



# ICAR–Central Potato Research Institute Newsletter

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## Research Highlights

### MS/10-1529: An advanced potato hybrid with excellent keeping quality identified

Keeping quality of semi-perishable potatoes assumes significance in view of rising temperatures coinciding with harvest of potatoes in subtropical plains, where about 90% potatoes are produced. Storage of potatoes is necessary for a regular supply of potatoes to the consumers during off season and in general potatoes are stored for over six months at 3-40C in cold store. However, many of the small and marginal farmers cannot afford to store their produce as they need cash to meet their production expenses or don't have access to cold store in their surroundings. Therefore, farmers use traditional storage system for 60-75 days enabling them to sale their produce periodically. Keeping this in view, the breeding population was evaluated for adaptability, keeping quality and late blight resistance at Modipuram during 2013-14, 2014-15 and 2015-16. Based on mean performance over the years, an advanced hybrid MS/10-1529 was identified with desirable tuber attributes, high yielding ability with moderate resistance to late blight and excellent keeping quality.

MS/10-1529 is a selection from the cross MS/0-3740 x CP2364 attempted during 2008-2009 at CPRI Campus Modipuram, Meerut. The hybrid produces attractive white-cream, round-ovoid tubers (8-10/plant) with medium eyes and cream flesh. The advanced hybrid MS/10-1529 with 34.33 t/ha total tuber yield showed advantage of 22.55 %, 15.02%, 3.34% and 19.41% respectively over Kufri Bahar (28.01 t/ha), Kufri Garima (29.84 t/ha), Kufri Pukhraj (33.22 t/ha) and Kufri Sadabahar (28.75 t/ha) at 75 days crop duration.

However at 90 days, MS/10-1529 with 46.26 t/ha total tuber yield revealed advantage of 35.99%, 7.97%, 7.89% and



MS/10-1529-Leaf, flower, sprout and tubers

16.74%, respectively over Kufri Bahar (34.02 t/ha), Kufri Garima (42.85 t/ha), Kufri Pukhraj (42.88 t/ha) and Kufri Sadabahar (39.63 t/ha). The hybrid possessed moderate level of resistance (AUDPC: 378) to late blight as compared to late blight susceptible variety Kufri Bahar (AUDPC: 801).

It possessed extremely long tuber dormancy (>10 weeks) with only 2.48 % sprouting as compared to 98% in Kufri Sadabahar (>6 weeks), 100% in Kufri Bahar (<6 weeks), Kufri Garima (>6 weeks) and Kufri Pukhraj (>6 weeks) at 75 days of on-farm storage. Consequently it had almost nil (0.01%) losses due to sprout weight as against 0.14% (Kufri Sadabahar), 0.19% (Kufri Garima), 0.40 (Kufri Pukhraj) and 1.35% (Kufri Bahar). The hybrid showed relatively less weight loss due to rotting (1.91%) than Kufri Bahar (2.25%) and Kufri Sadabahar (2.68%). The hybrid MS/10-1529 revealed less total weight losses (10.92%) as compared to Kufri Bahar and Kufri Garima (16.24%), Kufri Pukhraj (13.25%) and Kufri Sadabahar (12.63%).

Tubers of MS/10-1529 are easy to cook (15-20 minutes) and free from discolouration after cooking. It possesses pleasant flavour and mealy texture. The hybrid holds promise to become a cultivar and can be used as parental line in breeding aiming to develop variety with high productivity and keeping quality attributes.

*SK Luthra, VK Gupta and Mehi Lal*

### Effect of new soil fumigant Basamid 90G on potato cyst nematode population and yield

Application of Carbofuran 3G @ 65 kg/ha at the time of planting is being recommended as a part of package of practices for the management of potato cyst nematode in Nilgiris, however it is not that much effective to control the PCN population. Therefore, in order to identify the alternate chemical, new soil fumigant molecule Basamid 90G was evaluated at ICAR-CPRS, Muthurai, Ooty with the susceptible variety Kufri Girdhari in pots as well as in field conditions with different doses viz., 20, 30, 40 and 50 gm/m<sup>2</sup> along with untreated control and Carbofuran. Among the treatments, pots applied with Basamid 90G@40 g/m<sup>2</sup> and recorded less



*Effect of Basamid 90G on PCN (60 DAP) and tuber borne diseases (120 DAP)*

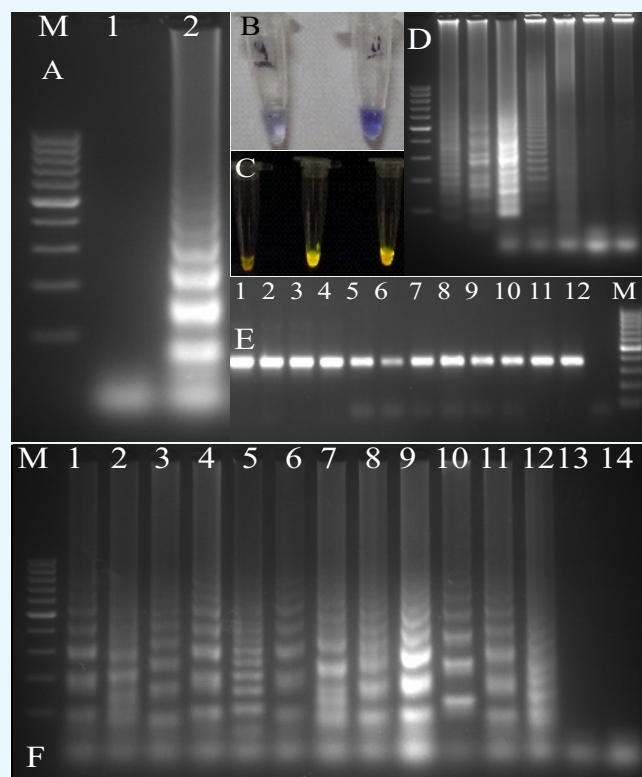
nematode multiplication ( $R_f = 0.30$ ) as compared to Carbofuran 3G @ 6.5 g/m<sup>2</sup> ( $R_f = 0.70$ ) and untreated control ( $R_f = 1.40$ ). However, in field conditions plots applied with Basamid 90G@ 50 g/m<sup>2</sup> recorded less nematode multiplication ( $R_f = 0.87$ ) followed by Basamid 90G@ 40 g/m<sup>2</sup> ( $R_f = 1.05$ ) as compared to Carbofuran 3G @ 65 kg/ha ( $R_f = 1.17$ ) and untreated control ( $R_f = 1.34$ ). In addition, application of Basamid 90G@ 50 g/m<sup>2</sup> (33.4 t/ha) resulted 131 to 216% increase in total tuber yield followed by Basamid 90G@ 40g/m<sup>2</sup> 105 to 181% as compared to Carbofuran (14.48 t/ha) and untreated control (10.57 t/ha). In general application of Basamid 90G increased the yield of 25-75g as well as >75g tubers as compared to Carbofuran and untreated

control. Moreover, application of Basamid 90G also reduced the infection of tuber borne diseases viz., common scab, powdery scab etc.

*Aarti Bairwa, EP Venkatasalam, R Sudha and BP Singh*

### Development of Reverse Transcription Loop-Mediated Isothermal Amplification for Rapid Detection of Potato Virus Y

ELISA and RT-PCR based assays are being used globally for detection of pathogens. More recently, there are many reports on loop-mediated isothermal amplification (LAMP) assay which is a novel technique for amplification of DNA under constant temperature, with high specificity, sensitivity, rapidity and with user-friendly protocol. We developed a reverse transcription LAMP (RT-LAMP) assay for detection of PVY by designing primer with the help of PrimerExplorer V4 software. RT-LAMP reaction was setup using RNA of PVY-infected potato leaves, buffer, virus specific LAMP primers, MgSO<sub>4</sub>, dNTPs, Betaine, Bst DNA polymerase, reverse transcriptase and Hydroxynaphthol blue (HNB). The amplification was carried out at 42°C for 1 hour and 63°C for 90 min followed by 80°C for 10 min. The results were directly visualized based on the change in colour from violet to sky



*Optimization of RT-LAMP assay with negative control (A), visual detection using HNB dye (B), SYBR green acid stinging dye based detection (C), primer combinations (D), RT-PCR (E) and RT-LAMP (F) based detection of PVY in field collected potato leaf samples.*

blue and the same was visualized in gel electrophoresis where multiple bands were observed indicating positive result. The results of LAMP product can also be visualized directly on UV trans-illuminator by adding SYBR green nucleic acid staining dye where change in colour from dark orange to fluorescent yellowish green was observed. Further, the assay was optimized by varying the components of LAMP mixture, incubation temperature and by reducing its reaction volume as well without compromising the sensitivity of the assay. The reproducibility of the assay was compared with routinely used RT-PCR by running across field collected potato leaf samples wherein, both the assays (RT-PCR and RT-LAMP) showed same results indicating that the assay is reliable. All the reactions were carried out with proper controls. The assay was also examined for its cross reactivity with other potato viruses including healthy sample and found no cross reactivity indicating the specificity of the primers and the assay. Therefore, based on the above studies carried out it can be concluded that the assay is sensitive, rapid, user-friendly and has high reproducibility indicating that it can be applicable for quick and reliable detection of PVY in diagnostic laboratories.

***Baswaraj Raigond, Shivani Roach, Jeevalatha A, Ravinder Kumar, Tarvinder Kochhar, Ambika Verma, Sanjeev Sharma, Vinay Sagar and SK Chakrabarti***

### **Isolation and cloning of LB responsive SWEET promoters from K. Bahar and K. Girdhari**

Expression of SWEET genes was analyzed by using real-time PCR under late blight conditions in two contrasting potato varieties Kufri Bahar (late blight susceptible) and Kufri Girdhari (late blight resistant). Six out of 37 SWEET genes were found to be responsive to late blight. Contrasting expression pattern of these genes at transcript level in K. Bahar and K. Girdhari, led to speculate the presence new cis-acting elements in the promoter regions of these genes. In order to identify the late blight responsive cis-acting elements, putative promoter elements of these SWEET genes (2Kb up-stream elements) were cloned and sequenced from both the cultivars.

***Hemant Kardile, Nirmal Kant Sharma, Deodhar Singh, Virupakshagouda Patil, Prashant Kawar and Vinay Bhardwaj***

## **Transfer of Technology**

### **Training and Demonstration of Drip Irrigation Technology at ICAR-CPRI, Shimla**

A training and field demonstration on drip irrigation technology for potato cultivation was organized at ICAR-CPRI,



Shimla on 22nd July, 2016. A total of 33 farmers including men and women farmers from Cheog, Fagu and Talai Villages of Shimla district participated in this demonstration and training. A lecture on micro irrigation technology was also delivered to farmers. Benefit from Drip and Sprinkler methods of irrigation was discussed with farmers. They were shown the working of drip technology at CPRI lower lab, Kanlog and immensely benefited from practical demonstration.

### **Kisan Gosthi under Mera Gaon Mera Gaurav organized at Shimla**

On the occasion of Institute Foundation day on 20th August, 2016; CPRI organized a one day training programme and kisan gosthi for farmers on different aspects of scientific potato cultivation. Fifteen farmers from Shimla district from adopted villages of Mera Gaon



Mera Gaurav programme participated in this function. They were delivered lecture on seed potato cultivation and disease as well as pest management of potato by the concerned scientists. Visit to institute museum was also organized for the farmers.

## Farmer's Training on potato cultivation

The institute organised a three days farmer's training on "Aloo ki unnat kheti" for farmers from Kheda district of Gujarat during 12-14 September, 2016. The training was sponsored by Agriculture Technology Management Agency of Kheda



district of Gujarat. A total of 11 farmers participated in this training and learned latest technologies of potato cultivation through lectures, presentations, lab and field visit.

## Live Phone-in Programme at Doordarshan

Scientists from CPRI, Shimla participated in the Live-phone programmes on different subjects on Doordarshan from July to September, 2016. The details of the topics along with experts are given below.

Month	Topics (Live phone in on Doordarshan)	Name of the Expert
July	Potato disease and pests and their management	Dr. Vinay Sagar Dr. Shridhar J.
August	Intercultural operations undertaken in potato crop before harvesting	Dr. Jagdev Sharma Dr. Tanuja Bucksheth

## Important Meetings, Events & Visitors

### Dr. Trilochan Mohapatra, Secretary, DARE & DG, ICAR, New Delhi visited ICAR-CPRI, Shimla on its 68th Foundation Day Celebration

ICAR-CPRI, Shimla celebrated its 68th Foundation Day on 20th August, 2016. Dr. Trilochan Mohapatra, Secretary, Department of Agricultural Research & Education & Director General, Indian Council of Agricultural Research, Ministry of



Agriculture & Farmers Welfare, Govt. of India, New Delhi graced this occasion as the Chief Guest. On the foundation day lecture he emphasized on “Farmer based research to increase the production and productivity and India must be the torch bearer in potato development for the world and congratulated the Director and staff of CPRI, Shimla. Before this, Dr Mahapatra visited all the laboratories of the institute and interacted with the scientists. He was briefed about the research work being conducted in different labs and sections viz. Cell Biology, AKMU, Library, Post-Harvest Technology Lab, Diagnostic lab, Tissue Culture facility, Genomics lab etc.

Dr. Mohapatra was accompanied by Dr. A.K. Singh, DDG (Extn. & Hort.) ICAR, Dr. S.K. Malhotra, Agriculture & Horticulture Commissioner GOI & Dr. T. Janakiram ADG (Hort. Sci.) ICAR, New Delhi as Guests of Honour along with Sh. Sanjay Chauhan, Mayor, Municipal Corporation, Shimla as special guest.



Dr. AK Singh, in his address highlighted the research work at CPRI and suggested that the Institute must work hard to bring out the varieties and storage technology improvement. He also advised that KVKs may be rope in for quality seed production. On this occasion, Dr. SK Malhotra spoke about Food and nutritional security through potato production and utilization of ever increasing population of the country. Dr. T Janakiram emphasized over the development of climate resilient potato varieties to ensure the quality potato seed production and processing priority. Two entrepreneurs from Punjab shared their experiences of aeroponic seed production technology and thanked CPRI for development of these kind of techniques. A Kisan Gosthi and school children visit to CPRI was also organized on this occasion.

On this occasion, DG, ICAR gave the best worker award of the institute to selected persons under scientific, administrative,

technical as well as supporting category. Smart Potato Portal was also launched by DG, ICAR for providing all decision support system developed in potato under one umbrella. Two publications on potato processing were also released by the dignitaries. Later on, Director General, ICAR interacted with all the staff of the institute and assured all kind of help from council for development of the institute. Nearly 300 people attended this function.

### ICAR-Central Potato Research Institute organized Kisan Gosthi and put up an Exhibition Stall in the Inter State Horti Sangam-2016 at Hajipur (Bihar)

ICAR-Central Potato Research Station, Patna organized a Kisan Gosthi and put up an Exhibition Stall in the Horti Sangam-2016 organized by National Horticulture Board, Gurgaon during 9-10 July, 2016 at Hajipur in Vaishali district of Bihar. Hon'ble Union Minister of Agriculture & Farmers' Welfare, Shri Radha Mohan Singh ji inaugurated the event on July 9,



2016 at 11:00 hrs in the presence of Shri Ram Vilas Paswan, Hon'ble Minister of Consumer Affairs, Food & Public Distribution. ICAR-Central Potato Research Station, Patna put up an exhibition stall for displaying various technologies developed by the institute. Live demonstration of High Yielding potato varieties was also organized during the Exhibition. Nearly 1000 farmers visited the stall and get acquainted with latest varieties and technologies in potato.

The station organized a Kisan Gosthi on the topic entitled, “Scientific cultivation of potato and other tuber crops” on July 10, 2016 in the technical session of the event. Dr. S.K. Chakraborti, Director, ICAR-CPRI, Shimla inaugurated this Kisan Gosthi and delivered a talk on importance and scope of potato and other tuber crops in Eastern Plains of India. Expert scientists of ICAR-CPRI, Shimla from different disciplines

interacted with farmers on topics like potato varieties, seed production technology as well as processing and storage of potato and answered to the queries of farmers. Scientist from RAU, Pusa delivered a lecture on cultivation of other tuber crops. About 1000 folders and technical bulletins were distributed among potato growers during the Horti Sangam and Kisan Gosthi.

### Visit of ICAR-GB Committee Member at CPRI Campus, Modipuram

Shri Suresh Chandel, Member, Governing Body, ICAR and Ex-Member of Parliament visited CPRI Campus, Modipuram on 21st September, 2016. Dr Manoj Kumar, Joint Director, CPRI Campus welcomed to Shri Suresh Chandel and told about current potato research activities being conducted at the



Campus. Shri Chandel visited Tissue culture & Soil testing laboratories and Potato Museum at the Campus and showed his interest in research works of potato at the Campus

### Workshop on IPR Literacy: Patent Drafting & Filing

In the present scenario, collaboration among different scientific and academic institutions is becoming a major impetus in the research arena to promote the creativity and innovation.

Recently ICAR-CPRI, Shimla has signed a memorandum of understanding (MoU) with Himachal Pradesh University on dated August 27th, 2016 to facilitate the collaborative research efforts among both the organization. As a result of which both the organizations have jointly organized a Workshop entitled "IPR Literacy: Patent Drafting & Filing" on October 2-3rd, 2016 at Department of Life Sciences, Himachal Pradesh Shimla. Experts from CPRI, Mr. Krishan Gopal, Research Associate, Institute Technology Management Unit



(ITMU), and Mr. Hemant Kardile, Scientist, Crop Improvement, ICAR-CPRI, Shimla along with Dr. Hemant Sood, Assistant Professor, JUIT, Solan, delivered a talk on IPR instruments and Patent drafting & filing. The interactive workshop was the first experiment of its kind as it forged new paths of co-operation and research between the two organizations with aim to address the current burning IPR related issues in India and was built encompassing different aspects of IPR including detailed procedure behind drafting and filing the patent application in India. The faculty, researcher and students of the HP University and Dr. YS Parmar UHF Nauni attended the workshop and have shown great enthusiasm in knowing about the patent drafting and filing.

## Human Resource

### Scientific

#### Joining

1. Dr. Manoj Kumar, Head, CPRS, Patna has joined as Joint Director, CPRIC, Modipuram with effect from 24.08.2016.

#### Transfers

1. Dr. Rajendra Singh, Sr. Scientist, CPRI, Shimla transferred to CPRIC, Modipuram w.e.f. 25.07.2016.

#### Retirements

1. Dr. PM Govindakrishnan, Project Coordinator (AICPIP), CPRI, Shimla retired from Council's Service with effect from 31.08.2016.

### Administrative

#### Promotions

1. Smt. Sonia Chauhan, LDC, CPRI, Shimla promoted through LDCE to the post of UDC w.e.f. 06.08.2016 (AN)

#### Granted financial up gradation under MACP Scheme

1. Sh. Suresh Kumar, PA, CPRI, Shimla Granted 2nd MACP w.e.f. 11.04.2016 in the PB Rs. 9300-34800+4600 GP.
2. Sh. Pradyuman Kumar Sarswat UDC, CPRIC, Modipuram Granted 2nd MACP w.e.f. 11.03.2016 in the PB Rs. 5200-20200+ Rs. 2800 GP.
3. Sh. Sandeep Verma, Sh. Deep Ram, UDC, CPRI, Shimla Granted 2nd MACP w.e.f. 15.03.2016 in the PB Rs.5200-20200+ Rs. 2800 GP.

#### Transfers

1. Sh. Kamal Chand Verma, UDC transferred from CPRS, Gwalior and he joined at CPRI, Shimla w.e.f. 01.07.2016.

#### Reversion

1. Sh. Akhilesh Singh, LDC, CPRS, Patna got reversion to the post of Skilled Support Staff w.e.f. 18.06.2016
1. Sh. Padam Chand, LDC, CPRI, Shimla reversion to the post of Skilled Support Staff w.e.f. 09.08.2016

#### Skilled Supporting Staff

##### Retirements

1. Sh. Manjinder Singh, Skilled Support Staff, ICAR-CPRS, Jalandhar (31.7.2016)
2. Sh. Karnail Singh, Skilled Support Staff, ICAR-CPRS, Jalandhar (31.8.2016)
3. Sh. Ram Prakash, Skilled Support Staff, ICAR-CPRS, Jalandhar (30.9.2016)



## From the Director's Desk



Potato is the third most important non-cereal food crop in the world after rice and wheat with a record global production of 365 million tonnes (MT). The development of 52 indigenous varieties, indigenous seed production systems and area specific agro-techniques made India the second largest producer after China with a record production and productivity of 45 MT and 23.6 t/ha respectively. Healthy potato seed production is the key for enhancing the potato production and productivity in India. Seed plot technique has since revolutionized the indigenous good quality seed production system in sub-tropical plains of India by extending from hills to plains. The principle of SPT is growing seed potato crop using healthy seed during low aphid period from October to first week of January coupled with

IPM, rouging and dehauling the seed crop during January before aphids could reach the critical limit. Today, 90 percent of seed is being produced in northern (Punjab), north central (Gwalior) north western (Modipuram) and eastern plains (Patna) of the country. This seed is being supplied to the north-eastern, Deccan plateau and Southern parts of the country which are not suitable for quality seed production. However, continuous monitoring of vector dynamics revealed that aphids cross critical limits one week early in Punjab and 1-2 weeks early in western UP in the recent past. Beside vector pressure also has increased many folds as compared to 1980's which is a cause of concern. There is a need to develop new seed production systems. There is also an urgent need to explore possibilities of seed production in non-traditional areas using modern techniques. The efforts are being continuously made to explore such areas for healthy seed potato production and initial findings suggest that Kalyani (West Bengal), Chikmagalur and Chikballapur (Karnataka) may serve the purpose. This country currently requires about 4.7 million tons of quality seed to achieve 100% seed replacement rate. But only >10% seed is being replaced every year which is much below than desired 25%. Moreover, 'CPRI vision 2050' has projected the domestic demand of potatoes to be 125 MT by 2050 which is nearly three times more than current production.

To bridge huge gap of seed demand, CPRI has initiated seed production programme in public-private partnership mode under MoU, augmentation of seed chain by supporting establishment of tissue culture and aeroponic based high-tech systems supplementing conventional approach to meet the growing demand for healthy potato seed in the country. However, many challenges such as impact of climate change on vector dynamics and short seed production window, emergence of new vectors and viruses and viral strains, increasing pressure of soil and tuber borne diseases, interception of new viruses and production of quality seed in non-traditional areas pose threat to healthy potato seed production. As of now 14 aphid species have been recorded on potato in India of which 12 of them are vectors of PVY. The vector diversity and density has been increasing over the years due to change in cropping patterns and rising temperatures. Besides, whitefly transmitted Tomato leaf curl New Delhi virus-potato (ToLCNDV-potato) has been spreading widely in potato growing regions of the country and posing threat to healthy seed production. Moreover, thrips transmitted tospovirus, Groundnut bud necrosis virus on potato has also been increasing in warmer climates such as Deesa, Chhindwara etc. Recently it was also recorded in Shimla hills infesting potato. Therefore, these vector borne viruses play a crucial role in limiting the healthy and ware potato production in the country in near future.

Virus incidence and vector pressure is increasing with rising mean temperature during the past few decades. Breeding for virus resistance, development of virus resistant transgenic lines, avoidance of vectors, forecasting for viruses/vectors, tuber indexing and clonal multiplication, identification of new seed production areas and integrated management of virus/ vectors will help to maintain and further enhance the status of potato seed production systems in India.

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