ICAR–Central Potato Research Institute Newsletter

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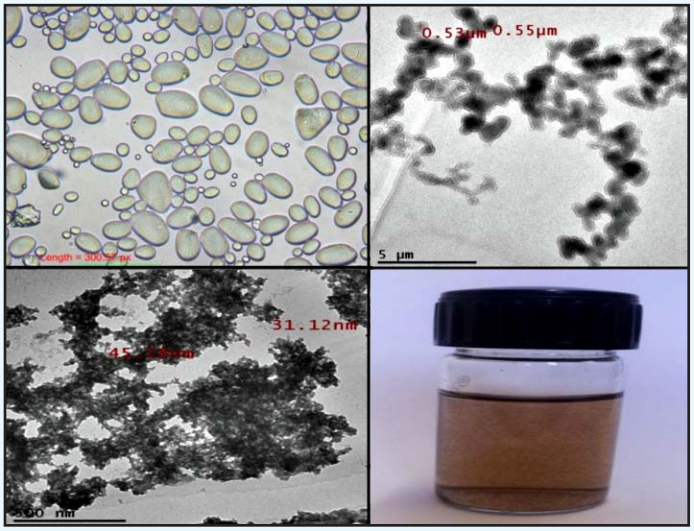
Research Highlights

Potato starch nanocrystals: Strong candidate for reinforcement material

Potato starch is already being used in textiles, paper, food and pharmaceuticals industry. However its applications can further be broadened by reducing its size to nano scale. Due to its intrinsic rigidity, high crystallinity and low permeability, starch nanocrystals are suitable reinforcement material. In this study the method of synthesizing potato starch nanocrystals by 'Top Down' approach was optimized. To convert potato starch granules into starch nanocrystals, the starch was extracted from Kufri Chipsona-1. Starch nanocrystals were prepared by acid hydrolysis method.

The size of starch crystals ranged from 500-1200 nm on 6th day of acid hydrolysis. After 12th day of acid hydrolysis the size of the starch crystals reduced further as confirmed by Transmission Electron Microscope (TEM) analysis wherein the size of the crystals ranged from 25-50 nm. This is a simple methodology for synthesis of starch nanocrystals from potato starch. These nanocrystals can be used in nanocomposites to enhance the strength and barrier properties of the material. As these starch nanocrystals are derived from edible material, it is safe to use wherever the metal nanoparticles are used to enhance the strength and permeability of the material. These nanocrystals of potato starch are eco-friendly (biodegradable) in nature, easy to prepare and cost effective also as compared with other nanoparticles. These nanocrystals with further modification as per user's requirement can replace the metallic nanoparticles.

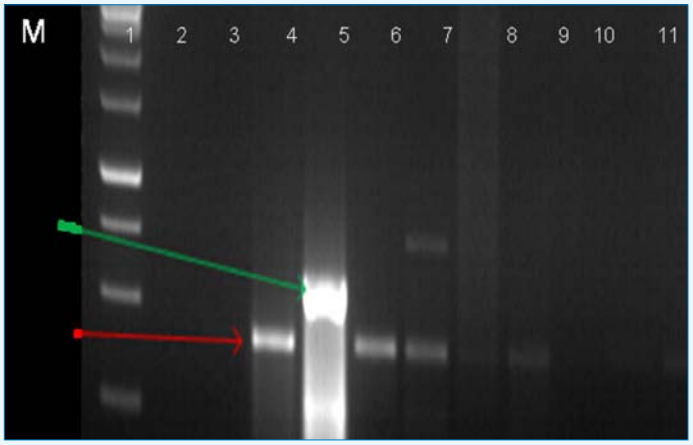
Pinky Raigond, Baswaraj Raigond, Tarvinder Kochar, Ankita Sood, Brajesh Singh and Bir Pal Singh



Potato starch granules, crystallization and nanocrystals

Uniplex RT-PCR protocol for detection of *PLRV* and *PVY* in aphids collected from potato fields

Aphids are the prime insect vectors of economically damaging potato viruses. The detection of viruses from plants as well insect vectors is crucial for its management. Therefore,



M- 1kb DNA Marker, Lane1- Water control, 2- Healthy control, 3- +ve control, 4-Internal control (M. persicae), 5, 6, 7, 8, 9, 10 & 11 are aphids from Shillong, Modipuram, Jalandhar, Shimla, Sikkim, Nagaland & Arunachal Pradesh respectively

reverse transcription polymerase chain reaction (RT-PCR) assay was used to detect *Potato leaf roll virus* (PLRV) and *Potato virus Y* (PVY) from field collected aphids. Total RNA was isolated from the potato aphids using total RNA isolation kit and the same was used for cDNA synthesis. In PCR assay, the primers specific to coat protein genes of PLRV and PVY were used.

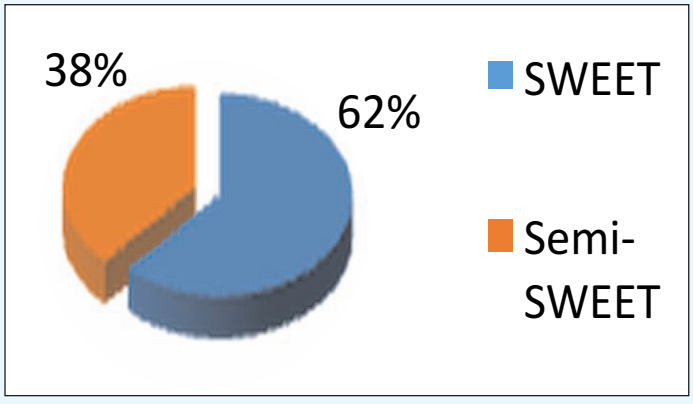
The specific bands of 464 and 395 bp corresponding to PLRV and PVY were observed without any non specific bands. The RT-PCR results revealed that amongst the aphids collected from potato fields of Shimla, Jalandhar, Modipuram, Patna, Pune and Shillong, the ones from Shillong carried both PLRV and PVY but in other locations only PVY was detected, confirming the viruliferous nature of the aphids. The amplicons of PLRV and PVY were sequenced and the sequence was analysed by BLAST and the results showed that the sequences were matching 96-98% with the reported coat protein sequence of PLRV and PVY. Therefore, the protocols developed in this study can be successfully employed for detection of PLRV and PVY in aphids which in turn would aid in decision making in vector management for seed potato production.

V Venkateswarlu, J Sridhar, A Jeevalatha, R Baswaraj, S Sharma, M Nagesh, and BP Singh

Potato SWEET gene family of sugar transporters for enhancing the productivity

SWEET *(Sugars Will Eventually get Exported Transporter)* proteins are novel family of sugar efflux transporters having involvement in diverse physiological functions such as sugar efflux, apoplasmic phloem loading, biotic and abiotic stresses and reproductive tissue development. Genome-wide identification and expression profiling of SWEET genes have been performed in potato. 37 potato SWEET genes have been identified and mapped to their respective chromosomes. On the basis of TMDs, potato SWEET proteins were categorized as SWEETs (62%) and Semi-SWEETs (38%). Analysis of 1 kb upstream elements reveals the presence of various cis-acting elements *viz.* light, hormone, abiotic and biotic stresses responsive etc. Our results indicated the highest number of cis-acting for abiotic stress (StSWEET2, 20), biotic stress (StSWEET5), hormone-responsive (StSWEE T36) whilst, all SWEETs are enriched with light-responsive elements. *In-silico* expression analysis of identified potato SWEETs in publically available transcriptome data, revealed that many have manifolds up-regulation under biotic and abiotic stresses, implying a significant role in combating unfavorable environmental perturbations namely late blight, scab and drought. Further we hypothesize that manipulation of SWEET gene expression in specific tissues (phloem sap, stolons, and developing tubers) will contribute towards enhancement of sugar delivery to developing tubers ultimately leading to increase in the yields.

Hemant B Kardile, Clarissa Challam, PG Kawar, VU Patil, G Vanishree, S Sundresha, V Bhardwaj and BP Singh



Classification of potato StSWEET proteins based on number of 3-TM domains

Performance of Kufri Pushkar under FLD at farmer's field in Bihar

Front Line Demonstration (FLD) is a proven method for technology dissemination among farming community. The concept of FLD was evolved by ICAR with the inception of Technology Mission on Oilseed crops during mid-eighties. These are field demonstration conducted under close supervision of scientists. The major objective of Front Line Demonstration is to demonstrate the superiority of new varieties or technologies at farmer's field as compared to existing ones. Five FLDs of Potato variety Kufri Pushkar was laid out at farmer's field in Farhangpur village of Bhojpur district of Bihar. Farmers were provided breeder seed of Kufri Pushkar and other critical inputs viz. fertilizers and pesticides for laying out these FLDs. All the recommended package of practices like fertilizer dose, agronomic practices and

Recording of observation at farmer's field in demonstration plot

appropriate plant protection measures were applied in demonstration plot. The observations were recorded periodically and results were compared to existing farmer's practices where they were using traditional variety Kufri Sinduri. Analysis of observations revealed that the average intensity of late blight was nearly 2% under farmers practice while it was only 0.25% in demonstration plot. The average yield of Kufri Pushkar was found to be 22.5 t/ha which was 27.1% higher as compared to local check Kufri Sinduri which yielded only 177.2 qt/ha. Thus, farmers of the region should adopt new varieties of potato to get a higher yield and higher return.

Dhiraj K Singh, NK Pandey and Arjun Sharma

Transfer of Technology

Farmer Scientist Interaction and Technology Demonstration at CPRI, Shimla

For the celebration of ***Jai Kisan - Jai Vigyan*** **week** from 23-29 December, 2015, a "Farmer Scientist Interaction and Technology Demonstration" was organized at CPRI, Shimla on 23rd December, 2015. A total of 30 farmers from different villages of Shimla district participated in this function. Lecture on Improved methods of potato cultivation was organized along with demonstration of modern potato varieties and technologies for participating farmers. Selected farmers were awarded during the function for maintaining their soil health. Similar kind of programmes were organized at different Regional Stations of the institute during the Jai Kisan - Jai Vigyan week.

Model Training Course organized at CPRI, Shimla

ICAR-CPRI, Shimla successfully organized an 8 days Model Training Course on "Post-harvest management and processing of potato" during October 27 to November 3, 2015. Model training course was sponsored by Directorate of

Extension, Govt. of India. The objective of this training was to enhance the knowledge and skills of trainees regarding latest technologies for scientific methods of processing potato cultivation and post harvest management. A total of 22 Agriculture/ Horticulture officers from 8 State Development Deptt. working in the field of potato R&D participated in this programme. A variety of training methods viz. lecture-cum-discussion, practical sessions, skill demonstration, field visits and video film shows were used during model training. Field visits to CPRS farm at Kufri-Fagu and practical demonstration of processing were also organized during the course.

Farmers Training organized at ICAR-CPRI, Shimla

The institute organized two three days training on "Processing potato cultivation" during 6-8 October and 27-29 October, 2015. These training were sponsored by ATMA, Sabarkantha and Deputy Director (Horticulture), Sabarkantha, Gujarat. A total of 47 progressive farmers from Sabarkantha district of Gujarat participated in these training programmes. Farmers were trained on processing aspects of potato cultivation. Lectures, live demonstration and practical on potato processing and processed products were delivered to farmers. They also visited mini processing plant at CPRS, Kufri.

Extension Officers Training on potato cultivation at ICAR-CPRI, Shimla

The institute organized a three days training on "Package of practices & disease and pest management in potato production" for 18 field extension officers from Dr Reddy's Foundation from different parts of the country during 18-20 November, 2015. They were trained by the scientists from CPRI, Shimla on different aspects of potato cultivation viz. seed production, plant protection, water management, disease and pest management, organic farming, storages and marketing of potato. A variety of training methods viz. lecture, practical, discussion, field visits and videos film shows were used during this training.

Farmer's Training Programme on "Value Addition in Potato Crop" at Shimla

Two Farmers Training of three days duration were organized on "Value Addition in Potato Crop" during 30th November to 2nd December and 9-11 December, 2015. These trainings were sponsored by Project Director, ATMA, Banaskantha, Gujarat and a total of 54 farmers from Banaskantha district attended these trainings. Farmers were trained in different aspects of potato production such as seed preparation, planting, fertilizer and water management, disease and pest control, storage technologies with more emphasis on value addition in potato.

Important Meetings, Events & Visitors

Swachh Bharat Abhiyan

During the National Cleanliness Drive as a part of Swachh Bharat Abhiyan undertaken from 26-31 October, 2015, Safai work was done in the Institute campus and nearby public places. Institute adopted a place/village called kanlog near its campus for implementation of Cleanliness Drive as a part of Swachh Bharat Abhiyan. Similar activities were exercised at all the regional stations of the Institute.

Workshop on Advance technologies of potato cultivation

A state-level workshop on *Advance technologies of potato cultivation* was organized by the Department of Horticulture, Telangana State, Hyderabad in collaboration with CPRI, Shimla on 26 and 27 November 2015. About 200 potato growers from Medak, Rangareddy, Khammam and Adilabad districts attended the training, which was followed by field trips to potato growers at Zaheerabad, Medak district at on 27.11.2015. Dr. P. M. Govindakrishnan, PC, AICRP (Potato), Dr. N. K. Pandey, Head, Division of Social Sciences, Dr. Brajesh Singh, Head, Division of CPB & PHT, and Dr. M. Nagesh, Head, Divison of Plant Protection were the resource persons.

Live Phone- in Prgramme at Doordarshan

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

Month	Topics (Live phone in on Doordarshan)	Name of the Expert
October	Seed preparation and planting of potato in lower hills of HP	Dr. Ashwani Sharma Dr. Jagdev sharma
November	Intercultural operation and weed management in potato	Dr. VK dua Dr. Pooja Chaukhande
December	Disease and pest management in potato	Dr. Ravinder Kumar Dr Sridhar J.

Human Resource

Scientific

Joining

1. Sh. Mohd. Shah, Scientist joined as Scientist (On Probation) at CPRI, Shimla on 12.10.2015.
2. Sh. Mahatre Priyank Hauman, Scientist joined as Scientist (On Probation) at CPRI, Shimla on 12.10.2015.
3. Sh. Maharishi Tomar, Scientist joined as Scientist (On Probation) at CPRI, Shimla on 12.10.2015.
4. Ms. Suman Lata, Scientist joined as Scientist (On Probation) at CPRI, Shimla on 12.10.2015.
5. Ms. Sugani Devi, Scientist joined as Scientist (On Probation) at CPRI, Shimla on 12.10.2015.
6. Sh. Brajesh Nare, Scientist joined as Scientist (On Probation) at CPRI, Shimla on 12.10.2015.
7. Sh. Amit Kumar Singh, Scientist joined as Scientist (On Probation) at CPRI, Shimla on 12.10.2015.

Transfers

1. Dr. KK Pandey, Principal Scientist to Indian Institute of Vegetable Research, Varansi from 15.12.2015 (AN).
2. Dr. Alka Joshi, Scientist to Indian Agricultural Research Institute, New Delhi from 19.12.2015 (AN).

Technical

Promotions

1. Sh. Parmesh Dutt, Sr. Technician, CPRI, Shimla. w.e.f. 31.12.2014
2. Sh. Sunil Kumar Singh, Sr. Technician, CPRS Patna, w.e.f. 14.4.2015
3. Sh. Ramhat Singh(Retired), Sr. Technician, CPRS, Gwalior w.e.f. 01.01.2015
4. Sh. Ram Jivan, Technical Assistant, CPRS, Kufri w.e.f. 8.9.2014
5. Sh. Syed Danish Abbas Rizvi, Tech.Asstt., CPRS Patna w.e.f. 23.01.2015
6. Smt. Jatinder Kaur Arora, Tech. Asstt. CPRI, Shimla w.e.f. 10.8.2015
7. Sh. Kulvinder Singh, Sr. Tech. Asstt., CPRS, Jalandhar w.e.f. 4.3.2015
8. Sh. Naresh Chand Sharma, Sr. Tech. Asstt, CPRI, Shimla. w.e.f. 28.2.2015
9. Sh. Parveen Kumar, Sr. Tech. Asstt, CPRS, Jalandhar w.e.f. 7.3.2015
10. Sh. Rakesh Shrivastav, Tech. Officer, CPRS, Patna w.e.f. 12.7.2015
11. Sh. Sheesh Ram Thakur, Tech. Officer, CPRI, Shimla. w.e.f. 5.5.2015
12. Sh. Rajender Kumar Smadhiya, Tech. Officer, CPRS, Gwalior w.e.f. 23.3.2015
13. Sh. DP Guatam,Tech. Officer, CPRI, Shimla w.e.f. 21.02.2015
14. Sh. Harvir Singh, Sr. Tech. Officer, CPRIC Modipuram w.e.f. 30.9.2014
15. Dr. (Smt.) Sumita Sharma, Sr. Tech. Officer, CPRI, Shimla. w.e.f. 28.5.2015
16. Sh. Ravinder Kumar, Tech. Asstt. CPRI, Shimla. w.e.f. 30.6.2014
17. Sh. Prithi Raj, Tech. Asstt. CPRI, Shimla. w.e.f. 22.6.2014
18. Sh. Anil Kumar Chandel, Tech. Asstt, CPRS, Jalandhar w.e.f. 27.9.2014

Retirements

1. Dr. TK Sinha, Chief Tech. Officer, CPRI, Shimla retired on 30.11.2015
2. Sh. Emralstone Syiemlieh, Tech. Officer, CPRS, Shillong retired on 31.12.2015
3. Sh. RK Sharma, Tech. Officer, CPRIC, Modipuram retired on 31.12.2015
4. Sh. Agrenand Singh, Sr. Tech. Asstt., CPRS, Patna retired on 31.12.2015

Administrative

Promotions

1. Sh. Rajesh Kumar, Personal Assistant promoted to the post of Private Secretary w.e.f. 18.11.2015 at CPRIC, Modipuram.
2. Sh. AD Sharma, AAO, CPRI, Shimla promoted to the post of AO at DMR, Solan, on 9.11.2015.
3. Sh. Rakesh, UDC, CPRS, Jalandhar granted 2nd MACP w.e.f. 11.11.2015 in the PB Rs.5200-20200 +2800GP Rs. GP

Transfer

1. Sh. Krishan Lal, Assistant transferred from CPRS, Patna and he joined at CPRI, Shimla w.e.f 18.12.2015

Retirements

1. Sh. Baldev Raj, AAO, CPRI, Shimla retired on 30.11.2015
2. Sh. Naresh Kumar, Assistant, CPRS, Jalandhar retired on 31.12.2015

Foreign Deputation

Dr. Bir Pal, Singh, Director, CPRI, Shimla attended the Board of trustees meeting held at Lima, Peru during 01-04 December, 2015.

From the Director's Desk

Potato is the fourth most important crop of the world after rice, wheat and maize and is a wholesome food. In India, potatoes have been utilized largely for consumption as fresh potatoes and the major part of potato harvest (approx. 68.5%) goes to domestic table consumption. Whereas, in the developed countries, table potato utilization is merely 31%, rest being frozen French fries (30%), chips and shoestrings (12%) and dehydrated products (12%). The processing of potatoes in the country was not in vogue till 90's and with the openings of organized processing by multinationals and indigenous players, potato processing industry has grown manifolds. Presently about 7.5% of potato production is being used by processing industry and the sector is still increasing at a rapid rate. The pattern of Indian potato industry suggests that the demand for potatoes for processing purpose is expected to rise rapidly over next 40 years for French fries (11.6% ACGR) followed by potato flakes/ powder (7.6%) and potato chips (4.5%). At this pace, the demand for processing quality potato is expected to rise to 25 million t during the year 2050. Potatoes can be processed into various forms such as chips, fries, dehydrated products (dehydrated chips, dice or cubes, waris, papads, flakes, granules and flour) potato starch, etc. Potato processing is carried out both by organized and unorganized sectors. Organized sector mainly involves large manufactures with brand names. Whereas, small manufactures that are preparing processed potato products for local market without any brand name come under unorganized sector. Along with potato chips, dehydrated potato products such as potato shreds and potato chips are also made by unorganized sector. However, to strengthen the processing in unorganized sector, small scale entrepreneurship development is the need of the hour and the Institute is committed to provide trainings in this direction. One such model training programme on "Post-harvest management and processing" was therefore, organized at ICAR-CPRI, Shimla during October 27- November 3, 2015, wherein officials of different states along with entrepreneurs were trained on all the aspects of potato processing. Such trainings have become a regular feature at the Institute with an ultimate aim of skill development in this field and providing proper remuneration to potato farming community.

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