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IARI News

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RESEARCH

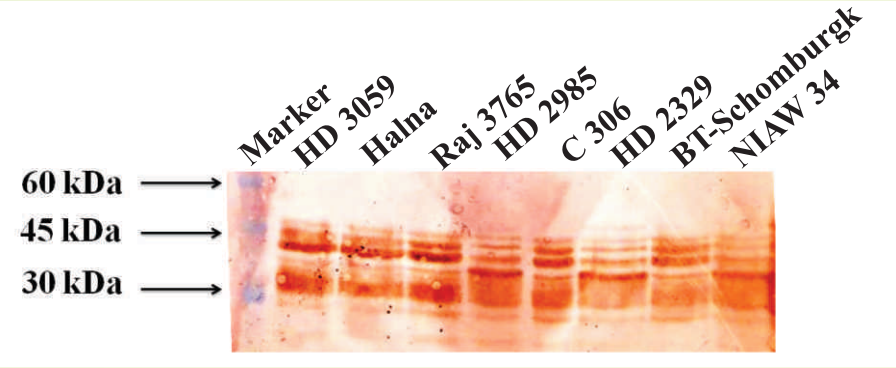
Wheat Variety Identified for Release

HI 1620, a bread wheat genotype developed by ICAR-IARI, Regional Station, Indore, was identified for release under timely sown, restricted irrigation conditions of North Western Plains Zone. HI 1620 is high yielding (4.91 t/ha) genotype with a yield potential of 6.18 t/ha. It also showed significantly high yield gain at one irrigation (28.8%) and two irrigations (40.7%) over no irrigation conditions. It is a medium late maturing (140-145 days) genotype with 95-100 cm plant height. It has uniform bold and lustrous grains having high thousand grain weight (43 g). It has excellent *chapati* making quality (7.52) with high sedimentation value (52 ml) along with good biscuit quality (6.82). It has high protein content (11.9%) and protein quality (perfect *Glu* score of 10/10) for high molecular weight subunits and presence of 5+10 subunit of Glu-D1 reflecting higher gluten strength. It showed good levels of adult plant resistance to prevalent and virulent stripe rust pathotypes 46S119 and 110S119; and leaf rust pathotypes 77-5 and 77-9. It also showed good levels of resistance to leaf blight, Karnal bunt, *Fusarium* head blight, loose smut and flag smut.

HI 1620: A field view

Characterizing the Protein Quality of Wheat Grains through Mapping the Gliadin Protein Integrity

Gliadin is a class of proteins present in wheat and several other cereals within the grass genus *Triticum*. Gliadins, which are a component of gluten, are essential for giving bread the ability to rise properly during baking. We observed very distinct bands of gliadin in the range of 30 – 60 kDa. The bands were observed very intact in the grains of wheat cvs. Halna, Raj 3765 and C 306. Other cultivars showed diffused gliadin protein bands. The bands observed on the gel using the gliadin specific polyclonal antibody basically showed the different forms of gliadin protein present in the grains of these wheat cultivars. Maximum forms of gliadin proteins were observed in Raj 3765, HD 2985, C 306 and BT-Schomburgk.



Immunoblot assay of gliadin protein in grains of contrasting wheat cultivars

AGRODATE - Rapid, Easy Method of Transient Agro Infiltration in Soybean Tackling Leaf Heterogeneity

The Institute developed a rapid and easy transient expression system termed as "AGRODATE – Agrobacterium mediated disc assay for transient expression" in mature soybean leaves using an optimized infiltration buffer (10mM 2-(N-morpholino) ethane sulfonic acid sodium salt, 10mM MgCl2, 0.2mM acetosyringone, 400mgl-1 L-Cysteine, 0.5mM DTT & 0.01% Tween 20) under vacuum using a needless syringe, which delivered 58% transformation efficiency within 4 days of infiltration. This not only limits the issues associated with heterogeneity but also genetic pollution and in addition can be conducted without any specialized instruments. AGRODATE offers a viable approach for application of high throughput agro infiltration for rapid gene expression analysis.

GFP Tagging Based Method to Analyze Efficiency of Genome Editing

The CRISPR/Cas (Clustered regularly interspersed short palindromic repeats/CRISPR – associated proteins) is regarded as revolutionary technology because of its easy manipulation, high efficiency and its wide application in functional studies of genes and genetic crop improvement. Several tools are available to generate large number of gRNAs with minimum off target effects, quick criteria that can be used to distinguish efficient and inefficient sgRNAs based on cleavage efficiency is still limited. Thus to minimize the generation of non-edited transgenic plants resulting from inefficient sgRNAs, a strategy was adopted to tag exogenous /endogenous genes with green fluorescent protein (*GFP*)to rapidly analyze genome editing efficiency of gRNAs targeting gene of interest. Within 7 days of time period, the most efficient gRNA can be determined through tracking GFP fluorescence signal in the leaves co-infiltrated with *GFP* tagged genes + CRISPR/Cas9 gRNA constructs in *N. benthamina* leaves or any suitable model crops. The present study has demonstrated the utility of GFP fluorescence marker to detect the targeting efficiency of gRNAs which can be broadly applicable to study genome editing efficiency of gRNAs targeting both endogenous and exogenous genes through transient expression systems in *N. benthamiana*. It helps to select the most efficient gRNAs to edit the gene of interest in several crop species.

Bacterial Volatiles for Plant Disease Management

Dual action of bacterial origin volatile organic compound, 6-dimethyl pyrazine as biocidal as well as elicitor of plant defense was observed. Conidial germination, mycelial growth and sporulation of *Magnaporthe oryzae* Isolate 1637 was significantly affected by 6-dimethyl pyrazine. Complete inhibition of germination was observed. Synthetic bacterial volatile compounds 2-Methyl Pyrazine was found to suppress blast disease incidence and severity incited by *Magnaporthe oryzae* Isolate 1637 on rice upon seed volatilization and seedling volatilization. 2-methyl pyrazine

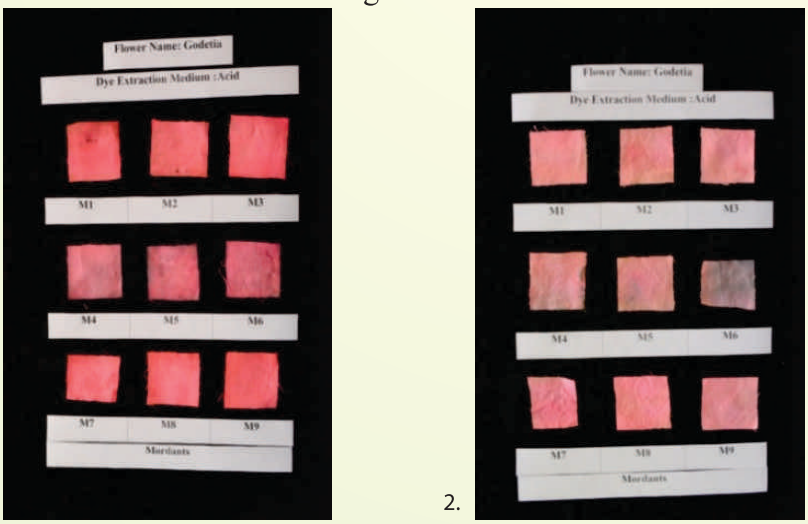
Effect of 2-methyl pyrazine on blast disease severity

was found to alter expression level of defense related gene, *Os*PAD4. This is the first report of SA mediated defense activation by induction of *Os*PAD4 in rice plants by pyrazine group of volatiles. This is also the first report of microbial volatile mediated seed priming leading to suppression of rice blast disease in rice.

Extraction of Natural Dye from Godetia Flowers

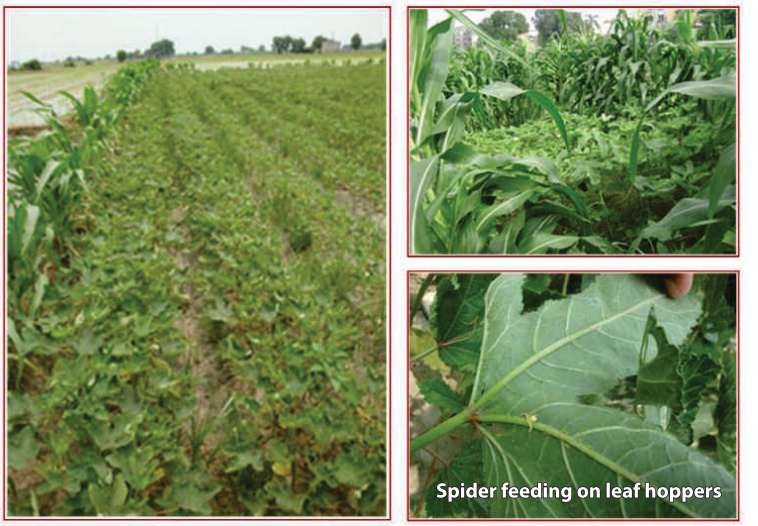
An investigation was carried out to extract the natural dye from godetia; a very beautiful, lesser known winter season bedding plant in the laboratory of Division of Floriculture and Landscaping, using fresh flowers of godetia to ascertain its potential for obtaining natural dye. For extraction of dye different solvents like acid, alcohol, alkali and water were used to extract dye from fresh flowers. It was observed that 50% Hydrochloric acid (HCl) i.e. acidic extraction method was best for obtaining original colour followed by aqueous method in godetia flowers.

After extraction of dye, the retention of colour of dye on cotton cloth was observed using different mordants/fixers as well as mordanting methods. Among mordants, 5% alum was found to be the best mordant and among methods of mordanting, both pre- and post-mordanting were good and helped in fixing the original dye colour to the fabric.



1. 2.

Effect of pre-mordanting (1), and post-mordanting (2) on cotton fabric for colour fixation (dye extracted from acidic medium)



Okra intercropped with maize

Insect Pest Management in Okra through Intercropping with Maize

Okra, an export oriented crop of the country, is prone to be attacked by many insect pests. Managing these pests through eco-friendly strategy is really a challenging task. Intercropping okra with maize resulted as successful technique in checking both kinds of insect pest viz., sucking and borer insect pests. Sucking insect pests, leafhoppers and whiteflies reported less in number than sole crop and reduced their population up to 30%. Due to good health of the okra plants, borer infestation is also reduced to 25-30% in okra intercropped with maize. Experiments were conducted wherein okra was border cropped and intercropped with maize after every 15 rows of okra. Maize harbors lot of natural enemies which suppresses overall insect pests of okra and also acts as

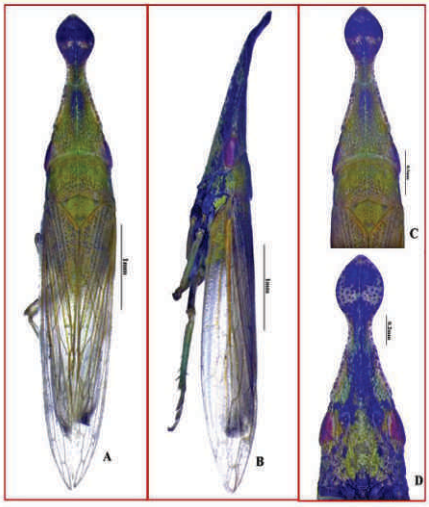
barrier for movement its insect pests. Both crops have no common insect pests. Furthermore, maize plants provide pollen and nectar as food source and also shelter to arthropod predators.

Okra intercropped with maize was useful in conserving and enhancing about 20 species of natural enemies like spiders, *coccinellids, syrphids, Chrysoperla,* besides some others. The technology also helps to reduce number of sprays at initial growth stage of the okra crop, thereby, reducing the load of insecticides in the nature. Technology may also generate additional income to the farmer by sale of fodder and cobs, besides conservation of biodiversity of both plants and natural enemies of insect pests.

Discovery of New Leafhopper Species *Paradorydium kirkaldyi* from Himachal Pradesh

The leafhopper genus *Paradorydium* (Hemiptera: Cicadellidae) is largest among six genera of the Paradorydiina having 34 species world wide and species look like the seeds of the different grasses. This group exclusively feeds on grasses having wide distribution around Palearctic, Afrotropical, Oriental and Australian regions. This group is easily diagnosed by the strongly produced or spatulate head, gena without fine erect seta beside laterofrontal suture, genal margins strongly emarginate (~90° angle), forewing veins raised or carinate, metafemur apical setae 2+0, metatarsomere I expanded apically.

A new species of leafhopper *Paradorydium kirkaldyi* sp. nov. (from Himachal Pradesh: Kinnaur: Powri) from India, is described. The species is named after Prof. G.W. Kirkaldy for his monumental contributions towards classification and leafhopper taxonomy. This species closely resembles *P. khasianum* Viraktamath but differs in male genitalia characters and molecular analysis using COI gene (NCBI GenBank sequence ID: MG489870) to confirm the difference, and also the taxonomic position of new species in the tribe is established with Histone H3 gene. More survey and collection is needed to ascertain the probable host of the new species. Also requires the studies on the biology of this species.



Paradorydium kirkaldyi sp. nov

EDUCATION

"Graduation Ceremony" of ANASTU

Indian Agricultural Research Institute (IARI) is playing an important role in developing trained human resource for agricultural research in Afghanistan, and in establishing Afghanistan National Agricultural Sciences and Technology University (ANASTU) at Kandahar in Afghanistan with the support of the Ministry of External Affairs (MEA), Government of India under the bilateral cooperation programme. Besides, organizing training programmes for the Faculty and Technicians from Afghanistan, the second batch of 18 students of M.Sc. Agronomy from ANASTU was trained at IARI, New Delhi. They undertook 10 courses at IARI, while other four courses were taught by the ANASTU faculty. After completing research work at ANASTU, they again arrived at IARI on July 12, 2018 for thesis writing and submission. The 18 students, after completing their degree requirements, were awarded transcripts in a "Graduation Ceremony"function held on September 13, 2018 at Dr. B.P. Pal Auditorium, IARI. Dr. Trilochan Mohapatra, Secretary (DARE) & Director General (ICAR) graced the occasion as Chief Guest and distributed the transcripts to the ANASTU

"Graduation Ceremony" of ANASTU

students. Ms. Namgya Khampa, Joint Secretary, DPA-III, MEA, presided over the function. Dr. A.K. Singh, Director, IARI (Additional Charge) and DDG (Extension), ICAR delivered the welcome address. Professor Anupam Varma, Advisor (ANASTU) appraised the gathering about the human resource development under ANASTU programme. Dr. Khal Mohammad Ahmadzai, Chancellor (ANASTU) also participated in this programme. The programme concluded with a formal vote of thanks by Dr. R.K. Jain, Dean & Joint Director (Education), IARI.

Teachers' Day Lecture

IARI organized Teachers' Day Lecture 2018 on September 5, 2018 at Dr. B.P. Pal Auditorium of the Institute to pay tribute to Dr. S. Radhakrishnan, the ex-President of India and a great educationist, prolific writer, philosopher, statesman and above all renowned Professor of Philosophy. Dr. R.K. Jain, Dean & Joint Director (Education) emphasized the significance of the Teachers' Day and the lecture series. Dr. A.K. Singh, Director (Additional Charge), IARI chaired the function and introduced the Speaker of the function, Dr. Sankar K. Pal, Former Director, Indian Statistical Institute, Kolkata. Dr. Pal delivered the Teachers' Day Lecture on the topic "Machine Intelligence and Granular Mining: Uncertainty Modeling and Agricultural Analytics". He explained the significance of pattern recognition and machine intelligence in Agriculture with some examples. The program ended with a formal vote of thanks by Dr. Vinod, Professor, Division of Genetics, IARI.

Dr. Sankar K. Pal, former Director, Indian Statistical Institute, Kolkata delivering the Teachers' Day Lecture

Y.M. Upadhyaya Memorial Lecture

A lecture series has been initiated at the Regional Station, Indore in the fond memory of late Dr. Y.M. Upadhyaya, legendary wheat breeder who laid the "Technical Foundation" of the Station, and immensely contributed to the realization of "Green Revolution" in central India. Dr. Rupesh Deshmukh, Ramalingaswamy Fellow working at National Agri-Food Biotechnology Institute, Mohali, Punjab delivered a lecture entitled "Role of Silicon in Crop Plants" on August 7, 2018. He discussed the role of silicon being played in different processes of plants and how it significantly affect each one of them.

66th Extension Council meeting

EXTENSION

Extension Council Meeting

The 66th Extension Council Meeting was held on September 12, 2018 in the Information hall, Prof. M.S. Swaminathan Library under the Chairmanship of Dr. A. K. Singh, Director, ICAR-IARI. Dr. J.P. Sharma, Joint Director (Extension & Research) emphasized the role of extension in achieving priorities of the government in Agriculture. He suggested the celebration of Technology Day in future with the initiation of lecture series from next year.

Director, ICAR-IARI highlighted that the Extension Council is very important body to set extension priorities. Level of participation in different extension programmes needs to be introspected. The impact of *Mera Goan Mera Gaurav* (MGMG) programme needs to be documented in terms of area covered under new varieties, its adoption, dissemination, linkages developed with other stakeholders, awareness about improved technologies generated among the farmers, etc. He called for making small teams including scientists, students, innovative farmers for short term regular impact assessment of improved technologies and successful models. Availability of quality seed may be facilitated through participatory Seed Production programme and also developing a mechanism for seed quality monitoring.

He emphasized that Innovator Farmers Day, which is celebrated for the first time, may be celebrated now on a bigger scale, where farmers can deliver lectures for sharing their knowledge and exhibit their produce in a small exhibition.

Round table conference on sustainable development goals

Round Table Conference on Sustainable Development Goals

ICAR-Indian Agricultural Research Institute, New Delhi, in Collaboration with Confederation of NGOs of Rural India (CNRI) and Pricewaterhouse Coopers Private Limited (PWC) organized one day "Round Table Conference on Sustainable Development Goals and Making Indian Agriculture Sustainable ,Productive, Profitable and Opportunities Ahead" on September 14, 2018. Hon'ble Union Minster of State for Agriculture & Farmers Welfare and Panchayati Raj, Shri Purshottam Bhai Rupala and Shri Som Pal Shastri, former Minister of state for Agriculture, Govt. of India graced the occasion.

Follow-on Workshop on Agriculture Extension and Sustainable Development Goals (SDGs)

IARI organized in collaboration of Participatory Rural Development Initiatives Society (PRDIS) a Follow-on Workshop on "Agriculture

Follow-on workshop on agriculture extension and sustainable development goals

Extension and Sustainable Development Goals (SDGs)" on September 17, 2018 at Prof. M. S. Swaminathan Library to review the recommendations of International Conference on "Transforming Agricultural Extension System: Towards Achieving the Relevant Sustainable Development Goals (SDGs) for Global Impact". Dr. Ashok Dalwai, IAS, Chief Executive Officer, NRAA, Ministry of Agriculture and Farmers Welfare, was the chief guest of the program. Dr. Dalwai delivered an extensive talk to transform the recommendations of the conference into actionable methods. He emphasized on the need of extensive training for extension agents so that they can give on the spot advice to farmers. Dr. A.K. Singh, DDG (Extension), and Director, IARI. Dr. J.P. Sharma, Joint Director (Extension & Research), Prof. S.V. Reddy, President & Executive, PRDIS, Dr. V.V. Sadamate , former Advisor (Agriculture), Dr. Srinath Dixit, Principal Scientist and Head, ICRISAT, Shri Satya Priya, Ms. Rubi Pathania, WWF, Shri Sudarshan, IISA, Ms. Rebecca from FAO and Dr. M.N. Reddy, former Director, MANAGE attended the workshop.

IARI Participated in Exhibitions

- International Agri-Horti Expo, 2018 at Pragati Maidan, New Delhi from July 27 to 29, 2018.
- Krishi India Expo at Pragati Maidan, New Delhi from August 20 to 22, 2018.
- *Kisan Samridhi Mela* at CODISSIA, Coimbatore, Tamil Nadu from August 24 to 26, 2018.
- *Kisan Mela* at YFA Campus, Rakhra on September 15, 2018.
- *Krishi Mela*-2018 at the University of Agricultural Sciences, Dharwad from September 22 to 25, 2018.

CAPACITY BUILDING

Trainings

The Division of Agricultural Extension conducted six training programmes under the UNDP sponsored project of "Strengthening Agri-nutri Linkage for Enhancing Nutritional Security and Empowering Farm Women in India: Leveraging Agriculture for Nutrition" at Sandel Klan village, Sonipat district; Dadri Toye and Jharli village, Jhajjar block, Jhajjar district; and Sangail and Jajuka villages, Mewat District, Haryana. In each of the training programme, a group of 51 rural

Participatory demonstration on processing and value addition to pearl millet and soybean

women representing various Self Help Groups participated.The Division also organized a sensitization programme on "Community Agri-Nutri Centre" under the project entitled "A Nutrition led Extension Model of Community Agri-Nutri Centres (CANSCs) for Nutrition Security of Women" on July 21, 2018 at Lehchhoda village, Baghpat District, Uttar Pradesh. The Division of Agricultural Extension organized another training programme on "Extension led Nutritional Security" under the Centre of Advanced Faculty Training (CAFT) from September 4 to 24, 2018. In total, 21 participants from 4 ICAR institutes and 17 state agricultural universities (SAUs) and *krishi vigyan kendras* attended this training programme.

The Institute's Zonal Technology Management& Business Promotion Development Unit organized a training programme on "Hands-on Training Programme on Patent Drafting" from July 18 to 20, 2018 to provide an insight into the intricacies of drafting of patent applications and how to perform it at individual level. A total 21 participants were benefitted from the training.

The Institute's Centre for Agricultural Technology Assessment & Transfer (CATAT) organized an off-campus training on "Efficient Use of Fuel in Agricultural Operations and Maintenance of Tractor and Pump Set" in Khajurka village, Palwal, Haryana on August 10, 2018. About 30 farmers participated in the programme. CATAT also conducted a skill development programme on "Use of Cono Weeder in Paddy Crop and Safety Measures in Use of Farm Machineries" in Rajpur village, Aligarh, Uttar Pradesh on September 5, 2018. Thirty five farmers and farm women participated in the programme. CATAT organized four training programmes each for 25 extension staffs and farmers sponsored of NCR, Delhi on: i) "On *Kharif* Crops (Maize, Paddy, *Jowar*, *Bajra*, *Arhar*, *Urd* and Vegetables) on September 13 & 14, 2018; ii) "Mushroom Cultivation" on September 20, 2018; iii) "Organic Farming Certification" on September 25, 2018; and iv) "Good Agricultural Practices on Flower and Vegetables" on September 28, 2018.

CATAT also organized six training programmes under Pt. Deen Dayal Upadhyay Krishi Siksha Yojna, on "*Prakurtik Kheti, Jaivik Kheti, Gau Adharit Gramin Arthvyavastha*" at Swadeshi Prakurtik Shodh Sansthan, Nisurkha, Bulandshahr, Uttar Pradesh; *Vaidik Gaushala* and *Anusandhan Kendra*, Rohini, Delhi; Gramin Siksha evam Sahayata Association, Mitraun, Delhi, and Thana Bhawan, Shamli, UP.

The Division of Soil Science and Agricultural Chemistry organized a training programme on "Advanced Level Training in Soil Testing, Plant Analysis and Water Quality Assessment" from August 7 to 27, 2018. Eleven participants from ICAR institute/ SAU/ KVK/fertilizers industries/other organizations participated in the training.

The Institute's *Krishi Vigyan Kendra* (KVK) at Shikohpur organized two vocational training programmes on: i) "Beekeeping" from September 18 to October 8, 2018 (10 youths from different villages of Gurugram district participated); and ii) "Micro-irrigation and Integrated Farming Practices". In the 3-day training programme, live demonstration of mushroom production, bee-keeping and kitchen gardening were showed to the farmers of Mewat district (50 farmers and farm women from 25 villages of the Mewat district participated). During this training, the farmers were motivated to adopt the technologies for better return from agriculture. The KVK also organized an in-service training programme on "Importance of Hygiene in Child Care" on September 20, 2018 at the *Anganwadi* center, Manesar. In this training programme, 25 *Anganwadi* workers participated.

An in-service training programme on "Importance of Hygiene in Child Care"

The Center for Advanced Faculty Training (CAFT), Division of Biochemistry organized a training on the topic "Biochemistry of Food Crops: From Omics Studies to Nutrient Analysis" from September 25 to October 15, 2018.

MISCELLANEOUS

New Externally Funded Projects Sanctioned

- "Field demonstration of battery assisted four wheel weeder (Pusa Model)" funded by ATARI. Amount: ₹ 1.50 lakhs for one year. Principal Investigator: Dr. S.P. Singh, Principal Scientist, Division of Agricultural Engineering.
- "Revival of Darjeeling mandarin cultivation in traditional and non-traditional areas of north Bengal" funded by NABARD. Amount: ₹ 6.68 lakhs for three years. Principal Investigator: Dr. Sujit Sarkar, Scientist, IARI Regional Station, Kalimpong.
- "Marker-assisted breeding for drought tolerance in wheat" funded by DBT. Amount: ₹ 120.89 lakhs for three years. Principal Investigator: Dr. P.K. Singh, Principal Scientist, Division of Genetics.
- "Whitefly (*Bemisia tabaci*) in North Eastern India: Diversity, factors of virus transmission and natural inhibitor" funded by DBT. Amount: ₹ 29.67 lakhs for three years. Principal Investigator: Dr. Amlendu Ghosh, Scientist, Division of Plant Pathology.
- "Development of diagnostic for detection of *Sarocladium oryzae* causing sheath rot in paddy using molecular markers and its eco-friendly management" funded by DST-SERB. Amount: ₹ 27.18 lakhs for three years. Principal Investigator: Dr. Atul Kumar, Principal Scientist, Division of Seed Science and Technology.
- "Marker-assisted introgression of waxy1 allele for development of high amylopectin maize genotypes" funded by DBT. Amount: ₹ 27.42 lakhs for three years. Principal Investigator: Dr. Vignesh M., Scientist, Division of Genetics.
- "Development of citrus tristeza virus (CTV) resistant elite mandarin genotypes through RNAi approach to revive citrus industry in North East India" funded by DBT. Amount: ₹ 37.17 lakhs for three years. Principal Investigator: Dr. Kajal Kumar Biswas, Principal Scientist, Division of Plant Pathology.
- "Pullulanase based identification of high resistant starch rice (*Oryza sativa* L.)" funded by DST-SERB. Amount: ₹ 37.98 lakhs for three years. Principal Investigator: Dr. Archana Singh, Principal Scientist, Division of Biochemistry.

- "Identification and validation of QTLs linked to Fusarium wilt resistance in pigeonpea using SNP markers"funded by DST-SERB. Amount: ₹ 43.38 lakhs for three years Principal Investigator: Dr. Rama Prasad G., Scientist, Division of Genetics.
- "Study on the changes in microbial community structure and function in organic farming vs. conventional farming"funded by DBT. Amount: ₹ 71.57 lakhs for three years.Principal Investigator: Dr. Anil K. Choudhary, Senior Scientist, Division of Agronomy.
- "Identification of key indicators and establishment of their critical limits in assessing soil health under different agro-ecological regions of India" funded by DST-SERB. Amount: ₹ 32.18 lakhs for three years. Principal Investigator: Dr. Sunanda Biswas, Scientist, Division of Soil Science & Agricultural Chemistry.
- "Establishment of thrips cell line to identify the factors responsive to tospovirus transmission" funded by DBT. Amount: ₹ 77.35 lakhs for three years. Principal Investigator: Dr. Amalendu Ghosh, Scientist, Division of Plant Pathology.
- "Identification of QTL(s) for fruit quality traits(s) in mango (*Mangifera indica* L.)" funded by DBT. Amount: ₹ 76.11 lakhs for three years. Principal Investigator: Dr. Manish Srivastav, Principal Scientist, Division of Fruits & Horticultural Technology.
- "QTL mapping of black rot (*Xanthomonas compestris* pv. *compestris*) resistance (race-4) genes in cauliflower" funded by DBT. Amount: ₹ 50.37 lakhs for three years. Principal Investigator: Dr. Shyam Sunder Dey, Scientist, Division of Vegetable Science.
- "Development of locality adapted haploid inducer lines in maize through marker-assisted introgression of pollen-specific MATRILINEAL phospholipase gene" funded by DBT. Amount: ₹ 26.11 lakhs for three years. Principal Investigator: Dr. Firoz Hossain, Senior Scientist, Division of Genetics.
- "Production and processing of micro-algal biomass for biodiesel and other industrially important co-products: an algal refinery approach"funded by NASF, ICAR. Amount: ₹ 33.96819 lakhs for three years. Principal Investigator: Dr. Dolly Wattal Dhar, Principal Scientist, CCUBGA, Division of Microbiology.
- "Epigenomics of drought acclimatization and stress memory in rice" funded by NASF, ICAR. Amount: ₹ 277.37360 lakhs for three years. Principal Investigator: Dr. Suresh Kumar, Principal Scientist, Division of Biochemistry.
- "Identification of super donors and alleles for spikelet fertility and low chalkiness under thermal stress in rice"funded by NASF, ICAR. Amount: ₹ 46.66890 lakhs for three years. Principal Investigator: Dr. Madan Pal Singh, Professor, Division of Plant Physiology.
- "Identification of host factors responsible for infection and development of nano-particle based dsRNA delivery system for imparting resistance to begomoviruses" funded by NASF, ICAR. Amount: ₹ 111.4119 lakhs for four years. Principal Investigator: Dr. Bikash Mandal, Principal Scientist, Division of Plant Pathology.

Patents Granted

- Amphiphilic polymers based slow release nano formulations of ß-Carotene and method of preparation thereof
- Animal Feed Crusher
- Beneficiation of phosphate rock for the segregation of phosphorus-containing heavy metal free minerals

Trademarks Registered

- IP Spectra: IP Facilitation Centre for Agro based MSME's
- Logo of IP Spectra
- PUSA

PPV & FRA Filed

- Extant variety of wheat - HD 4728

Technologies Commercialized

During the period under report, Compost Inoculant Biofertilizer Technology was licensed to one (01) Industry Partner, generating a revenue of ₹1,00,000 (Rupees one lakh only).

Arise Business Incubation Programme

Two start-up companies, viz., Aginnovate Farm Pvt. Ltd. and Himalayan-Maharani Promoters & Consultant signed MoA with IARI for incubation at ZTM&BPD Unit, IARI under the II[nd] Arise Business Incubation Programme 'Arise, Launch pad for Agri Start-ups' for 2017-18.

Corporate Membership

In this quarter, 19 industry partners were registered through corporate memberships. Out of which 11 new members were enrolled and 08 existing members renewed their membership, generating a revenue of ₹ 1,00,000/- (Rupees one lakh only).

Hindi Chetna Mass

The Institute celebrated "*Hindi Chetna Mass*" from September 1 to 30, 2018. The function was inaugurated by Dr. Indra Mani Mishra, Chairman, official language Inspection Committee, Division of Agricultural Engineering on September 1, 2018 at CESCRA auditorium. On this occasion, a Hindi essay writing competition was organized. A large number of scientific, technical and administrative staff members participated in this competition. During *Hindi Chetna Mass*, 10 competitions were organized for all categories of the staff for promoting the use of Hindi. A general knowledge competition was also organized only for the skilled supporting staff of the Institute. Different divisions/regional stations of the Institute also organized Hindi Pakhwara /Saptah/Diwas as a part of month long Hindi awareness programme and conducted different Hindi competitions. A Hindi *Karya shala* on the topic "*Hindi Mein Vigyan Lekhan: Samasyayen evum Samadhan*" was also organized at the IARI Regional Station, Indore on September 28, 2018.

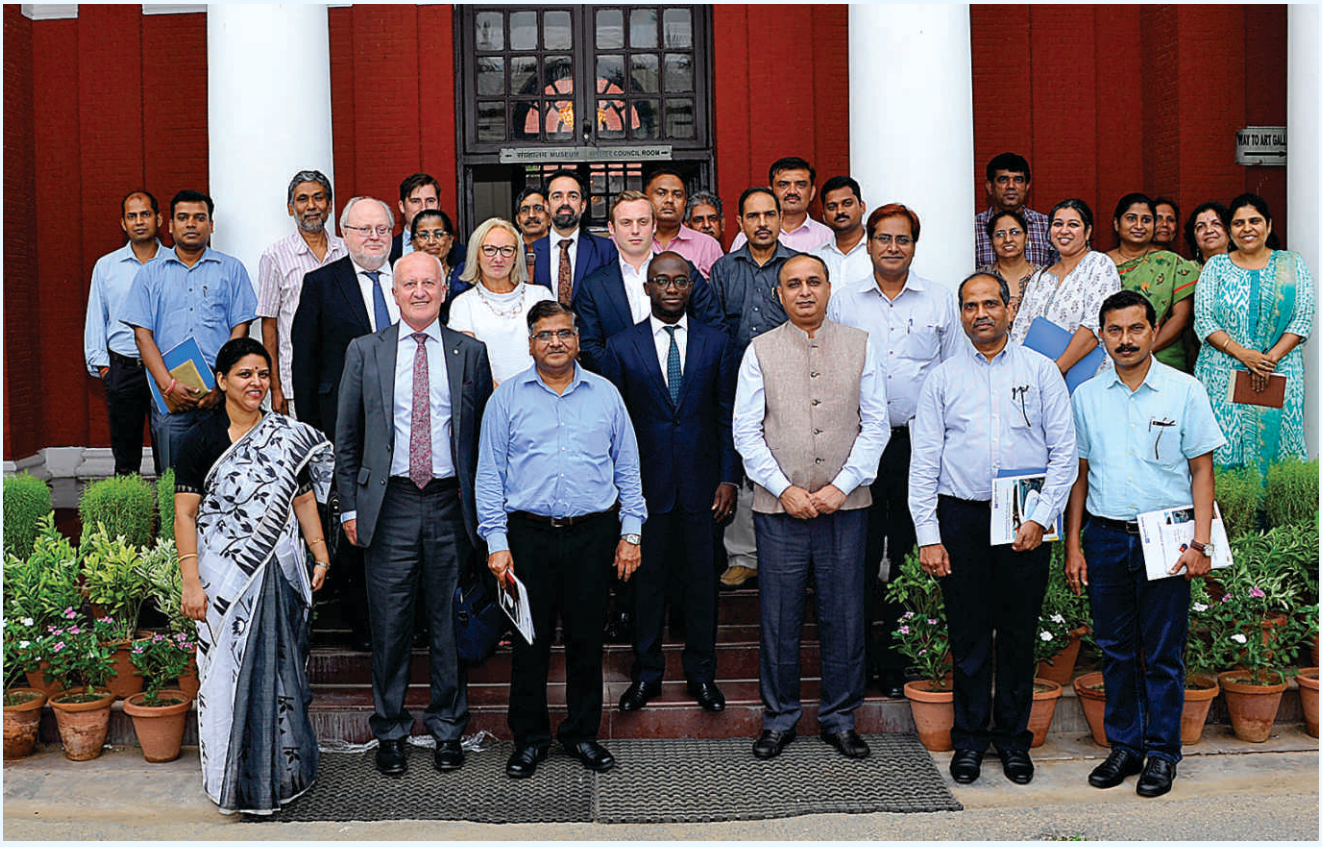
Awards

- Dr. B.S. Dwivedi, Head, Division of Soil Science and Agricultural Chemistry was conferred with Rafi Ahmed Kidwai Award for his outstanding research in Agricultural Sciences 2017 during the 90[th] ICAR Foundation Day celebration by Indian Council of Agricultural Research, New Delhi.
- Dr. Alka Singh, Professor, Division of Agricultural Economics, Dr. Archana Sachdev, Principal Scientist, Division of Biochemistry and Dr. Tapan J Purakayastha, Principal Scientist, Division of Soil Science and Agricultural Chemistry were conferred with Bharat Ratna Dr. C. Subramaniam Outstanding Teacher award 2017 during the 90[th] ICAR Foundation Day celebration by Indian Council of Agricultural Research, New Delhi.
- Dr. Shelly Praveen, Head, Division of Biochemistry received the most prestigious Panjabrao Deshmukh Outstanding Woman Scientist Award in the 90[th] Foundation Day celebration of Indian Council of Agricultural Research.

- Dr. Sachin Suroshe, Principal Scientist, Division of Entomology received Fellowship of Society for Biocontrol Advancement (SBA), ICAR-NBAIR, Bengaluru for the year 2018.
- Dr. Ranjeet R. Kumar, Scientist (Sr. Scale), Division of Biochemistry was awarded the Associateship of the National Academy of Sciences, India.
- Dr. Virendra Kumar, Senior Technical Officer, Water Technology Centre received the third prize of Rajbhasha Gaurav Puruskar Scheme 2017-18 from the Ministry of Home Affairs, Govt. of India for the article entitled "*Ghatata Bhoojal Star: Karan Or Niwaran*" published in *Bhagirath Patrika* (October-December, 2017 issue).

Visitors from Abroad

During the period July-September 2018, three delegation one each from UK and Thailand and China visited the Institute.



Delegation from UK with IARI team

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