ICAR – Central Potato Research Institute
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## Research Highlights

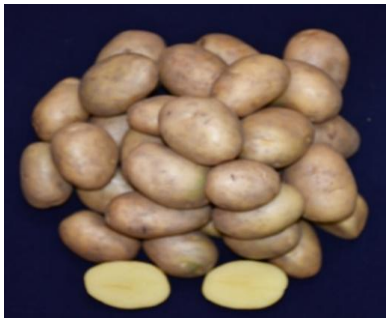
### Development of nitrogen use efficient advance hybrids of potato

In the 21st century, food availability is a serious challenge for more than 9 billion population by 2050 in the world (United Nations, 2015). The situation would be more severe in developing countries where population growth is rapid, cultivable land resources are limited and soil fertility is degrading due to excess application of N fertilizers in crops. Potato prefers nitrate form of nitrogen than ammonium, and it is prone to nitrate leaching. The situation is more aggravated due to irrigated cultivation and shallow rooted nature of potato crop. N loss in the form of volatalisation of ammonia or nitrous oxide ($N_2O$) gases causing greenhouse gas emission is the main problems with N fertilization. High N application also causes increase in production cost and deteriorates health of soil, water resources and air quality. Presently, more than 100 million tonnes of N fertilizers are applied to crops in fields, of which about 3 million tonnes in root and tuber crops including potato (FAO, 2015).

Since, less than half of N is utilized by crops and the remaining N is lost in environment, there is a need to improve plant nitrogen use efficiency (NUE). Therefore, global agriculture urgently requires technology for limited resources. In which, development of nitrogen use efficient potatoes is one of the environment friendly options to save N uses.

NUE/15 -8

NUE/15 -23



NUE/15-67

Our aim was to develop advance potato hybrids with enhanced NUE and yield contributing traits under limited N availability. We generated a bi-parental population of 116 progenies by crossing two contrasting varieties viz., Kufri Jyoti (N inefficient) and Kufri Gaurav (N efficient). After six years (2015-21) of breeding, clonal selection and field trials, we developed advance hybrids based on 20 traits of agronomic, physio-biochemical and NUE parameters. Significant variations were

| SN | Genotype | N doses | | |
|---|---|---|---|---|
| | | Without N | 50 kg/ha | 180 kg/ha |
| 1. | NUE/15-8 | 19.13 | 44.92[a] | 37.72[a] |
| 2. | NUE/15-23 | 18.90 | 46.94[a] | 42.45[b] |
| 3. | NUE/15-67 | 19.74 | 39.74[a] | 42.78[b] |
| 4. | Kufri Gaurav | 18.68 | 44.51[a] | 35.50[a] |
| 5. | Kufri Jyoti | 17.48 | 33.27[b] | 33.90[a] |
| | **Mean** | 18.79 | 41.87 | 38.47 |

*Means of two years tuber yield data of selected NUE potato hybrids*

observed in the progenies for most traits such as plant height, total leaf area, shoot dry weight and tuber traits (number, yield and dry matter). Further, plant total N content, NUE variables (NUE, NUpE, NUtE, HI and NHI) and physio-biochemical properties also differed significantly. The principal component analysis (PCA) and agglomerative hierarchical clustering (AHC) distinguished variation. We observed significant and positive correlations with tuber traits and NUE variables. Finally, we demonstrate here three advance hybrids (NUE/15-8, NUE/23, and NUE/15-67) with high yield and NUE combined with other desirable tuber traits. Our study also implies that tuber yield and NUE are the key criteria for selection of N use efficient genotypes under limited N input.

***JK Tiwari, D Kumar, R Zinta, P Raigond, T Buckseth, RK Singh, B Singh, S Rawal, VK Dua, V Kumar, V Bhardwaj, SK Luthra, Dalamu, S Rawat & Manoj Kumar***

## Development of whitefly, *Bemisia tabaci* (Gennadius) handling cage

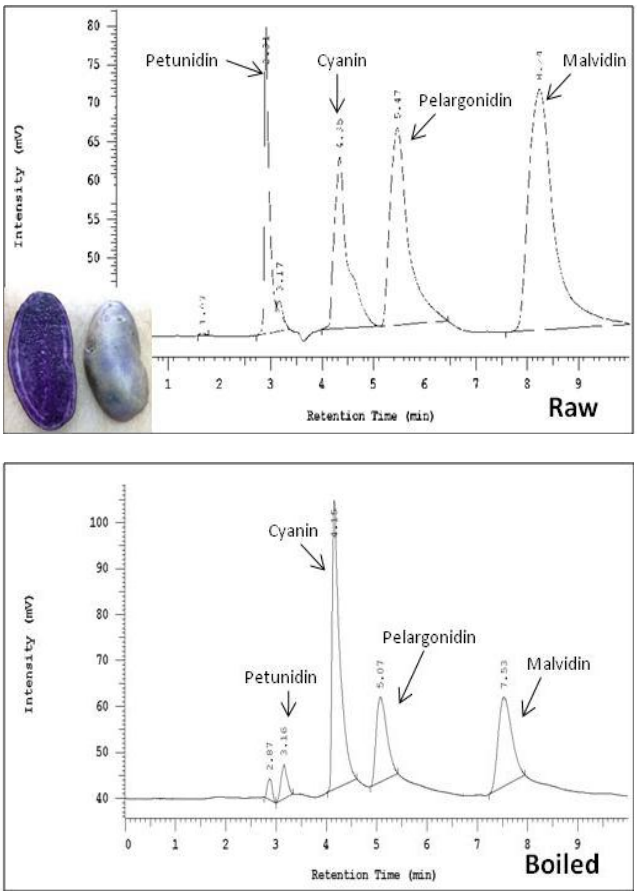
Whitefly, *B. tabaci* (Gennadius) is a highly polyphagous pest causing serious economic losses to many vegetable crops including potato. The B. tabaci cause direct losses by sucking the phloem sap and indirectly by transmitting plant viruses. Conducting studies like varietal screening, virus-vector interactions etc. sometime it is necessary to take a defined number of *B. tabaci* adults. Since the *B. tabaci* is tiny in size and very active flier make the adult handling cumbersome. Negative consequences of $CO_2$ or with acetone to anesthise and handle the *B. tabaci* adult's limits their use. Hence it is necessary to develop or design a devise that overcome the whitefly adult handling problem. Here we designed a small clip cage with an added feature of aspirator, using this cage we can transfer the whitefly adults directly from the host plant to test plants. To use this cage first it has to be fixed to leaves of test plant then desired number can be aspirated from the source plant. Then the associated tubes at clip cage required for aspiration can be detached and the holes can be covered up using the parafilm to avoid escape of whitefly. This device make the whitefly adult handling very easy and comfortable without exposing to $CO_2$ or acetone. The experiments require specific whitefly sexes limits the use of this device.


*A. Modified clip cage, B. Cage fixed to the test plants*

***KC Naga, RK Tiwari, Subhash S, Ravinder Kumar, Gaurav Verma, S Sharma & Manoj Kumar***

## Method developed for estimation of anthocyanins through HPLC

Anthocyanins are present in low concentrations in pale-yellow fleshed potatoes and in higher concentrations in potatoes with red and purple flesh color. Red fleshed potatoes contain pelargonidin, whereas purple fleshed potatoes contain malvidin, petunidin, peonidin and delphinine. The most common method used for estimation of anthocyanins is through




*HPLC chromatogram of anthocyanidins in raw and boiled potatoes*

spectrophotometer by which concentration of pelargonidin and malvidin can be estimated. However, to get more precise results a new method was developed on HPLC which can be used to estimate anthocyanidins from raw and boiled potatoes and can also be used to estimate their bio accessibility. In the present method, limit of detection and quantification are quite low which indicates that the method can estimate even the lower concentration of these compounds from potatoes. The chromatograms show the peaks of petunidin, pelargonidin, cyanin and malvidin in raw and boiled purple potatoes. The results showed that this method is superior to spectrophotometric method due to estimation of more number of anthocyanidins and better precision.

***P Raigond, Vandana Parmar, SK Luthra, Asha Thakur, Som Dutt, AK Jaiswal & B Singh***

## Gluten-free potato *Jalebi*

*Jalebi* is one of the most popular sweet dishes of India, which is a fermented crispy sweet, deep-fried pretzel made from refined wheat flour/black gram flour/gram flour and eaten as snack food. Traditionally, *jalebi* is prepared by a fermented batter of refined wheat flour along with added Dahi (curd) or yeast, salt and water. The thick leavened batter is squeezed and deposited as continuous spirals into hot edible oil. These fried spirals are removed from fat and submerged in hot scented sugar syrup, which saturates their hollow

*Gluten-free Potato Jalebi*

insides. But the presence of refined wheat flour makes traditional *jalebi* unfit for gluten intolerant persons. Another problem is that traditional *jalebi* cannot be stored for longer times as *jalebi* is preferred when served hot and crispy. To satisfy the *jalebi* hunger of the gluten-intolerant population and bring something new for *Jalebi* lovers, ICAR-CPRI has developed and

standardized the process for potato-based gluten-free ready-to-reconstitute potato *jalebi* and Instant potato *jalebi* premix. In ready-to-reconstitute type potato *jalebi*, before consumption jalebi need to be submerged in hot sugar syrup for 2 minutes. Moreover, potato *jalebi* has a shelf life of 3-4 months at ambient storage conditions. The utilization of the whole potato also makes potato *jalebi* rich in dietary fibers. Interestingly unlike other potato products such as chips and French fried potato the potato *jalebi* is independent of shape, size, dry matter, sugar and variety of potatoes. Partially damaged or cold-stored potatoes can also be utilized. This technology can be easily adopted by industries involved in the production of ready to reconstitute food products, sweet shops and food industries involved in the production of snacks. As this product is ready-to-reconstitute type therefor can be easily sold at sweet shops, Kirana shops, malls, supermarkets, and departmental stores also. Technology is ready for commercialization.

***AK Jaiswal, Y Gupta, MK Lal, P Raigond& B Singh***

## Transfer of Technology

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

A farmers' training programme on "Potato Cultivation in Nilgiri Hills-New Problems and Way Forward" was organized under Scheduled Caste Sub Plan at ICAR-CPRI, RS, Ooty during 8th-10th March 2021. In this training Dr. EP Venkatasalam detailed about the research activities of ICAR-CPRI, RS, Ooty and delivered lectures on potato seed production technology and potato storage. Besides this, Dr. Priyank Hanuman Mhatre provided the information about existing and newly emerging pests and diseases of potato crop and their management in Nilgiri Hills. The farmers were also taken to the field and laboratory of the station to demonstrate the technologies/ varieties/machineries developed by ICAR-CPRI. The training programme was attended by 90 farmers belonging to scheduled caste from 9 villages of Nilgiri district. Under this programme three farmers *viz.*, Mr. L. Udhayakumar from Village Dhoddani, Mr. K. Ganesh from village Ganagnagar, Iduhatti and Mr. R. Sivakumar from village Solada, Kalhatty, were awarded with the "Progressive Farmer Award" for their excellent contribution in agriculture/horticultural cultivation and being an example in their society. During the training programme several lectures on different crop activities for potato based cropping systems have been delivered by the resource persons from respective institutions *viz.*, ICAR-CPRS, Ooty, ICAR-IISWC, RC, Ooty, ICAR-IARI, RS, Wellington, TNAU-HRS, Ooty, State Government

and CSI Collage. During the training, the training manual and extension folders were published, released and distributed to the farmers.

### Farmers training programmes on temperate fruits, vegetables and improved techniques of potato cultivation under TSP & SCSP

Three on campus trainings each of 3 days on "*Sheetoshan falon, sabjiyon tatha aloo ki fasal ki unnat taknike*" was organised by the institute in the month of February, 2021. The first training was organised from 15-17 February for 20 farmers of Ribba village falling under tehsil Bhurang distt. Kinnaur. The second training was organised from 22-24 February for 20 farmers of villages falling under tehsil Sangla distt. Kinnaur. The third training was organised from 26-28 February for 20

farmers of villages falling under tehsil Nichar distt. Kinnaur. The highlight of these trainings was a large number of female participants in the trainings. These trainings were undertaken for the

Schedule tribes farmers under TSP component. "*Aloo Diwas*" on 15 February was also celebrated during the first training. The objective of the training was to enhance the knowledge and skill of the trainees regarding cultivation of temperate fruits and vegetables along with production of seed potato and value addition in potato. Training methodologies like lecture cum discussion, practical sessions, skill demonstration, field visit and video film show etc. were the modes for imparting the training to the participants.

Besides, a 3 days training on "*Sheetoshan falon, sabjiyon ttha aloo ki fasal ki unnat taknike*" was conducted in collaboration with ICAR-IARI, Regional Station, Dhanda, Shimla from 17 to 19 February for 100 farmers of different villages of Shoghi and Cheog panchayats of district Shimla. This training was for the Schedule Caste farmers under SCSP component and in this training each farmer was provided with inputs like apple, kiwi and pomegranate plants along with pruning scissor. The training was conducted at ICAR-IARI, Regional Station, Dhanda, Shimla and sponsored by ICAR-CPRI, Shimla.

## Kisan Melas cum Training under TSP

Two Kisan Melas cum Training programmes were organised in the month of March 2021 under TSP. The first one was organised at Narmada, Gujarat during 09-10th March, 2021 and the programme

was attended by about 1000 farmers. The second was organized at Mandla, Madhya Pradesh during 13-14th March, 2021 and the programme was attended by about 2000 farmers.

## Officers training programme on scientific potato cultivation

A three day training on "Improved Potato Cultivation" was organised by the institute during 7-9 January for 5 officers from agriculture

department of Mansa district of Punjab. The training programmes was sponsored by Chief Agriculture Officer Mansa, Punjab (Under ATMA Project). The objective of the training was to enrich the knowledge and skill of the trainees regarding potato cultivation so as that they could deliver the same to the end users.

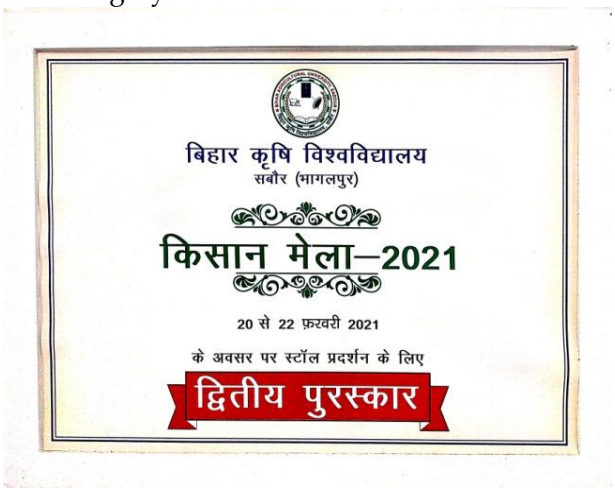
## Farmers (Scheduled Caste) Training Program, Gonpura, Patna

One day training was held on 8th February, 2021 at Gonpura, Patna under the farmers (Scheduled Castes) training program. In this training program, important information was given by the scientists

regarding the production of seeds and edible potatoes and crop protection. In this training program, 27 farmers from different villages of Phulwarisharif block participated. In the training, complete information related to scientific cultivation of potato was given to the farmers by Dr. Shambhu Kumar, Head, ICAR-CPRI, RS, Patna. During this, various problems of farmers related to potato production were also resolved.

## Kisan Mela was organized at Bihar Agricultural University, Sabour, Bhagalpur

Kisan Mela was organized from 20 to 22 February' 2021 at Bihar Agricultural University, Sabour, Bhagalpur, in which ICAR-Central Potato Research Institute, Regional Center, Patna also set up its stall. The fair was inaugurated by VC Dr. RK Sohane. In the closing ceremony of Kisan Mela, ICAR-CPRI, RS, Patna got second prize in the ICAR category




## Potato Workshop at Nalanda Garden College, Noorsarai, Nalanda

One day potato workshop cum exhibition was organized at Nalanda Udyan College, Noorsarai, Nalanda on 2nd February, 2021 in the premises of Nalanda Udyan College, Noorsarai. This fair was inaugurated by Hon'ble Agriculture Minister, Government of Bihar. ICAR-Central Potato Research Institute, Regional Station, Patna also set up a stall to give the latest information related to potatoes to the farmers. The stall of ICAR-CPRI, RS, Patna got the second prize.

## Krishi Unnati Mela-21 Krishi Vigyan Kendra, Parsauni, East Champaran

A two-days Krishi Unnati Mela-21 was organized on 20th and 21st March, 2021 in the premises of Krishi Vigyan Kendra, Parsauni, East Champaran. The fair was inaugurated by Hon'ble Shri Radha Mohan Singh, former Minister of Agriculture and Farmers Welfare, Government of India. In the


Krishi Unnati Mela, the ICAR-Central Potato Research Institute, RS, Patna also displayed various improved varieties of potatoes. Central Potato Research, Patna got first prize in ICAR's Best Stall category.

## Field Days organized in Various locations of Uttar Pradesh under Biotech Kisan Project

Under biotech kisan project 3 FLD on quality potato seed production of variety Kufri Chipsona-3 under insect free low cost net house were conducted in three districts namely Meerut, Hapur and Bulandsher under Biotech Kisan Hub DBT project. During the crop season, a field day was organized at each location on their demonstration sites, at Village Dangarh in Bulandshahar on 22 January, at village Lawar in Meerut on 30 January, 2021 and at village Jatpura in district Hapur on 6th February, 2021. A total of 176 farmers 16 different neighbour villages were participated in three field day. Dr Hansraj Singh, Head and Professor of Krishi Vigyan Kendra, Hapur, Dr Ashok Kumar Sengar, Scientist, KVK Hapur and Dr Satya Prakash, Professor and Head, College of Horticulture, Sardar Vallabhbhai Patel University of Agriculture &Technology, Meerut, Mr Umesh Chauhan, In-charge, Potato seed production farm, Danpur, Bulandshahar participated as resource persons in these field day.

## Institute's participation in Aloo Festival organized in Agra

On the occasion of "*Potato Mahotsav*" (dated February 20-21, 2021) organized by the Department of Horticulture and Food Processing of Uttar Pradesh at Taj View Garden, Agra, ICAR-CPRI Regional Station, Meerut displayed the potato production techniques of the Institute. A stall was set up for live demonstration. On the occasion of the closing ceremony of this event, the first prize was given by the Chief Guest of the function, Hon'ble Horticulture Minister Shriram Chauhan, for the excellent performance of the

institute. In this festival, Dr. Vijay Kishore Gupta, Principal Scientist, Dr. Mehilal, Senior Scientist and Dr. Ashok Kumar Chauhan of Modipuram campus demonstrated the techniques of the institute.

## Live Phone-in Programme at Doordarshan

Scientists from ICAR-CPRI, Shimla participated in the live phone programme for Himachal Pradesh during Jan-March, 2021. The detail of the topic alongwith experts are given below:

| Month | Topics | Name of the Expert |
|---|---|---|
| January, 2021 | Potato varieties, sowing and fertiliser management for Mid hill | Dr. Vinod Kumar<br>Dr. Tanuja Buckseth |
| February, 2021 | Intercultural operations, harvesting and storage of potatoes in Lower hill | Dr. Brajesh Singh<br>Dr. VK Dua |
| March, 2021 | Potato field preparation and selection of right seed of potato in the High hill | Dr. Ashwani Sharma<br>Dr. Dalamu |

## Important Meetings, Events & Visitors

### Foundation stone for potato cold storage and post-harvest facility laid

On March 09, 2021, Dr. Trilochan Mohapatra, Secretary (Agriculture Research and Education Department) and Director General, ICAR-Central Potato Research Institute, Regional Center,

Modipuram duly laid the foundation stone for potato cold storage and post-harvest facility in the august presence of Dr. Anand Kumar Singh, Deputy Director General (Horticulture Science), Dr. Bhupendra Nath Tripathi, Deputy Director General (Animal Science), Dr. Suresh Kumar Chaudhary, Deputy Director General (Natural Resource Management) and Dr. Vikramaditya

Pandey, Assistant Director General (Horticulture Science). On this occasion, Dr. Azad Singh Panwar, Director, ICAR-Indian Agricultural Systems Research Institute, Meerut and Dr. Abhijit Mitra, Director, ICAR-Central Animal Research Institute, Meerut were also present. Till now this center has been facing storage related problems due to lack of cold storage. This state of art with few thousand quintal capacity cold storage and post-harvest facility will play an important role in developing post-harvest technology for potato research. In which valuable breeder seeds of potatoes produced at the center and precious potato hybrids

can be stored. The Director General congratulated all the scientists, officers and employees of the center for the successful construction and operation of the cold storage. Dr. Manoj Kumar, Director (A), ICAR-CPRI welcomed all the guests who visited the centre. On this occasion, the Director General and the dignitaries present visited the exhibition organized to showcase the technologies developed by the institute. The guests showed special interest in the initiative of the institute to use drone technology in potato crop and in the different potato species being developed, especially the improved potato hybrids with different colors of peel and pulp. On this occasion, the Director General named HT-7/1329, an advanced heat resistant variety of potato recently developed by the Institute, as "Kufri Kiran".

## ICAR-CPRI RS, Ooty bagged the best stall award at National Horticulture Fare-2021

The ICAR-Indian Institute of Horticultural Research, Hesaraghatta, Bengaluru has organized National Horticulture fair (NHF) 2021 on the

theme Start-Up & Stand-Up India from 8th to 12th February, 2021 at Bengaluru. The NHF-2021 was inaugurated by the Union Minister of state for Agriculture and Farmers Welfare, Shri Kailash Chaudhari via virtual mode. The Indian spiritual leader, Sri Sri Ravi Shankarji was the chief guest of the inaugural function. ICAR-CPRI RS, Ooty participated in the fair and exhibited the technologies developed by the Institute and its stations. During the fair more than a lakh stake holders including farmers, students, entrepreneurs and others from different parts of the country visited the stall and gathered the information on various technologies developed by ICAR-CPRI. In the fair, the stall exhibited by ICAR-CPRI, RS, Muthorai, Udhagamandalam bagged the best stall award among the ICAR and AICRP category.

## International Water Day celebration at Chamad Bharech, Solan

On the occasion of International Water Day i.e. 22 March, a "Kisan Goshthi" was conducted at Chamad Bharech panchayat, Distt. Solan. The goshthi was attended by more than 200 farmers from different villages of Chamad Bharech panchayat of distt. Solan. The farmers were given tips for the cultivation of potato along with a


lecture on the importance of water conservation and its judicial use. The objective of the farmer's trainings was to enhance the knowledge and skill of the participants regarding production of quality potato through new techniques and practices with minimal use of water.

## Hindi workshop organized

A one-day Hindi workshop was organized for skilled support staff on 26.03.2021 at the Headquarter of Central Potato Research Institute. The main theme of the workshop was "Easy use of Hindi in office work". 21 skilled support staff participated in this workshop. 12 employees of

Headquarter participated offline and 9 employees of Kufri/Fagu Unit of the institute participated through online. The lecturers were attached to the Headquarter of the Institute.

## Human Resource

### Scientific

#### Joining

1. Sh. Vikas Mangal, Scientist (GPB) joined at ICAR-CPRI, Shimla on 05.02.2021 (AN).

#### Promotions

1. Sh. Rahul Rameshrao Bakade, Scientist (Plant Pathology), ICAR-CPRI, RS, Patna (transferred to ICAR-IINR&G, Namkum, Ranchi–834010, Jharkhand) promoted to the next higher grade of Scientist (RGP Rs. 7,000/-) under CAS w.e.f. 11.05.2015
2. Sh. Raj Kumar, Scientist (Vegetable Science), ICAR-CPRI, Shimla (transferred to ICAR-IARI, New Delhi) promoted to the next higher grade of Scientist (RGP Rs. 7,000/-) under CAS w.e.f. 01.01.2018.

#### Transfers (Inter-Institute)

1. Dr. Kumar Nishant Chourasia, Scientist (GPB), ICAR-CPRI, Shimla relieved on 23.01.2021 (AN) to join at ICAR-CRIJ&AF, Nilgunj, Barrackpore, Kolkata, West Bengal-700121.
2. Sh. VU Patil, Senior Scientist (Agricultural Biotechnology), ICAR-CPRI, Shimla relieved on 08.02.2021 (AN) to join at ICAR-IIHR, Bengaluru.
3. Dr. Shashi Rawat, PS (Computer Application & IT), ICAR-CPRI, Shimla relieved on 09.02.2021 (AN) to join at ICAR-CIAE, Bhopal (MP).
4. Dr. Mohd. Abas Shah, Scientist (Agricultural Entomology), ICAR-CPRI, RS, Jalandhar relieved on 10.02.2021 (AN) to join at ICAR-CITH, Srinagar (J&K).

### Technical

#### Transfers

1. Sh. Harvinder Singh, STO, ICAR-CPRI, Shimla transferred to ICAR-CPRI, RS, Modipuram form 12.02.2021.
2. Sh. Santosh Kumar, ACTO, ICAR-CPRI Kufri-Fagu Unit transferred to ICAR-CPRI, Shimla from 29.01.2021.
3. Sh. Sanjeev Kumar Meena, Technician, ICAR-CPRI, RS, Patna transferred to ICAR-CPRI, RS, Gwalior from 04.02.2021.

#### Retirements

1. Sh. Pravesh Kumar Yadav, Sr. Technician, ICAR-CPRI, RS, Patna retired on 28.02.2021 (AN).

### Administrative

#### Promotions

1. Sh. Sanjeev Kumar, Asstt., ICAR-CPRI, RS, Patna promoted to the post of Asstt. Admn. Officer and joined at ICAR-CPRI, RS, Gwalior w.e.f. 01.01.2021
2. Sh. Sachin Kumar, UDC, ICAR-CPRI, Shimla promoted to the post of Assistant w.e.f. 10.03.2021(AN).
3. Sh. Hans Raj, UDC, ICAR-CPRI, Shimla promoted to the post of Assistant w.e.f. 10.03.2021(AN).

#### Transfers

1. Smt. Chandni Bhagta, Assistant transferred from ICAR-CPRI Kufri-Fagu Unit w.e.f.

25.02.2021 (AN) and joined at ICAR-CPRI, Shimla on 26.02.2021 (FN).

### Retirements

1. Smt. M. Rani, Assistant, ICAR-CPRI, RS, Muthorai Voluntary retired on 01.02.2021 (FN).

### Skilled Supporting Staff

### Promotions

1. Smt. Kiran, SSS, CPRI, Shimla promoted to the post of LDC w.e.f. 13.01.2021.

## From the Director's Desk

Potato crop is a high demanding crop in terms of fertilizers inputs and often the application of fertilizers is done beyond the recommended doses. This results in excessive pollution and hence judicious application of fertilizers is the requirement of the day. Therefore, a user friendly mobile app has been developed for calculating the required dose of fertilizer on potato crop by the Institute. It has been named as Fertilizer Dose calculator for potato (FDCP). The Mobile App is in two languages- English and Punjabi. FDCP suggests potato growers about the amount of fertilizers to be applied in their fields and as per the area to be cultivated. It also takes care of the purpose for which the crop is to be grown (whether seed or table purpose). The app recommends fertilizer application rates on soil test basis as per the Soil Health Card or other such soil tests. FDCP also gives the option of fertilizer combinations. These built-in combinations are the combinations recommended and followed in the region. The target users of the present version (Version I) of FDCP are the potato growers of Punjab. The output i.e. amount of fertilizer to be applied, is displayed in 'kg' as well as 'bags' along with details of amount to be applied in each split. It is expected that the app shall help in decision making at the end of farmers for judicious use of fertilizers and also save the cost of inputs. The app is further being refined for other regions for its wider implication.

**Compiled and edited by:** Brajesh Singh, Ravinder Kumar, Pooja Mankar & Kumar Nishant Chourasia
**Published by:** Director, ICAR-Central Potato Research Institute, Shimla-171 001, H.P. (India)
**Secretarial Assistance:** Sachin Kanwar & Dharmendra Gupta
Phone: 0177-2625073, Fax: 0177-2624460, E-mail: director.cpri@icar.gov.in, website: https://cpri.icar.gov.in