

**DEPARTMENT OF AGRICULTURAL RESEARCH AND EDUCATION
MONTHLY SUMMARY - MARCH 2021**

IMPORTANT RESEARCH ACHIEVEMENTS:

Varietal Improvement/Promotion:

- A high yielding Wheat variety DBWH 221 with potential yield of 76 q/ha and highly tolerant to heat stress and rich in protein content (11.3%) and good for chapati, bread and biscuit making developed. The variety is also resistant to stripe rust and other important diseases and is recommended for notification and cultivation in the state of Haryana.
- Salt tolerant rice variety-CSR76, which can tolerate sodicity up to pH~9.6 identified for cultivation in sodic soils of Uttar Pradesh.
- At ICAR-IISR, Lucknow, 5000 tissue culture plantlets of newly released sugarcane variety CoLk 14201 were planted in glass house for hardening and further transfer in the field.
- Ascomata induction in *guchchi* mushroom (*Morchella*) was successfully done.

Agricultural Biotechnology:

- Molecular characterization of 802 accessions of wild rice, collected by ICAR-NIPB, New Delhi from natural habitats of 11 agro-climatic zones of India, revealed three sub-populations, namely Pro-Indica, Pro-Aus and Mid-Gangetic. Pro-Indica and Pro-Aus were present all over the country while Mid-Gangetic population was mainly confined to Mid-Gangetic plains. The wild rice represented much higher genetic diversity than rice cultivars, which can be harnessed for identifying useful genes for important agronomic traits.
- Functional marker based on probable disease resistance protein differentiated IISR Shakthi, IISR ThevamSubhakaraSreekara, Girimunda, Panchami, Pournami, Panniyur1, PLD2, P24O4, Kalluvalli, Karimunda, Malabar Excel, HP, HP-780, 1108-Perambamundi with two bands from Vadakkan, Agali and ACC-114 (400bp) with single band. A specific pattern for Narayakodi with bands with amplicon size of ~400 bp and ~550 bp, and Chumala with bands with amplicon size of ~400 bp and ~650 bp identified. This R gene can be used as the genotype specific marker for the pre-breeding programs.
- At ICAR-NBPGR, New Delhi, Genome-wide analysis with 26 microsatellite markers revealed high molecular variation in 104 maize landrace accessions.
- ICAR-IISS, Mau completed the polymorphism survey between two parents IR-36 and GP-74 by SSR markers using 600 SSR primers for polymorphism of which 150 primers showed polymorphism between parents. Those polymorphic primers were subsequently used for genotyping of the population.
- The recombinant Newcastle disease virus containing the chicken anemia virus genes was characterized by fluorescent microscopy with specific markers conjugated to the virus and immunogenic proteins.
- ICAR-IASRI in collaboration with ICAR- Indian Agricultural Research Institute, ICAR-National Institute for Plant Biotechnology, and Shere-Kashmir-University of Agricultural Sciences and Technology identified twenty novel mitogen-activated protein kinase (MAPK) genes in wheat through gel-based proteomics and RNA-seq data analysis. Native wheat MAPK showed maximum activity in thermos-tolerant cv. under heat stress. MAPK was observed to stabilize the starch quality of the grains under heat stress.

- ICAR-IASRI in collaboration with ICAR-Indian Institute of Spices Research, ICAR-National Research Centre for Grapes and ICAR-Indian Agricultural Research Institute, identified rotundone backbone genes viz., α -guaiene synthase & α -guaiene oxidase in black pepper. The identification of the genes & compounds of the guaiene skeleton is expected to help in bioprospecting of black pepper varieties & also in recombinant production of the aroma compound.

Conservation and Management of Genetic Resources:

- One thousand six hundred thirty seven (1637) accessions were added to the National Genebank bringing the Genebank holdings to a total of 450375. Additionally, 827 regenerated accessions were added to long-term conservation. Twenty accessions along with the proposals for release of varieties were received for long-term conservation. Seed health testing of 1306 accessions was carried out for its pest free conservation in National Genebank, by the Division of Plant Quarantine and 1285 accessions were approved for conservation.
- The current holding status of *In vitro* Genebank is 1916 accessions and that of Cryo bank is 14,126 accessions at NBPGR, New Delhi.
- At ICAR- NBPGR, New Delhi, a total of 4303 accessions of imported exotic germplasm were processed for quarantine clearance and all were released to the indenters. Major interception made was that of *Bipolaris myadis* in *Zea mays* imported from Mexico, *Aphelenchoides besseyi* in *Oryza sativa* imported from the Philippines and *Avena sterilis* in *Triticum aestivum* imported from Afghanistan.
- A total of 502 accessions (6421 cultures) of various vegetatively propagated crop species were sub cultured at ICAR-NBPGR, New Delhi for maintenance. Sixteen (16) accessions including *Ziziphus nummularia*, *Z. mauritiana*, *Ziziphus* sp., *Grewiaflavescens*, *Rubiaccordifolia*, *Elaeocarpus floribundus*, *Phyllanthus emblica* and *Citrus sinensis* seeds were added to the Cryogenebank.
- Five thousand eight hundred and fifty five (5855) accessions of various crop species namely cereals (5272), pulses (62), vegetables (136), oilseeds (278) etc. were introduced from 12 countries. The major promising accessions that were imported include Glyphosate tolerant transgenic soybean variety (EC1074837) from USA; Wild maize *Zea mexicana* (EC1074700-1074743) from Mexico and wild linseed (EC1073020-1073129) from USA.
- One perennial *Bhendi* accession, one yellow peel passion fruit and three accessions of *Garcinia dhanikhariensis* from South Andaman and seven accession of Beach pea from Swaraj Dweep (3) and Shaheed Dweep (4) in Andamans were collected.
- Forty-eight herbarium specimens were added to the National Herbarium of Cultivated Plants bringing the holdings to a total of 24, 335 herbarium specimens.
- At ICAR-IARI, New Delhi, 500 new specimens were added to 1.4 million insect specimens preserved in the institutes' "National Collection of Insect Specimens".
- Over 300 varieties of Rose and over 100 varieties of chrysanthemum are also maintained at ICAR-IARI, New Delhi.
- Under material transfer agreement, one thousand six hundred eighty (1680) accessions of various crop species namely cereals (810), pulses (55), fruits and vegetables (782), fruits (3) and Millets (30) were introduced from 12 countries. Four Cotton accessions (SHS 102, SIMA 5, M 55, MCH 84) were exported to Uganda.

- Three hundred fifty (350) sugarcane genotypes consisting of *Saccharum officinarum*, *S. barberi*, *S. sinense*, ISH clones, Ikshu ISH clones, LG selections, commercial hybrids, somaclonal variants etc., are being maintained at ICAR-IISR, Lucknow.
- ICAR-CICR, Nagpur deposited 18 GMS genetic stocks for Medium Term Storage (MTS) in the Cotton Gene Bank, ICAR-CICR, Nagpur.

Management of Natural Resources:

- Prepared Land Resources Inventory (LRI) on 1:10000 scale for Maynaguri (Jalpaiguri, West Bengal), Santipur (Nadia, West Bengal) blocks.
- Developed organic farming package for basmati rice-wheat system with improved varieties (Basmati rice (*Pant Sugandha* dhan-27) - wheat (HD-2967)) for Uttarakhand.
- The Babycorn-chickpea recorded highest chickpea equivalent yield (4.65 t/ha) followed by Babycorn-barley and maize (cob)-chickpea cropping systems. The highest net returns and B:C ratio were also recorded with Babycorn-chickpea cropping system as reported by ICAR-IARI, New Delhi.
- The highest system productivity in terms of pigeonpea equivalent yield (3603 kg/ha) was recorded by IARI, New Delhi with two hand weeding in pigeonpea-wheat cropping system. However, highest net return was obtained with the application of pendimethalin 1.0 kg/ha with one hand weeding at 30 days after sowing in pigeonpea and pinoxaden 50 g/ha with metsulfuron 5 g/ha (Tank mix) at 30 DAS in wheat.
- ICAR-IARI, New Delhi observed that the foliar spray of 0.2% murate of potash at 7 days after anthesis was found to be equivalent to the two spray of KCl in mitigating heat stress in wheat.

Livestock, Poultry & Fish Health:

- 2529 samples from 11 States/UTs including Maharashtra, Madhya Pradesh, Gujarat, Chhattisgarh, Jammu & Kashmir, Rajasthan, Delhi, Uttarakhand, Haryana, Himachal Pradesh and Punjab were tested for Avian Influenza. 123 samples from poultry, ducks, crows, wild birds and environmental samples were tested positive for Highly Pathogenic Avian Influenza virus including 14 H5N1 and 109 H5N8 subtypes.
- Twelve clinical samples from imported Minipigs were tested and found negative for Porcine Reproductive Respiratory Syndrome (PRRS), African Swine Fever (ASF), Porcine Epidemic Diarrhoea (PED) and Swine Influenza. Besides, 11 imported pork/pig bristle samples were also tested and found negative for Porcine Reproductive Respiratory Syndrome (PRRS) and African Swine Fever (ASF).
- Screened 168 bovine serum samples received from Karnataka livestock farm for brucellosis by iELISA of which 5 (2.98%) samples were found positive for anti-*Brucella* antibodies.
- Screened a total of 560 pig sera samples from different states for the presence of CSFV antibodies using CSF- AB check kit of which 221 (39.46 %) samples were found positive.
- A total 16,704 serum samples were tested for measuring anti-FMDV structural antibody. NADCP round 1 sample testing with respect to Jharkhand, UP and Mizoram was completed.
- SPCE kit for testing of 5000 serum samples (Haryana), DIVA kit for testing of 5310 serum samples (Odisha and CCSNIAH, Baghpat), were supplied to carryout sero-monitoring and sero-surveillance under NADCP.
- The disease outbreaks data reported from 516 districts and 120 villages in the country updated in the NADRES database.

- Forecasted livestock disease outbreaks for the month of April 2021 for 13 economically important livestock diseases. The number of diseases in which outbreaks predicted were as follows – Anthrax– 29, Babesiosis– 44, Black quarter–47, Bluetongue–0, Enterotoxaemia– 21, Fasciolosis– 46, Foot and mouth disease–54, Haemorrhagic septicaemia– 47, Peste des petits ruminants– 69, Sheep & Goat pox– 35, Swine fever– 54, Theileriosis–51 and Trypanosomiasis–45.

Integrated Pest Management:

- Biological Control of coconut rugose spiralling whitefly with entomo-pathogenic fungi, *Isaria fumosorosea* (NBAIR- Pfu 5) spray and the introduction of exotic natural enemy, *Encarsia guadeloupa*e parasite was effective in managing rugose spiralling whitefly and was accepted by coconut farmers of north coastal districts of Andhra Pradesh.
- Comparison of five plant extracts (*Urticadioca*, *Thujaorientalis*, *Melia azadirachta*, *Zanthoxylum armatum* and *Parthenium hysterophorus*) as biocontrol agents against cauliflower aphids (*Lipaphis erysimi*) under poly-houses revealed that of plant extract of *Zanthoxylum armatum* (5% spray) was most effective against the pest with 72% control.
- A database on the performance of different germplasms against brown spot was prepared as “brown spot database” and hosted in ICAR-NRRI, Cuttack website. This contains data from 1336 germplasms. The database will help researchers to utilise a particular genotype for identification of gene/QTLs or utilisation in resistant breeding.
- ICAR-NCIPM, New Delhi observed white rust on leaf and inflorescence. Out of three modules, label claim based pesticide module (which includes metalaxyl + mancozeb foliar spray @0.25%) was found effective in management of white rust, whereas bio-intensive (*Trichoderma* soil application @2.5 kg/ha + seed treatment @ 10 g/kg seed and one foliar spray of freshly prepared garlic clove extract @2%) module was found effective in management of Sclerotinia leaf and stem rot.

International Cooperation/recognition

- ICAR-IASRI, has initiated a study entitled “Technical Guidance on the sampling strategy and developing sampling methodology for 2019/20 Lao Agriculture Census” funded by FAO-Laos, Vientiane, Lao PDR. This relates to providing technical guidance to the International Agency for the sampling methodologies developed by ICAR-IASRI, New Delhi.
- An International Webinar cum Workshop on Post-Harvest Technologies for Better Seed Quality – under the aegis of Indo-German cooperation and Seed Sector Development was organized by ICAR-IARI, New Delhi during March 15-17, 2021.
- Mid-term review meeting of UN Environment GEF project “Mainstreaming agricultural biodiversity conservation and utilization in agriculture sector to ensure ecosystem services and reduced vulnerability” was held by ICAR-VPKAS, Almora on March 16, 2021.

Farm Implements, Machinery and Post-harvest Technologies Developed:

- During the last 1 month ICAR developed a number of new farm implements which include; FYM applicator for grape orchards, tractor operated bund former for mulched fields, small millet dehuller, pineapple cutter cum slicer, pineapple harvester, ginger washer cum

peeler, grain treater for enzymatic pretreatment to pigeon pea, meat mincer cum bowl chopper, rotating drum collector for aligned nanofiber production, a digital Ginning Percentage Indicator (DGPI) for Portable Cotton Gins, grader for multiplier onion (Manual & power operated) and a fermenter for lignocellulolytic enzyme production. Ergonomic interventions in semi-automatic vegetable transplanter were also studied.

- An improved version of rotary disc drill for seeding in the surface retained crop residues was tested by IIWBR, Karnal in sugarcane ratoon with complete trash retained on the soil surface as well as surface retained rice residue of up to 15 t/ha. Under both the conditions the performance was very satisfactory.
- IIRR, Hyderabad developed and fabricated 25 kg soil / batch soil puddling machine for pot culture.
- Developed and fabricated a new plastic removal device which can be used for removing macro- and micro- plastics from water. The trials conducted at Juhu creek demonstrated its potential for removal of macro- and micro-plastics from water flowing to sea from the water channels.
- Also developed innovative products like; cereal-gluten free instant ribbon pasta, Avocado-Milk-Browntop millet drink, multi millet instant dosa mix, antioxidant rich rhododendron squash, clove bud oil based functional edible coating for extending the shelf life of strawberry and pomegranate arils. Goat milk-derived protein hydrolysates was found to have pancreatic lipase inhibitory activity.

Copyrights /Patents:

- ICAR-IIRR, Hyderabad succeeded in registering three copyrights namely i) A Web based Photothermic Indexing (PTI) Calculator for Rice Genotypes- SW-14313/2021; ii) IIRR profile mobile app- SW-14289/2021 and iii) IIRR Geoportal - SW-14256/2021.

Technology Promotion and Commercialization:

- ICAR-IIWBR signed the Memorandum of Agreement to foster the Breeding Rights of Wheat and Barley Varieties of ICAR-IIWBR namely DBW 187, DBW 252, DBW 107 and DWRB 137 with Dr. Rajendra Prasad Central Agriculture University, Samastipur, Bihar.
- NBAIR, Bengaluru licensed the three technologies viz. 1) Technologies on Mass production of *Isaria fumosorosea* and *Encarsia guadeloupae* for the management of rugose spiralling whitefly in oil palm; 2) Wettable Powder based formulation of *Bacillus megaterium* NBAII 63 for the growth promoting ability in brinjal and tomato and 3) Liquid formulation of indigenous *Bacillus thuringiensis kurstaki* (Btk) isolates against lepidopteran pests to Godrej Agrovet limited.
- The microbial consortia application technology developed by ICAR-IISR, Indore was identified for release for Central (CZ) and Northern Plain Zone (NPZ). Considering the significantly higher grain yield (up to 20%) from the combined application of *Paenibacillus polymyxa* HKA 15 and Arbuscular Mycorrhizal Fungi in association with 75% recommended dose of fertilizers.
- Technology for solid and Liquid Jaggery / organic jaggery and powder jaggery production licenced to 7 progressive entrepreneurs for commercialization.
- Technology of milk Protein-enriched Bajra Snacks commercialized by ICAR-NDRI to Ms Sarvagya Ayur and Pharma (OPC) Private Limited Maharashtra.

- MoU signed between ICAR-CIRCOT and Cotton Corporation of India Ltd. For “Development of Standard Protocol for ensuring Transparency in Evaluation of Quality and Lot Wise Analysis of Cotton Fully Pressed (FP) Bales”.
- MoU Signed for technology licensing of a) Pomegranate juice, and RTS beverage development and b) Extraction of pomegranate Seed Oil with M/S Ortiz Beverages Pvt. Ltd. Solapur, Maharashtra.

Farmers/Public Outreach:

- Frontline demonstrations on oilseed and pulses were taken up all over the country covering an area of 13336.07 ha and involving 35723 farmers.
- Organized 595 field-days with the participation of 14389 farmers and 638 *Kisan Goshties/Melas* with the participation of 53737 farmers.
- A total 3199 training courses for 69169 farmers, 412 trainings for 5734 rural youths and 302 trainings for 7198 extension functionaries and in-service personnel were organized in the frontline areas of technology development.
- KVK scientists undertook 35872 visits to the farmers’ fields for diagnosing various problems and to sensitize them on location specific recommendations during the month.
- In *Mera Gaon Mera Gaurav* program, 584 scientists visited 653 villages and organized 1599 demonstrations benefitting 20581 farmers. A total of 6154.00 quintals of seed and 24.16 lakh planting materials were also distributed to 14051 and 45428 farmers respectively.
- ICAR- Directorate of Poultry Research, Hyderabad supplied a total of 91509 numbers of improved chicken germplasm and 1,763 improved duck germplasm during the last 1 month to the farmers and various stake holders across the country.
- ICAR- National Research Centre (NRC) on Mithun conducted 2 Technology Awareness Programmes in Arunachal Pradesh to benefit 433 farmers.
- ICR-NRC on Yak conducted Awareness programme of transhumant yak farmers on climate resilient farming at Zemithang, Arunachal Pradesh. A total of 130 participants attended the programme.
- Advisories for Veterinarians and Farmers with respect to African Swine Fever (ASF) issued and made available in the institute website (www.nrcp.in) by ICAR-NRC on Pigs.

Agromet Advisories:

- Agro-met advisory bulletins are prepared by IARI, New Delhi every Tuesday and Friday. During February 20 – March 19, 2021, a total of 8 agro-advisory bulletins were prepared in Hindi as well as in English and SMSs sent to the farmers through farmers Kisan portal. These advisories are sent to IMD for preparation of national bulletins and uploaded on the IMD website (www.imdagrimet.gov.in) in both Hindi and English. These advisories and real time weather data along with medium range weather forecast was uploaded on the IARI website (www.iari.res.in). E-Atlas on inland waterbodies of 18 States of India is made available for public use through Institute website (<http://cifri.res.in/UR/ls/index.html>).
- The data generated at the satellite data reception centre established at ICAR-IARI, New Delhi is regularly used for monitoring crop health and drought condition in all the districts of the country. The information, available to all stakeholders for their own decision making, was regularly updated in the web portal <http://creams.iari.res.in>.

Other important activities:

- The XXVI meeting of the ICAR Regional Committee VI comprising the states of Gujarat and Rajasthan, UTs of Dadra and Nagar Haveli and Daman and Diu was held on March 13, 2021 through video conferencing. Shri Parshottam Rupala ji, Hon'ble Minister of State for Agriculture and Farmers Welfare, Government of India graced the meeting as Chief Guest. Shri Lal Chand Kataria ji, Hon'ble Cabinet Minister of Agriculture, Animal Husbandry and Fisheries, Government of Rajasthan and Shri J. C. Parmar ji, Hon'ble Minister of State for Agriculture, Government of Gujarat participated as Guests of Honour. Senior officers from ICAR, Vice Chancellors of the State Agricultural/Veterinary Universities of the region, Directors of ICAR Research Institutes, Senior Officials of the State Departments of Agriculture, Animal Husbandry, Dairy and Fisheries participated. Various issues related to agriculture and allied areas raised in the meeting by the concerned states/UTs were discussed, actionable points identified and a road map was drawn to resolve them.
- International Women's Day 8th March, 2021 was celebrated by ICAR Research Institutes and Krishi Vigyan Kendras under Indian Council of Agricultural Research at 761 locations all over the country. The theme "Women Leadership in Agriculture: Entrepreneurship, Equity and Empowerment" was especially chosen for these celebrations. The main event was coordinated virtually from New Delhi which was graced by Hon'ble Ministers of State for Agriculture and Farmers Welfare, Shri Parshottam Rupala and Shri Kailash Choudhary. Mrs Archana Chitnis, Former Minister, Woman and Child Development Govt of Madhya Pradesh, Padmashree, Rajkumari Devi and Smt. Krishna Yadav, Krishna Pickles, Gurugram shared their views with the participants. A publication highlighting the success stories of 263 farm women from different parts of the country was also released on the occasion. A total 67037 participants attended these celebrations from different locations during which over 1650 successful women farmers and entrepreneurs from different parts of the country were felicitated by ICAR for their distinguished achievements in different areas of agriculture and allied sectors on this occasion. On this occasion, a special training programme on Bajra cookies & ladoo preparation was organized by ICAR-IARI, New Delhi for 40 rural women at village Ata in Mewat district of Haryana. Besides, a training cum workshop on Amla (Gooseberry) processing, and agricultural utility equipment for women was also organised at Dadhota village of Palwal district in Haryana in which 50 women participated.
- ICAR-IIMR, Hyderabad was empanelled as the Cluster Based Business Organization with Small famers Agri Business Consortium (SFAC), DAC & FW to promote & incubate Farmers Producer Organization (FPO) under New 10000 FPO formation scheme of Ministry of Agriculture & Farmers Welfare. As a part of project, a woman FPO was incorporated by ICAR-IIMR under companies act 2013. Board of Directors of newly incorporated FPO Hulsoor Mahila Kisan Millets Producer Company was felicitated by the Institute on International Women Day, 2021.
- ICAR –NIVEDI organized 'Sensitization e-workshop on important Zoonotic diseases of Karnataka state' on 10th February 2021 sponsored by National centre for disease control under intersectoral co-ordination programme and a total of 66 participants representing IDSP units of Karnataka participated in the workshop by virtual mode.
- ICAR-CIFA established Aquaculture technology park and Aquaculture field school at *Papumpare Eco-agro, Sonajuli*, Arunachal Pradesh on March 07, 2021. Demonstrated composite fish culture, freshwater pearl culture, improved rohu and catla culture and

ornamental fishes brood pond management at this technology Park along with establishing one mini feed mill.

- Fish catch mobile app was developed to tap the potential of mobile communications and technology towards gathering fishery catch data from landing center. This app will facilitate updating daily species wise catch data to centralized server at Port Blair.