



### From Director Desk...



During the last three months, our major research highlights include release of three biofortified crop varieties, two in wheat (HI-1633 and HD-3298) and one in mustard (Pusa Mustard-32). In addition, two wheat genotypes with multiple disease resistance against leaf and stripe rust, Karnal bunt and flag smut along with high grain yield, phenolics rich brinjal line and tomato lines tolerant to tomato leaf curl diseases were registered as genetic stocks with NBPGR. Further, PCR assay for simultaneous detection of chickpea stunt associated virus and phytoplasma and a new phytoplasma associated papaya disease were developed. Scientists also established SO<sub>2</sub> as source of plant sulphur nutrient and regulatory role of iron & sulphur uptake and assimilation in wheat. Significant achievements were also made an impact of conservation agriculture on soil quality indices under rice-mustard system. Hindi Chetna Maas and National Agricultural Education Day were also organized in virtual mode. In addition, the capacity building programme for the extension personnel and farmers through training programme, field days and visit were organized.

I am sure that the information included in newsletter would be useful to stakeholders. I wish to congratulate all the scientists, technical staff and member of publication unit for bringing out the newsletter in time.

*A.K.S.*  
Dr. A.K. Singh  
Director, IARI

### RESEARCH

#### DBWR-190-44-3-2-5: A White Fruited Phenolics Rich Brinjal Line

A new white round fruit brinjal line DBWR-190-44-3-2-5 was developed through interspecific hybridization. The plants are semi-vigorous. The fruits are oval round shiny white with green calyx. The average weight of the fruit is 100-110g. The line gives an average yield of 46.78 t/ha. It is also rich in total phenolics of 46.58 mg GAE per 100 g FW which can serve as a potential antioxidant source for human health.



Fruits of brinjal line DBWR-190-44-3-2-5

#### IARI-bred Biofortified Crop Varieties

Hon'ble Prime Minister, Shri Narendra Modi dedicated 17 biofortified crop varieties to the nation on the occasion of World Food Day celebrated on October 16, 2020. It was a proud moment for the Institute that three varieties (wheat: HI-1633 and HD-3298; mustard: Pusa Mustard-32) have been bred at IARI, New Delhi. HI-1633 possesses high iron (41.6 ppm), zinc (41.1 ppm) and protein (12.4%) as compared to 28-32 ppm of iron, 30-32 ppm of zinc and 8-10% protein available in traditional varieties. HI-1633 provides 41.7 q/ha of average yield under late sown irrigated conditions in Maharashtra, Karnataka and plains of Tamil Nadu. HD-3298 is rich in iron (43.1 ppm) and protein (12.1%). It has an average production of 43.7q/ha under very late sown irrigated

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#### Compilation Committee

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HI-1633 wheat variety



HD-3298 wheat variety



Pusa Mustard-32

conditions. HD-3298 is adapted to Punjab, Haryana, Delhi, Rajasthan (except Kota and Udaipur Divisions), Western UP (except Jhansi Division), parts of Jammu and Kashmir (Jammu and Kathua district), parts of Himachal Pradesh (Una district and Paonta Valley) and Uttarakhand (Tarai region). Pusa Mustard-32 possesses low erucic acid (<2.0% in oil) in comparison to >40.0% in popular varieties. It has seed yield of 27.1 q/ha with 38% oil content under timely sown irrigated conditions. It is adapted to Punjab, Haryana, Delhi, Western Uttar Pradesh, plains of Jammu & Kashmir and Himachal Pradesh. These varieties would provide sustainable solution to address malnutrition in the country.

### Wheat Genotypes Registered with ICAR-NBPGR, New Delhi as Sources of Multiple Disease Resistance

#### HI 1619

HI 1619, a bread wheat genotype has semi erect growth habit, having strong waxiness on leaf sheath, flag leaf, peduncle and spike. It showed significant superiority in grain yield (46.9 q/ha) of 0.2- 5.9% over checks (WH 1142 - 44.3q/ha, HD 3043- 44.7q/ha, PBW 644- 46.3q/ha and WH 1080-46.8q/ha) in NIVT and AVT-I restricted irrigation conditions of North Western Plains

Zone trials. HI 1619 was found to be resistant to leaf and stripe rusts, Karnal bunt and flag smut in multi-location testing from 2016 to 2019. As the availability of multiple disease resistant high yielding genotypes is rare, HI 1619 can be used as potential resistance donor to breed varieties against leaf and stripe rusts, Karnal bunt and flag smut along with high grain yield.

#### HI 8791

HI 8791, durum wheat genotype is an erect genotype having strong waxiness on leaf sheath, peduncle and spikes. It is a very high yielding genotype, with an average yield of 43.0 and 38.4 q/ha in NIVT and AVT-I, respectively. It showed significant superiority of 16% to 2.6% in NIVT and AVT-I respectively in comparison to check variety HI 8627 in Central Zone. HI 8791 was found to be resistant to stem, leaf and stripe

rusts and flag smut in multi-location testing from 2016 to 2019. The average coefficient of infection was below 7 for all three rusts over the years of testing. It also showed immune response to flag smut over two years of testing at different locations. As the availability of multiple disease resistant high yielding genotypes is rare, HI 8791 can be used as potential resistance donor to breed varieties against these multiple pathogens and also a source of high grain yield.

### MASTOLCV-2: A Marker Assisted Selection derived Tomato Lines Tolerant to Tomato Leaf Curl Disease

The tomato leaf curl disease (ToLCD) is one the most predominant and economically important disease affecting tomato crops. All the tomato varieties released by ICAR-IARI, are



Reaction of MAS TOLCV-2 to ToLCD compared with recurrent parent Pusa Sadabahar



Fruiting in MAS TOLCV-2 under epiphytic conditions for ToLCD



susceptible to ToLCD. Among various *Ty* gene(s), *Ty-3* was most effective for enhancing resiliency to ToLCD reaction. In order to improve resiliency of Pusa Sadabahar to ToLCD reaction, marker assisted backcross breeding (MABB) approach was used for introgression of *Ty-3* gene from breeding lines. MAS TOLCV-2 is a dwarf-type, short duration (90 DAT) and suitable for high planting density with yield (60 t/ha). It is suitable for growing without stacking, reducing the cost of production. The introgression of *Ty-3* gene was confirmed through linked molecular marker. MAS TOLCV-2, evaluated using both under natural epiphytotic conditions as well as under controlled conditions, was found promising for ToLCD tolerance. This MAS line will be a potential variety or genetic stock for resistance breeding programme for rainy, autumn-winter (*kharif*) as well as spring-summer (*rabi*) seasons. The line will be suitable for developing ToLCD tolerant hybrids.

#### Pusa Khor

Pusa Khor, a walnut cultivar, was evolved by the scientists of IARI Regional Station, Shimla. This particular accession has started bearing in the second year of its grafting with multi-fruiting behaviour. The walnut normally takes 12-15 years or even more to come into fruit bearing. The fruit appears to be borne in lateral position as well as terminally. The nut is thin shelled and kernel is not adhered to the nut which can be easily removed. Kernel colour is light yellow and good in taste. It is an early, regular, heavy bearing and good quality walnut selection. The oil percentage and shelling percentage recorded was 55.6 and 50.1, respectively.

#### Sulphur Dioxide, as Source of



Pusa khor cultivar of walnut



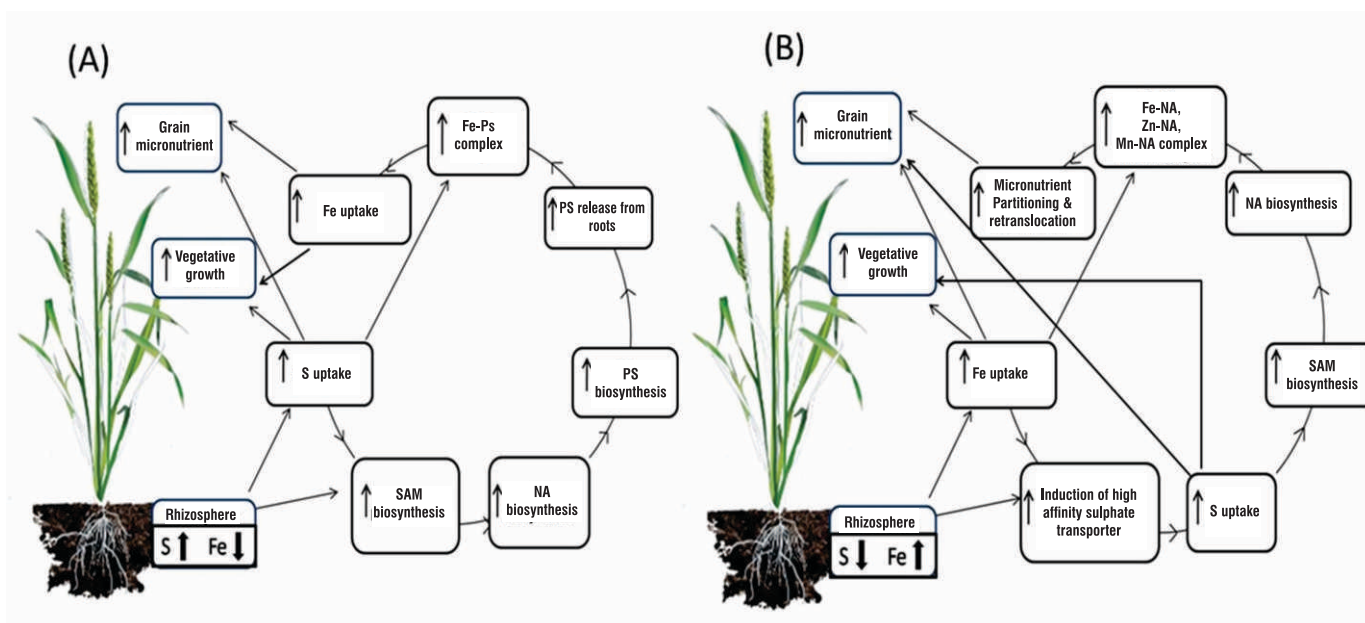
#### Plant Sulphur Nutrition and Physiological Basis of SO<sub>2</sub> Tolerance in Crops

The present study was conducted in controlled fixed tunnels and especially designed field chambers to assess the effect of short term (7 days, 1h daily) and long term (30 days, 3h daily) enrichment of SO<sub>2</sub> (~25-50 µg m<sup>-3</sup> over the ambient level) on growth and sulphur nutrition of bread and durum wheat, barley, chickpea, carrot, tomato, spinach and mustard. Durum wheat and tomato responded most positively to elevated SO<sub>2</sub> levels under the long and the short term SO<sub>2</sub> enrichment studies while chickpea and spinach were most susceptible to SO<sub>2</sub> stress. Further, the relative tolerance of crops to the SO<sub>2</sub> was observed to be related to a lower level of superoxide, H<sub>2</sub>O<sub>2</sub> radicals and lipid peroxidation and a higher level of antioxidants. However, under the short term SO<sub>2</sub> stress, the superoxide radical activity was induced more under HSE than LSE. Level of antioxidants i.e., ascorbic acid, peroxidase and superoxide dismutase activity, increased under

SO<sub>2</sub> stress in vegetable, cereal and oilseed crops in a dose dependent manner.

#### Crop Response to SO<sub>2</sub> Enriched Air Environment

Tomato maintained a higher activity of ascorbic acid and peroxidase even after 14 DAE. Gas exchange attributes viz., Pn, Gs and E declined across the crops, however, more significantly in spinach and mustard under the SO<sub>2</sub> stress. SO<sub>2</sub> stress tolerant species were found to utilize SO<sub>2</sub> towards the plant S nutrition as evident from a higher activity of the sulphate assimilating enzymes and sulphur accumulation in the plant shoot. Further, the foliar absorption of SO<sub>2</sub> and the in-plant translocation of the assimilated SO<sub>2</sub>-S was confirmed through the radio tracer studies using <sup>35</sup>S in carrot. Short term <sup>35</sup>SO<sub>2</sub> showed a higher accumulation of <sup>35</sup>S in the root than the shoot of carrot cultivar. Carrot cultivar Meghali alone showed a significantly higher dose dependent increase in <sup>35</sup>S accumulation in the shoot. In conclusion, these results clearly revealed that the phytotoxic



Sulphur (S) and iron (Fe) interaction in plants (A) high S and low Fe and (B) low S and high Fe in the rhizosphere

response of plants to  $\text{SO}_2$  stress is species dependent and is determined by a regulated balance expression of the oxidative and antioxidative characteristics. The observed increase in OAS-TL and SAT activity and shoot S accumulation under the  $\text{SO}_2$  stress hints at utilization of  $\text{SO}_2$  towards S nutrition of the experimental crops. Further the radiotracer  $^{35}\text{S}$  studies provided evidence for absorption and utilization of  $\text{SO}_2$ -S in plant S nutrition.

### Regulatory Role of Iron on Sulfur Uptake and Assimilation in Wheat

The role of iron in S uptake and their distribution in bread and durum wheat cultivars were assessed. In the first experiment, the wheat cultivars were grown on Fe deficient (~3ppm) and Fe sufficient soil (~12 ppm) soil under different S level viz. 0 (S0), 30 (S1) and 60 (S2)  $\text{kg S ha}^{-1}$ . A higher shoot mass, leaf chlorophyll and gas exchange attributes particularly the rate of photosynthesis was recorded under the Fe+S2 than the Fe-S0 treatment. The shoot S was significantly increased under Fe+ than Fe- treatment with an increasing

S-supply. A higher content of S-containing amino acid, cysteine was observed under Fe+S0 than Fe-S0. Further, an increasing S-supply caused a dose dependent increase in cysteine content under both Fe+ and Fe- treatments. Fe availability was also observed to positively induce the activity of key enzymes of sulfate assimilation viz., SAT and OASTL. Possible role of plant N-nutrition in mediating the Fe-S interaction was also examined. S-supply was observed to positively regulate the N uptake; however, the affect was independent of Fe availability.

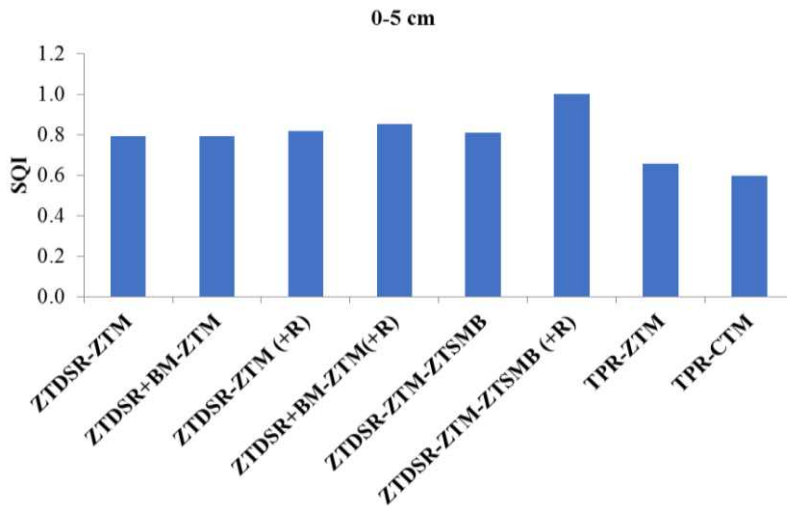
Another experiment performed under Fe and S deficient and sufficient (Fe: 1  $\mu\text{M}$  (Fe-) and 100  $\mu\text{M}$  (Fe+); S: 0 (S0), 1.25 mM (S1) and 2.5 mM (S2)) conditions in nutrient solution showed relatively higher biomass accumulation and synthesis and release of phytosiderophore in the bread wheat than the durum wheat under Fe deficiency. An increase Fe in shoot with an increasing S-supply and vice-versa was observed under both Fe+ and Fe- treatments. The study

indicates a critical role of Fe in determining S availability and uptake in wheat, which was further confirmed through the use of radiotracers of Fe and S ( $^{59}\text{Fe}$  and  $^{35}\text{S}$ ). The results showed a higher uptake of  $^{35}\text{S}$  under Fe+S0 than Fe-S0 condition. Under Fe deficiency, the  $^{59}\text{Fe}$  uptake was higher under S2 than S1 and S0 condition, which may be attributed to a favorable regulation of phytosiderophores (PS) biosynthesis by S. An increase in SULTR1;1 and SULTR2;1 transcript expressions were observed in the presence of Fe. These results suggest that Fe and S synergistically interact and may regulate their respective uptake by inducing SULTR1;1, high affinity sulphate transporters, which is of consequence under the limited S-availability.

### Soil Quality Indices in Conservation Agriculture Based Rice-Mustard Cropping System

The systematic research on the effect of medium-term conservation agriculture (CA) on soil quality, especially under the rice based cropping systems is limited. Hence,





ZTDSR-ZTM = zero till direct seeded rice (ZTDSR) – zero till mustard (ZTM); ZTDSR + BM-ZTM = ZTDSR with Sesbania brown manuring (BM) – ZTM; ZTDSR-ZTM (+R) = mustard residue in ZTDSR – rice residue in ZTM; ZTDSR + BM-ZTM (+R) = mustard residue in ZTDSR with BM – rice residue in ZTM; ZTDSR-ZTM-ZTSMB = ZTDSR – ZTM – ZT summer mungbean (ZTSMB); ZTDSR-ZTM-ZTSMB (+R) = mungbean residue in ZTDSR - rice residue in ZTM- mustard residue in ZTSMB; TPR-ZTM = transplanted puddled rice (TPR)-ZTM; TPR-CTM = TPR-conventional till mustard (CTM)

Impact of conservation agriculture on soil quality indices (SQI) under the rice-mustard system

the specific objectives of the study were to develop soil quality indices with key soil physical, chemical and biological indicators under the conservation and conventional tillage practices in a rice–mustard cropping system. The highest SQI in the 0-5 cm layer was obtained in the zero till direct seeded rice (ZTDSR)–zero till mustard (ZTM)–ZT summer mungbean (ZTSMB (+R)) (mungbean residue in ZTDSR - rice residue in ZTM- mustard residue in ZTSMB) treatment followed by the ZTDSR+BM (brown manuring) – ZTM (+R) (mustard residue in ZTDSR with BM – rice residue in ZTM). The lowest SQI was obtained in transplanted puddled rice (TPR) -

conventional till mustard (CTM) for both soil layers. The identified key indicators for SQI in this Inceptisol were saturated hydraulic conductivity ( $K_s$ ), pH, total N, available P, and available K. Thus, the medium-term CA with triple or double zero tillage with crop residue retention could lead to maintain agricultural sustainability under rice-mustard system.

**Inauguration of Eco-friendly and Profitable Crop Residue Management Centre**

Division of Agricultural Engineering established an “Eco-friendly and Profitable Crop Residue Management Centre” at Krishi

Vigyan Kendra, Tepla, Ambala was inaugurated by Dr. A.K. Singh, Director, ICAR-IARI on November 09, 2020. The centre was established with financial support from CNHI in its CSR programme. Dr. Singh, in his inaugural address emphasized the profitable uses of crop residue more specifically paddy residue. The various uses of the crop residue like preparation of nutrient rich animal feed blocks and rapid composting are the solutions for ensuring healthy soil and healthy animals. The demonstration of animal feed mixer and animal feed block making machine was carried out for the benefits of the farmers. Sri Akhil Bakshi, Chairman, KVK, Ambala



Inauguration of crop residue management centre at KVK, Ambala (a) and farm Sun Fridge at Chamrara, Haryana (b,c)

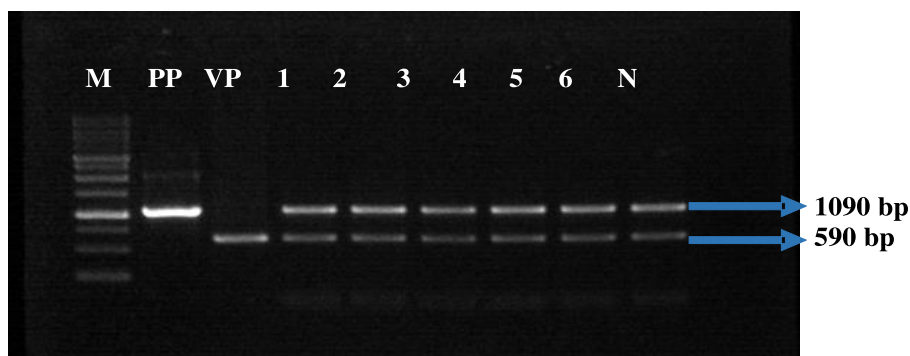
thanked IARI authorities for choosing KVK, Ambala as the venue for this programme of national importance.

### Inauguration of Farm Sun Fridge at village Chamrara, Haryana

The 2<sup>nd</sup> Farm SunFridge was inaugurated at Ranjeet Farms, village Chamrara, Dist. Panipat, Haryana by Dr. A.K. Singh, Director, ICAR-IARI on November 09, 2020 in the presence of Prof. Indra Mani, Dr. Sangeeta Chopra, Dr. P.K. Sharma, Dr. P.K. Sahoo, Incharge KVK, Panipat and villagers. The project is operating under the PEER, NAS project. The on-farm off-grid batteryless Farm SunFridge is operated solely on solar energy during the day and kept cold by a “water battery” during the night. Dr. A. K. Singh, Director, in his address stated that this technology is an important pillar of the economy. He encouraged farmers to utilize the cold store and other emerging technologies dedicated to farmers. Mr. Ranjeet Singh the owner of the farm thanked IARI authorities for support and providing all kinds of facilities for erection of Farm Sun Fridge for larger benefits of the villagers.

### Agri-horticulture Produce Processing and Value Addition Hub Established at Chitrakoot District by IARI, New Delhi

The scientists of ICAR - IARI have established an Agri-horticulture micro-processing unit at KVK, Chitrakoot under DBT Biotech KISAN Hub Project on December 16, 2020. The equipment provided in the hub from the project for use by the local farmers for Agri-horticulture produce processing and value addition purpose at farming community level. This unit established by IARI scientists will serve as an entrepreneurial hub for Chitrakoot area. The farmers can develop several value added



Gel electrophoresis image for duplex PCR assay results of phytoplasma and CpCDV showing expected amplicons from symptomatic chickpea isolates; Lane M: 1kb ladder, Lane PP: Phytoplasma positive control, Lane VP: CpCDV, Lane N: Negative control, Lane 1 to: Samples positive for both CpCDV and phytoplasma

products for their own use and also for market, which would help in reducing post-harvest losses and increasing farmers' income.

### Organic Nitrogen Fractions in Soil under Elevated CO<sub>2</sub> and Temperature Condition

A study was conducted inside the Open Top Chambers to quantify the interactive effect of elevated carbon dioxide (CO<sub>2</sub>) (550±25 ppm) and temperature (+2-2.2C) on organic nitrogen (N) fractions in soil under rice crop. Organic N fractions in soil like total hydrolysable N, amino acid N and amino sugar N decreased under elevated CO<sub>2</sub> and temperature condition under lower nitrogen doses. When N was applied in super optimal doses the plant N demand was met thereby causing lesser depletion of total hydrolysable N. The study revealed that better N management will alleviate faster depletion of native soil N under future climate change condition.

### Duplex PCR Assay for Simultaneous Detection of Chickpea Chlorotic Dwarf Virus and Peanut Witches' Broom Phytoplasma in Chickpea

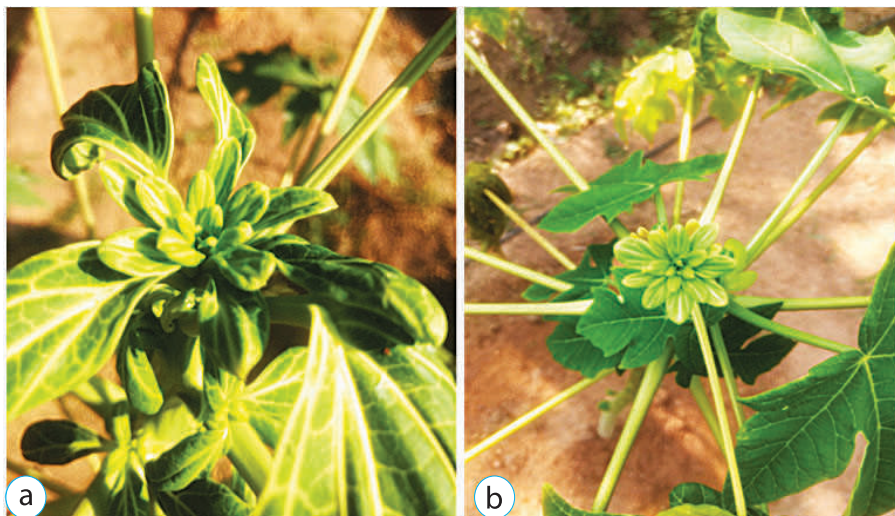
A duplex PCR assay was developed by optimizing PCR reaction components and cycles for the simultaneous detection of chickpea chlorotic dwarf virus (CpCDV) and a peanut witches'

broom (PWB) phytoplasma associated with the chickpea stunt disease. Two sets of CP specific primer pair (MCPF/MCPR) for CpCDV and *tuf* gene primer pair (TUF-II-F2/TUF-II-R1) for phytoplasma were employed. Different concentrations of the PCR components such as primers, *Taq* polymerase and PCR annealing temperature were optimized for amplification of CpCDV and phytoplasma DNA in the duplex PCR assay. Expected amplicons of 590 bp for CpCDV and 1090 bp for phytoplasma were consistently amplified from the symptomatic chickpea tissues in single and duplex PCR assays. This duplex PCR assay was found equally efficient and sensitive in detecting single or mixed infection of CpCDV and PWB phytoplasma in symptomatic chickpea stunt samples in two states of India. The results indicated the robustness and reliability of the developed duplex assay for a sensitive and rapid detection of virus and phytoplasma indexing in chickpea samples associated with CpS disease.

### Aster Yellows Phytoplasmas Association with a Little Leaf Disease of Papaya in Kerala

Symptoms of papaya little leaf was observed in papaya plants in Vellayani, Thiruvananthapuram,





Phytoplasma symptoms observed on papaya plants: in (a) papaya little leaf symptom and in (b) papaya little leaf making a whorl on the canopy.

Kerala, India. Phytoplasmas were detected in the symptomatic papaya little leaf samples by nested polymerase chain reaction with primer pairs amplifying 16S rRNA and *secA* genes. Pairwise sequence comparison, in vitro RFLP and phylogenetic analysis of these gene sequences indicated the presence of phytoplasmas related with strains in the aster yellows ribosomal group (16SrI-D subgroup).

### Identified of Promising DH wheat Line Resistant to Rust

Eighteen doubled haploid lines were screened against eight races of yellow rust (*110S119*, *110S247*, *238S119*, *78S84*, *110S84*, *111S68*, *T* and *P*) and eighteen races of brown rust (*11*, *12-5*, *12-7*, *12A*, *77*, *77-1*, *77-2*, *77-5*, *77-7*, *77-8*, *77-10*, *77A-1*, *104-2*, *107-1*, *108-1*, *162-1*, *77-9* and *104-1*) at seedling stage and with mix race of yellow and brown rust in adult plant stage (at Dhaulakuan, Bajaura and Shimla). At the seedling stage, DH-1 showed resistance to all the yellow and brown rust pathotypes except for *77-5* race of brown rust. The adult plant response of this DH-1 line also showed resistance to both yellow and brown

rust. The DH-1 was postulated to carry leaf rust resistant genes *Lr26+Lr23+1+* and yellow rust resistant gene *Yr9+* gene based on host pathogen interaction. Molecular characterization of the DH line with gene-specific primers showed that the developed DH-1 contains leaf rust resistance genes *Lr34* and *Lr32* genes. The DH lines have been sent to NBPGR for further registration. At seedling stage, DH-4 also showed resistance to all yellow rust pathotypes tested, while DH3 showed resistance to all eighteen races of brown rust pathotypes. Among other doubled haploid lines: DH-7, DH-8, DH-10, DH-11, DH-13, DH-14 also showed resistance to all yellow rust pathotype except 28S119.

## EDUCATION

### Hindi Chetna Maas

*Hindi Chetna Maas* was celebrated from September 14 to October 13, 2020. In order to encourage the officials/employees to do their official work in Hindi, various competitions were organized during this period in online mode for the skilled supporting staff of the institute. Employees from all the

categories of the institute participated in these competitions enthusiastically. Hindi Week/Hindi Day/Hindi Fortnight was also celebrated in different divisions and regional stations of the institute.

### Online Orientation and Teaching

The students of the 4<sup>th</sup> batch of M.Sc. Agronomy of National Agricultural Sciences & Technology University (ANASTU), Afghanistan were unable to travel due to the ongoing COVID-pandemic. Therefore, online orientation programme was organized on November 16, 2020 of the 4<sup>th</sup> batch of ANASTU M.Sc. Agronomy students at IARI, New Delhi.

The programme started with the welcome note by Dr. V.K. Singh, Head, Agronomy & Joint Director (Extn.), IARI followed by introduction of the students and faculty. On this occasion, Dr. Ashok Kumar Singh, Director, IARI; Dr. Rashmi Aggarwal, Dean & Joint Director (Education), IARI; Dr. Anupam Varma, Advisor, ANASTU programme; and VC, ANASTU, also addressed the participants.

### National Agricultural Education Day

National Agricultural Education Day through virtual mode on December 3, 2020 was organized at ICAR-IARI. This day is celebrated to commemorate the birthday of first President of India Shri Rajendra Prasad and also the first Agriculture Minister. The programme was chaired by Dr A.K. Singh, Director, ICAR-IARI, New Delhi, Joint Directors and scientists from IARI and other ICAR Institutes also participated in the programme. Dr. S.L. Mehta, former Deputy Director General (Education), ICAR was the speaker on this occasion.

Dr. S.L. Mehta delivered a talk on “Quality human resource development holds the key to Agricultural transformation”. Dr. Mehta highlighted the significant contributions made by ICAR in the past and challenges ahead. He stressed upon upcoming challenges of climate change, declining in factor productivity, technology intensive agriculture, artificial intelligence and need of quality human resource for future agriculture. Dr. Mehta suggested to have rigor in assessment for public and private institutions, need of autonomy of the institutions, improving university administration through delegation and decentralization of powers and accountability. He also emphasized on recruitment of competent faculty and managers, high quality human resource development, digitization of universities, e-governance and adoption of experiential learning. Overall, the speech was very informative, fruitful, visionary and knowledge enriching.

## EXTENSION

### Field Day on Pulses

Institute's KVK, Shikohpur was organized a field day cum farmers'

training under NFSM pulses on pigeon-pea on October 3, 2020 at Tajnagar village block Farukhnagar for CFLDs under NFSM on improved variety (Pusa Arhar-16) with package and practices of cultivation. The total area under CFLDs under NFSM was 20 ha with 60 farmers/ farm women. During the field day, production technology of pigeon pea, soil health improvement and use of bio-fertilizers, water saving technology, problems faced farmers during crop season and method, soil sampling methodology for next crop was discussed.

### Foundation Day, Regional Station, Indore

ICAR-Indian Agricultural Research Institute, Regional Station, Indore was celebrated its 69<sup>th</sup> 'Foundation day' on October 3, 2020, through virtual mode. Dr. S.V. Sai Prasad, Head, welcomed the guests and given a brief introduction about the most salient achievements of the IARI-Regional Station. Dr. AK Joshi, CIMMYT Asia Regional Representative & MD, BISA had delivered “Dr. M.V. Rao Memorial Lecture” on “The Future of Wheat Research and Farming”. Dr. D.K. Yadav, ADG (Seeds), ICAR, New

Delhi as Guest of Honour, Dr. GP Singh, Director, ICAR-IIWBR, Karnal as Chief Guest, Dr. JP Tandon, Ex-PD, IIWBR, Karnal as guest and Dr. A.K. Singh, Director ICAR-IARI, New Delhi chaired the session.

### Mahila Kisan Diwas

Institute's KVK, Shikohpur was organized Mahila Kisan Diwas on October 15, 2020 in which 82 farm women participated from different villages of Gurugram district. Dr Ravinder Kaur, Principal Scientist, Water Technology Centre and Former Director, I/c IARI was the chief guest. She encouraged the empowerment of women through education to girl child and appeals the women folk not to stop their daughters for school and higher education. Head KVK, emphasized that Indian women is doing all agricultural operations other than land ploughing that need to be rewarded and they need to be treated as farmer and in future land ownership. Speech competition among college girl students was also organized on the “Role of women in Agriculture”.

### Interactive Meet on “Enabling the Specially-abled Farmers”

Division of Agricultural Engineering organized an interactive meet “Enabling the specially-abled farmers” on October 22, 2020. The objective of the meet was to bring individuals and organizations on a common platform to share, learn and benefit from expertise to develop solutions for disabled farm workers. Dr K. Alahgusunram, DDG (Engg), was the chief guest of the interaction. The presentations were made by resource persons of different backgrounds. The discussion and interaction were very fruitful, and



National agricultural education day online meeting



recommendations emerged out will be used for formulating projects in the future for enhancing the productivity of specially-abled farmers.

### World Soil Day 2020

World Soil Day was celebrated on December 5, 2020, jointly by the Division of Soil Science and Agricultural Chemistry, and Delhi Chapter of the Indian Society of Soil Science. The programme started with welcome address by Dr. Sarvendra Kumar, Secretary, Delhi Chapter of Indian Society of Soil Science. Dr. R.N. Pandey, HOD, Division of Soil Science and Agricultural Chemistry addressed on “Significance of soil health management, challenges and opportunity”. Dr. S.P. Datta, Professor, delivered a lecture on the topic “Soil and Society” in which he explained the necessity to keep soils alive and measures to protect soil biodiversity. Later on a quiz competition on the topic Soil and Society was organized. An extempore competition on the different topics related to importance of soils in human, animal and environment was also organized.

The evening session was chaired by Dr. V.K. Singh, Joint Director (Extension), ICAR-IARI. Later, Dr. Singh addressed to more than 50 farmers from different States of India and emphasized the need for sustainable soil management and practical ways to keep soil healthy. Dr. (Mrs.) Vandana Dwivedi, former Additional Commissioner (INM), Govt. of India, delivered a talk on Government initiatives for soil health evaluation and different Government sponsored programmes. After that an interaction session with the farmers was held, in which experts from different disciplines from ICAR-IARI, addressed to the

queries related to soil health raised by different farmers.

### Human Rights Day

Regional Station, Pune organized the Human Rights Day on December 10, 2010 on Zoom platform. The programme was organized for school children, hosted by DIIL - *Domain for Intellectual & Imaginative Littles* (Convener: Mrs Madhumita Panigrahi). A small group of school children (*Sanskriti school, Bal Bharati Public School, Bhatnagar International Foundation, School, Modern School, Vasant Vihar, Gyan Mandir Public School, Amarbani Convent School, Daffodils etc*) joined online with their parents, to discuss and get awareness on human rights. Participants were rewarded with e-Certificates of Appreciation.

### PM Kisan Samman Nidhi Programme

Institute's KVK, Shikohpur was organised one day programme on PM Kisan Samman Nidhi on December 25, 2020 for live telecast of PM Kisan Samman Nidhi transfer. The farmers of different villages of Gurugram district namely Daboda, Basunda, Tirpadi, Taj Nagar, Langra, Panchgaon, Hasanpur, Farruknagar, Jhamuawas, Harinagar Duma, Sakatpur, Shikohpur, Budhera, Chandu, Khandewala, Joniawas and Janola witnesses the PM Kisan Nidhi transfer of an amount of 18000 crore rupees in 9000 crore farmer's account. The farmers were watching patiently the live telecast. A total of one hundred twenty one farmers and twenty KVK staff have attended the programme.

## CAPACITY BUILDING

### Training

- Institute's KVK Shikohpur was organized vocational training on

“Mushroom production” during October 6-12, 2020 in two phases for thirtysix beneficiaries.

- Regional Station, Shimla was conducted one day training program under SCSP on October 7 and 9, 2020 at Research Farm, Dhanda, H.P. More than thirty farmers/orchadists from SC category have participated. Delivered talks on temperate fruit nursery management, production technology of temperate fruit as well as Wheat and Barley and distributed horticultural tools, farm tools, plant protection chemicals, antibird net, antihail net, planting materials, folders, pamphlet etc.
- Division of Entomology organized a training course for State Agricultural officers and KVK personnel in Hindi on “Adhik aaye evam surakshit paryawaran hetu samekit keet prabandhan evam upyogi keet palan” on October 8, 2020. Dr. Debjani Dey, Head, Division of Entomology was the Course Director and Dr. S R Sinha, Chief Technical Officer and Mrs. Rajna S, Scientist were the coordinators. More than 100 attendees participated in the programme. Fifteen lectures were delivered by eminent scientists from ICAR institutes and SAUs on insect pest management of important crops, management of white grubs, selection, dilution and application of suitable pesticides.
- Regional Station, Shimla was organized farmers-scientists interaction cum training on October 29, 2020 at Chitkul, Kinnaur district of Himachal Pradesh for scientific cultivation of temperate fruit crops

particularly Apple under TSP program organized by NBPGR, Phagli.

- Regional Station, Shimla was organized Farmers Field School at Ladi village of District Solan and on farm trial on November 27, 2020. Delivered lectures to the farmers regarding cultivation of Fruit Crops and nursery techniques as well as cultivation of wheat and barley crops.
- Regional Station, Shimla was organized three days online training program on improved technology on nursery as well as orchard management of Apple during December-03-05, 2020. Total sixty five farmers attended the training program. Eighteen experts from SAU, Central and State institutes gave lectures regarding apple orchard, nursery, horticulture diversity, pest, disease and nutrient management.
- Institute's KVK, Shikohpur was organized eighteen soil health campaigns in eighteen different villages of Gurugram and Nuh district of Haryana benefitting seven hundred eighty four farmers. World soil day was organized on December 5, 2020. Soil health cards were distributed to thirty farmers of Gurugram district.
- Institute's KVK, Shikohpur was organized Swatchta pakhwada during December 16-31, 2020. During this pakhwada, recycling of farm waste to convert as compost/vermicompost, awareness on sanitation and hygiene to different Women self-help groups was organized by KVK Gurugram. A total of one hundred seventy three participants have attended the programme. Cleaning and

sanitation drive was organized with in KVK Campus also where in all the staff has participated.

- Institute's KVK Shikohpur, was organized seven Farmer's awareness programmes on use of "Meghdoot App" to popularize Meghdoot App in villages of Gurugram and Nuh district of Haryana, where in two hundred seventy six farmers had been participated to understand the forecast of the weather events helps for suitable planning of farm activities. Meghdoot app provide forecast relating to temperature, rainfall, humidity, and wind speed and direction, which play critical roles in agricultural operations and advisories to the farmers on how to take care of their crops and livestock.
- Institute's KVK, Shikohpur was organized twelve day-long farmer's trainings on weed management, seed production, INM and plant protection measures of Rabi crops, drudgery reduction technologies income generation activities for women empowerment, minimization of nutrient loss in processing were organized benefitting 257 farmers and farm women in different villages of Gurugram district.

### Webinar

#### **Swatchha Kheti – Safe Use of Pesticides**

To compliment the current campaign launched by our Hon'ble Prime Minister on *Swatchha Bharat Abhiyan*, ICAR-IARI Regional Station, Pune organized an Online Joint Webinar on December 31, 2020 on the occasion of *Swachhta Pakhawada* (December 16-31,

2020). Dr S.K. Sharma, PS and Coordinator welcome the Directors and their reps, of various Pune-based ICAR institutes. The Webinar "Clean Agriculture Green Agriculture" was led by IARI Regional Station (Pune) in collaboration with Pune based ICAR institutes viz., ATARI-Pune, Directorate of Onion & Garlic Research, Directorate of Floriculture and NRC Grapes. The objective of the webinar was to create awareness among all stakeholders about the importance of Swatchha Kheti - the basic hygiene in various farm activities, inclusive of safe use of pesticides.

### Symposium

- CATAT unit was organized a review e workshop on October 20, 2020 under the chairmanship of Dr. A.K. Singh, Director, IARI. The workshop was organized to review the performance of the crops / technologies under demonstrations during *Rabi*, 2019-20 and to decide the future course of action under National Extension programme in collaboration with ICAR Institutes/ SAUs and IARI-VOs partnership outreach programme. Twenty-nine officials of partner organizations and twenty-five IARI scientists participated in the workshop.
- Division of Plant Pathology and Indian Phytopathological Society was organized Delhi zonal symposium on Modern trends in systematics and bio-prospecting of fungi on December 16, 2020 to provide a platform for researchers, educators, industrialists and young students to share, learn and exchange experiences, innovations, possibilities, and



concerns in the field of basic and applied mycology. In IPS-Delhi chapter, in addition to keynote and award presentations (Prof. M.J. Narasimhan Academic Merit Award Contest and APS-IPS travel award for PhD students), poster session was also organized online mode.

## MISCELLANEOUS

### Externally Funded Projects Sanctioned

- Mass production of manure/fertilizer from agricultural Bio-Mass funded by NITI Aayog for an amount of ₹ 45 lakhs for one year. PI: Dr. K. Annapurna, Head, Division of Microbiology.
- Reducing uncertainties in Nitrous Oxide emissions from rice cultivation funded by MoEF&CC for an amount of ₹ 60 lakhs for two years. PI: Dr. Arti Bhatia, Principal Scientist, CESCRA.
- Development of Crisps from Fruits and Vegetables funded by MoFPI for an amount of ₹ 24.24 lakhs for two years. PI: Dr. V.R. Sagar, Head, Division of Food Science & Post Harvest Technology.
- Development of haploids and doubled haploids in cucumber (*Cucumis sativus*) for germplasm innovation funded by CSIR for three years with sanctioned budget of Rs. 14.78 lakhs. PI: Dr. Shyam Sundar Dey, Senior Scientist, Division of Vegetable Science.
- Development of appropriate machinery systems for rice mechanization under Project Climate Smart Management Practices funded by ICAR-International Rice Research Institute (IRRI) for three years

duration with sanctioned budget of US \$ 2000. PI: Dr. Indra Mani, Head, Division of Agril. Engineering.

### Contract Research

- Evaluations of efficacy of polymer-coated DAP, P-NCPC and Zn-NCPC in comparison with conventional fertilizers with IARI and Coromandel International Limited at a total cost of ₹ 21,72,560/- for two years of duration. PI: Dr. S.P. Datta, Principal Scientist, Division of SS&AC.

### PPV&FRs Registered

- Pusa Basmati 1637 (REG/2019/141)
- Pusa Samba 1850 (REG/2019/143)
- Pusa Basmati 1609 (REG/2019/142)
- HD 3117
- HD 3171
- Bread Wheat HD CSW16 (REG/2022/389)

### IPSPECTRA

IP Spectra (Intellectual Property Facilitation Centre established at

### IP Facilitation Services Provided to Start-Ups/Small Enterprises

IPRs	Application No./ Registration No./ Grant No.	Name of Beneficiary	Name of Innovation/ Technology/ Product/ Variety
Trademark	4647583 in Class 30	Craftcomm Farms Pvt. Ltd.	Mystiq Garden
Trademark	4647584 in Class 29	Craftcomm Farms Pvt. Ltd.	Mystiq Garden
Trademark	4647586 in Class 31	Craftcomm Farms Pvt. Ltd.	Mystiq Garden
Patent	201911049097	Bonformo (CT) Pvt. Ltd.	Smart Sugarcane Bud-Stalk Extractor

### Technology Commercialization

During October-December, Wheat variety HD 3086 was licensed to Twenty Three (23) Industry Partners generating revenue of Rs. 5,75,000 (₹ Five Lakhs Seventy Five only). The online MOA and Payment processes were streamlined and strengthened by the Unit to avoid disorder in the peak of Rabi season.

### IP Management

#### Patent Granted

- Novel Naphthyridine Based Hydrazines As Potent Agrochemicals [349105 (2964/DEL/2010)]
- Zinc in clay-mineral receptacles in nano forms for their use as advanced materials including novel fertilizer [2093/DEL/2013]

#### Trademarks Registered

- SAMARTH (4430607)

ZTM & BPD Unit, ICAR-IARI, New Delhi) in the last quarter (Oct-Dec, 2020) one patent application is submitted and responses to office action were provided for four trademark applications which are under registration process under various classes. Two sessions related to “Process of IP Protection” were organised to build IP awareness among start-ups and young entrepreneurs.

### Incubation Activities

#### Launch of Agri India Hackathon

PusaKrishi, ICAR - IARI, Indian Council of Agricultural Research (ICAR) & Department of Agriculture, Cooperation & Farmers' Welfare, Ministry of Agriculture & Farmers' Welfare was organized a program on Agri India Hackathon to create a multi-dimensional platform empowering

Indian Agriculture Innovation launched on December 31, 2020 at Krishi Bhawan, New Delhi by Hon'ble Minister of Agriculture & Farmers Welfare Shri Narendra Singh Tomar Ji along with Shri Kailash Choudhary Ji, MOS (Agri.& Farmers Welfare), Shri Parshottam Rupala Ji, MOS (Agri.& Farmers Welfare) along with Dr. Trilochan Mohapatra, Secretary (DARE) & DG (ICAR), Ms. Dolly Chakrabarty, Additional Secretary, MoA& FW, Ms. Chhavi Jha, Joint Secretary (RKVY), Dr A. K. Singh, Director, ICAR-IARI, Dr. Neeru Bhooshan, CEO, Pusa Krishi and Principal Scientist, ZTM & BPD Unit and other official representatives and media personnel.

Agri India Hackathon is believed to create an ecosystem for budding entrepreneurs and to encourage more and more entrepreneurs to apply under Hackathon and get a chance to win a cash prize of INR 1,00,000 each at the end of event as per the focus areas. The winning innovations will get an exclusive preference for incubation support, pre-seed & seed-stage funding of five Lakhs & twenty five Lakhs respectively at any one of the twenty nine RABIs, subject to assessment by the independent RABI. The winning innovations will also have the opportunity of field trials and will also be able to access technology validation from our network of institutions, if they opt for incubation support.

### Launch of Agri India Meet

With more than forty speakers in seven power-packed sessions,

Agri India Meets is envisioned to create meaningful conversations & connections with the most important people in agriculture from Businesses, Start-ups, Industry to Policy, Education, Media, and others.

First Agri India Meet was organized by PusaKrishi and was launched on December 30, 2020 by Dr. Neeru Bhooshan. More than 2000 participants from pan India registered for the first Agri India Meet. The 1.5-hour brainstorming panel session helped in creation of a strong foundation in the minds of the fellow audience and discussion on the scope and opportunities under the broad domain of farm mechanization and precision farming with future prospects towards 2<sup>nd</sup> Green Revolution was another initiative taken by the panelists.

### RC Meeting of Cohort 2020

RC Meeting was held on Oct 06, 2020 under chairmanship of Ms. Chhavi Jha, Joint Secretary, DAC&FW, along with Dr. Neeru Bhooshan, In-charge, ZTM&BPD Unit. The committee recommended Eleven startups under Pre-Seed stage funding i.e. upto 5 lakh grant-in-aid and Seven start-ups for Seed Stage grant-in-aid support of upto ₹ 25 lakhs.

### Meetings

In this quarter One Institute Technology Management Committee (ITMC) Meeting and One Techno-Commercial Assessment and Expert Committee Meeting with Agrinnovate India was

organized on November 23, 27 and December 28, 2020, respectively, via online mode under the chairmanship of the Director, ICAR-IARI to evaluate research outcomes of the technologies, forage the inventions that need to be protected under IPR, management of IPR portfolios and to fix the terms and conditions for commercialization of new varieties and technologies developed by IARI.

### Awards

- ❖ Dr. G.P. Rao, Principal Scientist, Division of Plant Pathology awarded the fellowship of Royal Association for Science-led Socio Cultural Advancement, New Delhi.
- ❖ Mr. Aditya KS, Scientist, received RT Doshi best paper presentation award (1<sup>st</sup> Prize) at the 28<sup>th</sup> Annual Conference of the Agricultural Economics Research Association held virtually at UAS Bengaluru from December 16-18 2020.
- ❖ Mr. Praveen KV, Scientist, received RT Doshi best paper presentation award (2<sup>nd</sup> prize) at the 28<sup>th</sup> Annual Conference of the Agricultural Economics Research Association held virtually at UAS Bengaluru from December 16-18, 2020.

### Corporate Membership

In this quarter, Unit enrolled new membership of 63 industry partners and membership of twenty nine existing members were renewed thereby generating a revenue of ₹ 2,57,000.