



IARI News



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RESEARCH

Pearl Millet Variety Identified

Pusa composite 701, a dual purpose pearl millet variety, was identified for release in the rainfed conditions of Zone A comprising states of Rajasthan, Haryana, Gujarat, Punjab, Uttar Pradesh, Madhya Pradesh and Delhi. It is high yielding (2313 kg/ha) composite variety and has an average stover yield of 6.8 t/ha. The variety responds favorably to additional doses of nitrogen. It is

highly resistant to downy mildew and tolerant to blast. Pusa composite 701 has an average protein content of 11.15% and matures on an average in 80 days (77-82 days in zone A) with flowering in 49 days. It is medium tillering (2.07) and produces compact panicles of 26-28 cms in length filled with medium size grains (seed weight of 8.6 g/1000 grains) of globular shape and grey brown colour. The variety attains

height of approximately 211 cm and the panicle is 2.5 cm thick.

Prunus japonica- A potential Dwarfing Rootstock for Grafting of Stone Fruits

IARI Regional Station, Shimla identified a multiscionic rootstock, botanically named as *Prunus japonica* which is also called as bush cherry, suitable for grafting in different stone fruits, viz., apricot, peach, plum, almond, cherry, etc. with more than 90% graft success. The plant usually grows from seed but can also be multiplied by cutting or layering. Mound



A dual purpose pearl millet variety, Pusa composite 701



Peach grafted on *Prunus japonica*

layering before the onset of monsoons has also been found very successful. The growth habit of the plant is very dwarf with profuse ornamental flowering. This selection has a potential use as a standardized dwarfing rootstock for high density plantings of apricot, plum, almond, cherry and peach as well as for kitchen gardening of stone fruits.

Pusa Soil Test and Fertilizer Recommendation Meter Developed

The Institute developed a digital tool, named Pusa Soil Test and Fertilizer Recommendation (STFR) Meter consisting of a meter, a mini shaker, a reagent kit (for 50 samples) and other important accessories needed for soil testing. There are two electrodes for measurement of electrical conductivity (EC) and pH. It can be connected with laptop/computer/thermal printer to generate soil health card.

Utility of Pusa STFR Meter

- ❖ It determines ten soil parameters i.e., soil reaction (pH), lime requirement of acid soil,
- ❖ It is a programmable colorimeter and analyses soil parameters quantitatively, thus its accuracy is better than other soil test kits which analyze qualitatively based on visual comparison of colours.
- ❖ Additionally, it also shows crop-specific fertilizer recommendations.
- ❖ It is highly useful for the areas where soil testing facility is not available.
- ❖ With two days' training, Pusa STFR Meter can be used for soil testing by the farmers themselves.
- ❖ It can be used by village panchayat, agri-input dealers and several self help groups working in the villages for soil testing purpose.
- ❖ It can be used by educated unemployed youths for soil testing business.

gypsum requirement of alkali soil, salt content (EC), organic carbon, available macro and micronutrients, viz., phosphorus, potassium, sulphur, zinc and boron.

Commercialization

Pusa STFR Meter is licensed to seven firms for commercial production, of which two firms have already started commercial production and marketing of Pusa STFR Meter.

Development of Controlled Release Nano Formulations of Bioactive Molecules

Controlled release nano formulations of various bioactive molecules, such as carbofuran, azadirachtin A, cyfluthrin, imidacloprid, thiamethoxam, thiram, carbendazim, azoxystrobin, etc., have been developed using laboratory synthesized poly (ethylene glycol) (PEG) based functionalized amphiphilic copolymers. The method of preparing these nano formulations is based on the aggregation of amphiphilic polymers in aqueous medium to form micelles and these micelles have been utilized for the encapsulation of bioactive material for improving the shelf life and increase the availability of bioactive materials for protection against various pests. The cumulative release kinetics of the pesticides from developed controlled release



Pusa Soil Test Fertilizer Recommendation Meter (Pusa STFR Meter) along with accessories



Nano formulation of Carbofuran



(CR) nano formulations were studied and compared with those of the commercially available formulations. Pesticide release from the commercial formulations was found to be faster than that of developed CR formulations. The bioefficacy of developed controlled release nano-formulations have also been evaluated.

Breeder Seed of New IARI-wheat Varieties Produced

The Institute's regional station at Indore produced a total of around 225 t of breeder seed of new IARI-wheat varieties including 136.6 t of seven bread wheat varieties, viz., HD 2932, HD 2987, HI 1418, HI 1479, HI 1500, HI 1531, and HI 1544, and 88.4 t of five *durum* varieties, viz., HI 8498, HI 8627, HI 8663, HI 8713, and HI 8737. To popularize the recently released (notified in 2014) *durum* variety HI 8737 (Pusa Anmol), 7.7 t of breeder seed of the variety was produced. This has created good genetic diversity in wheat cultivation, thereby, minimizing the chances of recurrence of any rust epidemics in the region. The high yielding, climate change resilient gene pool

has significantly contributed to bumper production and record productivity of wheat in Madhya Pradesh, which helped the state in receiving the prestigious *Krishi Karman Award* for the third successive year.

KILH- 13: A 'Precocious Flowering' Liliium Breeding Line

First time in India, interspecific crosses were attempted success-

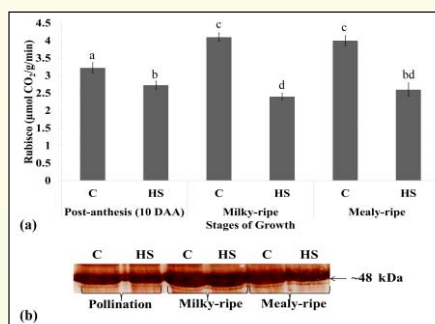
fully in liliium and a line with precocious flowering ability was developed with reduced juvenile period having no vernalization requirement. Out of 25 acclimated progenies of a cross *Lilium formosanum* × *Lilium longiflorum*, eight progenies were bolted and reached anthesis within one year. These lines took 301 to 335 days to flower from the time of seed sowing, which were further used in the development of Indigenous hybrids in liliium with noval traits.

Rubisco: Most Altered Enzyme in Response to Heat Stress (HS) in Wheat Leaves during Grain-Filling

Rubisco, one of the key enzymes of carbon-assimilatory pathway, were analyzed for its activity and accumulation pattern under pollination and grain-filling (milky-ripe and mealy-ripe) stages.



Interspecific liliium progenies with precocious flowering



Rubisco activity and accumulation pattern under pollination and grain-filling (milky-ripe and mealy-ripe) stages

Maximum Rubisco activity was observed during milky-ripe stage, as compared with pollination and mealy-ripe stage. A significant decrease in the Rubisco activity was observed when plant was exposed to HS; percent decrease was observed maximum during milky-ripe stage. Decrease in the Rubisco activity under HS was observed minimum during pollination stage. Immunoblot assay validate the activity pattern of Rubisco as observed earlier. The accumulation of Rubisco was observed maximum during milky-ripe stage, as compared with other stages as evident from the distinct band. Under HS, a significant decrease in the band was observed on the gel; percent decrease was observed maximum during mealy-ripe stage. There is need to identify thermo-stable Rubisco in order to maintain the source to sink ratio under HS, in order to get bold and completely filled grains.

GeoPest-DSS –A Weather Based Geospatial Pest Decision Support System

GeoPest-DSS (Geospatial Pest Decision Support System) is a decision support system (DSS) integrating weather based



forewarning and management of two major insect pests (aphid & painted bug) and two major diseases (white rust & *Alternaria*) of mustard for the districts of Delhi-National Capital Region (NCR). Three automatic weather stations (AWS) have been installed in 3 locations within NCR. The GIS maps of NCR districts including mustard growing villages and pest - disease forewarning models are installed and programmed in the server. Forewarning of each insect pest and disease are getting generated in the server. As per different forewarning, different IPM practices are generated as solution for use of the farmers and stakeholders. The softwares used are Quantum GIS, Myself 5.5, pup 5.5, html and JavaScript.

A website has been launched for GeoPest-DSS which can be accessed through IP address: geopestdss.iari.res.in. It is providing the necessary information regarding situation of aphid, painted bug, white rust and *Alternaria* one week in advance with plant protection advice as per integrated pest management (IPM) principles through GIS maps to the farmers/pest managers of rapeseed-mustard growing villages of NCR directly through internet.

InfoCrop v2 Released

The second version of InfoCrop is uploaded at www.iari.res.in for download by the users. InfoCrop is a generic crop growth model that can simulate the effects of weather, soil, agronomic managements (planting, nitrogen, residue and irrigation), and major pests on crop growth and yield. The model dynamically simulates different growth and development processes of a crop. The model requires various coefficients such as thermal time for phenological stages, potential grain weight, specific leaf area, maximum relative growth rate and maximum radiation use efficiency. Crop management inputs include time of sowing, application schedule, and the amount and type of fertilizer and irrigation. Soil input data include pH, texture, layer-wise thickness, bulk density, saturated hydraulic conductivity, organic carbon, slope, water holding capacity and permanent wilting point. Location-wise daily weather data (solar radiation, maximum and minimum temperatures, rainfall, wind speed and vapour pressure) are also required to simulate the crop performance.

The characteristics of new model are: i) a total of 1457 soils with all respective soil characteristic parameters, based on the AESR database of NBSS & LUP, are uploaded in the database; ii) the updated crop models are in tune with the latest literature on crop-wise response to temperature and CO₂; iii) powerful weather conversion module with capability

to convert numerous files quickly to InfoCrop or DSSAT format; iv) in addition to soil moisture dependent sowing, the user can define the sowing window, a new option in InfoCrop; v) the climate change analysis has improved option. One can change temperature and rainfall variably even at monthly interval; vi) this version also offers the users a 'Batch Processing option'. This enables the user to run large number of simulations; and vii) the InfoCrop model is compatible with the operating system versions of Windows 7 onwards with system requirement: 32 or 64 bit systems, minimum RAM 1GB and Windows xp and Windows 7 onwards. So far 832 downloads are from 32 countries across the world covering six continents. Feedback is taken for further improvement.

EDUCATION

Dr. B.P. Pal Memorial Lecture

Prof. C.R. Babu, Professor Emeritus and former Pro Vice-Chancellor, University of Delhi delivered the 22nd Dr. B.P. Pal



Prof. C.R. Babu, Professor Emeritus and former Pro Vice-Chancellor, University of Delhi delivering the 22nd Dr. B.P. Pal memorial lecture

memorial lecture on May 26, 2015 on topic "Biodiversity Parks – An Innovative Model for Conservation of Urban Living Resources and Enhancement of Quality of Urban Environment". Prof. R.R. Hanchinal, Chairperson, Protection of Plant Varieties and Farmers' Rights Authority, New Delhi presided over the function. Dr. R.K. Jain, Dean and Joint Director (Edn.) welcomed the Chairman, Speaker and the audience present on this occasion. Dr. Ravinder Kaur, Acting Director, IARI presented the introduction of the lecture series and the Chairman. Dr. Vinod, Professor of Genetics presented the vote of thanks.

First Y.M. Upadhyaya Memorial Lecture

The Institute's regional station at Indore initiated a lecture series 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. K.N. Guru Prasad, Professor, Dept. of Life Sciences, Devi Ahilya Vishwavidyalaya, Indore delivered the lecture on "Growth and Yield of Maize and Soybean after Pre-germination Treatment of Seeds with Magnetic Field". Studies led by him showed that exposure to 100-200 mT magnetic field for 1-2 h considerably improved the seed germination, seedling growth, root growth, leaf width, photosynthesis, biomass and yield in both the crops.

EXTENSION

Participation in Exhibition

- ❖ IARI participated in Horti-Fair 'Sangam' 2015 at Barahi, Hazaribagh, Jharkhand from June 27 to 28, 2015.
- ❖ IARI participated in Agri-Exhibition and *Kisan Goshthi*, organized in collaboration with 'Uttarakhand Jan Vikas Manch', Dehradun at Udham Singh Nagar district, Uttarakhand on June 22, 2015. Hon'ble Minister of State for Agriculture and Food Processing Industries, Dr. Sanjeev Kumar Balyan was the Chief Guest on this occasion.

Agro-Advisory Campaign

IARI conducted Awareness Campaign at IARI model villages and other locations to generate awareness about agricultural practices to combat situation of deficient monsoon rainfall in *Kharif* season, 2015. The Agro-advisories pertaining to the above were disseminated through the campaign organized at Bhureka, Mathura, Uttar Pradesh (June 15, 2015); Khajurka, Palwal, Haryana (June 16, 2015); Beenjpur-Raghunathpura, Alwar, Rajasthan (June 17, 2015); Kutbi, Muzaffarnagar, Uttar Pradesh (June 18, 2015) and Rajpur, Aligarh, Uttar Pradesh (June 19, 2015).

Interaction Meet – Post Office Linkage Extension Model

The Division of Agricultural Extension, IARI is experimenting an innovative IARI – Post Office

Linkage Extension Model for dissemination of technology information to the distantly located farmers. An Interaction Meet of the partner KVKs of Zone I was organized jointly by ICAR-Indian Agricultural Research Institute, New Delhi and ICAR-Zonal Project Directorate, Zone I, Ludhiana at PAU campus, Ludhiana on April 7, 2015. Dr. J. P. Sharma, Joint Director (Extension), IARI was the Chief Guest and Dr. K. S. Risham, Director, Extension Education, SKUAST, Jammu was the Guest of Honour. Dr. J. P. Sharma highlighted the present day challenges in extension and emphasized the need for alternate extension models and approaches to meet such challenges. Dr. K. S. Risham stressed for effective implementation of the model and proactive role of the partners in experimentation of this model.

Frontline Demonstrations

The Institute's regional station at Indore conducted 19 demonstrations of 10 new IARI-wheat varieties using recommended package of practices in 12.40 ha area in 4 villages under Indore and Dhar districts of Madhya Pradesh during Rabi 2014-15. Overall increase in yield was 63% in these demonstrations, compared to plots of old 'check' varieties grown with farmers' conventional practices.

Field day

A field day on wheat was organized on April 7, 2015 in Khanpur village of Gurgaon district. In this field day, 28 farmers participated.

Mass Awareness Campaign against Crop Residue Burning

The Institute's KVK at Shikohpur organized a Pakhawara (fortnight) on Mass Awareness Campaign against Crop Residue Burning with the theme "*Vatavaran Ko Bachao-Bhuse Ko Na Jalao aur Khet Ke Avshes Khet Main*" from April 16 to 30, 2015 in 12 villages of Gurgaon district. In this campaign about 300 farmers from these villages of Gurgaon participated. SMSs were also sent to 1128 registered farmers of the district to create awareness for not to burn crop residue.

CAPACITY BUILDING

Trainings

The *Krishi Vigyan Kendra*, Shikohpur organized a vocational training courses on "Dairy Farming" at KVK campus (40 rural youth from Gurgaon district participated), and two in-service trainings on: "Integrated Pest Management in *Kharif* Crops" on May 22, 2015 at Gurgaon (20 ADOs participated) and "Integrated Plant Nutrient Management (IPNM) in

Kharif Crops" on June 5, 2015 at Haryana Agriculture Department, Gurgaon (21 ADOs participated).

The Division of Seed Science and Technology organized a two-day training programme on "Seed Standards and Legal Aspects" from June 5 to 6, 2015 for the field technical staff of Indian Farm Forestry Development Co-operative Ltd. (IFFDC), Gurgaon. Seventeen participants attended the training programme.

Two on-campus training programmes were organized at CATAT on "Improved Horticultural Technologies" from April 21 to 25 (20 Horticultural Officers sponsored by Horticultural Mission for North East and Himalayan States participated), and "Seed Production Technology" from April 27 to May 3, 2015 (16 farmers of Purnea, Bihar participated).

Workshops

Centre for Agricultural Technology Assessment and Transfer (CATAT) organized two workshops to assess performance

of *Kharif* 2014 demonstrations under IARI-VO partnership programme on April 9, 2015, and to evaluate performance of technology demonstration of *Kharif* 2014 under National Extension Programme on April 10, 2015.



An in-service training on "Integrated Pest Management (IPNM) in *Kharif* Crops"

MISCELLANEOUS

External Funded Projects

1. "Studies on the Burl: An unresolved woody disorder of mango trees in India" funded by DST (SERB). Principal Investigator: Dr. P.L. Saran, IARI Regional Station, Pusa (Bihar).
2. "Investigation on foraging behaviour and life history attributes of ladybird beetles attacking sucking insect pests of field crops" funded by DST (SERB). Principal Investigator: Dr. Sachin S. Suroshe, Division of Entomology, IARI.
3. "Systematic studies of leaf eating semiloopers belonging to Plusiinae (Lepidoptera: Noctuidae) from India" funded by DST. Principal Investigator: Dr. P.R. Shashank, Division of Entomology, IARI.
4. "Determination of factors governing host specificity in nematode bacteria symbiotic relationship" funded by DST (SERB). Principal Investigator: Dr. Vishal Singh Somvanshi, Division of Nematology, IARI.
5. "Enrichment of nutritional quality in maize through molecular breeding" funded by DBT. Principal Investigator: Dr. Firoz Hossain, Division of Genetics, IARI.
6. "Identification of DICER-Like (DCL) protein interaction" funded by DBT. Principal Investigator: Dr. Viswanathan Chinnusamy, Division of Plant Physiology, IARI.

7. "Deciphering the role of Xop-T355 effectors of *Xanthomonas axonopodis* pv. *punicae* in the modulation of PAMP-triggered immune response in pomegranate" funded by DBT. Principal Investigator: Dr. K.K. Mondal, Division of Plant Pathology, IARI.
8. "Marker assisted improvement of rice variety Pusa 44 for phosphorus use efficiency" funded by DBT. Principal Investigator: Dr. K.K. Vinod, IARI-RB & GRC, Aduthurai.
9. "Exploring heat-stable rubisco activase from wheat or maize for augmenting the activity of rubisco under the heat stress" funded by DST (SERB). Principal Investigator: Dr. Ranjeet Ranjan Kumar, Division of Biochemistry, IARI.
10. "Development of white rust resistant mustard with high oil quality" funded by DBT. Principal Investigator: Dr. D.K. Yadava, Division of Genetics, IARI.
11. "Referral center for virus testing of tissue culture raised plants" funded by DBT.

Principal Investigator: Dr. V.K. Baranwal, Division of Plant Pathology, IARI.

12. "Understanding cellular and genetic mechanisms and identifying molecular markers for seed viability in soybean" funded by NASF. Principal Investigator: Dr. Akshay Talukdar, Division of Genetics, IARI.

Patents Filed

- ❖ Digital Soil Test and Fertilizer Recommendation (STFR) Meter
- ❖ Nanofabrication process involving clay minerals as receptacles for manufacturing advanced nanomaterials including novel fertilizers
- ❖ Nanofabrication of phosphorus on kaolin mineral receptacles
- ❖ Beneficiation of phosphate rock for the segregation of phosphorus containing heavy metal free minerals.

Technologies Commercialized

Five IARI Technologies have been licensed to six different



MoA signing ceremony with M/s Mangalam Agrotech for VAM Technology

industry partners and generated a revenue of ₹ 11,11,473.00. The licensed technologies include: rice variety Pusa 1612, Biofertilizer technologies, i.e., NPK Liquid Bio-Fertilizer Technology, VAM technology, and mustard seed variety Pusa Mustard 30.

Corporate Membership

In this quarter, 44 new members were registered and 52 corporate memberships were

renewed generating a revenue of ₹ 4,79,500.00

Honours/Awards

- ❖ IARI Regional Station, Karnal received the “Centre of Excellence Award” in recognition of best performance in Breeder Seed Production under AICRP-NSP (Crops) for the year 2014-15 during XXX Annual Group Meeting held on April 3-5, 2015 at ICAR-

Directorate of Seed Research, Mau.

- ❖ Dr. D.K. Yadava, Head, Division of Seed Science & Technology and Dr. G.P. Singh, Principal Scientist, Division of Genetics were elected Fellows of National Academy of Agricultural Sciences w.e.f. 1st January, 2015 during the Silver Jubilee Function of NAAS on June 5, 2015.

Visitors from Abroad

During the period April-June 2015, three delegations – one each from Chile, Ethiopia and China visited the Institute.



Chinese delegation interacting with IARI team

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Joint Director (Research): Dr. K.V. Prabhu; In-charge, Publication Unit (English): Dr. S.S. Sindhu

Website : <http://www.iari.res.in>