



IARI NEWS



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58th IARI Convocation

The 58th Convocation of the Post Graduate School of the Indian Agricultural Research Institute was held on February 14, 2020. Hon'ble Vice-President of India, Shri M. Venkaiah Naidu was the Chief Guest and delivered the Convocation Address. Shri Narendra Singh Tomar, Hon'ble Union Minister of Agriculture and Farmers Welfare, Rural Development & Panchayati Raj, Govt. of India presided over the function and Shri Kailash Choudhary, Hon'ble Minister of State for Agriculture and Farmers Welfare, Govt. of India graced the function as Guest of Honour. Dr. T. Mohapatra, Secretary, DARE & Director-General, ICAR, former Director-Generals of ICAR; former Directors & Deans of IARI also graced the occasion. The Chief Guest presented the medals and awards to the students and faculty, while the Chairman presented the degrees to the students.



Degree distribution by Hon'ble Vice-President of India, Shri M. Venkaiah Naidu

During the Convocation, various publications and a total of 34 varieties/hybrids were released which included 9 varieties of wheat, 4 of maize, 2 of chick pea, and one each of lentil, mungbean and soybean. Eleven varieties/hybrids of vegetables (brinjal-1, cucumber-1, summer squash-1, ridge gourd-1, cauliflower-3, tomato-1, spinach-1, and muskmelon-2) were released for better nutrition potential as well as higher yield and income. Four new varieties of fruit crops including two varieties of mango and one each in pummelo and grape were also released. One variety of gladiolus, Pusa Shanti was released for timely sown conditions of NCR, Delhi.

The Chief Guest, Shri M. Venkaiah Naidu, Hon'ble Vice President stated that the agriculture is the basic culture of India and is the real backbone of the Indian economy. He applauded the scientific, technological and industrial advancements made in the agriculture sector and allied sciences. He highlighted about the contributions of ICAR-Indian Agricultural Research Institute for bringing about the green revolution in the country. Shri Naidu stated that the Institution contributed significantly in regular researches and advancements in the development of new varieties that have led to enhanced production of food grains to about 283.37 MT in 2018-19. He also mentioned about the predominance of the Pusa Basmati rice varieties over the cultivation of other rice varieties in the country. He also emphasized that the wheat varieties HD 2967 and HD 3086 have played a vital role in enhancing the wheat production and productivity in the country. He urged for finding out the ways to make the country 100% hunger free. He also stressed on achieving the nutrition security along with food security in the country. The Hon'ble Vice

President also highlighted about the various Central Government's Schemes like Pradhan Mantri Kisan SAMPADA Yojana which aimed at enhancing the income and livelihood of the agricultural and farming communities.

Dr. Ashok Kumar Singh, Director, IARI presented the Director's Report on the significant research achievements of the Institute during 2019, while Dr. Rashmi Aggarwal, Dean & Joint Director (Education) presented the Dean's Report and proposed a formal vote of thanks.

During this Convocation, 242 candidates (144 M.Sc., 9 M. Tech. and 89 Ph.D.) including 15 (11 M.Sc. and 4 Ph.D.) international students were awarded degrees. One student each in M.Sc. (Mr. Arkaprava Roy, Discipline of Soil Science & Agricultural Chemistry) and Ph.D. (Mr. Mahawar Himanshu Ravi, Discipline of Microbiology) were awarded the Best Student of the Year Awards. Dr. Neera Singh, Professor of Agricultural Chemicals received the Best Teacher Award. Dr. S.V. Sai Prasad, Head, IARI Regional Station, Indore awarded Sukumar Basu Memorial Award for his contributions towards developing durum wheat varieties. Dr. T.K. Behera, Professor, Division of Vegetable Science, IARI, New Delhi awarded Hari Krishna Shastri Memorial Award for his research contribution in vegetable breeding. The fifth Dr. A.B. Joshi Memorial Award for the biennium 2019-20 was awarded to Dr. G.P. Singh, Director, ICAR-Indian Institute of Wheat and Barley Research, Karnal for his outstanding research contributions in genetics and plant breeding. Dr. J.P. Sharma, Joint Director (Extension), IARI, New Delhi awarded Best Agricultural Extension Scientist Award for the biennium 2019-20, for his outstanding contributions in the field of agricultural extension, education, communication and management.

Pusa Krishi Vigyan Mela 2020

Pusa *Krishi Vigyan Mela* 2020 themed “IARI Technologies Towards Achieving Sustainable Development Goals” was organised at IARI from March 1-3, 2020. The mela was inaugurated by Shri Narendra Singh Tomar, Hon'ble Union Minister of Agriculture and Farmers Welfare, Panchayati Raj and Rural Development, Government of India. The inaugural function was presided over by Honorable Minister(s) of State for Agriculture and Farmers Welfare, Sh. Parshottam Rupala and Sh. Kailash Choudhary. Dr. Trilochan Mohapatra, Secretary, DARE & Director General, ICAR, was the Guest of Honour. During the inaugural session, other dignitaries present on the dais were Dr. T. R. Sharma, DDG (Crop Science), Dr. A K. Singh, DDG (Agri. Extn.), Dr. A K. Singh, Director IARI, Dr. J.P. Sharma, Jt. Director (Extension) and Dr. J.P.S. Dabas (Incharge, CATAT).



During Pusa Krishi Vigyan Mela 2020

Sh. Narendra Singh Tomar appreciated the commendable efforts of the scientists of the ICAR and NARS system in developing improved and modern agricultural technologies. Sh. Parushottam Rupala, congratulated the Institute for arranging the *Kisan mela* and providing good quality seeds to the farmers. He also desired that ICAR and MoA&FW should organize conference on Climate Change in all the 8 Agro-climatic zones across the country. Shri Kailash Chudhary informed about various government schemes to the farmers and invited them to take benefit of all such schemes like *Pradhan Mantri Krishi Sinchai Yojana*, *Per Drop More Crop*, *Kisan Samman Nidhi* etc.

Farm technologies developed by the Institute for sustainable agricultural development were displayed. Besides, live demonstrations on improved crop varieties, vegetables production technology, IFS Models, farm machineries were also demonstrated to provide first-hand experience to farmers and were the major attractions of *mela*. In total, 900 farmers were provided free of cost 'Farm Consultancy Services' including soil and water testing at the *mela* site by the agricultural scientists. Free Health Camp 'One Health' was also organised for the first time.

A total 270 of stalls were put up by ICAR Institutes (53), SAUs (4), public sector organization (11), private organizations (116), NGOs (8), farm entrepreneurs (68) and flower show (10) from across the country through which they displayed their technologies and products. The *mela* also provided a platform to many organisations and progressive farmers to directly sell their agri-products to the consumers.

More than 80,000 visitors from different parts of the country including farmers from 24 states, farm women, extension workers, entrepreneurs, students and others visited the *mela*.

Four technical sessions were organised on different themes of agricultural importance and the farmers' queries were also addressed by scientists. The session 1 on "Agricultural Technologies for Sustainable Production and Nutrition Security" was chaired by Dr. T. R. Sharma, DDG (Crop Science). Deliberations on the topic were delivered by Dr. R. K. Sharma, Head, Genetics Division, Dr. B. S. Tomar, Head, Vegetable Science, Dr. S. K. Singh, Head, Division of FHT and Dr. V. K. Singh, Head, Division of Agronomy followed by question hour session. On the second day- March, 2 the session 2 on "Sustainable Development Goals and Gender Equality" was co-chaired by Dr. R. B. Singh, Chancellor, CAU, Imphal and Dr. Shridhar Dwivedi, Senior Consulting Cardiologist, National Heart Institute. Dr. A. K. Tripathi, DG, National Solar Energy Institute, Dr. M. C. Sharma, Former Director, IVRI, Dr. Shashi Sharma, Principal, PG College, Muzzaffarpur and Padamshree Sh. Sultan Singh participated in the session as experts. The session 3 on "Natural Resource Management for Eco-friendly Development" was chaired by Dr. A. K. Singh, Secretary NAAS and former VC, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior and Dr. K. Alagusundaram, DDG (NRM), ICAR. Dr. A. K. Singh, Director, IARI, Dr. J. P. Sharma, JD (Extension), Dr. Man Singh, PD, WTC, Dr. B.S. Dwivedi, Head, SS&AC, Dr. Indramani Mishra, Head, Agricultural Engineering, Dr. V. K. Singh, Head, Agronomy and Dr. Archana Suman, PS, Microbiology participated and interacted with farmers and answers their queries. On the third day- March, 3 in the forenoon, session 4 "Innovative Farmers Meet" was organized. Dr. K. V. Prabhu, Chairperson, PPVFRA was the Chief guest and Dr. S. K. Patil, Former Director, IARI, Dr. P. Das, Former DDG (Extension), Dr. P. N. Mathur, former JD (Extension) and Padmashri Bharat Sh. Bhushan Tyagi were Guests of Honour. In this session, the awardee Innovative Farmers and Fellow Farmers shared their success stories of farming and innovations practices.

Seeds of high yielding varieties of different crops worth Rs. 46.80 lakhs and bio-fertilizers worth Rs. 1.20 lakh were sold through Pusa seed sale counter during the *mela* period. Revenue generated through advertisements in *mela* souvenir was Rs. 47000. Fourteen publications useful for farmers and agri-entrepreneurs were also released during *mela*.

The valedictory function was graced by Sh. Kailash Choudhary, Honorable Minister of State for Agriculture and Farmers Welfare, Prof. Ramesh Chand, Chairman, Niti Ayog, Dr. Trilochan Mohapatra, Secretary, DARE and Director General-ICAR, Dr. A. K. Misra, Chairman, ASRB and Dr. R. C. Aggarwal, DDG (Education), ICAR were the Guests of Honour. IARI Fellow and IARI Innovative Farmers' Awards were bestowed upon farmers. Shri Chaudhary emphasized on more applied research work needed for doubling the farmer's income by 2022. He said modern technologies and crop varieties must reach to the farmers without any time lag and must be demonstrated on farmers' fields for winning their confidence.

Dr. RC Agarwal stressed on the importance of human resources development for successful implementation of govt. initiatives. Dr. A. K. Singh, Director, IARI greeted the farmers and the dignitaries and shared the significance of the Mela. The programme was concluded with formal vote of thanks proposed by Dr. J P Sharma, Joint Director (Extension).

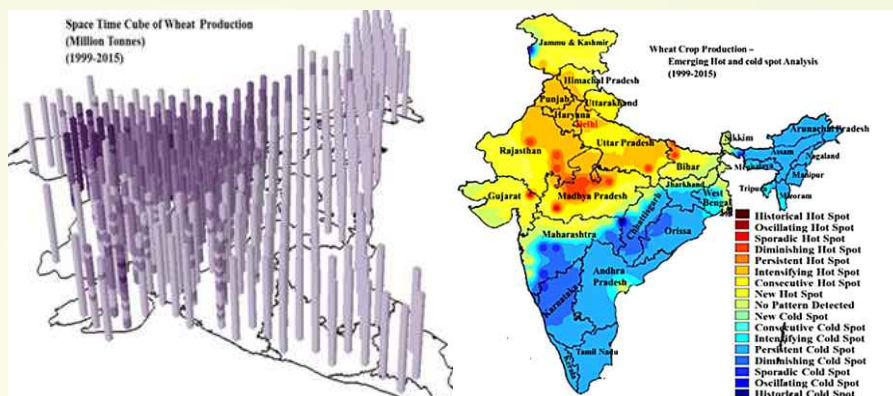
RESEARCH

Pusa Shanti: New Gladiolus Variety

One new gladiolus variety 'Pusa Shanti' was released for NCR Delhi region which was a cross between Yellow Stone x Melody. This variety had spikes of more than 120 cm and florets range from 19-21 in number on medium long sturdy spikes which lasted for more than 15 days in field life. The vase life of this variety in normal tap water was 9-10 days. It is very good multiplier and produces 3.33 corms per plant and 67.77 cormels from each mother corms.



Pusa Shanti variety



Hot spots / cold spots for wheat production in india

This is medium flowering hybrid and takes 100 - 105 days to first floret opening after planting. Floret colour is attractive and outer three tepals are in whitish group (NN 155B) and highly suitable for commercial cut flower production, garden display, floral arrangement and landscaping.

Hot Spot/Cold Spot Analysis for Wheat Production

The hot spot and cold spot analysis using the Getis-OrdGi* statistical technique was performed for wheat production in India with the geo-referenced data from 1999 to 2015. The analyses of space-time cube and space-time cluster density helped to identify, locate and describe

different categories of hot and cold spots for wheat production. The persistent hot spots were identified in the Northern states of Uttarakhand, Uttar Pradesh, Punjab and Haryana, however, the intensifying hot spots were appeared within the Indo-Gangetic plains. The new hot spots were observed in the regions of Central India (especially during the years 2014 and 2015), while the new cold spots were located in Rajasthan and Gujarat. Using the GIS based data models with hot spot/cold spot analysis, the most significant clusters of changes over active wheat crop cultivation can be segregated for a better production management options.

Development of Prototype for Spatial Wheat Yield Forecasting System

A reliable crop yield forecast system was developed by assimilating remote sensing derived LAI and weather forecast into crop simulation model, Info Crop-wheat using minimum observations as model inputs. The CSM model was calibrated and validated at research farm of IARI and farmers' fields during *rabi* season 2015-16 and 2016-17 and showed good performance. The developed forecasting framework consisted of four components, *viz.* (1) retrieve LAI from multi-spectral remote sensing images, (2) assimilate LAI into modified Info Crop model, (3) Incorporate bias corrected WRF modelled weather forecast and (4) computer coded prototype system for spatial implementation. Our study demonstrated that assimilation of LAI through EnkF improved not only crop yield prediction performance but also phenology and growth of wheat. The

workable system showed acceptable accuracy in forecasting phenology, total dry matter and yields of spring wheat at fine scale and minimized the large management input data requirements. It has the potential to be adopted for actual applications in many national projects like FASAL and PMFBY.

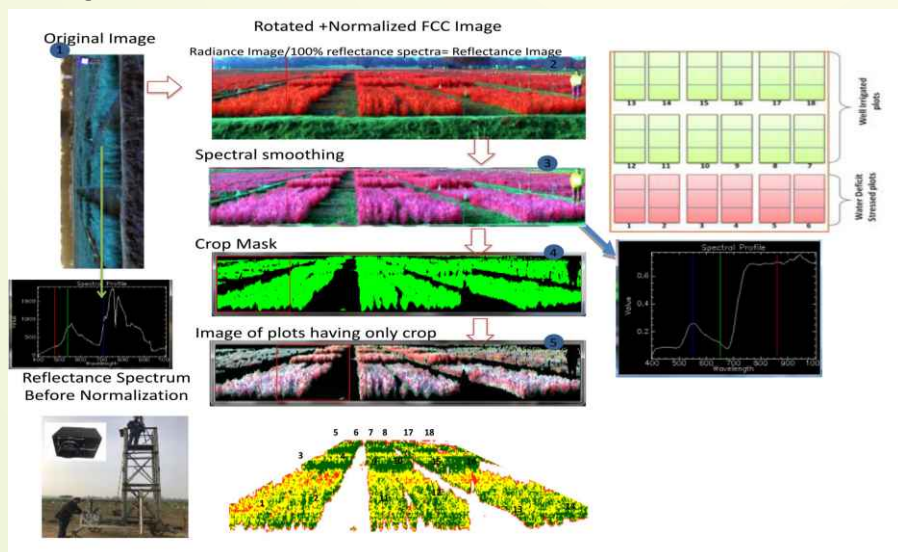
Water Stress Monitoring in Wheat Crop through Imaging Spectroscopy

Hyperspectral imaging was done over experimental field of wheat grown in 54 plots of randomized block design (RBD). Six blocks of wheat crop (18 plots) were kept under water deficit stress condition whereas 12 blocks (36 plots) were grown under irrigated condition. The hyperspectral image acquired from an elevated platform was used to estimate the relative water content (RWC) of crop for different plots. To obtain a more robust and practical equation, optimum wave bands were found and fed into MLR based

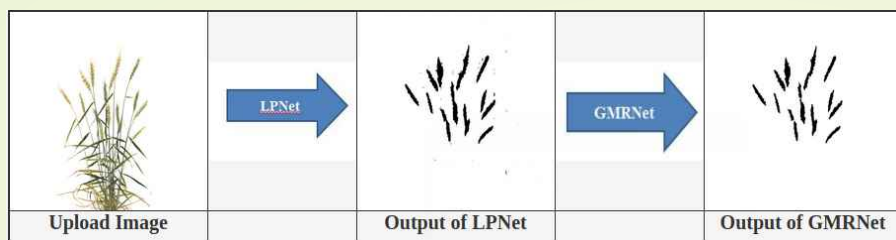
modelling approach for estimating RWC of this wide area coverage imagery and to determine water deficit stress condition. This image depicts that plots in front row (1, 2, 11, 12, 13 and 14) have lower RWC% whereas the plot in the second and third row (rest all plots) have higher RWC%. Actually, plots depicting lower RWC% in this image were raised by using no irrigation treatment; thus are water deficit stressed plots, which could be effectively captured by the spectral images.

SpikeSeg Net : A Visual Imaging Method for Spike Segmentation and Counting in Wheat

Detection, counting of spikes, the grain bearing organs of wheat are critical for phenomics of a large set of germplasm and breeding lines in controlled and field conditions. For spike identification, a novel deep-learning network, SpikeSegNet, was developed by considering “U-Net” convolutional architecture. SpikeSegNet, which is a combination of two proposed feature network: Local Patch extraction Network (LPNet) and Global Mask refinement Network (GMRNet). Visual (RGB) images of 200 wheat plants were captured using LemnaTec imaging system. The precision, accuracy, and robustness (F_1 score) of the proposed approach for spike segmentation were recorded as 99.93%, 99.91%, and 99.91%, respectively. For spike counting, the average precision, accuracy, and robustness were 99%, 95%, and 97%, respectively. A dedicated deep



Hyper spectral image acquisition and processing for wheat crop for water deficit stress monitoring in IARI field



Spike counting Flowchart

learning approach has been developed to identify and count spikes in the wheat plant. The performance of the approach demonstrated that SpikeSegNet is an effective and robust approach for spike detection and counting.

De Novo Transcriptome Sequencing to Dissect Candidate Genes Associated with Pearl Millet Grain Quality

In spite of being the important nutri-cereal, very limited information is available on genes/transcripts of pearl millet linked with the quality of the grains and the networking of respective pathways. Rancidity is one of the major problem in pearl millet flour and the genes/ enzymes associated with the lipid oxidation have not been characterized till date. Diverse genotypes of pearl millet, Chadi Bajri, Damodar Bajri (landraces), Pusa 1201 and Pusa Composite 701 (hybrids) were selected for

the whole transcriptome sequencing using IlluminaHiSeq 4000. Pooled samples (stem, leaves and spikes) collected from the plant during the dough stage were used for the sequencing. The raw reads obtained are presented in table.

The high quality reads were used to generate one pooled assembly using Trinity assembler with default options. All assembled transcripts were subjected to annotation using rice database and 3,70,000 Trinity sequences got gene description based on rice db. A total of 34,000 rice cds were identified showing homology with Trinity sequences. Differential Gene Expression Analysis (DGEA) was performed using edgeR program and comparative view of landraces (Damodar Bajri vs Chadi Bajri) showed 2834 downregulated genes and 2158 upregulated genes. The raw data

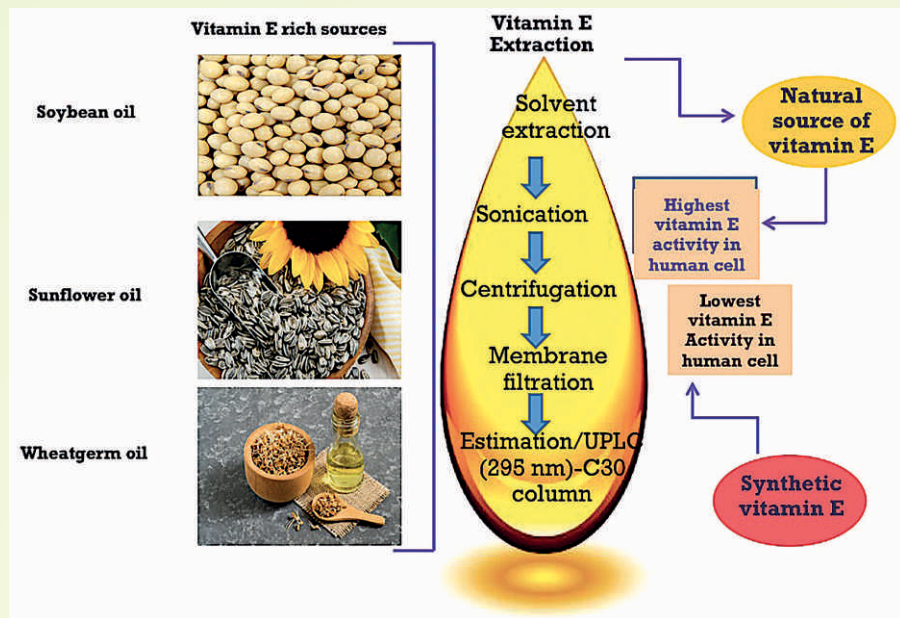
Table. Summary of raw data generated from the whole transcriptome sequencing of diverse genotypes of pearl millet using IlluminaHiSeq 4000.

Sample Name	Number of Reads	Number of Bases (Mb)	GC (%)	Q30
Chadi Bajri-R1	9,08,18,954	9081.9	49.16	95.595
Chadi Bajri-R2	9,04,20,574	9042.06	49.775	97.605
Damodar Bajri-R1	14,34,54,980	14345.5	49.65	97.575
Damodar Bajri-R2	8,24,89,542	8248.96	47.705	97.64
Pusa Composite 701-R1	10,25,67,450	10256.74	45.975	97.55
Pusa Composite 701-R2	9,82,39,658	9823.96	49.38	97.59
Pusa-1201-R1	8,77,26,100	8772.62	46.595	97.395
Pusa-1201-R2	10,24,62,724	10246.28	48.095	97.675

generated were submitted in Sequence Read Archive of NCBI and a Bio Project was also generated with accession no PRJNA625418.

Effect of Exogenous Silicon Application on Expression of Heat-responsive Transcription Factors (HSFs) and Heat Shock Proteins (HSPs) in Wheat under Heat Stress (HS)

Wheat cultivars HD3086 (thermo-tolerant) and BT-Schomburgk (thermo-susceptible) were grown under regulated conditions and were exposed to silicon treatment (2.5 mM based on pilot experiment) and HS treatment (38°C, 2 h) during pollination and grain-filling stages. The flag leaf collected after treatment was used for the expression analysis of HSFs and HSPs in order to understand the effect of Si on tolerance of the plant. The expression of *HSFA6e* and *HD97* TFs were observed to increase in response to $Si_{2.5}$ and HS treatments. The expression of *HSFA6e* was observed maximum (2.8-fold) in wheat *cv.* HD3086 during pollination stage and 2.1-fold in wheat *cv.* BT-Schomburgk during grain-filling stage. Similar pattern of expression of *HD97* was observed in wheat *cvs.* HD 3086 and BT-Schomburgk during pollination and grain-filling stages. The expression of high molecule weight HSPs (*HSP90* & *HSP70*) and low molecular weight HSPs (*HSP23* & *HSP17*) were observed responsive to $Si_{2.5}$ under HS. *HSP17* showed maximum fold increase of expression in both the *cvs.* in



Methodology of extraction of natural vitamin E using solvent extraction and membrane filtration process.

response to $Si_{2.5}+HS$. The exogenous application of Si provides a viable and user-friendly technology to mitigate the effect of the terminal HS in wheat without compromising with the quality of the grains.

Efficient Methodology for Extraction of Natural Vitamin E from Edible Vegetable Oils

The huge demand for natural vitamin E is required due to lower biological activity of synthetic vitamin E of <50% to that of natural vitamin E. Hence, it is important to produce more of natural vitamin E from natural resources. Domestic production of vitamin E in India is not gaining momentum because of non availability of efficient protocols and high production cost. A methodology of extraction of vitamin E enriched with tocopherols in their natural isoforms was developed using solvent extraction and membrane filtration process. The process

comprises a selection of solvent(s) followed by screening step (based on efficient extraction), where in, the most efficient organic solvent(s) or mixtures are determined to generate an extracted vitamin E enriched with tocopherols in their natural isoforms from vegetable oils such as soybean oil, sunflower oil and wheat germ oil. This prototype needs up-scaling at the industrial level. The results revealed that the total vitamin E yield was higher in wheat germ oil (4370 $\mu\text{g/ml}$), followed by soybean oil (2018.99 $\mu\text{g/ml}$) and sunflower oil (554.65 $\mu\text{g/ml}$).

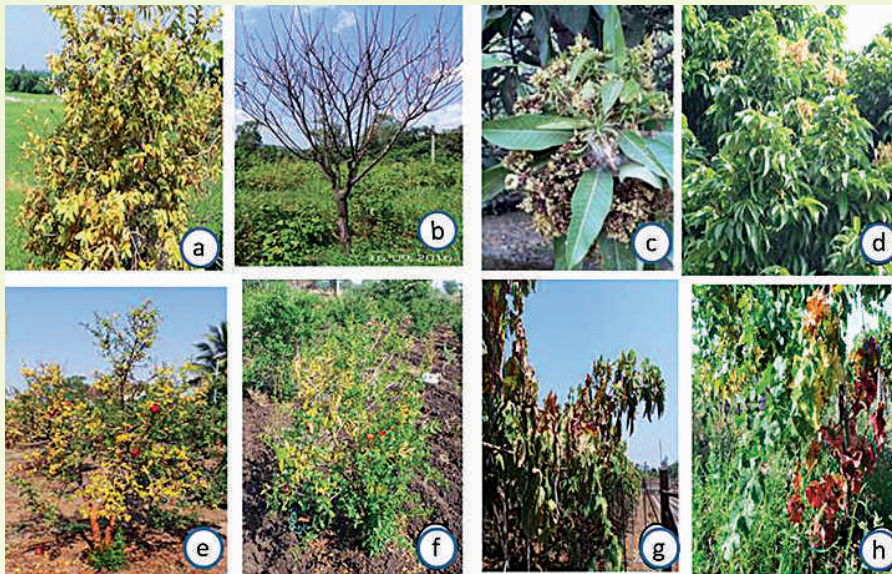
Development of a Non-structural Protein-based Recombinant Polyclonal Antibodies for Specific Detection of Watermelon Bud Necrosis Virus in Plants and Thrips Vectors

Recombinant antibodies against a truncated (243bp) region of Non-structural (NSs) protein unique to WBNV by

cloning in a bacterial expression vector pET-28a+ was developed. The recombinant protein was expressed in the *E. coli* strain BL21 (DE3) through the induction with 1mM IPTG and incubation at 37°C at 200 rpm for 4 hrs. The gel-purified protein was used as an immunogen to raise the polyclonal antibodies (pAbs) which was proved. The pAbs could react specifically with only the WBNV infected (plant and thrips) samples at 1:1000 dilution, but not those infected with GBNV. This anti-WBNV NSs antiserum is the first of its kind in the world with regard to the pAbs specific to WBNV against NSs protein. This antiserum would have great significance in evaluating the watermelon genotypes for resistance to WBNV and virus-vector relationship studies.

Detection of Phytoplasma Association in Fruit Crops

Phytoplasmas belonging to three different groups were detected in symptomatic fruit tree samples in polymerase chain reactions with phytoplasma specific primer pairs amplifying 16S rRNA and secA genes and sequence analysis comparison. 'Candidatus Phytoplasma asteris' - related strain was detected in apricot showing decline symptoms in Siot (Jammu & Kashmir). 'Ca. P. australasia' - related strain was identified in guava, lychee, mango and pomegranate in Rajbag, Sunjwan (Jammu & Kashmir), Pusa (Delhi) and Baramati



Phytoplasma symptoms on fruit plants (a) Guava leaf yellowing at Rajbag; (b) Decline symptom in apricot at Siot; (c) Mango malformation symptoms at Pusa; (d) Lychee little leaf symptoms at Sunjwan; (e) Pomegranate leaf yellowing symptoms at Baramati; (f) Pomegranate leaf yellowing symptoms at Pusa; (g) Grapevine leaf reddening symptoms at Baramati; (h) Grapevine leaf yellowing and reddening symptoms at Baramati.

(Maharashtra), respectively, exhibiting little leaf, leaf yellows and malformation symptoms. Furthermore, a rice yellow dwarf group (16SrXI-B) - related strain was detected in pomegranate and grapevine that showed leaf yellowing and reddening at Pusa (Delhi) and Baramati, respectively.

EDUCATION

50th Lal Bahadur Shastri Memorial Lecture

As a part of the Convocation Week, Prof. Padmanabhan Balam, Former Director, Indian Institute of Science, Bengaluru, delivered the 50th Lal Bahadur Shastri Memorial Lecture on the topic "Chemistry, Biology & the Unity of Nature" on February 13, 2020. Professor R.B. Singh, Former Chancellor, CAU, Imphal presided over the function.



50th Lal Bahadur Shastri Memorial Lecture



International women's day lecture

Celebration of International Women's Day

Every year, 8th March is being celebrated as International Women's Day. On this occasion, IARI, New Delhi organized a function on the theme "Gender Equality and Women Empowerment" in Plant Virology Auditorium of the Institute on March 7, 2020. Dr. Ashok Kumar Singh, Director, IARI; Dr. Rashmi Aggarwal, Dean & Joint Director (Education), IARI; Dr. Rekha Bhagat, Former Head, Division of Agricultural Extension, IARI and Dr. Shelly Praveen, Head, Division of Biochemistry graced the occasion and shared their views. Besides, a large number of faculty, staff and students also attended the function.

EXTENSION

Field Day under On Farm Trials (OFT) on IWM and INM in Wheat

Two field days were organized under on farm trial (OFT) on Integrated Nutrient

Management (INM) and Integrated Weed Management (IWM) in wheat crop at Sakatpur village and Basunda village on March 6 and 12, 2020 respectively. During each of the programme, 55 farmers were participated. During the programme, farmers were taken to field for exposure on technologies. One field day under OFT on “*Fusarium* wilt management in garden pea” was organized on March 12, 2020 at Tajnagar village of Gurugram district wherein thirty two farmers were participated.

Awareness on Meghdoot App

Institute's KVK, Shikohpur, Gurugram was organized four awareness programmes for “Meghdoot App” under Gramin Krishi Mausam Sewa in the district at Sakatpur, Basunda, Tajnagar, and Sanpka villages of Gurugram district on March 6, 12, 17 and 19, 2020 wherein a total of two hundred farmers and farmwomens had participated.

Direct Webcast of Global Potato Conclave

A live webcast of Global Potato conclave addressed by the PM Shri Narendra Modi on January 28, 2020 was organized at KVK, Shikohpur, Gurugram, where in thirty two farmers were participated. A kisan gothi was also organized to address the farmer's problems.

Kisan Diwas

One day “Kisan Diwas” on “Selection of healthy plants and planting of trees of temperate fruit crops scientifically” was

organized at ICAR-IARI, Regional Station, Dhanda Farm, Shimla on January 17, 2020 and more than one hundred fifty farmers were participated.

CAPACITY BUILDING

Trainings/Workshops

- A short-term training program on “Omics Tools and Techniques for Nutritional Evaluation and Enhancement” was organized for the MSc. and PhD. students from different SAUs and ICAR research institutes at Division of Biochemistry from January 09–20, 2020. The training program was attended by thirty three trainees from different parts of India.
- An international human resource improvement training programme was

organized on “Plant Variety Protection, Seed Testing and Certification” for five officials from Kenya Plant Health Inspectorate Service (KEPHIS), Govt. of Kenya at Division of Seed Science and Technology, during January 17–28, 2020. It was inaugurated by Dr KV Prabu, Chairperson, Protection of Plant Variety & Farmers Authority and Valedictory speech was delivered by Dr. A.K. Singh, Director, ICAR-Indian Agriculture Research Institute.

- A five days training programme was organized by CATAT unit of the Institute on "Improved Agricultural Technologies for Higher Income for farmers of North Tripura District, Tripura" from



Group-photo of NAHEP-CAAST at Division of Biochemistry IARI, New Delhi



Group-photo of training programme for Kenya officials



Group photo with Rector YAU and Resident Director, ACARE, YAU, Myanmar

January 19-23, 2020. Thirteen farmers and officials attended the training programme.

- NAHEP (CAAST) sponsored training course was organized at Division of Plant Pathology on “Patho-phenotyping and Genome Guided Characterization of Rust Fungi Infecting Wheat and other Cereals” during January 22-Feb 1, 2020.
- Three training programmes of one day each were organized at CATAT unit on (i) Grading, Packing and Post-harvest Management; (ii) Protected Cultivation and (iii) Bio-fertilizers and Waste Management from Crop Residue and Compost Preparation for extension staffs and farmers of Delhi on January 24; February 4 and March 12, 2020, respectively. Each training was attended by thirty participants.
- Training programme of five days was organized by CATAT unit of the Institute on "Improved Agricultural Technologies" for farmers of Dausa district (Rajasthan) from February 21-25, 2020. Thirty two farmers attended the training programme.
- Institute's Krishi Vigyan Kendra (KVK), Shikohpur, Gurugram organized training programmes on “Protected Cultivation” on February 24 to March 15, 2020 and “Dairy Farmer/Entrepreneur” and “Floriculturist (Protected Cultivation)” during February 24 to March 21, 2020. Under these training programmes, trainees were trained in the technology of protected cultivation of high value vegetables, growing off-season vegetables in poly house/net houses, preservation of seasonal fruits and vegetables and take up it as entrepreneurial activity. Under dairy farming training, participants learnt about the breeds of dairy animals, their management, housing, balance feeding, disease management, bank loans and insurance facilities etc. while the participants of floriculturist training learnt the technology of growing of different cut flowers like gerbera, lillium, rose, carnation etc. Exposure visits were also organized for the trainees during which, they were exposed to the practical

aspects of the subject of the training.

- Training programme of five days was organized by AKMU on "ICT Applications in Agricultural Research" for technical personnel of ICAR from March 16-20, 2020. Twenty five participants were participated.
- A short capacity building training course was organized during February 24-March 06, 2020 under Indo- Myanmar Project by the Division of Agricultural Extension on "Methods of Social Research and Impact Assessment Techniques" in Advanced Centre for Agricultural Research and Education, Yezin Agricultural University, Myanmar. The training course was designed with a view to develop the knowledge and skills of stakeholders of Myanmar agricultural sector in conducting social research, program evaluation and impact analysis. A total of twenty trainees from different disciplines of agriculture and allied sciences from state department of agriculture, Myanmar, Yezin Agricultural University and different NGO's were participated.
- A workshop was conducted on “Virus Diagnostics and Metagenomics for Virus Discovery” during February 21-22, 2020 under the auspices of Department of Biotechnology & Indian Virological Society in conjunction with VIROCON 2020 at Division of Plant Pathology.

- Awareness cum capacity building workshop was organized at Research Farm, Dhanda, Shimla, on February 26, 2020 sponsored by NHB. More than eighty participants participated in this program. Cultivation, protection and different schemes of Horticultural crops were discussed.

ITMC Meetings

During January-March, 2020, two Institute Technology Management Committee (ITMC) meetings were organized by the unit under the chairmanship of



the Director, ICAR-IARI. These meetings are organized to evaluate research outcomes of the technologies, management of IPR portfolios, forge the inventions that need to be protected under IPR and to contrive the terms and conditions for commercialization of new varieties and technologies developed by IARI.

Agri Business Incubation

ARISE 2020

ARISE 2020- Launchpad for agri-startups is an unique

designed incubation program specifically for early-stage agri-startups and was launched on March 1, 2020 with an aim to promote entrepreneurship and innovation in the field of agriculture. The window for applications were opened from March 01 to March 29, 2020, and further extended till April 15, 2020.

Centre of Excellence (CoE) Incubation Evaluation Meeting

Pusa Krishi-ZTM&BPD Unit, IARI conducted the Centre of Excellence (CoE) Incubation Evaluation Meeting for twelve

programs i.e. Agripreneurship Orientation Program, a pre-seed funding program with a funding support of upto Rs 5.00 lakhs for the startups at ideation stage and Seed Funding program with a funding support of Rs. 25.00 lakhs for startups in the pre commercialization stage. A total of 204 startups were evaluated by the committee and 189 startups were recommended for funding of Rs 1444.75 lakhs.

Marketing and Networking Platforms for Startups

• Pusa Krishi Mela

The unit provided the stalls to incubate startups with motive to showcase the innovation/ technologies to the farming community as well as other stakeholders of agricultural development in Pusa Krishi mela from March 01-03, 2020. Shri Narendra Singh Tomar, Hon'ble Minister of Agriculture & Farmers Welfare and Shri Kailash Choudhary, Hon'ble Minister of State visited the stalls. Dr. A.K. Singh, Director, IARI and Dr. Akriti Sharma, Scientist



Glimpses of Pusa Krishi Mela

Raftaar Agribusiness Incubators (RABIs) under the RKVY-RAFTAAR scheme from Feb. 27 to March 12, 2020 for final evaluation, selection and recommendation of startups for funding of two incubation

ZTM&BPD unit introduced the incubatees and briefed about the technologies. Shri Tomar interacted with the incubated startups about the usefulness of their technologies and services in agriculture domain, and



Shri Ramanathan interacting with incubates at Arise Technology Demo Day

appreciated the technologies developed by them.

• Arise Innovation Demo Day:

Incubates of Pusa Krishi participated and showcased their innovation at Arise Innovation Demo Day organized by NITI Aayog on February 05, 2020 at Agriculture & Farmers Welfare at Atal Incubation Centre (AIC)-Entrepreneurship & Management Process International (EMPI) Business school, New Delhi.

Agripreneurship Development Program (ADP) Organized

Five days ADP on "Integrated Approach for Diagnostics and Management of Insect Pests,

Vectors and Natural Enemies” was organized by ZTM&BPD Unit and Division of Entomology, IARI from January 20-24, 2020. Participants received hands on training in the use of various tools

& techniques for identification, monitoring and rearing of both useful and pest insects, their damage symptoms and management. Further they were also acquainted with safe handling and use of insecticides.

IP Management

One (1) patent granted, one (1) copyright was registered and fifteen (15) trademark applications were filed during January-March, 2020.

IPRs	Application No./ Registration No./ Grant No.	Name of Innovation/ Technology/ Product/ Variety
Patent	(2395/DEL/2011)(330282)	Digital Soil Test and Fertilizer Recommendation Meter
Copyright	SW-13196/2020	Irrigation and Fertigation Scheduler (IFSLED)

Corporate Membership

Corporate membership allows Industry partners and NGOs direct access to breeder seeds developed by IARI and its regional stations. In this quarter fourteen corporate members were enrolled.

Visitors from Abroad

During the period January-March, 2020 one delegation from Bhutan visited the Institute. The delegation from Bhutan was led by Dasho Karma Tshiten former Chairman of Civil Service Commission, Bhutan.

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