



HIMGIRI Newsletter

(Cereals & Horticultural Crops)

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From Director's Desk

It gives me immense pleasure to present Himgiri, the annual newsletter of the ICAR-Indian Agricultural Research Institute, Regional Station, Shimla, showcasing the major achievements, scientific advancements, outreach activities, and institutional progress made during the year.

During the year under review, significant progress was achieved in the areas of barley improvement, temperate fruit research, crop protection, and sustainable agricultural technologies. A promising barley variety, BHS 497 (Pusa Shakuntla), was identified for release in the Northern Hill Region, representing an important milestone in the crop improvement programme.

Research efforts on improved fruit cultivars, eco-friendly disease management strategies, and post-harvest protection technologies contributed substantially towards strengthening hill agriculture and enhancing the sustainability of farming systems in the region.

Farmer-centric research continued to remain a major focus of the station through demonstrations, training programmes, outreach activities, and Tribal Sub Plan initiatives aimed at promoting the dissemination and adoption of improved agricultural technologies among farming communities. These initiatives played a significant role in strengthening the interface between research and extension and in addressing the emerging needs of stakeholders in hill agriculture.

The station's scientific contributions during the year were reflected through quality research publications, collaborative research programmes, extension activities, and the successful organization of the National Symposium on "Frontiers in Plant Health Management: Integrating Research, Technology and Sustainability." The symposium provided an effective platform for scientific deliberations, knowledge exchange, and fostering collaboration among researchers, academicians, and other stakeholders engaged in agricultural research and development.

I sincerely appreciate the valuable contributions of the scientists, staff, students, farmers, and collaborators whose collective efforts continue to strengthen the research and development mandate of the station. Their dedication, commitment, and support have been instrumental in achieving the milestones highlighted in this newsletter.

Contents

Research	2
Awards & Institutional Activities.....	6
Research Grants & Publications	7
Glimpses of activities	8

I am confident that the ICAR-IARI Regional Station, Shimla, will continue to contribute meaningfully towards sustainable agricultural development and the transformation of hill farming systems through excellence in research, innovation, and technology dissemination.

Ch. Srinivasa Rao
Director, ICAR-IARI

RESEARCH

Variety Identified/Released

BHS497 (Pusa Shakuntla): A Promising Barley Variety Identified for Release

Barley variety BHS497 (Pusa Shakuntla) developed from a cross “HBL276/BHS352” is identified for release during the 64th All India Wheat and Barley Research Workers' Meet, held from 25-27 August, 2025 at Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya Pradesh (Fig 1).



Fig 1: Field view and grains of variety BHS497 (Pusa Shakuntla)

Genetic Resources

Barley Genetic Stock BHS 490 (BBM 879) Registered

Barley genetic stock BHS 490 (BBM 879) developed from a cross “HBL704/BHS369” is registered with INGR25007 for its multiple rust resistance traits with NBPGR, New Delhi. The genotype exhibited:

- Seedling resistance against all tested pathotypes of leaf rust.
- Adult plant resistance to yellow rust with an Average Coefficient of Infection (ACI) below 10 (1.5) and a maximum susceptibility score of 5S.
- Strong adult plant resistance to leaf rust with a highest susceptibility score of 0.

Wheat and Barley Improvement

Introgression of Rust Resistance from Rye to Wheat through Triticale

Leaf Rust Resistance: SW288 (T/W17-5), developed from the cross TL2942/HS562, is identified as a promising source of leaf rust resistance. The genotype exhibited seedling resistance against 38 leaf rust pathotypes, including highly virulent pathotypes 77-5 and 77-9 prevalent in Northern India. The broad-spectrum resistance observed in SW288 (T/W17-5) may be attributed to the accumulation of resistance genes contributed by both the parental varieties.

Powdery mildew resistance: Among 40 triticale × wheat derivatives, SW244 (T/W7-4) showed an immune reaction against both Shimla and Wellington isolates of powdery mildew. Under natural field conditions at Shimla, a recognized hotspot for powdery mildew, SW244 (T/W7-4), SW288 (T/W17-5), and TL2942 recorded low Area Under Disease Progress Curve (AUDPC) values of 0.00, 35.00, and 17.50, respectively.

Agronomic Performance: In addition to disease resistance, SW288 (T/W17-5) recorded significantly higher spike length (13.67 cm) and grains per spike (64.33), also showed numerical superiority for spikelets per spike (23.67) compared to the check variety HS490. Seven derivatives (SW263, SW256, SW253, SW254, SW262, SW259, and SW257) significantly outperformed HS490 for grain yield per plot. Notably, SW256 (T/W9-5) demonstrated superiority for six agronomic traits, including days to flowering, peduncle length, plant height, grain weight per plant, grain yield per plot, and harvest index under preliminary yield evaluation.

Genomic in-situ Hybridization (GISH) for Detection of Rye Chromosomes in Stocks:

The presence of rye chromosomes in SW244 & SW288 was detected using whole rye genome probe tagged with Alexa Fluor 488 dye. SW244 ($2n=6x=44$) carry two pairs of additional rye chromosomes whereas SW288 carry 42 chromosomes, probably two wheat chromosomes have been replaced with a pair of rye chromosomes (Fig 2. A, B, C & D).

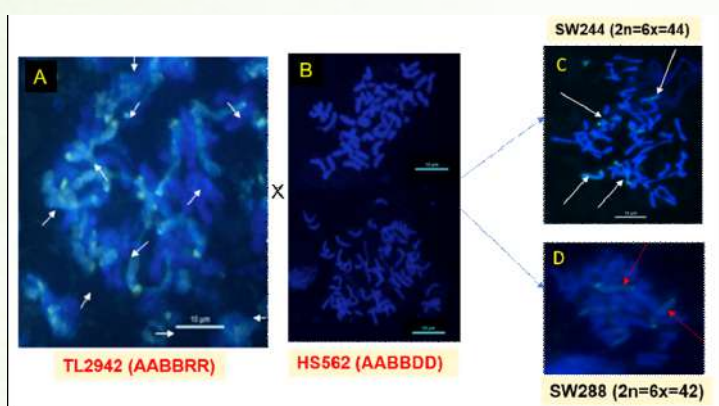


Fig 2: Genomic in-situ hybridization

Molecular marker assisted detection of rye chromosomes in SW244: The 5R chromosome specific marker KU-5R-120 amplified 450bp DNA fragment and 5RL chromosome arm specific marker BAMR amplified 560bp DNA fragment in triticales, SW244 and rye, revealed the presence of 5R and 5RL. Similarly, 6RS specific marker SW22057 and 6RL specific marker SW22063 amplified 404bp DNA fragment in triticales, SW244 and rye but not in wheat variety HS562 and Agra Local. Molecular markers, scss30.2, SW28002, KU-4R.732 and KU-4.012 amplified their diagnostic DNA fragments for presence of 1RS, 3RS, 4RS and 4RL, respectively in triticales variety TL2942 and rye, but absent in wheat variety HS562, SW244 (T/W7-4) and Agra Local. This study detected the presence of 5R, 5RL, 6RS and 6RL in SW244. Marker SW13721 detected the presence of 7RL in TL2942 & Rye (Fig 3).

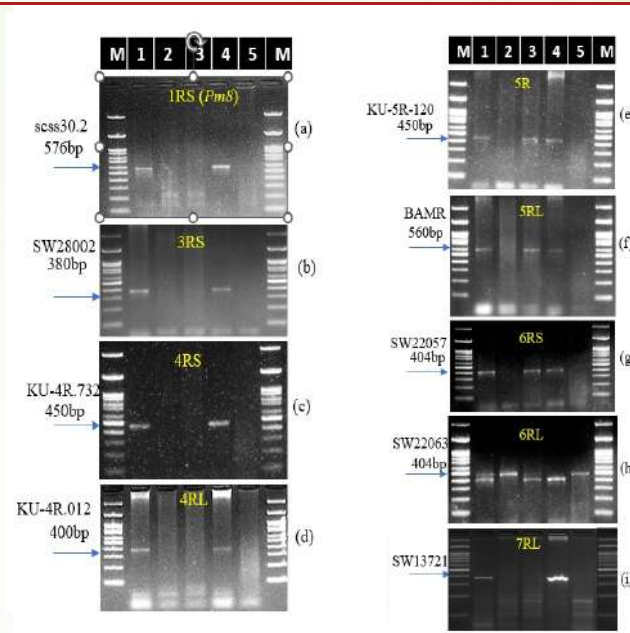


Fig. 3 M-100bp; 1-TL2942, 2-HS562, 3-SW244 (T/L7-4), 4-Rye (+check), 5-Agra Local (-check). Chromosome/gene specific markers represent to the presence of rye chromosomes (a-1RS; b-3RS; c-4RS; d-4RL; e-5R; f-5RL; g-6RS; h-6RL; i-7RL)

Pipe line Promising Entries of Wheat and Barley

Five wheat genotypes, HS715, HS716, HS717, HS718 and HS719 were contributed for testing in timely sown rainfed production conditions of Northern Hill Zone (NHZ) under All India Coordinated Research Project (AICRP). Similarly, 03 genotypes, HS720, HS721 and HS722 were nominated for late sown restricted irrigation production condition of NHZ under AICRP trials. Besides, two wheat genotypes HS723 and HS724 were nominated for very high altitude timely sown Summer Sown production conditions of NHZ.

Based on the agronomic performance in station trials, 07 promising entries of barley, namely BHS 511, BHS 512, BHS 513, BHS 516, BHS 517, BHS 518, and BHS 519, were nominated for timely sown production condition of NHZ under AICRP for hulless and dual-purpose category trials.

Temperate Fruit Improvement

Field Evaluation of Improved Apple Hybrids

Two apple hybrids, Pusa Gold and Pusa Amartara Pride, were evaluated under farmers' field conditions. Pusa Gold, developed from a cross between Golden Delicious and Tydemans Early Worcester, was bred to combine early maturity with superior fruit quality. It ripens earlier than its parent Tydemans Early Worcester and produces attractive red-golden fruits that are juicy, flavorful, and possess good keeping quality. The cultivar can also be utilized as a pollinizer for early-season apple varieties.

Pusa Amartara Pride originated from a cross between Royal Delicious and Prima, an apple scab-resistant cultivar. It was developed to incorporate scab resistance while maintaining the desirable fruit characteristics of Royal Delicious. The hybrid matures 7-10 days earlier than Royal Delicious and exhibits enhanced fruit colour, making it a promising option for apple growers.

Rootstock Evaluation for Enhanced Orchard Productivity

Evaluation of different rootstocks for stone fruits indicated that *Prunus japonica* performed better under varying planting spacings, highlighting its potential for improving orchard establishment and productivity.

Assessing New Plum and Prune Varieties for Quality Traits

Newly introduced plum varieties along with prune variety Green Gauge were evaluated following top working on *Prunus japonica*. Red Beaute recorded maximum fruit weight, Fariar showed highest total sugars, while Black Amber exhibited superior shelf life under Shimla conditions.

Innovations in Propagation and Rootstock Technologies

Inter-stock trials in apple, stone fruits, and pear are underway to develop dwarf and stress-resistant planting material, while a cocopeat-based potting mixture showed maximum rooting success in kiwi propagation

Evaluating Emerging Fruit Germplasm for Future Cultivation

Among 25 Russian pomegranate accessions, 18 showed flowering and fruiting with considerable variation in fruit quality traits. Strawberry genotypes exhibited variability in fruit weight and vitamin-C content, while kiwi cultivars showed differences in rooting and growth characteristics.

Crop Protection

Identification of the Causal Organism of Blue mold

Blue mold is an important post-harvest disease of apple that adversely affects fruit quality and storage life. The present investigations revealed that nearly 10% of stored fruits were affected by the disease. The causal organism was isolated and identified as *Penicillium crustosum* Thom based on morphological characteristics (Fig. 4), molecular analyses involving ITS, LSU, and Beta-tubulin gene sequences, and pathogenicity tests.

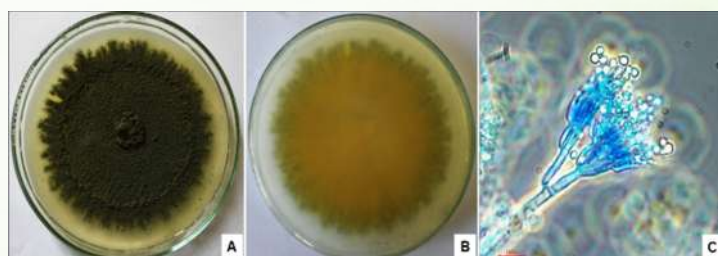


Fig 4: Pure culture of blue mold fungus along with conidia and conidiophore. A: pure culture of causative fungus showing bluish-green conidia, B: reverse side of Petri plate showing yellow to orange colour, C: circular conidia attached with phialides and metulae

Evaluation of Sustainable Disease Management Approaches

Following pathogen identification, eco-friendly disease management approaches involving eight essential oils (EOs) and six biocontrol agents (BCAs) were evaluated against the pathogen. Among the treatments tested, spray application of *Ocimum tenuiflorum* essential oil (0.5%) and fumigation with *Ocimum sanctum* essential oil (1%) proved highly effective in suppressing blue mold development. This study represents the first documented report of apple blue mold caused by *P. crustosum* in India and highlights the potential of environmentally safe management strategies for sustainable post-harvest disease management in apple.

Emerging Bacterial Disease Threat in Stone Fruits

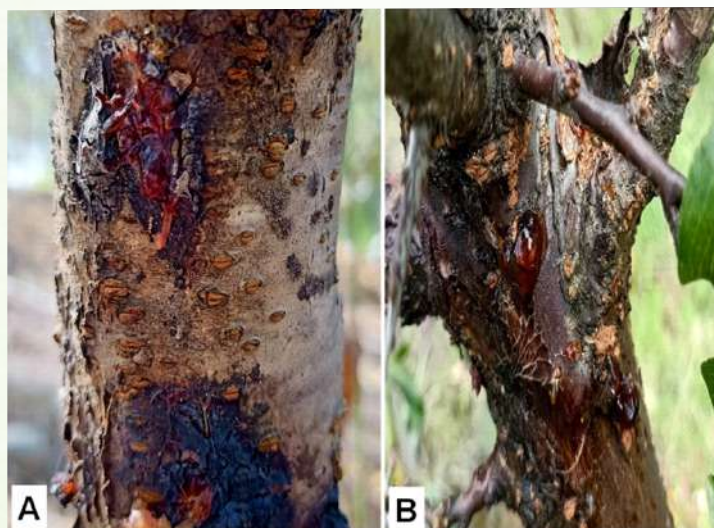


Fig 5 Stone fruit plant showing symptoms of canker, and gummosis. A: canker and gummosis symptom in peach cultivar 'Red Haven'; B: canker and gummosis symptom in plum cultivar 'Black Amber'

Peach and plum orchards surveyed in different locations showed severe incidences of shot hole, canker, and gummosis, with disease incidence ranging from 51.25% to 88.95%. Diseased plants exhibited yellow to purplish-brown necrotic leaf spots leading to shot hole symptoms, along with cankers and gummy exudation on twigs (Fig. 5).

The causal bacterium was isolated and identified as *Pantoea agglomerans* based on morphological, biochemical, molecular, and pathogenicity studies. This is the first report of *P. agglomerans* causing shot hole, canker, and gummosis in stone fruits in India. The findings provide valuable baseline information for developing effective disease management strategies against emerging bacterial pathogens in stone fruits.

Management of Apple Seedling Blight

Seedling blight is an important disease of apple seedlings. During a survey, seedling blight symptoms were observed in Himachal Pradesh (Fig 6). A causal organism of the disease was isolated and its identity was confirmed as a *Sclerotium rolfsii* Sacc. Soil-borne diseases are difficult to manage hence we planned an experiment for the management of seedling blight through the use of recent fungicides, commonly available botanicals, and nutrients. Based on the findings of this study, the application of propiconazole at 1 ml/L of water and fluopyram + tebuconazole at 0.62 ml/L of water is recommended for managing seedling blight in apples.



Fig 6: Symptoms and pure culture of seedling blight caused by *Sclerotium rolfsii*

AWARDS/RECOGNISATIONS

- Dr. Madhu Patial received the “Best Hindi Nodal Adhikari” award of ICAR-IARI, New Delhi, in recognition of her outstanding contribution towards the promotion and implementation of Hindi language activities.
- Dr. Santosh Watpade has been inducted into the Editorial Board of Indian Phytopathology

INSTITUTIONAL ACTIVITIES

National Symposium Organized

ICAR–Indian Agricultural Research Institute Regional Station, Shimla organized a National Symposium on “Frontiers in Plant Health Management: Integrating Research, Technology and Sustainability” from 18–20 November 2025 in collaboration with the Indian Society of Plant Pathologists and Indian Phytopathological Society – Northern Zone. The three-day symposium brought together scientists, researchers, academicians,

industry experts, students, and progressive farmers from across the country, providing a common platform for scientific exchange and collaboration.

More than 40 eminent experts from ICAR institutes, State Agricultural Universities (SAUs), research laboratories, and agri-tech industries delivered lectures on emerging areas including climate-resilient disease management, pathogen genomics, AI-based diagnostics, bio-nanotechnology, precision agriculture, and remote sensing–based crop disease surveillance. The symposium also featured interactive technical sessions, panel discussions, and networking opportunities aimed at strengthening interdisciplinary research collaborations.

Over 100 poster presentations by young scientists and postgraduate students further enriched scientific discussions, encouraged knowledge sharing, and highlighted innovative research approaches for sustainable plant health management and future agricultural resilience.

TRAINING PROGRAMS AND AWARENESS CAMPAIGN

Activity	Location	Date	In-put	No of farmers
उत्पादकता एवं पोषक तत्वों से भरपूर गेहूं की प्रजाती HS 562	KVK Hamirpur at Bara	26.09.2025	20 Qtls (20Kg each+ farm tools)	100
अच्छी पैदावार के लिये गेहूं की प्रजाती HS562	KVK Mandi at Sunder Nagar	28.09.2025	20 Qtls (20Kg each+ farm tools)	100
गेहूं की उन्नत प्रजातियां एवं वैज्ञानिक खेती	Chailchowk district Mandi	05.11.2025	12 Qtls (12Kg each+ farm tools)	100
Vikshit Krishi Sankalp Abhiyan	District Shimla	29 to 12.06.2025	Awareness campaign about improved technologies of ICAR	2000
Farmers Training on production technology and nursery management of Temperate Fruit Crops at Research Farm Dhanda	Research Farm Dhanda, Regional Station, Shimla	15 to 17.01.2025	Awareness about orchard and nursery management	245
Training and Pruning of Temperate Fruit Crops	Research Farm Dhanda, Regional Station, Shimla	21.01.2025	Awareness about orchard management	35

RESEARCH GRANTS

Title of the project	Funding agency	Total cost
Pre-breeding for climate-resilient and disease-resistant wheat by harnessing genes from triticale × wheat derived rye chromatin (PI: Dr Niranjana M, Division of Genetics; Co-PI: Dr Dharam Pal, RS, Shimla; Dr OP Gangwar, IIWBR RS Shimla)	IGNITE Life Science Foundation	122.81 (Lakhs)
Evaluation of PIF320 for Post-Harvest Disease Management in Apple during ambient temperature and refrigerated conditions (PI: Dr Santosh Watpade, Co-PI: Dr Dharam Pal; Dr KK Pramanick, RS Shimla)	PI Industries Limited	16.76 (Lakhs)
Assessment of the bio efficacy of Etoxazole 10%SC (New Source) against European Red Mite and two spotted spider mite in Apple (PI: Dr KK Pramanick, Co-PI: Dr Dharam Pal; Dr Santosh Watpade, RS Shimla)	Sumitomo Chemical India Limited	12.42 (Lakhs)

RESEARCH PUBLICATIONS

SN	Publication (Papers with >6 NAAS rating)	Impact factor	NAAS rating
1	Watpade Santosh, Devi Isha, Bagul Samadhan Yuvraj, Khadke, GN, Kumar Dinesh, Kumari Hema, Kumar Rishav, Kumar Jitender, Pramanick Kallol Kumar, Pal Dharam, Mhatre Priyank H., & Kedar Santosh. (2025). Exploring eco-friendly strategies for the management of blue mold of apple caused by <i>Penicillium crustosum</i> Thom. Postharvest Biology and Technology. 227:1-8. https://doi.org/10.1016/j.postharvbio.2025.113581	6.8	12.80
2	Twinkle Jena, R.S. Bana, Deepak Singh, Anil K. Choudhary, Ramanjit Kaur, Samarth Lal Meena, Vijay Singh Meena, Sandeep Kumar, Madhu Patial, V. Spandana, Vijay Pooniya, Ravi C. Nirmal, Megha Kumari, Ruchi Bansal. 2025. Strategic sulphur-micronutrient application reduces plant stress while improves maize yield stability, grain nutrient-density and soil microbial health across diverse ecologies. Journal of Agriculture and Food Research. 23, 102309. https://doi.org/10.1016/j.jafr.2025.102309 .	6.2	12.20
3	Nabi, S. U., Parveen, S., Kamil, D., Khokha, K., Watpade, S., Raja, W. H., Mir, J. I., Verma, M. K., Manzoor, S., Amin, Z., Ayaz, A., Rasool, B., Manzoor, T. (2025). Diversity of fungal species causing apple canker disease in India using multigene characterization. Physiological and Molecular Plant Pathology, 139, 102817.	3.3	9.30
4	Patial, M., Bishnoi, S.K., Kashyap, P.L. et al. 2026. The genetic saga of barley leaf rust: evolution, resistance, and breeding innovations. Molecular Breeding 46, 32. https://doi.org/10.1007/s11032-026-01656-7	3.0	8.60
5	Sharma Shakshi, Tomar Manica, Watpade Santosh, Shukla Arti, Devi Sunita, & Verma Pramod. 2025. Characterization of <i>Pantoea agglomerans</i> associated with shot hole, canker and gummosis in peaches and plums from the Northwestern Himalayan region of India. Crop Protection. 191:1-11	2.5	8.50
6	Basandrai, D., Sood, T., Mehta, A., Kaur, J., Patial, M., Singh, S., & Basandrai, A.K. 2025. Field relevant resistant sources to yellow rust (<i>Puccinia striiformis</i>) and powdery mildew (<i>Blumeria graminis tritici</i>) in some exotic wheat (<i>Triticum aestivum</i> L.) and their yield potential. Indian Journal of Genetics and Plant Breeding, 85(03), 426–436. https://doi.org/10.31742/ISGPB.85.3.8	0.8	7.00

- ✓ Papers with <6 NAAS rating=5
- ✓ Conference Souvenir-cum-Compendium of Abstracts: 01
- ✓ Book Chapters=2
- ✓ Popular articles = 10
- ✓ Extension Bulletin=1

NEW JOINING

- Dr. Pooja Devi, Scientist joined the Station on 07th July, 2025.

SUPERANNUATION

- Mr. Bharat Bhushan superannuated on 30th September, 2025.
- Mr. Baldev superannuated on 31st October, 2025.

GLIMPSES OF ACTIVITIES



National Symposium at PAU Ludhiana



National Symposium at PAU Ludhiana



KVK Hamirpur at Bara



KVK Mandi at Sunder Nagar



Chailchowk district Mandi



VKSA at Khatnol, Shimla

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हर कदम, हर डगर
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