



# ICAR-Central Potato Research Institute

Newsletter



ISO 9001:2008

Number 68

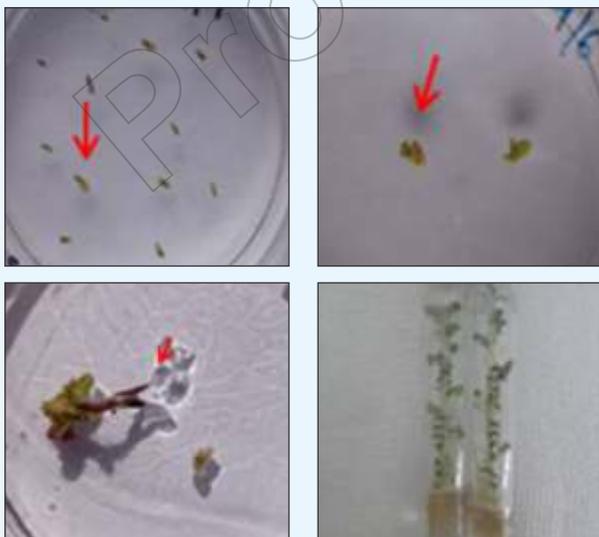
April - June 2017

## Research Highlights

### Improved droplet vitrification method for cryopreservation of potato shoot tips

Cryopreservation is becoming an increasingly used method for the long-term storage of plant genetic resources (PGRs) as it requires only a minimum of space and low level of maintenance. Cryopreservation techniques using *in vitro* shoot tips are recognized as a long-term storage tool for PGR. Presently, preservation of potato genetic resources (GRs) in genebanks is mostly by vegetative propagation due to their allogamous nature and many genebanks are maintaining potato GRs as field collections. Cryopreservation has been proved to be efficient method for long term preservation of the potato shoot tips. Several cryopreservation

methods viz., vitrification, droplet vitrification, encapsulation-vitrification and encapsulation-dehydration have been employed for potato shoot tips. The procedure for Droplet Vitrification was optimized in which explants are submitted to cold acclimatization for one month. From the cold acclimatized plants, shoot tips are excised (about 1-2mm) and precultured in liquid medium containing sorbitol and DMSO (0.5 M sorbitol +0.01 M DMSO) and kept at 5° C in dark condition for two days. Osmoprotection is performed by Loading Solution (MS medium with 2 M glycerol and 0.4 M sucrose) for 20 minutes at RT and shoot tips are then dehydrated by PVS2 for 15 minutes at 0° C. These shoot tips are then transferred to a PVS2 drop (10–15 µl) on an aluminum foil strip (0.5 × 2 cm). The strip holding the shoots are rapidly immersed into liquid nitrogen (LN). The strips are then rewarmed quickly by dropping them in liquid MS medium with 1.2 M sucrose at RT and incubated for 20 min for regeneration. Post-cryo culture are kept in the dark with regeneration media containing 0.01% Pluronic F-68 for 15 days after which they are exposed to light conditions until they regenerate. The pretreatment with 0.5M sorbitol and 0.01M DMSO, LS treatment for 20 min, PVS2 for 15 minutes and regeneration media with 0.01% Pluronic F-68 gave 50-60% survival rate, but the regeneration rate still is 20-30% and efforts are being made to enhance regeneration rate and make cryo preservation technique more efficient and economical to compliment present *in vitro* conservation.



Stepwise regeneration of the potato shoot tips using improved Droplet Vitrification method

Vanishree G, Shruti Gupta, RP Kaur,  
Virupaksh U Patil, Vinod Kumar & Rajendra Singh

## Promising potato genotypes for organic farming systems

Organically grown food is safe and nutritious, and would remain in high demand in domestic and international market. Availability of organic potatoes will not only boost the consumption of potatoes internally but also holds the chance of export in neighbouring countries. Usually potato breeding efforts are focused for conventional production systems with optimum fertilizer and pesticide inputs, but varietal recommendations are rarely specific for organic farming. Genotypes have wider variations in productivity, tolerance to abiotic and biotic stresses, storability and taste under organic farming. Although, trials on organic farming started during 2002-03 in India, but, the information on identification of suitable varieties for this system remained less understood.

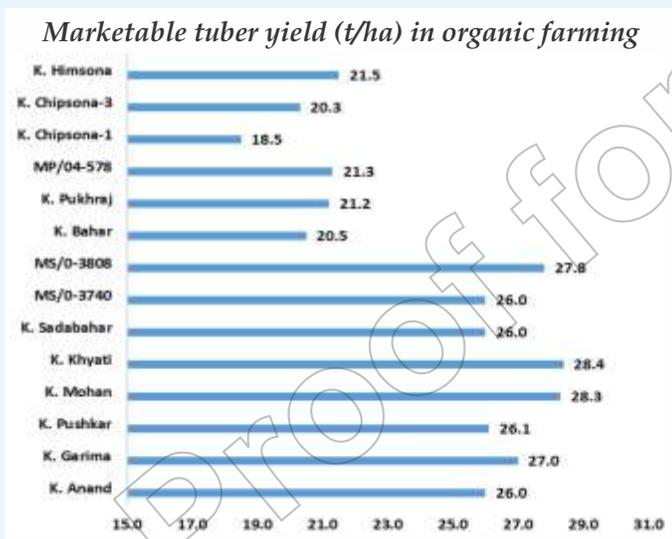
Keeping this in mind, 54 potato genotypes including advanced hybrids and indigenous varieties were evaluated with organic sources of nutrition and twelve genotypes were selected based upon their productivity

and Kufri Garima (27.0 t/ha). Kufri Khyati, Kufri Mohan, MS/0-3808 and Kufri Garima maintained 64.8, 55.1, 63.2 and 61.6% marketable tuber yield in organic nutrition over inorganic management, while popular varieties Kufri Bahar and Kufri Pukhraj had yield maintenance of 60.5 and 49.4%. Among processing varieties, Kufri Himsona recorded highest marketable tuber yield (21.5 t/ha) followed by hybrid MP-04/578 (21.3 t/ha) maintaining 63.4% and 59.8% yield, respectively. Adoption of suitable potato varieties in organic farming systems will not only support agroecosystem, but also help potato growers in fetching remunerative prices in the market.

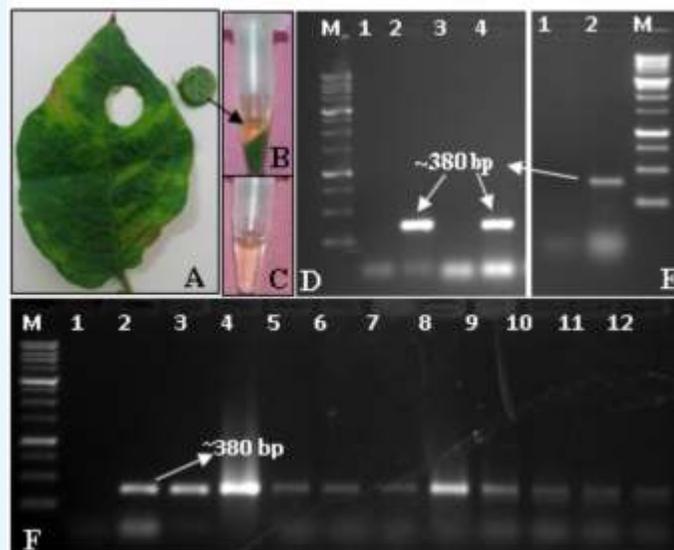
SK Luthra, Sanjay Rawal & VK Gupta

## Development of simplified, cost effective and rapid one-step virus nucleic acid release protocol for RT-PCR based detection of *Potato virus Y*

Now-a-days most of the diagnostic laboratories depend on kit based nucleic acid extraction system for total RNA isolation, which is time-consuming, expensive and laborious and furthermore, they yield much larger quantities of good quality viral nucleic acid than those needed for RT-PCR based detection. Hence, keeping in view of the above drawbacks, we aimed to develop a simple, cost-effective and rapid one-step viral nucleic acid release protocol suitable for RT-PCR based diagnostic assays. A disc of infected leaf (PVY) sample is simply crushed in an Eppendorf tube containing 100µl simplified nucleic acid extraction buffer and incubated at 95°C for 10 min followed by a short spin. The supernatant is transferred to a fresh Eppendorf tube which is used as a template (RNA) for further studies.



and percent yield maintenance under organic system. These genotypes were further evaluated for their suitability under organic nutrition. In general, foliage senescence was advanced, and tuber number and yield were decreased in organic farming system over inorganic nutrition. In organic system, Kufri Khyati (28.4 t/ha) and Kufri Mohan (28.3 t/ha) recorded highest and significantly better marketable tuber yield over control Kufri Pukhraj (21.2 t/ha) and Kufri Bahar (20.5 t/ha). Other promising genotypes having comparable yield were hybrid MS/0-3808 (27.8 t/ha)

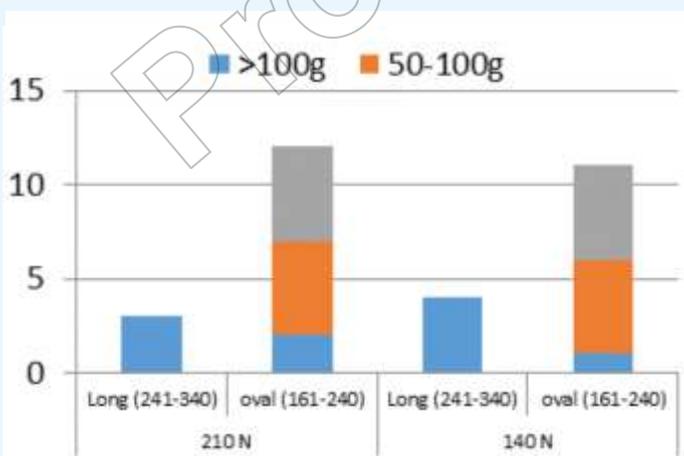


Reverse transcription-polymerase chain reaction (RT-PCR) is carried out using cDNA synthesis kit and in-house optimized PCR conditions and master mix with primers targeting coat protein gene of PVY. The protocol has been validated by running across more than hundred samples collected from field for detection of PVY where, it showed consistent results for the presence of PVY indicating its reliability. The developed protocol for virus nucleic acid release is very simple, less laborious (two simple steps) and time-saving (10-12 minutes) as compared to kit based protocol involving 9-10 steps which are bit laborious and time-consuming. In addition, the kit based RNA isolation is costly as it demands around three hundred rupees per sample whereas the developed protocol demands less than a rupee per sample of total RNA isolation. Hence, it can be used in diagnostic laboratories for detection of PVY and can also be extended for detection of other RNA viruses infecting potato.

*Baswaraj Raigond, Ambika Verma, Tarvinder Kochhar, Shivani Roach, Sanjeev Sharma & SK Chakrabarti*

### Does Nitrogen Availability Influence Tuber Shape in Potato Crop?

Apart from varietal identity, tuber shape in potato has emerged as an important trait in ascertaining the suitability for a particular segment. Shape of tuber is a simple inherited genotypic trait which is also influenced by environmental conditions. It is possible that the differences in shape which result from changes in environmental conditions may be partly due to differences in nutrient supply and genotypes are known



**N fertilizers and tuber shape (estimated as potato shape index) in potato variety Kufri Mohan**

to differ in their response to nutrition. This has been found to be true for certain other crops as well. In case of sweet potato, it was generally believed that marked differences in shape were due to factors such as soil type, depth of ploughing, etc. Extensive work in this context showed that these changes in shape result from a modification of soil nutrients. Another variable which influence tuber shape in potato is the crop duration. Shape of tubers in an immature crop (60 days) remains towards roundness even in a cultivar known to produce oval tubers at maturity.

Among nutrition, nitrogen is the most fluctuating element in potato cultivation. Keeping this in view, effect of N levels on tuber shape *per say* was investigated in a fully mature crop of recently released potato variety Kufri Mohan. This variety attains its ultimate tuber shape in approximately 90 days in plains. Tuber samples were drawn in three replications from fully mature field crop so as to get the actual tuber shape. Fifteen tubers, five each representing small (<50g), medium (50-100g) and large (>100g) size per sample were drawn randomly from low (140 kg ha<sup>-1</sup>) and high (210 kg ha<sup>-1</sup>) N treatments. Rest of the soil nutrients particularly P and K were kept at the level of sufficiency. Each tuber was measured for maximum length (L), width (W) and thickness (T) representing three different planes. Measurements were made by using a simple potato gauge in centimetre (cm). Maximum value across a particular plane was taken and potato shape index (PSI) was calculated using the formula:  $PSI = \{(L)^2 / (W \times T)\} \times 100$ . Results showed that tuber shape did not deviate in two doses of nitrogen and 75-80% tubers retained oval shape followed by longer ones. Findings suggest that tuber shape is relatively stable at varied levels of nitrogen availability.

*Devendra Kumar & Sanjay Rawal*

## Transfer of Technology

### Kisan Prashn Manch programme under Mera Gaon, Mera Gaurav

Kisan Prashn Manch programme under Mera Gaon, Mera Gaurav, a field based programme on recent initiatives of Cental Govt. Schemes like 'Mera Gaon Mera Gaurav', 'Swachhata Abhiyan' and 'Beti Padhao Bet Bachao' was organized on 18th May, 2017 by ICAR-



CPRI, Shimla at Cheog panchayat in collaboration with DD Kisan Channel of Prasar Bharti. In this programme, around 50 farmers and general public participated and awareness was created among the participants on different schemes by the experts from institute and other Govt. organization. The programme had been broadcasted by the DD Kisan Channel for the benefit of lakhs of farmers.

#### ICAR-CPRI Shimla participated in Kisan Goshti cum Exhibition at Shyamalghat

ICAR-CPRI Shimla participated in Kisan Goshti cum Exhibition at Shyamalghat, Ghanahati organised by Kisan Club, Mushobra block, HP on 11<sup>th</sup> May 2017. CPRI staffs also participated in the goshti and provided solutions to the queries asked by the farmers. About 200 farmers visited the CPRI stall and they were made aware about various technologies of the institute. Technical folders were distributed free of cost during the function.



### 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
April	Varietal requirement and planting of potato in higher hills of HP	Dr. Rajesh Kumar Singh Dr. Ashwani Kumar Sharma
May	Intercultural operations of potato in HP	Dr. V.K Dua Dr. Jagdev Sharma
June	Storage and marketing of potato in HP	Dr. Brajesh Singh Dr. N.K Pandey

### Important Meetings, Events & Visitors

#### International Yoga day at ICAR-Central Potato Research Institute

The International Yoga day was celebrated on 21st June 2017 at ICAR- Central Potato Research Institute, Shimla in the auditorium. The Aasans, Pranayam and Dhayan of Yoga were demonstrated by Dr. Som Dutt, Senior Scientist of this institute. Dr. S.K Chakrabarti, the director of the institute also followed these practices and while addressing the gathering of around 200 people he emphasized on the role of "Yoga" in achieving the motive of "Health is Wealth" and "Prevention is better than cure" since he expressed that the "Yoga" is unique and a must use tool for everyone, not only in making him or her healthy but in preventing many diseases too. Oath to make the "Yoga" as a regular practice in their daily routine was also taken by all the participants.



## World Environment Day celebrated at CPRIC, Modipuram

World Environment Day was observed as Environmental Awareness Day on June 05, 2017 at ICAR-Central Potato Research Institute-Regional Center, Modipuram. On this occasion, a seminar on environmental awareness was organized. The seminar was chaired by Dr. Manoj Kumar, Joint Director of the Center. On this occasion, a discussion program was also organized on the Environment Conservation Awareness in the meeting room of the office, in which Dr. Shanti Swarup, Chairman Meerut Dahlia and Guldudi Society, Meerut were the chief guests. He highlighted the importance of Environment Day in his address. With the environmental imbalance being faced, the outbreak of many diseases is increasing. All the officers and employees working on the Campus took part in the program and took their views for environmental protection. On this occasion, Dr. Sanjay Rawal, Principal Scientist gave lecture on the need to promote organic farming under the protection of environment and to adopt a consolidated nutrient management. He told how we have played the environment for the sake of development, which has resulted in the unbalanced environment. The impact of this climate change is also on agricultural production. Dr. Nam Singh, Principal Scientist emphasized the need to conserve water by using modern methods of irrigation water in agriculture. Dr. Luthra suggested to take more and more splendid, vegetable and fruit plants to promote environmental protection and to take and give the plants as a gift to the virtues. In his address, Dr. Manoj Kumar called upon present scientific and technical officers and emphasized the need to increase the quantity of organic matter in the soil by utilizing the efficient use of organic residues in agricultural land, as well as to make meaningful contribution by planting and preserving them in the protection of the environment.



After this seminar, a plantation was also organized at the center. Under which the staff of the center was planted trees under the leadership of the Joint Director. Finally, the present scientists, technical officers / employees took oath to give their meaningful contributions to the world environment protection. In the end, they emphasized the need to change their mentality towards environmental protection as a conscious citizen from all. The program was conducted by Dr. Ashok Kumar.

## Human Resource

### Scientific Joining

1. Dr. Paresch Baldeorao Chaukhande, Scientist at CPRI, Shimla-01.04.2017.
2. Dr. Sunayan Saha, Scientist at CPRS, Jalandhar-03.04.2017.

### Promotions

1. Dr. Sanjeev Sharma, Sr. Scientist to the grade of PS from 02.07.2015 under CAS.
2. Dr. Vinay Sagar, Sr. Scientist to the grade of PS from 28.07.2015 under CAS.

### Transfers

1. Dr. Dhiraj K Singh, Scientist from ICAR-CPRI, Shimla to ICAR- Regional Centre for Eastern Region, Patna - 28-06-2017.

### Technical Promotions

1. Sh. Balak Ram, Asstt. Chief Tech. Officer, to Chief Technical Officer, CPRIC, Modipuram -03.02.2016.
2. Sh. Om Pal, Sr. Tech. Officer, to Asstt. Chief Tech. Officer, CPRIC, Modipuram -13.10.2015
3. Sh. Santosh Kumar, Sr. Tech. Officer, to Asstt. Chief Tech. Officer, CPRIC, Modipuram -17.06.2016
4. Sh. Jaswinder Singh, Sr. Tech. Officer, to Asstt. Chief Tech. Officer, CPRIC, Modipuram -29.10.2014

### Transfers

1. Sh. Vinod Gir, Technician from CPRI, Shimla to CPRS, Patna
2. Sh. Kehar Singh, Sr. Technical Asstt. From CPRIC, Modipuram to IWBR, Karnal.
3. Sh. Kapil Kumar, Asstt. Chief Technical Officer from CPRS, Jalandhar to CPRS, Kufri.

### Administrative

#### Granted MACP Scheme

1. Sh. Pawan Kumar, UDC, ICAR-CPRI, Shimla Grant 2<sup>nd</sup> MACP w.e.f 01.03.2017
2. Sh. Hans Raj, UDC, ICAR-CPRI, Shimla Grant 2<sup>nd</sup> MACP w.e.f 04.03.2017
3. Sh. Kamal C Verma, UDC, ICAR-CPRI, Shimla Grant 2<sup>nd</sup> MACP w.e.f 04.03.2017
4. Sh. Ashwani Gupta, ICAR-CPRI, Shimla Grant 2<sup>nd</sup> MACP w.e.f 01.03.2017
5. Sh. Ashok Kumar, LDC, CPRIC, Modipuram Grant 2<sup>nd</sup> MACP w.e.f 31.03.2017

### Retirements

1. Sh. Krishan Lal, AAO, CPRS, Gwalior on 05.04.2017 on VRS.
2. Sh AD Sharma AO, ICAR-CPRI, Shimla on 30.04.2017
3. Sh. PC Sharma, AAO, ICAR-CPRI, Shimla on 30.04.2017

### Skilled Supporting Staff

#### Retirements

1. Sh. Subhash, CPRS, Jalandhar on 30.06.2017.
2. Sh. Niril, CPRS, Jalandhar on 30.06.2017

## From the Director's Desk



Exemplary progress in potato crop is providing confidence for food and nutritional security of common people in the country. Time has come now for encouraging diversified utilization of this crop which would give a boost to all stakeholders particularly farm income of potato growers. The institute is working in this direction and one component of developing organic potato cultivation practices has also been taken up on priority apart from processing in past one decade. Now a technology capsule is almost ready to be shared with farmers and organic potato production can be demonstrated at farm scale to promote the organic farming.

Table purpose varieties like Kufri Khyati, Kufri Mohan, Kufri Garima, Kufri Pushkar, Kufri Sadabahar and Kufri Anand can easily produce 26-29 t/ha marketable tubers under organic cultivation as compared to popular varieties like Kufri Bahar (20) and K. Pukhraj (21). Process grade tuber productivity of cultivar Kufri Himsona and Kufri Chipsona-3 is also fair ranging between 20- 21 t/ha.

System based production technology includes one more main food or vegetable crop apart from potato and low input requiring nitrogen fixing leguminous crops. In newly developed food grain based system, groundnut and maize + green gram is taken up before and after potato crop, respectively. Cowpea- potato- okra sequences is selected for vegetable production. Integrated use of resources for nutrient management consist of microbes (*Bacillus* sp., *Azotobacter*, *Azospirillum*, *Rhizobium* sp. and *Trichoderma* sp.), crop residue incorporation, organic manures and vermi- compost. Weed control mainly depends on cultural methods such as hot weather cultivation, proper seed bed preparation, inter-cultivations and mulching of farm wastes. Both water platform conventional ridge furrow irrigation and micro irrigation have been used for organic potato production. Main objective of using drip and sprinkler irrigation is to reduce nutrient leaching beyond root zone of potato crop.

It is possible to attain 75% of potato productivity in organic farming by combining micro-irrigation with other management practices. Similarly, comparable system productivity (82-89%) is achievable in food grain and vegetable based crop rotations in drip and sprinkler irrigation while converting field into organic. Improvement in individual potato crop and system productivity was quite visible in initial years while comparing organic versus inorganic nutrition. Even in ridge furrow irrigation, potato yields improved from 57% to 70% in third year in groundnut- potato- maize + green gram system, while cowpea- potato- okra system productivity increased from 77% to 82% in second year.

Potato diseases can be managed to certain extent in organic potatoes using integrated approaches. For example, late blight disease (*Phytophthora infestans*) can be managed by adopting moderately resistant newly released potato varieties like Kufri Mohan along with sprays of bioformulations based on bacterial (*Bacillus subtilis*, *Pseudomonas* sp. etc), fungal (*Trichoderma* sp. etc) and certain botanicals. Copper based products may be used by adhering to NPOP guide line. Soil and tuber borne diseases are managed by following crop rotations, summer cultivation and bioformulations based seed treatment.

In potato crop sucking pests like whitefly (*Bemisia tabaci*), aphids (*Aphis gossypii* and *Myzus persicae*), leafhopper (*Amrasca* b. *biguttula*) and mite (*Polyphagotarsonemus latus*) are more important as they attack the crop since very beginning. To produce potatoes organically and keep insect population in control, the first and foremost thing is to keep fields clean as several insects take shelter on weeds. Winged aphid and whitefly population can be reduced by placing yellow sticky/ water trap in field after 8-10 days of planting. Dried neem leaves used as mulch in organic plots reduces sucking pest population by their decomposition and repellent action. Weekly foliar sprays of summer oil (0.5%) is also very useful in controlling these pests. Use of Almora and NCIPM light traps at night reduce number of moths as potato is attacked by many defoliators during its growth phase. It is hoped that organic potato cultivation will become popular however efforts are on to increase awareness of potato cultivators and market forces on the advantages of organic potato farming.

**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)

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

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