



ICAR-Central Potato Research Institute

Newsletter



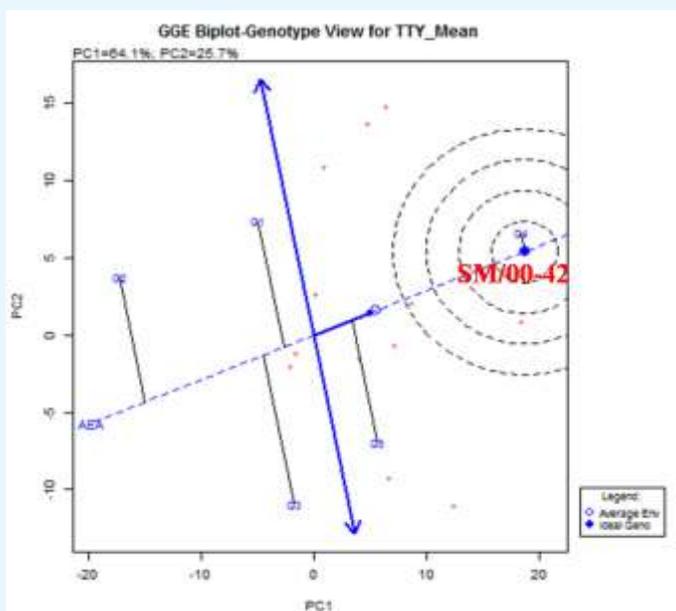
Number 72

April - June, 2018

Research Highlights

SM/00-42: A putative late blight resistant stable potato hybrid for Indian hills

Potato is an important crop in India, grown from higher hills in Himalayas to Southern plains. The development of wide adaptable, disease resistant and high yielding genotypes is therefore, a major thrust area in potato breeding. Three advanced late blight resistant potato hybrids namely, SM/00-42, SM/00-120 and VMT 5-1 with two control varieties viz., Kufri Himalini and Kufri Jyoti were evaluated in randomized complete block designs at 6 locations for two years for total and marketable tuber yield. The



Stability of advanced hybrids through GGE biplot

combined ANOVA for both tuber yields showed that Environments (E), Genotypes (G) and Genotype by Environment interaction (GEI) were highly significant ($P < 0.01$). The partitioning of GEI sum of squares using GGE biplot analysis indicated that the first four PCAs were highly significant ($P < 0.01$). The first two principal components accounted for around 90% of the interaction sum of squares for both total and marketable tuber yield. Among the hybrids,



Tubers of SM/00-42

SM/00-42 was the best performer for total and marketable tuber yield in all the locations for both the years, while SM/00-120 and VMT 5-1 were moderate yielders and the control varieties, Kufri Jyoti and Kufri Himalini were poor yielders. Among all the locations, Kufri showed wide range of variation while Srinagar had the least variation for yield during both the years. The late blight resistant hybrid, SM/00-42 had the highest stability as well as mean yield and is

therefore the most promising hybrid for the tested locations.

Salej Sood, Vinay Bhardwaj, Dalamu, Rajendra Singh, Vinod Kumar, EP Venkatasalam, Mehi Lal, Dharminder Verma & SK Chakrabarti

Loop-Mediated Isothermal Amplification technique for detection of *P. infestans*.

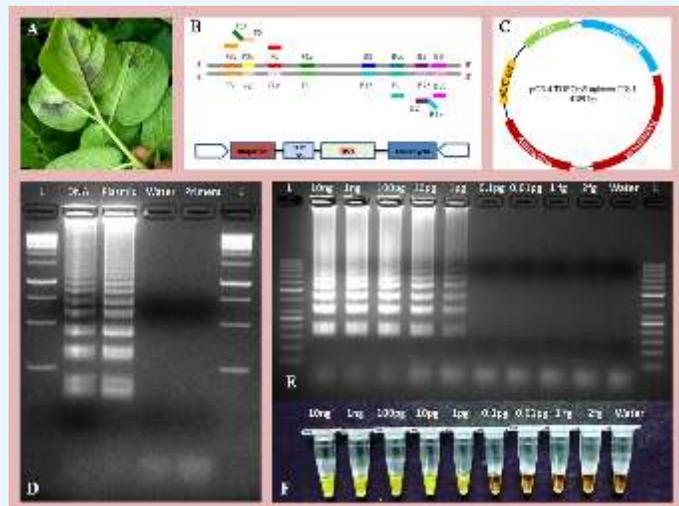
A loop-mediated isothermal amplification (LAMP) assay was developed targeting internal transcribed spacer (ITS) region of *Phytophthora infestans* for its visual detection. *P. infestans* is a destructive plant pathogen best known for causing late blight of potato (A) and economically important to manage it worldwide. The ITS regions of ribosomal DNA are commonly used in diagnostics due to their relatively high copy number and species specificity. LAMP is based on loop-amplification of a specific site of the genome by Bst polymerase with DNA-strand displacement activity. Warm-start Bst polymerase has been reported as a better alternative to Bst polymerase due to its precise activation at particular temperature to avoid random amplification. Present study focused upon ITS 1 region due to its higher specificity among commonly found *Phytophthora* species. The method used two sets of primers: two outer primers (F3 and B3), two inner primers (FIP and BIP) to accelerate the reaction (B). The targeted region was PCR amplified and the product was sequenced to make assay more specific and reliable. The F3 and B3 primers spanning 233 nt region was cloned in pCR 4 TOPO vector and works well as positive control (C).

The ITS1-LAMP assay efficiently amplified the target region in 60 min at 65°C (D). The assay was also optimized to decrease runtime for quick detection within 28 minutes of incubation at 65°C and it worked well. The assay also detected *P. infestans* from infected potato leaf tissues (D). The limit of detection (LOD) of ITS1-specific LAMP assay for *P. infestans* was 1pg/μl DNA (E). The described method employs SYBR Green dye, a nucleic acid stain found to be suitable for LAMP detection by fluorescence (F). The obtained results have shown ITS1-LAMP assay as a sensitive, less time consuming and specific alternative for PCR-based detection methods of *P. infestans*.

G Verma, S Sharma, B Raigond & SK Chakrabarti

Canopy management practices to reduce undersized tuber numbers in net house crop of potato

Potato is an input intensive crop with seed alone accounting for 40-50 per cent of the total cost of cultivation. Production of good quality seed production of potato is difficult because of the high vector pressure during the crop season in sub-tropical plains resulting in higher cost of potato seed thus forcing many to use locally grown seed despite severe yield losses. Multiplication of early seed generations under insect proof net house has been adapted by several farmers to multiply their own seed in a disease-free state over a longer period. However, the information on specific horticultural management for multiplication of seed potato under net house is not available which are different from commercial potato production.



ITS-1 based detection of *P. infestans* through Loop-Mediated Isothermal Amplification



Net house crop with & without net

Besides, due to limited space there is much overcrowding of branches, less circulation of air and poor light inside the canopy and related abiotic factors which indirectly affect productivity and are possibly a major cause for production of higher undersize tubers. These result in plant lodging, poor aeration and poor light penetration causing the leaves to turn yellow and fall on ground, leading to significant decrease in photosynthesis. Canopy management as practiced in several horticultural crops was attempted to counter the aforesaid issue. An experiment was designed at Central Potato Research Station, Jalandhar using Single (SLC) and Double (DLC) layer canopy netting system under net house conditions in three varieties (Kufri Pukhraj, Kufri Gaurav, Kufri Chipsona-1) which keeps plants upright and was compared to control plants having no canopy management structures. The single and double net systems consisted of nylon net for providing support were attached on angles fixed on the corners of the plot and pulled with hooks for keeping potato crop in upright position. First net was established at 30 days after planting in both SLC and DLC and second net at 45 days after planting in only DLC. These canopy management practices allow good aeration inside canopy thus increase photosynthesis and also reduce chances of pest and disease attack (as no favourable micro-climate for pathogen build up is available). The number of undersized tubers (<3 g) were also significantly reduced by both of the treatments in comparison to control in all three varieties. In Kufri Pukhraj total

weight of tubers in DLC was increased by 28.14% and by 16.66% in SLC system over control (CN). The number of undersized tubers in Kufri Pukhraj reduced by 23.21% in double net system over control whereas in Kufri Gaurav the reduction was about 81% over control. In Kufri Chipsona-1 number of undersized tuber were 57.14% higher in control over double net system and 10% higher over single net system. Based on the experiment it can be concluded that with canopy netting practices we can significantly reduce number of undersized tubers and overall tuber productivity making it more economical.

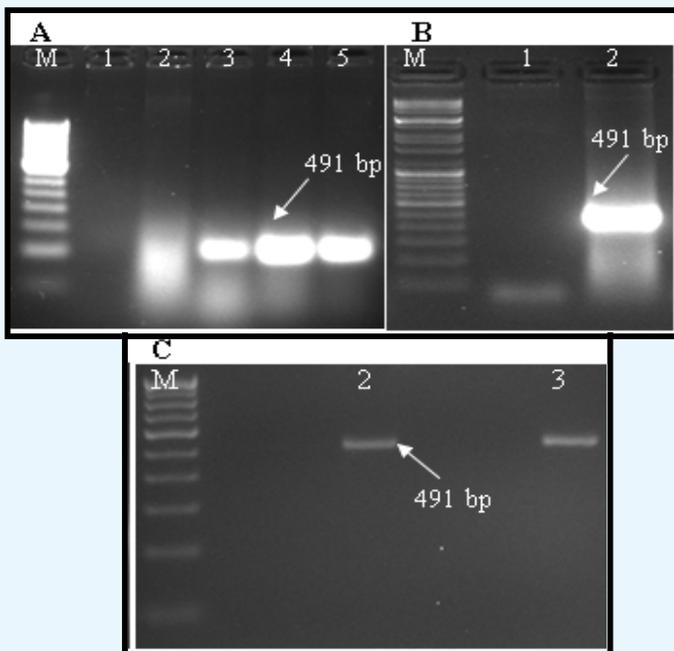
Sugani Devi, Sukhwinder Singh, RP Kaur, AK Singh & RK Singh

Recombinase Polymerase Amplification: A rapid isothermal based molecular assay for detection of DNA virus infecting potato

The current diagnostic techniques for detection of DNA virus infecting potato includes molecular assays like polymerase chain reaction (PCR), Rolling Circular Amplification (RCA) and real-time PCR (qPCR) which are highly specific and sensitive as well. But, the utilization of these assays is limited as they are time consuming, involve expensive thermal cyclers and require skilled personnel. Recombinase polymerase amplification (RPA), a highly specific and rapid (20 to 30 min) isothermal based nucleic acid amplification technique, can be a possible alternative. The process of RPA starts after the association of proteins with monomers of oligonucleotides in presence of ATP. Hence, the RPA assay was developed for detection of DNA virus infecting potato i.e., *Tomato leaf curl New Delhi virus*-[potato] (ToLCNDV-[potato]). The assay was carried out by adding rehydration buffer to lyophilized master mix (TwistAmp^R Basic RT) and to this mix virus specific primers spanning 491 bp region of DNA-A segment of the virus and DNA template of target virus were added. The reaction was set at isothermal temperature of 40 °C for 30 min by adding magnesium acetate (MgAc). The amplified product was visualized in 2% agarose gel by adding SDS where, an expected amplicon of 491 bp was visible indicating its putative amplification. The findings were confirmed



Montioring of crop with double net



RPA for detection of ToLCNDV-potato. Standardization of RPA with controls, PCR based confirmation of RPA findings and gel eluted product for its sequence based confirmation

by the reported conventional PCR based detection using same primers where it supported the findings of RPA. Further, the amplified product of RPA was directly sequenced and the nBLAST analysis showed 97 % similarity (KC205278 and KC205277) with the reported ToLCNDV-[potato] infecting potato. This is the first report of developing RPA assay for detection of ToLCNDV-[potato] infecting potato. It is expected to support diagnostic laboratories, for the rapid detection of the target virus.

Baswaraj Raigond, Shruti Pathania, Ambika Verma Gaurav Verma, Tarvinder Kochhar & SK Chakrabarti

Transfer of Technology

Ten days training program for agriculture officers of West Bengal

ICAR-CPRI Shimla organized a 10 days training programme on “Seed potato production” during 4th-13th April, 2018 for agriculture officers of West Bengal. The training was sponsored by Department of Agriculture, West Bengal. The objective of the training programme was to enhance the knowledge and skills of trainees regarding the recent advances of seed potato production technologies. A number of

training methodologies like lecture cum discussion, practical sessions, skill demonstration, field visits and video film show, etc. were implemented during this training.

Five days International training on hi-tech potato seed production

Five days training programme was organized by CPRI Shimla in collaboration with International Potato Center (CIP) for scientists of Nepal during 18th June - 22th June, 2018. The objective of the training



programme was to enhance the knowledge and skills of the trainees on different aspects of seed potato production with special reference to hi-tech system. Lecture-cum-discussion, video shows, demonstrations, practical exercises, field and lab visit, etc. were the modes for imparting training to the participants.

Three days training program on scientific potato seed production

A training programme on “scientific potato seed production” was organized for progressive potato growers of Keylog, Lahaul & Spiti (Himachal Pradesh) on 7th June, 2018. Various technologies of the institute like live sample of potato varieties, processed products, minitubers from net house, microtubers from aeroponic system, etc. were also displayed during the training. Different aspects of potato cultivation like planting, irrigation, insects and diseases management, nutrient management, post-harvest management, etc. were delivered to the trainees by the expert scientists from the institute.



ICAR-CPRI participated in exhibition during International Day for Biological Diversity 2018

ICAR-CPRI Shimla participated and put up an exhibition stall during the “International Day for Biological Diversity 2018” at ICAR-CPRI, Shimla. Various technologies of the institute like live sample of potato varieties, processed products, True Potato



Seeds (TPS), minitubers, microtubers, virus testing kits, etc. were displayed during the exhibition. A large number of farmers, scientists, students, policy makers and other stakeholders visited the CPRI stall and they were made aware about various technologies of the institute. The visitors were also provided with technical bulletins, folders, etc free of cost.

Two day training programme on aeroponics at ICAR-CPRI, Regional Station, Jalandhar

ICAR-Central Potato Research Institute, Regional Station, Jalandhar organized a two day training program on “Minituber Production through Aeroponics”, on 25-26 June, 2018 under Agri-business



Incubator. Total six participants from two licensed companies/departments (JPG Biotech Producer Company Ltd., Jalandhar and Punjab Agriculture Department, Center of Excellence on Potato) for CPRI-Aeroponic Technology, participated in this training program. The main objective of this training was to educate the officers/technicians of license holding companies about the technology, operation, maintenance, trouble shooting and management aspects. Dr. Arvind Jaiswal and Er. Brajesh Nare assisted in organizing this training satisfactorily.

One day training program entitled “Agri-business opportunities in seed potato production” at ICAR-CPRI, Regional Station, Jalandhar

A one day farmers training on “Agri-business opportunities in potato seed production” was organized on May 17th 2018 under Agri-business Incubator at ICAR-Central Potato Research Institute, Regional Station, Jalandhar, Punjab. The purpose of this training was to create awareness about CPRI developed promising varieties of potato, management practices for insect, pest and diseases, seed plot technique and net house for the production of quality seed potato production. Dr. Jagdish Grover, Associate Director, KVK, Faridkot was chief guest in



the inaugural session. The Chief Guest praised the constant efforts and contribution of the Central Potato Research Institute in the production of seed potato and promising varieties of potato. A total of 60 farmers from various parts of Punjab participated in this event and took advantage of the information given by the subject experts on the importance of good quality seed potato. About 25 farmers from Farmer Producer Organization, Khushaal Seed Producer Association, Jalaldiwal, Ludhiana were also participated in this training.

Live Phone-in Programme at Doordarshan

Scientists from ICAR-CPRI, Shimla participated in the Live-phone programmes during June, 2018. The details of the topics along with experts are given below.

Month	Topics	Name of the Expert
June	Storage and marketing of potato in central parts of Himachal Pradesh.	Dr. RK Singh Dr. Brajesh Singh

Important Meetings, Events & Visitors

Stakeholders Meet for Identification of Potato Export Zones

A Stakeholders meet on identification of potato export zones in Punjab, Madhya Pradesh and Gujarat for producing export quality potatoes was organised under the Chairmanship of Dr. AK Singh, Deputy Director General (HS) on 21.04.2018 at NASC Complex, New Delhi. The meeting was



attended by Dr. PK Chakrabarty, Dr. RK Walia and Dr. Rajan from ICAR; Dr. SK Chakrabarti, Dr. Sanjeev Sharma, Dr Vinay Sagar and Dr. Kamlesh Malik from ICAR-CPRI, Shimla, Dr. Kuldeep Singh, Dr. Kavita Gupta and Dr. Jameel Akhtar from ICAR-NBPGR, New Delhi; Dr. Harish Chandra, Dr. Gyaneshwer Banchhor and Dr. SM Gaikwad from DPPQ & S, Faridabad; Dr. CB Singh from APEDA, New Delhi; Dr. Farooq Panj and Sh. JK Patel from Directorate of Horticulture of Gujarat; Dr. RN Patel from AICRP(P), Deesa, Gujarat; Sh. Satbir Singh, Directorate of Horticulture of Punjab; Dr. Vijay Aggarwal from Directorate of Horticulture of Madhya Pradesh; representatives from seed and processing industries like Sh. Davinder Singh Dosanjh from Mahindra HZPC; Dr. Santosh Tiwari from Pepsico Holdings; Sh. NK Jha from ITC, and Sh. Tanvir Bhatti from Bhatti Agritech; and exporter Sh. Sandip Thakkar from SK International, Ahmedabad, Gujarat. The roadmap for identification of districts for producing export quality potatoes in the states of Punjab, Madhya Pradesh, Gujarat, Rajasthan and Uttar Pradesh was discussed. A mega project would be prepared by ICAR-CPRI, Shimla for funding from APEDA involving Directorates of Horticulture and SAUs of above mentioned states. It was also decided that review meetings would be held after every two months.

ICAR- Central Potato Research Institute, Shimla" celebrated Fourth "International Yoga Day

The 4th International Yoga Day was celebrated on 21st June 2018 at ICAR- Central Potato Research Institute, Shimla. The Aasans, Pranayam and Dhyan



of Yoga were demonstrated by learned and experienced Art of Living teachers Ms. Dhara Saraswati Ji and Shri Abhay Sharma Ji, and practiced by all staff member and research scholars of the institute. The aasans performed included Trikonasan, Salabhasan, Bhujangasan, Dhanurasan, Nokasan, Suryanamaskar, Natarajasan, Savasan, etc. The Pranayam performed included Anulomvilom and Bhramari. Also, a session on Meditation (Dhyan) was conducted. The yoga teachers also explained beneficial effects of all the demonstrated Aasans, Pranayam and Dhyan techniques. While sharing their experiences, all the participants told that after the yoga session they felt very happy and found their minds calm and at peace. The director



thanked the teachers and the participants. Simultaneously, the yoga day was also celebrated at all the regional stations of ICAR-CPRI, Shimla.

Human Resource

Technical

Promotions

1. Sh. Ram Kumar Verma, Chief Technical Officer, ICAR-CPRI, Regional Station, Modipuram, granted one advance increment w.e.f. 02.12.2014, as per the provisions of TSR.
2. Sh. Mahipal Singh Bharti, ACTO, ICAR-CPRI, Regional Station, Modipuram promoted as CTO w.e.f. 01.07.2017
3. Sh. Murari Lal, Sr. Tech. Officer, ICAR-CPRI, Regional Station, Modipuram promoted as ACTO w.e.f. 16.01.2017.

4. Sh. Satander Kumar, Sr. Tech. Officer, ICAR-CPRI, Regional Station, Modipuram promoted as ACTO w.e.f. 03.02.2017
5. Sh. Pravesh Jassal, Sr. Tech. Officer, ICAR-CPRI, Shimla promoted as ACTO w.e.f. 29.01.2017.
6. Sh. Yogesh, Sr. Tech. Officer, ICAR-CPRI, Shimla promoted as ACTO w.e.f. 01.02.2012.
7. Sh. Omvir Singh, Tech. Officer, ICAR-CPRI, Regional Station, Modipuram, promoted as Sr. Tech. Officer w.e.f. 09.01.2017.

Retirement

1. Sh. Yash Pal, Tech. Officer, ICAR-CPRI, Shimla retired on 30.04.2018
2. Sh. Ramesh Chand, ACTO, ICAR-CPRI, Regional Station, Modipuram, retired on 30.04.2018.
3. Sh. Hesting Jyrwa, Sr. Tech. Asstt. (Driver), ICAR-CPRI, Regional Station, Shillong retired on 30.04.2018

Death

1. Sh. Prithi Raj, Tech. Asstt, ICAR-CPRI, Shimla, expired on 16.05.2018.

Administrative

Promotions

1. Mis. Prawartika Das, Asstt. ICAR-CPRI, Shimla promoted to Asstt. Admn. Officer on dated 03.04.2018. On promotion she has been posted at ICAR-CPRI, Regional Station, Jalandhar.

Skilled Supporting Staff

Promotions

1. Sh. Nand Lal, SSS (Wash Boy), ICAR-CPRI, Shimla promoted to LDC on 23.06.2018

Retirement

1. Sh. Gain Singh, SSS, ICAR-CPRI, Regional Station, Jalandhar retired on 30.04.2018
2. Sh. Bir Bhadur, SSS, ICAR-CPRI, Shimla retired on 31.05.2018
3. Sh. Ram Balak Ram, SSS, ICAR-CPRI, Regional Station, Patna, retired on 30.06.2018



The Frontline Demonstration (FLD) is one of the important extension approaches evolved by the Indian Council of Agricultural Research during mid-eighties for transferring of latest technologies to farmers. The main objective of the FLD is to demonstrate newly released crop production and protection technologies and management practices at the farmers' fields under different agro-climatic regions and farming situations, helping farmers to learn latest technologies under real farming situation at their own fields. It is one of the most powerful tools of extension because farmers, in general, are driven by the perception that '*Seeing is believing*'. FLD also provides an opportunity to researchers and extension functionaries for understanding the farmer's resources, requirement and their constraints to fine tune and/or modify the technologies for easy adaptability at farmers' fields. FLDs are generally conducted in a block of two to four hectares of land in order to have better impact on the farmers and field level extension functionaries. FLD is used as a source of generating data on factors contributing to higher crop yields and constraints of production under various farming situations.



Realizing the importance of FLD in transfer of potato technologies, ICAR-CPRI, Shimla has regularly been conducting FLDs on several improved potato technologies like new potato varieties, Seed Plot Technique for quality seed production, insect and disease management and other crop production and protection technologies at the farmers' fields in almost all potato growing states of the country, with the active involvement of the scientists of the institute. The results of the FLD data conducted recently on new varieties showed that there was 20-50 per cent increase in yield over the farmers' practices resulting in increasing the farmers' income and uplifting the standard of living of the farming communities. Similar results were also found in other technologies. Moreover, FLD also acted as a very successful tool in enhancing the knowledge and skills of farmers about various potato technologies, thus motivating them to adopt more number of improved potato technologies. In some cases, the beneficiary farmers also acted as sources of knowledge and quality potato seeds to other farmers in their villages and nearby areas, thus helping in speedy dissemination of demonstrated technologies among farming communities.



It is estimated that by the year 2050, India would require 125 million of potato and in order to achieve this, India has to harvest it with an average productivity of 34.5 t/ha at a ACGR of 1.46 %. Increasing potato productivity from current status, i.e., 20.5 t/ha (as per FAOSTAT for the year 2016) to 34.5 t/ha in 2050 would be an uphill task for potato R&D. However, it is reported that at present level of farm management practices, we are actually able to harvest only 42-45% of the achievable yield, which could be improved to 80% by efficient and effective dissemination and implementation of farm technologies. Concerning these challenges, many surveys have been conducted by the institute in those areas/regions where potato productivity is low for identifying the knowledge and adoption gaps of potato growers and also constraints faced by them in adoption of improved potato technologies. Accordingly, possibilities are being explored for laying out FLDs and organizing other extension activities in those areas in collaboration with Krishi Vigyan Kendras (KVKs) and other institutes involved in agriculture.

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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