



# ICAR – Central Potato Research Institute

Newsletter

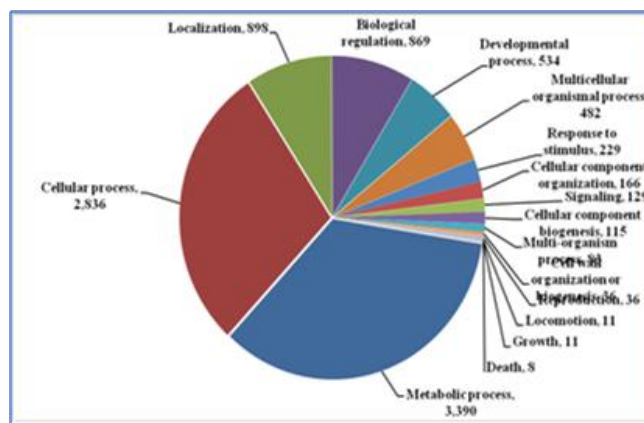
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## Research Highlights

### Whole genome sequencing of *Rhizoctonia solani* (AG3 PT) that cause stem canker and black scurf of potato

The fungus *Rhizoctonia solani* Kühn anastomosis group 3, AG3-PT (The potato type) is the subgroup of AG3 and main causal agent of stem canker and black scurf of potato worldwide including India causing losses up to 50%. Looking at the importance of the pathogen in quality potato production, and to gain insight into basis underlying infection and pathogenesis processes, the present study was undertaken to sequence whole genome of AG3-PT strain RS-20.



Classification of the predicted *R. solani* proteins based on GO annotation. (The sequence is submitted to NCBI/Genebank)

Freshly harvested tubers from Kufri infected with black scurf were sectioned and affected tissues were plated onto potato dextrose agar (PDA). *Rhizoctonia*-like colonies were identified and after further sub-culturing on PDA, genomic DNA was isolated from harvested mycelia using CTAB method and its identity confirmed by comparing ITS (ITS1-F and ITS4 Primers) sequences with AG3-PT sequences on

GenBank (JX27814 and KC157664). The purified DNA was used for rapid library preparation and further sequencing using Roche 454 GS (FLX Titanium) platform. Two shotgun sequences yielded high quality 2,827,025 reads amounting to 1.03 Gb with 17-fold coverage of its estimated around 60 Mb genome. The draft genome of strain RS-20 has G-C content of 48.3% and a total of 11,431 protein coding regions (CDSs) spread over genome covering 13.36 Mb (29.4% of genome as coding) and coding for different functions. Average Nucleotide Identity (ANI) among *R. solani* Anastomosis Groups (AGs) datasets revealed a close association between AG3-PT (Strain RS-20) and AG3 (Strain Rhs-1AP) (97.75%), whereas, least association was found with AG1-IA (Strain B275) (75.87%).

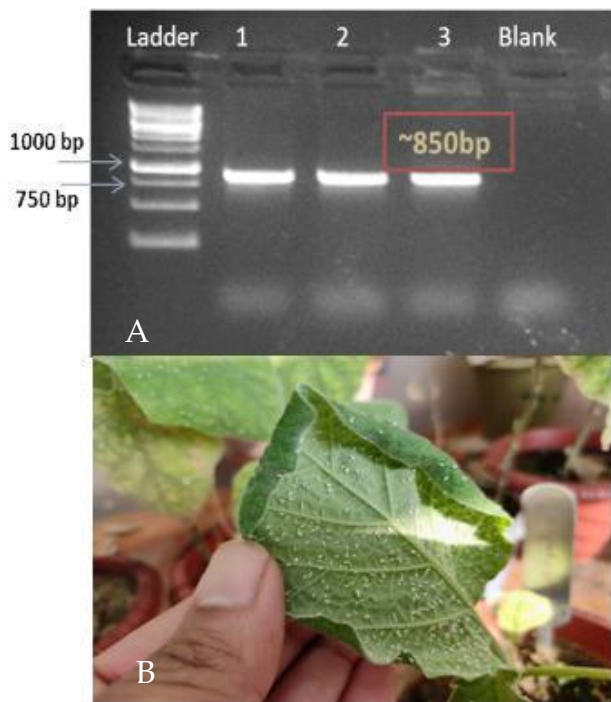
These preliminary studies of the genomes indicate the presence of greater diversity among the anastomosis groups of *R. solani* and a detailed genomic study needs to be taken up among sequenced genomes of the class agaricomycetes for better understanding and to fine-tune their systemic classification, epidemiological and quarantine studies. The gene prediction from this strain would be a great source for further identification possible targets for bio control organisms for better management of the pathogen.

Virupaksh U Patil, Vanishree G, Vinay Sagar, Vinay Bhardwaj & SK Chakrabarti

### Identification of Genetic group of whitefly on potato at Jalandhar and an improved method for mass culturing

The whitefly, *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) is recognized as a cryptic species complex and exhibit considerable phenotypic variability with regard to the relative ability of different genotypes to transmit begomoviruses, the rate of development and ability to utilize different

hosts. Hence correct insect identification and finding suitable host for raising the population is crucial for



(A) PCR amplification of *mtCOI* (B) Whitflies on brinjal leaf region

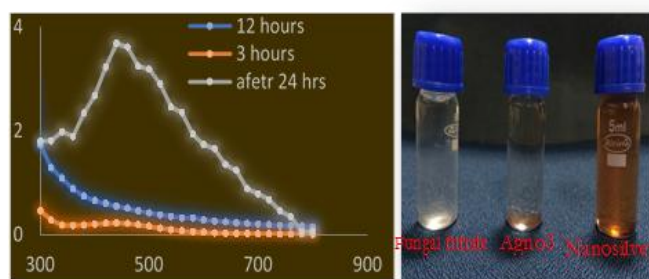
virus-vector studies. Whitefly collected from Jalandhar (Punjab) from potato host was maintained on potato at Shimla in glasshouse with  $26 \pm 2^{\circ}$  C. The whitefly population was identified by sequencing mitochondrial cytochrome oxidase region (*mtCOI*). Multiple sequence alignment of *mtCOI* sequences with reference data revealed the potato whitefly from Jalandhar as Asia II 5 genetic group. To find the suitable host for mass culturing fifty whiteflies were released on five different hosts viz., potato, brinjal, tomato, cotton and okra separately in insect proof cages and the population buildup was observed regularly. The brinjal was found to be the most suitable host for mass culturing whitefly (Asia II 5). The host may be used for raising the Asia II 5 genetic group once, the effect of host nutrition on endosymbionts have been established. The present study reveals the whitefly genetic group prevalent in Jalandhar on potato. The correct identification of whitefly genetic group will help to establish genetic groups wise relationships with ToLCNDV which is responsible for Potato Apical Leaf Curl Disease in potato and finding suitable host will help in mass

raising the whitefly for virus vector studies.

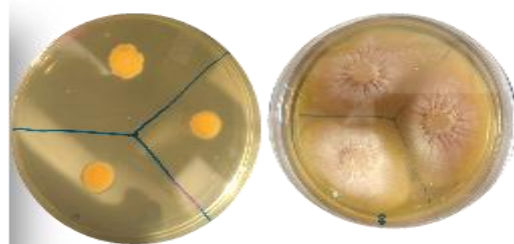
*Kailash Chandra Naga, Sundaresha S, MA Shah, Subhash S, Aarti Bairwa, Gaurav Verma, RK Tiwari, Sanjeev Sharma & S K Chakrabarti*

### A methodology of bioagent mediated synthesis of nanosilver and evaluation of its effect on dry rot causing pathogen in potato

Bioagent mediated synthesis of antimicrobial nanosilver is one of the most innovative and sustainable management approaches. *Chaetomium globosum* is a fungal bioagent of subdivision *ascmycotina* which has been found very effective against several diseases. In present scenario antimicrobial nanosilver compounds derived from plants as well as fungal bioagents are coming up which are having high antifungal activity. So far there is no report of *C. globosum* mediated synthesis of nanosilver and its effect of dry rot causing fungus viz. *Fuarium* sps. So, a protocol was standardized here for synthesizing nanosilver using fungal mycelia as substrate. In present experiment *C. globosum* fungus (Gene bank Accession no. MN228658) was mass cultured in potato dextrose broth by culturing at  $26^{\circ}$  C for 7 days incubation with continuous shaking. Further the mycelial balls were filtered through Whatman filter. The mycelial supernatant was washed three times with distilled water and incubated in water for 2 days at  $26^{\circ}$  C in an incubator shaker. A 10 ml. of 1 mM  $\text{AgNO}_3$  solution was prepared and mixed with



Uv-vis spectroscopy showing silver particle peaks X-axis (wavelength), Y axis (OD value)



AgNP Treated

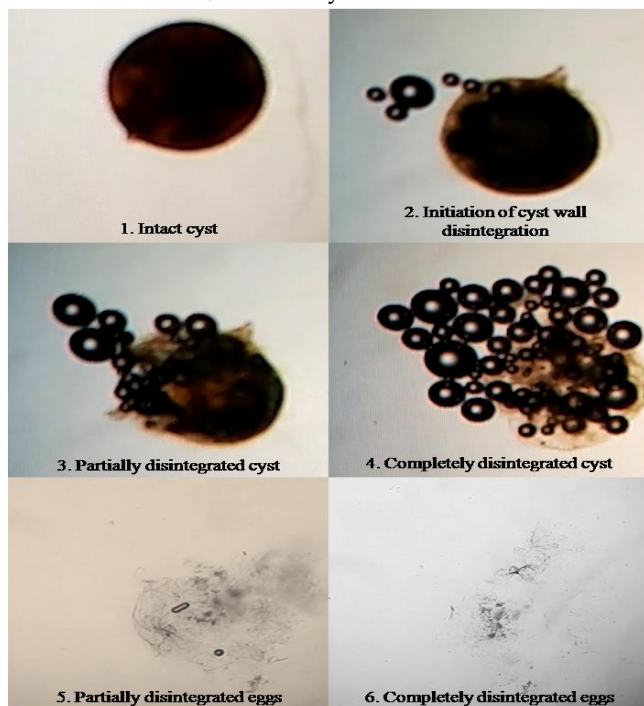
Control

90 ml of fungal filtrate. This solution was kept at 26 °C for 4 days with continuous stirring and repeated samples were taken for the spectroscopy and particle size analysis and in vitro assay. All results clearly showed the synthesis of silver nanoparticles. The synthesized nano silver was tested against *Fusarium sambucinum* (Dry rot in Potato) *in vitro* where it shown 100 % inhibition of mycelial growth. In future this can be a very promising sustainable antifungal product against potato pathogen.

Rahul K Tiwari, Aarti Bairwa Bhawna Dipta  
Sanjeev Sharma, Vinay Sagar, Ravinder Kumar,  
Milan K Lal, Kumar N Chourasia & Kailash C Naga

### Sodium hypochlorite (NaOCl) tuber treatment: To destroy potato cyst nematode (*Globodera* spp.)

Potato cyst nematode (PCN) is one of the serious pests of potato worldwide including India. Infested seed tubers and soil are the primary means of spread of cysts to non-infested areas whereas air, water, human, animals, field equipments, composts, gunny bags are other means of spread. However, till date no seed treatments strategy has been established in India to treat the seed potato tubers infested with PCN. Therefore, a study was carried out with



Disintegration of cyst in NaOCl 2% solution

different concentrations of NaOCl under *in vitro* and *in vivo* condition to see its decontamination effect on potato cyst nematode (PCN). Accordingly PCN cysts

were treated with different concentrations of NaOCl *viz.*, 0.5, 1.0 and 2.0% under *in vitro* condition. It was observed that with increase in concentration, time required for disintegration of cyst wall reduced drastically. Among the treatments, cent-percent cyst disintegration was recorded in NaOCl @ 2.0% after 10 min whereas it took 30 min. in NaOCl @ 1.0% and 120 min in NaOCl @ 0.5%. The left out eggs after incubation in different treatment were checked for their hatching in potato root exudates but no hatching was recorded even after seven days of incubation. In addition, under *in vivo* condition PCN infested unspouted seed potato tubers were treated



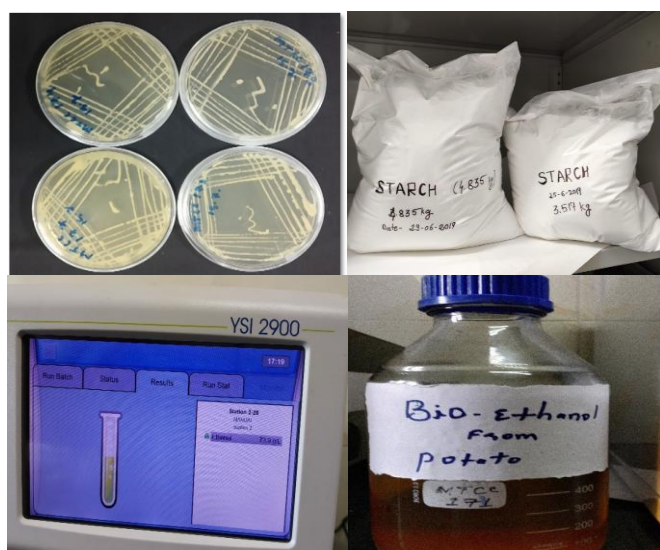
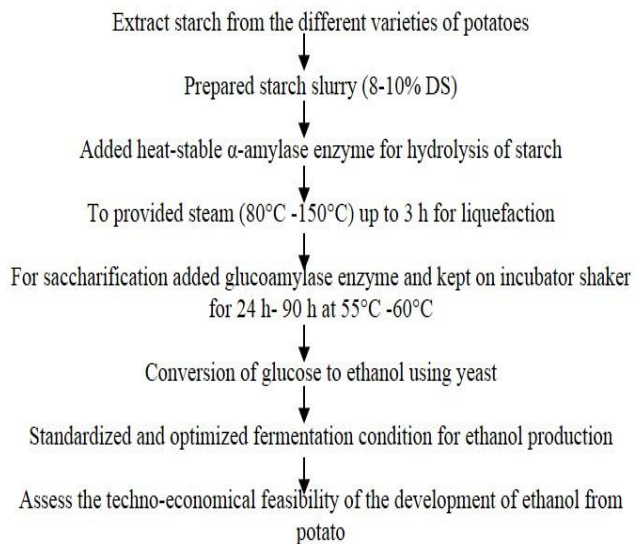
Sprouting of seed potato tubers treated with different concentration of NaOCl

with different concentration of NaOCl *viz.*, 0.5, 1.0 and 2.0% for different durations *viz.*, 30, 60 and 120 min. to check its effect on PCN disintegration along with control (water). Among the treatments, 100% cyst disintegration was recorded in NaOCl @2.0% after 30 min., 60 min. in NaOCl @1.0% whereas it took 120 min. in NaOCl @0.5%. In addition different treatments had no adverse effect on sprouting of seed tubers after two months of storage.

### Bio-ethanol production from waste potatoes

Aarti Bairwa, Sanjeev Sharma, E P Venkatasalam,  
A K Sharma, Priyank H Mhatre & S K Chakrabarti

Potato is the third most important food crop in the world after wheat and rice in terms of human consumption. India is the second-largest country after China in terms of world total potato production. Out of the total potato production, 68% is consumed as fresh, 8.5% as seed, 7.6% for processing, and approximately 16% go waste. There is a dire need for technology to the alternative use of waste potatoes (by-product in processing and surplus production of potatoes). Using these waste /surplus potatoes for bio-ethanol production can be a useful approach. This research deals with the



conversion of the starch to a fermentable carbon source (sugars) by saccharification through liquefaction by using enzymes such as alpha-amylase, amyloglucosidase, pullulanase, etc. In my study optimized the different concentrations of saccharification enzymes with different ranges of temperature and pH. Moreover, the conversion of potato starch into glucose by enzymes is more cost-effective, and fermentation with baker's yeast *Saccharomyces cerevisiae* yields the maximum amount of ethanol, optimized conditions and evaluated different strains of yeast such as *S. cerevisiae* MTCC 170, *S. cerevisiae* MTCC 171, *S. cerevisiae* MTCC 173, *S. erevisiae* MTCC 174, *S. cerevisiae* MTCC 177 and *S. cerevisiae* MTCC 178. The results are showing below the table that the significant bioethanol production

was achieved while using the parameters like temperature (30 °C) pH (6) and an incubation time of 96 hrs.

*Dharmendra Kumar, Som Dutt, Pinky Raigond, Sushi S Changan, Milan K Lal, Brajesh Singh & S K Chakrabarti*

## Transfer of Technology

### Farmers training programme on scientific potato cultivation

Two training programmes of three days duration on "Aloo ki Unnat Kheti" were organised by the institute in the month of February on 4-6 and 17-19 for 21 potato growers of Aravali district of Gujarat and 23 farmers from Siliguri (West Bengal). The training programmes were sponsored by DDH (Gujarat Horticulture Mission) Aravali (Gujarat) and Project Director (ATMA) Siliguri (West Bengal), respectively. The objective of the trainings was to enhance the knowledge and skill of the trainees regarding



production of quality potato through new techniques and practices. Training methodologies like lecture cum discussion, practical sessions, skill demonstration, field visit and video film show etc. were the modes for imparting the trainings to the participants.

### Famers' training programs organized at ICAR-CPRI, RS, Gwalior

Two Farmers' training programmes were organized under Scheduled Caste Component at ICAR-CPRI RS, Gwalior on "Advanced technologies for potato production" during 4-5 January and 18-19 January, 2020. In these training, Dr. S P Singh detailed about the research activities of ICAR-CPRI, RS, Gwalior. In the first session, lectures on different crop activities for potato production were delivered. Besides this, farmers were provided information on different aspects like potato seed production technology, potato crop pests,

disease management and potato storage. During the training, the farmers were taken to the field and laboratory of the station. 58 Farmers from Dabra, Gohad, Mehgaon, Bhind districts of Gwalior and Baah village from Uttar Pradesh participated in the first training programme. 61 farmers from Behta, Chakraipur, Dikshit ka pura, Mahoori ka pura, Bhadrauli, Sirsauda, Aino, Gormin, Mehgaon, Gohad districts of Gwalior and from Baah Village of Uttar Pradesh participated in the second training programme. During the training, the propagation



booklet and folder published on the potato production technique were released and distributed to the farmers. The reports of above training programs were also published in the institute's website and local newspapers.

Five days training programme sponsored by Agricultural Technology Management Agency on "Advanced technologies of Potato production and management" was organized at ICAR-CPRI RS, Gwalior during 16-20 March, 2020.

In this training, Dr. S P Singh, in his address, detailed



about production of breeder seed and research activities of the station. Subsequently, in the first session of the training, lectures were given on potato

cultivation, potato irrigation and weed control and potato fertilizer management. During the training, detailed information was provided on the major pests and management of potato crop, necessary precautions during the use of agricultural chemicals and potato seed production techniques for production in Madhya Pradesh.

### Live Phone-in Programme at Doordarshan

Scientists from ICAR-CPRI, Shimla participated in the live phone programme during Jan-March, 2020. The detail of the topic alongwith experts are given below:

Month	Topics	Name of the Expert
Februray 2020	Potato harvesting, storage and marketing in the plain areas of HP	Dr. NK Pandey Dr. Brajesh Singh

### Important Meetings, Events & Visitors

#### Global Potato Conclave organized at Gandhinagar, Gujrat

Indian Potato Association, Shimla in collaboration with Indian Council of Agricultural Research, New Delhi and ICAR-Central Potato Research Institute, Shimla organized Global Potato Conclave-2020 (GPC2020) at Mahatma Mandir, Gandhinagar, Gujarat during 28-31 January, 2020. The Conclave



had three pillars, The Conference, Agri-Expo and Potato Field Day. The Conclave was inaugurated by the Hon'ble Prime Minister, Sh Narendra Modi ji in the presence of Chief Minister of Gujarat Sh. Vijay Rupani, Union Agriculture Minister Sh Narendra

Sigh Tomar, MOS for Agriculture Sh Parshottam Rupala, State Agriculture Minister Sh RC Faldu and other dignitaries.

The Conference and the Agri-Expo were held concurrently at Mahatma Mandir, Gujarat during 28-30 January 2020. The Conference was attended by over 400 delegates from India and abroad. More than 70 delegates from over 17 foreign nations also participated in the Conference. There were 14



Technical Sessions in the Conference which provided an opportunity for researchers to present their work and share their knowledge with national and international scientists and academicians. Various issues related with trade and industries were also discussed during Panel Discussions.

In Agri-Expo, more than 70 companies exhibited their products. Which included farm implements, chemicals, processing units, storage solutions etc? Besides, seed companies also exhibited their varieties. The State Departments, SAUs, ICAR Institutes, several PSUs etc also participated in the



Expo and demonstrated their products, technologies

and research and extension activities being undertaken by them. About 1,500-2,000 visitors attended the Agri-Expo during three days.

The Potato Field Day was organised at Village Chandarala, Gandhinagar, which is about 25 km from Gandhinagar, on 31st January 2020. The live



demo of the potato technologies and farm machineries were arranged in about 13 acres of land. More than 10 companies participated in live demo which included demo of the potato varieties, drip and sprinkler irrigation systems, drone technology, potato planter and digger, potato grading machines, potato processing machines, aeroponic unit etc. Besides, in over 50 stalls, exhibitors demonstrated their products/ technologies /implements etc. Over 3,000 farmers and other stakeholders attended this one day event.

#### **Activities under Constitution-Day at ICAR-CPRI, Shimla (HP)**

As per GOI/ICAR directions an awareness campaign focused on Citizen Duties including fundamental



duties as enshrined in the Indian Constitution is to be conducted from 26<sup>th</sup> Nov., 2019 to 26<sup>th</sup> Nov., 2020,

throughout the year. In this connection, a lecture on **“Constitutional amendments and their significance”** was delivered by Sh. Rajiv Rai, Advocate, High Court, Shimla (Invited Expert) with focus on main constitutional amendments viz. amendment no. 7, 24, 42, 44 & 86<sup>th</sup> organized on 23.1.2020. In continuation to the yearlong programmes in the month of February a talk on **“Constitution and citizen duties, Land legislation and Reform”** was delivered on 28.02.2020 in which more than 70 officials representing scientific/ technical/ administrative/supporting staff of the institute participated. The talk was delivered by Sh. Sandeep Singh Dudi, Administrative Officer, ICAR-CPRI, Shimla. He thoroughly elaborated various parts of constitution with special emphasis upon the act related to Land legislation and the reforms that has taken place in the constitution. The talk was highly interactive and the listeners also participated enthusiastically.

### **"Potato Day" celebrated at Central Potato Research Institute**

"Potato Day" was organized on 15 February 2020 by ICAR-Central Potato Research Institute at its Regional station, Modipuram. On this occasion, a farmers' seminar was organized to increase the knowledge of the potato growers, in which the



experts of the institute gave information about advanced techniques of potato production- like advanced varieties, crop production activities, plant protection, storage etc. and farmer's problems were resolved. On this occasion, the officials of State Bank of India, the associate of the event, gave information about the agricultural schemes of the bank to the farmers and responded to their queries. Agriculture / potato quiz was also organized for the farmers

present on the occasion, based on the answers given; the winning farmers were selected for the award. A small exhibition to showcase potatoes and other techniques for the enlightenment of farmers was also organized on this occasion.

The chief guests of the event was Dr. S K Chakrabarti, Director of the Institute, Joint Director of the Station welcomed all the distinguished guests and farmers. In his presidential address, Director advised farmers to take up farming, especially potato, at a commercial level, so that farmers can increase their income by lowering input cost and high quality production to meet the challenges. On this occasion, farmers who made significant contributions in the field of potato production were honoured and the winners of the quiz were also awarded.

## Human Resource

### Scientific

#### Joining

1. Dr. Anil Kumar Chaudhary, Senior Scientist (Agronomy), ICAR-CPRI, Shimla, joined on 17.01.2020 (FN) transferred from ICAR- IARI, New Delhi.

#### Retirements

1. Dr. Swarup Kumar Chakrabarti, Director, ICAR-Central Potato Research Institute Shimla, retired from Council's service w.e.f. 31.03.2020.

### Technical

#### Transfer

1. Sh. Ajay Kumar, Tech. Trainee, ICAR-CPRI, RS, Patna transferred to ICAR-CPRI, RS, Modipuram.

#### Retirement

1. Sh. Vijay Kumar Yadav, Sr. Tech. Officer, ICAR-CPRI, RS, Modipuram retired on 29.02.2020.

#### Death

1. Sh. Jasvir Singh, ACTO, ICAR-CPRI, RS, Modipuram expired on 16.01.2020.

### Administrative

#### Retirement

1. Sh. Santosh Kumar, Assistant retired on 29.02.2020 from Council's Service.

### From the Director's

Potato is the third most important food crop in terms of global consumption, and it has been recommended by the Food and Agriculture Organization (FAO) of the United Nations (UN) as a food security crop. The world population is projected to reach 10 billion by 2050 and we need to be prepared with acceptable and assessable innovative technologies and tools for future sustainable potato production at global as well as local scale for keeping potato in upper echelon in the global food security crops.

IT professionals over the globe are working on optimizing the entire potato production chain, from field to fork. The Artificial Intelligence (AI) & Information Communication Technology (ICT) are aiming that, farmers can optimize harvesting procedures and improve yields; When the farmers are in the field, AI & ICT can offer forecasts that assist the decision making processes, provide networks filled with data and information on topics as diverse as agricultural machinery, disease forecasting, optimizing water use, price forecasting, etc. AI systems can be trained to deal with different anomaly detection and diagnosis system i.e.; the system can detect, identify and quantify many of the common blemishes affecting potatoes with the help of Image Sensors.

In India ICAR-CPRI is premier institute exclusively working on potato R&D. ICT based research & development for potato had been initiated at this institute. Potato acreage forecasting using remote sensing and GIS, GIS studies like thematic mapping, Agro ecological zonation, characterizing potato growing environment, potato crop modelling (Info crop Potato), decision support systems like Potato Pest Manager (PPM), Computer Aided Advisory System for Potato Crop Scheduling (CAASPS), Potato Weed Manager, potato Growing Season Descriptor (PPGSD), etc, late blight forecasting tool (Indo Blight Cast), were developed and based on them the advisories are generated for the stake holders. Thus, AI and ICT plays a crucial role in making potato commodity as a deliverable “smart services” among the farmers, industrialist, policy planners and researchers which eventually leads to a roadmap for a better world.



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

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