



केन्द्रीय आलू अनुसंधान संस्थान Central Potato Research Institute Newsletter

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From the Director's Desk

Diffusion of potato through its spectacular adaptability has made great impact on the welfare of people throughout the world irrespective of culture and religion. Today, potato is the world's third most important food crop and by far the most important vegetable. Starting its journey in early sixteenth century from the Andes, it is now grown in more than 100 countries over 19 million ha land. In India it was introduced in late 16th century and by 19th century it became a most visible vegetable being grown in India. The rapid expansion of potato cultivation in India has been primarily due to better adapted potato varieties developed by Central Potato Research Institute (CPRI), and ability to capitalize on cultivation compatibility between potatoes and other important crops, especially rice and wheat. However, the major driving force for the expansion in potato cultivation has been the farmers by themselves who have taken up potato

cultivation in a big way to meet the demand of expanding markets and changing consumer preferences. The emergence of potato as an important vegetable crop in the Indo-Gangetic plains reflects the synergy between R&D organizations. Development of suitable varieties and technologies fueled by the enabling Govt. policies helped in subtropicalization of potato that made it possible to adapt and expand in subtropical plains; while private sector investment in large cold storage facilities greatly increased the availability of ware potatoes during hot summer and rainy season months, and kept seed potatoes in right physiological state for next year's planting. Public-sector supported agriculture research led by CPRI in India, besides development of varieties and

technologies, developed indigenous seed production system that led to real impact on potato production in the country.

Till late nineties, potato was consumed primarily as vegetable but, thereafter potato processing sector had expanded on a fast pace. Currently, over 5% of the potatoes are processed in the country, which is likely to touch 10% during next 3-4

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years. This turnaround in diversified utilization was made possible through development of processing varieties accompanied by complementary agro-techniques and long-term storage technology.

Our efforts so far have yielded desired result; however, there are issues that need to be addressed on priority. Some of these issues include: i) production of disease-free seed material through public-private partnership, ii) development of short duration disease and pest resistant varieties to cope with climate change, and specialty potato for value addition and diverse utilization, iii) exploration of newer research avenues, especially biotechnological application in potato improvement and protection, and exploitation of wild gene pool, iv) formation of efficient market intelligence; v) introduction of market intervention scheme (MIS), export incentives and promotion, and minimum support price (MSP). Therefore, there is need to reorient our research strategies to address these issues for providing sustainability to potato production and enhancing farm income.

Research Highlights

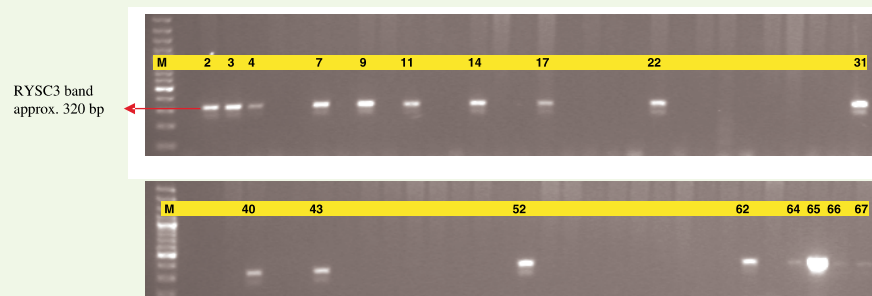
Identification of Elite Parental Clones Having Extreme Resistance to PVY Using Marker Assisted Selection (MAS)

Potato viruses are omnipresent and they significantly reduce the yield due to progressive degeneration of vegetatively propagated seed stocks. Amongst more than 40 different viruses that infect potato crop, Potato Virus Y (PVY) is the most important

often causing yield reduction up to 80% in combination with other viruses. Moreover, more than 90% potatoes in India are grown under sub-tropical conditions that favour proliferation of viruses due to congenial environment conditions prevalent for their vectors threatening the seed production system. The strategy being followed at the Institute is to initially introduce host resistance to PVY which can be further fortified by combining resistances to other biotic stresses. Several tightly linked markers have been identified for the PVY extreme resistance gene Ry_{adg} . It is a single, dominant gene imparting extreme resistance (ER) to PVY. An allele specific SCAR marker RYSC3 for the detection of Ry_{adg} gene was used for MAS. To identify parental lines, 127 germplasm accessions including Indian potato varieties, and advanced stage hybrids developed were screened using tightly linked SCAR marker RYSC3. Besides, five tubers per clone were also challenge inoculated under controlled glass house conditions with PVY. Inoculated plants were observed for visual symptoms and upper fully expanded leaves were tested for PVY by double antibody sandwich ELISA at 5 weeks of post inoculation with polyclonal antibodies.

The presence of Ry_{adg} gene has been confirmed in eighteen germplasm accessions, Kufri Alankar, Kufri Chipsona-1, Kufri Jawahar, Kufri Himsona, MP/97-625, MP/97-699, MP/97-921, MP/04-578, CP 2058, CP 3771, CP 4038, CP 4039, CP 4046, CP 4047, CP 4052, CP 4055, CP 4056 and CP 4058. The PVY resistance in these accessions has also been confirmed by DAS-ELISA. The four advanced processing hybrids (MP-series) besides possessing resistance to PVY also have acceptable processing traits i.e. high dry matter (> 24%), good chip colour (score <2.00), low reducing sugars (<50 mg/100g fresh weight), free amino acid (450-800 mg/100g fresh weight) and phenol contents (20-60 mg/100g fresh weight). The material identified in the present study can be used as elite parental lines for use in breeding programs both for hills and plains. Use of the marker has hastened the selection process besides reducing the cost of screening by ELISA in each selection cycle.

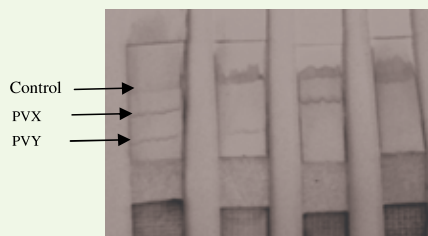
– **Vinay Bhardwaj, SK Kaushik, SV Singh, Reena Sharma, Baswaraj R and Vinod Kumar**



Patterns of amplified DNA finger print of 127 accessions for the detection of Ry_{adg} gene. The positive potato genotypes were present in different lanes viz., 2-CP4054; 3-CP4038; 4-CP4052; 7-CP4056; 9-CP4046; 11-CP4055; 14-CP4047; 17-CP4039; 22-K.Chipsona-1; 31-K.Jawahar; 40-K.Himsona; 43-MP/97-699; 52-MP/97-625; 62-K.Alankar; 64-MP/04-578; 65-MP/97-921; 66-CP3771 and 67-CP2058. Lane M contains the 100-bp DNA ladder as molecular size marker.

Dipstick Assay for the Detection of Potato Viruses

Use of healthy planting material is amongst the most effective approaches to manage potato pathogens. One of the elements essential for successful certification programs to produce such healthy propagation material is the availability of sensitive diagnostic methods. Serological techniques have been extensively used in CPRI for detection of potato pathogens. The most commonly used serological test is chloroplast agglutination that can be conducted in the field provided provision for refrigeration of antisera is made. Chloroplast agglutination test was the standard method used for indexing potato clones till 1984 at CPRI. The technique suffered few drawbacks like requirement of large quantities of antisera under refrigerated condition, its applicability to only high titted viruses like PVX, PVS and PVM and a low sensitivity. These limitations of chloroplast agglutination were overcome when CPRI introduced the use of ELISA (enzyme-linked immunosorbent assay) techniques in 1984. Presently, CPRI produces ELISA reagents for PVA, PVM, PVS, PVX, PVY, and PLRV. ELISA is reasonably sensitive and highly amenable to high throughput automation. However, ELISA techniques require sophisticated laboratory settings and cannot be conducted at farmers' field. Availability of testing kit that can be used at the field level itself would be of great help for ensuring health status of foundation and certified seed of potato. Therefore, dipstick kit based on lateral flow immunoassay was standardized for the detection of five potato viruses viz., PVX, PVA, PVS, PVM, PVY.



Dipstick showing simultaneous detection of PVY and PVX. 1st from left: sample with PVY and PVX infection; 2nd: sample with PVY infection only; 3rd: sample with PVX infection only; 4th: healthy check.

The dipstick kit consists of the following components: (i) Sample pad – an absorbent pad onto which the test sample is applied, (ii) Conjugate or reagent pad – this contains antibodies specific to the target virus conjugated to colloidal gold nano-particles, (iii) Reaction membrane – typically a hydrophobic nitrocellulose or cellulose acetate membrane onto which anti-target antibodies are immobilised in a line across the membrane as a capture zone or test line, (iv) Wick or waste reservoir – a further absorbent pad designed to draw the sample across the reaction membrane by capillary action and collect it. The components of the strip are fixed to an inert backing material. Virus specific IgG conjugated with colloidal gold particles are loaded on conjugate release matrix and virus specific IgG and antirabbit IgG is loaded on reaction membrane and allow to be dried. Extracts of healthy and infected samples are prepared in sample buffer and the dipstick is dipped in the sample extracts for 1 min and placed horizontally for band development. The sample migrates from the sample pad through the conjugate pad where any target virus present will bind to the conjugate. The sample then continues to migrate across the membrane until it reaches the capture zone where the target/

conjugate complex will bind to the immobilised antibodies producing a visible line on the membrane. The sample then migrates further along the strip until it reaches the control zone, where excess conjugate will bind and produce a second visible line on the membrane. This control line indicates that the sample has migrated across the membrane as intended. The kit developed at CPRI can detect maximum of two viruses simultaneously. Separate kit has been developed for simultaneous detection of PVY+PVX, PVA+PVS, PVY+PVM. Three bands (2 for viruses and 1 for control) are detected when the sample is infected with two viruses; one virus-specific band and the control band are detected when it is infected with one virus. A single line in the control zone is a negative result. The efficacy of the diagnostic kit has been validated at CPRI seed farms. Further validation is on at farmers' field and AICRP centres.

- SK Chakrabarti, A Jeevalatha, Priyanka Kaundal and BP Singh

Hybrids Tolerant to Hopper and Miteburn Developed

Potato cultivation in early planting conditions of north-western/central plains, are characterized by high day and night temperatures. These conditions caters to congenial environment for sucking pests like leaf hopper (*Empoasca biguttula* Ishida) and mite (*Polyphagotarsonemus latus* Banks) resulting in significant yield losses. Development of potato cultivars with tolerance to heat stress and damage to leafhopper and mite is the need of the day in the era of climate change. Scientists at CPRI have started the breeding programme



Symptoms of mite burn in Kufri Surya at 75 days



Hybrids HT/4-935 free from mite at 75 DAP and tubers at harvest



to develop varieties having tolerance to heat stress as well as tolerance to mite and hopperburn. Hybrid HT/92-621 identified as tolerant to heat, mite and hopperburn, was released as commercial cultivar Kufri Surya in the year 2005. This variety has proved itself in the areas of peninsular India and early planting season of Indo-gangetic plains. Besides, this variety has the potential to expand potato cultivation in non traditional areas where night temperatures are marginally above the required range for tuberization (above 20°C). Under the same breeding programme, few more hybrids have been identified, which possess these traits viz., HT/04-935, HT/04-755 and HT/04-744. Amongst these, advance stage potato hybrid HT/4-935 has been found to have tolerance to heat stress and damage to leafhopper and mite in the investigations carried out at Central Potato Research Institute Campus, Modipuram.

The results revealed that the hybrid HT/4-935 was highly tolerant (3% hopper burn and 1% mite burn incidence) as against Kufri Surya (11% hopper burn and 20% mite burn). The significantly less mite burn damage in hybrid indicated its worth for early planting conditions. The hybrids HT/4-744 and HT/4-

755 produced tuber yield at par with Kufri Surya however, HT/4-935 was slightly less yielder than Kufri Surya. All the three hybrids had higher tuber dry matter than Kufri Surya. These hybrids would be useful in developing new varieties as well as for potato production in the warmer areas, thereby ensuring food security in these areas where hopper and mites are real threat.

**-VK Gupta, Kamlesh Malik,
SK Luthra, JS Minhas, Jai Gopal,
BP Singh and SK Kaushik**

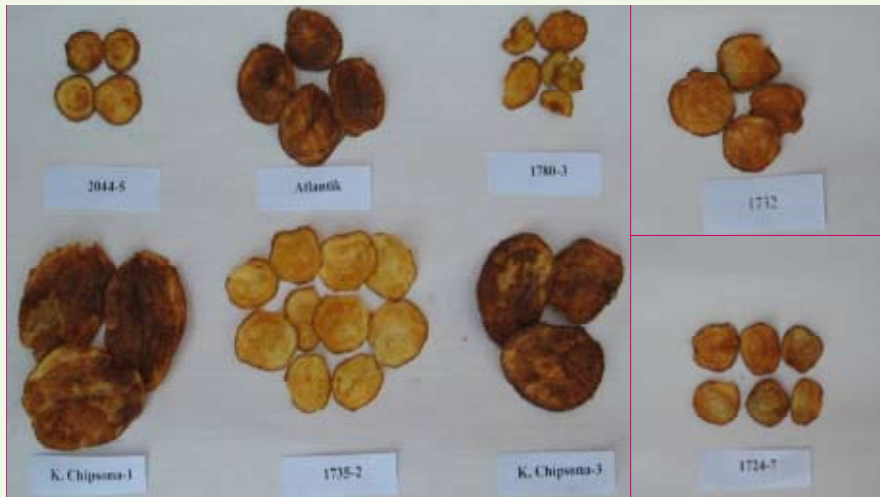
Potato Genetic Resources Possessing Resistance to Cold Induced Sweetening Identified

In India, nearly 90% of potatoes are cultivated during short days of winter season in sub-tropical plains. Potato is a semi-perishable commodity and temperature starts rising when the crop is harvested during February-March; therefore, cold storage is an integral requirement for round the year availability of potatoes. Storage at 2-4°C temperature is ideal and a common practice throughout the country however, excessive accumulation of reducing sugars imparts sweetening known as 'cold induced sweetening' in cold stored potatoes. Sweetened potatoes are unfit for processing due to brown

coloured processed products and are also not liked by consumers as table potatoes

Low reducing sugars (<100mg/100 gram fresh tuber weight) and high dry matter (>20%) are basic requirements for the preparation of good quality fried potato products like chips or French fries and dehydrated products like flakes, flour and powder. Therefore varieties with low reducing sugars are required to meet the growing demand of the processing industry. The biggest impediment towards development of cold resistant potato cultivars through conventional breeding is lack of suitable germplasm to be used as parents. Therefore, to identify genotypes resistant to cold induced sweetening, 72 accessions of 15 wild and cultivated species were screened for glucose content before and after cold storage (cold stored at 2-4°C for nearly six months, without reconditioning) at Central Potato Research Institute Campus, Modipuram during 2007-08 and 2008-09. The glucose estimation was done by analysing the potato tuber juice through YSI Biochemistry Analyzer.

Wild species accessions namely SS1763-6, (*S. albicans*), SS1780-3 (*S. berthaultii*), SS1732, SS1735-2,



Chip colour of some promising accessions after cold storage

SS1846 (*S. demissum*), SS1652-9 (*S. jamesi*), SS2044-5 (*S. tuberosum* ssp. *andigena*) maintained low glucose level (glucose content <50 mg/100 gram fresh tuber weight) before and after cold storage over the years. The chip colour of some wild accessions SS1724-7, SS1732, SS1735-2, SS1780-3 and SS2044-5 was far superior than processing varieties Atlantic, Kufri Chipsona-1 and Kufri Chipsona-3 without reconditioning of the cold stored material. The accessions of wild species can be used to diversify the genes of resistance to cold induced sweetening in cultivated potatoes as most of the wild species can be crossed to cultivated types following ploidy manipulations. Since *Andigena* group of cultivated potatoes are easily and directly crossable with the other predominant cultivated group *Tuberosum*, resistance to cold induced sweetening from *Andigena* can be transferred easily to the cultivated varieties. Thus, these accessions may be useful for breeding varieties resistant to cold induced sweetening.

- SK Luthra, J Gopal, Dinesh Kumar, BP Singh, SK Pandey and VK Gupta

Training & Technology Transfer

Award Function of Aloo Pathshala and Farmers Training at Shimla

Division of Social Sciences organized award function of Aloo Pathshala in which farmers who had actively participated in the programme were given away prizes by the CPRI Director. On this occasion a two days (November 8-9, 2010) training course on “Quality seed potato production” was also organized in which 18 potato growers of different states of the country participated. They were trained in various new technologies in potato cultivation, marketing, processing and storage and motivated by the experts of different fields to adopt these modern technologies.

Besides, two other training courses on “Modern techniques for quality seed potato production” during October 28-30, 2010 and November 18-20, 2010 were also organised. These trainings were sponsored by



Inauguration of the training programme

ATMA, Uttarakashi (Uttarakhand) and ATMA, Chaibasa (Jharkand), respectively. Altogether, 47 farmers were trained on diseases and pest management, improved varieties, planting operations, integrated nutrient management, processing and storage of potato. An exposure visit to potato seed farms at CPRS Kufri-Fagu was also organized to create awareness and give first hand information on potato seed production technology to these potato growers.



Trainees and awardees at CPRI

Farmers' Training at CPRS, Jalandhar

Farmers training programme on “Potato seed production” was organized at CPRS, Jalandhar on 6th Dec 2010 which was attended by over 150 farmers of Jalandhar, Moga, Hoshiarpur, Kapurthala and Bhatinda districts. The inaugural session was presided over by Dr Bir Pal Singh, Director, CPRI. Dr PS Naik, Project coordinator AICRP potato, Dr Satvir Singh, Deputy Director Horticulture Punjab, President of Potato growers

association POSCON, Mr Sukhjit Singh Bhatti, Representative of President of Jalandhar potato growers association Master Kesari Singh were the guest of honour. Dr Bir Pal Singh in his inaugural address extended the support of CPRI to the potato growers of Punjab. He persuaded the farmers for their constant interaction with CPRI to improve upon the technologies being developed by CPRI. A training manual was released on the occasion which is scripted in the gurmukhi entitled “*Aadhunik taknika dwara aalu beej utpadan*” for the easy referral by the potato farmers of Punjab.



Trainees at CPRS, Jalandhar

The Training consisted of a series of lectures on different aspects of potato seed production delivered by the Scientists and technical staff of CPRI.



Inauguration of the training programme

The lecture session was followed by a field visit to the CPRS farm area and demonstrations. The simultaneous all day exhibition on machinery, potato varieties, Potato

disease symptoms, Tissue culture technologies, virus detection methods especially through ELISA and dip stick method developed by CPRI were put up. A technical kit consisting of the released training manual and manuals on potato seed production and potato storage were distributed to the farmers for future reference. The feedback of the farmers revealed their major problems as getting the breeder seed. Majority of the farmers felt that after attending the training they would adapt the practice of getting the soil tested before the application of fertilizers and use phosphorous judiciously, dehaulm before first week of January, follow proper roughing technique and try to adapt the micro irrigation systems available. The event was covered by Doordarshan, All India Radio, Jagbani, Amar Ujala and Hindustan Times.

Farmers' Training at Modipuram

A Training-cum-exposure visit on “*Improved Cultivation Practices of Potato*” was organized at CPRI Campus, Modipuram during 9-12 November, 2010. This programme was sponsored by the Directorate of Agriculture, Kokrajhar (Assam). Two Agricultural Development Officers, 10 Village Level Extension Workers and 10 farmers participated in this

programme. This programme included lectures, practicals and exposure to laboratories, fields and other research activities at the Campus. Dr. SK Kaushik, Joint Director of the Campus advised the trainees to learn advanced technologies of potato production and in future, train other farmers to enhance the productivity of potato in Assam region.



Group photograph with trainees

Live Phone-in-Programmes on Doordarshan

The following scientists participated in Live Phone-in-Programme and gave talk on various topics at Doordarshan, Shimla:

Live Phone-in-Programmes on AIR, Shimla

Dr Bir Pal Singh, Director, Dr Sanjeev Sharma, Senior Scientist, Dr Vinay Sagar, Senior Scientist and Dr VK Dua, Senior Scientist participated in Live Phone-in-Programme on All

Month	Title/Topic	Name of Expert & Designation
JULY	Post harvest operations of potato in mid hills of Himachal Pradesh	Dr Brajesh Singh & Dr Sanjeev Sharma
SEPTEMBER	Harvesting and storage of potato in high hills of Himachal Pradesh	Dr Vinod Kumar & Dr Ashwani Kumar
OCTOBER	Marketing and storage of seed potato in high hills of Himachal Pradesh	Dr NK Pandey & Dr Brajesh Singh
NOVEMBER	Seed preparation , planting and intercultural operations in potato in lower hills of Himachal Pradesh	Dr VK Dua & Dr Manoj Kumar
DECEMBER	Disease management in potato in lower hills of Himachal Pradesh	Dr. Sanjeev Sharma

India Radio on the topic “Diseases management in potato crop”, “Post harvest operation of potato in mid hills of Himachal Pradesh”, Disease management in potato” and “Planting of potato in mid hills of Himachal Pradesh”, respectively during the last six months.

Information Technology Training Course for IGNOU Students

CPRI Library organized a 17 days computer, IT, and database creation and operation practical training for Bachelors and Masters Degree students of Library and Information Science, IGNOU, Regional Centre, Shimla. The course was organized during 26th July 2010 to 11th August, 2010 at the institute library.



Students on Practice Session

A total of 32 students of BLIS and MLIS from different parts of Himachal and neighbouring states attended the course for partial fulfillment of their Bachelors and Masters Degree Programmes. The students were trained in creation, manipulation, storage, searching, and retrieval of bibliographic databases and information using library automation software i.e. WINISIS, Alice for Windows, and WINSPIRES. Besides, they were exposed to latest IT Application of library resources and services management viz., Digital Library Creation, Searching and retrieval of digital data & information, E-Book,

E-Journal search, Full Text database search, retrieval and download etc.



Students Interaction with Director

CPRS Shillong Exhibition

Scientists of CPRS, Shillong attended the ICAR-Industry Meet 2010 organised by ITMU, ICAR Research Complex for NEH region and Zonal Technology Management – Business Planning and Development Unit, NIRJAFT, Kolkata on 18th and 19th November, 2010 at Umiam, Meghalaya and put up the potato exhibition stall. Shri RS Mooshahary, Hon'ble Governor of Meghalaya along with other dignitaries visited the Institute's stall and appreciated the efforts being done by CPRI and its regional stations for the cause of potato.



Shri RS Mooshahary, Hon'ble Governor of Meghalaya visiting CPRS stall

CPRI Campus, Modipuram Exhibition

CPRIC, Modipuram participated in India International Potato Expo-2010 organised by Indian Chamber

of Commerce, Kolkata at NASC Complex, Pusa, New Delhi during July 8-9, 2010 and put an exhibition depicting various activities of the Institute.

CPRS, Patna participated in Agri-Expo, Dimapur, Nagaland

CPRS, Patna participated and displayed the potato exhibits like popular varieties of potato, potato products, TPS, microplants, minitubers along with few processed potato products like Starch, Custard powder in AGRI-Expo, held at Dimapur in Nagaland. A large number of visitors interacted at ICAR stall that contained a unified representation of all the ICAR Institute-centres etc. in North-east including CPRS, Patna. Agrl. Production Commission of Nagaland also visited the ICAR pavilion and showed immense interest in potato crop and its scope in Nagaland.

Important Meetings

Research Advisory Committee Meeting Held at Shimla

The Research Advisory Committee meeting was held at CPRI, Shimla during 6th to 7th October 2010 under the chairmanship of Dr. KR Dhiman, Vice Chancellor, YS Parmar University of Horticulture and Forestry, Solan. Dr Bir Pal Singh, Director, CPRI extended formal welcome to the committee. He solicited advice and guidance of the RAC for improving the new research programmes being formulated for the next five years at the Institute. Dr Dhiman in his remarks emphasized on breeding for late blight and bacterial wilt resistance and also for earliness in

view of the need for short duration varieties for fitting into different cropping systems. Dr. MN Khare, former Dean of JNKVV, Jabalpur and Dr. MS Kadian, Regional Research Scientist of CIP, New Delhi were the other advisory members present in the meeting. The action taken report was presented by Dr. R Ezekiel, Member Secretary.



A view of RAC meeting at CPRI

During the meeting review of the research programmes was done for the work done in the previous year and the plan of work was presented for the year 2010-2011 by various programme leaders. Various recommendations were made by the RAC members for bringing about improvements in the new research programmes. The Chairman in his concluding remarks appreciated all the programme leaders for their excellent presentations and observed that the new programmes have been well thought out and planned. The Director, CPRI thanked the chairman and members of the RAC for attending this meeting and also for their critical suggestions in various research programmes.

Institute Research Council Meeting Formulates New Programmes

The Institute Research Council

meeting was held at CPRI, Shimla on 8th and 9th October 2010 under the chairmanship of Dr. Bir Pal Singh, Director, CPRI. It was attended by 50 scientists from CPRI headquarters and its regional stations. The basic objective of this meeting was to formulate new research programmes of different disciplines. During the opening session Dr. SS Lal, Secretary, IRC welcomed the new chairman and gave his brief introduction to the house. He congratulated newly appointed Head of Stations and Scientists and the award winners of different awards and fellowships. Chairman, IRC emphasized on formulation of clear cut objectives and activities in various research programmes for their effective monitoring. He advised the scientists to work in groups and develop linkages with other laboratories of repute for benefitting the undergoing research.

During the two days IRC meeting the newly formulated research programmes were presented by the researchers and elaborate discussions were held regarding their objectives, plan of work, manpower deployment, facilities, expected outcome, etc. As a result several recommendations and decisions were made by the IRC for follow up by the programme leaders and the associates. During



Chairman addressing the IRC

the concluding session, Chairman laid emphasis on development of team spirit based on work culture and equal credit sharing. He suggested the scientists to develop competence through more discussions and cohesiveness and informed that the Divisions are only for management purpose but the research activities should be multi-disciplinary for better acceptability of the outcome in form of technologies. The meeting concluded with the vote of thanks.

Group Meeting of AICRP (Potato) held at Shimla

The 28th Group Meeting of the All India Coordinated Research Project on Potato [AICRP, Potato] was held at the Central Potato Research Institute, Shimla during September 10-12, 2010. The meeting was inaugurated by Dr. HP Singh, Deputy Director General (Horticulture), ICAR, New Delhi. The inaugural session was chaired by Dr. KR Dhiman, VC, Dr. YSPUH&F, Nauni, Solan and co-chaired by Dr. BP Singh, Director, Central Potato Research Institute, Shimla. It was attended by number of dignitaries from the SAUs, ICAR, AICRP Scientist and representatives from potato based industries.



Inauguration of the 28th group meeting by Dr. HP Singh, DDG (Horticulture)

In his inaugural speech, Dr. HP Singh informed the house that the AICRP is unique research mechanism

in the world through which it is possible to transfer technologies across the diverse agro-ecological regions of the country. He expressed his satisfaction on the growth of potato crop in the country and hoped that very soon India will be second in the world in terms of potato production as this year the country has produced more than thirty million tones of potatoes. However, unequal growth of potato crop across the country is a matter of concern. He asked the scientists to identify productivity gaps and challenges faced by this crop in their respective areas and develop strategies to address them. Major challenges are monitoring of pests and diseases in changing global climate; validation of seed production sites in non-traditional areas of West Bengal, West Rajasthan, North Gujarat and Plateau region; development of late blight forecasting models for different regions; monitoring and management of potato tuber moth in Gujarat and late blight, *Sclerotium* wilt and bacterial wilt in Karnataka. He advised the delegates to bring synergy in their working and generate new ideas.



Dignitaries of AICRP meeting

The activities of AICRP (Potato) during 2009-10 were discussed in three technical sessions on potato improvement, potato production and potato protection. In addition to finalization of technical

programme for 2010-11, following three recommendations were brought out in the group meeting.

(a) Late blight management in Hassan area of Karnataka:

Following fungicide spray schedule may be followed for managing late blight in Hassan area of Karnataka.

- Spray the crop (first spray) thoroughly covering the lower as well as upper part of the plant with mancozeb @ 0.2% just at the time of canopy closure (30-45 days after planting).
- Spray the crop (second spray) with dimethomorph + mancozeb or cymoxanil + mancozeb @ 0.3% after one week of the first spray.
- Spray the crop (third spray) with mancozeb @ 0.2% after one week of second spray.

(b) Integrated management of bacterial wilt/brown rot in Hassan area of Karnataka:

Following integrated package is recommended for managing bacterial wilt/brown rot in Hassan area of Karnataka.

- Soil solarization by covering the plot with low density polyethylene (LLDPE) sheet during summer for at least 15 days.
- Use of healthy seed tubers obtained from bacterial wilt-free regions.
- Dip well chitted tubers in 0.25% (10^6 CFU/ml) suspension of *Bacillus subtilis* (B-5) and dry under shade before planting.
- Crop rotation with finger millet or ragi.

(c) Management of white flies

- Place yellow sticky traps (15 x 30 cm²) just above the canopy height @ 60 traps per hectare at equidistance from each other.
- Seed treatment with imidacloprid (200 SL) @ 0.04% (4 ml/10 lit.) for 10 minutes before planting.
- First spray with imidacloprid (200 SL) @ 0.03% (3 ml/10 lit.) at the time of emergence of crop.
- Second spray with thiamethoxam (25 WG) @ 0.05% after 15 days of crop emergence.

NAIP CAC Meeting at CPRIC, Modipuram

The Fifth meeting of Consortium Advisory Committee (CAC) of the sub-project “Value Chain on Potato and Potato Products” under NAIP-ICAR-World Bank was held on 26th November, 2010 at the Central Potato Research Institute Campus, Modipuram, Meerut. Dr. PC Gaur, Chairman CAC, chaired the meeting.



Members of the NAIP CAC meeting

Dr. BP Singh, Director, CPRI and CPI of the project welcomed the participants and informed that this project is ranked in top 5 by NAIP, New Delhi based on performance and completion of assignment within stipulated time. Dr. PC Gaur in his opening remarks congratulated

the partners on progress of work under the project. He indicated that progress in technical field has been very good and fund utilization is also as per guidelines but progress of partners need improvement. Dr. SK Kaushik, Joint Director, CPRIC, Modipuram thanked the chairman and participants of this CAC meeting.

IJSC Meeting at Gwalior

The Institute Joint Staff Council meeting was held at CPRS, Gwalior on 10th December 2010. The meeting was chaired by Dr. Bir Pal Singh, Director of the Institute. It was attended by the elected IJSC members and the nominated members of CPRI. Dr. AK Somani, Head, CPRS, Gwalior was special invitee for this meeting. The chairman informed the IJSC that Institute is doing good work under the umbrella of ICAR and the credit goes to the previous directors of the Institute, who have set high standards of work and culture and all the staff members should join together to keep the Institute at this standard and also for further enhancement in quality output of the Institute.

Invited Lectures & Visitors

Dr. S. Ayyappan, Director General, ICAR Visits CPRI Campus, Modipuram

Dr. S. Ayyappan, Director General, ICAR & Secretary, DARE, Ministry of Agriculture, GOI visited the Modipuram Campus of CPRI on 20th November, 2010. Dr. HP Singh, DDG (Horticulture) accompanied



DG, ICAR and DDG(H) with CPRI staff

him during his visit. Dr. BP Singh, Director, CPRI, Shimla and Dr. SK Kaushik, Joint Director, CPRI Campus, Modipuram welcomed Dr. Ayyappan on his first visit to CPRIC. Dr. Ayyappan visited the experimental fields, potato seed crop raised in the net houses following hi-tech seed production technique. He showed special interest in potato seed production through soil-less aeroponics system. He appreciated the research activities at the Modipuram Campus. He also showed interest in interacting with potato scientists in future.



DG visiting the aeroponics facility

DG Visits CPRS, Patna

Dr. S. Ayyappan, Secretary, DARE & DG, ICAR, New Delhi

made his first visit to CPRS, Patna on 12th December, 2010. He reviewed the work of Station and took stock of the situation by visiting different sites. He was briefed about the progress of work undergoing at Station and all other activities by Dr. Bir Pal Singh, Director of the Institute. Other relevant queries of Hon'ble DG were complied by Dr. RP Rai, Head of the



DG planting mango sapling at Patna station

Station. Dr. UC Shrivastava, ADG (Hort.), ICAR, New Delhi was also present on this occasion.

Dr. Ayyappan interacted with the staff members of the Station and asked about their Welfare. Staff was overwhelmed with the gracious gesture of the DG. Dr. Ayyappan also planted a sapling of mango-variety Swarnrekha on the premises of the new building as mark of his visit.

Member, National Commission for ST Visits CPRS, Shillong

Hon'ble Member of National Commission for Scheduled Tribes, Shri O.S. Myriaw visited Central Potato Research Station, Shillong on 8th

October, 2010. He was accompanied by Ms. P Syiemlieh, Assistant Director, National Commission for Scheduled Tribes for the North Eastern region. Shri Myriaw visited the tissue culture laboratory, poly-houses and potato store. He showed keen interest in the production of quality seed of potato through tissue culture techniques and lauded the effort made by CPRS, Shillong in providing quality seed of potato to the tribal population. He showed his happiness towards the supply of seeds to farmers in the NE region, various demonstrations and training programmes organized by the station and overall work done at the station.



Shri OS Myriaw visiting Shillong museum

Ms. P Syiemlieh, Assistant Director, National Commission for Scheduled Tribes for the North Eastern region showed her satisfaction over the general administration and the handling of the scheduled tribe people of the region by the station's staff.

Scientists Meet at CPRI, Shimla

Scientists meet is a regular activity of the Institute, where scientists, technical workers and research associates meet to discuss & deliberate on latest emerging R & D issues. Following lectures were delivered & discussed during the last 6 months:

15.7.2010	Dr. Ravish Sharma	Bio Image Navigator Olympus FSX100
22.7.2010	Dr. Shashi Rawat, CPRI Shimla	Overview of International training on Bio-informatics at Wageningen University
22.7.2010	Dr. SK Chakraborty, CPRI Shimla	Interactive meeting on Agro Biotechnology Research in ICAR
15.10.2010	SD Fine Chemicals	Introduction to the new range of products for use in research
18.12.2010	Dr. PM Govindakrishnan, CPRI Shimla	Overview of study and exchange visit to CIP on Modelling tools.
18.12.2010	Dr. VK Dua, CPRI Shimla	Presentation on International training on prediction modeling at Wageningen University

Human Resource

Appointments

Name	Post	Joined on
Scientific		
Dr. Fand Babasaheb Bhaskar	Scientist, Entomology at CPRI, Shimla	27.8.2010
Dr. Dheeraj Kumar Singh	Scientist, Agriculture Extension at CPRI, Shimla	28.8.2010
Dr. A K Somani	Head, CPRS, Gwalior	28.8.2010
Dr. J S Minhas	Head, CPRS, Jalandhar	15.9.2010
Sh. Sanjay Kumar Yadav	Scientist, Agromony at CPRS, Shillong	27.8.2010
Kumari Bandana	Scientist, Biochemistry at CPRIC, Modipuram	17.9.2010
Sh. Malkhan Singh Gurjar	Scientist, Plant Pathology at CPRS, Shillong	1.9.2010
Sh. Rahul R Bakade	Scientist, Plant pathology at CPRS, Patna	18.9.2010
Dr. SK Kaushik	Joint Director, CPRI Campus, Modipuram	28.10.2010

Promotions

Name	To	Date
Technical		
Sh. Rakesh Mani Sharma, T-6	T-7-8	17.3.2010
Administrative		
Sh. Chet Ram Nahata, Sr. Stenographer	Private Secretary	25.10.2010
Sh. Hari Krishan Verma, PA	Private Secretary	25.10.2010
Sh. Dharam Dass Kashyap, UDC	Assistant	25.11.2010
Sh. Devendra Kumar, UDC	Assistant	26.11.2010
Financial upgradation granted to 16 administrative staff under MACP Scheme on different dates. These are: Sh. Jagtar Singh, Sh. R S Mehta, Sh. Roshan Lal, Sh. H K Sen, Sh. Lekh Ram, Sh. Miraj Ul-Haq, Smt. M. Lathika, Smt. I C Dharma Paul, Smt. Roseline, Sh. Laiq Ram, Ms. Reeta Walia, Sh. Amar Chand, Smt. Kanta Rani, Smt. Sonia Chauhan, Sh. Narender Paul and Sh. Ashish Kalyan.		

Transfers/ Selections

Name	From	To
Scientific		
Dr. Parveen Kumar, Sr. Scientist	CPRIC, Modipuram	As PS at CSSRI, Karnal on 30.9.2010
Dr. Babasaheb Fand Bhaskar, Scientist	CPRI, Shimla	NIASM, Baramati on 23.10.2010

Retirements

Name	Post	Retired on
Dr. J P Singh	Principal Scientist, CPRS, Jalandhar	31.8.2010
Dr. K R Dhiman	Principal Scientist, CPRS, Kufri	30.9.2010
Dr. Gulab Ram	Principal Scientist, CPRS, Patna	31.10.2010
Sh. V K Awasthy	T-5, CPRI, Shimla	31.10.2010
Sh. Jeet Ram	T-4, CPRI, Shimla	30.11.2010
Sh. Vijay Kumar	Assistant, CPRS, Kufri	31.7.2010
Sh. R R Das	Assistant, CPRS, Gwalior (Voluntarily retired)	1.8.2010
Sh. Roshan Lal Chauhan	Finance & Accounts Officer, CPRI, Shimla	31.8.2010
Sh. Ranvir Singh Mehta	Private Secretary, CPRI, Shimla	30.11.2010
Sh. Sheo Balak Paswan	SSS, CPRS, Patna	31.7.2010
Smt. Sumitra Devi	SSS, CPRIC, Modipuram	31.8.2010
Sh. Lal Singh	SSS, CPRI, Shimla	30.9.2010
Sh. Sarjeet Singh	SSS, CPRS, Jalandhar	31.10.2010
Sh. Inder Singh	SSS, CPRS, Kufri	30.11.2010

Demises

Name	Post	Date
Sh. Hari Dass	SSS, CPRI, Shimla	10.9.2010

Honours, Awards & Foreign Visits

CPRI, Shimla Bags Best Poster Award

The First Prize for the Poster Presentation was bagged by Drs. Vinay Sagar, A K Somani, R K Arora, Sanjeev Sharma, S K Chakrabarti and B P Singh for their research paper on 'Status of bacterial wilt of potato in Malwa region of Madhya Pradesh' during the National Symposium of Indian Phytopathological Society

on 'Perspective in the Plant Health Management' held at Anand Agricultural University, Anand from 14-16 December, 2010.

Foreign Visits

1. Dr. Jagesh Kumar, Scientist participated in training programme on Marker Assisted Selection at International Potato Centre, Lima-Peru w.e.f. 7.th June to 4th September, 2010.
2. Dr. Vinod Kumar, Sr. Scientist participated in International Training in Plant Variety Protection and DUS Testing for

Indian Experts at the National Institute of Agricultural Botany (NIAB), Cambridge, U.K. from 28th June to 09th July, 2010.

3. Dr. S.V. Singh, Principal Scientist and Dr. Parveen Kumar, Sr. Scientist, CPRI Campus Modipuram attended International Symposium on Agronomy and Physiology of Potato at Navsehir, Turkey from 20-24 September, 2010.
4. Dr. B.P. Singh, Director visited Bhutan as a part of Indian delegation w.e.f. 20-25 September, 2010.
5. Sh. A.K. Singh, Chief Administrative Officer participated in exposure training and orientation to research grants management, project monitoring at Cornell University, Ithaca, USA during 4-15 October, 2010.
6. Dr. R.K. Arora, Principal Scientist, CPRS, Jalandhar participated in the Regional Workshop of Seed Potatoes for Asian Countries at Bandung, Indonesia during 19-21 October, 2010.
7. Dr. B.P. Singh, Director, Dr. S.K. Kaushik, Jt. Director and Dr. S.K. Chakrabarti, Head participated in the ABSP-II partner level meeting during 3-4 November, 2010 at Dhaka, Bangladesh.
8. Dr. P.M. Govindkrishnan, Principal Scientist participated in CIP Study and Exchange Program during 16-28 November, 2010 at International Potato Centre, Lima-Peru.

Fellowship to CPRI Scientist

Dr. Brajesh Singh, Senior Scientist (Plant Physiology) was admitted as the Fellow of Indian Society for Plant Physiology, New Delhi for the year 2010. He received

the certificate during the ISPP seminar held at BHU, Varanasi during November 25-27, 2010.

Future Activities

Trainings on Potato Cultivation

Division of Social Sciences, CPRI, Shimla is planning to hold a training programme on potato cultivation for the farmers of Gujarat in the 3rd Week of February, 2011.

Two trainings on potato cultivation practices are planned in the month of February for the farmers of Kangra and Mandi districts of Himachal Pradesh under the Mini Mission programme.

National Consultation and Udyan Mela

CPRI in collaboration with Indian Potato Association is organizing a National Consultation on "Production of Disease Free Quality Planting Material Propagated Through Tubers and Rhizomes" during 4-5 March 2011 at CPRI Campus, Modipuram.

An Udyan Mela is also being organized at CPRI Campus, Modipuram during 5-6 March 2011. About 2500 farmers are participating in this Udyan Mela and large number of public and private institutions are participating and putting up their exhibition at the venue.

International Potato Events

Following international potato events are planned to be held during the future months:

Canada: A Global Potato tour is scheduled to take place during the last week of February 2011. The venue will be the largest potato producing

province of Canada - Prince Edward Island.

South America: Another global potato tour is being planned for South America in March/April 2011.

The Netherlands: Potato Europe 2011 is being hosted in the Kain city of The Netherlands during 7-8 September 2011.

China: China Potato Expo 2011 is being organized during April 20-22, 2011 at National Agriculture Exhibition Center, Beijing, China.

Source: Internet

Article on Potato

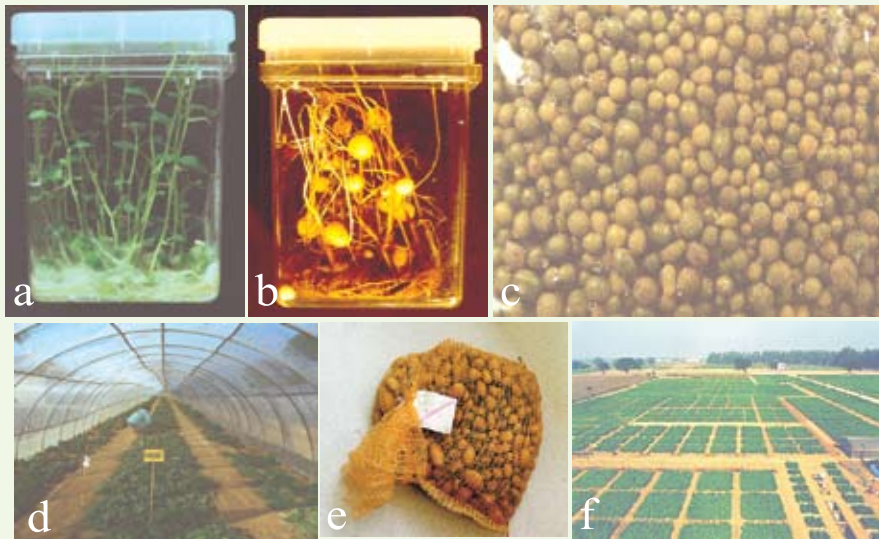
Role of Biotechnology in Potato Improvement

Potato has always been a close companion to biotechnology. It is, therefore, not surprising that potato is one of the first beneficiaries of many biotechnological advances. This new-world crop with a history of only 300 years of cultivation in rest of the world was one among the few to have received the attention to a wide range of biotechnological manipulations since the early 1990s. Tremendous advances and refinements in the techniques of plant biotechnology have allowed the problems of crop productivity and quality to be improved in new ways without adverse effects on desired crop traits. Potato, being vegetatively propagated crop, is highly amenable to asexual clonal propagation techniques in vitro and consequently genetic engineering. Although, the crop has been a real challenge for genetic studies using molecular markers owing to tetraploidy with tetrasomic inheritance, molecular mapping and functional genomics

studies have made rapid progress in recent years. Besides, potato has the distinct advantage of possessing a commercially viable carbon sink in the form of tuber. Therefore, it has also been looked upon as a potential bioreactor for the production of novel compounds of therapeutic and industrial values. This reflects the importance of potato throughout the world, the relative ease with which the crop can be manipulated through biotechnological means, and genetic limitations associated with traditional potato breeding owing to sterility, tetraploidy and high level of heterozygosity. A brief account of successful application of biotechnology in potato production and improvement is discussed here.

In Vitro Culture

Potato is perhaps the premier example of a crop plant to which in vitro technology has been most extensively applied in all aspects of production, improvement and germplasm handling. The propagation method and the genetic nature of this crop impose several limitations on seed multiplication, conservation of genetic resources and genetic improvement. Problem driven use of in vitro technology in potato has been instrumental in addressing all these inherent problems associated with vegetatively propagated, heterozygous polyploid crop. The first successful establishment of tissue cultures from potato tubers was reported as early as 1951. Since then, the in vitro produced disease-free plants, somaclones, haploids and somatic hybrids, plants resistant to diseases and microtubers produced in test tubes have been moved from the laboratory to the field and propagated on a large scale in various countries.



Steps in producing tissue culture raised planting materials in potato.

a: potato micro-plants growing in vitro, b: microtubers produced in vitro, c: microtubers after greening, d: G1 crop inside a nethouse, e: minitubers harvested from G1 crop, f: G2 crop.

Potato, being a vegetatively propagated crop, seed is conventionally produced through repeated clonal multiplication of tubers, which has low multiplication rate and risk of accumulation of degenerative viral diseases in the resulting seed. As a result non-availability vis-à-vis high cost of good-quality seed is the major constraint in potato production, especially in the developing countries. Making use of the enormous regenerating capacity and the inherent totipotency of cells and isolated protoplasts, *in vitro* asexual multiplication of plant tissues is exploited for potato propagation multiplication in mass scale for commercial planting. Nodal segment culture in which axillary buds and terminal buds grow into new plants is predominantly used for the initial *in vitro* shoot multiplication in potato. *In vitro*-derived microplants are used either as direct transplants in the greenhouse/field for the production of minituber/tubers or as explant sources for the production of microtubers *in vitro*. Micropropagation revolutionizes potato seed production system by supplying disease-free transplants

without any seasonal barrier. *In vitro* potato cultures have also been used to conserve and distribute valuable genetic resources, which are otherwise difficult or impossible using the conventional approaches.

Microtuber has subsequently augmented potato seed production. Microtubers are miniature tubers developed under tuber-inducing conditions *in vitro*. These small dormant tubers are particularly convenient for handling, storage and distribution. Unlike micropogated plantlets, they do not need the time-consuming hardening period in a greenhouse, and can be adopted easily to large-scale mechanized planting in the field. The ease, with which microtubers can be produced, handled and exported bolsters potato seed production schemes.

Potato viruses and virus-like agents are a detriment to crop productivity. In addition to direct crop loss it also cripples seed production by affecting seed vigour and quality. In absence of chemical control measures, meristem culture technique offers

solutions to effectively eliminate virus infection from the systemically infected potato cultivars. This technique is based on the observation that extreme shoot apex is free from viruses and involves culturing of small apical meristematic region of stem tip or axillary bud on a nutrient medium for plant regeneration under aseptic conditions. Meristem culture was the first biotechnological approach successfully adopted and applied, as such or in combination with thermotherapy or chemotherapy, to obtain virus-free stocks for further propagation as well as for the production of clean seeds. This method of using disease-free stocks combined with *in vitro* clonal propagation has become an integral part of seed production in many countries over the years and resulted increased yield.

Somatic hybridization through fusion of protoplasts has been extensively used in potato. Interspecific protoplast fusion for regeneration of somatic hybrids between *Solanum tuberosum* x *S. chacoense*, *S. tuberosum* x *S. brevidence* and *S. tuberosum* x *S. nigrum* has resulted introgression of disease resistance from wild species to the cultivated crop. This is also a powerful tool to introduce genetic variability in this crop. Exposure of mesophyll protoplasts of early blight susceptible cultivars, Russet Burbank, to the culture filtrate of *Alternaria solani* (causing early blight) resulted clones resistant to inoculation by conidia of *A. solani*, as well as field resistance. Likewise, cell cultures of diploid potato exposed to culture filtrates of *Phytophthora infestans* (causing late blight, the most devastating fungal disease of potato) yielded variant cell lines, which upon regeneration into whole plants showed resistance to infection. By fusing protoplasts of

a wild resistant species, *S. chacoense*, with those of *S. tuberosum*, the disease resistance was transferred to the later. Resistance to potato viruses, X, Y, PLRV, and also resistances against the cyst nematode have been introduced by using pollen-derived plants. These resistances followed quantitative as well as qualitative modes of inheritance. Similarly, transfer of resistance to PLRV from *S. brevidence* to *S. tuberosum* has been achieved through protoplast fusion. Selection of desirable somaclones for virus resistance is another potential approach. Following this approach protoclones of Russet Burbank resistant to PVY has been obtained. There appears to be no known source of genetic resistance to PSTVd, and in this case somaclonal variation may provide an alternate source of resistance.

In vitro technology has facilitated the production of haploids and their utilization in potato improvement programmes. By conventional methods it may take 6-8 years to obtain a stable pure line for incorporation into breeding programmes. This period can, however, be reduced to a few months through the use of anther/pollen culture, and selection can be made at the F1 level. Furthermore, in potato, which is essentially an autotetraploid ($2n = 4x = 48$) the importance of its reduction to dihaploid ($2n = 2x = 24$) and monohaploid ($2n = 1x = 12$) for breeding improved clones is obvious. The monohaploid and dihaploid cell and protoplast cultures are being used to facilitate mutation work. As already mentioned, dihaploid potato cell cultures are used for selection of resistance against *P. infestans*.

In vitro technique has facilitated conservation and international

exchange of germplasm in an unprecedented way. Large number of related species and high heterozygosity impose serious constraints in conservation of germplasm employing conventional procedures. The situation is more aggravated owing to the fact that many wild potato genotypes do not tuberize under certain environmental conditions. Therefore, in vitro storage and cryo-conservation have been developed for conservation of potato genetic resources. Moreover, these techniques have facilitated international exchange and distribution of valuable clonal material in disease-free condition and in less restrictive way. Potato is a pioneering example where in vitro approach has been successfully adopted for germplasm movement across the world. The International Potato Centre (CIP), Lima, Peru has played a leading role in development of in vitro based technologies for exchange and distribution of potato germplasm worldwide.

In India, research on in vitro potato cultures dates back to the late 1970s at Central Potato Research Institute, Shimla. The initial emphasis had been to explore the biotechnological means for integration into disease-free potato seed production. Meristem culture technique in combination with viral diagnostic procedures was successfully used to eliminate major viruses from Indian potato cultivars. Methods were developed for large-scale laboratory propagation (micropropagation) of virus-free potato clones, and subsequently towards the end of 1980s microtuber-minituber schemes were integrated into potato-seed production programmes. Tissue-culture technique employing in vitro minimal growth

approach has been used to conserve valuable potato germplasm resources collected from all over the world, and newer approaches have been developed for cryopreservation of shoot tips for long-term conservation of potato germplasm.

Molecular Markers

In the past decade, use of molecular marker has emerged as a powerful approach to research in plant science because of its use on diverse aspects of crop improvement. Successful applications include cultivar identification and protection, estimation of genetic diversity, analysis of breeding systems, detection of mutations, conservation of genetic resources, marker-assisted selection and map-based cloning of gene. Researchers from different countries are now increasingly using DNA fingerprinting based identification and assessment of genetic diversity. Many economically important traits, both qualitative and quantitative, are tagged with DNA markers. The linked markers will greatly assist in preservation and exploitation of germplasm, allow marker-aided selection and facilitate in generating particular combinations of resistance gene and in resistance gene introgression in elite cultivated species. In potato, the major emphasis of molecular marker studies is directed towards identification of location of disease resistance genes or loci. Resistance gene deployment is the major components of many breeding programme in potato. Molecular mapping of late blight resistance genes in potato needs special mention here. Late blight resistance is governed by many genes/loci encompassing both race specific and general resistance. Genes or loci conferring both types

of resistance are identified and located at different chromosomes in potato. Scientists worldwide are now focusing on cloning and characterization of those genes or loci.

DNA fingerprinting of all the Indian potato cultivars using different techniques was accomplished and a fingerprinting database was created at Central Potato Research Institute for cultivar identification and assessment of genetic diversity. Efforts are now directed to identify molecular markers tightly linked to late blight resistance to be used in molecular diagnostic of late blight resistance to complement breeding programme.

Virus/Viroid Detection

As already mentioned, potato harbours many viruses and viroids, which deteriorate the seed tuber quality subsequently affecting yield adversely. Therefore, availability of virus-free healthy planting stocks is the foremost requirement for economical potato cultivation. Most of the potato producing countries has established seed multiplication and certification systems to ensure regular supply of healthy seed potatoes. Molecular tools for virus/viroid detection coupled with rapid multiplication *in vitro* have revolutionized potato seed production programme in many countries in an unprecedented way. Viral infection is detected through immunodiagnosis or serodiagnosis of specific viral antigens. The immunological techniques being employed are Enzyme Linked Immunosorbent Assay (ELISA), Immuno Electron Microscopy (IEM), Immunofluorescence etc. In recent days, nucleic acid probe based test, variously termed as spot hybridization, sap-spot hybridization, dot blot hybridization or nucleic acid spot hybridization (NASH), is favoured because of its universal applicability

for the detection of both viruses and viroids (because of lack of presence of any protein components in viroids, serological test can not detect viroids) and high sensitivity. The use of NASH was first introduced in 1981 for the detection of viroids and subsequently, it has become the technique of choice for viroid detection.

Major potato viruses are routinely being tested through ELISA in tuber indexing programme at Central Potato Research Institute. The disease free indexed tubers are multiplied for production of nucleus seed. In addition, quarantine clearance of exotic potato germplasm received in the country is one of the responsibilities of CPRI. The exotic potato germplasm is checked for viroid infection through NASH test.

Potato Genetic Engineering

Genetic engineering by employing different strategies for virus resistance is one of the major success stories in potato transgenic biology. The best-documented approach for generating virus resistant transgenic potato is coat protein-mediated resistance, now widely effective against PVX, PVY and PLRV. A novel strategy has been employed to control viroids, which encode none of the proteins necessary



Field evaluation of RB-transgenic potato lines against late blight. The surviving green plants are RB-transgenic potato; all other varieties are totally killed by late blight pathogen.

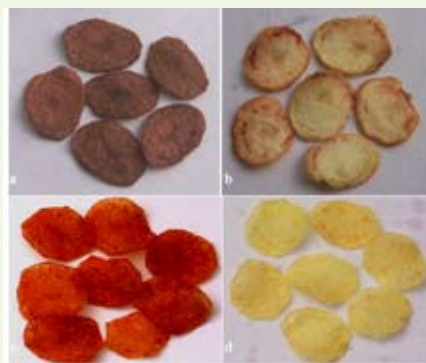
to support their own replication but rely on host components for survival. Resistance against potato spindle tuber viroid (PSTVd) was achieved by expressing a double stranded RNA-specific ribonuclease from yeast. Since the first field test of transgenic potato expressing the coat protein gene, there have been many large-scale field trials of transgenic potato, which confirmed durability of the trait.

Fungal pathogens cause several important diseases in potato. Among these, late blight (caused by *Phytophthora infestans*) was responsible for the infamous Irish potato famine of 1845 and has become a global threat to potato production, especially during the last decade because of emergence of complex races of the pathogen. Among many strategies developed for genetic manipulation of fungal resistance, the strategy of inducing hypersensitive cell death in response to fungal attack at the site of infection has been employed successfully. Under this approach, a bacterial ribonuclease gene (barnase, which degrades ribonucleic acid) and an inhibitor of barnase, barstar, were introduced into potato. The two genes are engineered in transgenic potato in such a way that the level of barnase will exceed to that of barstar only in the close vicinity of infection sites leading to cell death specifically in infected host tissues that restricts spread of the disease. Recently, a dominant resistant gene (RB gene) has been cloned from wild potato species *S. bulbocastanum*. Introduction of RB gene into susceptible cultivars conferred late blight resistance. Limited field trials of RB transgenic potato lines conducted by Central Potato Research Institute demonstrated durable resistance under Indian condition.

Major plant carbohydrates such as cellulose, starch and sugar

are important raw materials in food, paper, textile, cosmetics, pharmaceuticals, plastics and adhesive industries. Genetic tinkering of plants has opened up the possibility of manipulating carbohydrate metabolism to suit industrial applications. Potato tuber being commercially viable sink for carbon, a significant amount of research is directed towards the control and manipulation of carbohydrate metabolism in potato with an aim to develop novel products. Transgenic potatoes have been developed through metabolic-manipulation of starch synthesis to predominantly produce only one type of starch, either amylose or amylopectin. Depending on the industrial applications, both amylose-rich starch and amylopectin-rich starch are required as binding materials. Attempts are also being made to produce novel carbohydrates like fructan and cyclodextrin that are routinely used in food and pharmaceutical industries. The horizon of possibility of exploitation of potato as a potential bioreactor has been expanded by the production of immunotherapeutic molecules such as vaccines for the improvement of human and animals' health. Edible vaccines against diseases like cholera have been produced in transgenic potato and are under clinical trials.

Plant storage proteins are utilized as the primary source of nutrition for human beings and livestock. Nutritional properties of proteins are influenced by parameters such as amino acid composition and protein digestibility. Potato protein suffers from deficiencies in sulfur containing amino acids. Plant breeding has had limited success in improving the nutritional quality of plant proteins. Introduction of gene encoding seed albumin protein from



Reduction of cold-induced sweetening of potato by genetic manipulation. a: Non-transgenic Kufri Badshah after 45 days storage at 4°C, b: Kufri Badshah overexpressing the tobacco invertase inhibitor gene, c: non-transgenic Kufri Chipsona 1 after 45 days storage at 4°C, d: Kufri Chipsona 1 transformed with RNAi construct for down-regulation of vacuolar invertase gene.

amaranth, which is rich in cysteine and methionine, has elevated the level of sulfur containing amino acids of potato proteins. Central Potato Research Institute (CPRI), Shimla in collaboration with National Centre for Plant Genome Research (NCPGR), New Delhi has already introduced this gene into several Indian potato cultivars. The evaluation trials are under progress. This may partly help addressing protein-calorie malnutrition in the country.

Besides nutritional improvement, CPRI scientists are also working on other aspects of potato biotechnology like improvement of processing attributes of potato tubers after cold storage, biotic stress tolerance against bacterial wilt and viral diseases. Transgenic potato lines to improve cold-chipping attributes by RNAi-mediated silencing of vacuolar invertase gene are in different stages of development and evaluation. CPRI has also undertaken collaborative research on developing potato transgenics with two other leading institutes – NRC on Plant Biotechnology, IARI, New Delhi, for insect resistance and Advanced Center on Plant Virology,

IARI, New Delhi for resistance to potato viruses.

Issues and Concerns for GM Potatoes

The economic and environmental benefits of transgenic crops including potato are enormous. However, in the wake of public concerns regarding the food and environmental safety of the transgenic crops, a need has arisen to deal these issues critically. As transgenic crops are being developed using genes from diverse sources, people are apprehensive that GM food might not be safe for consumption and/or for environment. A major concern against GM crops is possible development of allergies. It is needless to mention that no food is inherently safe. A number of anti-nutritional factors, toxins and allergens are present in most food sources, albeit at low concentrations (classical examples are peanut, milk and sea foods). They are considered safe because of history of safe use as food. The occurrence of unintended effects of expression of toxins or anti-nutrient or allergen is negligible in genetically modified foods as compared to that produced by conventional crop breeding. For example, high glycoalkaloid concentrations were found in the conventionally bred potato variety Lenape. This variety was subsequently withdrawn by U.S. Department of Agriculture. However, no such stringent safety evaluation rules are enforced in the developing countries for conventionally bred varieties. Therefore, the allergenic risks posed by GM plants are in principle no greater than those posed by conventionally derived crops. Nevertheless, it is important to consider potential allergenic risks posed by GM plants. In fact, extensive

data on allergenic response of GM food is generated before its approval by regulatory authority.

Public concerns are raised against possible environmental pollution and food contamination by the GM crops. Pollen from transgenic plants may migrate to neighbouring species. However, creation of chimeric plant species or super-weed because of fertilisation by such pollens is just an imagination without any scientific truth. Because of natural trans-species barriers, fertilisation by migrating pollen never takes place with other plant species. To overcome such apprehensions it is necessary to generate sufficient data on dispersal of novel traits through pollens. It is also necessary to ban cultivation of GM crops in the Centre of origin of that particular crop. It has also been opined that Bt transgenic pollen will affect the population of non-target beneficial insects. However, elaborate experiments conducted by highly acclaimed entomologists demonstrated that such a risk, if at all present, is only negligible. The concern of creating resistant insect population is a genuine risk for not only Bt toxin but for all insecticides. This risk is being

evaluated very closely during cultivation of transgenic crops for the last 8 years and not a single case has so far been reported. Nevertheless, appropriate measures (refugia, gene pyramiding etc.) should always be taken to minimize the risk.

It is very essential that India should promote need based transgenic research keeping in view national priorities and social/religious issues. Although, an open market economy is favoured, transgenic research in the hands of a few multinational companies may not be favourable for small and marginal farmers, as research in the private sector is mainly driven by profits. Indian Council of Agricultural Research has an important role to play to make its institutes competitive and productive to combat polarization of transgenic research and also to develop public-private linkages in this field. However, the potential of biotechnological research will not be tapped unless people are educated about the safety and benefits of transgenics, especially in wake of anti-GM zeal driven by some vested interests. Both the authorities and researchers have daunting task

ahead to educate people to remove misconceptions about GM food. In fact, artificial genetic modifications of crops and organisms had been started since the dawn of human civilization when people started selection of better crop plants and organisms. Moreover, the process of natural selection continues unnoticed in the process of evolution. Therefore, genetic modification of organisms through biotechnological means should not be viewed as witchcraft.

Conclusions

From the 16th century Andean highlands to the 21st century cultivated potato species worldwide, biotechnology has transformed potato from test tube to the field in such a way that its production, especially in developing countries, has outpaced all other crops. These developments have far-reaching implications not only in the production and improvement of present day potato but also for the induction of genetic variability, which would enable the synthesis of novel future potatoes.

- *Debasis Pattanayak, VU Patil, Jagesh Tiwari, SK Chakrabarti and BP Singh*

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संसदीय राजभाषा समिति का ऊटी दौरा

माननीय संसदीय राजभाषा समिति ने 10 जुलाई, 2010 को संस्थान के ऊटी स्थित केन्द्र में राजभाषा संबंधी कार्यों का निरीक्षण किया। उन्होंने ऊटी केन्द्र के राजभाषा कार्यों की भरपूर प्रशंसा की और केन्द्र में हिन्दी के प्रयोग को बढ़ावा देने की दिशा में कुछ महत्वपूर्ण सुझाव दिए। इस अवसर पर लोकसभा के सांसद डा. प्रसन्न कुमार पाटसाणी ने बैठक की अध्यक्षता की। उनके साथ श्री किशन भाई वी. पटेल, श्री धर्मन्द्र यादव, श्री रमेश बैस, श्री वाई.पी. त्रिवेदी आदि सांसद उपस्थित थे।

सर्वप्रथम केन्द्र के अध्यक्ष, डा. टी.ए. जोसफ ने सभी उपस्थित सांसदों का स्वागत करते हुए उन्हें केन्द्र में हो रहे अनुसंधान कार्यों के साथ-साथ हिन्दी प्रगति की जानकारी दी। संस्थान के निदेशक, डा. बीर पाल सिंह तथा परिषद् के सहायक महानिदेशक (बागवानी), डा. उमेश श्रीवास्तव तथा निदेशक (राजभाषा) श्री हरीश चन्द जोशी व संस्थान के सहायक निदेशक (राजभाषा) श्री प्रवीन चांदला ने समिति के प्रश्नों के उत्तर संतोषजनक तरीके से दिए। इस अवसर पर संस्थान द्वारा प्रकाशित हिन्दी प्रकाशनों तथा आलू की विभिन्न किस्मों

एवं उत्पादों की प्रदर्शनी भी लगाई गई। कुल मिलाकर समिति का यह दौरा हर दृष्टिकोण से सफल रहा।

संस्थान ने मनाया हिन्दी चेतना मास

भारत सरकार की राजभाषा नीति के कार्यान्वयन व सरकारी कामकाज में हिन्दी के प्रभावी प्रयोग में गति लाने के उद्देश्य से वैसे तो सालभर प्रयास किए जाते हैं किन्तु हिन्दी चेतना मास के अवसर पर इस ओर विशेष ध्यान दिया जाता है। इसी कड़ी में इस वर्ष 14 सितम्बर से 13 अक्टूबर, 2010 के दौरान संस्थान के

मुख्यालय में हिन्दी चेतना मास का आयोजन किया गया। संस्थान के निदेशक डा. बीर पाल सिंह ने 14 सितम्बर को इस आयोजन का विधिवत उद्घाटन किया। हिन्दी दिवस के मौके पर हिमाचल प्रदेश प्रशासनिक सेवा से सेवानिवृत्त श्रीयुत् श्रीनिवास जोशी के विशेष व्याख्यान ने इस आयोजन को यादगार बना दिया।

सम्पूर्ण माह तक चलाए गए इस आयोजन के दौरान संस्थान के लिपिकों के लिए हिन्दी कार्यशाला का आयोजन किया गया। इस कार्यशाला में कर्मचारियों को भारत सरकार की राजभाषा नीति की जानकारी देने के साथ-साथ हिन्दी के प्रयोग, हिन्दी शब्दावली, नोटिंग-ड्राफ्टिंग संबंधी जानकारी दी गई। इस दौरान कम्प्यूटर पर हिन्दी टाइपिंग, हिन्दी स्मरण शक्ति, राजभाषा शब्द ज्ञान, हिन्दी निबन्ध, हिन्दी टिप्पण एवं प्रारूप, चित्र कहानी तथा प्रश्नमंच जैसी प्रतियोगिताओं का आयोजन किया गया। इन प्रतियोगिताओं में वैज्ञानिकों सहित हर वर्ग के कर्मचारियों ने भाग लिया।

हिन्दी चेतना मास का समापन व पुरस्कार वितरण समारोह का आयोजन 23 अक्टूबर, 2010 को संस्थान के सभागार में किया गया। इस अवसर पर संस्थान के निदेशक डा. बीर पाल सिंह, अखिल भारतीय समन्वित अनुसंधान परियोजना (आलू) के परियोजना समन्वयक डा. प्रकाश श्यामराव नाइक तथा संस्थान के मुख्य प्रशासनिक अधिकारी श्री अनिल कुमार सिंह ने संयुक्त रूप से प्रतिभागियों को पुरस्कार देकर सम्मानित किया। संस्थान के सहायक निदेशक (राजभाषा) श्री प्रवीन चांदला ने अपने संबोधन में राजभाषा और हिन्दी कार्यान्वयन की महत्ता पर प्रकाश डाला। संस्थान के निदेशक एवं

परियोजना समन्वयक महोदय ने कर्मचारियों को अपना अधिक से अधिक सरकारी कामकाज हिन्दी में करने का आह्वान किया।

प्रश्नमंच एवं नोटिंग-ड्राफ्टिंग में संस्थान का पहला स्थान

नगर राजभाषा कार्यान्वयन समिति, शिमला के तत्वाधान में आयोजित हिन्दी प्रतियोगिताओं में इस बार प्रश्नमंच प्रतियोगिता में संस्थान के श्री हीरा नन्द शर्मा एवं श्री चन्द्र मोहन सिंह बिष्ट की जोड़ी पहले नम्बर पर रही है जबकि नोटिंग एवं ड्राफ्टिंग प्रतियोगिता में श्रीमती पूनम सूद अब्बल रहीं। इन्हें नराकास के वार्षिक समारोह में सम्मानित किया गया। उल्लेखनीय है इन प्रतियोगिताओं में शिमला स्थित केन्द्रीय सरकार के कार्यालयों, उपक्रमों, निगमों एवं बैंकों के प्रतिनिधि भाग लेते हैं।

दीपावली मेला सम्पन्न

संस्थान के मुख्यालय की स्टाफ वेलफेयर एसोसिएशन के तत्वाधान में 22 अक्टूबर, 2010 को संस्थान के परिसर में बड़ी धूमधाम से दीपावली मेला आयोजित किया गया। मेले का उद्घाटन श्रीमती मधु सिंह ने किया। इस अवसर पर मोटर बाइक, म्यूज़िकल चेयर, पेंटिंग, मेंहदी, श्री एवं श्रीमती भाग्यशाली जैसी कई आकर्षक प्रतियोगिताएं आयोजित की गईं। तम्बोला, लक्की सेवन, केच द टार्गेट जैसे स्टाल आकर्षण का केन्द्र रहे। इस बार मेले में बुनकर, टाटा इन्डीकॉम, एयर सेल, आइडिया जैसी कम्पनियों ने अपने उत्पादों की बिक्री व प्रचार भी किया। खाने-पीने के विभिन्न स्टालों में अच्छी-खासी भीड़ रही। लक्की ड्रा और प्रतियोगिताओं के विजेताओं को मुख्य अतिथि

व निदेशक महोदय ने पुरस्कार देकर सम्मानित किया। मेले के सफल आयोजन के लिए निदेशक महोदय ने एसोसिएशन के सचिव श्री नरेश कुमार शर्मा व उनकी टीम के सदस्यों की भूरि-भूरि प्रशंसा की।



दीपावली मेला

संस्थान के केन्द्रों में हिन्दी पखवाड़ा

जहां एक ओर संस्थान के मुख्यालय में हिन्दी चेतना मास का आयोजन सफलतापूर्वक किया गया वहीं दूसरी ओर इस आयोजन में संस्थान के मोदीपुरम परिसर, पटना, ग्वालियर व शिलांग केन्द्र भी पीछे नहीं रहे।

संस्थान के मोदीपुरम परिसर 14-18 सितम्बर, 2010 के दौरान हिन्दी पखवाड़े का आयोजन किया गया। इस अवसर पर आशुभाषण, कम्प्यूटर पर हिन्दी टाइपिंग, निबंध लेखन, मौखिक सामान्य ज्ञान, हिन्दी नोटिंग एवं ड्राफ्टिंग, कृषि एवं आलू संबंधी सामान्य ज्ञान, प्रश्नोत्तरी व स्वरचित काव्य पाठ प्रतियोगिताओं का आयोजन किया गया। पहला, दूसरा व तीसरा स्थान पाने वाले प्रतिभागियों को पुरस्कार देकर सम्मानित किया गया।

संस्थान के पटना केन्द्र में केन्द्र के अध्यक्ष डा. राजेन्द्र प्रसाद राय की अध्यक्षता में हिन्दी दिवस



पुरस्कार वितरण समारोह



मेले का उद्घाटन



पुरस्कार वितरण समारोह

समारोह का आयोजन किया गया। इस आयोजन में हिन्दी सलाहकार समिति के सदस्य श्री वीरेन्द्र कुमार यादव मुख्य अतिथि के रूप में उपस्थित थे जबकि प्रोफेसर (श्रीमती) भुपेन्द्र कलसी, पूर्व प्राध्यापक, हिन्दी विभाग, मगध विश्वविद्यालय, बोध गया तथा डा. जर्नादन जी, प्रधान वैज्ञानिक व सह अध्यक्ष (राजभाषा), भारतीय कृषि अनुसंधान परिषद् (पूर्वी क्षेत्र), पटना ने विशेष अतिथि के रूप में समारोह में भाग लिया।



शिलांग केन्द्र में हिन्दी दिवस

संस्थान के शिलांग केन्द्र में हिन्दी दिवस के उपलक्ष्य में भाषण और अनुवाद प्रतियोगिता का आयोजन किया गया। इस आयोजन में सर्वे ऑफ इण्डिया, शिलांग के वरिष्ठ स्थापना एवं लेखा अधिकारी ने मुख्य अतिथि के रूप में शिरकत की तथा प्रतिभागियों को पुरस्कार देकर सम्मानित किया गया। उन्होंने अपने संबोधन में राजभाषा हिन्दी की महत्ता की जानकारी दी तथा केन्द्र में हिन्दी के विकास के लिए किए जा रहे प्रयासों की सराहना की।



ग्वालियर केन्द्र में हिन्दी पखवाड़ा

संस्थान के ग्वालियर केन्द्र में 14-30 सितम्बर, 2010 के दौरान हिन्दी पखवाड़ा मनाया गया। इस अवसर पर निबन्ध लेखन, तत्काल भाषण, अंताक्षरी और शुद्ध हिन्दी लेखन जैसी प्रतियोगिताओं का आयोजन किया गया तथा केन्द्र के अध्यक्ष डा. अशोक कुमार सोमानी ने विजेताओं को पुरस्कार देकर सम्मानित किया। अपने सम्बोधन में उन्होंने बताया कि ग्वालियर स्थित 76 कार्यालयों में हिन्दी के अधिकाधिक प्रयोग के मामले में उनका केन्द्र प्रथम दस कार्यालयों की सूची में शामिल है। उन्होंने कर्मचारियों से आह्वान किया कि कार्यालय में हिन्दी के प्रयोग को निरन्तर बढ़ाते रहें। डा. शिव प्रताप सिंह के धन्यवाद प्रस्ताव के साथ कार्यक्रम सम्पन्न हुआ।

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केन्द्रीय आलू अनुसंधान केन्द्र, ग्वालियर मध्य प्रदेश में गाजर घास, कांग्रेस घास आदि नामों से जानी जाने वाली Parthenium weed को उखाड़ने हेतु जागरूकता अभियान एक पखवाड़े के रूप में दिनांक 05 अगस्त, 2010 से 17 अगस्त, 2010 तक मनाया गया। इस संबंध में केन्द्राध्यक्ष की अध्यक्षता में दिनांक 04.08.2010 को एक सभा का आयोजन किया गया। जिसमें समस्त वैज्ञानिकों, तकनीकी सहायकों एवं फार्म अधीक्षक ने भाग लिया। केन्द्र पर कार्यरत कुशल सहायी कर्मचारियों ने गाजर घास को जड़ से उखाड़ने का कार्य केन्द्र के बी ब्लॉक (59.45 ha) से प्रारंभ कर क्रमशः ए ब्लॉक (28.03 ha) सी ब्लॉक (12.20 ha) एवं डी ब्लॉक (14.4 ha) में किया। यद्यपि ए व बी ब्लॉक्स में गाजरघास के कम पौधे थे लेकिन उन खेतों में गाजर घास के पौधों की संख्या अधिक थी जहां पर खेत ज्यादातर खाली पड़े रहते हैं। इस पखवाड़े में प्रतिदिन 2 से 3 टाली गाजरघास के पौधे जड़ से उखाड़कर और उसे उसी दिन एकत्रित कर टैक्टर टाली में डालकर गहरे गडढे में नष्ट किया गया।

पखवाड़े में केन्द्र के लगभग 120 हक्टेयर क्षेत्र से करीब 10 से 15 टाली गाजरघास निकाली गई। केन्द्र परिसर एवं प्रक्षेत्र को गाजरघास मुक्त करने का सफलतम प्रयास किया गया है। कार्यक्रम को सफल बनाने के लिए कुशल सहायी कर्मचारियों, तकनीकी सहायकों ने केन्द्राध्यक्ष एवं केन्द्र पर कार्यरत वैज्ञानिकों की उपस्थिति एवं निर्देशन में कार्य किया।

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