



# ICAR-Central Potato Research Institute

## Newsletter



Number 67

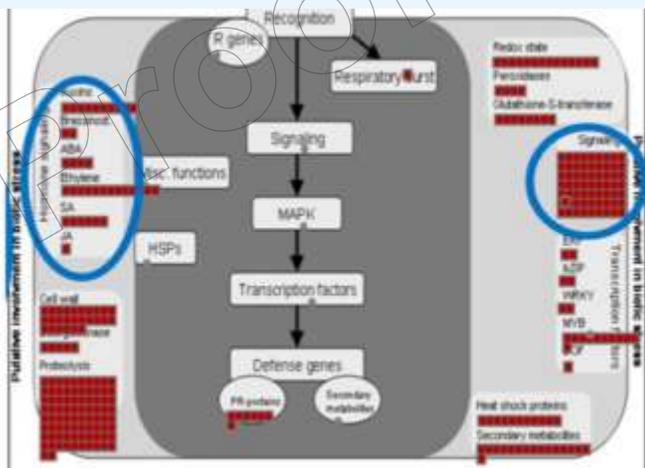
January - March 2017

### Research Highlights

#### Possible pathway of inducing defense against *Phytophthora infestans* in potato

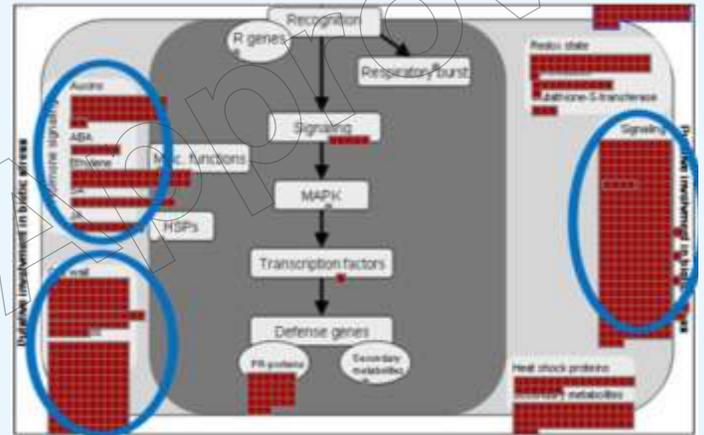
*Phytophthora infestans* is a hemibiotroph pathogen which involves two phases of infection. During the early phase, the pathogen invades as biotroph and later as necrotroph. During biotrophic phase, the pathogen secretes effectors from haustoria which help in pathogenicity and induce defence mechanism (HR) depending upon genetic background of the host. In the present studies, Kufri Girdhari (Resistant) and Kufri Bahar (Susceptible)

Kufri Bahar



cultivars were used to see the induction of defense genes, resistance related metabolites and pathogenicity factors following pathogen invasion. Microarray analysis was performed using 39,083 protein coding genes sequence in Nimblegen platform. Differences in gene expression profile between resistant (Kufri Girdhari) and susceptible (Kufri Bahar) cultivars were identified at 24hpi. Genes

Kufri Girdhari



which were up regulated >2 fold in Kufri Girdhari (5308) and Kufri Bahar (3889) were mapped to potato genome using MAPMANer software. In Kufri Girdhari, expression differences were observed in the category of signal transduction, transcription factors and hormone signalling in comparison to Kufri Bahar. In total, 215 signalling receptor proteins were involved strongly in inducing defense pathway compared to Kufri Bahar (63 signalling receptors). Transcription factors (ERF (30), WRKY (17), MYB (28) were strongly induced in Kufri Girdhari compared to Kufri Bahar. Whereas cell wall related, peroxidases, redox state genes and hormone signalling like auxin, salicylic acid, glucanase and PR proteins were highly induced in resistant cultivar compared to susceptible cultivar. Secondary metabolites, heat shock proteins and proteolysis factors were down regulated in Kufri Bahar cultivar. The differences in expression of these genes is entirely consistent with the fact that these genes have often been identified as differentially expressed in response to pathogen attack. The findings of this study would help in understanding the possible defense pathway as well as pathogenicity factors responsible for

late blight in potato. Once the roles of such genes are known, the most useful genes would be used for the management of late blight using conventional and molecular approaches.

*S Sundaresha, Sanjeev Sharma, Vandana Thakur, Shubhangi Sharma, A. Jeevalatha, Vinay Bhardwaj, Bir Pal Singh & SK Chakrabarti*

### ***In-vitro* soil less culture of potato cyst and root knot nematode**

Maintaining axenic culture of an obligate root pathogen using soil is very difficult due to the presence of several biotic soil inhabitants which lead to contamination of the culture. Here we developed an indigenous growth pouches (a soil less medium) to maintain pure culture of potato cyst nematode (PCN), *Globodera* spp. and root knot nematode (RKN), *Meloidogyne* spp. in controlled conditions. These pouches can be used for the studies viz., seedling root biology and growth, development and maintenance of pure cultures of PCN and RKN without soil. The growth pouch is made up of whatman paper enclosed in a thin transparent polythene envelope. Tissue



**Maintenance of tissue cultured potato plant (Cv. Kufri Jyoti) in growth pouches**

cultured potato seedlings (Cv. Kufri Jyoti) without roots were transferred to these growth pouches using sterile forcep. After transferring the plants enough watering should be done to wet the paper and these pouches were supported with two thermocol sheets of 0.5 inch thickness and were kept vertically in plastic/glass trays with sufficient water to moisten the paper through capillary action. After rooting one layer of the polythene bag was lifted to expose the roots for inoculation. Before inoculation, a small rectangular piece of GF/A filter paper was placed just below root tip to increase the infection efficiency and 20 $\mu$ l nematode suspensions with 20-25 second stage nematode juveniles were inoculated on this rectangular piece of filter paper then it was covered with another piece of filter paper of similar size. After 2-3 days of inoculation, the filter paper was removed using sterile forcep. The points of inoculation were marked on the



**Development of nematodes on growth pouches**

polythene sheet to track the progress of nematode infection and establishment. The trays were kept in BOD and maintained at 22°C for 60 days. The nematode growth and development was monitored through transparent polythene sheet until completion of life cycle. After 60 days, PCN cysts filled with eggs were harvested from pouches. The pouches were also tested for culturing RKN using Tomato seedlings. The same procedure as described above was followed for nematode inoculation and maintenance. After 30 days, the development of eggs were observed on the root surface inside gelatinous matrix. The presence of normal eggs in cyst in PCN and gelatinous matrix in RKN indicated that these nematodes are able to complete their life cycles successfully in these pouches. Hence these growth pouches are potential soil less low cost option for maintaining axenic cultures of different nematode species. This study can be further extended for resistance screening against PCN and host differential studies.

*Priyank H Mhatre, EP Venkatasalam, Divya KL, R Sudha, J Jenifer, Aarti Bairwa & J Berliner*

### **High density planting in net house for increased minituber production**

Potato has become one of the most important food commodity in the present times, with its increasing popularity and demand. However, productive potato production is extremely dependent on disease-free good quality seed of notified varieties. Potato seed production involves stringent and controlled growth conditions. With the advent of Hi-tech seed production system, tissue culture labs, net houses and Aeroponic units have been established and adopted by several seed producers to maintain high seed standards. However, net house space has become not only a limiting factor but also an expensive investment in overall seed production programme. There is dire need of utilizing this resource with utmost judiciousness. Present adopted method is mainly ridge and furrow system with 30x10 cm geometry. For obtaining higher number of tubers per unit area, high density



**Flat-bed planting in net house at CPRS, Jalandhar**

planting in flat-beds can be an important alternative to best utilize the available net house space. An experiment to evaluate high density flat-bed planting as against conventionally used ridge and furrow method in net house was conducted, at Central Potato Research Station, Jalandhar with two varieties Kufri Chandramukhi and Kufri Surya and different row spacings of 30 cm (T30), 20 cm (T20), 15 cm (T15) and 10 cm (T10) as against control ridge and furrow planting at 30 cm (TC). Plant to plant spacing at 10 cm was kept uniform in all treatments. Method of irrigation was over-head sprinkler system. The characters yield, total no. of tubers, undersize, oversize and seed size tubers were evaluated for the treatments on per meter square basis. The spacing of 10 cm x 10 cm (TC) significantly out yielded the other treatments in producing not only yield but also the total number of tubers. On an average the flat bed planting at 10 cm row to row spacing provides a benefit of twice the number of tubers and 1.5 times the yield over control ridge and furrow planting on per meter square basis. The adoption of flat-bed planting in net house has tremendous potential in increasing the overall seed production from net house which would present itself favourably in advanced seed production generations. An approximate advantage of 8 times seed production is projected in G2 on the basis of number of tubers produced. The worked out economics provide an estimated profit of 1.73 times more under high density flat bed at T10 as against standard ridge and furrow method (TC) as produced in the present experiment. The high-density flat-bed planting may be suitably used for planting less than 5 gm mintubers to produce larger amount of good quality seed by seed producers.

*RP Kaur, JS Minhas, Sukhwinder Singh,  
Sugani Devi & AK Singh*

## Potato varietal decision support system

A web based potato varietal DSS has been developed by ICAR-Central Potato Research Institute, Shimla to facilitate potato stakeholders to take decision regarding the planting of variety suitable for particular agro-ecological zone, duration (early, medium, late), disease attributes and other related traits like parentage, year of release, morphological & agronomic features, etc. The database is developed in



DOT NET technology with SQL database at the backend. The DSS is simple, easy to use and based on graphical user interface (GUI) requiring minimum inputs in the form of selection from drop down menus. Based on the choices made by the user the most relevant search results are provided as output. Simultaneously, the database also provides user with the option to see the specification of the varieties individually.

The principal target of this DSS would be the Farmers, but it would also help researchers and other stakeholders who intent to know about the crop. Presently the database holds information on the 51 varieties released by ICAR- Central Potato Research Institute. The tool would also find utilization for breeding, in selection of parents, as information on pedigree of the varieties has also been provided. The tool is very flexible and user-friendly, and can be used for a number of different applications.

*Shashi Rawat, Ratna Preeti Kaur  
Shefali Sood & SK Chakrabarti*

## Transfer of Technology

### Farmer's training on potato cultivation in collaboration with CIP, New Delhi

The institute organised a one day off campus farmer's training on "Aloo ki vaigyanik kheti" at Nachna village for farmers from Jaisalmer district of Rajasthan on 9<sup>th</sup> March,



2017. The training was organized in collaboration with CIP, New Delhi. A total of 70 farmers participated in this training and learned latest technologies of potato cultivation through lectures and field visit. The focus of this training was expansion of potato area in warmer zones of Rajasthan. For this purpose, heat tolerant varieties were promoted among farmers for cultivation.

### **Training programme for farmers of Mehsana, Gujarat**

A three days farmer's training was organized at CPRI, Shimla on "Improved methods of potato cultivation" during 18-20 March, 2017. The training was sponsored by ATMA, Mehsana, Gujarat and a total of 30 farmers along with two officials participated and benefitted from this



training. The training included lectures from CPRI Scientists on different topics, Film show, museum visit and a field visit to Kufri-Fagu. Special focus on potato for processing purpose was given by the experts during this training.

### **Two days training program on scientific cultivation and processing of potatoes**

Central Potato Research Station Patna organized two days training program on "Scientific Cultivation and Processing of Potatoes" from 27<sup>th</sup> to 28<sup>th</sup> February, 2017. 64 trainees



consisted of NGO women members, students, teachers and social workers attended the training programme. Various aspects of production and processing of potatoes were covered during the training. Lecture-cum-discussion, video shows, demonstrations, practical exercises, field and lab visit, etc. were the modes for imparting training to the participants.

### **ICAR-CPRI Shimla participated in 5th India International Potato Expo 2017**

ICAR-Central Potato Research Institute-Shimla participated and put up an exhibition stall in 5th India International Potato Expo 2017 at Milan Ground, Kolkata from 09<sup>th</sup> to 10<sup>th</sup> March, 2017.



The Expo was jointly organized by the Indian Chamber of Commerce with the active support of Ministry of Agriculture, Ministry of Commerce & Industry and Government of West Bengal. A large number of farmers, scientists, policy makers, manufactures, companies, NGO members, women entrepreneurs and other stakeholders in agriculture and allied activities visited the CPRI stall.

### **ICAR-Central Potato Research Station (CPRS) Patna bagged second best stall award**

ICAR-Central Potato Research Station (CPRS) Patna participated and put up an exhibition stall during Bihar

Kisan Mela organised Bihar Agriculture University on 3-5 Mar, 2017. Various technologies of the institute like live sample of potato varieties, processed products, True Potato Seeds (TPS), minitubers from net house, microtubers from aeroponic system, virus testing kits etc. were displayed during the exhibition. A large number of farmers, scientists, professors, NGO members, women entrepreneurs and other stakeholders in agriculture and allied activities visited the stall and they were made aware about various technologies of the institute. ICAR-CPRI Patna bagged second best stall award during the exhibition.



### Organizing farmers' training by Modipuram under mera gaon mera gaurav program

Two farmer training programs based on potato crop were organized under 'mera gaon mera gaurav' program on village Mahmudpur (Hapur) and Modipuram campus by Central Potato Research Institute Campus, Modipuram. A farmer's seminar was organized on March 20, 2017 in Mahmudpur village of the district Hapur. In which the campus scientists explained the available advanced techniques of potato production to farmers in the potato varieties, balanced use of fertilizers, storage and processing. About 50 farmers participated in this event. In this order, on the campus about 100 potato farmers of different districts of Uttar Pradesh like Meerut, Hapur, Fatehpur and Rangareddy (Telangana) participated on March 22, 2017. The available technical information of potatoes and other crops was given to the farmers in the seminar. The program was started by Dr. Manoj Kumar, Joint Director of the campus with his address. The program provided detailed information about potato varieties, soil testing, agronomic practices of potato production, methods of prevention of potato crops by diseases and pests and methods of storage of potato. Dr. D.V. Singh and Dr. Amit Kumar, invited from Sardar Vallabh Bhai Patel Agricultural and Technology University, Meerut, were



given information on fish and animal husbandry. The program concludes with the Farmers Quiz Summit.

### Live Phone-in Programme at Doordarshan

Scientists from CPRI, Shimla participated in the Live-phone programmes on different subjects on Doordarshan from January to March, 2017. The details of the topics along with experts are given below.

Month	Topics	Name of the Expert
January	Potato varieties, planting and nutrient management in mid hills of HP	Dr. Vinod Kumar Dr. Rajesh Kumar Singh
February	Intercultural operations, harvesting and storage of potato in lower hills of HP	Dr. Ashwani Sharma Dr. Brajesh Singh
March	Potato disease and pest management in mid hills of HP	Dr. Sanjeev Sharma Dr. Sridhar J.

### Important Meetings, Events & Visitors

#### Meeting on doubling farmers income in HP organized at ICAR-CPRI, Shimla

The coordination committee meeting on "Doubling Farmer's Income in Himachal Pradesh" was organized at ICAR-CPRI, Shimla on 17<sup>th</sup> March, 2017. The meeting was chaired by Dr. H.C. Sharma, Hon'ble VC, YS Parmar University of Horticulture & Forestry, Nauni and convened by Dr. SK Chakrabarti, Director, ICAR-CPRI Shimla. It was also attended by Dr. Ashok Sarial, VC, CSK HPKV, Palampur, and Representative of different line departments like Agri/Horti / Fisheries/Animal Husbandry & other delegates and all heads of Divisions of CPRI Shimla. Discussions were held on How to double



income of farmers by 2022. Interventions like Crop diversification, provisioning of irrigation, introduction of new varieties & technologies etc were discussed in length by the Chairman and members of the Committee. The committee has been given responsibility to prepare road map for Doubling Farmer's Income in Himachal Pradesh by taking into consideration views of all the stake holders involved in agriculture development in this state.

### **The 5<sup>th</sup> Potato Stakeholders' meet and Science Day celebrated at CPRS, Jalandhar**

The 5<sup>th</sup> Potato Stakeholders' meet was held at Central Potato Research Station, Jalandhar on 28<sup>th</sup> February 2017 under the chairmanship of Dr. S.K.Chakrabarti, Director, Central Potato Research Institute, Shimla. Eighteen scientists and 62 progressive potato seed growers, potato industry persons, and related government officials participated in the meeting. During the meet an interactive discussion ensued among the scientists and the stakeholders where several issues including seed production systems, quality of potato seed, seed producing areas etc. were discussed. The meeting was an important forum to sensitize the stakeholders about the challenges faced by potato seed industry and producers and become aware of the issues faced by the potato-based producers and industry to carry out future need based research. An extension folder entitled "Maintaining Seed Potato Quality under Net House: A Boon



to Farmers" was also released on the occasion

Science day-2017 with the theme "Science and Technology for the Specially Abled Persons" was also celebrated concurrently. On this occasion Mr. Harnek Singh, Block



Agriculture Officer, Moga was honoured and felicitated as a specially abled guest, who has been proactive in the region for promoting green technologies irrespective of his ability and has made several landmark achievements in the past.

### **Visit of Dr Jurgen Kroshchel, Country Manager, CIP at CPRI Campus, Modipuram**

Dr Jurgen Kroshchel, Country Manager, CIP, New Delhi and Dr. MS Kadian, Regional Potato Leader, CIP, New Delhi visited the Campus on 20<sup>th</sup> February, 2017. Dr. Manoj Kumar, Joint Director and Scientists welcomed the delegates and described research activities conducted at the Campus. Dr. Kroshchel visited the Seed Production Unit, Machhari and the CIP-CPRI experiments at the Campus.



Dr. Kroshchel appreciated the research activities being carried out at the Campus.

### **Professor Dr. R. B. Singh visited Modipuram Institute campus**

Prof. RB Singh, formerly Chairman, ASRB, honored with Padma Bhushan by the Government of India. And

Chancellor, Central Agricultural University, Imphal and former President, National Academy of Agricultural Sciences, visited the Central Potato Research Institute Campus, Modipuram on 17th February, 2017. Dr. Manoj Kumar, Joint Director of the campus welcomed the dignitaries and provided detailed information about the activities of potato research on the premises.



During his visit, Dr. Singh looked at the aeroponic and tissue culture methods of producing quality potato seeds and appreciated the techniques. Thereafter, Dr. Singh discussed the expansion of various areas of potato research from the campus scientists and appreciated the ongoing scientific activities on the premises.



On the campus, he looked at the healthful purple skin and pulp potato tubers and appreciated the ongoing efforts in this direction. Dr. Singh advised the scientists to work on connecting potato processing methods with the employment of the villagers.

### Quarterly Hindi workshop organized at Shimla

Forth quarterly Hindi workshop for the year 2016-17 was organized at ICAR-Central Potato Research Institute, Shimla on 22<sup>nd</sup> February, 2017. It was scheduled for Skilled Support Staff of the institute, but the participation of the officers/staff responsible for submitting quarterly progressive report of divisions/sections was also invited. To deal with various problems in the use of Hindi the title of the workshop “Methods to encourage the use of Hindi



and practice to fill quarterly report proforma”, Sh. S.L. Gautam, Assistant Director (Official Language), Bharat Sanchar Nigam Limited, Kasumpti, Shimla (HP) was the main speaker on this occasion. About 20 officers/staff participated in this workshop and got benefited.

#### Scientific Joining

1. Dr. Salej Sood, Scientist, Genetics and Plant Breeding at CPRI, Shimla-27.03.2017.
2. Dr. Arvind Kumar Jaiswal, Scientist, Food Science and Technology at CPRS, Jalandhar-22.03.2017.
3. Dr. Subhash Katare, Sr. Scientist, Agril Entomology at CPRS, Gwalior-15.03.2017.

#### Transfers

1. Dr. Pardeep Kumar, Scientist, Gen. & Pl. Breeding, CPRS, Shillong to IIMR, Ludhiana-31-01-2017.
2. Dr. MA Khan, PS, Agril. Chem., CPRIC, Modipuram to IARI, New Delhi-07.03.2017.
3. Dr. Sanjay Kumar Yadav, Scientist, Agronomy, CPRS, Patna to ISRI, Lucknow-07.03.2017.
4. Dr. Rajendra Singh, Sr. Scientist, Gen. & Plant Breeding, CPRIC, Modipuram to IARI, New Delhi-14.03.2017.
5. Dr. (Smt.) R. Sudha, Scientist, Fruit Science, CPRS, Ooty to CPCRI, Kasaragod-07.03.2017.

#### Retirements

1. Dr. JS Minhas, PS, CPRS, Jalandhar-28.02.2017.
2. Dr. (Mrs.) Ashiv Mehta, PS, CPRS, Jalandhar -31.03.2017.

#### Administrative Promotion

1. Sh. Deep Ram, UDC, CPRI, Shimla promoted to the post of Asstt. through LDCE w.e.f 16.01.2017 (AN)
2. Smt. Poonam Jyoti, LDC, CPRI, Shimla promoted to the post of UDC w.e.f 28.01.2017 (AN)
3. Sh. Sandeep, Asstt., CPRIC, Modipuram promoted to the post of AAO through LDCE w.e.f 16.01.2017 (AN)

#### Transfers

1. Sh. Jagbir Singh, AAO transferred from CPRS, Patna to CPRIC, Modipuram w.e.f.14.03.2017

#### Inter-Institutional Transfers

1. Sh. Sanjib Kumar, Asstt., Indian Veterinary Research Institute, Izatnagar joined at CPRS, Patna w.e.f. 27.01.2017

#### Deputations

1. Sh. Dileep Kumar, Assistant, National Research Centre on Litchi, Muzaffarpur joined to the post of Asstt. Admn. Officer at CPRS, Patna w.e.f.01.03.2017 on deputation basis.

#### Skilled Supporting Staff

##### Retirements

1. Sh. Suraj Singh, Skilled Support Staff. ICAR-CPRIC, Modipuram (31.1.2017)
2. Smt. Kamla Devi, Skilled Support Staff, ICAR-CPRI, Shimla (28.2.2017)

## From the Director's Desk



Water requirement of potato crop is quite high (400-600 mm). The frequent and light irrigations are necessary to maintain optimum moisture and high nutrient status in soil throughout period of crop growth. About 90 % of potato cultivation of the country is concentrated in the plains where it is grown under assured irrigation, however, the water use efficiency of furrow irrigation is only about 40-50 %, it could be increased if water losses are minimized. Potato use only 30-50 % nitrogen, 10-15 % phosphorous and 40-50 % potash under irrigated conditions. The evaporation losses of water can be checked by use of mulching whereas percolation losses by resorting to micro irrigation methods like drip and sprinkler.

Micro-irrigation enhances the plant growth, tuber development and potato yield qualitatively in the form of dry matter, tuber size and numbers especially by improving the efficiency of water and nutrients. Institute findings highlighted that the productivity of potato can be increased up to 35 tons/ha as against 22.7 tons/ha with the saving of 40-50 % water and 25 % NPK fertilizers by using drip irrigation. However, the cost of drip installation could be minimized by cultivating potato in paired and triple rows raised wide bed planting patterns at 90 and 120 cm spacing, respectively for sustainable crop yield. Sprinkler irrigation also provides scope to utilize fertilizer nutrients and irrigation water efficiently, it enhances potato productivity by 15-20 % along with saving of 30-40 % water and 25 % N in comparison to furrow method of irrigation. Micro-irrigation methods may reduce the pressure on water resources and fertilizer producing companies by using proper agro-techniques, crop residues and optimum fertilizers cum organic manures schedule for cost effective quality output. In the present day conditions, due to increasing water scarcity and recurring droughts in many parts of the country, the use of drip and sprinkler irrigation methods have become extremely important. The farmers of Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh, Gujarat, Punjab, Haryana and Utter Pradesh are taking steps for using these approaches for raising agriculture & horticulture crops. The Institute has installed the drip irrigation facility at all its farms and demonstrating this to the potato growers for its beneficial attributes with the ultimate goal of achieving "More Crop, Per Drop".

**Complied and edited by :** Brajesh Singh, Ravinder Kumar, Pinky Raigond, Pynbianglang & Rakesh Mani Sharma

**Published by :** Director, ICAR-Central Potato Research Institute, Shimla-171 001, H.P. (India)

**Secretarial Assistance :** Sachin Kanwar

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Printed at : Azad Offset Printers, Press site, Industrial Area, Phase-I, Chandigarh

Ph. : 0172-4611489, 2656144, 2657144, 9814011543