, VL892, HS 420, Sonalika, VL 738 and Barley Local

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 hullless 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.

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, Dhaulakuan 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, Dhaulakuan and Khudwani

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

(c) Chemical control of foliar blight*: Karnal, Faizabad, Varanasi, Coochbehar and Pusa (Bihar)

*The layout and other details will be provided by P.I, (Crop Protection).

PROGRAMME 10. WHEAT ENTOMOLOGY

The Entomology programme for the crop year 2013-2014 formulated at the 52nd All India Wheat and Barley Research Workers Meet held at CSAUA&T, Kanpur during September, 1-4, 2013. The various activities to be executed at respective centres after the deliberations with all the entomologists are given below:

(A) HOST PLANT RESISTANCE

EXPT.1. ENTOMOLOGICAL SCREENING NURSERY FOR

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

EXPT.2 MULTIPLE PEST SCREENING NURSERY

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

(B) CHEMICAL CONTROL

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

EXPT.4 Management of termite damage through broadcasting of newer insecticides in standing wheat crop. (Centres: Durgapura, Ludhiana, and Vijapur).

EXPT.5 Chemical control of foliage feeding wheat aphids. (Centres: Karnal, Ludhiana, Niphad and Pantnagar).

EXPT.6 Eco-friendly management of aphids through biorational approaches. (Centres: Niphad, Karnal, Ludhiana and Pantnagar).

EXPT.7 Management of brown wheat mite with different pesticides/acricides. (Durgapura and Ludhiana)

(C) INTEGRATED PEST MANAGEMENT

EXPT.8 Survey of pests infesting wheat and barley and their natural enemies (All centres)

EXPT. 9 Incidence and population build of major insect pest indifferent dates of sowing. (Niphad, Ludhiana and Karnal) **(New trial)**

EXPT.10 Basic studies for development of IPM strategies

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

(D) STORED GRAIN PESTS

EXPT.11 Management of stored grain insect pest. (Durgapura, Kanpur and Ludhiana)

PROGRAMME 11. WHEAT NEMATOLOGY

The Nematology programme for the crop year 2013-2014 formulated at the 52nd All India Wheat and Barley Research Workers Meet held at CSAUA&T, Kanpur during September, 1-4, 2013.

The various activities to be executed at respective centres after the deliberations with all the Nematologists are given below:

1. Monitoring of Nematodes:

- i) ***Anguina tritici***: Pusa (Bihar), Jammu, Durgapura, Ludhiana, Varanasi, Delhi and Palampur
- ii) ***Heterodera avenae***: Durgapura, Delhi, Hisar, Ludhiana and Malan,
- iii) **Community analyses of Nematodes in wheat**: Durgapura, Delhi, Hisar, Ludhiana, and Malan
- iv) **Mapping of nematode population**: Durgapura, Delhi, Hisar, Ludhiana, and Malan
- v) **Soil borne nematodes**: Survey will be conducted in Bihar (RAU Pusa centre), Varanasi commissionerary (BHU 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) and HP (Malan)

2. System based Research:

i) Population monitoring in wheat based systems:

Rice-Wheat: Ludhiana, Pusa (Bihar), Chattha (Jammu), Varanasai, Kangra (Palampur) and Delhi.

Cotton - Wheat: Hisar and Ludhiana.

Maize - Wheat: Chatha (Jammu).

Bajra - Wheat: Durgapura.

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, 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 and Delhi.

3. Evaluation of resistance against Nematodes parasitizing wheat:

I) ***Heterodera avenae***: Hisar, Durgapura and Delhi,

II) ***Heterodera filipjevi***: Ludhiana.

ii) **Screening against *M graminicola***: Pusa (Bihar), Ludhiana.

iii) **Biochemical/Molecular studies on *M graminicola***: IARI, New Delhi

iv) **Evaluation of international nurseries against CCN**: All centres (subject to availability of materials from the overseas source).

Monitoring of Nematodes: Team (Drs DJ Kaur, RS Kanwar, SS Vaish): 1st week of Feb., 2014

Research Planning Meeting - Wheat Quality

September 3, 2013

Chairman : Dr RK Gupta

Rapporteurs: Dr D Mohan & Dr Anil Kumar

The Wheat Quality Group met on September 3, 2013 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 diccicum* 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 *diccicum*. 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 *diccicum* 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 2012-13, will be analyzed by DWR Quality lab. All the IInd 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 γ -gliadin.
12. The last dates for supplying the samples by respective centres were finalised as follows:

NHZ & SHZ	15 th June 2014
NWPZ & NEPZ	20 th May 2014
CZ	10 th May 2014
PZ	30 th April 2014
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.diccicum* 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, 2014, by e-mail and also hard copy with C.D.

Work Planning Meeting – Barley Network

September 1st, 2013
3.30 PM – 5.30 PM

Chairman : Dr. A.S. Kharub
Rapporteurs: Drs. S R Vishwakarma & Vishnu Kumar

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 2013-14 crop season are as given hereunder:

A) Yield Evaluation Trials

Name of Trial		AVT-RF-NHZ-Grain	
No. of Trial Centres		13	
State	No.	Name of centres	
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		21	
Contributing Centres		No.	Name of varieties
IARI, RS, Shimla		4	BHS 423, BHS 424, BHS 425, BHS 427
Pantnagar		3	UPB 1031, UPB 1037, UPB 1038
Almora		4	VLB 137, VLB 138, VLB 139, VLB 140
Bajaura		4	HBL 713, HBL 718, HBL 719, HBL 731
DWR Karnal		2	DWRB 129, DWRB 130
Checks		4	HBL113, BHS352, VLB118, BHS 400 (I)

Name of Trial		AVT –IR-NWPZ-FB	
No. of Trial Centres		11	
State	NO.	Name of centres	
Himachal Pradesh	1	Dhaulakuan	
Haryana	3	Bawal, Hisar, Rohtak	
Punjab	2	Bathinda, Ludhiana	
Uttarakhand	1	Pantnagar	
Rajasthan	4	Durgapura, Navgaon, Tabiji, SG Nagar	
No. of varieties including checks		5	
Contributing Centres		No.	Name of varieties
Durgapura		1	RD2832*
Checks		4	RD 2035, RD 2552, BH902, BH 946

Name of Trial	AVT –IR-CZ-FB	
No. of Trial Centres	5	
State	NO.	Name of centres
Rajasthan	3	Kota, Udaipur, Banswara
Gujarat	2	SK Nagar, Vijapur
No. of varieties including checks	4	
Contributing Centres	No.	Name of varieties
Durgapura	1	RD 2833*
Hisar	1	BH959*
Checks	2	PL751, RD2786

Name of Trial	AVT-IR-MB-NWPZ-TS	
No. of Trial Centres	12	
State	NO.	Name of centres
Himachal Pradesh	1	Dhaulakuan
Haryana	3	Hisar, Karnal, Bawal
Punjab	2	Bathinda, Ludhiana
Rajasthan	3	Navgaon, Durgapura, SG Nagar
U.P.	2	Modipuram, Mathura
Uttrakhand	1	Pantnagar
No. of varieties including checks	8	
Contributing Centres	No.	Name of varieties
Karnal	1	DWRB101*
Durgapura	1	RD2849*
Ludhiana	1	PL 874
Hisar	1	BH 976
Checks	4	DWRUB52, K551, BH902, DWRB 92

Name of Trial	AVT-IR-MB-NWPZ-LS	
No. of Trial Centres	8	
State	NO.	Name of centres
Haryana	2	Hisar, Karnal,
Punjab	2	Bathinda, Ludhiana
Rajasthan	2	Durgapura, SG Nagar
U.P.	1	Modipuram
Uttrakhand	1	Pantnagar
No. of varieties including checks	6	
Contributing Centres	No.	Name of varieties
Hisar	1	BH968*
Karnal	1	DWRB 118
Checks	4	DWRB73, DWRUB64, BH902, DWRB91

CROP	BARLEY
Name of Trial	AVT –SST-NWPZ/NEPZ
Zone	NWPZ / NEPZ
No. of Trial Centers	7

State	NO.	Name of centers
U.P.	3	Dalipnagar, Faizabad (2 sets)
Haryana	2	Hisar, Bawal
Rajasthan	2	Rampura, Bhilwara
No. of varieties including checks	20	
Contributing Centers	No.	Name of varieties
Kanpur	2	KB 1370, KB 1375
Faizabad	4	NDB 1586, NDB 1587, NDB 1592, NDB 1600
Karnal	1	DWRB 131
Hisar	4	BH 972 , BH 984, BH 985, BH 986
Durgapura	6	RD 2860 , RD 2886, RD 2887, RD 2888, RD 2889, RD 2890
Checks	3	RD2552, NDB1173, RD2794

Name of Trial	AVT-DP-NHZ	
No. of Trial Centers	5	
State	NO.	Name of centers
H.P.	3	Shimla, Bajaura, Palampur
Uttrakhand	2	Almora, Majhera
No. of varieties including checks	19	
Contributing Centers	No.	Name of varieties
IARI, Shimla	5	BHS 428, BHS 429, BHS 430, BHS 431, BHS 432
Almora	5	VLB130* , VLB 137, VLB 138, VLB 139, VLB 140
Bajaura	4	HBL 717, HBL 718, HBL 719, HBL 731
Pantnagar	3	UPB 1037, UPB 1038, UPB 1039
Checks	2	HBL276, BHS380

Name of Trial	IVT-TS-MB-NWPZ	
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
Uttrakhand	1	Pantnagar
No. of varieties including checks	19	
Contributing Centers	No.	Name of varieties
Hisar	3	BH 987, BH 988, BH 989
Kanpur	3	KB 1349, KB 1354, KB 1363
Durgapura	4	RD 2891, RD 2892, RD 2893, RD 2894
DWR Karnal	6	DWRB 122, DWRB 123, DWRB 124, DWRB 126, DWRB 127, DWRB 128
Checks	3	DWRUB52, BH902, DWRB 92 (I)

Name of Trial	IVT-MB-LS-NWPZ	
No. of Trial Centers	7	
State	NO.	Name of centres
Haryana	2	Hisar, Karnal
Punjab	2	Ludhiana, Bhatinda
Rajasthan	1	Durgapura
U.P.	1	Modipuram
Uttrakhand	1	Pantnagar
No. of varieties including checks	18	
Contributing Centres	No.	Name of varieties
Hisar	3	BH 990, BH 991, BH 992
Durgapura	4	RD 2895, RD 2896, RD 2897, RD 2898
DWR Karnal	6	DWRB 121, DWRB 123, DWRB 124, DWRB 125, DWRB 126, DWRB 128
Ludhiana	2	PL 880, PL 881
Checks	3	BH 902, DWRUB64, DWRB91

Name of Trial	IVT-FB-IR	
Zone	NWPZ/ NEPZ / CZ	
No. of Trial Centers	15	
State	NO.	Name of centers
Haryana	1	Hisar
Punjab	1	Ludhiana
Rajasthan	5	Durgapura, Tabiji, Banswara, Navgaon, Udaipur
Uttrakhand	1	Pantnagar
U. P	3	Kanpur, Varanasi, Faizabad
M. P	1	Rewa
Gujarat	2	Vijapur, SK Nagar
Bihar	1	Pusa
No. of varieties including checks	28	
Contributing Centers	No.	Name of varieties
Kanpur	3	KB 1353, KB 1369, KB 1367
Varanasi	2	HUB 236, HUB 237
Faizabad	2	NDB 1578, NDB 1580
Hisar	3	BH 980, BH 981, BH 982
Durgapura	4	RD 2874, RD 2875, RD 2876, RD 2877
Pantnagar	3	UPB 1040, UPB 1041, UPB 1042
Rewa	2	JB 290, JB 291
Ludhiana	2	PL 880, PL 881
Checks	7	BH902, RD2552, Jyoti, PL751, RD2786, HUB 113 (I), BH 946 (I)

Name of Trial	IVT-IR-DP	
Zone	NWPZ /NEPZ/CEN	
No. of Trial Centers	17	
State	NO.	Name of centres
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	19	
Contributing Centres	No.	Name of varieties
Faizabad	2	NDB 1584, NDB 1585
Varanasi	2	HUB 238, HUB 239
Hisar	2	BH 980, BH 983
Durgapura	4	RD 2878, RD 2879, RD 2880, RD 2881
Pantnagar	3	UPB 1040, UPB 1041, UPB 1042
Kanpur	2	KB 1347, KB 1369
Checks	4	RD2035, RD2552, AZAD, RD2715

Name of Trial	IVT-RF-NEPZ	
No. of Trial Centers	8	
State	NO.	Name of centers
UP	5	Kanpur, Varanasi, Faizabad, Mirzapur, Tisuihi
MP	1	Rewa
Bihar	2	Pusa, Sabour
No. of varieties including checks	20	
Contributing Centers	No.	Name of varieties
Kanpur	3	KB 1347, KB 1351, KB 1360
Varanasi	5	HUB 231, HUB 232, HUB 233, HUB 234, HUB 235
Faizabad	1	NDB 1577
Durgapura	4	RD 2882, RD 2883, RD 2884, RD 2885
Rewa	2	JB 292, JB 293
Ludhiana	2	PL 881, PL 882
Karnal	1	DWRB 131
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 for leaf blight to DWR, Karnal for further analysis. Any entry showing >40S rust reaction in the trials has to be informed to DWR, Karnal and sample is to be to Flowerdale, Shimla for race analysis.

All the cooperators are requested to send the samples of leaf blight, covered smut, powdery mildew, leaf smut and loose smut from their respective survey areas / station trials.

2. Evaluation for status of host resistance in test entries:

- Initial Barley Disease Screening Nursery (IBDSN):** The nursery will have test entries of station trial entries of barley breeding centres. The entries will be screened against rusts and leaf blight at hot spot locations.

ii. National Barley Disease Screening Nursery (NBDSN): This nursery will comprise of entries from yield trials (IVT and AVT) which will be screened against three rusts, leaf blight and powdery mildew.

iii. Elite Barley Disease Screening Nursery: This nursery will have resistant entries identified in NBDSN 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.

v. Germplasm evaluation : Selected germplasm entries will be screened against leaf blight (Varanasi & Faizabad) and stripe rust (Durgapura)

3. Chemical control of barley leaf blight (Varanasi, Faizabad)

- a. Seed treatment (ST) with Vitavax 3g/Kg
- b. Seed treatment with Raxil @ 2g/Kg
- c. ST + Tilt spray @0.1%
- d. ST+ Folicur spray @0.1%
- e. Tilt spray @0.1% only
- f. Raxil spray @0.1%
- g. Folicur spray @0.1% only
- h. Control without ST with Vitavax

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

4. Chemical control of leaf rust (Centre: Kanpur, Karnal & Dharwad)

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

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

5. Chemical control of stripe rust (Centres: Durgapura, Ludhiana and Bajaura)

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

2. Chemical Control of Foliar Aphids: This trial will continue during 2013-14 with following chemicals. **Centres:** Vijapur, Ludhiana, Kanpur and Durgapura

No.	Treatments	Dosage ai/Ha
1	Confidor (Imidacloprid 200SL)	20
2	Actara (Thiamethoxam 25WG)	12.5
3	Flubendiamide	20
4	Ekalux (Quinolphos 25EC)	125
5	Rogor (Dimethoate 30EC)	100
6	Acetamiprid 20SP	50
7	Dantop (Clothianidin 50 WDG)	15
8	Control	

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

RD 2832 Checks: BH902, RD2552, BH 946 (I)

IR-TS-MB-NWPZ

DWRB101, RD 2849 Checks: DWRUB52, BH 902, DWRB 92 (I)

IR-LS-MB-NWPZ

BH 968 Checks: DWRB 73, DWRUB 64, DWRB 91

IR-TS-FB-Central zone

RD 2833, BH 959 Check: PL751, RD 2786

RF-TS-DP-NHZ

VLB130 Checks: HBL276, BHS380

2. Special experiments on updating package of practices

Ongoing experiments

1. 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 6:1
5. Barley + gram 6:2
6. Barley + gram 6:3
7. Sole barley, oat, mustard and gram
8. Dual purpose barley

Centres: NWPZ (Agra, Durgapura, Hisar)

2.To fine tune the date of sowing in different zones under changing climatic conditions

NWPZ (TS)

Date of sowing

D1- 25 Oct- 5 Nov. D2- 6 Nov.- 15 Nov. D3 - 16 Nov.- 25 Nov.

D4- 26 Nov.- 05 Dec.

Varieties- BH 902, RD 2552, DWRUB 52, RD 2668

NWPZ (LS)

Date of sowing D1- 01 Dec- 10 Dec. D2- 11 Dec- 20 Dec.

D3 - 21 Dec- 30 Dec. D4- 31 Dec- 09 Jan.

Varieties- DWRUB 64, DWRB 73, DWRB 91, RD 2508

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

NEPZ (TS)

Date of sowing D1- 05 Nov.- 14 Nov.

D2- 15 Nov.- 24 Nov. D3 - 25 Nov.- 04 Dec.

D4- 05 Dec.- 14 Dec. Varieties- RD 2552, K 508, K 551, JB-1

NEPZ (Kanpur, Varanasi, Rewa, Faizabad)

NHZ (TS)

Date of sowing D1- 25 Oct.- 09 Nov. D2- 10 Nov.- 24 Nov.

D3 - 25 Nov.- 09 Dec. D4- 10 Dec.- 24 Dec.

D5- 25 Dec- 09 Jan.

Varieties- BHS 352, UPB 1008, VLB 118, HBL 113

Centres: Bajaura and Malan

3.To study the phosphorus and potash requirement of feed barley under rainfed conditions in NHZ

Treatments-

a. Phosphorus kg/ha- 0, 20, 40

Potash kg/ha- 0, 20, 40

Variety- VLB118

Centres: Bajaura and Malan

4.Effect of sprinkler irrigation method on yield and quality of barley

Treatments-

a. Irrigation scheduling-

1 (First at 20DAS followed by irrigations at 15 days interval till physiological maturity)

2 (First at 20DAS followed by irrigations at 20 days interval till physiological maturity)

3 (First at 20DAS followed by irrigations at 25 days interval till physiological maturity)

4 (First at 20DAS followed by irrigations at 30 days interval till physiological maturity)

5 Control- Flood irrigation

Variety- DWRUB 52, BH 902

Centres: Durgapura

5. Effect of mulching on water saving and productivity of barley in NEPZ

Treatments-

1. 6t/ha mulching, no irrigation

2. 6t/ha mulching, one irrigation at 35 DAS

3. 6t/ha mulching, two irrigation at 35 and 85 DAS

4. 4t/ha mulching, no irrigation

5. 4t/ha mulching, one irrigation at 35 DAS

6. 4t/ha mulching, two irrigation at 35 and 85 DAS

7. No mulching, No irrigation

8. No mulching, one irrigation at 35 DAS

9. No mulching,, two irrigation at 35 and 85 DAS

Centres: Kanpur, Varanasi, Rewa, Faizabad

6. Foliar spray of chemicals/fertilizers to mitigate the effect of heat stress and to improve the water use efficiency in barley

Treatments

1. KNO₃ - 2%

2. DAP- 2%

3. KCl- 2%

4. CaCl₂ -2%

5. KNO₃ (1%)+ CaCl₂ (1%)

6. DAP (1%)+ KCl (1%)

7. Water spray

8. No spray

Spray at 55 and 75 DAS

Centres: NWPZ (Durgapura, Hisar, Karnal, Ludhiana)

7. To study the effect of sulphur application on malting quality of barley

Doses of Sulphur application

1. 0
2. 10 kg/ha
3. 20 kg/ha
4. 30 kg/ha

Varieties DWRUB 64, DWRB 73, DWRB 91

Centres: NWPZ (Durgapura, Hisar, Karnal, Ludhiana)

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

1. Weed management in barley in NEPZ

Treatment

Metsulfuron+Carfentrazone 15g
Metsulfuron+Carfentrazone 20g
Metsulfuron+Carfentrazone 25g
Metsulfuron+Carfentrazone 15g+ NIS 0.2%
Metsulfuron+Carfentrazone 20g+ NIS 0.2%
Metsulfuron+Carfentrazone 25g+ NIS 0.2%
Metsulfuron 4g
Carfentrazone 20g
2,4-D 500g
Weedycheck
Weedfree

2. Weed management in barley in NWPZ and NHZ

Treatment

Pinoxoden 30g
Pinoxoden 40g
Pinoxoden 50g
Pinoxoden 40g +Metsulfuron 4g
Pinoxoden 40g followed by Metsulfuron 4g
Pinoxoden 40g+Carfentrazone 20g
Isoproturon 1000g
Isoproturon 750g+ 2,4-D 500g
Isoproturon 750g+Metsulfuron 4 g
Weedycheck
Weedfree

3. Nitrogen levels and scheduling in barley in NHZ

Treatment

Nitrogen levels kg/ha-20, 40, 60 and 80
N scheduling- 100% basal, 50% basal and 50% after first rain
2/3 as basal and 1/3 after first rain
Variety- VLB 118

Quality evaluation

The samples of malt barley IVT & AVT (Timely and late sown) are to be sent to DWR for malt quality evaluation. Similar grain samples of feed barley trials also need to be sent. In barley quality screening nursery a total of 82 genotypes will be included for evaluation at different locations to test the quality traits under seven categories (High & low beta glucan, high protein content, high starch content, high thousand grain weight, low husk content and high anti-oxidant activity).

SESSION III

Crop Year Review, 2012-13

September 2 & 3, 2013

Chairman: Dr Swapan K Datta

Co-Chairmen: Dr RP Dua & Dr JP Tandon

Rapporteurs: Dr PN Rasal & Dr Arun Gupta

The session was chaired by Dr Swapan K Datta, DDG, Crop Science and co –chaired by Dr RP Dua, ADG (FFC), ICAR & Dr JP Tandon. Chairman invited the different Principal Investigators to present the progress report in crisp manner and asked them to provide the key messages only.

Dr Vinod Tiwari, PI, Crop Improvement presented the progress report for the year 2012-13. During last one year, 5 varieties of bread wheat and one variety of triticale were notified for release by CVRC for different zones and production conditions of the country. Besides, 2 new genetic stocks namely DDK 1037 (dicoccum) and UAS 320 was registered with NBPGR for resistance to loose smut and flag smut, respectively. During 2012-13, 471 trial sets were supplied to 131 centres, out of which 464 trials were actually conducted, in which 538 test entries were tested. The per cent conduction of trial was 98.5%, however 80% was found suitable for reporting. The most promising entries in AVT, NIVT and special trials were brought to the notice of the house. Last year, six national nurseries, two segregating stock nurseries and shuttle breeding material were shared with number of cooperating centres in order to provide an opportunity to the breeders to select the material as per their need. Besides, 1441 germplasm lines received in the form of international nurseries and trials from CIMMYT were evaluated at various locations for utilization in wheat improvement. During monitoring of trials, as many as 31 trials were rejected by the monitoring team in different zones. During 2012-13, a surplus production 6960q breeder seed was produced against the allocation of 21028q, however, he showed his concern over the breeder seed production of some of the recently released varieties was deficient at some of the centres. Against an indent of 842 q nucleus seed of 154 wheat varieties, a total 1660 q nucleus seed of 149 varieties was produced. Based on physiological investigation on thermal stress in wheat, entries namely RAJ4250, GW433, WH1123, MP3353, HD3059, NIAW1689, GW431 and GW432 were found less sensitive to thermal stress. He highlighted markers assisted gene prospecting for traits of economic importance in AVT entries.

Dr KV Prabhu raised the issue regarding rejection of entries based on ACI of PPSN data and suggested for monitoring of PPSN sites. Chairman asked the PD (Wheat) to look in the matter and the data should be recorded in scientific manner.

Dr RK Sharma highlighted the achievements of resource management group and shared with the house that a total of 142 trials were conducted out of 160 proposed trials. He presented that new genotypes in rainfed early sown, irrigated late sown, restricted irrigation, irrigated timely sown, rainfed timely sown and irrigated late sown agronomical trials were superior in performance to their respective checks in different agro-climatic zones. In order to address the various issues in different wheat growing zones of the country, special coordinated trials on sowing time, spacing and integrated nutrient, water and weed management were conducted. To mitigate terminal heat stress in wheat through mulching and foliar nutrition under late sown condition, trials were conducted in NWPZ and CZ. KCL spray at 0.2% at post anthesis stage recorded highest grain yield. Dr Swapan K Datta suggested to develop crop calendar for each site by including all possible variance of soil, water, nutrient etc., which will help to boost wheat yield. Dr Tandon suggested to study the practices followed by the farmers regarding application of fertilizer, irrigation, plant population and use of hydrogel and need to give more emphasis on site specific recommendations. He further suggested to include local popular variety as checks in agronomical trials.

Dr MS Saharan, PI Crop Protection presented the major thrust areas of Crop Protection programme and shared with the delegates regarding crop health monitoring (pre and post harvest), distribution of rust pathotypes, host resistance, rust resistance genes postulation and pest management are major activities of the programme. During 2012-13, wheat rusts was widely distributed, however except for the yellow rust which appeared with high intensity in some areas in Haryana, Punjab and Himachal Pradesh, there was no major incidence of other rusts. A total of 8004 grain samples were collected from various *mandies* from different zones were analysed for karnal bunt, No samples from Gujarat Maharashtra and Karnataka were found infected with Karnal bunt. Six trainings on different aspect of crop health management were organized. Dr Sanjay Kumar raised the issue regarding sowing of single lines including checks in PPSN and suggested that there should not be coding for checks in PPSN to avoid any doubts while disease recording. Dr Jagshoran suggested to utilize Yr10 and Yr15 genes in breeding programme. He further suggested that the more studies are required to find out alternate host of black and brown rusts in SHZ. The issue regarding high score in PPSN was raised by many scientists.

Dr SC Bhardwaj, Incharge DWR Regional Station Flowerdale, Shimla presented dynamics of wheat rust pathogen and informed the house that the rust disease development occurred one month late in comparison to the previous year. This year was characterized by a shift of virulence pattern in favour of pathotype 46S119, which occurred in 67% of the samples. He highlighted the pathotype distribution of all three rusts in India and neighboring countries during 2012-13. He also informed the house regarding number of resistance lines identified through seedling resistant test in wheat and barley. He presented the report on SAARC wheat disease monitoring nursery and also informed the house regarding maintenance of 126 rust pathotypes in their National repository. Dr Indu Sharma put the challenge before the breeders to incorporate 3-5 rust resistant genes including *Yr10* and *Yr15* for gene pyramiding. Dr A Mishra raised the issue regarding rejection of proposal by CVRC on the basis of high score of rust at one location. Chairman suggested that behaviour of pathotypes are changing due to change in climate. Hence, the chairman suggested to develop durable rust resistant genotypes global as well national rust gene stewardship programme. DWR should take initiative to aware farmers on management of diseases.

Dr RK Gupta, PI (Wheat Quality) presented in his report that 10,712 wheat samples of AVT, NIVT, Special trials and QCSN were analysed for different quality parameters. Product specific entries were identified for *chapati*, bread and pasta products. Promising genotypes for various processing and nutritional quality parameters were identified. The distribution of High Molecular Weight Glutenin Subunits was studied in 229 entries. 5555 samples received from FCI were analysed for various wheat grading parameters, this resulted in exporting of > 4.0 million tones of wheat through various agencies. He also presented the highlights of work carried out at Dharwad, Ludhiana, IARI, Pantnagar and Vijapur centres. Dr RP Dua, ADG suggested to study the stability of quality parameters across the centres. Dr JP Tandon suggested to give weightage for hectolitre weight(>78), while promoting/identifying the varieties. Dr RK Sharma said by mean of hydrogel application one can increase the hectolitre weight in response of query raised Dr JP Tandon.

The report on Barley Network was presented by Dr AS Kharub. He shared with the house that the barley production and productivity has increased during last 3 years. During the cropping year, two varieties namely RD 2786 and DWRB 91 were released and notified. Out of 127 yield evaluation trials proposed, 119 trials were conducted. In all 115 test entries were evaluated. Promising entries for malt barley, feed barley, dual purpose barley were identified for different productions in different zones. Monitoring team visited different centres and monitored the coordinated trials. Against an allocation of 1029 q of 27 varieties, a total of 698 q breeder seed was produced. He also presented report on barley crop protection and resource management and emphasized on refinement of production technology including intercropping, row spacing, weed management and dose and time of Nitrogen application. Dr JP Tandon suggested developing varieties with high lysine and high beta glucan.

Dr Rajender Singh presented the report on wheat summer nursery at Dalang Maidan. He summarized the work carried out at DWR Regional station at Dalang Maidan. He informed that the off season nursery facility of Dalang Maidan is being utilized by around 20 co-operators for generation advancement of breeding material, disease screening and seed multiplication. This year around 42000 lines have been planted by them at Dalang Maidan. They are strengthening the double haploid facility at Dalang Maidan.

Dr Randhir Singh presented the impact of FLDs in popularizing Wheat and Barley technologies. He shared with the house that during the cropping year, a total of 675 wheat FLDs were conducted through 68 centres. He highlighted different constraints observed during conduct of FLDs and listed *Phalaris minor*, *C. album*, Yellow rust and small land holding were the main constraints across the locations/zones. He also highlighted the work on barley front line demonstration. He pointed out that DAC, MoA has stopped funding for Barley Network, but he strongly advocated the need of Barley FLDs for popularization of Malt Barley in Haryana, Punjab, Rajasthan and UP. Dr. Randhir Singh raised the issues regarding balance amount of Rs.13,91,087/- due from DAC, MoA, New Delhi. ADG raised the issue regarding criterion for ranking the constraints. Dr JP Tandon raised the issue regarding cultivation of wheat varieties HD2733(released for NEPZ) and HD2932 (released for PZ) in Punjab as these varieties are highly susceptible to yellow rust and need to collect site specific data.

Mr Kiran Shankar Reddy presented an overview on Malt quality of Indian barley varieties. In his presentation he said that Indian brewing industry may require 2.1 MMT by 2020. He also presented at length the future of malt barley and expected collaboration with Directorate.

The meeting ended with thanks to the chair.

Special discussion held on “Testing of genotypes developed by MAS and NILs” on 2nd September, 2013 during the 52nd AICW&BIP researchers meet at CSAUA&T, Kanpur

At the outset, Chairman Dr SK Datta asked the Project Director, DWR to put up the issue before the house. Dr Indu Sharma requested the house to provide their opinion in setting up a procedure for testing the lines developed through incorporation of genes for specific traits using MAS and recovering the background of the recurrent parent. Initiating the discussion Dr. KV Prabhu informed that number of markers, at least two on each chromosome arms covering all the 21 chromosomes along with markers in the close vicinity from either side of the genomic region of the introgressed gene confirming foreground selection is needed. He informed the house that the material for such a trial is available at some centers.

Dr. Datta enquired about what could be the procedure for credit sharing as the varieties developed through this method are simply essentially derived varieties. The next question comes on the technical issues regarding the time span for which the variety should be recommended. Should there be mechanism of de-notifying such varieties if the gene incorporated for value addition trait loses its ground. Thirdly, he asked if these varieties can be released after just two years of testing in the programme.

Replying to the questions Dr Prabhu opined that the variety developed should fall in the EDV category and the credit should be duly given also to the breeders of the original variety which is used as the recurrent parent for MABB. He stressed that the variety should be notified as per the normal norms of time span of 15 years. He was of the opinion that since the original variety falls as a check in the respective adaptability zone, its data is available with the coordinated programme and hence there is no need of the material to be tested in IPPSN. It should be simply tested for 2 years in the trial.

Chairman in his closing remarks said that this is an issue which requires further deliberations involving some very experienced members of the wheat research community. The guidelines and the procedure for formulating the procedural details should be such as to provide a long term strategy rather than a hurriedly proposed approach so that it is sustainable.

SESSION IV

Advances in wheat and barley research

September 2, 2013

Chairman : Dr Swapan K Datta

Co-Chairman : Dr RP Dua

Rapporteurs : Dr Ratan Tiwari and Dr NS Bains

In all four presentations were made during this session. The first presentation was made by Dr (Mrs) Karabi Datta on “Transgenic rice and perspective for wheat and barley. Considering transgenics as one of the techniques for crop improvement, She emphasized that it could be useful for all kind of traits including tolerance to biotic and abiotic stresses, weed management, nutritional and processing quality. Dr (Mrs) Datta presented case studies of several successful transgenics in rice. These included DREB genes (drought tolerance), Rab16A (salt tolerance), Xa21 (Bacterial blight resistance), oxalate oxidase gene (sheath blight resistance,) Bt gene (insect resistance), Ferritin gene (iron content), phytoene synthase & Lycopene synthase (pro-vitamin A), phytase genes (enhanced nutrient bio availability). RNAi mediated down regulation of hpxygenase gene in rice was also discussed in context of maintaining quality and viability during storage.

The wheat transgenic prospects were viewed in the light of some advances already made. The first GM wheat trial involving DREB transgenic which was conducted in Mexico was mentioned. Dr (Mrs) Datta informed that constitutive expression of DREB was detrimental and only induced promoters seemed to have utility. For wheat some of the transgenics of basic and applied importance included P5CS gene, rice NAC gene (drought tolerance), Bar gene (weed control), β -1,3 glucanase (powdery mildew resistance), β -farnesone gene (aphid resistance). She highlighted recent progress in wheat transgenics including RNAi technology for reducing gliadin expression and transgenics with improved fiber content. Advances in methodology such as plastid transformation, use of transit proteins for protein targeting and isolation of barley heat shock protein promoter were discussed. The relevant information for arriving at a comparative perspective of rice and wheat transgenic was well marshaled.

In his comments, Chairman, Dr SK Datta highlighted the potential for transfer of technology between wheat and rice for future transgenic work. In response to a question on transfer of rust resistance from rice to wheat, it was mentioned that rice gene expression when challenged with wheat rust was being analysed at IRRI under a BGRI/DRRW project. Dr Prabhu enquired if suppression of gliadins would impair chapatti quality. Dr Seva Ram commented that suppression of gliadins genes may be incomplete on account of multiple gene copies in wheat. Concern was voiced about the extent to which phytates can be lowered. Dr. Datta mentioned that reduction to 1/3rd level of normal may be safe. Primarily germination ability should not be compromised.

The second presentation was on “Wheat expert system” by SN Islam, IASRI, New Delhi. Wheat expert system is a computer based system for wheat crop management. It is capable of advising development workers and farmers wherever experts are not available in person. The system supports output in English, Hindi and some regional languages. The system has been developed by technical inputs from DWR and IARI. With increasing penetration of internet in rural areas, this system has great potential. Mr Islam informed that the system also provides important statistics on production, area, productivity, MSP *etc.* The system is available at IASRI webpage and would soon be linked to DWR home page. Chairman Dr Datta commented that the system was highly useful. Queries from Dr Sujoy Dutta and Dr JP Tandon were answered by Mr Islam.

The third presentation was made by Dr Ravish Chatrath on “Indian wheat database” an online initiative. He informed in his presentation that “Indian Wheat database” was developed under the Agri-bioinformatics promotion programme of Department of Information Technology, Ministry of Communication, GOI. The data base in its present form covers information on 381 released

varieties. Fifty seven morphological descriptors recorded on these varieties are included in the database. Besides morphological attributes data on quality and rust resistance genes has also been included. The marker database covers more than 1600 SSR markers. Twenty six gene tagged markers are included in the database. Dr Chatrath also gave an online demonstration of the database, which was appreciated by the chairman.

The last presentation was made by Dr Sujoy Dutta on "Wheat rust forewarning and detection in Rabi 2013. He informed the house that by combining weather data and satellite imagery, generation of wheat rust area map at tehsil/ group of villages level was attempted. Analysis and forewarning system was piloted during *Rabi* 2013 for Nurpurbedi block of Ropar district in Punjab along with rust prone areas of Hoshiarpur district of Punjab and Yamuna Nagar district of Haryana. Suitable temperature profiles for rust spread were mapped for Punjab and Haryana over relevant period of the season. Future plans for combining 3 days weather forecast, cloud and fog cover, general vegetation conditions and presence of alternate host into the prediction model was also presented by Dr Sujoy Datta.

Dr RK Sharma queried that since satellite data resolution is about 25 m and a minimum of 9 pixels are required for change detection which is about one acre, hence the detection of disease incidence would be possible only after high incidence *i.e.* damage to the crop has already been done. Therefore, remote sensing can be employed only for post martem analysis to estimate the extent of damages. Dr Sujoy Dutta responded that the prediction has a wider area as its target and weather data will be used to prewarning that the disease incidence is going to occur in a particular area. Dr Sai Prasad commented that variety information (*i.e.* if it is susceptible or resistant) needs to be integrated into the prediction model. Dr (Mrs) Indu Sharma pointed out that there is great potential for application of new technologies (Such as IT, remote sensing etc.) in agriculture.

SESSION V

Varietal Identification Committee Meeting

September 2, 2013	Chairman	: Dr Swapan K Datta
	Member Secretary	: Dr Indu Sharma

The meeting of Varietal Identification Committee of Wheat & Barley was held at Vice Chancellor's Committee Room, CSAU&T, Kanpur, on 2nd September, 2013 under the Chairmanship of Dr. Swapan K. Datta, DDG (CS). The following attended the meeting:

Voting Members

1. Dr Swapan K Datta, DDG (CS), ICAR, Krishi Bhavan, New Delhi
2. Dr RP Dua, ADG (FFC), ICAR, Krishi Bhavan, New Delhi
3. Dr JS Chauhan, ADG (Seeds), ICAR, Krishi Bhavan, New Delhi
4. Dr LP Tiwari, Director Research, CSAU&T, Kanpur
5. Dr JP Tandon, Former Project Director, DWR & Former ADG (FFC)
6. Dr GS Mahal, Ex Zonal Coordinator, PAU, Ludhiana
7. Dr SK Gupta, GM (P), NSC, New Delhi
8. Dr SL Bajpai, Area Manager, NSC, Kanpur
9. Dr AM Rao, Group Leader Wheat, Mahyco, Jalna, Maharashtra

Non-Voting Members

1. Dr (Ms) Indu Sharma, Project Director, DWR, Karnal (Member Secretary)
2. Dr Vinod Tiwari, PI (CI), DWR, Karnal
3. Dr RK Gupta, PI (QBS), DWR, Karnal
4. Dr RK Sharma, PI (RM), DWR, Karnal
5. Dr MS Saharan, PI (CP), DWR, Karnal
6. Dr Ravish Chatrath, PI, Computer Science & Statistics and Tech. Cell, DWR, Karnal
7. Dr AS Kharub, PI Barley Network, DWR, Karnal
8. Dr SC Bhardwaj, Principal Scientist & Incharge, DWR RS, Flowerdale, Shimla
9. Dr Randhir Singh, PI (SS), DWR, Karnal


The committee considered a total of 25 proposals (21 wheat and 4 barley) submitted for identification and after detailed deliberations, made the following recommendations as indicated against each proposal:

	Name of Variety	Production conditions	Recommendations
WHEAT			
Northern Hills Zone (NHZ): Hills of J&K (except Jammu and Kathua districts), HP (except Paonta Valley and Una district), Uttarakhand (excluding Tarai region), Sikkim and hills of WB and NE States.			
1	HS 542	RF-ES	The proposed variety was considered by the committee. Though the said variety did not have high yield as well as any additional advantage, it was identified on the basis of adding genetic diversity to the existing varieties.
North Western Plains Zone (NWPZ): Punjab, Haryana, Delhi, Rajasthan (except Kota & Udaipur divisions), West UP (except Jhansi division), Jammu & Kathua districts of J&K, Paonta Valley & Una district of HP, and Tarai region of Uttarakhand.			
2	HD 3086	IR-TS	Both varieties were considered simultaneously and identified based on better SRT of DBW 88 and low ACI of HD 3086 for stripe rust.
3	DBW 88		
4	DBW 90	IR-LS	Both were identified on account of 7.6% yield jump and resistance to stripe rust in both the varieties.
5	WH 1124		
6	PBW 674	RF-TS	All the three proposals were considered together and PBW 660 identified on account of chapati quality, rust resistance and lustrous grain appearance. PBW 674 and PBW 675 not identified due to no additional advantage.
7	PBW 675	RF-TS	
8	PBW 660*	RF-TS	
9	PBW 660*	RI-TS	Committee considered both the varieties at the same time. PBW 660 not identified due to negative yield while HD 3070 had no advantage in yield and rust. Hence not identified.
10	HD 3070*	RI-TS	

North Eastern Plains Zone (NEPZ): Eastern UP, Bihar, Jharkhand, Orissa, West Bengal, Assam and plains of NE States.			
11	NW 5054	IR-TS	The committee considered the all the five proposals concurrently. NW 5054 and K 1006 were identified on the basis of yield and having ACI of brown rust within limits, hence providing resistance to brown rust. Additionally K 1006 had high zinc and iron. HD 3076, PBW 661 and WH 1120 were rejected on account of no yield superiority.
12	K 1006		
13	HD 3076		
14	PBW 661		
15	WH 1120		
16	RAJ4250	IR-LS	Not identified on account of high susceptibility to yellow rust and no significant yield advantage.
Central Zone (CZ): Madhya Pradesh, Chhatisgarh, Gujarat, Kota & Udaipur divisions of Rajasthan and Jhansi division of Uttar Pradesh.			
17	HI 8731 (d)	RF-TS RI-TS	Not identified because of no significant yield advantage and quality.
Peninsular Zone (PZ): Maharashtra, Karnataka, Andhra Pradesh, Goa and plains of Tamil Nadu.			
18	MACS 6478	IR-TS	Identified based on higher yield, better disease resistance and chapati quality.
19	HD 3090	IR-LS	The committee deliberated on HD 3090 variety and found it suitable for identification due to stem and brown rust resistance.
20	DBW 93	RF-TS RI-TS	The committee after discussions identified DBW 93 for only restricted irrigation due to yield advantage and rust resistance, but not for rainfed conditions.
All Dicoccum growing areas in Gujarat, Maharashtra, Karnataka and Tamil Nadu			
21	HW 1098 (dicoccum)	IR-TS	The committee considered the variety HW 1098 based on yield superiority and resistance to rust, hence identified.
BARLEY			
1	BHS 400	RF-TS-NHZ	The said genotype has high yield and stripe rust resistance, hence identified.
2	DWRB 92	IR-TS-Malt NWPZ	DWRB 92 was found good for malt quality, hence identified.
3	BH 946	IR-TS-feed NWPZ	BHS 946 was identified based on yield advantage and rust resistance.
4	HUB 113	IR-TS-NEPZ	Identified based on yield and rust resistance. The variety was approved for identification subject to re-submission of proposal with good quality photographs.

* Tested for four years

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

Finalization of Work Plan and Recommendations

August 26, 2012

Discipline	Coordinator
Crop Improvement	Dr V Tiwari
Resource Management	Dr RK Sharma
Crop Protection	Dr MS Saharan
Wheat Quality	Dr RK Gupta
Barley network	Dr RPS Verma

The details of this session have been given in Session-II, i.e. Research Planning Meeting from page number 19 to 83.

Session VII

Global efforts in enhancing wheat and barley production

September 3, 2013

Chairman: Dr. Thomas Lumpkin
Co-Chairman: Dr Swapan K Datta & Dr (Mrs) Indu Sharma
Rapporteurs: Dr Sewa Ram and Dr SV Sai Prasad

The chairman gave brief account of role of CIMMYT in Green revolution in India which started with the wheat seed of dwarf varieties (18,000 tonnes) sent by great visionary Noble Laureate Dr. Borlaug. He informed that as a legacy of Dr. Borlaug, BISA has been created in India to complement Indian wheat improvement programmes for accelerating green revolution. He also pointed out that Dr S Rajaram and Dr Ravi Singh contributed very significantly in this endeavour. He however cautioned that there is great challenge ahead for enhancing production and productivity of wheat under less water and land and changing climate. He emphasized the synergy with private sector and farmers. This was followed by presentations by various speakers.

Dr E Duveiller, Director, BISA gave presentation on an overview of CIMMYT-India and ICAR-BISA collaboration for enhancing wheat production in Asia. He informed that with climate change and limited land and water and nutrient resources there would be 20-30% reduction in the yield of wheat by 2050. Therefore, the challenges would be breaking yield barrier, yellow rust, heat and nutrient deficiency. He emphasized the role of shuttle breeding in improving yield potential with higher adaptability under changing climate. He informed about BMZ project under which research is being done for improving wheat under heat stress by using genomic selection methodology and accumulating combination of desirable alleles of genes such as *vrn*, *Pdp* and *eps*. Genomic selection has benefits of predicting useful cross combinations, estimating breeding value, enhancing genetic diversity and shorten the breeding cycle for developing variety. He also informed about the role of sensor based instrumentation in application of fertilizer in improving precision in application of nutrients and irrigation and thus enhancing system profitability. He also informed in the progress made in development of farm at Ludhiana for precision of phenotyping and underground irrigation system. He informed that membrane thermo-stability, photosynthetic capacity and starch biosynthesis can be used in improving wheat for heat stress. He also emphasized enhancing germplasm exchange and using high science and developing collaborations.

Dr Sukhwinder Singh from CIMMYT, Mexico made presentation on recent advances in wheat improvement. He informed that there is a need to have 2.4% yield enhancement annually in wheat in future to meet requirement of food in the world. This can be achieved by enhancing genetic diversity using exotic resources, land races, synthetic hexaploids and elite lines and historical checks. He informed that more than 200 exotic alleles are being used to improve heat tolerance and disease resistance and grain quality and a set of core germplasm has been developed for association mapping studies. Molecular atlas of global wheat germplasm has been developed using 30K genotypes along with 70 K phenotypic data and data base has been provided on SeeDsite. For genomic diversity studies, genotyping by sequencing (GBS) has been used and prebreeding was done using LTP approach.

Dr M Baum from ICARDA presented new avenues and challenges in barley research: an overview of ICARDA-India collaboration and planning for 2013-14. He pointed out that drought, heat and rusts are major challenges in wheat. He reported that large numbers of genetic stocks with drought tolerance, high yield potential and having rust resistance have been identified and association mapping studies are being conducted for these traits. He also pointed out that ICARDA has role in exchange of germplasm for strengthening genetic resources and conducting basic and strategic research.

Dr RPS Verma from ICARDA gave detailed information about research issues related to barley. He reported that there is decrease in areas under barley in developing world during last few decades. He also emphasized for collaboration between India and ICARDA and to exchange germplasm both ways. He reported that there are more than 27000 barley accession in ICARDA and need screening for identification of genetic stocks and development of molecular markers for sustainable increase in productivity.

Dr Ian King from BBSRC presented information about BBSRC-India Collaboration: strategy and planning. He pointed out that there is a decrease in genetic diversity of recently released varieties. Therefore, distant races should be utilized for enhancing genetic variation and germplasm development. Examples are the development of amphidiploids in wheat by introgressing *T. urartu* and *thinopyram* accessions for enhancing photosynthetic capacity, water and nutrient use efficiency and rust resistance. Dr. Martin B Roadley from BBSRC gave detailed account of high throughput root phenotyping facility by which several thousand genotypes can be screened within short span of time.

Dr Swapan K.Datta inquired about preparing for 2020 and time line for snp based wheat breeding. Dr. Ian replied that 15 tonnes average productivity per hectare by 2020 is the target in Britain. SNP data have been created and available on website. Dr Thomas inquired about ICARDA-CIMMYT collaboration.

The major recommendation of this session was on “Enhancing international collaborations in all disciplines of wheat and barley research for their improvement for yield, quality and resistance to abiotic and biotic stresses by germplasm exchange and using genomes based information in breeding”.

The chairman thanked speakers for presenting latest developments in wheat and barley science to enhance global production of these crops.

SPECIAL SESSION VIII

Developmental issues in Wheat and Barley

September 3rd, 2013

Chairman : Dr JS Sandhu
Co-Chairman : Dr GS Mahal & Dr JP Tandon
Reporters : Dr Gyanendra Singh & Dr NB Singh

This session was chaired by Dr JS Sandhu, Agriculture Commissioner, Govt. of India, New Delhi and co-chaired by Dr GS Mahal, Former Zonal Coordinator NWPZ and Dr JP Tandon, Former Project Director, DWR. The Chairman extended formal welcome to the session and then invited speakers to make presentations.

The first presentation was made by Sh Subhash Zadoo, Executive Director (FCI) on “Scenario of export of Indian wheat from central pool stocks - FCI perspective”. Sh Zadoo informed the house that FCI has operations for procurement and storage of stocks of central pools. He informed that three year old stocks are usable and in case of wheat, we have very little, that is also is upgradable. He also apprised house that surplus states like Punjab, Haryana, Rajasthan, U.P., Bihar & M.P. are the major contributors and MP has taken lead in procurement followed by UP. Mr. Zadoo highlighted that FCI procures wheat based on quality specifications according to potential of exporting wheat. He also informed house that in future, Karnal bunt may be issue but fungus does not produce toxic & yield is not affected. Dr. Swapan K. Datta, DDG (CS), asked that can FCI procure wheat from all states particularly North East, India. Speaker replied that FCI can arrange procurement in every state. Dr. JP Tandon asked that now in view of export, we should segregate the stocks and the premium on durum is necessary.

Dr GK Chaudhary presented status paper on National Food Security Mission (NFSM) – Towards secured Indian wheat. In his presentation he told house that production and productivity of wheat has increased with adoption of new technologies and efforts are being made to improve soil health. He also apprised that deficit states will get more focus in next plan to ensure food security at national level and accordingly and allocation for 12th plan has been proposed. Dr. R.P. S. Verma asked that weather barley is also included in NFSM. The chairman informed the house that barley is covered under NFSM.

Dr. DN Sharma from MP made a presentation about scenario of wheat in his state and also the outstanding achievements. He told that variety GW 322 has potential to yield above 7 t/ha and there is scope for proclivity enhancement with available technology. For this, timely sowing adoption of new technologies, improved seed replacement rate, balanced fertilizers and farm field schools are taken up as approach. Dr JP Tandon told that though MP has made tremendous progress but then why old varieties like Lok-1 and others are still being cultivated in your state when high yielding new varieties are available? Dr JP Tandon emphasized that new varieties should be popularized to replace old varieties. Dr Tandon informed the house that in view of limited irrigation for wheat crop varieties like HI 1531 that have given up to 45 q/ha yield should be encouraged.

The next presentation was made by Dr DP Tripathi, JDA (Planning), Bihar and indicated that the productivity of wheat must be increased. Dr Tripathi presented status paper and mentioned following factors as a constraints in productivity of wheat.

1. To address the issue of heat tolerance, there is need of thermo-heat tolerant and short duration varieties especially under late sown condition after harvesting of paddy.
2. There is need of more use of zero tillage and quality dibbler.
3. There is need of balanced use of fertilizer and irrigation water.

Dr Tandon told that there is need to popularize new wheat varieties in North Eastern Plain Zone and concerned states should give indent for breeder seed in advance. He told that SWI has

been demonstrated on larger area but the results are not very convincing. The zero tillage (for advancing sowing) and rotavator (for minimum tillage) have good scope on Bihar.

The representative from Himachal Pradesh gave wheat statistics in the state and also the target for 2013-14. He also explained new initiatives (seed treatment, management of yellow rust, model seed farm and organic farming) taken up by the state. Dr RPS Verma asked that many new varieties have been listed but still breeder seed indent of all varieties are placed. Dr JS Sandhu informed that FLD proven varieties need to be indented for enhancing productivity.

Sh. RR Singh, Additional Director (Rice) from UP state presented status wheat crop scenario and mentioned that with the initiatives taken up, UP will touch productivity level of Haryana very soon. According to him, there is no plan for area increase under wheat in next 2-3 years. Among the major constraints, thermo-tolerance varieties, new technologies including high yielding varieties, expensive farm mechanization and small holdings were emphasized. E said that to improve productivity in Mirzapur and Vidhyanchal use of zero-tillage and rotavator need to promote. Dr. Tandon express satisfaction about future plans but at the same time highlighted the need for training the farmers about technology, machines, timely sowing *etc.* in the state.

Dr Randhir Singh, Principal Investigator (Social Sciences), DWR, Karnal was requested to make a brief presentation on impact of front line demonstration (FLD). Accordingly, Dr Singh presented the summary of allotment, conduct, monitoring, results and impact of FLDs in different states. He also highlighted yield gains shown by different technologies across zones demonstrated under FLDs. Dr Indu Sharma, Project Director, informed the house that FLDs were conducted as a package and have shown gains in all the cases across states in different zones. The Project Director also made a mention about possibilities of enhancing 8-10 million tons of production by bridging the yield gaps and making use of micro level assessment for strategies planning and execution in different states. Dr JS Sandhu, Chairman of Session, asked about the different technologies that have been demonstrated in each zone, constraints and impact of individual technology in enhancing productivity and production. Dr Randhir Singh responded to the queries and ensured that suitable corrective measures will be taken in light of the suggestions by the chairman.

The session ended with a vote of thanks.

SESSION IX

Progress of Research in PZ and SHZ: A Review

September 4, 2013	Chairman	:	Dr RP Dua
	Co-Chairman	:	Dr. Mahesh Shrimali
	Rapporteurs	:	Dr BS Tyagi and Dr Suma S Biradar

This session was chaired by Dr RP Dua ADG (FFC) and co-chaired by Dr Mrs Indu Sharma Project Director, DWR, Karnal. In his opening remark, the chairman appreciated the system of Zonal Review System of Wheat Crop during the workshop and welcomed the delegates. In his opinion this review system helps in understanding the activities of other zones and problems as well. This year two zones were taken and in all, six presentations namely UAS, Dharwad (Dr V Rudra Naik); ARS, Niphad (Dr PN Rasal); ARI, Pune (Dr SC Mishra); RRS, Mahabaleshwar (Dr NV Savant); RRU, Akola (Dr NR Potdukhe) from Peninsular zone while IARI, Regional Station, Wellington (Dr J Kumar) from Southern hill zone made the presentations. All the speakers briefly discussed the achievements in different disciplines, conduction of co-ordinated trials, breeding material developed along with the basic/ applied research undertaken at their respective centres. Research highlights of individual centres are given below:

UAS, Dharwad

Dr V Rudra Naik highlighted the achievements of the station. He informed the house that centre has developed five wheat varieties including 1 bread wheat, 3 durum and 1 dicoccum and two genetic stocks during the last five years. The centre is working on development of high yielding varieties in all the three species for irrigated condition and bread and durum wheat for rainfed situation. This center is also focusing on development of free threshable dicoccum wheat through special breeding approach. They are also engaged in designing therapeutic food from dicoccum wheat for diabetic patients.

The chairman appreciated the good work being done at Dharwad centre and suggested the group to keep same pace. He enquired about the area under rainfed situation and agronomic management practices recommended to conserve the moisture. Dr. Indu Sharma Project Director complemented the centre but showed serious concern about enhancement of area under wheat. Further, she suggested to tap the potential area and identification of newer molecules to control rust.

MPKV, ARS, Niphad

Dr PN Rasal informed house that AICW&BIP is in operation at this location since 1971 as the main centre of Peninsular zone for coordinating the wheat improvement programme of the states of Maharashtra, Karnataka and Tamil Nadu. He informed that most of the breeding, pathological and agronomy trials are being conducted at this center successfully. So far center has developed 26 wheat varieties including 16 bread wheat and 10 durum wheat and where as, one rainfed variety and one genetic stock during the period. Efforts have been made to provide latest production technologies through front line demonstrations.

Chairman enquired about the rainfed area and the breeding programmes initiated to address that situation. Project Director suggested to present highlights on objectives of the crossing block and percentage of material selected from own breeding programme or selection from international nurseries.

ARI, Pune

Dr SC Mishra made presentation on the work done at ARI, Pune during the past five years. This is also another center involved in development of wheat varieties in all the three species of wheat. The center has contributed two wheat varieties during last five years. They are engaged in search of new sources for rust resistance through use of synthetic hexaploid wheat. The center has developed public private partnership with ITC.

Chairman appreciated the center for its good work however, he enquired about status of hybrid wheat in Peninsular zone. Dr Indu Sharma Project Director was of opinion that thorough discussion should be held on hybrid wheat by reserving one complete session in the next workshop.

Regional Wheat Rust Research Station, Mahabaleshwar

Dr NV Savant who is the wheat rust mycologist, presented the research highlights of the station. He highlighted the importance of the center in maintenance and screening wheat genotypes for different pathotypes of leaf and stem rusts. The center is also involved in the multiplication and supply of inocula to needy centers. The station identified 18 leaf rust and 7 stem rust pathotypes.

Project Director emphasized the importance of the center and asked to develop facilities like Shimla to analyze different races of rust so as to address the southern India. Further, she assured for any support from Directorate.

Dr PDKV, Wheat Research Unit, Akola

Dr NR Potdukhe presented the report of this center. This voluntary center is working since 1981. The center has developed two bread wheat varieties and registered nine genetic stocks for various traits. The center is conducting all breeding trials. It is also involved in breeder seed, foundation seed and certified seed production in sufficient quantity. The chairman asked about the rainfed area and the breeding programmes to address that situation.

IARI, Regional Station, Wellington

Dr. Jagdish Kumar made presentation on work done at Regional station during the past five years. He mentioned that the center was established in 1954 under cereal rust control programme of ICAR. He indicated that the center is the hot spot for rust as it is primary source of inoculum for stem and leaf rust. He also indicated that center is providing offseason facility for multiple crops.

The chairman and Project Director appreciated the good work being done at Wellington and suggested to share all valuable genetic stocks developed with all the centers so that others can take the benefit of the material and go for joint release proposal. She asked about origin of new races of leaf rust in Karnataka and southern hill zone and further suggested to check role of alternate hosts.

Dr BS Tyagi suggested that some demonstration on wheat including dicoccum be planted around Mandya and Mysore. In this area of Karnataka the crop is good and the land is fertile. After rice the wheat crop may be tried for crop diversity. This will help in increasing the area of wheat. At last, Dr. JP Tandon former Project Director appreciated about the development of good many number of varieties for the zone, however showed serious concern about improper cultural practices followed in most of the villages of the zone. Further, he suggested agronomists to address location specific problems of the zone since, within very short crop duration realizing higher yield further should be addressed by agronomic practices.

The session ended with vote of thanks to the Chair and the Co-chair.

SESSION X

Plenary Session

September 4, 2013	Chairman	: Dr Swapan K Datta
	Co-Chairman	: Dr RP Dua & Dr Indu Sharma
	Rapporteurs	: Dr R Chatrath & Dr PC Mishra

The important plenary session of four days wheat research workers meeting was chaired by Dr Swapan K Datta, DDG (CS), ICAR and co-chaired by Dr. RPDua ADG (FFC) ICAR and DrIndu Sharma, Project Director, DWR, Karnal. Chairman welcomed the delegates and appreciated the discipline and sincerity of delegates. He also appreciated the presence of scientists even during last day of the workshop and started proceedings of the session. The first item was presentation of significant recommendation and highlights of work plan for 2013-14 by various PI's and the details are mentioned as under

Crop Improvement

The recommendations and plan of work for Crop Improvement was presented by Dr Vinod Tiwari, PI, Crop Improvement and were based on the Research Review meeting of Crop Improvement while the composition of different trials including AVTs, NIVTs, IVTs and special trials for various zones to be conducted during the crop season 2013-14 were finalized in the Work Plan meetings.

The following recommendations were made by the group.

1. The promotion of test entries for the AVTs has been made on the basis of significant advantage in yield over the best check and at par entries which were superior to the best check were only considered. The same principle would be applicable in future also.
2. The promotion of entries for rainfed and restricted irrigation condition was delinked for purpose of promotion and separate trials for the two conditions have been proposed for CZ and PZ like in NWPZ.
3. In view of area under rainfed is getting reduced and due to scarcity of water, the centres would devote more efforts towards developing suitable genotypes for limited irrigation conditions.
4. The ACI limit for yellow rust in NEPZ would continue to be same as existing 25.0 for both irrigated and rainfed conditions.
5. The special trial on triticale would also be conducted at a few centres in NWPZ in addition to NHZ
6. The entries being artificially boosted by some centres would not be considered for promotion. Dr RP Dua, ADG (FFC) directed that in such cases the particular location should be deleted before final analysis.
7. It was also emphasized that in order to save the seeds of RILs/NILs developed by some centres, a set of seed should be deposited at DWR, Karnal for posterity. However the supply of this material to any indenter would be done in consultation with the original developer.
8. After a long deliberation the house agreed to test durum entries in NIVT-3 within the allocated quota of centres.
9. A new special AVT trial will be constituted comprising recipient entry, recurrent parent, best check and latest three checks to test genotypes developed through MABB. The entries in this trial would be tested for two years only.
 - a. IPPSN data is must requirement for entering MAS entry into AVT trial. However, this condition stands relaxed for 2013-14 season.
 - b. The recipient genotype should be a popular variety with significant trial seed indent in previous years.
 - c. The contributing centre will give recipient (test) entry along with recurrent parent as check in AVT

- d. Total number of markers used, number of polymorphic markers and percent genome recovery information has to be provided which is supported by field /evaluation data.
- e. It is to be ensured that salient traits, that define the adaptation of the recipient variety, should not get altered.

ADG (FFC) Dr.Dua made a remark that IPPSN testing of MABB lines is essential before such material is tested in trials.

10. A special trial on biofortified wheat would be conducted at HarvestPluscentres (DWR, Karnal; IARI, Delhi; PAU, Ludhiana and BHU, Varanasi) and in addition Kanpur, Hisar, Durgapura and Niphad may also be included.

During the discussions a point was raised by Dr GP Singh of IARI, New Delhi that in the group meeting decision was taken that only significantly superior entry than the best check would be promoted in AVT. However, during trial finalization at par entries were also included. Chairman pointed out that usually best check is taken into consideration. In some cases it may happen that at par entries are also included but DWR will look into the matter again and asked him to give in writing. Dr AN Mishra, IARI, Regional station, Indore raised the issue that entries should be compared with zonal check rather than best check, while formulating AVT. He further said that durum should be encouraged in NWPZ also for diversification. Co-Chairman, Dr.Dua showed his concern that IPPSN data for MAS entry has been relaxed for 2013-14 season but it should be tested in artificially inoculated nursery at identified center and if it performs better at other centers also, may be considered for AVT. Dr Indu Sharma, Project Director opined that genotypes developed through MABB may be compared with best check only. Dr Dua also suggested deleting centres giving extraordinary yields at their centre.

Resource Management

Dr RK Sharma, PI, Resource management presented the recommendations and plan of work for 2013-14 crop season. The Resource Management and Social Sciences groups after thorough deliberations arrived at the following recommendations;

Technical Recommendations

1. The optimum sowing period being followed for CZ was 46th(12-18 Nov) Julian week. The Resource Management group conducted experiment with three periods of sowing *i.e.* 45th (5-11 Nov), 46th (12-18 Nov) and 47th (19-25 Nov) Julian week at eight to nine locations. Based on two years data the 46th Julian week (12-18 Nov) was found optimum for maximizing wheat productivity.
2. The experiment on row to row spacing maintaining 100 kg/ha seed rate was conducted at 3-4 locations in PZ. The wheat was planted at 15, 17.5, 20 and 22.5 cm row to row spacing. Based on three years data, the row spacing effect was not significant but marginally higher yield was recorded at 20 cm spacing. The narrow spacing also helps to reduce the weed infestation. Therefore the row spacing needs to be reduced for higher productivity.
3. The experiment on broadleaf weed control was conducted at 7-8 locations across NWPZ, NEPZ and CZ for two years. Among herbicide treatments, application of metsulfuron+carfentrazone (Ready mix)+0.2% NIS at 25 g *a.i./ha* effectively controlled broadleaf weeds and produced maximum grain yield in all the three zones. Therefore, ready mixture may be used for effective weed control compared to the sole application of herbicides for higher wheat productivity.
4. For broad spectrum weed control in wheat, the experiment was conducted at 13-15 locations across NHZ, NWPZ, NEPZ and CZ. Based on two years results, the application of ready mixture (Vesta and Total) provided effective broad spectrum weed control and higher wheat productivity.
5. An experiment on mulching and spray of CaCl₂ and KCl was conducted at 5 locations across NWPZ and CZ, to evaluate their role in climate change mitigation. Use of mulch produced significantly higher grain yield than no mulching and spray application of KCl and

CaCl₂ @ 0.2% at booting/post anthesis recorded higher grain yield. Therefore, use of mulch coupled with spray of KCl or CaCl₂ @ 0.2% can help mitigate the climate change effect in wheat productivity.

6. The experiment on System of wheat intensification (SWI) was conducted at 2-3 locations across NWPZ and NEPZ. Based on two years data, it can be concluded that the SWI had no advantage over conventional practice of drill sowing. Moreover, SWI involved a very high cost compared to conventional planting of wheat crop.
7. The experiment on use of hydrogel to enhance wheat productivity was conducted at 10-12 locations across NWPZ, NEPZ, CZ and PZ for two year. Application of 2.5 to 5.0 kg/ha hydrogel produced higher grain yield under restricted irrigation.

Administrative Recommendations

1. Funds for wheat front line demonstrations of one ha each need to be increased to Rs 8000.
2. Funds allocated for the FLD must be released in one installment by the DAC, Ministry of Agriculture by 30 September positively to enable conduct the FLDs. The pending balance of 13,91,000/- (Thirteen lakhs and ninety one thousands) for the year 2009-10 and 2010-11 must be released immediately.
3. The DWR should be provided an additional amount of Rs 3.5 lakh for monitoring of wheat and barley front line demonstrations.
4. In view of the substantial increase in labour wages and other inputs costs, the contingency needs to be enhanced by at least two and half times.
5. The group recommended that in view of the development of herbicide resistance, new molecules, if available, may be tested under coordinated programme at multi-location and/or at DWR, Karnal. Similarly, any new fertilizer molecule may also be evaluated for their effectiveness and use efficiency in wheat.

During discussions, Dr Indu Sharma, Project Director remarked that farmers are taking up to 9 t/ha yields in Haryana by manipulating seed rate and fertilizer. Dr AN Mishra said that seed is economic commodity while fertilizer is petroleum product and it may increase cost. To this Dr Sharma replied that the results may be more beneficial. She also narrated that heavy shower at flowering resulted lodging and if seed rate is less it may reduce the lodging. Dr JP Tandon said that farmers are harvesting 9 t/ha yield but we are getting less than 4.5 t/ha. Therefore, site specific recommendations must be developed on the basis of water conservation technologies. We should work on the sprinkler irrigation and drip irrigation. He further said that in MP and Rajasthan water is declining and farmers are not able to give irrigation properly. Our recommendation is that the second irrigation must be given after 65 days but farmers are applying after 50 days due to unawareness. Chairman pointed out that Gujarat is utilizing drip and sprinkler irrigation in certain crops. Therefore location specific scientific research and technology must be developed and utilized. Dr RK Sharma while replying to various issues raised said that greater dose of fertilizer and less seed rate may give the good result which to be tested. He further said that at 2-3 locations drip irrigation can be tested but fund must be provided for the purpose. He also emphasized that in sprinkler irrigation after flowering there may be incidence of black point whereas drip irrigation may not suit to wheat due to closer row spacing. Accordingly, more study is required on these systems. Dr Pandey (Pantnagar) raised the issue of contingency for special trials to which Project Director replied that it will be solved.

Crop Protection

Crop Protection's Recommendations and the Work Plan 2013-14 were presented by Dr MS Saharan, PI-Crop Protection, DWR, Karnal. He informed that the programme was reviewed in presence of all the scientists from Co-Operating centers. Dr. Indu Sharma, Project Director, DWR, Karnal gave valuable suggestion for planning of the programme for 2013-14. She emphasized to make wheat disease monitoring nursery more meaningful by reporting its data

regularly. She also impressed upon the role of border rows in creating artificial epiphytotics and suggested an action plan to activate Mahabaleshwar center. Dr. Swapan K Datta, DDG (CS) gave valuable suggestion for developing durable rust resistant varieties and emphasized on farmers' awareness for managing wheat rusts. He also stressed a judicious use of rust resistance genes, rapid transmission of information on any disease threat, breakdown of resistance and active participation in gene stewardship. Keeping in view the valuable suggestions, the needful changes in the programme were made to make it more effective. With the coding of entries, it becomes difficult to compare, identify the changes in disease score and susceptibility of resistant lines. Therefore, the Crop Protection group felt that there should not be coding of PPSN material. Dr. J.P.Tandon, former Project Director, DWR, Karnal congratulated the Crop Protection achievements and also agreed that coding in PPSN is not required. The house accepted this suggestion after deliberating on this. The Chairman congratulated the Crop Protection group for their role in food security of the country. As suggested by Dr M S Saharan, AVTs in PPSN will be evaluated in two rows for rusts. Dr. Lakshmi Kant suggested not to grow stripe rust susceptible varieties in NHZ. Dr. A.N.Mishra, IARI, Regional station, Indore showed his concern that disease reaction should be recorded carefully. There was a suggestion to include breeder in PPSN monitoring team. The PI-Crop Protection accepted the suggestion. In the last, the Chairman stressed on precise phenotyping and monitoring of PPSN jointly by the Pathologists and Breeders. He also suggested to formulate a Indian network of scientists on Gene Stewardship for effective sharing of information. Most of the ongoing experiments would be continued in 2013-14. In addition, following research and technical recommendations were finalized:

I. Research Recommendations

(i) Multiple Disease Resistant Genotypes

Resistant to rusts: MACS 3742, DBW 58, HS 534, TL 2968, UP 2763, TL 2969, HI 8703, UAS 320, HI 8722, HPW 360, HS 545, HUW 640, MACS 3828, PBW 648, TL 2975, VL 941, HI 8713, HI 8715, KRL 304 and PDW 324

Resistant to rusts + powdery mildew (PM): MACS 3742, DBW 58, HS 534, TL 2968, UP 2763, TL 2969, UAS 320, HI 8722, HPW 349, HPW 360, HS 545, MACS 3828, TL 2975, HI 8713, HI 8115, KRL 304 and PDW 324

Resistant to rusts + PM + Karnal bunt (KB) + flag smut (FS): MACS 3742, TL 2969, HI 8722, HPW 360, MACS 3828, TL 2975, HI 8713, HI 8715 and PDW324

Resistant to rusts + leaf blight (LB): HS 545, HUW 640, PBW 648, TL 2975 and VL 941

Resistant to rusts + LB + PM: HS 545 and TL 2975

Resistant to rusts + LB + PM +KB + FS: TL 2975

(ii) Multiple Disease and Insect Pest Resistant Genotypes

Resistant to rusts + LB + PM + KB + FS + Shoot Fly: TL 2975

Resistant to rusts + LB + Shoot Fly: HUW 640

Resistant to rusts + PM +KB + FS + Shoot Fly: MACS 3742

(iii) Constitution of National Genetic Stock Nursery (NGSN)

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

(iv) Reconstitution of Wheat Disease Monitoring Nursery (WDMN)

Keeping into account the changed varietal situation, the zone specific varieties of NWPZ and NEPZ were recasted. The detailed constituents of WDMN from 2013 onwards would be as given below:

Common set of varieties of wheat disease monitoring nursery

WL 711, HD 2329, Agra Local, HD 2160, LalBahadur, WL 1562, HW 2021(Sr26/Sr24), HD 2204, C 306, WH 147, HW 2008 (Sr24/Lr24), Kharchia mutant, HP 1633, DL 784-3 and Lr24.

Zone specific varieties

NWPZ: DBW17, WH 542, PBW 343, DPW 621-50 and WH 896

NEPZ: K 8804, HD 2402, HP 1102, HUW 468 and NW 1014

CZ: HI 8381, DL 803-3, Lok -1, GW273 and GW322

PZ and SHZ: MACS 2496, Bijaga Yellow, HW 971, HD 2501 and HW 2022 (*Sr24/Lr24*)

NHZ and High Altitude Zone: HPW 251, VL892, HS 420, Sonalika, VL 738 and Barley Local

(v) Preparedness to combat Sr31 virulence (Ug99)

Evaluation of AVTs lines at Kenya and Ethiopia for Ug99 resistance will be continued.

(vi) Chemical management of rusts

In addition to propiconazole (Tilt 25 EC), two other fungicides namely tebuconazole (Folicur 250 EC) and triademefon (Bayleton 25 WP) @ 0.1 per cent recommended already are again emphasized for use under emergency situation for stripe rust management in northern India and leaf rust control in Peninsular Zone.

(vii) Chemical management of foliar aphids and brown wheat mites

Foliar application of Clothionidin 50 WDG @ 15 g. a. i. /ha was found quite effective for management of foliar feeding wheat aphid, hence again emphasized for the control.

II. Technical Recommendations

1. A strict vigil will be kept on stripe rust in NWPZ/NHZ and leaf and stem rusts in PZ and CZ. Teams have been constituted for monitoring of rusts in above areas during crop season and off season. Vigil will also be kept on other rusts and insect pests.
2. Precise rusts surveys using latest gadgets will be strengthened.
3. Efforts would be made to strengthen and validate remote sensing based monitoring for wheat rusts.
4. Varieties recommended for other zones and susceptible to yellow rust should not be grown in the yellow rust prone areas.
5. Post-harvest survey will be carried out for knowing Karnal bunt and black point status for facilitating export.
6. In absence of entries names, it becomes difficult to compare, identify the changes in disease score and susceptibility of resistant lines. **Therefore, there should not be coding of PPSN material.**
7. AVTs lines will be evaluated in two rows for rusts in PPSN.
8. Wheat Disease Monitoring will be planted in two rows at suitable site.
9. New chemicals for emergency stripe rust management will be tested at multilocations.
10. Efforts would be made to develop lines with two effective resistance genes to stripe rust of wheat which is main threat to main wheat belt of India.
11. Trial for termite management in standing crop will be conducted at multi locations.
12. Trial on management of brown wheat mites (*Petrobia latens*) will be repeated at multilocations.
13. Shoot Fly is emerging a problem in Karnataka (PZ) so nursery would be evaluated at Dharwadcentre.
14. Experiment on population dynamics of insects of wheat will be conducted at multilocations (Karnal, Ludhiana, Niphad) with different sowing dates.
15. A refresher course on techniques and procedures in Crop Protection will be organized at DWR, Karnal and Shimla for scientists from co-operating centres.
16. Frequent awareness programmes for the farmers as well as State govt. functionaries would be organized.

Wheat quality

The recommendation and work plan on wheat quality was presented by Dr RK Gupta, PI Quality Improvement. He presented important recommendations that involved use of the genetic resources and other promising genotypes excelling in important quality parameters including end products, identify by the quality groups, in their crossing programme to improve industrial and nutritional quality of wheat. These are detailed as follows:

1. The group recommended that the genotypes contributed for testing in Initial Plant

Protection Screening Nursery (IPPSN) should also be examined for important quality parameters. The entries will be supplied by PI, Crop Protection. (Action: DWR, Karnal).

2. Interaction with industry is crucial to carry forward the advances made in wheat quality research. Scientist associated with wheat quality research should make concerted efforts to show-case their quality rich materials to milling and baking industry in operation at the regional or national level. (Action: Zonal coordinators and scientists engaged in quality enhancement).
3. Scientists associated with the wheat quality programme should work hand in glove with the breeders at their respective centres in analyzing the wheat samples for quality traits. The group recommended that breeders should make use of the genetic resources and other promising genotypes excelling in important quality parameters including end products, identified by the quality group, in their crossing programme to improve the industrial and nutritional quality of wheat. (Action: concerned breeders and quality scientists).
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 Quality Component Screening Nursery (QCSN) would now be conducted at 15 centres (NHZ :Almora; NWPZ : Ludhiana, Karnal, Durgapura, Delhi, Hisar, Pantnagar; NEPZ: Kanpur and Pusa; CZ : Indore, Powarkheda, Vijapur and Junagarh; 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).
6. There is need to use quality traits such as sedimentation value, protein content test weight and grain appearance in combination for promoting varieties (Action: Concerned breeders and quality scientists).
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).

During the discussions the Chairman pointed out that screening of germplasm for low gluten line for specific product is important. He mentioned that in rice all kind of quality gradation is available but in wheat no any variety is used for specific purpose. Hence, screening for specific product is essential. Dr Gupta replied that product specific entries/varieties are identified from AICW&BIP and for gluten he has screened 100 old wheat varieties and observed variation. Dr NB Singh, Kanpur raised the issue that genotypes must be screened for Zn and Fe and further added that stability of quality traits should be worked out across the zone/locations. Dr. Gupta replied that QCSN is conducted at 15 locations across the zones and it may give idea about stability. Chairman pointed out that the screening for Fe and Zn should be done carefully to avoid some contamination. He asked Harvest Plus to provide protocols for proper handling and analysis of micronutrients.

Barley Network

The report on Barley network was presented by Dr. AS Kharub. He informed the house about the plan of work for 2013-14 as well as ongoing and new experiments to be conducted during the season. He also laid emphasis on availability of quantity seed for which efforts will be made for a strong public-private partnership and that a meeting with representative from industries

will be convened in this regard. He also pointed out that the programme should be further strengthened in terms of genetic enhancement of dual purpose barley. Dr. Kharub added that the lodging is the major concern for high input barley and barley improvement programme should emphasize on better plant type. He also suggested that the attention should be paid on husk less barley. For this hill zone centers should play more active roles. The important recommendations that emerged were;

Recommendations

1. To ensure the availability of quality seed, efforts should be made for public private partnership. A meeting with representative from industries will be convened in this regard.
2. Dual purpose barley is emerging need and the programme should be further strengthened in terms of genetic enhancement. For feed and fodder purpose barley breeding, linkage should be established with animal science institutes.
3. Crossing programme should be strengthened using international and NBGSN genotypes.
4. Lodging is the major concern for high input barley and barley improvement programme should emphasize on better plant type.
5. Health benefits of consuming barley should be popularized and work should be strengthened to identify superior genotypes with better nutritional traits.
6. Attention should be paid on huskless barley. For this hill zone centres should play more active role.
7. Barley trial conducting contingencies should be released timely to all the non-funded centres immediately after receiving AUC.
8. For barley area expansion, the MSP of barley should be comparable to the wheat, more FLDs should be allocated and the private companies should come forward for more contract farming.

Technical Recommendation

1. In dual purpose barley in NHZ, the recommendation for nitrogen dose should be 60 Kg/ha and the scheduling of nitrogen should be 1/3 as basal, 1/3 immediate after cutting (70DAS) and 1/3 at 100 days after sowing for higher grain and forage yields.

Dr JKumar, Head, IARI Regional Station, Wellington presented the information on the prospect of promoting dicoccum wheat in PZ and SHZ owing to its therapeutic value. Dr Indu Sharma, Project Director, DWR, Karnal presented report on Variety Identification Committee meeting and congratulated the team whose varieties had been identified.

The Chairman felicitated the superannuating scientists and highlighted their contribution to wheat research. In the concluding remarks, Chairman Dr. Swapan K Datta said that all the four days of meeting were very exciting and productive with regard to wheat research work during last year and planning for next year. He pointed out that the presence of eminent dignitaries from CIMMYT, ICARDA, UK. and other countries and also from India was very useful in planning and guidance for the programme. He summarized that to get maximum response of our variety, we have to exploit all the information of package of practices and any model developed at any site be utilized to get 100 mt in near future. Chairman opined that emphasis should be given on molecular breeding, salt tolerance, transgenic, less water availability, weed management *etc.* He said wheat and barley programme is well conducted in country and it needs genetic gain through enhancement of genetic variability, He highlighted that akin to global gene stewardship Indian gene stewardship must also be brought about. He expressed his thanks to the authorities, delegates and organizers for making this event a grand success.

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

Annexure-I

List of final year entries & check varieties, 2013-14

Trial	Final year entries	Checks
1. Northern Hills zone		
(i) AVT-RF-TS-TAS	VL 967	VL 804, VL 907, HS 507, HPW 349
(ii) AVT-IR-TS-TAS	VL 967	VL 804, VL 907, HS 507, HPW 349
(iii) AVT-RF-ES-TAS	HPW 376	HS 277, VL 829, HPW 251, HS 542(I)
2. Northern Western Plains Zone		
(i) AVT-IR-TS-TAS	PBW 681, WH 1138, HUW 666	DPW 621-50, HD 2967, WH 1105, DBW 88(I), HD 3086 (I)
(ii) AVT-IR-LS-TAS	WH 1129	PBW 590, WH 1021, HD 3059, DBW 90(I), WH 1124 (I)
(iii) AVT-RI-TS-TAS	WH 1142	WH 1080, HD 3043, PBW 644
3. Northern Eastern Plains Zone		
(i) AVT-IR-LS-TAS	HD 3118, DBW 107, K1114	NW 2036, DBW 14, HD 2985, HI 1563
(ii) AVT-RF-TS-TAS	BRW 3723	C 306, K 8027, HD 2888
4. Central Zone		
(i) AVT-IR-TS-TAD	MP 3382, HI 8736(d), HI 8737 (d)	GW 322, HI 1544, HI 8498 (d), MPO 1215 (d)
(ii) AVT-RF-TS-TAD	NIAW 1885, PBW 689, WH 1142	HI 1500, MP 3288
(iii) AVT-RI-TS-TAD	DBW 110	HI 1500, MP 3288, HI 8627 (d), A 9-30-1 (d)
5. Peninsular Zone		
(i) AVT-RF-TS-TAD	UAS 347, NIAW 1994, UAS 446 (d)	NI 5439, NIAW 1415, AKDW 2997-16 (d)
6. Special Trial		
(i) SPL-DIC-IR-TS-ALL ZONES	MACS 5022, DDK 1042	DDK 1029, MACS 2971, MACS 2496 (aest), HW 1098 (I)