

ICAR – Central Potato Research Institute

Newsletter

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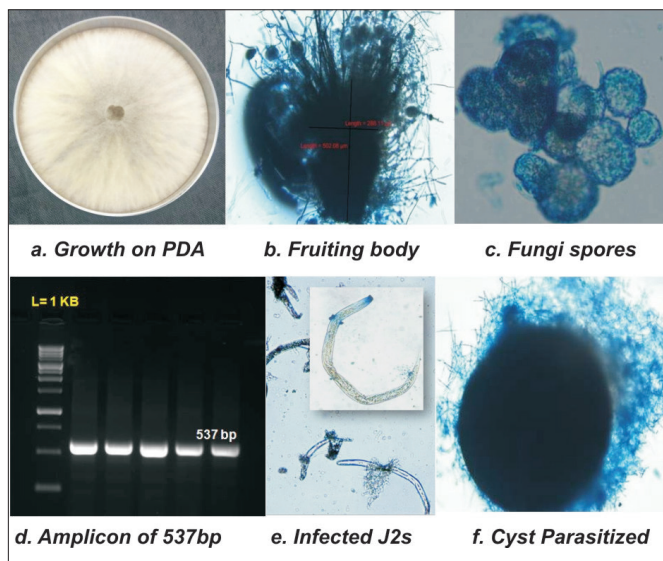
Research Highlights

First report of fungal antagonistic strain *Chaetomium globosum* KPC3, isolated from potato cyst in India and its effect on *Globodera* species

Potato cyst nematodes (PCN) represent main pests of potato causing the significant damages worldwide and causes estimated yield loss of 30%, while in India, the tuber yield loss estimates vary from 5 to 80% depending on the initial inoculum level. Till date for the management of PCN, application of Carbofuran-3G @2 kg a.i. /ha, was found to be effective however it is harmful to human beings as well as environment. Therefore, identification of native isolates of bio-agents and its use against PCN management would be less expensive and environmentally safe. Accordingly, the soil samples were collected randomly at the end of the potato growing season from the rhizosphere of nematode sick fields of ICAR-CPRS, Kufri (H.P.).

Cysts of *Globodera* species were extracted from the collected soil samples using Fenwick can extraction technique. Symptomatic cysts were separated using a stereo zoom microscope, surface sterilized with sodium hypochlorite (1%) followed by ethanol (70%) and further washed with distilled water, crushed with 100µl nuclease free water and spread on sterilized pre-poured PDA petri dishes. Then petri dishes were incubated at 25°C for one week and a total of 12 fungal colonies were purified based on morphological characters and were checked for their antagonistic activity against *Globodera* species and one fungus was selected for further study. To identify the fungal isolate, ribosomal DNA internal transcribed spacers region was amplified (537 bp) using fungal genus specific ITS-1 and ITS-4 primers and sequenced. The ITS sequence obtained was blast analysed with available reference sequences on National

Centre for Biotechnology Information (NCBI). Which showed similarity with *Chaetomium globosum* (99.63%). The liquid culture of *C. globosum* KPC3 was evaluated for its anti-nematode activity under in vitro conditions against *Globodera* species and the results revealed that it caused 100% mortality of J2s after 72 hrs of incubation. Further studies showed fungal parasitisation on cysts after 24 hrs of incubation in liquid culture and the maximum parasitisation was recorded after 72 hrs. The sequence of *C. globosum* KPC3 were deposited in Gene Bank under NCBI (accession no. MN228658) and CSIR-MTCC, Chandigarh (accession no. 12971).

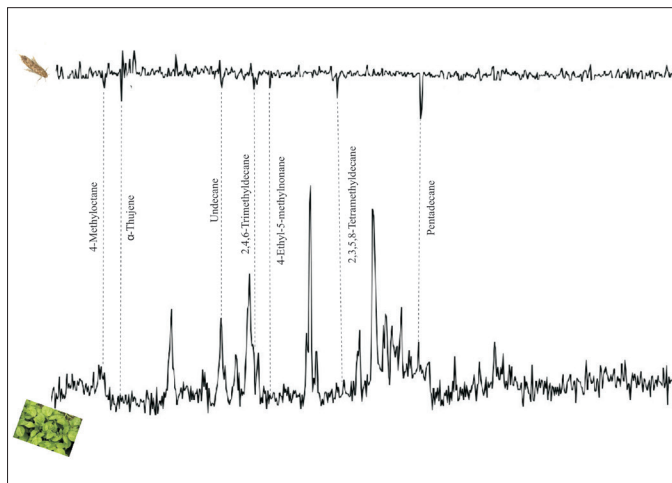


Aarti Bairwa, Bhawna Dipta, Rahul K Tiwari, Venkatasalam EP, Sanjeev Sharma, Subhash S & Priyank HM

Development of Kairamone based traps: A novel approach for pest management

Natural plant extracts and phytochemicals have long been a major subject of research in an effort to develop

alternatives to conventional insecticides mainly to have less impact on health and environment. Insects have mastered the art of using chemical cues (semiochemicals/phytochemicals) to locate their host plants, survive and reproduce in their specific environments. This dependence of insects on chemical cues provides number of opportunities for their control. Potato has been found to be a second major host plant after Tomato for the invasive pest South American pin worm, which causes significant yield loss. Therefore, using the interaction between the, pinworm *Tuta absoluta* (Meyrick) and *Solanum tuberosum* L. as a model system we show the importance of plant secondary metabolic compounds in the host selection behaviour of insect pest species. The objective of present study was to evaluate attractiveness of host plant volatiles of *S. tuberosum* to *T. absoluta* gravid females.



GC-EAD traces showing the response of *T. absoluta* gravid female to *S. tuberosum* plant volatiles

Gravid females of *T. absoluta* were reared on tomato leaves placed in glass cages, were collected and starved for an hour before bioassay. Potato plants (cv. *Kufri Jyoti*) at 30 days after planting were used for volatile collection. Headspace volatiles of plants were collected by air entrainment using Porapak Q. Perspex four-arm olfactometer was used for behavioural assay. Porapak Q elutes were analysed by GC equipped with coupled MS/MS. GC coupled with Syntech EAG and IDAC-2 system with stimulus controller CS-55 was used. When *T. absoluta* were exposed to healthy plant volatiles, they spent significantly more time in the treated region of the olfactometer than in the control region when a 10 µl aliquot of *S. tuberosum* cv. '*Kufri Jyoti*' headspace

sample was used. A total of 27 plant volatile organic compounds were identified from the GC-MS analysis of potato volatiles. Coupled GC-EAD with *T. absoluta* gravid females response to *S. tuberosum* plant volatiles revealed seven biologically active volatile organic compounds viz., 4-Methyloctane, α -Thujene, Undecane, 2,4,6-Trimethyldecane, 4-Ethyl-5-methylnonane, 2, 3, 5, 8-Tetramethyldecane, Pentadecane that could elicit an EAD response. This will make possible future studies where a lure for adult *T. absoluta* may be developed for monitoring and mass trapping applications.

Subhash S, Kailash C Naga, Aarti Bairwa, Rahul K Tiwari, Kumar N Chourasia, Milan K Lal, Sanjeev Sharma, SK Chakrabarti & PD Kamala Jayanthi

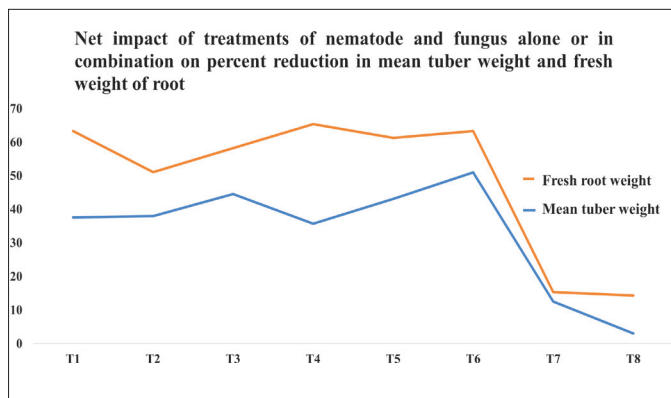
Effect of simultaneous and sequential nematode fungus interaction on plant growth parameters in potato.

The greatest number of complex involving nematodes includes fungi as another component in combined stress. There have been a plethora of studies of this interaction on different host plants. However the impact of simultaneous and sequential kind of combined stress on plant growth parameters and nematode development is still unclear in potato. Present study focused on the interactive effect of nematode and fungus of potato and the resultant losses caused by them. The very first step was to collect all the information from published literature involving nematode-fungus interaction. All the collected data sorted into different categories namely, yield/biomass associated, physiological, and molecular outcomes. After that parameters were categorized and data from control, combined stress, and individual stresses were extracted. The GetData Graph Digitizer software (<http://getdata-graph-digitizer.com/index.php>) was used to extract values from graphs. To normalize the data values were subjected to calculation as mentioned below,

$$\text{Difference } \Delta = (\text{Values}_{\text{control}} - \text{Values}_{\text{combined stress}})$$

$$\Delta \% = (\Delta / \text{Values}_{\text{control}}) * 100.$$

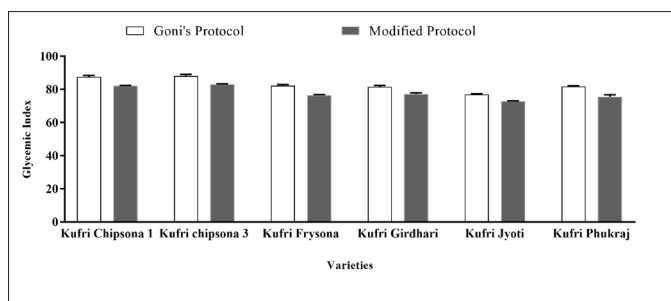
Study showed continuous reduction in tuber weight under combined stress compared to individual stresses. The extent of damage on tuber weight increased with inoculum density. Further studies are needed to understand the molecular mechanism of nematode-fungus interaction and only then suitable management practices can be applied.



Rahul K Tiwari, Subhash S, Aarti Bairwa, Kailash C Naga, Ravinder Kumar, Milan K Lal, Kumar N Chourasia, Sanjeev Sharma & SK Chakrabarti

Development of high throughput protocol for in vitro estimation of glycemic index in Potatoes

Potato starch is hydrolyzed in human in different stages in the digestive tract. Extended consumption of carbohydrate rich food with sedentary life style may increase the risk of type-2 diabetes mellitus, cardiovascular diseases and obesity. Consuming high GI food should be done with moderation to prevent insulinemic spike, which can be preventive measure against diabetes and related disorder. GI is the parameter that is used to measure the increase in blood sugar after a meal as compared to the reference food (glucose, white bread). We, for the first time developed an in vitro method for estimation of GI in potato. This method is simple, rapid and precise to estimate GI. We took six varieties viz., Kufri Chipsona 1, Kufri Chipsona 3, Kufri Frysona, Kufri Girdhari, Kufri Jyoti, Kufri Pukhraj for this study.



The protocol was for the potato with major modification in Goni's protocol for estimation of GI which showed a strong significant positive correlation with the Goni's protocol. Here we used dialysis membrane which

mimics the inner wall of the small intestine that help in absorption of digested material, which is transported by the process of a simple diffusion process. This protocol will have impact on developing potato lines with low GI that will be beneficial to general population and diabetics in particular.

Milan K Lal, Awadhesh Kumar, Pinky Raigond, Som Dutt, Sushil S Changan, Kumar N Chourasia, Rahul K Tiwari, Subhash S, Dharmendra Kumar, SK Chakrabarti & Brajesh Singh

Characterization of Indian potato cultivars for their carotenoid content

Potato being an energy rich food, also contains a wide range of bioactive phytochemicals including anthocyanins and carotenoids highly desirable in human diet. Characterizing the genetic base of essential cultivars in any crop is imperative for the breeders to utilize and improve it through breeding programs. Therefore, an attempt was made to characterize the major Indian potato cultivars for their total carotenoid content. Forty three lines including 41 popular and 2 indigenous potato varieties were used for estimation of total carotenoid using chloroform: methanol phase separation. Concentration was determined spectrophotometrically at 450 nm using the extinction coefficient for β carotene in methanol. Total carotenoid was expressed as $\mu\text{g}/100\text{g}$ f.w. (fresh weight) and was calculated using formula $[A \times V (\text{mL}) \times 10^4 / A^\beta \times P (\text{g})] \times 100$. Where, A is absorbance, V is volume of extract, A^β is β -carotene extinction coefficient in methanol and P is weight of sample taken. The carotenoid content in potato varied from 27.92 $\mu\text{g}/100\text{g}$ f.w in Kufri Bahar (lowest) to 281.20 $\mu\text{g}/100\text{g}$ f.w in Kufri Chipsona II (highest). The varieties were grouped into low (≤ 100 $\mu\text{g}/100\text{g}$ f.w) with 24 (including Gulmarg special) cultivars and medium (100-350 $\mu\text{g}/100\text{g}$ f.w) with 18 cultivars. None of the Indian potato cultivars possessed high (> 350 $\mu\text{g}/100\text{g}$ f.w) carotenoid content. The oxygen radical absorption capacity (ORAC), which is measure of capacity of an antioxidant varied from 31.8 μg tocopherol equivalents per 100g f.w. (Kufri Bahar) to as high as 41.0 (Kufri Chipsona II).

Virupaksh U Patil, Brajesh Singh, Vanishree G, Vinay Bhardwaj & SK Chakrabarti

Transfer of Technology

Model Training Course organized at ICAR-CPRI, Shimla.

Eight days Model Training Course on Protected cultivation, post-harvest technology, value addition and supply chain management in potato was organized at ICAR-Central Potato Research Institute Shimla from 23 to 30 September 2019. The training program was sponsored by Directorate of Extension, Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi and attended by 5 trainees from Gujarat, 3 from Chhattisgarh, 2 each from Punjab, Haryana, and Uttarakhand, one each from Maharashtra and Andhra Pradesh have participated in this training program.



During the Model training program 24 Lectures, 6 laboratories visits with hands-on-training were conducted. The lectures were delivered by Expert scientist over wide range of topics from Potato production to potato export. A one-day field visit was organized to ICAR-CPRI regional station at Kufri, Fagu and Dr YS Parmar University of Horticulture and Forestry, Solan's regional research center at Mashobra along with farmer's field visit.

Dr SK Chakrabarti, Director, ICAR-CPRI, Shimla emphasized that potato processing and post-harvest management along with export oriented potato production is the need of the hour and its very important to take it seriously in the current Indian potato production scenario. Dr Vijay Kumar Dua, the course director of the training program informed that around 25-30% knowledge gain was observed by pre and post-training evaluation of the participants.

A Farmer Gosthi was organized on quality potato production and commercialization through organic farming techniques



A Farmer Gosthi was conducted on quality potato production and commercialization through organic farming techniques on 04 August 2019 at ICAR-Central Potato Research Institute, Regional station, Modipuram, Meerut. More than 150 farmers from Meerut, Aligarh, Bulandshahar, Bijnor, Hapur, Muzaffarnagar, Baghpat districts of Uttar Pradesh and Gurugram and Faridabad districts of Haryana participated in the program. The Chief Guest at the event was Dr. VS Thakur, Former Vice Chancellor, YS Parmar Agricultural University, Solan (Higar) and Special Guest Dr. YP Sharma, Former Joint Director, NEH Region. The Gosthi was presiding over by Dr. SK Chakrabarty, Director, ICAR-Central Potato Research Institute, Shimla. All scientists of the center were participated in this program. The organizer of this event was Dr. Manoj Kumar, joint director and coordinators of the program were Dr. Anuj Bhatnagar, Principal Scientist and Dr. Sanjay Rawal, Principal Scientist. The main objective of this program was to



spread awareness among farmers about organic and natural farming and in this direction, the work done by the institute and the work to be done in the coming years were specially discussed. Dr. Jitendra Kumar Arya, Mr. Naresh Sirohi, Mr. Naresh Kumar and Mr. Pandey, who are farmers of organic farming, informed the farmers present the experience of commercialization of organic farming products.

Live Phone-in Programme at Doordarshan

Scientists from CPRI, Shimla participated in the Live-phone programmes during July to September, 2019. The details of the topics along with experts are given below.

Month	Topics	Name of the Expert
July	Storage and Marketing of potato in the mid-hills of Himachal Pradesh	Dr. NK Pandey Dr. Brajesh Singh
	Different potato varieties in Himachal Pradesh	Dr. NK Pandey

Important Meetings, Events & Visitors

ICAR-CPRI celebrated its 71st Foundation Day

ICAR-CPRI Shimla celebrated its 71st Foundation Day on 22nd August, 2019. Shri Kalraj Mishra, Hon'ble Governor of Himachal Pradesh was the chief guest of the event. On the occasion, Hon'ble Member of Parliament (Shimla Constituency) Sh. Suresh Kumar Kashyap, Mayor, Municipal Corporation, Shimla, Smt. Kusum Sadret and Dr. Parvinder Kaushal, Vice Chancellor, Dr. YS Parmar UHF, Nauni, Solan were also present as guests of honour. During the event Best Worker Awards were given to the staff of all categories of the institute



along with that the sports personnel of the institute were also honoured. Some institute publications were also released on the occasion. The programme was attended by a number of farmers from nearby areas, students, ex-staff of the institute, scientists from other institutes, policy makers, entrepreneurs and other stake holders in agriculture and allied activities. They all were made aware about technologies of the institute.

The Institute Research Committee Meeting (IRC), 2019

The Institute Research Committee Meeting (IRC), 2019 was held at ICAR-Central Potato Research Institute, Shimla from 23rd to 26th July, 2019, which was attended by 63 scientists from the Headquarters and Stations. Dr. VK Dua, Secretary, IRC welcomed Dr. SK Chakrabarti, Chairman IRC and Director CPRI, and to all participants. The Chairman emphasized scientists to focus on new areas of research like the development of hybrid/dihaploid varieties with improved vigor, production of apomictic seed, TPS for Kufri Jyoti variety, nutrient and water use efficiency, use of genomics in developing new technologies, climate-resilient varieties etc. He said that scientists should work on reducing cost of production for aeroponics, tuberization signaling in potato for increasing tuber number, TPS technology and making it available to farmers.



The chairman informed the participants about 100 days targets given by the Govt. of India and discussed some important points from the Govt. of India's manifesto-like doubling farmers' income, varieties import, assurance of quality seeds at farmers' door step at affordable price, improved varieties, doorstep testing, increase yield under organic production etc.

7th Quinquennial Research Team (QRT) meeting of the Institute was held during May 31 to June 1, 2019

The meeting of the 7th Quinquennial Research Team (QRT) of ICAR-Central Potato Research Institute (ICAR-CPRI), Shimla was held at CPRI, Shimla during May 31 to June 1, 2019 under the chairmanship of SM Paul Khurana, Former Director ICAR-CPRI and former Vice-chancellor, Rani Durgawati University Jabalpur and Director Amity Institute of Biotechnology, Amity University, Gurgaon, Haryana. Other members of the QRT (Dr. Pritam Kalia, Former Head, Division of Vegetable Science, IARI, New Delhi; Dr GP Rao, Principal Scientist, Division of Plant Pathology, IARI, New Delhi; Dr. VK Chandla, Principal Scientist (Rtd.), ICAR-CPRI, Shimla, Dr. Srinivasan, Principal Scientist (Rtd), NRCPB, IARI, New Delhi, Dr. BN Sadangi, Ex. Head, Social Science Division, CRRI, Cuttack) were also present in the meeting. During the meeting, Director, ICAR-CPRI presented the contributions and achievements of the Institute in last six years. Chairman QRT praised the work done by ICAR-CPRI and emphasized to do work on war-footing on water and nutrient use efficiency in potato and Climate change resilience. He suggested assessing the hybrids in field based on yielding ability, processing attributes, climate resilience and adaptability. He also mentioned that high Vitamin C and yellow flesh is desirable trait and should be looked upon during selection. QRT advised that CPRI scientist must develop a major program on genetic engineering mediated improvements in nutritional qualities of the potato (vitamins, proteins, carotenoids, minerals, resistant starch and other health promoting compounds etc.), neutral and geo-neutral varieties.



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 2019. Various technologies of the institute were displayed in the exhibition. A total of about 500 farmers, scientists, students, policy makers, NGO members etc. visited the stall put up in the exhibition by CPRI. They were made aware about various technologies developed by the institute. Institute publications were given to the needful during the mela.



Cleanliness drive under Mera Gaon Mera Gaurav

A one day cleanliness drive was organised under Mera Gaon Mera Gaurav programme on September 24, 2019 in the selected area of Cheog Panchayat as a part of Swachhta Pakhwara celebration of the institute. Students and staff of Govt. High School, Cheog along with staff of the institute, farmers and residents of the villages were actively involved in cleaning the school



premises, surroundings and the market during this event. Dr. Jagesh K Tiwari sensitized all participants about the objectives and importance of Swachhta Pakhwara and motivated them to take cleanliness a part of their daily routine.

Human Resource

Scientific Promotion

1. Dr. Prince Kumar, Scientist, ICAR-CPRI, RS, Jalandhar placed in Level – 11 (Pre-revised PB 15,600-39,100 + RGP 7,000/-) w.e.f. 01.01.2018.
2. Dr. (Mrs.) Tanuja Buckseth, Scientist, ICAR-CPRI, Shimla placed in Level – 11 (Pre-revised PB 15,600-39,100 + RGP 7,000/-) w.e.f. 01.01.2018.
3. Dr. Mehi Lal, Scientist, ICAR-CPRI, RS, Modipuram placed in Level – 12 (Pre-revised PB 15,600-39,100 + RGP 8,000/-) w.e.f. 10.02.2018 as Senior Scientist.
4. Dr. N. Sailo, Scientist, ICAR-CPRI, RS, Shillong placed in Level – 11 (Pre-revised PB 15,600-39,100 + RGP 7,000/-) w.e.f. 27.04.2015.
5. Dr. (Mrs.) Girimala Vanishree, Scientist, ICAR-CPRI, Shimla placed in Level – 11 (Pre-revised PB 15,600-39,100 + RGP 7,000/-) w.e.f. 09.05.2016.

Technical Appointment

1. Sh. Vinod Kumar Meena, Tech. Trainee, Joined at ICAR-CPRI, RS, Gwalior on 30.9.2019.

Promotions

1. Sh. Yogesh Kumar Gupta, Sr. Tech. Officer, ICAR-CPRI, RS, Jalandhar promoted to Asstt. Chief Tech. Officer w.e.f. 10.4.2016

Transfers

1. Sh. Rohit Verma, Tech. Trainee, ICAR-CPRI, Shimla transferred to ICAR-CPRI, RS, Modipuram on 27.7.2019.
2. Sh. Santosh Kumar, ACTO, ICAR-CPRI, RS, Modipuram transferred to ICAR-CPRI, RS, Kufri on 5.8.2019.

Retirements

1. Sh. Rambir Singh, Sr. Technician (T-2), ICAR-CPRI, RS, Modipuram retired on 31.7.2019(AN).

Administrative Joining

1. Dr. Pankaj Kumar joined as Chief Administrative Officer at ICAR-CPRI, Shimla on 26.07.2019 (AN).

Transfers

1. Sh. Zakir Hussain Khilji, Sr. Finance & Accounts Officer relieved on 26.08.2019 (AN) to join the post of Chief Finance & Accounts Officer, ICAR-NAARM, Hyderabad.

Retirements

1. Smt. Kanta Rani, Assistant, ICAR-CPRI, Shimla retired on 31.08.2019 (AN) from Council's Service.

Skilled Supporting Staff

Retirements

1. Sh. Roshan Lal, Skilled Support Staff, ICAR-CPRI, Shimla retired on 31.8.2019 (AN).

Expired

1. Sh. Krishan Pal, Skilled Support Staff, ICAR-CPRI, RS, Modipuram died on 15.6.2019.

From the Director's Desk

Potato, the wonder crop, emerged as the third most important food crop in terms of human consumption primarily because of its overwhelming popularity in two Asian giants, i.e. China and India who jointly contribute about 38% of total world production. In India, the potato sector witnessed rapid growth during last seven decades as a direct consequence of strong R&D support extended by ICAR-Central Potato Research Institute, Shimla. For example, total potato production in India increased from 34.7 million tonnes in the year 2008 when the second global potato conference was held in India to 53 million tonnes now; an increase of almost 53% in 10 years. Moreover, the sector is expected to grow at about 3% annual compounded growth rate in India till 2050. However, shifting economic status and aspiration of people of India as well as emerging global food market are casting inevitable influence on R&D orientation. The changing global climate and agricultural landscape also necessitate continuously fine-tuning of ways and means to achieve desired quality and productivity in sustainable manner through eco-friendly and climate smart technologies. It is high time that we prepare a vibrant roadmap for the potato sector in India with active participation of all stakeholders that will facilitate achieving the desired goals set by the policy makers and realize the dreams of our population in general. Therefore, a Global Potato Conclave 2020 (GPC 2020) has been planned as one step towards the same. This Conclave will provide a platform to share and celebrate our achievements and contemplate Potato for a Better World.



I invite all the stakeholders to participate in GPC 2020 where the Indian Potato Association (IPA) in collaboration with Indian Council of Agricultural Research, New Delhi, and ICAR-Central Potato Research Institute, Shimla, is going to organize this GPC 2020 during 28–31 January, 2020. This mega event is having equally important three major components; (i) The Potato Conference, (ii) The Agri Expo and (iii) Potato Field Day. The GPC 2020 will provide an opportunity for researchers to present their work and share their knowledge with national and international scientists and academicians; to trade and industries to showcase their products/technologies/implements etc. and to the farming communities about the latest in potato technologies related to various components of potato value chain including seed, production technology, storage, marketing, value-addition etc. It is expected that more than 2500 academicians, researchers, farmers, representatives from trade and industries, officials from various government organizations, students etc. will be participating in this mega event. The Conclave will be organized at The Mahatma Mandir, Gandhinagar, Gujarat, India, which provides 5-star facilities for holding such events.

It is my pleasure to share that, the First Circular evoked overwhelming interest among potato workers and related organizations/institutions across the globe. I feel highly encouraged and motivated by such an overwhelming response from potato growers, the world leaders in potato research, technology, trade and the policy makers. In furtherance to the First Circular, on behalf of organizers of the GPC 2020, I once again invite you to participate in this global event and add value to the three dimensions of potato; Farming, Health and Business. You can contribute as researcher through lead papers, oral/poster presentation. If you deal with any aspect of trade in potato you can demonstrate/ display your products/ technologies. As industry you can showcase your tools/ implements/ any other relevant process or product. Field Day component of this conclave will provide a platform for live demonstrations of your technologies/varieties/tools or implements etc. which is expected to be a very effective demonstration, meant for developers as well as the end-user. I do hope that your participation in the Conclave will help in devising a systems based roadmap for enhancing the role of potato in making our world a better one for all.

Compiled and edited by: Brajesh Singh, Ravinder Kumar, Pooja Mankar & Kumar Nishant Chourasia

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