ICAR-Indian Institute of Wheat and Barley Research

Proceedings of the 28th Meeting of

Research Advisory Committee

Held in Hybrid Mode on October 27, 2023

ICAR-IIWBR, Karnal-132001, Haryana

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ICAR-IIWBR, Karnal (Haryana)

(*Venue: V. S. Mathur Hall*)

The 28thmeeting of the Research Advisory Committee (RAC) of ICAR-Indian Institute of Wheat and Barley Research, Karnal was organized in the hybrid mode on 27th October, 2023. The following were present:

Dr. PL Gautam Former Vice Chancellor, GBPUAT, Pantnagar; Chairman PPVFRA and Chairman NBA, Chennai	Chairman
Dr. AK Sharma Former Director, ICAR-NBAIM, Mau (UP)	Member
Dr. ML Jat Global Research Program Director, Resilient Farm and Food System, ICRISAT, Patencheru, Telangana	Member
Dr. PS Birthal Director, National Institute of Agricultural Economics and Policy Research, New Delhi	Member
Dr. PC Sharma Dean Indraprastha University, New Delhi	Member
Dr. Gyanendra Singh Director, ICAR-IIWBR, Karnal	Member
Dr. Sharat K Pradhan Assistant Director General (FFC), Crop Science Division, ICAR, N Delhi	Member
Dr. Sunil Kumar Principal Scientist, ICAR-IIWBR, Karnal	Member Secretary

Dr Kuldeep Singh could not attend the meeting as he was on tour to Norway. All the scientists from ICAR-IIWBR, Karnal and scientists from its Regional Stations, Shimla and Hisar participated in the meeting.

The meeting started with welcome of the Chairman and members of the RAC by the Director of the institute.

Dr Gyanendra Singh, Director, ICAR-IIWBR, Karnal presented the highlights of the achievements of the institute including research and other activities. The director informed that some of the prominent wheat varieties of the institute like DBW187, DBW303, DBW327 are, contributing more than 27% of the total DAC (Department of Agriculture & Cooperation) indent. Barley variety, DWRB137, is now a pan-Indian variety. He underlined efforts on wheat improvement including, *inter alia*, stress tolerance, wheat blast management, developing climate resilient and biofortified varieties etc. and initiatives for reaching the farmers via various platforms. Dr Gyanendra Singh also prioritised a few issues for consideration in future research and management at the institute. These included need for

training of young scientists, commercialization of rotary disc drill through Agri Innovate, nature friendly farming, bio-fortified varieties, nutrient/water use efficient technologies, shortage of administrative and technical staff, and infrastructural / land resource constraints. The seed production at this institute has now become a role model for other crops. He also apprised the house about Mega University Hub at ICAR-IIWBR Karnal.

Dr Sunil Kumar, the Member Secretary, RAC, presented the action taken report on recommendations of the 27th meeting of the RAC held on 13th March, 2023. The RAC members responded to the recommendations *vis-à-vis* actions taken. The ATR was accepted by the committee and appreciated the staff for the progress.After discussion on ATR, the program-wise presentations were made by Dr B S. Tyagi (Pre-breeding), Dr Ratan Tiwari (Biotechnology and Plant Physiology), Dr Poonam Jasrotia (Crop Protection), Dr OP Gangwar (Regional Station, Shimla), Dr SC Tripathi (Resource Management), Dr Sewa Ram (Quality & Basic Sciences), Dr Om Vir Singh (Barley Improvement) and Dr Satyavir Singh (Social Sciences) on the achievements made in the research and the future research programmes (Annexure 1).

The Chairman expressed satisfaction with the progress of different projects. He praised the hard work by the farmers, researchers, and policy makers for record production during 2022-23. He lauded the work done in the field of pre-breeding, breeding, varietal development, seed program, quality improvement, resource management and plant pathology. He suggested for screening of early sown material which establishes early but flowers with the normal crop, thus, preventing crop from bird damage. He highlighted importance of AICRP in impacting Indian agriculture and suggested to pursue for inclusion of barley in "Shree Anna".

Dr. A K Sharma opined that the work done in the field of wheat and barley was commendable but at the same time he stressed upon keeping vigil on head scab, pests of millet and cotton-based crop rotations as the associated pathogens may attack wheat crop. He also pointed out that third generation problems of insect pests be identified and work be initiated. He pointed that Karnal bunt and Head Scab may lead to future threats if not contained.

Dr.ML Jat appreciated the exemplary work on weed management being done by the institute. He pointed out that huge discrepancy in the yield gaps has been observed in different climatic zones. He suggested that some analysis be done to decipher the determinants for these yield gaps. He opined that barley crop can be grown well in areas where salinity is increasing. He expressed apprehension about scope of organic wheat in a rice-wheat cropping system.

Dr. PS Birthal appreciated the work done in pre-breeding, varietal development, resource management, quality, and natural farming. He stressed that assessment of economic, social, and environmental impact of climate resilient varieties, natural resource management technologies be carried out using standard practices. He also emphasized to explore market opportunities for commercial production of barley and to execute work focusing the requirements of the consumers and farmers. He opined that majority research in crop science is on increasing yield and more efforts are needed on value addition and processing.

Dr. SK Pradhan, ADG (FFC), applauded the work being done at ICAR-IIWBR, Karnal and the growth rate of wheat productivity, contents of protein, iron, and zinc in last few decades in comparison to rice. He suggested that there is a need to have climate smart varieties which adjust to the changing climate. He stressed the involvement of speed breeding, enhanced accuracy in phenotyping and use of GWAS for abiotic stresses and physiological traits. Dr Pradhan pointed out that though resounding work has been done by the wheat breeders and identified genotypes with special traits, breeders should also identify genes for drought and high temperature tolerance. Since, barley is also one of the important crop and thus, scientists should put effort to strengthen work on it.

Dr. P C Sharma appreciated the team IIWBR and suggested that ICAR should be more open for collaborations, resource sharing and restricting duplication in research so that resources are efficiently utilized. He emphasized the relevance of nutrient and water-use efficiency that are going to be very relevant in future. Dr Sharma advocated for early sowing to ward off this stress utilizing information on wheat genomics.

During the detailed and long discussion, following general suggestions were made.

General suggestions:

1. Genetic studies on identification of novel gene(s) for biotic and abiotic stresses and convergence of multiple traits using non-allelic diverse donors in elite genetic backgrounds should be done. QTLs / genes for drought and high temperature tolerance should be identified.
2. Importance should be given for development of varieties with traits suitable for processing technology and value addition. Feedback should be taken from the farmers regarding their requirements and research should be focused on similar lines.
3. Collaborations should be established with other institutions for high throughput phenotyping and genotyping.
4. Virulent pathogen strains of Karnal bunt may be collected from KB prone areas and corresponding genes conferring resistance against these be elucidated. Both the models (mixed and general linear models) to be worked out for r^2 value for comparison and to have realistic estimate. For information on Karnal Bunt, Pantnagar location can be used as it is a hot spot to screen for Karnal Bunt.
5. Basic research should be promoted and focused on development of mega/single varieties which have multiple features such as abiotic/ biotic stress (multiple diseases) and heat tolerance and biofortified as per vision 2030/2050. Advance technologies like precise phenotyping, chip-based studies, speed breeding, genome editing *etc.* may be combined to develop such varieties.
6. Mechanization of breeding trials should be a top priority
7. Augmenting seed distribution system further, some private companies like Amazon, Flipcart etc. may be roped in.
8. An extensive exhaustive study of the impact of Wheat AICRP programme on Indian agriculture in terms of number of varieties released, area covered, seed disseminated/sold, human resource developed, and social impact on employment

generation, livelihood and R&D efforts may be conducted and widely disseminated for general awareness.

9. It was suggested that biofortification studies both at genetic as well as agronomic management level should continue.
10. Work on nano-urea should continue for offering comprehensive recommendations.
11. Develop a sample questionnaire for the farmers for quantity of pesticides used during storage of wheat grains. The samples should also be collected from AICRP centers and analysed for the pesticide content and traces.
12. The institute may prepare a herbarium of weeds and wild relatives of wheat and barley.
13. There is need to document impact assessment of technologies *i.e.* how much money has been generated due to adoption of different technologies, using services of an economist. Such studies should be a continuous process and presently we can take help of NCAP. Social scientist should calculate return on investment.
14. Millets are prone to ragi blast and recent popularization and cultivation of millets in wheat growing regions may affect wheat. So, proper survey and surveillance have to be carried out in early stages. Mealy-bug is attacking cotton in cotton -wheat cropping system. This insect may also spread to wheat as well. Hence, suitable measures are required.
15. Rust pathotypes prevalent in Ladakh region be monitored to keep vigil on the possible movement of the pathotypes outside Ladakh region.
16. Extensive efforts including brain storming session may be helpful in developing comprehensive strategy for increasing area under barley. The focus is needed for breeding of varieties suitable for farmers and consumers. Barley crop has potential in hilly areas, rainfed ecosystems and salinity prone areas. The linkages with the barley industry and National Institute of Nutrition, Hyderabad may also be useful. It was suggested to contact Door Darshan for special programmes on importance of barley crop.

Recommendations:

After deliberations, following specific recommendations were offered by the RAC:

1. Basic research should be promoted and focused on development of mega/single varieties which have multiple features such as abiotic/ biotic stress (multiple disease) and heat tolerance and biofortified as per vision 2030/2050. Advance technologies like precise phenotyping, chip-based studies, speed breeding, genome editing *etc.* may be combined to develop such varieties. Efforts be made to do high throughput gene-based identification of QTLs in wheat.
2. Efforts should be made for system-based research through collaboration with relevant NRM institutions of ICAR. IIWBR should start a focussed program for tailoring genotypes for conservation agriculture/regenerative agriculture/natural farming/ organic farming. Standardization of complete package of practices from sowing to harvesting for wheat and barley under natural/organic farming. Long term experiments be conducted under natural/organic farming for data generation including

monitoring of soil health and grain/nutritional quality *etc.* A case should be made for rotary disc drill machine to come under subsidy program of Government for its larger uptake by the farmers.

3. Studies should be taken up on the efficacy of pesticide sprays with drone *vs.* normal pump sprays to evaluate the saving, if any, in terms of dosage, efficacy, economy etc.
4. Survey and surveillance for crop health and pest monitoring be taken up under changing climate using modern tools like drone technology following relevant regulations.
5. The model seed distribution system evolved by the Institute should be augmented by roping in public, private and NGO sectors.
6. Technological and scientific data of ICAR-IIWBR should be documented in English and Hindi in the form of articles, bulletins, leaflets, documentary films etc. The impact of climate resilient varieties and natural resource management technologies in wheat in terms of economic and ecological benefits may also be assessed and documented.
7. Explore market opportunities for commercial production of barley and develop comprehensive strategy for its area expansion. The scientific data generated/available so far for the promotion of barley should be compiled in English and Hindi and disseminated through appropriate social/print/electronic media. Efforts should be made to pursue inclusion of barley in "Shree Anna" in view of its nutritional value and potential.

The Chairman and members of RAC, and scientific staff remembered the outstanding contributions of Prof. (Late) MS Swaminathan and the entire house rendered homage to the divine soul by observing silence. The Chairman RAC and members also visited facilities at ICAR-IIWBR during the RAC.

The meeting ended with the vote of thanks to the chair, members of RAC and staff of ICAR-IIWBR by the member secretary.

Consent received via mail
AK Sharma
(Member)

ML Jat
(Member)

PS Birthal
(Member)

Consent received via mail
PC Sharma
(Member)

Gyanendra Singh 12/12/23
(Member)

Telephonic consent
Sharat K Pradhan
(Member)

12/12/23
Sunil Kumar
(Member Secretary)

P L Gautam
(Chairman RAC)

Annexure 1 (List of projects)

Crop Improvement

Wheat improvement for enhancing genetic gain and productivity under changing climate (CRSCIIWBRCL20200020195)
Programme Leader: Dr. BS Tyagi

Project 1: Developing high yielding and climate resilient wheat varieties (PI: Dr. BS Tyagi

Project 2: Pre-breeding and germplasm enhancement (PI: Dr. BS Tyagi)

Project 3: New insights & basic studies for integrating molecular, physiological and bioinformatics tools for augmenting wheat improvement (PI: Dr. Ratan Tiwari)

Crop Protection

Biotic stress management in wheat (CRSCIIWBRCL20200030196)
Programme Leader: Dr. Poonam Jasrotia (PI-CP)

Project 1: Management of biotic stresses of wheat by integrating innovative approaches (PI: Dr. Poonam Jasrotia)

2.1 Mapping phenotypic diversity in wheat and barley rust pathogens, identifying resistance sources, and upkeep of culture collection (PI: Dr. O.P. Gangwar)

Resource Management

Enhancing the productivity, sustainability and resilience of wheat-based cropping systems (CRSCIIWBRCL20200040197)
Programme Leader: Dr. SC Tripathi (PI-RM)

Quality & Basic Sciences

Wheat Improvement for Industrial and Nutritional Quality (CRSCIIWBRSL20200050198)
Programme Leader: Dr. Sewa Ram (PI-QBS)

Barley Improvement

Barley For Feed, Food and Industrial Purposes (CRSCIIWBRCL20200060199)
Programme Leader: Dr. Omvir Singh (PI-BI)

Project 1: Barley improvement and technological interventions for yield, quality, biotic and abiotic stress tolerance for better farmers' livelihood (PI: Dr. Om Vir Singh)

Social Sciences

Technology Outreach and Impact Evaluation (CRSCIIWBRSL20200070200)
Programme Leader: Dr. Randhir Singh w.e.f 07.12.2022.
Project 1: Evaluation, Dissemination and Impact Assessment of Production Technologies (PI: Dr. Randhir Singh)