ICAR-Central Potato Research Institute

Newsletter

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Research Highlights

Multiplex RT-PCR system for rapid detection of Potato Virus A, X & S in Solanum tuberosum

A multiplex reverse transcriptase (RT)-PCR-based method was designed for the simultaneous detection of Potato Virus A, X & S causing economical losses to potato production in the country. This assay was targeted to amplify the specific region within the genome of respective viruses. The sequences were preanalyzed in sequence alignment tool with different accessions derived from NCBI of the respective viruses to remove chances of cross amplification. Thus, narrow down possibilities of getting false positive results during amplification. Each of the three pairs of oligonucleotide primers exclusively amplified the targeted regions of the specific pathogens (A). The targeted regions of respective viruses were cloned further in sub cloning vector (pCR4-TOPO) to make them work as positive control. The cloned targeted fragment was confirmed with restriction digestion and Sanger sequencing (B). The sequencing results provided 98% nucleotide sequence similarity with NCBI submitted accessions. The assay was optimized to determine its limit of detection (LOD). The sensitivity of the multiplex PCR using purified plasmid DNA was 25 pg for Potato virus A, 12.5 pg for Potato Virus X and 50 pg for Potato virus S. The multiplex PCR assay was useful for specific detection of the four viruses of Solanum tuberosum. Therefore, this method could be a useful alternative to routine diagnosis of same virus infections in potato.

G Verma, B Raigond, S Sharma & SK Chakrabarti

Potential of adopting Indian good agricultural practices (GAP) for the production of potato crop in the country

India is the second largest producer of potato and has a huge potential for export. Today, potato is being cultivated almost round the year in different states of the country. The potential importing countries for Indian potatoes are Vietnam, Malaysia, Russia, Turkey and Thailand whereas some Indian varieties are in demand in Afghanistan, Nepal, Bhutan, Bangladesh, Sri Lanka, Philippines, Madagascar,
Mauritius, Bolivia and Vietnam etc. Potato growers and other stakeholders in supply chain can gain better profits by doing concerted efforts in each component of this chain. First and foremost in the chain is the quality potato production, associated with increasing awareness among people about food and its quality especially chemical residues. Most of the importing countries either have their own standards for fresh and processed food items or have adopted Global GAP.

In past seven decades, ICAR- CPRI has developed Potato technologies for all potato growing agro-ecologies and their adoption by the farmers has resulted into marvelous progress in potato production. This has given confidence for going a step ahead, which is quality potato production for internal market and for global export. The Institute recommendations for potato production are safer in their time zone and are being refined periodically. Economic reforms and opening of trade at world level raised the issue of food quality and its traceability during nineties. Gradually all the developed and several developing countries have adopted good agricultural practices (GAP). As a responsible nation, we also cannot remain aloof to such developments. That's why that the Institute has developed Indian GAP for production of potato crop by integrating all aspects to be complied by potato growers during the process of crop production, harvesting, handling, and storage. This covers all technical processes for potato crop in order to ensure legal compliance developed by Quality Council of India (QCI).

QCI has designed Indian GAP (INDGAP) for necessary compliance at all level of supply chain including the farm operations. GAP certification as per these norms from the authorized agency will ensure the quality authenticity of the produce for domestic utilization as well for export. GAP includes all those critical, major and minor control points, on-farm or outside-farm operations that needs to be carried out in a healthy and hygienic condition along with surety of product traceability. In addition to better yield and quality of the produce, GAP has environmental and social dimensions, too.

Implementation of GAP would promote optimum utilization of farm inputs viz., water, seed, fertilizers, insecticide, pesticides, residues etc. with their zero or negligible wastage. This will help in environmental conservation along with preservation of flora and fauna. Its social dimension would develop world class skills in agricultural workers and protect their health. Record keeping of all farm activities along with necessary information is helpful in the process of certification.

GAP for potato production begins right from the selection of most appropriate site for cultivation, input quality check, soil and water testing, right choice of variety, following of all the recommended package of practices as per the purpose of crop utilization (table, seed or processing) etc. Scientific precautions during nutrient application, irrigation, weeding, intercultural operations, spraying, harvesting, grading and storage will ensure product quality. Use of safer chemicals within permissible limits and their integration into management with other alternatives will help in conserving ecology. In fact, GAP would help potato growers in reducing cost of cultivation, achieving maximum marketable tuber yields and fetch higher net farm profits due to ensured market by building trust in long run. Implementation of GAP would enable farmers to produce fine quality potatoes for organized domestic market and export, and high quality raw material for the processing industry.

This is an appropriate time to promote good agricultural practices for the production of potato crop where on one hand government is preparing policies and strategies for next generation of agricultural reforms in context of eco-friendly and sustainable agriculture, and on the other hand consumer is becoming aware about health and food quality.

Sanjay Rawal, Pooja Mankar, VK Dua, Kamlesh Malik, Mehi Lal, Sukhwinder Singh, Devendra Kumar & SK Chakrabarti
Differential expression pattern of RCA isoforms under elevated carbon dioxide and temperature conditions in potato

Photosynthesis is the major process contributing to the yield and is highly affected by the effect of global climate change. Rubisco is the key of photosynthesis and its activity is often affected by the elevated temperature and CO$_2$. Decrease in rubisco activation at high CO$_2$ concentration was caused by decrease in carbamylation of rubisco. However, it is unclear whether decrease in carbamylation rate at high CO$_2$ concentration is due to decrease in activity itself or content of rubisco activase. To clarify this ambiguity, investigation was performed to determine effects of elevated CO$_2$ concentration (550 ppm) and temperature (26°C) on rubisco activase activity in potato. Results show that out of four isoforms RCA56 and RCA16 are up regulated under elevated CO$_2$ and temperature respectively and rest isoforms remain down regulated under these stress conditions.

Hemant B Kardile, Prince Kumar, NK Sharma, Som Dutt, Vinay Bhardwaj, VK Dua & Brajesh Singh

Analysis of constraints to adoption of quality/certified potato seeds in West Bengal

The quality seeds of improved potato varieties are the basic and crucial determinants of productivity and sustainability of potato production. However, there are several constraints faced by farmers in adoption of quality potato seeds. The present study attempted to identify the constraints to adoption of quality potato seeds in West Bengal by interviewing 100 farmers (50 each from Bardhaman and Hoogly districts). Garrett’s Ranking Technique was used to identify and rank the constraints. Garrett’s formula for converting ranks into percent was given by

$$\text{Percent position} = \frac{100 \cdot (R_{ij} - 0.5)}{N_j}$$

where $R_{ij}$ = Rank given for the $i^{th}$ variable by $j^{th}$ respondents and $N_j$ = Number of variable ranked by $j^{th}$ respondents. With the help of Garrett’s table, the estimated percent position is converted into scores. Then for each constraint, the scores of each individual are added and mean values of score is calculated by dividing total value of scores by numbers of respondents.

The study indicated that the first major constraint ranked by potato growers was high cost of quality/certified seed (with overall score of 64.7). This was followed by non-availability of seeds of required varieties (score=52.3, Rank II), lack of information about improved varieties (score=50.2, Rank III), far from sources of quality seeds (Score=45.0, rank=IV) and lack of cold storages and high storage charges for keeping potato seeds (36.8, Rank V). The findings may be useful for state governments, policy makers and researchers in formulating plans, policies and researches related to the dissemination and adoption of quality seeds of improved varieties in the study areas and in other potato growing regions.

P Kharummid, NK Pandey, DK Gupta, Shilpa Attri, Arjun K Sharma & Rakesh Srivastava

Transfer of Technology

ICAR-CPRI, Shimla participated in mushroom mela at ICAR-DMR, Solan

ICAR-CPRI Shimla participated and put up an exhibition stall at ICAR-DMR Solan on 10th September, 2018. Various technologies of the institute were displayed during the exhibition. About 500 farmers, scientists, students, policy makers, NGO members, etc visited the CPRI stall and they were
made aware about various technologies of the institute. Technical publications were distributed free of cost during the mela.

**Farmer's training on scientific potato cultivation and disease management**

A three days on campus training programme on “Scientific potato cultivation and disease management” was organized by ICAR-CPRI Shimla for 10 progressive farmers of Uttarkashi district of Uttarakhand during 16th to 18th July, 2018. The training programme was sponsored by Border Area Development Programme (BADP), Uttarakhand.

Different aspects of potato cultivation like planting, irrigation, nutrient management, disease and insect management etc were delivered to the trainees by the expert scientists from the institute. 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 on quality seed production techniques**

ICAR-CPRI organized a three days training programme on “Quality seed production techniques” for five staffs of Jain Irrigation Systems Limited, Jalgaon, Maharashtra during 02nd to 04th August, 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. Different modes of imparting training like lecture-cum-discussion, video shows, demonstrations, practical exercises, field and lab visit, etc. were used.

**Five-day trainings on seed potato production and marketing**

ICAR-CPRI, Regional Station, Modipuram organized two five-days training programmes on "Seed potato production and marketing" on 09th–13th July, 2018 and 27th–31st August, 2018. A total of 70 trainees which include agricultural technical
assistants, assistant technical managers, block technical managers and progressive farmers from Uttar Pradesh participated in the programmes. The trainings were sponsored by Agricultural Technology Management Agency (ATMA), Lucknow (UP). Various topics related to seed potato production and marketing like improved varieties of potato, planting, improved irrigation system, balanced use of fertilizers, seed potato production, storage and marketing etc were imparted to the trainees. Certificates were given to the trainees.

One-day workshop on “Aeroponics for seed potato production” at Jalandhar

Agri-business Incubator, ICAR-Central Potato Research Institute, Regional Station, Jalandhar, Punjab organized one-day workshop on “Aeroponics for seed potato production” on September 25th 2018. The purpose of this workshop was to update the incubates/licensed holders about the recent upgradations in CPRI - Aeroponics Technology. Dr Satvir Singh, Deputy Director Horticulture, Jalandhar, Punjab was the chief guest and Dr Balwinder Singh, Project Officer, Centre of availability in the country using Aeroponics and low cost net house technology. About 20 representatives of license holding companies from Punjab and Haryana participated in this event and took advantage of the information exchanged by the subject experts regarding efficient use of CPRI-Aeroponic technology for production seed potato.

Live Phone-in Programme at Doordarshan

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

<table>
<thead>
<tr>
<th>Month</th>
<th>Topics</th>
<th>Name of the Expert</th>
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<tbody>
<tr>
<td>July</td>
<td>Potato diseases and their management in higher hills of Himachal Pradesh.</td>
<td>Dr. Vinay Sagar, Dr. Ravinder Kumar</td>
</tr>
<tr>
<td>August</td>
<td>Weeding and harvesting of potato in higher hills of Himachal Pradesh.</td>
<td>Dr. Jagdev Sharma, Dr. Tanuja Buckseth</td>
</tr>
<tr>
<td>September</td>
<td>Harvesting, storage and marketing of potato in higher hills of Himachal Pradesh.</td>
<td>Dr. Brajesh Singh, Dr. Vinod Kumar</td>
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Excellence for citrus was guest of honour in the inaugural session. On this occasion Head, ICAR-CPRI, RS, Jalandhar highlighted the significant achievements of CPRI in the field of potato varieties, production and processing. The chief guests applauded the constant efforts and contribution of the CPRI in developing technology for production of seed potato production through aeroponics. Er. Sukhwinder Singh highlighted the recent efforts made by ICAR-CPRI for enhancing potato seed

Important Meetings, Events & Visitors

Visit of Shri Chhabilendra Roul, Special Secretary, DARE & Secretary, ICAR, to ICAR-CPRI, Shimla

Shri Chhabilendra Roul, Special Secretary, DARE & Secretary, ICAR visited ICAR-Central Potato Research Institute, Shimla on 18th & 19th August, 2018. In the morning of 18th August, he visited the breeder seed production farm at Kufri/Fagu including the National Hybridization Facility & the Lister House, and interacted with the staff of the station. During the interaction he suggested that for the benefit of farmers, there is need to develop short duration processing potato varieties which can compete with
exotic processing varieties being imported by the multinationals. In the afternoon, he chaired a meeting of Senior Officers of the institute and regional stations of other sister institutes of ICAR at Shimla wherein Dr. S. K. Chakrabarti, Director, ICAR-CPRI, Shimla made a brief presentation on 'Potato Research in India'.

**Institute Research Council (IRC) Meeting held during 26th to 28th July, 2018 at Shimla.**

The Institute Research Council (IRC) Meeting of the year 2018 was held during 26th to 28th July, 2018 at ICAR – Central Potato Research Institute, Shimla. This meeting was attended by 60 scientists from Headquarters and its regional stations. A thorough discussion was held on the last year's recommendations and work done during the year. Work plan for next year i.e. 2018-19 were also finalized in this meeting.

**Hindi Divas Celebration,**

ICAR-Central Potato Research Institute, Shimla celebrated Hindi Divas 2018 on 14th September, 2018 in the institute auditorium. Dr. Swarup Kumar Chakrabarti, Director of the institute grace the occasion as Chief Guest of the function. On this occasion the Chief Administrative Officer welcomed the Chief Guest with the flower bouquet. Thereafter, Dr. Rakesh Mani Sharma, Incharge (Official Language) briefly highlighted about the Hindi Divas celebration and read out the message of the Agriculture & Farmers Welfare Minister, Govt. of India received from the Council (ICAR).

The Chief Guest on his address congratulated the staffs and officers of the institute for their continued efforts to continuously making progress in Hindi usage and appeals them to not only sustain this progress but also take to a new height. He also appeals the staff members to participate with the great enthusiasm in the different Hindi competitions / events proposed to be organized in ensuing Hindi Divas celebrations during 14th to 28th September, 2018. The Chief Administrative Officer of the institute in his address mentioned that all sections of administrations are doing all noting/drafting works in Hindi which is commendable step. He expressed his hope that institute will shortly achieve the target of Hindi usage set by the Department of Official Language, Ministry of Home Affairs, Govt. of India. On this occasion he appealed all staffs/officers of the institute to maintain this progress of Hindi usage and contribute to take it in the next level. At the end of Hindi Divas inaugural function Shri Naresh Chand Sharma, Secretary, Staff Welfare Association of the institute presented vote of thanks.
**Scientific**

**Joining**

1. Sh. Raj Kumar, Scientist (Horticulture/Floriculture) relieved from ICAR-NRC for Orchids, Pakyong, Sikkim w.e.f. 30.6.2018 (AN) and joined at ICAR-CPRI, Shimla on 04.7.2018 (AN).

2. Dr. Ngursangzuala Sailo, Scientist (Plant Physiology) relieved from ICAR-NRC for Orchids, Pakyong, Sikkim w.e.f. 06.7.2018 (AN) and joined at ICAR-CPRI, Regional Station, Shillong on 09.7.2018 (FN).

3. Dr. (Mrs.) P. Janani, Scientist (Spices, Plantation, Medicinal and Aromatic Plants) relieved from ICAR-Directorate of Cashew Research, Puttur, Dakshina Kannada district, Karnataka State, India w.e.f. 30.6.2018 (AN) and joined at ICAR-CPRI, Regional Station, Shillong on 02.7.2018 (FN).

**Transfer**

1. Dr. Satyajit Roy, Principal Scientist transferred from ICAR-Central Potato Research Institute, Regional Station, Gwalior w.e.f. 31.8.2018 to join at ICAR-Directorate of Medicinal and Aromatic Plants Research, Boriavi, Anand (Gujarat).

**Technical**

**Promotions**


7. Sh. Vipin Kumar, Sr. Technician (Driver), ICAR-CPRI, Regional Station, Modipuram Promoted to Tech. Asstt. (Driver) w.e.f. 31.3.2017.

8. Sh. B. Suresh, Technician, ICAR-CPRI, Regional Station, Muthorai promoted to Sr. Technician w.e.f. 21.6.2018.


**Administrative**

**Transfer**

1. Sh. SDA Rizvi, Tech. Asstt., ICAR-CPRI, Regional Station, Patna transferred to ICAR-CPRI, Regional Station, Modipuram and joined duty on 05.9.2018.

**Skilled Supporting**

**Staff Retirement**


2. Sh. J. Bhojan, Skilled Support Staff, ICAR-CPRI, Regional Station, Muthorai retired on 31.7.2018.

Though potato came to India ~ 400 years ago, it contributed <1% of global production till middle of twentieth century. This scenario changed completely after the establishment of ICAR-Central Potato Research Institute in 1949. High yielding potato varieties and location-specific agricultural practices developed by the institute triggered rapid growth in potato production making India the second largest potato producer contributing ~12% of global production now. Potato is a starchy staple with a potential to yield 216 Megajoules/ha/day dietary energy which is about 1.78 times higher than the rice. India is still an under fed country with average dietary energy intake per person per day of 2,233 Kcal for rural India and 2,206 Kcal for urban India; average energy intake is projected to increase to 2,700 by 2050. Energy dense and high productive crop like potato would play an important role in achieving that target. The crop witnessed 9.19 times increase in area, 31.30 times increase in production and 3.40 times increase in productivity during 1949-50 to 2016-17. Indigenous potato varieties developed by the institute played an important role in this remarkable achievement.

India produced 45.87 million tonnes of potato annually during the triennium 2014-17 and contributed ₹ 57,512 crore annually to the Gross Value Added (GVA) at current price. Potato varieties developed by ICAR-Central Potato Research Institute are very popular among farmers and cover nearly 95% of total area under potato. These varieties contributed about ₹ 54,636 crore annually during 2014-17. Four CPRI varieties namely Kufri Jyoti, Kufri Bahar, Kufri Pukhraj and Kufri Chipsona-1 together contributed around 75% of total area under potato. Kufri Jyoti, a day-neutral variety released in the year 1968 played a lead role in popularizing potato throughout the country. Because of wide adaptability of this variety, potato emerged as a principal component of the profitable maize-potato-wheat sequence in the vast North-Western plains. Similarly, potato after paddy became a successful crop sequence in many areas of eastern Indo-Gangetic plains. Presently, this variety occupies about 21% area in the country, thereby contributing about ₹ 11,800/- crore to the agricultural economy. Similarly, Kufri Bahar released in 1980 became the principal potato variety of Uttar Pradesh, the highest potato producing state of the country. It occupies about 17% area in the country and contributes about ₹ 9,551/- crore to the agricultural economy. An early bulking variety (60 days), Kufri Pukhraj released in 1998 is the leading variety today in India occupying >33% area. It contributes about ₹ 18,541 crore to the agricultural economy of the country. It is most suitable for rice-wheat based sequence in the northern plains.

Kufri Chipsona 1 released in 1998 is the first potato variety suitable for processing and the 4th leading variety of the country today occupying about 4% area under potato and contributing about ₹ 2,247/- crore to the agricultural economy. Besides, five more processing varieties have been released by the Institute catering to almost 35% of raw material for the processing industries. Potato processing companies like M/s Frito Lay India (Pepsico), ITC Ltd., Merino Industries, Mc Cains India, PRAN Food Ltd., Haldiram, Pailan Food Ltd., Balaji Wafers, Golden Fries, Bikaji Foods International Ltd. etc. use Indian processing varieties and sell their products as >100 brand names. This has resulted in tremendous growth of processing sector from mere <1% during 1990s to > 8% now. Besides, the contribution of potato varieties developed by the Institute, there has been several technological interventions which have brought pride and revenue to the country making it 2nd largest producers of potatoes in the world.

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