PROCEEDINGS

(Research Review, Recommendation & Plan of Work 2023-24)

अखिल भारतीय समन्वित गेहूँ एवं जौ अनुसंधान परियोजना

AICRP on Wheat and Barley

भा.कृ.अनु.प.–भारतीय गेहूँ एवं जौ अनुसंधान संस्थान, करनाल

ICAR-Indian Institute of Wheat and Barley Research, Karnal

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PROCEEDING

(Research Review, Recommendation & Plan of Work 2023-24)

62nd All India Wheat & Barley Research Workers' Meet

Held at

Maharana Pratap University of Agriculture & Technology (MPUAT), Udaipur (Rajasthan)

(August 28-30, 2023)

Organised By MPUAT, Udaipur & ICAR-IIWBR, Karnal

Issued By

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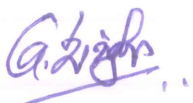
Foreword and Acknowledgement

It is a privilege and honour to organise the 62nd All India Wheat and Barley Research Workers' Meet at the MPUAT, Udaipur during August 28-30, 2023. The meet was inaugurated by Dr. Himanshu Pathak, Secretary, DARE and Director General, ICAR, New Delhi. The other dignitaries who graced the dais were: Dr. Ajeet Kumar Karnatak, Vice Chancellor, MPUAT, Udaipur as chairman. Dr. TR Sharma, DDG (CS) co-chairman and Dr. DK Yadava, ADG (Seeds) and Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi were Special guests for inaugural session. The other dignitaries who graced the occasion included Dr. AK Joshi, Asia regional representative CIMMYT, Dr. Michael Baum, Director BIGMP, ICARDA, Dr. Ronnie Coffman, BGRI. Dr. Golam Faruque, DG, BWMRI, Bangladesh. Dr. G. Subba Rao, JIRCAS, Japan, Dr. Aakash Chawade, Plant breeding, Lomma, Sweden and CIMMYT delegates including Drs. Pawan Singh, Velu Govindan and Maria Itria Ibba. The three-day meeting had total nine sessions including the inaugural, a session on reviewing the research progress of 2022-23, followed by five-year appraisal of the Northern Hill and Peninsular zone centres and planning of ensuing 2023-24 crop season. In addition, one session on international collaboration with the CIMMYT, ICARDA, and JIRCAS was held wherein the past collaborative research and future prospects were deliberated. Despite the challenges posed by the erratic weather during the crop season, the national wheat production registered an all-time high output of 112.74 million tonnes ensuring the food security to the country. I extend my heartfelt wishes and appreciation to the entire wheat and barley research fraternity for this significant achievement on production front which have been made possible with their continuous effort in technology development and outreach. Seed being the vehicle for technology delivery, a significant progress has been witnessed in 2022-23. Hitherto, the country has not witnessed any pests and/or disease epidemic which are attributed to the timely monitoring and vigil as well as offering contingent advisories. Emerging transboundary threats like wheat blast has been managed coherently, since it's reporting in the neighbouring countries. Support and able leadership of Dr. Himanshu Pathak, Secretary, DARE and DG, ICAR is highly rewarding. The unmatched hospitality and meticulous planning of the local organizers under the stewardship of Dr Ajit Kumar Karnatak, honourable Vice Chancellor of the MPUAT attracted appreciation from all the participants. I also extend my sincere gratitude to Dr. TR Sharma, DDG (Crop Science), ICAR for his incessant interest and meticulous planning leading to the betterment of the AICRP on wheat and barley. My profound and sincere thanks to the PMC experts Dr. RR Hanchinal, Ex-Chairman PPVFRA and VC, UAS Dharwad, Dr. ML Jat, Global Research Program Director, Resilient Farm & Food Systems (RFFS), Dr. NS Bains, Former Director Research, PAU, Ludhiana and Dr. SC Bhardwaj, Emeritus Scientist, ICAR-IIWBR-RS, Shimla for their constructive suggestions and wisdom sharing to improve the functioning of the project. I would like to express my heartfelt gratitude to the international collaborators, Dr. AK Joshi, CIMMYT, Dr. Michael Baum, Director BIGMP, ICARDA and national collaborators for their continuous support and guidance to attain the success. I also thank all the AICRP co-operators for their timely submission of data, Principal Investigators and staff for their meticulous reporting and successful conduct of this meet. My appreciations are due to the Chairperson, Co-chair and rapporteurs of different sessions for timely conduct and recording of the proceeding. The support rendered by the Organising and Co-Organising secretary of the 62nd AICRP meet is gratefully acknowledged. Finally, I believe the ensuing crop season brings new hope, new goals and new achievements.



(Gyanendra Singh)

Session I: Inaugural Session

August 28,2023	**Chief Guests**	Dr. Himanshu Pathak, Secretary DARE & DG, ICAR, New Delhi
9:00-11:15 AM	**Chairman**	Dr. Ajeet Kumar Karnatak, Vice Chancellor, MPUAT, Udaipur
	Guest of Honour	Dr.TR Sharma, DDG (CS), ICAR, New Delhi
	Special Guests	Dr. DK Yadava, ADG (Seeds), ICAR, New Delhi Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs. BS Tyagi and Suma Biradar
	Stage Convener	Dr. Anuj Kumar, ICAR-IIWBR, Karnal

The inaugural session of 62nd All India Wheat and Barley Research Workers' meet was held at MPUAT, Udaipur on 28th Aug.2023. The chief guest of the session was Dr. Himanshu Pathak, Secretary DARE & DG, ICAR, New Delhi. Dr. Ajeet Kumar Karnatak, Vice Chancellor, MPUAT, Udaipur graced the meet as chairman. Dr. TR Sharma, DDG (CS) was co-chairman and Dr. DK Yadava, ADG (Seeds) and Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi were Special guests for inaugural session. The other dignitaries who graced the occasion include Dr. AK Joshi, Asia regional representative CIMMYT, Dr. Michael Baum, Director BIGMP, ICARDA, Dr. Ronnie Coffman, BGRI. Dr. Golam Faruque, DG, BWMRI, Bangladesh. Dr. G. Subba Rao, JIRCAS, Japan, Dr. Aakash Chawade, Plant breeding, Lomma, Sweden and CIMMYT delegates including Drs. Pawan Singh, Velu Govindan and Maria Itria Ibba.

The inaugural session started with lighting the lamp and with ICAR and MPUAT songs. Dr. Arvind Verma, Director Research, MPUAT formally welcomed the dignitaries and participants for the workshop, at Udaipur. Dr. Gyanendra Singh, Director, ICAR-IIWBR presented the overall progress of the wheat programme made during 2023-24. Dr. Singh congratulated the wheat fraternity for all time high and record production of 112.74mt of wheat during the year 2022-23 and also praised crop improvement and resource management team for different technologies granted by ICAR during its foundation day. He appraised house with the progress made particularly varietal release, seed replacement, international collaborations and capacity building programmes etc. He also explained the significant findings of crop protection, resource management, wheat quality and social science divisions, new initiatives taken at IIWBR with respect to usage of drones and natural farming.

Dr. S.K. Pradhan, ADG (FFC) congratulated the wheat group for surpassing the targeted production even under the challenging situations like higher temperature and untimely rainfall and furthermore congratulated the scientists for development of climate resilient varieties, good seed production. He felt that the group deserves the appreciation for being the part of the global food security. He highlighted the way forward to achieve the set target for wheat production of 150million tons by the year 2047 under several challenges like changing climatic conditions, increasing population with decreasing area, biotic and abiotic challenges and stressed upon the enhancement of productivity. He advised to adopt the new genomic tools for biotic stresses to address frequent break down of new resistant genes and for wheat blast, combining of different resistant genes to achieve the goal of food security and nutritional

security. Comparing to rice, he applauded that there has been satisfactory achievement in increasing protein content to more than 13 percent, Zn and Fe more than 45 ppm and quite good number of technologies for promotion towards farming community. He invited the group to address increasing sensitivity of people to gluten by identifying low gluten lines and varieties with low glyceamic index through searching for the land races in wheat like Kasiya which is low in gluten and high in proline, while Sona Moti which is low in gluten with low GI and high folic acid. Genetic mechanisms need to be studied to improve nitrogen use efficiency, deployment of QTLs identified for high temperature and drought and speeding up the breeding process to achieve the set target of wheat production. Dr. D.K. Yadava ADG (Seed) praised the Wheat and Barley AICRP and said that it is an excellent model among all AICRP's of the ICAR. He appreciated the scientists for giving 41 Biofortified wheat varieties covering 5-million-hectare area and also complemented for development of more than 13 varieties with heat tolerance by giving more than 1200 licenses and faster seed replacement of new varieties in breeder seed indents. He urged the need for development of climate resilient varieties and salinity tolerant varieties.

Dr. TR Sharma, DDG, Crop science in his address, congratulated the whole wheat and barley family including researchers and farmers for record production inspite of many challenges and attributed the high production for development of climate resilient varieties and robust system of release of biofortified varieties. He emphasized to set the benchmark for Zn and Fe. He listed few thrust areas to be addressed in wheat and barley research for future sustenance. Dr. Sharma emphasized on targeted research for improving quality of specific products like bread, pasta and chapatti; to work on export quality wheat along with developing Karnal bunt free wheat; pyramiding of genes for improving multiple disease resistances; Marker assisted breeding for development of rust and powdery mildew resistant varieties; strengthening wheat blast screening efforts; developing input use efficient varieties including WUE and NUE varieties; conservation agriculture; marker assisted back cross breeding for large number of genomic resources; feed, food, fodder and multipurpose barley research; new avenues for public private partnership; development of nutri-dense varieties; speeding up the varietal development by speed breeding and application of precision phenotyping.

Dr. Ajeet Kumar Karnatak, Vice Chancellor, MPUAT, Udaipur expressed great pleasure in organizing the 62nd All India Wheat and Barley Research Workers Meet. He witnessed about the role of climate smart vanities in record wheat production. He urged upon the development of biofortified varieties, dual purpose barley varieties, varieties suitable to industry and faster translation of newer technologies. The meeting was later continued with the felicitation of Dr. Gyanendra Singh, Director, ICAR-IIWBR with a memento of Dr. NE Borlaug and a certificate for having achieved more than 112 million tons by Dr. AK Joshi, Asia Regional Representative CIMMYT.

The meeting later was followed by release of few publications by IIWBR and MPUAT, Udaipur. This was followed by felicitation of crop varieties developers and it had a list of varieties which included DBW 296 (Karan Aishwarya), DBW 332 (Karan Aditya), DBW 327 (Karan Shivani), DDW 55 (Karan Manjari) from IIWBR, Karnal, HI 8823 (Pusa Prabhat), HI 1636 (Pusa Vakula) from IARI, Indore, MP (JW) 1358 from JNKVV Jabalpur, HUW 838 from BHU Varanasi, Birsa Gehun-4 (JKW-261) from BAU, Ranchi, GW 513 from SDAU, Vijapur as wheat varieties. Organizers also felicitated several farmers and industrial partners. This was

followed by felicitating the scientists who are due to superannuate before next AICRP meeting for their significant contribution in Wheat/Barley research and these included Dr RPS Verma, from IIWBR, Dr. Ved Prakash from ARS Durgapura, Dr. Vinod Singh from NDUA&T, Kumarganj, Ayodhya.

Later, Dr. Himanshu Pathak, Secretary, DARE & Director General, ICAR, New Delhi addressed the participants. He welcomed all national and international dignitaries and congratulated the whole wheat and barley fraternity for record production. He was very much thrilled in sharing the view of Hon'ble Prime Minister Shri Narendra Modiji as the most successful programme in the ICAR is the Wheat Programme. He also mentioned that the significant and record production of wheat has to be celebrated. He also enlisted thrust areas as :- new varieties suitable to industry needs; reducing the inputs like fertilizers, water and pesticide; need for sustainable wheat production, use of huge data generated at AICRP system to derive the equations to predict wheat production, losses due to biotic and abiotic stresses; development of bulletin for reorientation of AICRP system as in rice; human resource development; prioritizing the AICRP activities based on the strength of funded centres; emphasizing on promotion of crop production and protection technologies to achieve sustained production; diversifying wheat cultivation by focusing on other wheat species like Durum wheat; strengthening wheat and barley programme by addressing science, economics and policy and reorientation of the wheat programme to achieve expected targets.

At the end he once again congratulated all wheat and barley workers. The inaugural session ended withthe formal vote of thanks by Dr. Ratan Tiwari, Organizing Secretary.

Session II: International Collaborations for Wheat & Barley Improvement

August 28, 2023	**Chairman**	Dr. Himanshu Pathak, Secretary DARE & DG ICAR
11.40AM -2.30 PM	**Co-Chairman**	Dr. TR Sharma, DDG, CS, ICAR
	Special Guests	Dr. Ronnie Coffman Vice Chairman, BGRI Dr. DK Yadav, ADG, Seeds, ICAR Dr. SK Sharma, ADG, HRM, ICAR
	Rapporteurs	Dr. Vishnu Kumar &Dr. Jaspal Kaur

The session on international collaborations was chaired by Dr. Himanshu Pathak, Secretary DARE & DG ICAR wherein seven presentations were made and discussed. First presentation was made by Dr. AK Joshi, MD, BISA titled "*Up-scaling wheat research in south Asia*". He presented the progress made by the wheat program and exhorted to integrate new traits like BNI, resistance for wheat blast, early heat tolerance andpre-harvest sprouting etc. Dr. Joshi discussed to strengthen the centres, focus on pre-breeding activities and to initiate work on GM wheat. The next presentation titled "*Healthy processed cereal based food*" was made by Dr. Maria Itria Ibba, Head Wheat Quality, CIMMYT. She presented the importance of dietary fibres and the research progress on arabinoxylans. Dr. Maria presented that the arabinoxylans are important polysaccharides and have many health benefits. She focused to enhance dietary fibers in the wheat germplasm lines. The third presentation was made by Dr. Michael Baum, ICARDA, he discussed the progress on ICAR-ICARDA collaborations. Dr. Baum emphasized the importance of smart sensing, climate smart farming and informed on *H. bulbosum* introgressed barley lines availability for barley breeders.

Dr. Golam Faruque, DG, BWMRI, Bangladesh presented the country report of the Bangladesh. He presented the release of high yielding, biofortified and disease resistant varieties like BARIGom33 and BWMRIGom3 in Bangladesh. He also discussed on wheat blast screening facility in the country. Dr. Aakash Chawade, Assoc. Prof., Lomma Sweden, made a presentation on "*Implementing new affordable methods for breeding wheat*". He stressed upon to adopt new phenotyping techniques in wheat breeding and to work towards reducing cost of genotyping. He cited the high throughput phenotyping work for tillers count in wheat. The next presentation was made by Dr. G V Subbarao, JIRCAS, Japan on BNI wheat. Dr. Subbarao presented that the BNI wheat is the need of hour to reduce the greenhouse gases and to reduce the nitrogenous fertilizer use in wheat. He presented the performance of BNI-Munal and BNI-Vorobey wheat varieties. The last discussion was made by Dr. Ronnie Coffman, Vice Chair, BGRI and he emphasized toincrease international collaborations for increasing wheat production and to develop rust resistant and climate smart wheat technologies.

Recommendations:

- Strengthening of the cooperating centers to take-up work on pre-breeding activities and to initiate work on genome editing in wheat.
- Research work on arabinoxylans (dietary fiber) should be strengthened and BNI wheat lines should be shared with the breeders for gainfully utilization.

- International collaborations should be augmented to tackle climate change and developing climate smart wheat varieties.

Session III: Special Session on Contemporary Issues

Aug. 28, 2023	**Chairman**	Arun K Joshi, Asia Regional Representative, CIMMYT
3:00-5:00 PM	**Co-chairman**	Dr. Major Singh, Member (PS), ASRB, New Delhi
	Rapporteur	Dr. Sunil Kumar, PS, ICAR-IIWBR, Karnal

The session was convened on contemporary issues of current times like climate change, processing and nutritional quality, natural farming, genetic gain, biofortification and crop intensification*etc*. Total six presenters deliberated on various topics of relevance.

Name of presenters:

1. Dr Sewa Ram, PI QBS, ICAR-IIWBR, Karnal
2. Dr Anil Khippal, PS, ICAR-IIWBR, Karnal
3. Dr Pawan Singh, Head, Wheat Pathology, CIMMYT, Mexico
4. Dr Velu G, Wheat Breeder, CIMMYT, Mexico
5. Dr Parminder Virk, Head, Crop Development, HARVEST Plus, India
6. Dr Sunil Kumar, Director, ICAR-IIFSR, Modipurum

Following points emerged during the session:

- India ranks 2nd in biscuit production in the world and has a market of nearly 12 billion $. While blending millets and other ingredients, there is need to focus on enhancement in nutritional status of wheat-based processed products using soft wheat background. Pulses can be added for high protein, pearl millet for iron while finger millet for calcium up to 20-30% level without affecting the spread factor. The pulses and millets can also enhance the mineral and vitamin content of wheat-based products.
- Natural farming is a way to gain more with less input by using organic material of natural resources rather than of chemical origin. Today nearly 12 lac ha of land in India is under natural farming in states like Andhra Pradesh, Karnataka, Himachal Pradesh, Kerala, Gujrat, and Uttar Pradesh. However, there is need to validate the natural farming practices in crops like wheat and barley, scientifically.
- Wheat blast pathogen *Magnaporthe oryzae* pathotype *triticum* mediated disease is seed and air borne. Promising non-2NS resistant sources can help contain the disease. The potency of the pathogen is increasing with time in Bangladesh and to contain the spread of wheat blast, there is need to identify more non-2NS sources of resistance, and to breeding and pyramiding of resistance genes.
- Wheat crop is resistant to extreme heat during anthesis. Speed breeding program of CIMMYT has reduced the breeding time from 4-7 years to 3-4 years (a 40% gain in time). This has improved disease resistance, grain Zn content etc.
- Biofortification is a food-based approach to reverse or prevent micronutrient deficiency. More than 400 varieties of 11 crops are biofortified. In India, one third of the seed produced is biofortified. Biofortification can meet Zn requirements in wheat up to 50% of daily needs. There is need of biofortification in the current context in various crops including wheat.

- To prevent loss of fertile soil and depletion of water, there is need of cropping system intensification. Diversification and intensification by double cropping and multiple cropping can help improve productivity, profitability, and soil health. Crop intensification and integrated farming can improve soil and biodiversity.

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

Session IV: Discipline Wise Presentation of Progress Report (2022-23)

August 29, 2023	**Chairman**	Dr.TR Sharma, DDG(CS), ICAR, New Delhi
	Co-Chairman	Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs. Ravindra Kumar and Vikas Gupta

The session was chaired by Dr. TR Sharma, DDG(CS), ICAR, New Delhi and co-chaired by Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi. The session was graced by Dr Gyanendra Singh,Director, ICAR-IIWBR, Karnal and Project Management Committee (PAMC) experts *viz.,* Dr. RR Hanchinal, Ex-Chairman PPVFRA and VC, UAS Dharwad, Dr. ML Jat, Global Research Program Director, Resilient Farm & Food Systems (RFFS), Dr. NS Bains, Former Director Research, PAU, Ludhiana and Dr. SC Bhardwaj, Emeritus Scientist, ICAR-IIWBR-RS, Shimla. The chairman in his opening remarks welcomed the delegates and invited Dr. Alok K Srivastava, Director, ICAR-NBAIM, Mau (U.P.) for delivering his special lecture on Microbial Formulations for Stress Amelioration in Cereal Crops. After this lecture the chairman invited Dr. OP Ahlawat (PI, Crop Improvement) to present the progress report for the year 2022-23.

Dr. OP Ahlawat presented the list of varieties released during 2022-23 (CVRC: 22 and SVRC: 07) along with the notification of DBW303 for area extension. He also apprised the house about the PPVFR&A registration of five varieties and registration of 19 genetic stocks for various traits. Dr. Ahlawat also told the house about the finalization of Crop Improvement work plan in a pre-workshop meeting held on 14th August, 2023 for the ensuing crop season. During the reported year, trial conduction was 98.7% across the zones, however, the trial reporting was 78%. The major reason for less reporting was low site mean and also the trials rejection by the monitoring teams. Dr. TR Sharma and Dr. SK Pradhan seriously pointed out the low reporting of trials from some centres and asked the Director, IIWBR to seriously look into this and take corrective steps. Dr. Ahlawat also elaborated on the different activities undertaken like Zonal monitoring, HRD activities, Visitors' Week and sharing of seed with the indenters and also wheat blast evaluation through CIMMYT collaboration. He also appraised the house that surplus breeder seed is produced against the DAC indent so that new variety seeds be made available to the farmers and the recently released varieties DBW303 and DBW187 were the highest indented varieties. The NBPGR activities related to the import of different nurseries and trials were also presented. Dr.TR Sharma also enquired about the pre-breeding work being taken up and asked to present it in next workshop.

Dr. SC Tripathi (PI, Resource Management) presented the progress report of resource management experiments conducted during 2022-23. He informed the house that the work plan for the ensuing crop season of the Resource Management was finalized in a pre-workshop meeting held on 14th August, 2023. He presented the work done during 2022-23 in which wheat genotypes HD 3386 and DBW377 were numerically superior than the best check varieties in the trials in NWPZ and CZ, respectively. Application of Pyroxasulfone in combination with metsulfuron @ 127.5 + 4 g/ha can be used as early post-emergence just before the first irrigation for broad spectrum of weed flora control in wheat. Pyroxasulfone, Pendimethalin and their combinations effectively control resistant biotypes of *Phalaris*

minor.Two foliar sprays of 0.5% $ZnSO_4.7H_2O$ at stem elongation and milk stages increases grain zinc content of 10.4-46.0% over RDF in NWPZ, NEPZ and CZ. Based on multilocational experiments, foliar spray of 5% urea + 0.5% $ZnSO_4.7H_2O$ at anthesis stage along with 75% RDF is recommended to improve grain yield (9.6%) and protein content of grains (3.6%) over RDF in barley.

Dr. Poonam Jasrotia (PI, Crop Protection) presented the progress report of crop protection. She outlined the total experiments and nurseries being conducted across 32 centres. While emphasizing on the importance of the crop protection programme, she highlighted that > 1200 lines were screened against rusts and blights, >130 advanced wheat breeding lines were screened against rusts, powdery mildews, blight, bunts etc. and 350 lines were tested against wheat blast with the help of CIMMYT. She informed that first appearance of yellow rust of wheat was noticed on 20.12.2022 from village Donal of Rupnagar on wheat *cv*. HD3086. She highlighted two recommendations; first: Foliar spray of Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.06% for management of leaf rust, stem rust and head scab of wheat. Second: Foliar spray of Tebuconazole 50% + Trifloxystrobin 25% WG @ 0.1% for management of leaf blight of wheat.

Dr. OP Gangwar presented significant achievements made at IIWBR RS Flowerdale, Shimla. He informed the house that all three rusts of wheat appeared endemically in India. During 2022-23, a total of 230 samples of stripe rust (*Puccinia striiformis* f. sp. *tritici*, Pst) were analyzed and eight pathotypes {238S119, 110S119, 46S119, T (47S103), P (46S103), 79S68, 6S0, and 7S0] were identified. The frequency of pathotype 238S119 was maximum (54.78%) followed by 110S119 (27.39 %). In case of stem rust (*P. graminis* f. sp. *Tritici*), five pathotypes were identified in which pathotype 11 was recorded in maximum frequency followed by 40A and 40-3. Similarly, in case of leaf rust 19 pathotypes were identified. Out of which,pathotype 77-9 was the most widely distributed in the analysed samples followed by pathotype 52-4.

Dr. Sewa Ram (PI, Wheat Quality) presented the action taken report and presented the significant achievements of wheat quality program. He briefly showed the status of product specific varieties available for industry as well as domestic consumption. He also showed the zone wise and centre wise variability in different wheat quality parameters such as protein content, hectoliter weight, grain hardness, sedimentation value, gluten content, bread volume, biscuit spread factor, yellow pigment etc. It was pointed out by the Chairman that quality analysis of mandi wheat samples does not carry any specific advantages since procurement is non-segregated, therefore wheat samples directly from farmers' field can be better option

Dr. Om Vir Singh (PI, Barley Network) presented the achievement and progress of barley coordination. He informed the house about the release of one barley variety HBL804 (Him Palam Jau 2) for Northern Hills zone along with registration of 15 genetic stocks for different agronomic traits. He highlighted the barley cultivar DWRB 137, which is a mega barley variety receiving highest indent. One recommendation emerged abouttwo sprays of viz., Tebuconazole 50% + Trifloxystrobin 25%@0.06 %which was found most effective in management of foliar blight of barley.

Dr. Satyavir Singh (Pr. Scientist, Social Sciences) presented the progress report on technology transfer through FLDs at the farmers' field. Barley FLDs (336) were conducted at 382 farmers'

fields whereas510 wheat demonstrations under the SCSP programme of high yielding wheat varieties was undertaken in different states.

After the presentation of progress report by all the section PI's, there was a detailed deliberation by the Chairman, Co-Chairman, PAMC experts and Dr. Gyanendra Singh, Director, ICAR-IIWBR, Karnal on various issues and following recommendations were made:

- Inclusion of few slides on pre-breeding work to be included in the PI- CI presentation.
- In NHZ, TS/LS entries shall be compared with their respective checks.
- Mechanization of sowing operations particularly for yield assessment trials to enhance precision of trial conduction and reporting
- The Resource management group should also work in coordination with other AICRPs which are working on the wheat based cropping system.
- Gene postulation work should be strengthened by including a greater number of resistance genes providing resistance against wheat rusts.
- Commercialization of rotary disc drill should be done with caution as multiple machines are available for the same operation.
- Capacity building programmes for new AICRP staff should be a routine activity for precision in yield and disease data recording and reporting.
- Exploration of landraces to capture diversity for drought tolerance, gluten sensitivity and dicoccum wheat programme should be strengthened. Quality analysis of AICRP trials should be done at one place as far as possible, to avoid errors while using different protocols /machines at different centres.

Session V: Panel Discussion on Increasing Area and Production of Barley

Chairman	Dr. JS Sandhu, Ex-DDG (CS), Ex-VC, NDUAT, Ayodhya & SKNAU, Jobner
Co-Chairman	Dr. SK Pradhan, ADG (FFC), ICAR-New Delhi
Session Co-ordinators	Drs. Rajeev Bairathi and Jogendra Singh
Rapporteurs	Drs. Navin Chander Gahtyari and Neha Sharma

The session started with a welcome address by Director, ICAR-IIWBR, Karnal, highlighting the importance of the session amid great concern about the decreasing area of barley in the country. He invited and urged the group to have a wider and more visionary perspective, and come up with actionable points for the future. The chairman of the session, Dr. JS Sandhu, emphasized the importance of barley as a future crop, especially in changing climatic scenario.

Dr. RPS Verma, former Principal Investigator, Barley Improvement Section, ICAR-IIWBR, Karnal, presented the status of barley at the world and India level, especially in the Asian countries. He pointed out that barley production has increased from 36.8 q/ha to 52.2 q/ha between 1993 and 2021. This enhancement in barley production is due to breeding efforts in 2-rowed barley. However, the area under barley is decreasing day by day. He suggested enhancing the area under barley, like an increase in breeder seed indent, the availability of quality seed to the farmers, and the popularization of high-yielding varieties. He also focused on growing barley as a forage crop in arid or semi-arid areas of the country because of the potential for climate change.

Dr. Omvir Singh, Principal Investigator, Barley Improvement Section, ICAR-IIWBR, Karnal, emphasized the importance of consuming barley because of its beneficial effects on human health, as it is endowed with a lower glycemic index and high dietary fibres, particularly b-glucan. He also pointed out that hulless barley had very good organoleptic qualities. Hence, it may be helpful in mitigating the ill effects of lifestyle diseases. He focused on the potential of naked barley and emphasized the need to develop high-yielding varieties along with quality traits and disease resistance. He also emphasized the need to create awareness about the health benefits of barley.

Dr. Lakshmi Kant, Director, ICAR-VPKAS, Almora, expressed his views regarding the status and prospects of barley in the hills. Compared to the national average, productivity and production on the hill are lower, primarily attributed to the difficult terrain and lack of industry. He talked about several challenges in the hills and strategies to overcome them. The challenges include the quality of raw materials, food, feed, and dual-purpose barley, resource management, diseases, and pest management in the barley crop. Policy intervention in the form of an increase in MSP is required if areas need to be enhanced. The hills primarily use barley as feed and fodder, and hence specific breeding interventions are required. Organic barley can be promoted in the hills. It is imperative to develop the suitable varieties that need to be identified and promoted, especially for the hills and valley areas of the NHZ.

Industry personnel also participated in the discussion and categorically stated the need for standardization of quality parameters for malt barley. According to them, the procurement of quality barley in India is a major issue for them. A Pune-based company representative said that European barley is most favoured due to its premier quality. The extraction rate of European barley is >90%, whereas in the case of Indian barley, it is lower and is around 80–85% for malt barley. Hence, enhancing the extraction rate and reducing protein content in Indian barley cultivars is a major issue and requirement for the industry. Participants also expressed their views regarding the poor storability of the barley, which is a major issue and

needs attention. Priority areas and product prioritization are the need of the hour for the barley crop, and thereafter, concentrated breeding efforts should be directed towards them.

In the concluding remarks, PAMC members, co-chairman, and chairman expressed their views. The issues in the barley crop can be categorized into three major categories, i.e., policy issues, researchable issues, and creating awareness. Salinity is slowly becoming a major issue across India, and hence, barley cultivation can be beneficial to such areas. It was further reiterated about the importance of dual-purpose barley to hills. Standardization of quality parameters is needed, and the blending of barley flour with others for making by-products can be explored. Members emphasized the popularization of barley through various communication channels like print media, electronic media, radio, TV, popular articles, etc. Researchable issues included GXE interactions for quality, recovery issues in malt barley, area profiling, and standardization of quality parameters. Also, the therapeutic and nutraceutical effects of barley need to be profoundly established through proper scientific experimentation. Finally, the chairman emphasized the need for mechanization in barley, especially at harvesting stages. He also urged the barley breeders to have targeted breeding efforts according to product profiling. He said that ICAR-IIWBR, Karnal, should prepare a strong proposal to project its importance so that the government includes it in its policies. The varieties should match international quality standards.

The following points for action were recommended in the meeting:

1. Hulless barley is a potential crop for health issues. Keeping this in mind, hulless barley varieties should be developed with desirable traits like semi-dwarf plant type, high grain weight, high quality traits, disease resistance, and ultimately high yielding.In this context, DWRB223 hulless barley entry was promoted to AVT-Final year.
2. Private malt barley companies emphasized enhancing the extraction rate and reducing protein content in Indian barley cultivars, which is a major issue and requirement for the industry.Keeping in mind the malting traits, malt barley varieties will be developed in high yielding background.
3. To increase the area under the barley crop, it becomes essential to develop the barley varieties that are suitable formarginal land, arid or semi-arid areas of India. Keeping this in mind, rainfed barley varieties, salinity tolerance, and dual-purpose barley varieties will be developedwith high yield performance.
4. Popularization of high-yielding barley varieties for food, malt, and feed, as well as for dual purposes and the availability of quality seed to the farmers
5. Create an awareness program regarding health benefits, especially hulless barley, through print media, electronic media, radio, TV, popular articles, etc.

The meeting concluded with a vote of thanks to the chair and all participants, which was proposed by Dr. Anil Khippal.

Session VI: Progress of research work in NHZ and PZ centres

August 28, 2023	**Chairman**	Dr. RR Hanchinal, Ex-chairman PPVFRA and Ex-VC, UAS, Dharwad
9:00-11:15AM	**Co- chairman**	Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs. Vikram Singh and Mamrutha HM
	Session Co-ordinators	Drs. Ram Hari Meena and Hanif Khan

Dr.RR Hanchinal, chairman of the session welcomed all the delegates and explained the importance of NHZ and PZ centres in wheat and barley AICRP programme along with different types of rusts prevailing in those zones. He invited opening remarks by Co-chairman, ADG (FFC). Dr. Pradhan emphasizedthat all centres of the zones should be reviewed before the workshop rather than reviewing for only few centres. Later, the chair invited the presentations from different centres of NHZ and PZ.

Dr. Navin Chandfrom Almora presented the progress of Almora centre. He explained about the significant contribution of Almora centre *w.r.t*. entries contribution for NIVT's, AVT's and wheat and barley varieties released during the review period. He mentioned about the centres contribution and utilization in different national nurseries. He explained the progress of winter x spring wheat programme and the different CRP projects at VPKAS, Almora along with FLD's conducted, breeder seed production, publications and awards of the centre. Chairman asked for one significant achievement of the centre and Dr. Navin appraised VL804 released for biscuit quality during 2023 as their significant achievement. Dr. Pradhan advised for pyramiding genes for rainfed condition.

Dr. Neha Sharma from Palampur presented the overall progress of the Palampur centre. She emphasised on progress of Palampur, Malan and Bajoura centre *w.r.t*. wheat and Barley breeding and crop protection activities along with Powdery mildew resistance screening. FLD's and outreach programmes of the centres. Chairman advised centre for strengthening on seed production and distribution activities.

Dr.DP Walia from IARI, Shimla centre presented the overall progress of the Shimla centre. He explained about progress of breeding and protection programmes including rusts, powdery mildew and other emerging new diseases. Chairman advised for using indigenous material for improving biotic stress tolerance. Dr. Pradhan commented for not to use marker assisted breeding for genetic stocks development.

Chairman invited for comments of PAMC members

Dr. Bharadwaj said that progress of NHZ is satisfactory and he mentioned that, centres should use stripe rust resistance material of PAU for their breeding and expressed his concern about less CVRC release and seed indent for NHZ varieties. Dr. Bains congratulated the centres and reiterated for channelizing seeds to farmers field for all newly released varieties from all centres. He also mentioned that NHZ centres should work on characterizing new genes for rusts. He enquired about shuttle breeding activities of Kukumseri centre and promotion of WxS pool at Almora for breeding.

House also discussed about exploring local barley land races quality in NHZ for further use and improvement. Dr. Lakshmi Kant mentioned that through SCSP and FLD's seeds are

distributed to farmers and WxS breeding material are shared to IIWBR. Dr. Tripati requested the house for reviewing agronomyprogrammes also from different centres.

Dr. Yashwant from ARI Pune presented the significant achievements of the centre, including the release of bio-fortified varieties and surplus seed production of the recently released varieties. He highlighted the various activities and events organized for the adoption of new wheat varieties. He mentioned about *dicoccum* wheat development with low glycemic index and with high yield and also for free threshing to improve protein for both chapati and Upma products development. Dr. Pradhan mentioned the need to tag low glycemic index and low gluten wheat by developing mapping population for low glycemic index and for WUE genes and asked to collaborate with head quarter at IIWBR, Karnal. Dr. Hanchinal asked for continuing *dicoccum* trial in AICRP and Director, IIWBR agreed for the same.

Dr. Gurudatt M. Hegde from University of Agricultural Sciences, Dharwad presented the overall progress of the centre. He explained about the commercialization of technologies, registration of new parental lines of *dicoccum* wheat for high micronutrients and recommended technologies of the centre. The centre has also submitted proposals claiming for GI Tag for Bannur Wheat and Karnataka *dicoccum* Wheat. He explained about the value-added products of *dicoccum* wheat like, flakes, savories and sweets. The centre'swheat flakes are also proposed for patenting. Dr.Hanchinal requested for quality scientist post at Dharwad and to continuerainfed trials in these zones. Dr. Pradhan advised to work on foot rot disease resistance through marker assisted breeding.

Dr. Dodke from Agricultural Research Station, Niphad presented the progress of the research work at Niphad centre. He explained about the significant contribution of the centres w.r.t. entries contribution for NIVT's, AVT's, screening of various nurseries and trials of agronomy, pathology, entomology and quality. Dr. Hanchinal asked for including seed production programme at Niphad for presentation and Dr. Pradhan emphasized to strengthen basic research at Niphad centre and asked to collaborate with head quarters.

Chairman invited for comments of PAMC members

Dr. Bharadwaj emphasised on *Emmer* wheat resistance to stem rust and *dicoccum* wheat importance for drought tolerance in PZ zone and advised Dharwad centre to work on extending products to reach more stake holders. Dr.Bains highlighted the need to work on free threshing of *dicoccum* and also advised for including Indigenous material in their crosses. He emphasized thatARI along with BARC should develop free threshing grain through mutants. He also mentionedthat new genes should be used for pyramiding the genes for future and need for networking in *dicoccum* research.

Dr. Pradhan emphasized on need of basic research in collaboration with headquarter for all centres. Dr. Shiva Swamy expressed interest to work on improving *dicoccum* wheat and disease resistance and requested to consider Wellington as one of the centres. He also mentioned that, they increased the free threshing and protein quality of *dicoccum* along with free threshing.Director, IIWBR mentioned that *dicoccum* wheat demand is increasing and wish to continue its trial. At the end, Chairman and Co-Chairman congratulated all centres for good work and asked to continue the same.

Session VII: Finalization of Work Plan (2023-24)

August 29, 2023	**Chairman**	Dr. RR Hanchinal, Ex Chairman PPVFRA & VC, UAS Dharwad
	Co- chairman	Dr. SK Pradhan, ADG(FFC), ICAR, New Delhi
17.00–18.00 PM		Dr OP Ahlawat, PI, Crop Improvement
	Rapporteurs	Drs. RS Chhokar and CN Mishra

The session on finalization of work plan was held under the chairmanship of Dr. RR Hanchinal, Ex Chairman PPVFRA & VC, UAS Dharwad and co-chaired by Dr S.K Pradhan, ADG(FFC), ICAR, New Delhi and Dr. OP Ahlawat, PI, Crop Improvement. Dr Satish Kumar, Senior Scientist, ICAR-IIWBR, Karnal presented the work plan of the crop improvement programme. During presentation, discussion was held on the promotion of the entries. Dr. Rajvir Yadav and Prof. Arun Joshi, CIMMYT pointed out that there is slow genetic gain and for promotion of entry besides yield gain, diseases resistant should be considered if it was agreed that the entries showing statistically at par performance with the best zonal check would be promoted or retained for the trial constitution. Dr. Vikas, ARI Pune, pointed out that in MABB trial, as per rule should be followed for identification of varieties. In this context, ADG (FFC) said that entries should be at par with recurrent parent.

- Dr. SC Tripathi, PI, Resource Management programme presented the work plan of Resource Management.
- Dr. Poonam Jasrotia, PI, Crop Protection presented the work plan of Crop Protection.
- Chairman, Dr. Hanchinal suggested toconduct studies on storage of barley in consultation with ICAR-NBAIM and in this context Dr Pradhan, ADG (FFC) suggested to initiate the trial at IIWBR, Karnal centre.
- Dr. Sewa Ram, PI, Quality & Basic Sciences presented the work plan of Quality & Basic Sciences.
- The work plan of social sciences was presented by Dr. Satyavir Singh.
- Dr. Omvir Singh, PI (Barley) presented the work plan of barley Network. The minimum site mean yield of coordinated barley varietal evaluation trials has been revised.
- PAMC member, Dr SC Bhardwaj, suggested that sample of the entries showing 40S infection should be sent to IIWBR- RS, Shimla. He also advised to keep the plot length in barley as 6 meters instead of 5 meters. It was also recommended that monitoring of wheat and barley trial should be carried out separately as maturity time of wheat and barley is different.

The session ended with vote of thanks to the chair and all the participants.

Work Plan of Crop Improvement (2023-24)

National Initial Varietal Trial

NIVT-1A-IR-TS-TAS, 2023-24

Conducting centres

Zone	No.	Centres
NWPZ	9	Delhi, Ludhiana, Gurdaspur, Hisar, Karnal, Pantnagar, Modipuram, Sriganganagar, Durgapura
NEPZ	6	Kanpur, Ayodhya, Varanasi, Sabour, Ranchi, Coochbehar
Total	**15**	

Details of trial entries

SN	Contributing Centres	No. of Entries	Name of entries
1.	IARI, Delhi	5	HD3474, HD3475, HD3476, HD3477, HP1981
2.	IIWBR, Karnal	5	DBW446, DBW447, DBW448, DBW449, DBW450
3.	Ludhiana	5	PBW936, PBW937, PBW938, PBW939, PBW940
4.	Pantnagar	3	UP3140, UP3141, UP3142
5.	Durgapura	3	Raj4584, Raj4585, Raj4586
6.	Hisar	2	WH1328, WH1329
7.	Ayodhya	1	NW8094
8.	Kanpur	1	K2301
9.	Varanasi	1	HUW858
10.	CSSRI, Karnal	1	KRL2202
11.	Jammu	1	JAUW723
12.	Nuziveedu Seeds	1	NWS2124
13.	Supreme Breeders	1	Supreme-1122
14.	Kalyani	1	BCW35
15.	Coochbehar	1	UBW 22
16.	Modipuram	1	SVPWL22-04
	Checks	**3**	**DBW187, DBW222, HD3086**
	Total	**36(33+3)**	

Experimental details

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	6 x 1.20m (6 rows)
Fertilizer dose (kg/ha)	:	150:60:40 (N:P:K)
Time of sowing	:	November 1-15
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 Director.*

National Initial Varietal Trial

NIVT-1B-IR-TS-TAS, 2023-24

Conducting centres

Zone	No.	Centres
NWPZ	8	Delhi, Ludhiana, Gurdaspur, Hisar, Karnal, Bulandshahr, Sriganganagar, Durgapura
NEPZ	7	Kanpur, Ayodhya, Varanasi, Sabour, Prayagraj,Ranchi, Kalyani
Total	**15**	

Details of trial entries

SN	Contributing centres	No. of Entries	Name of entries
1	IARI, Delhi	4	HD3478, HP1982, HD3479, HD3480
2	IIWBR, Karnal	5	DBW451, DBW452, DBW453, DBW454, DBW455
3	Ludhiana	5	PBW941, PBW942, PBW943, PBW944, PBW945
4	Pantnagar	2	UP3143, UP3144
5	Ayodhya	2	NW8089, NW8095
6	Hisar	2	WH1330, WH1331
7	Kanpur	2	K2303, K2304
8	Sabour	2	BRW3964, BRW3967
9	Durgapura	1	Raj4587
10	Ranchi	1	JKW317
11	Varanasi	1	HUW859
12	Nuziveedu Seeds	1	NWS2124
13	Kalyani	1	BCW32
14	Modipuram	1	SVPWL22-10
15	RPCAU, Pusa	1	RAUW107
16	CSSRI, Karnal	1	KRL2101
17	Bioseeds	1	BW20R105
	Checks	**3**	**DBW187, DBW222, HD3086**
	Total	**36 (33+3)**	

Experimental details

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	6 x 1.20m (6 rows)
Fertilizer dose (kg/ha)	:	150:60:40 (N:P:K)
Time of sowing	:	November 1-15
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 Director*

National Initial Varietal Trial
NIVT-2-IR-TS-TAS, 2023-24

Conducting centres

Zone	No.	Centres
CZ	10	Indore, Powarkheda, Jabalpur, Sagar, Gwalior, Bilaspur, Junagadh, Vijapur, SK Nagar, Udaipur
PZ	7	Niphad, Pune, Akola, Dhule, Parbhani, Dharwad, Nippani
Total	**17**	

Details of trial entries

SN	Contributing Centres	No. of Entries	Name of entries
1	IARI, Delhi	4	HI1694, HI1695, HW3298-1, HD3481
2	Pune	3	MACS6864, MACS6858, MACS6862
3	Vijapur	3	GW559, GW560, GW561
4	IIWBR, Karnal	2	DBW456, DBW457
5	Dharwad	2	UAS3030, UAS3031
6	Jabalpur	2	MP3583, MP3584
7	Niphad	2	NIAW4516, NIAW4581
8	Powarkheda	2	MP1400, MP1401
9	Junagadh	2	GW565, GW566
10	Udaipur	2	PWU13, PWU52
11	Ludhiana	1	PBW946
12	Durgapura	1	Raj4590
13	Bilaspur	1	CG1050
14	Akola	1	AKAW4764
15	Lok Bharti	1	LOK82
16	Nuziveedu Seeds	1	NWS2237
17.	Hisar	1	WH1332
18.	Sagar	1	JWS1528
	Checks	**4**	**GW322, DBW187, MACS6222, HI1650**
Total entries		**36 (32+4)**	

Experimental Details

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	6 x 1.20m (6 rows)
Fertilizer dose (kg/ha)	:	120:60:40 (N:P:K)
Time of sowing	:	November5-15
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 Director*

National Initial Varietal Trial
NIVT-3A-IR-LS-TAS, 2023-24

Conducting centres

Zone		No.	Centres
NWPZ		9	Delhi, Jammu, Ludhiana, Gurdaspur, Hisar, Karnal, Pantnagar, Durgapura, Modipuram
NEPZ		10	Kanpur, Ayodhya, Varanasi, Sabour, RPCAU-Pusa, Ranchi, Kalyani, Coochbehar, Burdwan, Shillongani
Total		**19**	

Details of trial entries

SN	Contributing centres	No. of Entries	Name of entries
1.	IARI, Delhi	4	HD3482, HP1983, HD3483, HD3484
2.	IIWBR, Karnal	5	DBW458, DBW459, DBW460, DBW461, DBW462
3.	Ludhiana	5	PBW947, PBW948, PBW949, PBW950, PBW951
4.	Hisar	3	WH1335, WH1336, WH1337
5.	Kanpur	2	K2306, K2307
6.	Durgapura	2	Raj4588, Raj4589
7.	Ayodhya	2	NW8081, NW8084
8.	Pantnagar	2	UP3145, UP3146
9.	Ranchi	1	JKW319
10.	Sabour	1	BRW3954
11.	Varanasi	1	HUW860
12.	Kalyani	1	BCW31
13.	Coochbehar	1	UBW21
14.	Modipuram	1	SVPWL22-02
15.	RPCAU, Pusa	1	RAUW 111
	Checks	**4**	**PBW771, DBW173, HI1563, HI1621**
Total entries		**36 (32+4)**	

Experimental Details

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	6 x 1.08m (6 rows)
Fertilizer dose (kg/ha)	:	120:60:40 (N:P:K)
Time of sowing	:	December5-15
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 Director*

National Initial Varietal Trial
NIVT-3B-IR-LS-TAS, 2023-24

Conducting centres

Zone	No.	Centres
CZ	9	Indore, Powarkheda, Jabalpur, Gwalior, Bilaspur, Junagadh, Vijapur, SK Nagar, Lok-Bharti
PZ	8	Dharwad, Niphad, Akola, Pune, Bagalkot, Dhule, Nippani, Parbhani
Total	**17**	

Details of trial entries

SN	Contributing centres	No. of Entries	Name of entries
1.	IARI, Delhi	4	HI1696, HI1697, HI1698, HI1699
2.	IIWBR, Karnal	2	DBW463, DBW464
3.	Dharwad	2	UAS3032, UAS3033
4.	Jabalpur	2	MP3598, MP3599
5.	Niphad	2	NIAW4621, NIAW4624
6.	Pune	2	MACS6868, MACS6854
7.	Vijapur	1	GW562
8.	Akola	1	WSM141
9.	Bilaspur	1	CG1061
10.	Hisar	1	WH1338
11.	Junagadh	1	GW567
12.	Lok Bharti	1	LOK83
13.	Ludhiana	1	PBW952
14.	Powarkheda	1	MP1402
	Checks	**3**	**HD2864, HD2932, HI1633**
Total entries		**25 (22+3)**	

Experimental Details

Design	: Simple Lattice
Replication	: Two
Plot size	: 6 x 1.08m (6 rows)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: December 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 Director*

National Initial Varietal Trial
NIVT-4-IR-TS-TDM, 2023-24

Conducting Centres

Zone	No.	Centres
NWPZ	6	Delhi, Ludhiana, Hisar, Karnal, Pantnagar, Sriganganagar
CZ	7	Powarkheda, Indore, Junagadh, Gwalior, Vijapur, Udaipur, Dhandhuka
PZ	6	Dharwad, Bagalkot, Nippani, Niphad, Pune, Akola
Total	**19**	

Details of trial entries

SN	Contributing Centres	No. of Entries	Name of entries
1.	IARI, Delhi	3+1	HI8853, HI8854, HI8855, HI8858
2.	Niphad	2	NIDW1542, NIDW1557
3.	IIWBR, Karnal	3	DDW65, DDW66, DDW 67
4.	Dharwad	2+2	UAS485, UAS486, DDK 1066(Dic), DDK1067(Dic)
5.	Ludhiana	3	PDW366, PDW367, PDW368
6.	Powarkheda	2	MPO1403, MPO1404
7.	Pune	2+2	MACS4147, MACS4146, MACS5064(Dic), MACS5065(Dic)
8.	Vijapur	2	GW1369, GW1370
9.	Hisar	1	WHD969
10.	Udaipur	1	PWU8
11.	Junagadh	1	GW1371
12.	Parbhani	1	PBN1841
13.	Akola	1	AKDW5520
14.	IARI, Wellington	2	HW 5305 (Dic), HW 5306 (Dic)
	Checks	**5**	HI8713, HI8737, MACS3949, PDW314, DDK1029(Dic. C)
Total entries		**36 (31+5)**	

Experimental Details

Design	**:**	Simple Lattice
Replication	**:**	Two
Plot size	:	6 x 1.20m (6 rows)
Fertilizer dose (kg/ha)	**:**	120:60:40 (N:P:K)
Time of sowing	**:**	November 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 Director*

National Initial Varietal Trial
NIVT-5A-RI-TS-TAS, 2023-24

Conducting centres

Zone	No.	Centres
NWPZ	10	Delhi, Jammu, Gurdaspur, Ludhiana, Hisar, Karnal, Sriganganagar, Modipuram, Bulandshahr, Durgapura
NEPZ	9	Kanpur, RPCAU-Pusa, Varanasi, Sabour, Ranchi, Kalyani, Coochbehar, Burdwan, Shillongani
Total	**19**	

Details of trial entries

SN	Contributing Centres	No. of Entries	Name of entries
1.	IARI, Delhi	4	HD3485, HD3486, HD3487, HD3488
2.	IIWBR, Karnal	4	DBW465, DBW466, DBW467, DBW468
3.	Ludhiana	4	PBW953, PBW954, PBW955, PBW956
4.	Pantnagar	1	UP3147
5.	Hisar	2	WH1339, WH1340
6.	Kanpur	1	K2310
7.	Varanasi	1	HUW861
8.	Ranchi	1	JKW320
9.	Sabour	1	BRW3959
10.	Jammu	1	JAUW719
11.	CSSRI, Karnal	1	KRL2203
	Checks	**4**	**HI1612, K1317, PBW644, NIAW3170**
Total entries		**25(21+4)**	

Experimental Details

Design	**:**	Simple Lattice
Replication	**:**	Two
Plot size	:	6 x 1.20m (6 rows)
Irrigations	:	Two (pre-sowing & one irrigation at 45-50 DAS)
Fertilizer dose (kg/ha)	**:**	90:60:40(N:P:K)
Time of sowing	**:**	Oct. 25 - Nov. 5
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 Director*

National Initial Varietal Trial
NIVT-5B-RI-TS-TAD, 2023-24

Conducting centres

Zone	No.	Centres
CZ	10	Indore, Sagar, Jabalpur, Bilaspur, Udaipur,Vijapur, SK Nagar, Junagadh, Dhandhuka, Powarkheda
PZ	7	Dharwad, Nippani, Niphad, Pune, Dhule, Akola, Parbhani
Total	17	

Details of trial entries

SN	Contributing Centres	No. of Entries	Name of entries
1.	Delhi	5	HI1700, HI1701, HI1702, HI8856(d), HI8857(d)
2.	IIWBR, Karnal	3	DBW469, DBW470, DDW67(d)
3.	Dharwad	2	UAS487(d), UAS3034
4.	Niphad	2	NIAW4533,NIDW1561(d)
5.	Vijapur	2	GW563, GW1372(d)
6.	Akola	1	AKAW5441
7.	Bilaspur	1	CG1052
8.	Jabalpur	1	MP3601
9.	Powarkheda	1	MP1405
10.	Pune	2	MACS6850, MACS6851
11.	Parbhani	1	PBN 2115
	Checks	**4(2A+2D)**	**DBW110, HI1605, HI8627(d), UAS446(d)**
Total entries		**25 (21+4)**	

Experimental Details

Design	:	Simple Lattice
Replication	:	Two
Plot size	:	6 x 1.20m (6 rows)
Irrigations	:	Two (1 pre-sowing & one irrigation at 40-45 DAS) (Limit of 3 irrigations in Gujarat)
Fertilizer dose (kg/ha)	:	90:60:40(N:P:K)
Time of sowing	:	Oct. 25 – Nov.05
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 Director*

National Initial Varietal Trial
NIVT-6-ES-IR-NWPZ/CZ, 2023-24

Trial conducting centres

Zone	No.	Centres
NWPZ	7	Delhi, Ludhiana, Ladowal, Hisar, Karnal, Bulandshahr, Sriganganagar
CZ	7	Indore, Powarkheda, Jabalpur, BISA-Jabalpur, Bilaspur, Junagadh, Vijapur
Total	**14**	

Details of test entries

Contributing Centres	No. of entries	Name of entries
Delhi/Indore	4	HD3489, HD3490, HD3491, HD3492
Ludhiana	5	PBW931, PBW932, PBW933, PBW934, PBW935
IIWBR/BISA	5	DBW471, DBW472, DBW473, DBW474, DBW475
Hisar	2	WH1333, WH1334
Durgapura	1	Raj4591
Pantnagar	1	UP3148
Vijapur	1	GW564
Junagadh	1	GW568
Powarkheda	1	MP1406
Checks	**4**	**DBW327, DBW187,DBW303, GW322**
Total	**25 (21+4)**	

Experimental details

Design	:	Simple Lattice (5x5)
Replications	:	Two
Plot size	:	6 x 1.20m (6 rows)
Fertilizer dose (kg/ha)	:	150% RFD+ FYM15 t/ha+ Growth Regulators*
Time of sowing	:	**NWPZ:** Oct. 25 – Nov.5; **CZ:** Nov 1-10
Seed requirement	:	7 Kg per entry

*** Note:** Two sprays as tank mix-Chlormequat chloride @ 0.2%+ tebuconazole @ 0.1% of commercial product dose at First Node and Flag leaf (Tank mix application). Use 400 l/ha of water for spraying.

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

Northern Hills Zone
Initial Varietal Trial, 2023-24
IVT-RF-TS-TAS

Trial conducting centres

State	Centres	Name of the centres
Himachal Pradesh	3	Malan, Shimla, Bajaura
Uttarakhand	3	Almora, Majhera, Gaja
J&K	2	Khudwani, Wadura
Manipur	1	Imphal
Total	**9**	

Details of test entries

Contributing Centres	No. of entries	Name of entries
IARI, Shimla	4	HS700, HS701, HD3493, HS702
CSKHPKV, Malan	4	HPW499, HPW500, HPW501, HPW502
VPKAS, Almora	4	VL2055, VL2056, VL2057, VL2058
SKUAST-K	1	SKW367
GBPUA&T, Pantnagar	1	UP3149
Checks	**2**	**HS507, HS562**
Total Entries	**16 (14+2)**	

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	3.5 x 1.20m (6 rows)
Fertilizer dose (kg/ha)	:	60:30:20 (N:P:K)
Time of sowing	:	Oct. 15-31
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 Director*

Northern Hills Zone
Advance Varietal Trial, 2023-24
AVT-RF-TS-TAS

Trial conducting centres

State	Centres	Name of the centres
Himachal Pradesh	3	Malan, Shimla, Bajaura
Uttarakhand	3	Almora, Majhera, Gaja
J&K	2	Khudwani, Wadura
Manipur	1	Imphal
Total	**9**	

Details of test entries

Contributing Centres	No. of entries	Name of entries
VPKAS, Almora	1	VL2059^{M}
Checks	**4**	**VL907, HPW349, HS562, VL2041**
Total Entries	**5 (1+4)**	

Experimental details

Design	:	R.B.D.
Replications	:	Six
Plot size	:	3.5 x 1.20m (6 rows)
Fertilizer dose (kg/ha)	:	60:30:20 (N:P:K)
Time of sowing	:	October 15-31
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 Director*

Northern Hills Zone
Advance Varietal Trial, 2023-24
IVT/AVT-IR-LS-TAS

Trial conducting centres

State	Centres	Name of the centres
Himachal Pradesh	3	Shimla, Malan, Bajaura
Uttrakhand	3	Almora, Majhera, Gaja
Manipur	1	CAU-Imphal
Total	7	

Details of test entries

Contributing Centres	No. of entries	Name of entries
CSKPHKV, Malan	3	HPW503,HPW504, HPW505
IARI, RS, Shimla	4	HS698, HS703, HS704, HS705
VPKAS, Almora	5	VL3031, VL3033, VL3034, VL3035, VL3036^{M}
Checks	**2**	**VL892, HS490**
Total Entries	**14 (12+2)**	

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	3.5 x 1.08m (6 rows)
Fertilizer dose (kg/ha)	:	90:60:40 (N:P:K)
Time of sowing	:	December 1-15
Seed rate (kg/ha)	:	125
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 Director

North Western Plains Zone
Advance Varietal Trial, 2023-24
AVT-IR-TS-TAS

Trial conducting centres

State	No.	Centres
Punjab	2	Ludhiana, Gurdaspur
Haryana	3	Hisar, Karnal, Bawal
Rajasthan	2	Sriganganagar,Durgapura
Uttar Pradesh	3	Bulandshahr, Modipuram, Nagina
Uttarakhand	1	Pantnagar
J & K	1	Jammu
Delhi	1	Delhi
Total	**13**	

Details of test entries

Contributing Centres	No. of entries	Name of entries
IIWBR, Karnal	4	DBW386*, DBW417, DBW476^{M}, DBW477^{M}
IARI, Delhi	2	HD3471^{M}*, HD3494^{M}
IARI, Indore	1	HI1668*
PAU, Ludhiana	3	PBW916, PBW957^{M}, PBW958^{M}
Checks	**8**	**HD2967, DBW88, HD3086, DBW187, DBW222, PBW826, PBW725, HD3386(I)**
Total Entries	**18 (10+8)**	

** denotes final year entry, ^{M} denotes MABB entry*

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.40m (12 rows)
Fertilizer dose (kg/ha)	:	150:60:40 (N:P:K)
Time of sowing	:	November 1-15
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 Director

North Western Plains Zone
Advance Varietal Trial, 2023-24
AVT-IR-LS-TAS

Trial conducting centres

State	No.	Centres
Punjab	2	Ludhiana, Gurdaspur
Haryana	2	Hisar, Karnal
Rajasthan	1	Durgapura
Uttar Pradesh	3	Nagina, Bulandshahr, Modipuram
Uttarakhand	1	Pantnagar
J & K	1	Jammu
Delhi	1	Delhi
Total	11	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	IARI, Delhi	3	HD3428*, HD3455,HD3495^{M}
2.	PAU, Ludhiana	1	PBW921
3.	IIWBR, Karnal	1	DBW422
4.	CCSHAU, Hisar	1	WH1324
5.	RARI, Durgapura	1	Raj4581
6.	NDUAT, Ayodhya	1	NW8071
	Checks	**4**	**HD3059, DBW173, PBW771, JKW261**
	Total	**12 (8+4)**	

** denotes final year entry, ^{M} denotes MABB entry*

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.16m (12 rows)
Fertilizer dose (kg/ha)	:	120:60:40 (N:P:K)
Time of sowing	:	December 5-15
Seed rate (kg/ha)	:	125
Seed requirement	:	15 kg per entry

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

North Western Plains Zone
Advance Varietal Trial, 2023-24
AVT-RI-TS-TAS

Trial conducting centres

State	No.	Centres
Punjab	2	Ludhiana, Gurdaspur
Haryana	3	Hisar, Karnal, Bawal
Uttar Pradesh	3	Modipuram, Nagina, Bulandshahr
Rajasthan	2	Sriganganagar, Durgapura
Uttarakhand	1	Pantnagar
J&K	1	Jammu
Delhi	1	Delhi
Total	**13**	

Details of test entries

Contributing Centres	No. of entries	Name of entries
IARI, Delhi	1	HD3468
PAU, Ludhiana	1	PBW927
Checks	**6**	**PBW644, NIAW3170, DBW296, HI1653, HD3369, WH1402(I)**
Total Entries	**8 (2+6)**	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: 6 x 2.40m (12 rows)
Irrigations	: Two (pre-sowing & one irrigation at 45-50 DAS)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: Oct. 25 – Nov. 5
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 Director

North Eastern Plains Zone
Advance Varietal Trial, 2023-24
AVT-IR-TS-TAS

Trial conducting centres

State	No.	Centres
Uttar Pradesh	4	Kanpur, Prayagraj, Ayodhya, Varanasi
Bihar	2	Sabour, RPCAU-Pusa
West Bengal	3	Coochbehar, Kalyani, Burdwan
Jharkhand	2	Ranchi, Dumka
Assam	1	Shillongani
Total	**12**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	IIWBR, Karnal	1	DBW386*
2.	IARI, Delhi	3	HD3447, HD3467, HP1978
3.	PAU, Ludhiana	3	PBW908, PBW913, PBW915
4.	GBUAT, Pantnagar	2	UP3123, UP3124
5.	CSSRI, Karnal	1	KRL2106
6.	BCKV, Kalyani	2	BCW28, BCW29
	Checks	**5**	**HD3249, DBW187, DBW222, PBW826, HD3388(I)**
	Total Entries	**17 (12+5)**	

** denotes final year entry*

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: 6 x 2.40m (12 rows)
Fertilizer dose (kg/ha)	: 150:60:40 (N:P:K)
Time of sowing	: November 1-15
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 Director*

North Eastern Plains Zone
Advance Varietal Trial, 2023-24
AVT-IR-LS-TAS

Trial conducting centres

State	No.	Centres
Uttar Pradesh	4	Kanpur, Prayagraj, Ayodhya, Varanasi
Bihar	2	Sabour, RPCAU-Pusa
West Bengal	4	Coochbehar, Kalyani, Burdwan, Manikchak
Jharkhand	1	Ranchi
Assam	1	Shillongani
Total	**12**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	CCSHAU, Hisar	2	WH1323, WH1324
2.	RARI, Durgapura	1	Raj4581
	Checks	**5**	**HI1563, DBW107, HD3118, HI1621, PBW833**
	Total Entries	**8 (3+5)**	

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.16m (12 rows)
Fertilizer dose (kg/ha)	:	120:60:40 (N:P:K)
Time of sowing	:	December 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 Director

North Eastern Plains Zone
Advance Varietal Trial, 2023-24
AVT-RI-TS-TAS

Trial conducting centres

State	No.	Centres
Uttar Pradesh	4	Kanpur, Prayagraj, Ayodhya, Varanasi
Bihar	2	Sabour, RPCAU-Pusa
West Bengal	3	Coochbehar, Kalyani, Burdwan
Jharkhand	2	Ranchi, Dumka
Assam	1	Shillongani
Total	**12**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	IARI, Delhi	1	HD3460
2.	BAU, Ranchi	1	JKW304
	Checks	**5**	**HI1612, K1317, HD3171, HD3293, DBW252**
	Total Entries	**7 (2+5)**	

Experimental details

Design	: R.B.D.
Replications	: Four
Plot size	: 6 x 2.40m (12 rows)
Irrigation	: Two (pre-sowing & one irrigation at 45-50 DAS)
Fertilizer dose (kg/ha)	: 90:60:40 (N:P:K)
Time of sowing	: Oct. 25 – Nov.5
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 Director

Central Zone
Advance Varietal Trial, 2023-24
AVT-IR-TS-TAD

Trial conducting centres

State	No.	Centres
Gujarat	5	Vijapur, SK Nagar, Junagadh, Anand, Dhandhuka
Madhya Pradesh	6	Jabalpur, Sagar, Gwalior, Powarkheda, Indore, Jhansi
Chhattisgarh	2	Bilaspur, Raipur
Rajasthan	1	Udaipur
UP	1	Banda
Total	**15**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	ARI, Pune	3	MACS6837, MACS4125(d), MACS4135(d)
2.	IARI, Indore	6	HI1669*, HI1683, HI1684, HI8848(d), HI8849(d), HI8850(d)
3.	JAU, Junagadh	2	GW554, GW555
4.	JNKVV, Jabalpur	1	MP3570
5.	JNKVV,Powerkheda	1	MP01395
	Checks	**6**	**GW322, MACS6768, HI1650, GW547(I), HI8737(d), HI8713(d)**
	Total Entries	**19 (13+6)**	

* *denotes final year entry*

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.40m (12 rows)
Fertilizer dose (kg/ha)	:	120:60:40 (N:P:K)
Time of sowing	:	November5-15
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 Director

Central Zone
Advance Varietal Trial, 2023-24
AVT-IR-LS-TAS

Trial conducting centres

State	No.	Centres
Gujarat	5	Vijapur, SK Nagar, Junagadh, Anand, Lok-Bharti
Madhya Pradesh	4	Jabalpur, Gwalior, Powarkheda, Indore
Chhattisgarh	2	Bilaspur, Raipur
UP	1	Banda
Total	**12**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	IARI, Indore	2	HI1674*, HI1687
2.	PDKV, Akola	1	WSM138
3.	ARI, Pune	1	MACS6830
4.	IIWBR, Karnal	1	DBW425
5.	JAU, Junagadh	1	GW556
	Checks	**4**	**HD2932, MP4010, HI1634, CG1029**
	Total Entries	**10 (6+4)**	

* *denotes final year entry*

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6m x 2.16m (12 rows)
Fertilizer dose (kg/ha)	:	90:60:40 (N:P:K)
Time of sowing	:	Dec. 5-15
Seed rate (kg/ha)	:	125
Seed requirement	:	15 kg per entry

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

Central Zone
Advance Varietal Trial, 2023-24
AVT-RI-TS-TAS

Trial conducting centres

State	No.	Centres
Gujarat	5	Vijapur, SK Nagar, Dhandhuka, Junagadh, Anand
Madhya Pradesh	5	Powarkheda, Jabalpur, Sagar, Indore, Jhansi
Chhattisgarh	2	Bilaspur, Raipur
Rajasthan	1	Udaipur
UP	1	Banda
Total	**14**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	IIWBR, Karnal	3	DBW441^{M}*,DBW428, DBW432
2.	UAS, Dharwad	2	UAS3029, UAS484(d)
3.	ARS, Niphad	1	NIAW4267
4.	IARI, Indore	2	HI8851(d), HI8852(d)
5.	ARI, Pune	1	MACS4131(d)
6.	JNKVV, Powarkheda	1	MPO1398(d)
	Checks	**7**	**DBW110, CG1036, HI1655, HI8627(d), HI8823(d), DBW359(I), CG1040(I)**
	Total Entries	**17(10+7)**	

* *denotes final year entry,* ^{M} *denotes MABB entry*

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.40m (12 rows)
Irrigations	:	Two (pre-sowing & one irrigation at 40-45 DAS (Limit of 3 Irrig. in Gujarat)
Fertilizer dose (kg/ha)	:	90:60:40 (N:P:K)
Time of sowing	:	Oct. 25 – Nov. 05
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 Director

Peninsular Zone
Advance Varietal Trial, 2023-24
AVT-IR-TS-TAD

Trial conducting centres

State	No.	Centres
Maharashtra	7	Niphad, Pune, Dhule, Akola, Parbhani, Nashik, Karad
Karnataka	4	Dharwad, Ugar-Khurd, Kalloli, Nippani
Total	**11**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	ARI, Pune	5	MACS6837, MACS6842, MACS6844, MACS4125(d), MACS4135(d)
2.	ARS, Niphad	1	NIAW4364
3.	JNKV, Jabalpur	1	MP3570
4.	PAU, Ludhiana	1	PBW891*
5.	IIWBR, Karnal	2	DBW443*, DDW62(d)
6.	PDKV, Akola	1	AKAW5100*
7.	IARI, Indore	3	HI8848(d), HI8849(d), HI8850(d)
8.	CCSHAU, Hisar	1	WH1306*
9.	Nuziveedu Seeds	1	NWS2222*
10.	UAS, Dharwad	1	UAS3026
11.	IGKV, Bilaspur	1	CG1045
12.	JNKVV, Powarkheda	1	MPO1395(d)
	Checks	**5**	**MACS6222, GW322, MP1378(I), MACS3949(d), HI8737(d)**
	Total Entries	**24 (19+5)**	

* *denotes final year entry*

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.40m (12 rows)
Fertilizer dose (kg/ha)	:	120:60:40 (N:P:K)
Time of sowing	:	November 5-15
Seed rate (kg/ha)	:	100 kg/ha
Seed requirement	:	15kg per entry

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

Peninsular Zone
Advance Varietal Trial, 2023-24
AVT-IR-LS-TAS

Trial conducting centres

State	No.	Centres
Maharashtra	7	Niphad, Pune, Nashik, Akola, Dhule, Karad, Parbhani
Karnataka	5	Dharwad, Ugar-Khurd, Bagalkot, Kalloli, Nippani
Total	**12**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	IARI, Indore	2	HI1674*, HI1687
2.	IIWBR, Karnal	2	DBW425, DBW426
3.	ARI, Pune	2	MACS6829, MACS6830
4.	ARS, Niphad	3	NIAW4114*, NIAW4120*, NIAW4432
5.	UAS, Dharwad	1	UAS3027,
6.	Lok Bharti	1	LOK79*
	Checks	**4**	**RAJ4083, HD2932, HD3090, HI1633**
	Total Entries	**15 (11+4)**	

** denotes final year entry*

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6m x 2.16m (12 rows)
Fertilizer dose (kg/ha)	:	90:60:40 (N:P:K)
Time of sowing	:	Dec.5-15
Seed rate (kg/ha)	:	125
Seed requirement	:	15 kg per entry

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

Peninsular Zone
Advance Varietal Trial, 2023-24
AVT-RI-TS-TAD

Trial conducting centres

State	No.	Centres
Maharashtra	6	Akola, Pune, Niphad, Nashik, Parbhani, Karad
Karnataka	5	Dharwad, Nippani, Bagalkot, Ugar-Khurd, Kalloli
Total	**11**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	ARS, Niphad	1	NIAW4267
2.	ARI, Pune	1	MACS4131(d)
3.	IGKV, Bilaspur	1	CG1047
4.	IARI, Indore	2	HI8851(d), HI8852(d)
5.	UAS Dharwad	1	UAS484(d)
6.	JAU, Junagadh	1	GW1368(d)
7.	JNKVV, Powerkheda	1	MPO1398(d)
	Checks	**7**	**HI1605, NIAW3170, UAS446(d), NIDW1149(d), DBW359(I), HI1665(I), UAS478(d)(I)**
	Total Entries	**15 (8+7)**	

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.40m (12 rows)
Irrigations	:	Two (pre-sowing & one irrigation at 40-45 DAS)
Fertilizer dose (kg/ha)	:	90:60:40 (N:P:K)
Time of sowing	:	Oct. 25 – Nov. 5
Seed rate (kg/ha)	:	100
Seed requirement	:	15kg per entry

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

SPL - HYPT, 2023-24
(IR-ES-TAS-NWPZ)

Trial conducting centres

Zone	No.	Centres
NWPZ	7	Delhi, Ludhiana, Ladowal, Hisar, Karnal, Modipuram, Sriganganagar
Total	**7**	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	IIWBR, Karnal	1	DBW438
	Checks	**5**	**DBW187, DBW327, DBW371, DBW372, PBW872**
	Total Entries	**6 (1+5)**	

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.40m (12 rows)
Fertilizer dose (kg/ha)	:	150% RFD+ FYM15 t/ha+ Growth Regulators*
Time of sowing	:	Oct. 25– Nov. 5
Seed rate (kg/ha)	:	100
Seed requirement	:	8 Kg per entry

**** Note:** Two sprays as tank mix-Chlormequat chloride @ 0.2%+ tebuconazole @ 0.1% of commercial product dose at First Node and Flag leaf (Tank mix application). Use 400L/ha of water for spraying*

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

SPL – HYPT, 2023-24
(IR-ES-TAS-CZ)

Trial conducting centres

Zone	No.	Centres
CZ	7	Indore, Powarkheda, BISA-Jabalpur, JNKVV-Jabalpur, Bilaspur, Junagadh, Vijapur
Total	7	

Details of test entries

SN	Contributing Centres	No. of entries	Name of entries
1.	SDAU, Vijapur	1	GW543*
2.	IGKV, Bilaspur	1	CG1044*
3.	IIWBR, Karnal	3	DBW434, DBW436, DBW445
4.	JNKVV, Powarkheda	1	MP1399
5.	CCSHAU, Hisar	1	WH1320
6.	IARI, Delhi	2	HD3461, HD3463
7.	PAU, Ludhiana	2	PBW906, PBW929
	Checks	**5**	**DBW187, DBW303, DBW327(I), DBW377(I), GW322**
	Total Entries	**16 (11+5)**	

Experimental details

Design	:	R.B.D.
Replications	:	Four
Plot size	:	6 x 2.40m (12 rows)
Fertilizer dose (kg/ha)	:	150% RFD+ FYM15 t/ha+ Growth Regulators*
Time of sowing	:	1-10 November
Seed rate (kg/ha)	:	100
Seed requirement	:	8 Kg per entry + Agronomy 16kg

**** Note:** Two sprays as tank mix-Chlormequat chloride @ 0.2%+ tebuconazole @ 0.1% of commercial product dose at First Node and Flag leaf (Tank mix application). Use 400L/ha of water for spraying*

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

Physiological Trial/Nursery

Heat & Drought Tolerance Screening Trial (HDTST), 2023-24

Conducting centres

Zone	No.	Centres
NWPZ	3	Hisar, Karnal, Ludhiana
NEPZ	3	Ranchi, Sabour, RPCAU-Pusa
CZ	3	Junagadh, Indore, Vijapur
PZ	3	Pune, Dharwad, Niphad
Total	**12**	

Details of trial entries

SN	Contributing centres	No. of Entries	Name of entries
1.	IIWBR, Karnal	4	DBW386, DBW441, DBW443, DDW55(d)
2.	Indore	3	HI1668, HI1669, HI1674
3.	PAU, Ludhiana	1	PBW891
4.	IARI, New Delhi	2	HD3471, HD3428,
5.	Hisar	1	WH1306
6.	Bilaspur	1	CG1044
7.	Nujewed seeds	1	NWS2222
8.	Akola	1	AKAW5100
9.	Niphad	2	NIAW4114, NIAW4120
10.	Lokbharti	1	LOK79
11	Vijapur	1	GW543
	Checks	**7**	DBW187, PBW826, WH730, HI1633, GW322, DBW110, NIDW1149(d)
Total entries		**25 (18+7)**	

Experimental details

Design	:	Simple lattice
Replications	:	Two
Plot size	:	6 rows of 3m length spaced 20cm apart (3.6m^2)
Treatments	:	3 (timely and late sown with minimum 21 days and maximum 1 month difference between the two sowings and one rainfed condition)
Time of sowing	:	**NWPZ&NEPZ:TS**: Nov.1-15 **LS:**Minimum 21 days and maximum 1 month difference between two sowings, **RF**-Oct.25-Nov.5th **CZ&PZ:TS:** Nov.5-15**LS:** Minimum 21 days and maximum 1 month difference between two sowings, **RF**-Oct.25-Nov.5th
Fertilizer dose (Kg/ha)	:	As per the recommendation of the zones
Seed rate (kg/ha)	:	TS:100, LS:125, RF:125
Seed requirement	:	5kg. per entry

Observations to be recorded: *Germination%, Days to heading, Days to anthesis, Days to maturity, Plant height (cm), Total biomass of each net plot at harvest (g), Productive tillers of one full row length, Grain yield of each gross plot (g), 1000-grains weight (g), Grain number per spike, Grain weight per spike. Two recordings of NDVI at 15 days after sowing and again at 21 days after anthesis. Canopy temperature at 15 days and 21 days after anthesis, Chlorophyll content at 15 days and 21 days after anthesis.*

Special Trial for Lodging Tolerance (STLT) 2023-24

Conducting centres

Zone	No.	Centres
NWPZ	5	Hisar, Delhi, Karnal, Ludhiana, Pantnagar
NEPZ	3	Faizabad, Sabour, Allahabad (Prayagraj)
Total	**8**	

Details of entries

SN	Contributing Centres	No. of Entries	Name of entries
1.	Karnal	4	DBW187, DBW222, DBW327, DBW372
2.	Delhi	1	HD3226
3.	Ludhiana	1	PBW826
	Total Entries	**6**	

Experimental details

Design	:	Split plot/Factorial
Replication	:	Two
Plot size	:	6 x 1.20m (6 Rows)
Treatments	:	3 (Control, Spray with lihocin, and Spray with IARI chemical)
Time of sowing	:	November 1-15
Fertilizer dose (Kg/ha)	:	150:60:40 (N:P:K)
Seed rate (kg/ha)	:	100 kg/ha
Seed requirement	:	5.0 kg per entry

Observations to be recorded: *Days to heading, Days to maturity, Plant height (cm), Internode length of last three internodes separately from the base of the plant (cm), Peduncle length, Culm diameter of second basal internode (mm), Total biomass/ plot at harvest (g), Length of spike (cm), Lodging (%), Lodging angle, Grain yield/plot (g), 1000-grains weight (g).*

NATIONAL GENETIC STOCK NURSERY (NGSN) [Suggested Crossing Block]

Conducting Centres

Zone	No	Centres
NHZ	3	Almora, Malan, Khudwani
NWPZ	7	IIWBR-Karnal, CSSRI-Karnal, Jammu, Hisar, Pantnagar, Ludhiana, Durgapura
NEPZ	8	Ayodhya, Kanpur, Sabour, RPCAU-Pusa, Ranchi, Coochbehar, Kalyani, IARI-Hazaribagh
CZ	11	Indore, Gwalior, Jabalpur, Udaipur, Vijapur, Bilaspur, Junagadh, Lok-Bharti, Powarkheda, Mandor, Sagar
PZ	5	Pune, Dharwad, Akola, Niphad, Parbhani
Total	**34**	

Details of entries & Checks

NGSN consists latest released/identified varieties, genetic stocks, confirmed elite lines from national nurseries, proven elite lines (with 3 years testing and/or published information)	
Contributing Centres	Dharwad, IARI-New-Delhi, IIWBR-Karnal, PAU-Ludhiana, CCHAU-Hisar, Vijapur, BARC, Pantnagar, NBPGR-New-Delhi
Checks	Total=04: Sonalika, HD 2967, DBW 187, HI 8713 (d)
Total	**100 (96+4)**

Experimental details

Design	**:**	Augmented Block Design
Plot size	**:**	02 row plot of 2.5m length spaced at 20cm apart (1.0 m^2)
Fertilizer dose	**:**	As recommended
Time of sowing	**:**	**NWPZ/NEPZ:** November 1-15; **CZ / PZ**: November 5-20
Seed requirement	**:**	750g seed each entry; 2.0 kg check varieties

Observations to be recorded: *Grain yield/plot (g), days to heading, days to maturity, plant height, tillers/m row, 1000 grains weight, rusts, leaf blight, powdery mildew, loose smut, other diseases (artificial epiphytotic conditions)*

Utilization report*: 1. As donor in hybridization 2. Direct selection 3. Germplasm enrichment (trait)*

27th SEGREGATING STOCK NURSERY (SSN)

Conducting Centres

Zone	No.	Centres
NHZ	3	Khudwani, Wadura, Almora
NWPZ	4	Jammu, Hisar, Pantnagar, Durgapura
NEPZ	4	Ayodhya, Kalyani, Ranchi, Sabour,
CZ	9	Bilaspur, Durgapura, Jabalpur, Udaipur, Lok-Bharati, Junagadh, Powarkheda, Mandor, Sagar
PZ	5	Akola, Parbhani, Pune, Dharwad, Niphad
Total	**25**	

Details of cross combinations

SN	Contributing Centres	No. of crosses	Priority trait(s)
1.	IIWBR Karnal		Yellow rust, spot blotch, quality, abiotic stress, pre-breeding
2.	IARI, Delhi		Yield, adaptation, pre-breeding, quality, leaf rust, stem rust
3.	Ludhiana		Yellow rust, quality, adaptation, KB, pre-breeding
4.	Hisar		Leaf rust, drought, heat, adaptation
5.	Pantnagar		Yellow rust, leaf rust, heat, KB, quality
6.	Almora		Winter x spring
7.	Pune		Stem rust, quality, heat, drought, pre-breeding
8.	Vijapur		Heat, short duration, bold grain, quality
	Total		

Experimental details

Design	:	Augmented Block Design
Plot size	:	4 row plot of 2.5 m length spaced at 20cm apart
Fertilizer dose	:	As recommended for the centre
Time of sowing	:	**NHZ / NWPZ / NEPZ** (November 1-15); **CZ / PZ** (November 5-20);
Seed requirement	:	250g seed for each cross combination

Utilization Report: *No. of cross combinations / plants selected (Selected / preferred traits).*

Drought and Heat Tolerance Screening Nursery (DHTSN), 2023-24

Conducting centres

Zone	No.	Centres
NWPZ	2	Hisar,Karnal
NEPZ	2	RPCAU-Pusa, Sabour
CZ	2	Junagadh, Indore
PZ	2	Pune, Dharwad
Total	**8**	

Details of Entries & Checks

Contributing Centres	Indore, Niphad, Vijapur, Dharwad, Pune, IARI, Hisar, Ludhiana, Karnal
No. of Entries	5 to 7 promising entries/ centre
Checks	C306, MP3288, K1317, DBW110, NI5439
Registered Genetic Stocks	WH730, DBW150

Experimental Details

Design	:	Augmented/Alpha lattice
Plot size	:	1.5m length x 3rows (spaced 20cm apart)
Agronomy	:	As per the package of practices
Seed requirement	:	1.5 kg per entry

Observations to be recorded:

Agromorphological observations: *Germination percentage, Days to heading, Days to anthesis, Days to maturity, Plant height (cm), Total biomass at harvest (g), Productive tillers of one full row length, Grain yield / plot (g), 1000-grain weight (g), Grain number/spike, Grain weight/spike.*

Physiological parameters: *Two recordings of NDVI (one month after sowing & 21 days after anthesis), Canopy temperature, Chlorophyll fluorescence and Chlorophyll content (15 days & 21 days after anthesis), respectively.*

Salinity/Alkalinity Tolerance Screening Nursery 2023-24

Conducting centres

Zone	Number of Centres	Conducting Centres
Haryana	3	ICAR-CSSRI Karnal, ICAR-IIWBR Hisar, HAU Hisar
Punjab	2	Muktsar, Bathinda
UP	3	ICAR-CSSRI Lucknow, Daleep Nagar, Ayodhya
Gujarat	2	ICAR-CSSRI Bharuch, Vijapur
Total	10	

These centers are tentative and all possibilities will be explored for trial conductance

Details of trial entries

SN	Cooperating Centre	Entries
1	CSSRI Karnal	8
2	IIWBR Karnal	6
3	CCSHAU Hisar	3
4	PAU Ludhiana	3
5	CSAUAT Kanpur	2
6	NDUAT Faizabad	2
7	Vijapur	2
	Checks	4 (Kh65, KRL210, DBW 187, GW 322)
	Total Entries	**30 (26+4)**

Experimental Details

Design	**:**	Augmented Design
Replication/Sets	**:**	Two
Plot size	:	5 x 0.60m (3 rows):($3m^2$)
Fertilizer dose (kg/ha)	**:**	120:60:40 (N:P:K)
Time of sowing	**:**	**HAR/PUN:** Nov. 5-20; UP/**GUJ:** 10-25 Nov
Seed requirement	**:**	Entries: 900 gm Checks: 3Kg

Quality Component Wheat Biofortification Nursery

Nursery Conducting Centres

Zone	Number	Centers
NWPZ	4	Ludhiana, Karnal, New Delhi and Pantnagar
NEPZ	2	Kanpur, Varanasi and Ranchi
CZ	4	Indore, Vijapur, Powarkheda and Junagadh
PZ	3	Dharwad, Pune and Niphad
Total	**13**	

Details of Test Entries

SN	Contributing Centres	No. of Entries	Name of Entries
1.	IARI Delhi	3	
2.	IIWBR Karnal	3	
3.	PAU Ludhiana	3	
4.	Hisar	2	
5.	Pantnagar	2	
6.	Kanpur	2	
7.	Varanasi	2	
8.	IARI Indore	2	
9.	Vijapur	2	
10.	Powarkheda	2	
11.	Junagadh	1	
12.	Dharwad	2	
13.	Niphad	2	
14.	Pune	2	
15.	Ranchi	1	
	Checks	5	DBW 187, DBW327, GW 322, HD3386, MACS 6222
	Total	**31+5**	

Experimental Details

Design	:	Simple Lattice (6x6)
Replications	:	2
Plot size	:	Gross: 4X0.8(4 rows)
Fertilizer dose (kg/ha)	:	NW/NE: 150:60:40 (N:P:K)
		CZ/PZ:120:60:40
Time of Sowing	:	05-20 Nov
Seed rate	:	100kg/ha
Seed requirement	:	2.500 Kg

Samples will be analysed at ICAR-IIWBR, Karnal for grain appearance score, test weight, protein content, grain hardness index, sedimentation value, Fe and Zn content. Hand threshed samples using cloth should be provided for Fe and Zn analysis separately.

Work Plan of Resource Management (2023-24)

Resource Management work plan was finalized based on the meeting held on 14th August 2023 in virtual mode and discussions held during the wheat and barley research worker's meet on 29th August 2023. The detailed work plan for 2023-24 is given below

The following nine co-ordinated varietal evaluation trials were formulated based on the entries received from the breeding group.

- Varietal evaluation trial at two dates of sowing (Timely and Late) under irrigated conditions (IRTS-DOS-TAS) in North Western Plains Zone
- Varietal evaluation trial at two dates of sowing (Late and Very Late) under irrigated conditions (IRLS-DOS-TAS) in North Western Plains Zone
- Varietal evaluation trial at two dates of sowing (Timely and Late) under irrigated conditions (IRTS-DOS-TAS) in North Eastern Plains Zone
- Varietal evaluation trial at two dates of sowing (Timely and Late) under irrigated conditions (IRTS-DOS-TAD) in Central Zone
- Varietal evaluation trial at two dates of sowing (Late and Very Late) under irrigated conditions (IRLS-DOS-TAS) in Central Zone
- Varietal evaluation trials under restricted irrigation (Zero, One and Two) conditions (RIR-TS-TAS) in Central Zone
- Varietal evaluation trial at two dates of sowing (Timely and Late) under irrigated conditions (IRTS-DOS-TAD) in Peninsular Zone
- Varietal evaluation trial at two dates of sowing (Late and Very late) under irrigated conditions (IRTS-DOS-TAD) in Peninsular Zone
- Evaluation of wheat genotypes under high fertility conditions (SPL-HYPT-IR-ES-TAS-CZ) in Central Zone.
- Coordinated wheat trial details are as under

Entry/Zones/Trials	Checks	Locations
IR-TS-DOS-TAS - North Western Plains Zone		
DBW386, HD3471^{M}, HI1668	HD2967, DBW187, DBW222, PBW826, HD3386(I)	Agra, Delhi, Durgapura, Gurdaspur, Hisar, Jammu, Karnal, Ludhiana, Pantnagar, Sriganganagar
IR-LS-DOS-TAS - North Western Plains Zone		
HD3428	HD3059, DBW173, PBW771, JKW261	Agra, Delhi, Durgapura, Gurdaspur, Hisar, Jammu, Karnal, Ludhiana, Pantnagar, Sriganganagar
IR-TS-DOS-TAS - North Eastern Plains Zone		
DBW386	HD3249, DBW187, DBW222, PBW826, HD3388(I)	Ayodhya, Coochbehar, Kalyani, Kanpur, Ranchi, RPCAU Pusa, Sabour, Shillongani, Varanasi
IR-TS-DOS-TAD - Central Zone		
HI1669	GW322, MACS6768, HI1650, GW547(I)	Bilaspur, Gwalior, Indore, Jabalpur, Junagarh, Powarkheda, Udaipur, Vijapur
IR-LS-DOS-TAS - Central Zone		
HI1674	HD2932, MP4010, HI1634, CG1029	Bilaspur, Gwalior, Indore, Jabalpur, Junagarh, Powarkheda, Udaipur, Vijapur

RIR-TS-TAS- Central Zone		
DBW441[M]*	DBW110, CG1036, HI1655, DBW359(I)	Bilaspur, Indore, Jabalpur, Powarkheda, Udaipur
IR-TS-DOS-TAD - Peninsular Zone		
PBW891, DBW443, AKAW5100, WH1306, NWS2222	MACS6222, GW322, MP1378(I)	Akola, Dharwad, Niphad, Pune
IR-LS-DOS-TAD - Peninsular Zone		
HI1674, NIAW4114*, NIAW4120, LOK79	RAJ4083, HD2932, HD3090, HI1633	Akola, Dharwad, Niphad, Pune
SPL-HYPT-IR-ES-TAS-Central Zone		
GW543*, CG1044*	DBW187, DBW303, DBW377(I), GW322	Powarkheda, BISA-Jabalpur, Jabalpur, Vijapur, Udaipur

- Coordinated Barley trial details are as under

Entry/Zones/Trials	Checks	Locations
IR-TS-FB-DOS - North Western and Eastern Plains Zone		
UPB 1106	BH 946, DWRB137, HUB113	NWPZ: Durgapura, Hisar, Ludhiana and Karnal NEPZ: Kanpur, Faizabad and Ranchi
IR-TS-HL- DOS- North Western and Central Zone		
DWRB 223	PL891, K1149, Karan16	NWPZ: Durgapura, Hisar, Ludhiana and Karnal CZ: Gwalior, Jabalpur, Vijapur, Udaipur
IR-SL- LON- NWPZ and NEPZ		
KB 2031	RD2907, NDB1173, RD2794	Dilipnagar (Kanpur), Faizabad, Hisar(CCS HAU), Hisar (IIWBR)

- The group decided to conclude the following five special trials and come out with recommendations of repeated experiments.
  SPL-1: Efficacy of herbicides against diverse weed flora of wheat
  SPL-2: Effect of nano urea under irrigated conditions
  SPL-3: Effect of nano urea under restricted irrigated conditions
  SPL-4: Agronomic interventions for quality enhancement in wheat
  SPL-5: Effect of NPK solubilizing microbial consortium on productivity

- The group decided that the following six new special trials will be initiated during the 2023-24 crop season.

Special Trials (2023-24) for updating agronomic package and practices of wheat and barley

Trial	Titles	Locations
SPL-1	Effect of tillage and rice residue management on wheat productivity and profitability	BISA Ladowal, Kalyani, Karnal, Pantnagar, BISA Samastipur, Shillongani
SPL-2	Effect of seed rate and growth regulators on productivity of	Agra, Almora, Durgapura, Gurdaspur, Hisar, Jammu, Karnal, Ludhiana, Pantnagar

	wheat under early sowing in NWPZ	
SPL-3	Precision N management in wheat using green seeker tool	Agra, Ayodhya, Coochbehar, Dharwad, Gurdaspur, Hisar, Kanpur, Karnal, Ludhiana, Malan, Pantnagar, Sabour, Shillongani, Vijapur, Varanasi,
SPL-4	Intercropping of oilseed/pulses with wheat and barley for enhancing productivity and profitability of rice-fallow area with one irrigation	Ayodhya, Kanpur, Sabour, Samastipur, Hisar, Jabalpur, Jammu, Shillongani, Varanasi,
SPL-5	Evaluation of herbicides for broad-leaved weed control in barley	Agra, Ayodhya, Durgapura, Gwalior, Hisar, Jabalpur, Kalyani, Kanpur, Karnal, Khudwani, Malan, Ranchi, Shillongani, Udaipur, Vijapur
SPL-6	Effect of seed rate and growth regulators on productivity of barley under early sowing in NWPZ	Agra, Durgapura, Gurdaspur, Hisar, Karnal, Ludhiana

Work Plan of Social Sciences (2023-24)

Barley Frontline Demonstrations (FLDs) in 140 Hectares.

SCSP programme
No. of Wheat Demonstrations = 520 Acres

No. of Training/Awareness Programmes = 6

No. of Nursery Plants = 1000

No. of Spray Pumps/Small Agri Tool Kits = 500

No. of Vegetables Seed Kits = 1000

TSP programme
No. of Training/Awareness Programmes = 4

No. of Wheat Demonstrations = 125 Acres

No. of Vegetables Seed Kits = 400

NEH programme
No. of Training/Awareness Programmes = 10

No. of Nursery Plants = 1000

No. of Spray Pumps/Small Agri Tool Kits = 900

No. of Vegetables Seed Kits = 1000

Work Plan of Crop Protection-Wheat (2023-24)

PROGRAMME 1: Host resistance -IPPSN and PPSN

Adult Plant Resistance for rusts & other diseases

1. **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:

   Stripe rust: Durgapura, Ludhiana, Gurdaspur, Pantnagar, Bajaura, Karnal, Hisar, Delhi, Dhaulakuan, Almora, Malan, Jammu and Khudwani.

   Leaf rust (North): Durgapura, Ludhiana, Pantnagar, Karnal, Kanpur, Delhi and Jammu

   Leaf rust (South): Junagadh, Mahabaleshwar, Pune, Indore, Niphad, Powarkheda, Vijapur, Dharwad and Wellington.

   Stem rust: Junagadh, Mahabaleshwar, Pune, Indore, Niphad, Powarkheda, Vijapur, Dharwad and Wellington.

   (b) Leaf blights: Ludhiana, Pantnagar, Ayodhya, Varanasi, Sabour, Kalyani, Coochbehar, Pune and Dharwad.

2. **Plant Pathological Screening Nursery (PPSN)**

   Objectives

   Evaluation of breeding material for promotion of entries from one stage to the other in the coordinated trials and identification of varieties for release after AVT level on the basis of their level of disease resistance.

   (a) Rusts:

   Stripe rust: Durgapura, Ludhiana, Gurdaspur, Pantnagar, Bajaura, Karnal, Hisar, Delhi, Dhaulakuan, Almora, Malan, Jammu and Khudwani.

   Leaf rust (North): Ayodhya, Durgapura, Ludhiana, Pantnagar, Karnal, Kanpur, Hisar Delhi and Jammu.

   Leaf rust (South): Junagadh, Mahabaleshwar, Pune, Indore, Niphad, Powarkheda, Vijapur, Dharwad and Wellington.

   Stem rust: Junagadh, Mahabaleshwar, Pune, Indore, Niphad, Powarkheda, Vijapur, Dharwad and Wellington.

   ***Note**: The samples of leaves of AVT entries and varieties (checks) in PPSN showed resistance in the past but now showing rust severity of 40S or more at any centre, should be sent to the Incharge, IIWBR Regional Station Flowerdale, Shimla for pathotype analysis, with information to P.I. (Crop Protection).*

For screening against rusts, the mixture of following races will be used and be provided by IIWBR, RS, Flowerdale, Shimla

Rust	Rust pathogen	Pathotypes
Stem/Black	*Puccinia graministritici*	11, 40A, 117-6, 21A-2, 122
Stripe/Yellow	*P. striiformis*	238S119, 46S119, 110S119, 110S84, T
Leaf/Brown	*P. triticina*	77-9, 77-5, 104-2, 12-5, 77-1

3. **Monitoring of PPSN**
   The teams of plant pathologists and breeders will be constituted by PI, CP for effective monitoring and data recording in PPSN at various locations in different zones.
4. **AUDPC based identification of slow rusters in AVT material:**
   Stripe rust: Ludhiana, Karnal, Durgapura
   Leaf rust: Ayodhya, Mahabaleshwar
   Stem rust: Mahabaleshwar, Indore

PROGRAMME 2: Seedling rust resistance and rust gene postulation

1. **Race specific adult plant resistance**
   AVT entries will be screened for adult plant resistance to specific predominant races
   (a) Stripe, leaf and stem rusts (under controlled conditions): Flowerdale, Shimla
   (b) Stripe rust – Ludhiana and New Delhi
   (c) Leaf rust –Ludhiana and New Delhi
   (d) Black rust (under controlled conditions): Pune, Indore and Mahabaleshwar

Race inoculum to be supplied by RS, IIWBR, Flowerdale and races should be the same for all the respective Centres as follows.

Rust	**Rust pathogen**	**Pathotypes**	
		Flowerdale	**Other Centres**
Stem/Black	*P. graministritici*	11, 40A, 117-6	11, 40A
Stripe/Yellow	*P. striiformis*	238S119, 46S119, 110S119	238S119, 46S119
Leaf/Brown	*P. triticina*	77-9, 77-5, 104-2	77-9, 77-5

2. **Seedling Resistance Tests (SRT) and postulation of rust resistance genes**
   (a)Stripe, leaf and stem rusts (All races): IIWBR, Regional Station, Flowerdale, Shimla for AVT's (*T. aestivum*) entries. Flowerdale centre to generate data on rust resistance genes of all the AVT entries.
   (b)Leaf and stem rust: Mahabaleshwar for SRT on AVT entries of CZ, PZ and NIVT (durum entries).

PROGRAMME 3: Leaf Blight

Leaf Blight Screening Nursery (LBSN):

This nursery will consist of AVT entries as well as other resistant entries identified. It will have all the released varieties and material found resistant in preceding years.

Centres:

NWPZ: Ludhiana, Karnal, Hisar, New Delhi and Pantnagar
NEPZ: Ayodhya, Varanasi, RPCAU Pusa, Sabour, Kalyani, Coochbehar and Shillongani
PZ: Pune and Dharwad

PROGRAMME 4: Karnal Bunt

Karnal Bunt Screening Nursery (KBSN):

This nursery will consist of the earlier identified resistant materials, released varieties along with AVT entries under artificially inoculated conditions.

Centres: Malan, Jammu, Ludhiana, Karnal, Hisar, New Delhi and Pantnagar

PROGRAMME 5: Loose Smut

Loose Smut Screening Nursery (LSSN):

It will contain resistant materials identified in the past released varieties and AVT entries.

Centres: Malan, Almora, Ludhiana, Hisar and Durgapura

PROGRAMME 6: Powdery Mildew

Powdery Mildew Screening Nursery (PMSN):

All entries of AVT, previously identified resistant material and released varieties (NHZ, NWPZ)

Centres: Malan, Dhaulakuan, Almora, Shimla, Jammu, Pantnagar and Wellington

PROGRAMME 7: Region specific diseases

1. **Flag Smut Screening Nursery:** Ludhiana, Hisar and Durgapura
2. **Head scab:** Dhulakuan, Gurdaspur, Karnal, Delhi, Coochbehar, Kalyani and Wellington
3. **Foot rot:** Dharwad
4. **Hill bunt:** Malan, Bajaura and Almora (AVT entries NHZ only)

PROGRAMME 8: Crop Health

1. **Pre- harvest crop health monitoring**

   Crop Health Monitoring: Pre harvest surveys

   - All the centres associated with crop protection programme will conduct the surveys on regular interval during crop season and will send the information after every survey. Rust samples collected during the survey should be sent to Incharge, ICAR-IIWBR, RS, Flowerdale, Shimla and other disease P.I. Crop Protection.
   - Wheat Crop Health Newsletter will be issued on monthly basis by PI (CP) IIWBR, Karnal, during the crop season. Information on off season surveys will be included in first issue.

Monitoring the pathotype distribution of rust pathogens: It will be undertaken by IIWBR, 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 according to recommended protocol.

Wheat Disease Monitoring Nursery (To be coordinated by Flowerdale, Shimla): The nursery will be planted at 38 locations including Kudwani (Srinagar), Varanasi KVK, Rampur and Yamunanagar (Haryana). Samples from this nursery should be sent regularly to IIWBR, RS, 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).

Off-season Disease Monitoring Nursery (To be coordinated by IIWBR Reg. Station, Flowerdale): This nursery will be planted in Dalang Maidan, Kukumseri, Sangla, Sarahan(HP) and Leh (J&K). High altitude varieties and one hulless barley variety will also be included in this nursery (Inclusion of PBW 757 in place of WL 711).

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, Ayodhya, Pantnagar and Wellington.

2. **Post- harvest crop health monitoring**

   Monitoring of Karnal bunt and black point in harvested grains

   Post harvest monitoring will be undertaken by all the cooperating centres by analysing samples from grain *mandies* of their respective states.

PROGRAMME 9: Integrated disease management

1. **Elite Multiple Disease Screening Nursery (EMDSN):** It will have sources of resistance to rusts and other diseases found earlier and will revalidate their status to different diseases:

   DISEASES

   Stripe rust: Durgapura, Ludhiana, Gurdaspur, Pantnagar, Bajaura, Karnal, Hisar, Delhi, Dhaulakuan, Almora, Malan, Jammu, and Khudwani.

   Leaf rust (North): Ayodhya,Durgapura, Ludhiana, Pantnagar, Karnal, Kanpur, Delhi, and Jammu

   Leaf rust (South) + Stem rust: Junagadh, Mahabaleshwar, Pune, Indore, Niphad, Powarkheda, Vijapur, Dharwad and Wellington.

   Leaf Blight: Ayodhya, Varanasi, RPCAU Pusa, Sabour, Kalyani, Coochbehar, Pune and Dharwad**.**

   Karnal Bunt: Malan, Jammu, Ludhiana, Karnal, Hisar, New Delhi, and Pantnagar.

   Loose smut: Malan, Almora, Ludhiana, Hisar and Durgapura.

   Powdery mildew: Malan,Dhaulakuan,Almora,Shimla,Jammu, Pantnagar and Wellington

   Flag smut: Ludhiana, Hisar and Durgapura

   Head scab: Dhaulakuan,Gurdaspur, Karnal, Kalyani, Wellington, Dharwad and Delhi

   Nematodes (CCN): Hisar and Durgapura.

The confirmed sources of resistance will be multiplied and seed will be shared with breeders along with passport data in NGSN.

2. **Management of diseases**

(a) Chemical management of Karnal bunt of wheat (New Experiment):

Centres: Malan, Jammu, Ludhiana, Karnal, Hisar and Pantnagar.

The chemicals will be tested are:

SN	Treatments	Doses
1	Azoxystrobin 11% + Tebuconazole 18.3% w/w SC	@ 0.1%
2	Azoxystrobin 18.2% + Difenoconazole 11.4% w/w SC	@ 0.1%
3	Azoxystrobin 18.2% w/w + Cyproconazole 7.3% w/w SC	@ 0.1%
4	Picoxystrobin 7.05% + Propiconazole 11.7% SC,	@ 0.1%
5	Pyraclostrobin 133g/l + Epoxiconaxole 50g/l SE,	@ 0.1%
6	Tebuconazole 50% + Trifloxystrobin 25% WG,	@ 0.06%
7	Propiconazole	@ 0.1%
8	Tebuconazole	@ 0.1%
9	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done at heading stage. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

(b) Chemical management of Loose smut of wheat (New Experiment):

Centres: Malan, Almora, Ludhiana, Karnal Hisar and Durgapura.

The chemicals will be tested are:

SN	Treatments	Doses
1	Imidacloprid 18.5% + Hexaconazole 1.5% FS	0.2%
2	Carboxin 37.5%+ Thiram 37.5%WS	3 gm/Kg seed
3	Difenoconazole 3% WS	2.5 g kg^{-1} seed)
4	Carbendazim 50%WP	2gm/kg seed
5	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done at heading stage. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

(c) Management of head scab through bioformulations (New Experiment)

Centres (Head scab): Gurdaspur, Ludhiana, Karnal and Wellington

SN	Treatments	Dose per 100g seed
1	KUSH-PlantEx	2 ml
2	KUSH-PlantEx	1 ml
3	KUSH-PlantEx	0.5 ml
4	KUSH-SalBoost	2 ml
5	KUSH-SalBoost	1 ml
6	KUSH-SalBoost	0.5 ml
7	KUSH-PhosphoBoost	2 ml
8	KUSH-PhosphoBoost	1 ml
9	KUSH-PhosphoBoost	0.5 ml
10	Control	-

The chemical will be evaluated under artificial inoculated condition using variety HD 2967 and spray will be done at heading stage. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

Parameters to be recorded: Seed germination, Disease incidence, Plant height after 30 days, Number of tillers, Root biomass, Root volume and Yield

Root biomass Determination method: Uproot the plants carefully in a such as that maximum number of roots remain intact. Remove soil particles by shaking and then clean under running tap-water. After cleaning, separate the roots from stem by cutting at the crown region. Soak excess water from the roots using paper towel or tissue paper. Weigh the roots using an electronic balance. Take observation at 28 and 60 days after sowing.

Root volume Determination method: After the root fresh biomass is recorded, put the roots (from each plant) into a beaker (250 ml or 500 ml) half of which is filled with water. Record the volume of the water displaced by the roots. The volume of the water displaced will be considered as root volume.

(d) Management of Leaf blight through bioformulations (New Experiment)

Centres: Karnal, Ayodhya, Sabour, Kalyani, Coochbehar, Pune and Dharwad

SN	Treatments	Dose per 100g seed
1	KUSH-PlantEx	2 ml
2	KUSH-PlantEx	1 ml

3	KUSH-PlantEx	0.5 ml
4	KUSH-SalBoost	2 ml
5	KUSH-SalBoost	1 ml
6	KUSH-SalBoost	0.5 ml
7	KUSH-PhosphoBoost	2 ml
8	KUSH-PhosphoBoost	1 ml
9	KUSH-PhosphoBoost	0.5 ml
10	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done at heading stage. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

Parameters to be recorded-Seed germination, Disease incidence, Plant height after 30 days, Number of tillers, Root biomass, Yield

(e) Assessment of yield losses caused by stripe rust in wheat (New Experiment)
Centres: Karnal, Ludhiana, Hisar, Pantnagar, Jammu, Durgapura, Gurdaspur

PROGRAMME 10:ENTOMOLOGY

1. **Host plant resistance:** Entomological screening nurseries (ESN), multiple pest screening nurseries (MPSN) and special screening nurseries of promising entries identified during previous season will be evaluated as per following plan.

(a) Entomological screening nurseries (ESN)- In these nurseries, AVT entries along with those found resistant during previous years will be screened for
- **(i)** Shoot fly (Centres: Dharwad, Ludhiana, Kanpur, Niphad)
- **(ii)** Brown wheat mite (Centres: Kanpur and Ludhiana)
- **(iii)** Wheat Aphids (Centres: Niphad, Ludhiana, Karnal, Khudwani, RPCAU Pusa, and Kharibari)
- **(iv)** Root aphid (Centres: Karnal and Ludhiana)

(b) Multiple pest screening nurseries (MPSN)- In these nurseries, the germplasm having resistance to multiple diseases and insect-pests will be screened for
- **(i)** Shoot fly (Centres: Dharwad, Ludhiana, Kanpur and Niphad)
- **(ii)** Brown wheat mite (Centres: Kanpur and Ludhiana)
- **(iii)** Foliar aphids (Centres: Niphad, Ludhiana, Karnal, Khudwani, RAU Pusa, and Kharibari)
- **(iv)** Root aphid (Centres: Karnal and Ludhiana)

2. **Integrated Pest Management**

(a) Survey and surveillance of insect-pests and their natural enemies in wheat and barley cropping systems *(All centres)*

Roving surveys will be carried out at fortnightly intervals during the cropping season in wheat and barley crops for insect-pests and their natural enemies. Population and damage levels of different insect-pests will be recorded and indicated as grades or percent damage inflicted to crop. The peak period of pest activity and its severity of damage will also be recorded.

(b) Influence of sowing time on the incidence and population build-up of major insect pest of wheat (Centres: Karnal, Ludhiana, Kharibari)

The effect of four different dates of sowing i.e. early (first fortnight of November), timely (second fortnight of November), late (first fortnight of December) and very late (second fortnight of December) will be evaluated on the population build-up of major insect-pests of wheat to better understand the insect-pest behaviour under different climatic conditions. At Kharibari, as the wheat sowing is done late, the four different dates of sowing that will be tested are early (first fortnight of December), timely (second fortnight of December), late (first fortnight of January) and very late (second fortnight of January) will be evaluated.

(c) Population dynamics of insect-pests and natural enemies under different residue management scenarios in rice-wheat cropping system (**Centres:** Karnal, Ludhiana)

Effect of different sowing methods (Happy seeder, Superseeder, Rotavator) under varied residue amounts will be tested to study the population dynamics of insect-pests and natural enemies in rice-wheat cropping system.

(d) Assessment of grain yield losses caused by aphid complex in wheat (New Trial) (**Centres:** Karnal, Ludhiana, Kanpur, Kharibari & Niphad, RPCAU, Pusa)

The susceptible wheat variety for aphids will be sown plots in 6 rows of 6 m length in a replicated trial under irrigated conditions in the month of November. The trial will consist of two treatments viz. sprayed and un-sprayed and spraying will be done with CIB recommended insecticide, Thiamethoxam 25% WG 12.5 a. i. g/ha against aphids. Data will be collected at flag leaf stage, ear head and milking stage. During each sampling date, five wheat plants from each plot will be selected randomly and the number of aphids per tiller of each plant will be counted. At harvest, the yield of both sprayed and unsprayed plots will be compared to assess yield losses. To determine the grain weight of sprayed and unsprayed plots, 1000 grains of every plot will be counted and their weights will be compared. Data on weather parameters will also be recorded to determine the change in yield losses with abiotic factors. The data obtained from this experiment will be used to revisit the economic threshold level of aphids for wheat crop.

(e) Management of aphids in wheat through border crops (New Trial) (Centres: Karnal and Kanpur Ludhiana, Kharibari)

The main hypothesis of the experiment is that more diverse cropping systems harboured lower incidence of aphids and help in reduction aphid infestation as compared to mono-cropping systems. In this experiment, the susceptible wheat variety for aphids will be sown plots size of 50 m2 under irrigated conditions in the month of November. Border crop of mustard and radish will be also sown at the same time. Five plants from each plot from main crop as well as border crop will be selected randomly, and observations will be recorded on the number of aphids per tiller of each plant. At harvest time, yield will be recorded from main and border crop.

Treatment	Treatment details
1	Wheat+ 1 row of border crop of mustard
2	Wheat+ 2 rows of border crop of mustard
3	Wheat+ 1 row of border crop of radish
4	Wheat+ 2 rows of border crop of radish
5	Control

(f) Management of aphids through foliar application of new chemical molecules (Centres: Karnal, Ludhiana, Niphad, Kanpur, P RAU Pusa, RPCAU, Pusa)

Following chemicals will be evaluated against foliar aphids in wheat. Insect population counts before and after the treatment will be recorded along with yield in each treatment.

Treatment ID	Treatments	Dosage g ai/ha
T1	Pymetrozine 50% WG	80 g
T2	Pymetrozine 50% WG	100 g
T3	Pymetrozine 50% WG	120 g
T4	Thiamethoxam 25% WG	12.5 g
T5	Imidacloprid 17.8 SL	100 ml
T6	Acetamiprid 20SP	100 g
T7	Untreated Check	-

(h) Management of lepidoterous pests (pink stem borer, army worm & cutworms) of wheat: (Centres: Karnal, Kharibari and Ludhiana)

Following chemicals will be evaluated against lepidopterous insect-pests in wheat. Observations will be recorded on percentage of damage tillers before and after 3,7 and 15 days of treatment. Yield in each treatment will also be recorded during harvest time.

Treatment ID	Treatments	Dosages/ha
T1	Foliar spray of Coragen 18.5 SC (chlorantraniliprole)	125 ml
T2	Soil application of fipronil 0.6 GR	7.0 Kg
T3	Soil application of chlorpyriphos 20EC	2.5 litre
T4	Takumi 20 WG (flubendiamide 20%)	40 g
T5	Takumi 20 WG (flubendiamide 20%)	50 g
T6	Takumi 20 WG (flubendiamide 20%)	60 g
T7	Untreated Check	-

(i) Management of termites through seed treatment of chemical molecules combinations (Centres: Durgapura, Kanpur, Ludhiana)

Following insecticides will be tested as seed treatment /soil application against termites. Observation will be recorded on plant population/m row, per cent damaged shoots/m row after 3,4 and 5 weeks of treatment, per cent damaged tillers/m row at ear head stage, No. of damaged effective tillers/ha and grain yield (q/ha).

Treatment ID	Treatment	Dosage
T1	Seed treatment with Neonix (Imidacloprid 18.5%+ Hexaconazole 1.5% FS)	2 ml/kg of seed
T2	Cruiser 70 WS (thiamethoxam)	1 ml/kg of seed
T3	Cruiser 70 WS (thiamethoxam)	1.5 ml/kg of seed
T4	Soil application of fipronil 0.3 GR	17.5 Kg
T5	Soil application of fipronil 0.6 GR	20 Kg
T6	Soil application of chlorpyriphos 20EC	2.5 l
T7	Soil application of chlorpyriphos 20EC	3.0 l
T8	Untreated control	-

3. Stored Grain Pest Management

(a)Storability and damage potential of major storage insect pests of barley; *Sitophilus oryzae* or *Rhizoperthadominica* in wheat (Centres: Karnal, Niphad, Kanpur and Durgapura)

Each treatment will consist of 0.5 kg seed sample of wheat in a cloth bag. Freshly emerged 20 adults of *Sitophilus oryzae* or *Rhizoperthadominica* will be released into each bag then bags will be closed and kept undisturbed. Experiment will be laid out in RBD design with three replications. The 1st census count will be taken 30 days after inoculation of insects and continued at 60, 90, 120, 150 and 180 days. At each census the dead insects will be removed. During each census, data on weight of seed grains, adult survival population, percent grain damage, percent repellence and percent seed germination will be taken.

PROGRAMME 11: NEMATOLOGY

1. **Monitoring of Nematodes:** *Heteroderaavenae, Anguina tritici, Meloidogyne graminicola* and other plant parasitic nematod*e*: All centres of Nematology
2. **Evaluation of resistance against nematodes parasitizing wheat**
   (a) *Heteroderaavenae*: Hisar and Durgapura. (AVT and EMDSN lines)
3. **Management of cereal cyst nematode, *Heteroderaavenae*in wheat through bio-agents and organic manure (New Trial)**
   Centres: Hisar and Durgapura.

Treatments:

T1-Purpureocillium lilacinum @ 2.5 Kg /ha.
T2-Purpureocillium lilacinum @ 3.5 Kg /ha.
T3-Pseudomonas fluorescens @ 2.5 Kg /ha.
T4-Pseudomonas fluorescens @ 3.5 Kg /ha.
T5-Trichoderma harzianum @ 2.5 Kg /ha.
T6-Trichoderma harzianum @ 3.5 Kg /ha.
T7-T1+500 kg Vermicompost / ha
T8-T4+500 kg Vermicompost / ha
T9-T6+500 kg Vermicompost / ha
T10-Untreated check

Work Plan of Crop Protection-Barley (2023-24)

(A) Plant Pathology

1. Crop Health Survey: All barley cooperating centres in their area of command will carry out the survey and record the incidence and infestation of disease and insect pest in the farmer's fields. **The infected samples of rust will be sent to IIWBR, RS Flowerdale and leaf blight to IIWBR, Karnal for further analysis.** Any entry showing > 40S rust reaction in the trials has to be informed to IIWBR, Karnal and sample should be sent to RS Flowerdale, Shimla for race analysis.

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

i. Initial Barley Disease Screening Nursery (IBDSN):

This nursery will comprise of test entries of station trial of barley breeding centres. The entries will be screened against rusts and leaf blight at hot spot locations.

Yellow rust: Ludhiana, Durgapura, Bajaura, Karnal, Almora and Jammu (6)

Leaf blight: Pantnagar, Kanpur, Faizabad, and Varanasi (4)

ii. National Barley Disease Screening Nursery (NBDSN):

This nursery will comprise of entries from yield trials (IVT and AVT) which will be screened against rusts and leaf blight.

Yellow rust: Ludhiana, Durgapura, Bajaura, Hisar, Almora, Karnal and Jammu (7)

Leaf rust: Ludhiana Jammuand Wellington (3)

Leaf blight: Pantnagar, Kanpur, Faizabad, Varanasi, Dharwad, Coochbehar, and Kalyani (7)

iii. Elite Barley Disease Screening Nursery (EBDSN):

This nursery will have resistant entries identified in NBDSN and EBDSN tested at hot spot locations. The confirmed sources of resistance would later be shared with different barley breeders for their utilization.

Yellow rust: Ludhiana, Durgapura, Bajaura, Hisar, Almora, Karnal and Jammu (7)

Leaf rust: Ludhiana Jammu and Wellington (3)

Leaf blight: Pantnagar, Kanpur, Faizabad, and Varanasi (4)

iv. Seedling Resistant Test (SRT) of NBDSN and EBDSN:

The test would be conducted against different pathotypes of three rusts at RS, Flowerdale, Shimla.

3. Chemical control of leaf blight (**Centres:**Pantnagar, Kanpur, Faizabad, Vijapur and Varanasi)

SN	Treatment	Dosages
1	Tebuconazole 50% + Trifloxystrobin 25%,	0.06%
2	Propiconazole 13.9% + Difenconazole 13.9%	0.1%
3	Azoxystrobin 12.5% + Tebuconazole 12.5%	0.1%
4	Picoxystrobin 7.05% + Propiconazole 11.7%	0.1%
5	Kresoxim Methyl 44.3% SC	0.1%
6	Propiconazole 25%	0.1%
7	Tebuconazole 25.9%	0.1%

8	Mancozeb 75%	0.2%
9	Control	-

The chemical will be evaluated under artificial inoculated condition and spray will be done on initiation of diseases and repeated once after 15 days. Design – RBD, Plot size – 6 rows of 3 meters, replications - 3.

(B) Entomology

1. **Screening of NBDSN and Elite lines against foliar aphids (Centres:** Ludhiana, Kanpur, Khudwani, Pantnagar, Durgapura, Hisar andKarnal).
   The national barley aphid screening nursery (NBDSN) will be continued. It will comprise entries from coordinated trials. Besides, 10-20 extra entries found promising for aphid resistance at Karnal will be screened against aphids at four centres; Ludhiana, Kanpur, Durgapura and Karnal.
2. **Survey and surveillance of insect-pests and their natural enemies in barley (*All centres*)**
   Roving surveys will be carried out at fortnightly intervals during the cropping season for insect-pests and their natural enemies. Population and damage levels of different insect-pests will be recorded and indicated as grades or percent damage inflicted to crop. The peak period of pest activity and its severity of damage will also be recorded.
3. **Management of aphids through foliar application of new bio-chemical molecules** (Centres: Vijapur, Ludhiana, Kanpur, Durgapura and Karnal)
   New chemical molecules will be evaluated against foliar aphids in barley. Insect population counts before and after the treatment will be recorded along with yield to determine efficacy of each treatment.
4. **Storability and damage potential of major storage insect pests of barley; *Sitophilus oryzae* or *Rhizopertha dominica* in barley (**Centres: Karnal, Niphad, Ludhiana, Kanpur and Durgapura)
   Each treatment will consist of 0.5 kg seed sample of barley in a cloth bag. Freshly emerged 20 adults of *Sitophilus oryzae* or *Rhizopertha dominica* will be released into each bag then bags will be closed and kept undisturbed. Experiment will be laid out in RBD design with three replications. The 1st census count will be taken 30 days after inoculation of insects and continued at 60, 90, 120, 150 and 180 days. At each census the dead insects will be removed. During each census, data on weight of seed grains, adult survival population, percent grain damage, percent repellence and percent seed germination will be taken.

(C) Nematology

1. Screening of NBDSN and EBDSN against CCN:

The entries of NBDSN and EBDSN will be tested against Cereal Cyst nematode (CCN) at Durgapura and Hisar centres in sick plots/field.

2. Management of cereal cyst nematode, *Heterodera avenae* in barley through bio agents and organic manure (New Trial)

Centres: Hisar and Durgapura.

Treatments

T1-Purpureocillium lilacinum @ 2.5 Kg /ha.
T2-Purpureocillium lilacinum @ 3.5 Kg /ha.
T3-Pseudomonas fluorescens @ 2.5 Kg /ha.
T4-Pseudomonas fluorescens @ 3.5 Kg /ha.
T5-Trichoderma harzianum @ 2.5 Kg /ha.
T6-Trichoderma harzianum @ 3.5 Kg /ha.
T7-T1+500 kg Vermicompost / ha
T8-T4+500 kg Vermicompost / ha
T9-T6+500 kg Vermicompost / ha
T10-Untreated check

Work Plan of Wheat Quality (2023-24)

Proposed work plan for 2023-24 discussed during the meeting held on 14th August 2023 in virtual mode and 29th August, 2023 held during the workshop meeting is given below.

NIVT and IVT

NIVT and IVT entries will be analysed for grain appearance score, test weight, protein content, and sedimentation value in both *aestivum* and durum wheat genotypes. In addition, phenol reaction in bread wheat and yellow berry and yellow pigment in durum wheat will also be analysed.

- **NIVT 1A** (Irrigated Timely Sown) samples from Ludhiana, Hisar, Durgapura, Delhi, Pantnagar (NWPZ), and Kanpur, RPCAU-Pusa, Varanasi and Sabour (NEPZ) **and**
  5A (NWPZ)(Restricted Irrigation Timely Sown) from Pantnagar, Hisar, Ludhiana, Durgapura, Delhi will be analysed at PAU, Ludhiana.
- **NIVT 1B** (Irrigated Timely Sown) from Ludhiana, Hisar, Durgapura, Delhi, Pantnagar (NWPZ), Kanpur, RPCAU-Pusa, Varanasi and Sabour (NEPZ) **and**
  NIVT 6 (NWPZ) from Ludhiana, Hisar, Delhi, Pantnagar samples will be analysed at RAU, Durgapura.
- **NIVT 2** (Irrigated Timely Sown) samples from Indore, Vijapur, Junagarh, Powarkheda (CZ), Dharwad, Pune and Niphad (PZ) **and**
  NIVT 6 (CZ) from Indore, Vijapur, Junagarh, Powarkheda will be analysed at SDAU**,** Vijapur.
- **NIVT 3A** (Irrigated Late Sown) Entries from Pantnagar, Hisar, Ludhiana, Durgapura, Delhi (NWPZ) andRPCAU-Pusa, Sabour, Kanpur, Varanasi (NEPZ) **AND**
  NIVT 5A (NEPZ)(Restricted Irrigation Timely Sown) from RPCAU-Pusa, Sabour, Kanpur, Varanasi will be analysedatGBPUA&T, Pantnagar Centre.
- **NIVT 3B** (Irrigated Late Sown *T. Aestivum*) samples from Vijapur, Indore, Powarkheda, Junagarh (CZ) and Dharwad, Niphad, Pune (PZ) will be analysed by the quality laboratory at ARS, Niphad.
- **NIVT 4** (Irrigated Timely Sown *T. durum*l) samples from Vijapur, Indore, Powarkheda, Junagarh (CZ) and Dharwad, Niphad, Pune (PZ) will be analysed by the quality laboratory at ARI, Pune.
- **NIVT 5B** (Restricted Irrigation Timely Sown,both durum and aestivum) samples from Vijapur, Indore, Powarkheda, Junagarh (CZ) and Dharwad, Niphad, Pune (PZ) will be analysed at UAS, Dharwad.
- **IVT (NHZ)** samples from Shimla, Almora and Malan will be analysed at ICAR-IIWBR, Karnal.

AVT and HYPT

- AVT and HYPT samples from all the centres mentioned in NIVTs and IVTs will be analyzed by ICAR-IIWBR, Karnal for various quality parameters including baking evaluation of IInd year entries and checks. Grain hardness index of selected centres of AVT/HYPT will be evaluated at ICAR-IARI, New Delhi.

All trials should be conducted as per the standard agronomic practices.

- The last dates for supplying the samples by respective centres were finalized as follows:

NHZ	15th June 2024
NWPZ & NEPZ	20th May 2024
CZ	15th May 2024
PZ	30th April 2024

- 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.

All the co-operators, who will analyze the wheat samples of various NIVTs should send the data to ICAR-IIWBR, Karnal positively by 15th July, 2024, by e-mail in the format used in annual report.

Work Plan of Barley Improvement (2023-24)

The tentative work plan finalized in on line meeting on 14thAugust 2023, was discussed and approved with some additions from the house in the meeting on 30thAugust, 2023 at MPUAT, Udaipur. The following are the details of the technical programme of barley improvement for the season 2023-24.

TECHNICAL PROGRAMME (RABI 2023-24)

AVT-MB-IR-TS-(NWPZ) AVT-I		
Ecology	Irrigated & Timely Sown	
Trial Centres (11)	11+1	Bawal, Hisar, Karnal, Ludhiana, Bathinda, Durgapura, Sriganganagar, Navgaon, Tabiji, Modipuram, Pantnagar, Dholpur (proposed)
No. of varieties + checks	7	
Contributing Centres	**No.**	**Name of varieties**
Karnal	2	DWRB 235, DWRB 238
Durgapura	1	RD 3064
Checks	4	DWRB137, DWRUB 52, RD 2849, DWRB 182
Experimental Design		RBD with 4 (Four) replications

IVT-MB-IR-TS-(NWPZ)		
Ecology	Irrigated & Timely Sown	
No. of Trial Centres	11+1	Bawal, Hisar, Karnal, Ludhiana, Bathinda, Durgapura, Sriganganagar, Navgaon, Tabiji, Modipuram, Pantnagar +Dholpur (proposed)
No. of varieties + checks	25	
Contributing Centres	**No.**	**Name of varieties**
Hisar	3	BH 1055, BH 1056, BH 1057
Pantnagar	2	UPB 1124, UPB 1125
IIWBR, Karnal	6	DWRB 2307, DWRB 2308, DWRB 2309, DWRB 2310, DWRB 2311, DWRB 2312
Durgapura	7	RD 3084, RD 3085, RD 3086, RD 3087, RD 3105, RD 3106, RD 3107
Ludhiana	3	PL 957, PL 958, PL 959
Checks	4	DWRUB52, RD 2849, DWRB 182, DWRB 137@
Experimental Design		Lattice (5x5)
Replications		2
Plot Size		Gross: 5 m x 1.08 m (6 Rows@ 20 cm)

AVT-FB-(NWPZ+NEPZ) AVT-II		
Ecology	Irrigated & Timely Sown	
No. of Trial Centres	7+1	Hisar, Karnal, Ludhiana, Durgapura, Tabiji, Pantnagar, Modipuram, Dholpur (proposed)
	7	Kanpur, Varanasi, Ayodhya, CAU Pusa, Sabour, Ranchi, BISA
No. of varieties + checks	5	
Contributing Centres	**No.**	**Name of varieties**
Pantnagar	1	UPB 1106 (AVT-II)
Checks	4	BH 946, DWRB137, HUB113, BH393 (Filler)
Experimental Design		RBD
Replications		5
Plot Size		Gross: 5m x 2.76m (12 rows)

IVT-FB-(NWPZ+NEPZ+CZ)		
Ecology	Irrigated & Timely Sown	
No. of Trial Centres	20+1	Hisar, Karnal, Ludhiana, Durgapura, Tabiji, Udaipur, Pantnagar, Modipuram, Kanpur, Varanasi, Kumarganj, Pusa (CAU), BISA Samastipur, Sabour, Ranchi, Gwalior, Morena, Tikamgarh, Banda and Vijapur + Dholpur (proposed)
No. of varieties + checks	25	
Contributing Centres	**No.**	**Name of varieties**
Kanpur	3	KB 2211, KB2212, KB 2258
Varanasi	2	HUB 290, HUB 291
Hisar	3	BH1058, BH1059, BH1060
Durgapura	3	RD 3093, RD 3095, RD3096
Pantnagar	2	UPB 1122, UPB 1123
Ludhiana	3	PL 954, PL 955, PL 956
Karnal	3	DWRB 2301, DWRB 2302, DWRB 2303
Vijapur	2	GB1, GB2
Checks	4	BH 946, DWRB137, RD2899, HUB113
Design		Lattice
Replications		2 (Two)
Plot Size		Gross: 5 m x 1.08 m (6 Rows@ 23 cm)

AVT-NB-(NWPZ+CZ)AVT-I & II		
Ecology	Irrigated & Timely Sown	
No. of Trial Centres	11+6	Hisar, Karnal, Ludhiana, Durgapura, Udaipur, Pantnagar, Modipuram, Gwalior, Morena, Tikamgarh and Vijapur (15) + (Proposed- Dholpur, Bawal, Bathinda, Sriganganagar, Navgaon, Tabiji,)
No. of varieties + checks	5	
Contributing Centres	**No.**	**Name of varieties**
Karnal	2	DWRB 223 (AVT-II), DWRB 244(AVT-I)
Checks	3	PL891, K1149, Karan16
Experimental Design		RBD
Replications		5 (Five)
Plot Size		Gross: 5m x 2.76m (12 rows)

IVT-NB-(NWPZ+NEPZ+CZ)		
Ecology	Irrigated & Timely Sown	
No. of Trial Centres	15+6	Hisar, Karnal, Ludhiana, Durgapura, Udaipur, Pantnagar, Modipuram, Kanpur, Varanasi, Kumarganj, Ranchi, Gwalior, Morena, Tikamgarh and Vijapur + (Proposed- DholpurBawal, Bathinda,Sriganganagar, Navgaon, Tabiji)
No. of varieties + checks	14	
Contributing Centres	**No.**	**Name of varieties**
Karnal	3	DWRB 2304, DWRB 2305, DWRB 2306
Pantnagar	1	UPB 1121
Durgapura	5	RD 3088, RD 3089, RD 3090, RD 3091, RD 3092
Ludhiana	1	PL 960
Kanpur	1	KB 2234
Checks	3	PL891, K1149, Karan16
Experimental Design		RBD
Replications		4 (Four)
Plot Size		Gross: 5m x 1.38m (6 rows)

IVT-Rainfed-NEPZ		
Ecology	Rainfed	
No. of Trial Centres	8	Kanpur, Varanasi, Kumarganj, Saini, Pusa (CAU), Sabour, Ranchi and Chiyanki
No. of varieties + checks	17	
Contributing Centres	**No.**	**Name of varieties**
Varanasi	2	HUB 287, HUB 288
Kanpur	5	KB 2201, KB 2215, KB 2231, KB 2247, KB 2255
Ayodhya	2	NDB 1821, NDB 1833
Durgapura	6	RD 3094, RD 3097, RD 3098, RD 3099, RD3100, RD 3108
Checks	2	K603, Lakhan
Experimental Design		RBD
Replications		4
Plot Size		Gross: 5m x 1.38 m (6 Rows),

AVT/IVT-SST-(NWPZ+NEPZ) (AVT- I&II+ IVT)		
Ecology	SST (SAL / ALK)	
No. of Trial Centres	7	Dalipnagar, Kumarganj, IIWBR Hisar-1, IIWBR Hisar-2, CSSRI Karnal, Fatehpur, Bhilwara
No. of varieties + checks	18	
Contributing Centres	**No.**	**Name of varieties**
Hisar	2	BH1061, BH1062
Kanpur	3	KB 2203, KB 2216, KB 2232, KB 2031 (AVT-II), KB 2158 (AVT-I)
Varanasi	2	HUB 293, HUB 294
Durgapura	7	RD 3101, RD 3102, RD 3103, RD 3104, RD 3109, RD 3110, RD 3111, RD 3080 (AVT-I)
Ayodhya	1	NDB 1829
Checks	3	NDB1173, RD2794, RD2907
Experimental Design		RBD
Replications		4 (Four)
Plot Size		Gross: 5 x 1.38 m (6 Rows)

AVT/IVT-RF-NHZ	**IVT+AVT-I**	
Ecology	Rainfed Hills	
No. of Trial Centres	9	Bajaura, Berthein, Malan, Shimla, Almora, Gaza, Khudwani, Wadura, Majhera
No. of varieties + checks	25	
Contributing Centres	**No.**	**Name of varieties**
Bajaura	5	HBL884, HBL885, HBL886, HBL887, HBL888
IARI, RS, Shimla	6	BHS 497# (AVT-I), BHS 498, BHS 499#, BHS 500#, BHS 501@, BHS 502
Pantnagar	3	UPB 1118@, UPB 1119, UPB 1120
Almora	6	VLB184 (AVT-I), VLB 185@, VLB 186, VLB 187, VLB 188@, VLB 189@
Checks	5	HBL113@, BHS352#, BHS380, BHS400, VLB118
Experimental Design		RBD
Replications		4 (2 for cut and 2 non cut)

IVT-DP-(NWPZ+NEPZ+CZ) IVT-Dual Purpose		
Ecology	Irrigated & Timely Sown	
No. of Trial Centres	15+1	Hisar, Karnal, Ludhiana, Durgapura, Udaipur, Pantnagar, Modipuram, Kanpur, Varanasi, Kumarganj, Ranchi, Gwalior, Morena, Tikamgarh and Vijapur +Dholpur (proposed)
No. of varieties & checks	14	
Contributing Centres	**No.**	**Name of varieties**
Karnal	6	DWRB 2313, DWRB 2314, DWRB 2315, DWRB2316, DWRB2317, DWRB2318
IGFRI Jhansi	6	JHSBD11, JHSBD22, JHSBF21, JHSBF28, JHSBB19, JHSBE16
Checks	2	DWRB137, RD 2715, RD 2552
Experimental Design		RBD
Replications		4 (Four)
Plot Size		Gross: 5m x 1.38m (6 rows)

Minimum site means to reject or accept all AICRP barley trials have been revised.

The following recommendations were made.

Zones	Sowing Time	Minimum limit of location mean yield, q/ha to retain trial for data analysis					
		Malt Barley	Feed Barley	Hulless Barley	Rainfed condition	Salinity Barley trials	Dual Purpose barley
NWPZ	Nov. 5-20	35 (30)	35(30)	30 (*)	20 (15)	20 (15)	25 (*)
NEPZ	Nov. 5-20	35(30)	35(30)	25 (*)	20(15)	20 (15)	20(*)
CZ	Nov 5-20	35(30)	35(30)	25 (*)	20(15)	20 (15)	20(*)
NHZ	Oct. 25-Nov.10	20 (*)	20 (15)	15 (*)	20 (15)	***	15 (12)
Recommended doses of fertilizers applications in Kg/ha.							
N:P:K		90:40:30	60:30:20	60:30:20	40:30:20	75:30:20	75:30:20

Figures given in brackets are previous limits. (*) previous limits not available.

Work Plan of Barley Quality (2023-24)

1.Malt Barley Yield Trials

Identification of Promising genotypes for malting quality traits

Trial: Advanced Varietal Trial (Malt Barley) and Initial Varietal Trial (Malt Barley)

Number of Locations: 12 each

Entries: AVT = 7, IVT = 25 Total = 32 genotypes

Traits to be analysed:

Grain traits: Test weight, Thousand Grain weight, Kernel Plumpness, Husk Content, Germination percentage, Protein Content, Starch Content, Beta Glucan content

Malt traits: Malt yield, Friability, Homogeneity, Wort Filtration rate, Wort pH, Wort Colour, Saccharification Rate, Hot Water Extract, Wort Beta Glucan, Wort Free Amino Nitrogen

2.Barley Quality Component Screening Nursery

Identification of promising sources of quality traits with respect to malt and food barley for use in Quality Improvement Programme

Malt Barley Genotypes: 25

Food Barley Genotypes: 25

Number of Locations: 6 (Karnal, Hisar, Ludhiana, Pant Nagar, Kanpur &Durgapura)

3.Feed &Hulless Barley Trials

Quality Evaluation of Feed and Hulless Barley Genotypes

Trials: AVT and IVT of Feed Barley/Hulless Barley

Zones: NWPZ, NEPZ, CZ & NHZ

Entries: AVT = 13, IVT = 111 Total = 124 genotypes

Grain Traits: Test Weight, Thousand Grain Weight, Protein, Starch, and Beta Glucan (in selected entries of hulless genotypes)

Session VIII: State report from State and Farmers Interaction

Chairman	Dr PL Gautam, Chairman RAC Karnal
Co- chairman	Dr SK Pardhan, ADG (FFC) ICAR New Delhi
	Dr Gyanendra Singh, Director, IIWBR, Karnal
Rapporteurs	Dr Hari Ram Saharan, PAU Ludhiana, Dr Amit Sharma

The session began with greeting remarks. The first lecture was given by Dr. Mathew Paul of Rothemstead Research, United Kingdom, on the topic of "Increasing plant blood sugar to increase wheat yield." He explained the role of sugar signalling in wheat crop yield enhancement. He emphasised the importance of using T6P enzyme to increase cereal yield. The Chairman inquired about the application of this concept to other crops/varieties. Yes, according to Matthew, this concept can be applied to other crops and varieties. Dr. Seva Ram PI (Wheat Quality) asked Matthew whether T6P is also metabolized in grains. Mathew replied, no, it is only metabolized within plants.

Farmers Interaction

The topic of discussion was terminal heat stress, as raised by farmer Sh Vikas Chaudhary from Tarawari, Haryana. He highlighted that this particular stress resulted in a yield loss of approximately 3-4q/acre during the agricultural season of 2021-22. The cause of the grain yield reduction in the previous year was attributed to lodging. The utilization of the Happy Seeder is considered to be the most optimal approach for effectively managing the challenges posed by terminal heat stress and lodging. The utilization of the happy seeder can be expanded to encompass additional crops such as maize, jowar, sorghum, and berseem. The seed rate in the Happy Seeder can be reduced to 25-30 kg. The individual expresses apprehensions over the presence of weeds in the use of Happy Seeder technology. Additionally, he sent a warning to the collective regarding the allure of rural youth towards the agricultural sector.

Mr. Umesh Pawar, hailing from Western Uttar Pradesh, expressed his felicitations to the Indian Institute of Wheat and Barley Research (IIWBR) for their commendable achievements in wheat production. The individual placed significant emphasis on the practice of organic farming in relation to the cultivation of sugarcane, wheat, and rice. The speaker placed significant emphasis on the utilization of C 306, DBW 187, and DBW 327 cultivars within the context of organic agriculture. The individual provided an explanation regarding the use of bio control methods for managing pests, the application of jeevamrit as a nutritional supplement, and the incorporation of nano particles to boost organic carbon levels in soil within the context of organic farming. He once again emphasizes the importance of breeding varieties of wheat that can withstand high temperatures in the month of March. The individual expressed gratitude to the Indian Council of Agricultural Research (ICAR) for providing a platform to market their goods at the Indian Agricultural Research Institute (IARI) in New Delhi. The farmer presented a researchable topic concerning the development of a new variety, specifically similar to C306 in quality, with enhanced resistance to rust.

Mr. Kuldeep Singh, a resident of Milkhaie village in Punjab, expressed his gratitude to the Indian Institute of Wheat and Barley Research (IIWBR) for extending an invitation to him for the meeting. The author examined the issue of differentiating glume blotch from cultivars

containing a specific gene. The individual expressed admiration for the efforts made by the Punjab Agricultural University (PAU) in developing varieties suitable for crop residue management (CRM), such as PBW 869, as well as other biofortified and high-quality types specifically intended for chapati preparation. The speaker emphasised the need to enhance research efforts to develop character-specific and CRM-specific varieties. Additionally, he cautioned against the occurrence of premature germination in the house due to unexpected rainfall.

There was no representative from any state who was available to provide a comment.

The session concluded with the expression of gratitude through a formal vote of appreciation.

Session IX: Plenary Session

August 30, 2023	**Chief Guest**	Dr RS Paroda, Chairman, TAAS and Former Secretary, DARE & DG, ICAR, New Delhi
	Chairman	Dr PL Gautam, Chairman RAC, ICAR-IIWBR, Karnal & Former Vice Chancellor, GBPUAT, Pantnagar
	Co-Chairman	Dr Ajeet Kumar Karnatak, VC, MPUAT, Udaipur
	Special Guest	Dr SK Pradhan, ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs PL Kashyap and Pramod Prasad
	Session Coordinators	Drs Vanita Pandey and Umesh R Kamble

The Plenary session of 62ndAll India Wheat and Barley Research Workers' meet started with the welcome address by Dr. Ratan Tiwari, Organizing Secretary of the meet. The chairman in his opening remarks welcomed the delegates and invited all the Principal Investigators (PI's) to present the significant recommendations for crop season 2023-24. The observations made by the Chairman and other dignitaries were as follows:

Dr PL Gautam, chairman of the session advocated for highlighting the contribution of indigenous and foreign materials in crop improvement programme and focus should be more on the utilization of indigenous wheat and barley genotypes in the future breeding programme. The Chairman desired clear and sound recommendations on the use of Nano-urea in wheat and barley crops after appropriate experimentation. Dr PL Gautam had emphasis on educating the people about health benefit of barley by organizing meetings, using digital and social media as well as by publishing in newspapers, newspapers and folders etc. Targeted research for product specific quality especially for malting purpose i.e., reduction of protein content under permissible limit should be initiated. He urged wheat researchers for judicious use of genetic resources, capacity building and nourishing of new staff, relook at the distribution of trials, data recording, statistical analysis of the data, etc. He was much concerned about the wrong conduction and rejection of AICRP trials.

Dr ML Jat discoursed to consider cropping pattern to analyze the effect of different fertilizers in wheat and barley, and to plan such trials with utmost care. Dr. RS Paroda suggested coming up with some critical and specific recommendations for all new technologies. He advised that wheat programme need to come with some good recommendation for the benefit of farming community and help in formulating new policies for the use of fertilizers in wheat and barley.

Dr. RR Hanchinal was concern about the non-conduction and rejection of AICRP trials. He suggested being practical while promotion and release of a particular wheat and barley variety, and promotion of *dicoccum* wheat especially for terminal heat stress prone areas. He recommended use of modern tools for precision phenotyping to get more reliable data. He also raised concern about the issues related to the celiac disease and reducing area under barley crop. Dr SK Pradhan emphasized on working for climate resilient varietal development, use of molecular markers for improved wheat and barley breeding, durable stress tolerance, and establishing quality parameters for barley.

After presentations by PIs of respective programmes, report of varietal identification committee was presented by Dr. Gyanendra Singh. He declared the list of varieties identified during 2022-23. A total of sixteen wheat and barley proposals were submitted for identification and area extension.

Dr. Ajeet Kumar Karnatak advised wheat workers to work for need based varietal development, food processing etc. He congratulated wheat and barley research workers for bumper yield and ensuring food security of the country. He acknowledged the organizing secretary of the meet for choosing MPUAT, Udaipur for this meeting.

After the remarks, felicitation of superannuating wheat & barley researchers was done and proposal for venue of 63rd All India Wheat and Barley Research Workers' Meet 2024 workshop were discussed. Two venues i.e., Dharwad and Srinagar were proposed by the participants. The final decision on the venue will be taken by governing body in due-course.

Finally, Dr. RS Paroda, congratulated and appreciated the hard work of wheat and barley group and quoted "*National Food Security is Synonymous to Wheat Production*". He was concerned about the final recommendation of the meeting, which he thought were not unambiguous rather very routine. He suggested wheat family to come up with a strategy paper on wheat, mentioning where we stand at present and could be future of wheat in India. He desired to see India as the leading wheat producer in the world by improving productivity and bridging the yield gap of average yield to the national average.He emphasized to diversify wheat production by promoting durum and *dicoccum* wheat, ensure international collaboration with the researchers from international organizations like CIMMYT, ICARDA, JIRCAS and others, monitor different AICRP trials, strengthen capacity building of researchers, etc. He was of the opinion of planning a separate annual wheat research conference alongside All India Wheat and Barley Research Workers' meet. The session ended with a vote of thanks by Dr Arvind Verma, Director Research, MPUAT, Udaipur, and Organizing Secretary, 62nd All India Wheat and Barley Research Workers' meet.

Significant Recommendations for Crop Season 2023-24

Crop Improvement

- Promotion and retention of the testing entries in breeding trials will be done on significant superiority. However, for crop season 2023-24 only entries statistically at par with the best check of the zone and /or with special traits will be promoted.
- Advanced varietal trials and initial varietal trials will be constituted at respective zonal coordination units. The entries for late sown conditions will be promoted in comparison to late sown check and separate AVTs for timely sown and late sown conditions will be constituted.
- Special trial for dicoccum will be initiated in PZ, and NIVT-4 will also be conducted in NWPZ. For the diversity analysis of AVT entries, more detailed data will be added. i.e., gene/allele specific data.
- QCBWSN will be constituted based on the pipelines materials from centres to addressed for quality parameters to provide additional data on grain quality.
- For streamlining trial conductance and reporting, one orientation course on AICRP activities for new incumbents will be conducted during 2023-24 at ICAR-IIWBR, Karnal. As an initiative to strengthen / orient research for wheat improvement, trials/problems specific programmes will be proposed at major centers.

Resource Management

- Pre-emergence tank-mix application of either pyroxasulfone + pendimethalin @ 127.5 + 1250 g/ha or pyroxasulfone + metribuzin @127.5 + 280 g/ha can be used for control of diverse weed flora in wheat.
- If pre-emergence application could not be done then pyroxasulfone in combination with metsulfuron @ 127.5 + 4 g/ha is recommended as early post-emergence just before the first irrigation for broad spectrum of weed flora control in wheat.
- Based on AICRIP experiment findings two foliar spray of either nano urea at 1600 ml/ha or 5% urea in 400 litre of water at tillering and jointing stages along with 75% RDF produced statistically similar yield as with RDF in NWPZ, NEPZ, CZ and PZ under irrigated timely sown and restricted irrigated conditions. Similarly, two foliar sprays of nano urea at 1600 ml/ha or 5% urea in 400 litre of water at tillering and jointing stages along with RDF improved the grain yield (3.0-5.0 q/ha) in NWPZ, NEPZ, CZ and PZ over RDF under irrigated timely sown conditions.
- Two foliar spray application of 0.5% $ZnSO_4.7H_2O$ at stem elongation and milk stages are recommended for agronomic biofortification of wheat with an increase of 10.4-46.0% Zn content of grains over RDF in NWPZ, NEPZ and CZ under irrigated timely sown conditions.
- It is recommended that foliar spray of 5% urea + 0.5% $ZnSO_4.7H_2O$ at anthesis stage along with 75% RDF may be used to improve grain yield (9.6%) and protein content of grains (3.6%) over RDF in barley in NWPZ depending upon the status of micronutrients in soil.

Wheat Quality

- There are huge variations in several quality traits across centres and hence it is recommended that standard common agronomic practices should be followed by each centre conducting the trials to identify superior genotypes for nutritional quality traits.

- Development of biofortified varieties has become a national priority and hence it is recommended to reinitiate Quality Component and Biofortification Nursery (QCWBN) and scientist contributing towards QCWBN should provide only the entries having exceptionally high Fe, Zn and protein content for testing.
- Keeping in view the health benefits of *dicoccum*, it is recommended to reinitiate *dicoccum* trial and UAS, Dharwad centre should help in evaluating quality parameters for identification of superior cultivars.
- Training on wheat quality protocols will be conducted at ICAR-IIWBR, Karnal (18-22 September, 2023) to minimize errors in estimating different quality traits. Hence, scientists from the centres involved in quality analysis should attend the meeting.

Crop Protection

- Two major recommendations i.e., need based applications Tebuconazole 50% + Trifloxystrobin 25% WG @0.06% for the management of leaf rust, stem rust and head scab in wheat and Tebuconazole 50% + Trifloxystrobin 25% WG @0.1% the management of leaf blight of wheat under farmers' fields.
- Besides this, need-based foliar spray of Chlorantraniliprole 18.5 SC (Coragen) @ 150 ml/ha was recommended for the management of pink stem borer in wheat.
- Use of preventive measures i.e., quarantine, adoption of alternate crop plan, grow wheat blast resistant varieties identified for the NEPZ with seed treatment etc. in disease prone areas were recommended along with strict monitoring for wheat blast in NEPZ specially areas bordering to Bangladesh.
- A basic training program will be conducted for the newly associated scientists/technical staff of crop protection programme to give them hand on experience on disease and insect pest scoring, recording and reporting of data to strengthen the program objectives.

Barley Network

- Information on row type and hulled/ hulless should be supplied by the centre at the time of nomination of their entries to ICAR-IIWBR, Karnal for constitution of trials, in addition to the germination report as per last year recommendation.
- All the centres must adhere to the technical programme sent to them and should follow the plot size and layout mentioned for each trial.
- To enhance the productivity in low moisture areas application of Silicon @ 150kg/ha with three irrigations is recommended based on AICRIP trial findings.

Social Sciences

- Wheat demonstrations will be conducted in 520 acres areas in Punjab, Haryana, Rajasthan, Jammu & Kashmir and Uttar Pradesh at schedules castes farmer's fields under SCSCP programme.
- In the case of barley, Front line demonstrations will be conducted in 140 ha as per the allocation from the Ministry of Agriculture and Farmers Welfare for the year 2023-24.

SPECIAL SESSION
Varietal Identification Committee Meeting

August 28, 2023
September 05, 2023

Chairman: Dr. T R Sharma, DDG(CS)
Member Secretary: Dr. Gyanendra Singh, Director, IIWBR
Venue: Dean's Committee Room, RCA, MUAT, Udaipur
Office of DDG (CS), ICAR Hqrs., KB, New Delhi

The meeting of Varietal Identification Committee of Wheat & Barley was held on 28 August 2023 during 62nd AGM of All India Coordinated Research Project (AICRP) on Wheat & Barley under the Chairmanship of Dr. T R Sharma, DDG (CS). The following members participated in the meeting:

1. Dr. T R Sharma, DDG (CS), ICAR, Krishi Bhavan, New Delhi*(Chairman)*
2. Dr. S K Pradhan, ADG (FFC), ICAR, Krishi Bhawan New Delhi
3. Dr. D K Yadav, ADG (Seed), ICAR, Krishi Bhawan New Delhi
4. Dr. P K Singh, Agriculture Commissioner, GOI, MOAFW (*Online*)
5. Dr. Sanjay Kumar, Director, ICAR-IISS, Mau Nath Bhanjan
6. Dr. M S Saharan, Head, Plant Pathology Division, IARI, New Delhi
7. Dr. P K Tyagi, GM (Production), NSC, Beej Bhawan, Pusa Campus, New Delhi
8. Dr. Arvind Verma, Director Research, MPUAT, Udaipur
9. Dr. G P Singh, Director, ICAR-NBPGR, New Delhi (*Online*)
10. Dr. Ravish Chatrath, Emeritus Scientist, Karnal
11. Dr. S K Sharma, MD, Signet Crop Science India Pvt., Ltd
12. Dr. Gyanendra Singh, Director, ICAR-IIWBR, Karnal (*MemberSecretary*)

All Principal Investigators (PI) from IIWBR, Karnal also attended as Non-Voting members.

The wheat & barley varietal proposals were examined during this meeting. Some of the proposals were considered for identification in this meeting.

Subsequently, to reconsider the pending proposals, a meeting was held on 05.09.2023 at 5:00 pm, in the Office of the Deputy Director General (CS), ICAR Hqrs., Krishi Bhavan, New Delhi. The meeting was attended by:

1. Dr. T R Sharma, DDG (CS), ICAR, Krishi Bhavan, New Delhi*(Chairman)*
2. Dr. P K Singh, Agriculture Commissioner, GOI, MOAFW
3. Dr. M S Saharan, Head, Plant Pathology Division, IARI, New Delhi
4. Dr. Ravish Chatrath, Emeritus Scientist, Karnal
5. Dr. Gyanendra Singh, Director, ICAR-IIWBR, Karnal (*Member Secretary*)

Other members were apprised of the concerns and their input was taken before the decisions taken on the suitability of the proposals. After detailed deliberations, during both the meetings, the following recommendations unanimously, as indicated against each proposal were made:

SN	Name of Variety	Production conditions	Recommendations
North Western Plains Zone (NWPZ): Punjab, Haryana, Delhi, Rajasthan (excluding Kota and Udaipur division), Western Uttar Pradesh (except Jhansi division), Jammu and Kathua district of Jammu & Kashmir, Paonta Valley and Una district of Himachal Pradesh and Tarai region of Uttarakhand.			
1.	HD3386	IR-TS	The variety was **identified** based on its **superior yield** and **disease resistance**.
2.	WH1402	RI-TS	The genotype was **identified** based on its **yield superiority**, **disease resistance** and **superior grain quality**.
North Eastern Plains Zone (NEPZ): Eastern UP, Bihar, Jharkhand, Orissa, West Bengal, Assam and plains of NE States.			
3.	HD3388	IR-TS	The variety was **identified** based on its **superior yield** and **disease resistance**.

Central Zone (CZ): Madhya Pradesh, Gujarat, Rajasthan and Chhattisgarh states.			
4.	NWS2194	IR-TS	Both the genotypes were considered together. NWS2194 was **identified** for release due to its **heat tolerance (HSI = 0.97)** and being **highly resistant** to black and brown rusts. GW547 was **identified** as based on its superior grain quality, **protein content (12.6%),sedimentation value (55.2cc**) and **zinc content (40.5ppm)**
5.	GW547	IR-TS	
6.	DBW359	RI-TS	Both the proposals were considered together and **both were identified**. CG1040 was having yield advantage and superior grain quality. DBW359 had better disease resistance and grain quality such as **sedimentation value (55.5cc)** and **iron content (40.3ppm)**.
7.	CG1040	RI-TS	
8.	DBW377	ES-HF	The genotype was**identified** as it hadyield advantage to the check varieties and also resistance to **wheat blast** disease.
Peninsular Zone (PZ): Maharashtra, Karnataka and plains of Tamil Nadu			
9.	MP1378	IR-TS	The proposal was considered by the committee and **identified** based on its yield superiority and disease resistance.
10.	HI1665	RI-TS	All the three breadwheat genotypes were considered together, and **were identified**for release based on yield and other parameters as indicated below: HI1665: **Protein content (12.0 %), Low gluten index (44)** and high G**rain zinc** (**40.0 ppm**). DBW359: Better disease resistance and grain quality such as **sedimentation value (55.5cc)** and **iron content (40.3ppm)**. NIAW4028: Rust resistance, P**rotein content (12.4%),sedimentation value (59.0cc**).
11.	DBW359	RI-TS	
12.	NIAW4028	RI-TS	
13.	UAS478(d)	RI-TS	Both the genotypes were considered together. UAS478(d) was **identified** based on yield superiority and better grain quality: High yellow pigment content (**7.2 ppm**). HI8840(d) was **identified** based on its yield advantage along with superior grain quality: high **grain zinc** (**41.1 ppm**), and excellent yellow pigment (**7.3 ppm**).
14.	HI8840(d)	RI-TS	
North Western Plains Zone (NWPZ): Punjab, Haryana, Delhi, Rajasthan (excluding Kota and Udaipur division), Western Uttar Pradesh (except Jhansi division), Jammu and Kathua district of Jammu & Kashmir, Paonta Valley and Una district of Himachal Pradesh and Tarai region of Uttarakhand.			
15.	DWRB219	IR-TS	The barley genotypes was **identified,** based on its yield superiority and malt quality.
Proposals for Area Extension			
16.	DBW327	CZ HF-ES	The variety was **recommended for area extension** in MP, Gujarat, Rajasthan, Chhattisgarh states.

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

G. Singh 05/9/23

Gyanendra Singh
(Member Secretary)

Tilak Raj Sharma
(Chairman)

OBSERVATIONS OF PAMC DURING 62ND ICAR - AICRP WHEAT AND BARLEY RESEARCH WORKERS' MEETING HELD AT UDAIPUR (AUGUST 28-30, 2023) AND RECOMMENDATION THEREOF:

It is a matter of great pleasure to note that an all time record production of more than 112 million tonnes of wheat production in 2022-2023 achieved by deployment of improved varieties, production and protection technologies, enhanced capacity and awareness among the farmers and other stakeholders. It was possible due to the great efforts of farmers, scientists and policy makers. During 62nd All India Wheat and Barley Research Workers' Meet held on 28-30 August, 2023, there was a marathon discussions on innovative approaches in varietal development, production and protection technologies to further improve the production and productivity in both Wheat and Barley. Based on the discussions for three days, PAMC recommends the following actionable points.

I. GENERAL RECOMMENDATIONS

1. Strengthening in-house breeding material development

Breeding strength of main centres should also be reflected in their ability to build upon and exceed the robust, widely adapted germplasm pipelines of CIMMYT and ICARDA rather than merely selecting out the better lines from these centres. Several gaps in form of general and region-specific challenges in the realm of biotic and abiotic stress tolerance as well as quality are present and need to be clearly demarcated for addressing through consistent breeding work by the centres. Near complete levels of stripe rust resistance required for yield protection, pyramiding of effective resistance genes against multiple rusts, Karnal bunt resistance, higher levels of tolerance to rapid-ramping heat stress in NWPZ, appropriate plant height and lodging tolerance under low sunlight/foggy winter conditions, premium chapatti quality, high bread loaf volume represent a few such targets. Exploitation of land races such as Hango (possess Lr80 and Sr65) for disease resistance, Sphaerococcum wheat for heat tolerance and Dicoccums for both heat tolerance and improved nutritional quality provide a small illustration of rich genetic resources which in-house breeding programmes can tap. In India more than one million cases per year are recorded on gluten sensitivity causing inflammation damaging the small intestine's lining, leading to medical complications caused by gluten intolerance and celiac disease. Hence, indigenous/exotic germplasm with low gluten should find use in developing new varieties to solve such emerging problems. ICAR-IIWBR thus needs to develop a long term strategy for energising in-house breeding material development.

2. Improving efficiency of the programme

- **Non performing centres:** Non performing centres and scientists should be quickly demarcated and dealt with strictly in the interest of overall health of the network.
- **Strengthening wheat quality centres: E**quipment and protocols in all laboratories should be uniform/at par for analysis of samples. Regular training to laboratory technicians may be introduced. Regular analysis of mandi samples may be continued.

- **Coding of trials and making sub packets:** Instances of dramatic change in rust resistance from one year to the next indicates problems in coding and making of sub packets Utmost care needs to be exercised and a cross checking mechanism should be introduced.
- **Conduct and monitoring of trials**

  In conduct of trials the field history (preceding crop and its management) should be clearly documented as this will have significant effect in crop response.

  Unrealistic situations in data recording such as a rust resistant entry at seedling stage becoming susceptible at adult plant stage should receive immediate/timely attention. It would help in resolving the cause- e.g., in this case it could be human error or a new race and also facilitate necessary follow up e.g., in this case samples showing more than 40S infection should be sent for racial analysis at Shimla.

  Monitoring of trials should be taken seriously and non-participation by designated scientists be reflected in the report. Monitoring of barley should be separate than that of wheat as there is a difference in the maturity of two crops.
- **Strengthening Agronomic Research:** The agronomic research should be conducted in a systems mode. The agronomic research needs to be strengthened through aligning/netter integration of wheat trials with various AICRPs related to NRM. IIWBR should engage with important AICRPs such as Weed management (DWR), cropping/farming systems (IIFSR), water management (IIWM), nutrient management (IISS) etc. to identify the common converging opportunities to avoid redundancy, improve efficiency and come-up with more meaningful recommendations.
- **Mechanization of trials:** To reduce variability and increase precision, all trials (breeding as well as agronomic) should be mechanized. This can be done in close association with other AICRPs and SAUs as mechanization needs for many crops are similar and multi-crop, multi-utility machinery can help. A status report of different centres may be prepared in this regard.
- **Capacity building in different disciplines:** With new batches of scientists joining the wheat and barley programmes, there should be frequent and regular induction and orientation training of scientists in precise conduct of the trials, recording of observations, and rating of disease reactions etc. If resource/ time are issues, these refresher courses can be conducted online also.

II. **SESSION BASED INPUTS**

1. Discipline wise presentation of Progress Report -2022-23 (Session IV)

- **Crop Improvement**

  The strength of the programme with respect to its size (number of trials) and stringency of evaluation is evident and was reflected in the presentation. While the data from the varietal trials is essentially for the year under report, some other information generated in this discipline is better captured if some perspective or trend over years is indicated. This is particularly true for marker based diversity analysis wherein a brief comment/perspective may be added to the dendrogram.

New insights are likely to emerge from the particular set of material under testing in a given year as also the unique features of each crop season. These new observations/insights have potential for course correction or providing feedback for the breeding strategy. The session on crop improvement should mention these new insights.

- **Resource Management**

  Apart from recommendations from experiments that have reached completion, updates from long term experiments (e.g., on resource conservation technologies) in terms of soil health improvement, productivity, etc. should be included in the presentations.

  The final recommendation on Nano Urea as presented during the session should include cost effectiveness vis-a-vis ordinary urea for dissemination this information to farmers and other stakeholders.

- **Crop Protection**

  The inconsistency and some very high scores in Karnal Bunt data across sites needs to be analysed for likely reasons. This screening procedure for this disease continues to be problematic and needs to be addressed by revisiting it. A brainstorming session organised by ICAR-IIWBR may be relevant in this regard. Ensuring training and sensitizing of scientists/technicians for precision screening is also important.

  It is not very useful to indicate completely defeated obsolete like Yr2 and Yr 9 in rust resistance gene postulation studies. Information available on effective genes needs to be highlighted. It may be useful to indicate likely resistance conferring source based on parentage and show how many of the test entries carry similar resistance genes (resulting in resistance gene based grouping).

  The pattern of rust pathotypes prevailing in different regions needs to be seen in context of varietal mosaic existing in these regions. As a large number of varieties are now available for each zone, the 'variety and rust pathotype' pattern can provide actionable information for varietal deployment on regional level as well as on individual farmers' fields.

III. Panel Discussion on increasing Area and Production of Barley (Session V)

- Looking into the importance of barley as low input, high nutritive, food and fodder crop, the barley crop needs promotion. Initial acreage promotion can come from enhancing proportion of barley with respect to wheat in areas where some traditional barley cultivation is already in place. Awareness campaigns about nutritional benefits of barley and consumer sensitization needs to be taken up. User base beyond feed and malt may be targeted by exploring options such as blending of barley flour with wheat flour for chapatti and other products. Some barley processing industries requested for re-introducing barley trials in Peninsular Zone which may be considered.
- Inter-institutional collaboration of IIWBR, Karnal with IGFRI, Jhansi for oats and barley for multipurpose types and broadening of germplasm base needs to be pursued. IGFRI representative may be invited to the workshop or special meetings conducted.

- Barley group incharge may prepare a policy input document to be sent to ICAR headquarters for taking up with relevant quarters the issues regarding imposing of import duty on barley to encourage local production and for ensuring procurement of barley at MSP

IV. Progress of Research Work by NHZ and PZ centres (Session VI)

- **Palampur, Almora, Shimla**
  - Wider spectrum of effective stripe rust resistance genes need to be deployed in NHZ, the vanguard region for this disease. ICAR-IIWBR should ensure availability of appropriate genetic stocks as donors to these centres.
  - In absence of regular seed indenters, farmers' field seed production programme need to be strengthened under guidance and monitoring of the research institutes
  - Regional germplasm strengths (e.g., barley landraces from Lahaul) or location advantages (winter wheat x spring wheat crosses at Almora) deserve appreciation and further strengthening
- **Pune, Niphad, Dharwad**
  - With the increased importance of tetraploid wheat in nutrition and therapeutic value, an emphasis on these especially dicoccum is required. Breeding work to improve the quality should also be taken up at Dharwad and Wellington centres.
  - Gene pyramiding using Lr 24 and Lr 28 was presented. Focus should shift to new genes as PZ is the critical region for this disease. ICAR-IIWBR should ensure availability of appropriate genetic stocks as donors to these centres.
  - There is considerable area under rainfed conditions in Karnataka and southern Maharashtra. Earlier there used to be separate rainfed trials in peninsular zone and now these trials are discontinued. Hence, these trials may be continued again keeping interest of rainfed wheat farmers.
  - Each recommendation/input may please be conveyed to relevant scientists or working groups for action at their end and submission of an action taken report before the next workshop.

Annexure II

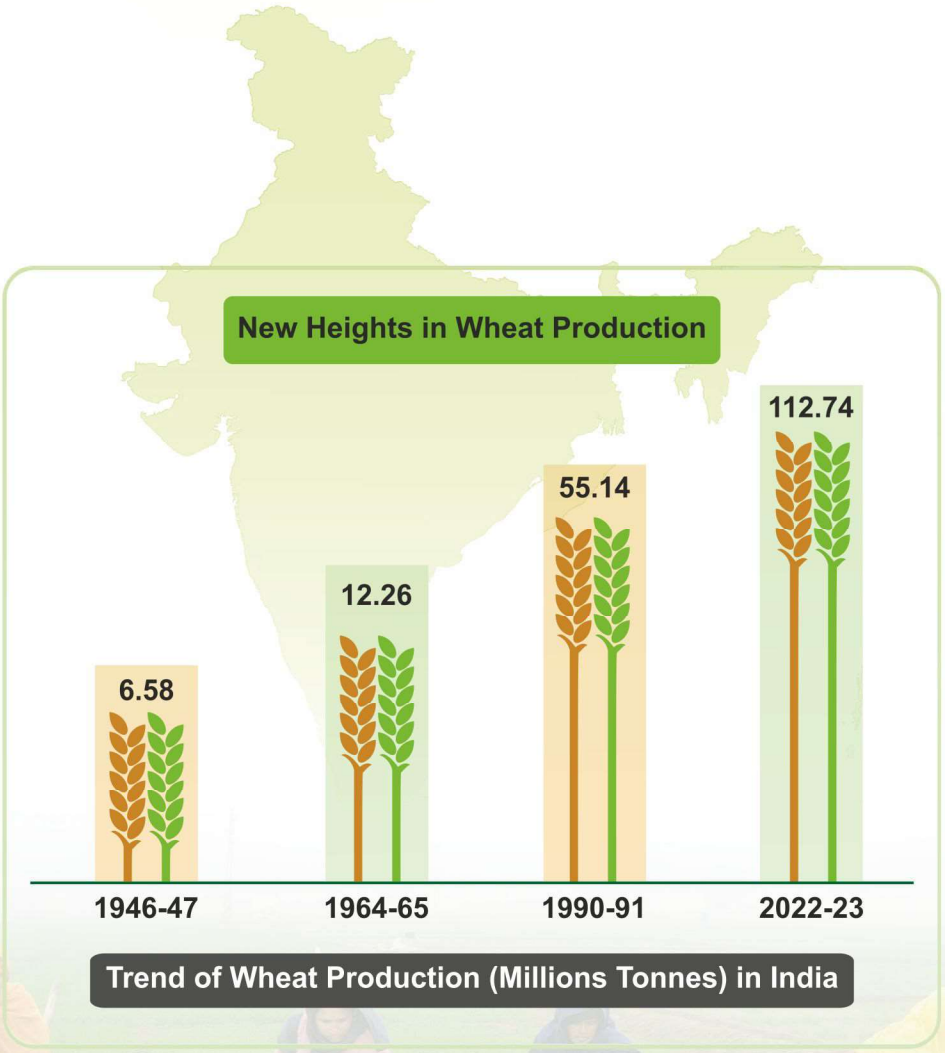
AGENDA 62nd ALL INDIA WHEAT & BARLEY RESEARCH WORKERS' MEET *Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur, (Rajasthan), India* *(August 28-30, 2023)* *Venue: RCA, Auditorium, MPUAT, Udaipur (Rajasthan)*		
DAY-1: August 28, 2023 (Monday)		
08.30-09.00	**Welcome Tea &Registration**	
09.00-11.15	***Session-I: Inaugural Session***	
	Chief Guest	**Dr. Himanshu Pathak,** Secretary, DARE & Director General, ICAR, New Delhi
	Chairman	**Dr. Ajeet Kumar Karnatak,** Vice-Chancellor, MPUAT, Udaipur
	Guest of Honour	**Dr. TR Sharma,** Deputy Director General (CS), ICAR, New Delhi
	Special Guests	**Dr. DK Yadava**, ADG (Seeds), ICAR, New Delhi
		Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs. BS Tyagi & Suma Biradar
	Stage Convener	Dr. Anuj Kumar, ICAR-IIWBR, Karnal
09.00-9.10	ICAR & MPUAT Songs	
09.10-09.15	Welcome Address	**Dr. Arvind Verma,** Director Research, MPUAT, Udaipur
09.15-09.30	Brief Progress Report (2022-23)	**Dr. Gyanendra Singh**, Director, ICAR-IIWBR, Karnal
09.30-09.40	Remarks by the Special Guests	**Dr. SK Pradhan,** ADG (FFC), ICAR, New Delhi
09.40-09.50		**Dr. DK Yadava**, ADG (Seeds), ICAR, New Delhi
09.50-10.10	Address by the Guest of Honour	**Dr. TR Sharma,**Deputy Director General (CS), ICAR, New Delhi
10.10-10.30	Address by the Chairman	**Dr. Ajeet Kumar Karnatak**, Vice-Chancellor, MPUAT, Udaipur
10.30-10.50	Presentation of Varietal Plaques & Release of Publications	All the Dignitaries on the Dias
10.50-11.10	Inaugural Address by the Chief Guest	**Dr. Himanshu Pathak,** Secretary, DARE & Director General, ICAR, New Delhi
11.10-11.15	Vote of Thanks	**Dr. Ratan Tiwari,** Organizing Secretary
National Anthem		
Tea Break (11.15-11.40)		
11.40-14.05	***Session II- International Collaborations for Wheat & Barley Improvement***	
	Chairman	**Dr. Himanshu Pathak,** Secretary, DARE & DG,ICAR, New Delhi
	Co-Chairman	**Dr. TR Sharma,** DDG (CS), ICAR, New Delhi
	Special Guests	**Dr. Ronnie Coffman,** Vice Chairman, BGRI & Director of International Programmes, Cornell University, New York
		Dr. DK Yadava, ADG (Seeds), ICAR, New Delhi
		Dr. SK Sharma, ADG (HRM), ICAR
	Rapporteurs	Drs. Vishnu Kumar & Jaspal Kaur
	Session Coordinators	Drs. Amit Trivedi & Rajender Singh
11.40-11.55	Up-scaling Wheat Research in South Asia	Prof. Arun K. Joshi, Asia Regional Representative CIMMYT & MD, BISA CIMMYT, New Delhi

11.55-12.10	Healthy Processed Cereal Based Foods	Dr. Maria Itria Ibba, Head, Wheat Quality Laboratory and Cereal Chemist, CIMMYT, Mexico
12.10-12.25	ICAR-ICARDA Collaboration in Wheat and Barley	Dr. Michael Baum, Director - BIGMP, ICARDA, Amman, Jordan
12.25-12.40	Country Report of Bangladesh	Dr. Golam Faruque, DG, BWMRI, Dinajpur, Bangladesh
12.40-12.55	Implementing New Affordable Methods for Breeding Wheat	Dr. Aakash Chawade, Plant Breeding, Lomma, Sweden
12.55-13.10	BNI Technologies in Wheat	Dr. Guntur V. Subbarao, JIRCAS, Tsukuba, Japan
13.10-13.25	India and the BGRI - Leading to Save the World's Wheat	Dr. Ronnie Coffman, Vice Chair. BGRI & Director of International Programmes, Cornell University, New York
13.25-13.40	Interaction	All Participants
13.40-13.50	Remarks by the Co-Chairman	Dr.TR Sharma, DDG (CS), ICAR, New Delhi
13.50-14.00	Remarks by the Chairman	Dr. Himanshu Pathak Secretary, DARE &DG,ICAR
14.00-14.05	Vote of Thanks	Dr. Randhir Singh, PI (Social Sciences), ICAR-IIWBR, Karnal
Lunch Break (14.05-14.40)		
14.40-17.00	***Session III- Special Session on Contemporary Issues***	
	Chairman	**Prof. Arun K. Joshi,** Asia Regional Representative CIMMYT
	Co-Chairman	**Dr. Major Singh,**Member (PS), ASRB, New Delhi **Dr. SK Pradhan,** ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs. Manoj Oak & Sunil Kumar
	Session Coordinators	Drs. Abhay Dashora& Anuj Kumar (Jr)
14.40-14.55	Welcome and Setting the Agenda	Dr. Gyanendra Singh, Director, ICAR-IIWBR, Karnal
14.55-15.15	Moving Towards NaturalFarming: Achievements and Prospects	Dr. OP Ahlawat, Dr. Anil Khippal, ICAR-IIWBR, Karnal
15.15-15.35	Development of Wheat Based Blended Products for BetterNutrition	Dr. Sewa Ram, PI, Quality & Basic Sciences, ICAR-IIWBR, Karnal
15.35-15.55	Wheat Blast: Research and Current Strategies	Dr. Pawan Singh, Head, Wheat Pathology, CIMMYT, Mexico
15.55-16.10	Accelerated Breeding to Advance Genetic Gains in Wheat	Dr. Velu G., Wheat Breeder, CIMMYT, Mexico
16.10-16.25	Biofortification for Whole Value Chain	*Dr. Parminder Virk, Head, Crop Development, HarvestPlus, India*
16.25-16.40	Cropping System Intensification & Overall Ecosystem Health	*Dr. Sunil Kumar, Director, IIFSR, Modipuram*
16.40-16.45	Concluding remarks by the Co-Chairman	Dr. Major Singh, Member (PS), ASRB, New Delhiand Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi
16.45-16.55	Concluding remarks by the Chairman	Prof. Arun K. Joshi**,** Asia Regional Representative CIMMYT
16.55-17.00	Vote of Thanks	Dr. Sunil Kumar, Wheat Quality, ICAR- IIWBR, Karnal
Tea Break (17.00-17.15)		

17.15-19.00	***Varietal Identification Committee (VIC) Meeting***	
	Chairman	**Dr. TR Sharma,** DDG (CS), ICAR, New Delhi
	Member Secretary (VIC)	**Dr. Gyanendra Singh,** Director, ICAR-IIWBR, Karnal
	Experts	VIC members and all PIs (Non-voting members)
	Facilitators	Drs. Arun Gupta & Satish Kumar
	Presentation of Varietal Proposals	Dr. Satish Kumar, Senior Scientist, ICAR-IIWBR, Karnal
DAY-2: August 29, 2023 (Tuesday)		
09.00-11.25	***Session-IV: Discipline-wise Presentation of Progress Report (2022-23)***	
	Chairman	**Dr. TR Sharma,** DDG (CS), ICAR, New Delhi
	Co-Chairman	**Dr. SK Pradhan,** ADG (FFC), ICAR, New Delhi
	PAMC	**Dr. RR Hanchinal,** Ex-Chairman PPVFRA and VC, UAS Dharwad **Dr. ML Jat,** Global Research Program Director Resilient Farm & Food Systems (RFFS); **Dr. NS Bains,** Former Director Research, PAU, Ludhiana;**Dr. SC Bhardwaj,** Emeritus Scientist, ICAR-IIWBR-RS, Shimla
	Rapporteurs	Drs. Ravindra Kumar & Vikas Gupta
	Session Coordinators	Drs. Jagdish Choudhary & Amit Sharma
09.00-09.15	Special Lecture: *Microbial Formulations for Stress Amelioration in Cereal Crops*	Dr. Alok K Srivastava, Director, ICAR-NBAIM
09.15-09.30	Crop Improvement	Dr. OP Ahlawat, PI, Crop Improvement
09.30-09.45	Resource Management	Dr. SC Tripathi, PI, Resource Management
09.45-09.55	Crop Protection	Dr. Poonam Jasrotia, PI, Crop Protection
09.55-10.05	IIWBR-RS, Shimla	Dr. OP Gangwar, I/c IIWBR-RS, Shimla
10.05-10.20	Quality & Basic Sciences	Dr. Sewa Ram, PI, Quality & Basic Sciences
10.20-10.35	Barley Network	Dr. Omvir Singh, PI, Barley Network
10.35-10.45	Social Sciences	Dr. Randhir Singh, PI, Social Sciences
10.45-11.00	Remarks by the PAMC	Dr. RR Hanchinal, Dr. ML Jat, Dr. NS Bains & Dr. SC Bhardwaj
11.00-11.10	Remarks by the Co-Chairman	Dr. SK Pradhan**,** ADG (FFC), ICAR, New Delhi
11.10-11.25	Concluding Remarks by the Chairman	Dr. TR Sharma,DDG (CS), ICAR, New Delhi
Tea Break (11.25-11.45)		
11.45-13.55	***Session V: Panel Discussion on Increasing Area and Production of Barley***	
	Chairman	**Dr. JS Sandhu,** Ex- DDG (CS), Ex-VC, NDUAT, Ayodhya & SKNAU, Jobner
	Co-Chairman	**Dr. SK Pradhan,** ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs. Navin Chander Gahtyari& Neha Sharma
	Session Coordinators	Drs. Rajeev Bairathi & Jogendra Singh
11.45-12.00	Introduction to the Discussion	Dr. Omvir Singh, PI/Dr. RPS Verma, Former PI; Barley Network
12.00-12.15	Status and Prospects of Barley in Hills	Dr. Lakshmi Kant, Director, ICAR-VPKAS, Almora
12.15-12.40	Industries Perspective	Ms. Akshi Jindal, Gurugram; Mr. Shubham & Mr. Vikas Jain, PMV Malting Pvt. Ltd., Gurugram
12.40-13.05	View of Progressive Farmers	Sh. Kailash Yadav, Alwar; Sh. Ramlal Achra, Sikar; Sh Ram Gopal Tiwari, Ayodhya; Sh. Vikas Chaudhary, Karnal; Sh. Atar Singh Tomar, Karari, Morena
13.05-13.20	Remarks by the PAMC	Dr. RR Hanchinal, Dr. ML Jat, Dr. NS Bains & Dr. SC Bhardwaj
13.20-13.30	Brief Remarks by the Co-Chairman	**Dr. DK Yadava, ADG (Seeds), ICAR, New Delhi**

13.30-13.50	Remarks by the Chairman	Dr. JS Sandhu, Ex- DDG (CS), Ex-VC, NDUAT, Ayodhya & SKNAU, Jobner
13.50-13.55	Vote of Thanks	Dr. Anil Khippal, ICAR-IIWBR, Karnal
Lunch Break (13.55-14.40)		
14.40-16.40	***Session VI: Progress of Research Work by NHZ and PZ Centers***	
	Chairman	**Dr. RR Hanchinal,**Ex-Chairman PPVFRA &VC,UAS Dharwad
	Co-Chairman	**Dr. SK Pradhan,** ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs. Vikram Singh & Mamrutha HM
	Session Coordinators	Drs. Ram Hari Meena & Hanif Khan
14.40-15.00	Welcome & Introductory Remarks	Dr. Gyanendra Singh, Director, ICAR-IIWBR, Karnal
15.00-16.00	Presentation of Research Work by NHZ and PZ centers (*7 minutes presentation & 3 minutes discussion*)	**NHZ:** Almora, Palampur, Shimla
		PZ: Pune, Dharwad, Niphad
16.00-16.15	Remarks by the PAMC	Dr. ML Jat, Dr. NS Bains & Dr. SC Bhardwaj
16.15-16.20	Remarks by Special Guest	Dr. Ishwar Singh, PS, FFC Section, ICAR, New Delhi
16.20-16.25	Remarks by the Co-Chairman	Dr. SK Pradhan**,** ADG (FFC), ICAR, New Delhi
16.25-16.35	Remarks by the Chairman	Dr. RR Hanchinal, Ex-Chairman PPVFRA and VC, UAS Dharwad
16.35-16.40	Vote of Thanks	Dr. BS Tyagi, PI, Coordination, ICAR-IIWBR, Karnal
Tea Break (16.40-17.00)		
17.00-18.00	***Session VII: Finalization of Work Plan (2023-24)***	
	Chairman	**Dr. SK Pradhan,** ADG (FFC), ICAR, New Delhi
	Co-Chairman	**Dr. Gyanendra Singh,** Director, ICAR-IIWBR, Karnal
	Rapporteurs	Drs. RS Chhokar & CN Mishra
	Session Coordinators	Drs. Pradeep Sharma & Vikas Gupta
17.00-18.00	Crop Improvement	Dr. OP Ahlawat, PI, Crop Improvement
	Resource Management	Dr. SC Tripathi, PI, Resource Management
	Crop Protection	Dr. Poonam Jasrotia, PI, Crop Protection
	Quality & Basic Sciences	Dr. Sewa Ram, PI, Quality & Basic Sciences
	Social Sciences	Dr. Randhir Singh, PI, Social Sciences
	Barley Network	Dr. Omvir Singh, PI, Barley Network
	Remarks by the PAMC	Dr. RR Hanchinal, Dr. ML Jat, Dr. NS Bains & Dr. SC Bhardwaj
DAY-3: August 30, 2023 (Wednesday)		
09.15-11.00	***Session VIII- Status Report from States and Farmers Interaction***	
	Chairman	**Dr. PL Gautam,** Chairman RAC, ICAR-IIWBR, Karnal & Former Vice Chancellor, GBPUAT, Pantnagar& Former Chariman, PPV&FRA, New Delhi & Former Chairman, NBA, Chennai
	Co-Chairman	**Dr. SK Pradhan,** ADG (FFC), ICAR, New Delhi
		Dr. Gyanendra Singh, Director, ICAR-IIWBR, Karnal
	Rapporteurs	Drs. Hari Ram Saharan & Amit Sharma
	Session Coordinators	Drs. Ram Hari Meena & Neeraj Kumar
09.15-09.30	Modifying Trehalose 6 phosphate sugar signaling to increase wheat yield under variable rainfall	Dr. Mathew Paul, Rothamsted Research, U.K.
09.30-09.45	Collaboration towards strengthening skill-oriented education	Dr. Anurag Tiwari, Chitkara University, Punjab
09.45-10.15	Progressive farmers views	Shri Vikas Chaudhari, Village Taravari, Karnal Shri Umesh Pawar, District Shamli, Uttar Pradesh
10.15-10.25	Remarks by the Co-Chairman	Dr. Gyanendra Singh, Director, ICAR-IIWBR, Karnal

10.25-10.35		Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi
10.35-11.00	Concluding Remarks by the Chairman	Dr. PL Gautam, Chairman RAC, ICAR-IIWBR, Karnal & Former Vice Chancellor, GBPUAT, Pantnagar & Former Chariman, PPV&FRA, New Delhi & Former Chairman, NBA, Chennai
Tea Break (11.00 - 11.30)		
11.30-14.25	***Session IX- Plenary Session***	
	Chief Guest	**Dr. RS Paroda,** Chairman, TAAS andFormer Secretary, DARE& DG, ICAR, New Delhi
	Chairman	**Dr. PL Gautam,** Chairman RAC, ICAR-IIWBR, Karnal & Former Vice Chancellor, GBPUAT, Pantnagar
	Co-Chairman	**Dr. Ajeet Kumar Karnatak,** VC, MPUAT, Udaipur
	Special Guest	**Dr. SK Pradhan,** ADG (FFC), ICAR, New Delhi
	Rapporteurs	Drs. Pramod Prasad, PL Kashyap
	Session Coordinators	Drs. Vanita Pandey & Umesh R Kamble
11.30-12.20	Significant Recommendations andHighlights of Work Plan (2023-24)	Respective PIs (Dr. OP Ahlawat, Dr. SC Tripathi, Dr. Sewa Ram, Dr. Poonam Jasrotia & Dr. Omvir Singh)
12.20-12.30	Discussion &Remarks	Dr. Gyanendra Singh, Director, ICAR-IIWBR, Karnal
12.30-12.40	Presentation VIC report	
12.40-13.05	Felicitation of Superannuating Scientists	All Dignitaries
13.05-13.10	Finalization of Venue for Next AICRP Workshop	All participants
13.10-13.30	Remarks by the PAMC	Dr. RR Hanchinal, Dr. ML Jat, Dr. NS Bains & Dr. SC Bhardwaj
13.30-13.40	Remarks by the Special Guest	Dr. SK Pradhan, ADG (FFC), ICAR, New Delhi
13.40-13.50	Remarks by the Co-Chairman	Dr. Ajeet Kumar Karnatak, VC, MPUAT, Udaipur
13.50-14.00	Remarks by the Chairman	Dr. PL Gautam, Chairman RAC, ICAR-IIWBR, Karnal & Former Vice Chancellor, GBPUAT, Pantnagar
14.00-14.20	Address by the Chief Guest	Dr. RS Paroda, Chairman, TAAS and Former Secretary DARE &DG, ICAR, New Delhi
14.20-14.25	Vote of Thanks	Dr. Arvind Verma, Director Research, MPUAT, Udaipur (Organizing Secretary)
National Anthem		



62वीं अखिल भारतीय गेहूँ एवं जौ अनुसंधान कार्यकर्ता गोष्ठी

महाराणा प्रताप कृषि एवं प्रौद्योगिकी विश्वविद्यालय, उदयपुर, राजस्थान

(अगस्त 28-30, 2023)

62nd All India Wheat and Barley Research Worker's Meet-2023

Maharana Pratap University of Agriculture and Technology (MPUAT),Udaipur, Rajasthan

(August 28-30, 2023)