Although potato is a wholesome food crop, it is unfortunate that it is a fragile commodity in terms of storage. As it represents a bulky perishable commodity, the potato production in a sub-tropical climatic conditions as in India is essentially conditioned by storage options. Consequently, the potato scientists working in any discipline are practically obsessed by storage-mania. There are distinct storage requirements for ware, processing and seed potatoes. In contrast to potato harvest followed by cold winter in temperate countries, it is followed by hot and humid summer in sub-tropical Indian conditions. And that was why the potato storage at high temperatures constituted one of the major research agenda during the formative period of potato research and development in the country just after independence. No doubt we have been successful in establishing a cold chain for refrigerated potato storage over the past few decades. But in a vast country like India, where the farming community essentially comprises millions of poor and marginal farmers, non-refrigerated storage can truly be the only viable option for sustaining the potato production and its emerging processing sector. In non-refrigerated storage, CIPC (isopropyl-N-3-chlorophenyl carbamate) is the most effective sprout inhibitor, although other suppressants like methyl ester of α-naphthalene acetic acid (MENA), maleic hydrazide (MH), Tetra chloro-nitro benzene (TCNB) and Tixit-C are also reported for their varying efficacies. The Institute has developed effective technologies for potato storage at high temperatures with CIPC treatment over the past few years. In this issue, the thematic article is on this aspect with information of technology, its economics and requirements for sustaining this storage option in the country. But we have to look beyond CIPC. In this era of sustainable crop production and management, there is an urgent need to develop effective bio-formulations to attain potato storage at high temperatures with much ease and alacrity. This necessarily calls for more basic and strategic research in this front.

**ISSUE HIGHLIGHTS**

- From Director’s Desk: 1
- Minister’s Visit: 2
- Research Highlights: 2
- Training & Technology Transfer: 3
- Important Meetings: 7
- Invited lectures & Visitors: 9
- Human Resource: 9
- Awards and Honours: 10
- Future Activities: 11
- Potato Facts: 11
- Articles on Potato: 12
Hon'ble Minister of State visits CPRI

Hon'ble Minister of State was informed about the ongoing research programmes at the campus and the progress made so far, especially in the field of breeders seed production and varietal improvement.

Hon'ble minister addressed the scientific staff of all the three ICAR Institutes viz. Central Potato Research Institute Campus, Modipuram, Project Directorate for Cropping Systems Research and Project Directorate on Cattle. He was of opinion that although unprecedented achievements in the field of agriculture through scientific intervention have been made but a lot more needs to be done keeping in view the changing world order especially with respect to WTO. Besides providing self-sufficiency in food, we have to provide balanced nutrition as well as enhance the income of the farming community. Our research efforts should be directed towards fulfilling these objectives.

Research Highlights

Potato Apical Leaf Curl Virus Disease: An Emerging Threat to Potato Cultivation in India

Potato apical leaf curl caused by potato apical leaf curl begomovirus is an emerging major disease, limiting potato production in the country. Sporadic incidence of this disease was noticed first time in December, 1996 at Hisar in Haryana. Later on, it was reported from Punjab and Western UP. The virus is spread by white flies (Bemisia tabaci) and the progress of the disease has positive correlation with white fly population and infestation period. In potatoes, apical leaf curl is a highly polycyclic disease because viruliferous white flies are very active fliers and feeders causing primary and secondary infections quickly within a single crop season.

Being a tuber borne disease, its incidences have been reported from several parts of the country. The disease causes severe yield losses (up to 30-40%) in early sown (1st week of October) susceptible potato cultivars in north Indian plains. The disease incidence varies from year to year depending on
weather conditions, vector population and cropping patterns of the area. White flies are highly polyphagous and have been reported to feed on more than 500 plant species in India. High incidence of apical leaf curl prevails in Hisar, Sirsa, Ambala and Kurukshetra districts (adjoining areas of cotton belt) as cotton crop harbours white flies that migrate to potato crop in October (after harvesting of cotton). In central, eastern and southern parts of the country, the white fly population remains high through out the potato season due to congenial higher temperatures. Recently, large population of white flies and apical leaf curl virus like symptoms in potato plants have been observed at Chhindwara (MP), Raipur (Chhattisgarh) and Bhubaneswar (Orissa). Disease incidence remains low, where large areas are planted with variety Kufri Bahar, having a good degree of resistance/tolerance against the disease.

Management
Following management strategies are essential to control apical leaf curl virus (ALCV) menace in potato.

1. Use of disease-free seed of resistant/tolerant varieties (Few Indian varieties have resistance/tolerance to ALCV, Kufri Bahar is the most resistant/tolerant variety).

2. Delayed planting (last week of October/1st week of November in north Indian plains) in susceptible varieties to skip white flies. However, delayed planting can lead to yield reduction, exposure to late blight in later part of the season and also disturb cropping sequence.

3. White flies can effectively be controlled by potato seed tuber treatment with imidacloprid @ 0.004% a.i. conc. (10 minutes dip) followed by need based sprays of imidacloprid @ 0.002% a.i. conc. at complete crop emergence and later on. Efficacy of imidacloprid can further be improved by its application with summer oil (1%).

4. Use of trap crops like oat and fenugreek sown and transplanted, respectively, 10-15 days earlier than potato can offer better protection against white flies.

Future strategies

1. National Survey on population dynamics of white flies and ALCV incidence in major potato growing areas to identify relatively white fly free potato growing periods.

2. Identification of ALCV resistant parental lines and their use in breeding programmes.


4. Presently only one insecticide (imidacloprid) is used to control white flies. Resistance development may pose a problem in future. Therefore, few more insecticides need to be identified for control of this vector.

5. The natural parasitoids like Encarsia spp., insecticidal fungus Verticillium lecanii and plant products like neem extract have considerable potential for eco-friendly control of white flies.

-BS Lakra (CCSHAU, Hisar), RS Chandel (CPRS, Kufri) KC Thakur and PS Naik (AICRP, Shimla).

DUS Testing of potato varieties
A three-day training course on ‘DUS Testing of potato varieties—principles and procedures’ was organized at Central Potato Research Institute Campus, Modipuram from 13 to 15 December, 2005 which was attended by 13 participants drawn from different ICAR Institutes and State Agricultural Universities.

The training course was inaugurated by Dr. RK Chaudhary, Project Director, Seed Research Directorate, New Delhi. Dr. SK Pandey, Director, Central Potato Research Institute, Shimla also had a detailed discussion with the participants on the utility of DUS testing of Indian potato varieties for checking biopiracy of the indigenous potato varieties and hybrids. He informed the participants that CPRI has developed 41 indigenous potato varieties which possess very important attributes required to

DUS training at Modipuram
meet the current challenges related to potato production—be it resistance to late blight, tolerance to viruses and abiotic stresses like heat stress, immunity to potato wart etc. These are valuable material especially in the context of Asian region and need to be protected for posterity. Dr. RK Chaudhary highlighted the IPR issues and responsibility of the scientific institutions, which cannot be taken care of unless an awareness campaign is carried out among the scientific community. This training course is a part of the awareness programme.

The highlight of the training course included lectures by invited speakers, hands on training on identification of markers and their application for DUS testing in potato varieties and other related issues. The concluding function was presided over by Dr. S. Mauria, Actg. ADG (IPR), ICAR, who gave away the certificates to the participants.

**International Training Course on TPS**

A three-day International Training Course on True Potato Seed production was organized at Central Potato Research Institute Campus, Modipuran from 28-30 Nov, 2005 in collaboration with International Potato Center (CIP), South, West & Central Asia, New Delhi.

The training course was attended by eight participants drawn from Armenia, Tajikistan, Kyrgyzstan, Azerbaijan, Uzbekistan, Turkmenistan and Georgia. At the inauguration, the International Potato Center was represented by Dr. Sarah Illangantileke, Regional Director, South, West & Central Asia and Dr. Carlo Carli, CIP scientist based at Uzbekistan. Dr. SK Pandey, Director, CPRI and course Director, inaugurated the training course.

Central Asia and the Caucasus region are deficient in quality potato seed. They need to explore/develop alternative methods of quality seed production in their respective countries to reduce the expenditure on seed imports and enhance potato productivity. This training course was designed to help achieve the above objective by imparting training to the participants on raising potato crop through TPS.

The highlight of this training included lectures, hands on training on selection and raising of parental lines under artificially extended photo period, crossing, selection of TPS, seed treatment, its germination and agro techniques related to raising of TPS crop for tuberlet production and for transplanting crop. The trainees were also familiarized with potato seed production through conventional methods and tissue culture. The impact of quality seed produced at Central Potato Research Institute
Model Training Course on Potato

The Institute organized 8 days Model Training Course on “Seed Potato Production, Handling and Marketing” during August 17-24, 2005 at Shimla which was sponsored by the Directorate of Extension, Ministry of Agriculture, Govt. of India. A total of 23 participants from 11 states attended the training course. Out of these 23 participants, 18 were from State departments of agriculture/horticulture and 5 were from NGOs. Pre- and post-training evaluation of the trainees was conducted to assess the effectiveness of the training course. It revealed that after the training, on an average the knowledge of the participants was improved by 30 per cent.

Arunachal Pradesh, Maharaashtra and West Bengal attended the training course. The course included aspects of potato cultivation, disease management, quality requirements for processing and storage.

Training for NEH Region Officers

The Institute organized 5 days training course on “Potato Production, Protection and Storage” during November 21-25, 2005 at Shimla under the project Mini Mission -1 of Horticulture Technology Mission. The training course was organized for the extension officers of the northeastern hill states and it was attended by 6 participants from Arunachal Pradesh, Sikkim and Tripura.

Exhibition in Kisan Mela at Nauni

The Institute put up an exhibition stall of potato technologies in the Kisan Mela organised by Dr. Y.S. Parmar University of Horticulture & Forestry, Nauni (Solan) on December 1, 2005. The exhibition stall of CPRI was attended by more than 200 farmers from different parts of Himachal Pradesh. These farmers were briefed about the potato technologies by Dr. Anil Kumar. This endeavour proved worthy in getting first hand information from the farmers and transferring the potato technologies to them. Besides, a number of priced publications of the Institute were sold to the farmers and scientists from the stall.

Training to Frito-lay Workers

The Institute organised 4-days training course on “Potato Production, Storage and Utilization” during September 3-6, 2005 at Shimla which was sponsored by FritoLay Division of Pepsico India Holdings Pvt. Ltd. The training was meant for the staff of FritoLay and a total of 9 extension officers of the company from Punjab, Haryana, Madhya Pradesh, Maharashtra and West Bengal participated in the programme.

Live Phone-in programme on AIR & Doordarshan

An innovative live phone-in programme in agriculture was initiated on All India Radio and Doordarshan during 2005. Several scientists of the Institute participated in the programme. Dr. NK Pandey and Dr. RS Chandel participated in the live phone-in programme of AIR held on 24.6.2005 on the topic “Potato Cultivation”, Dr. KR Dhiman participated in the live phone-in programme of Doordarshan held on 3.10.2005 on the topic “Cultivation of Potato”. Dr. V.K. Dua and Dr. Anil Kumar participated in the live phone-in programme of Doordarshan held on 21.11.2005 on the topic “Planting of Potato”.

Training to Farmer’s and Officer’s of North-East

A total of six farmer’s and one officer’s training was organized by the Institute in the North eastern states under the MM-1 project of Horticulture Technology Mission.
A team of four scientists from different disciplines viz., Dr. PH Singh, PS, Plant Pathology and Nodal Officer, Dr. KR Dhiman, Head, Crop Improvement, Dr. VK Chandra, PS, Entomology and Dr. Brajesh Singh, Crop Physiology and PHT were the resource persons for these training programs.

The first training programme was organized at ICAR Research Complex, Lembuchera, Tripura on 30th Nov and 1st Dec 2005 and 22 farmers from different districts of the state were nominated by the state horticulture department to attend the training. The second training was organized at Assam Agriculture University, Jorhat, Assam on 3rd and 4th Dec 2005, where 16 farmers participated from various districts of the state. The AICRP (Potato) Centre scientists of AAU also interacted with the trainees at Jorhat.

The third training was organized at ICAR Research Complex, Jharnapani, Nagaland on 6th and 7th Dec and 25 farmers attended this training programme. Here thecomplex staff helped the resource persons in translating the lectures in the local language. The next training was organized at Imphal, Manipur where 25 farmers were trained on 9th and 10th Dec.

The fifth training was organized at CPRS, Shillong on 12th and 13th December. Twenty-two farmers from east and west Khasi district participated in the programme and a visit of farmers to the station was also organized, where farmers were demonstrated with the potato cultivation technology.

Officers training at Shillong

The Extension Officers training was also organized at CPRS, Shillong where 14 state government officers (7 from Meghalaya, 2 each from Manipur and Sikkim and 1 each from Assam, Arunachal Pradesh and Nagaland) were given training on 14th and 15th December. The officers were trained by the resource persons from Shimla and also by Dr. Shantanu Kumar of the Station.

Farmers' Day at Hassan (Karnataka)

A “Field Day and Seminar on Potato” was organized at Agril. Research Station, Madenur – Hassan on 26th August, 2005, which was attended by nearly 900 farmers to acquire knowledge about the improved technologies of potato production.
Variety evaluation trials in tribal belts of Rajasthan

Demonstrations-cum-evaluation trials consisting four improved potato varieties viz., Kufri Pukhraj, Kufri Bahar, Kufri Badshah and Kufri Pushkar have been initiated for the first time in the four tribal belts in Udaipur, Chittorgarh, Banswara and Dungarpur of Rajasthan under the supervision of AICRP – Potato Centre located at Kota (Rajasthan).

In total 32 recommendations of this conference were approved in presence of Dr. G. Kalloo, DDG (Hort. and Crop Science) and have been printed separately in form of recommendations.

CPRl organizes Potato Symposium

Central Potato Research Institute, Shimla in association with Indian Potato Association successfully organized a one-day symposium on “Current Perspectives on Potato Research” at Maharana Pratap University of Agriculture and Technology, Udaipur on 11th Sept, 2005.

The symposium followed three-day workshop of AICRP and was attended by more than 150 delegates from all over the country. A special issue of Potato Journal containing the papers presented in the Symposium was released on the occasion. Dr. SL Mehta, Vice-Chancellor of MPUAT inaugurated the symposium and during his remarks praised the work done by the fraternities of potato scientists and workers.

AICRP (Potato) organized its 25th Group meeting

25th Group meeting of the all India Coordinated Research Project on Potato was organized at Maharana Pratap University of Agriculture and Technology, Udaipur during Sept. 8-10, 2005.

AICRP (Potato) was instrumental in releasing 20 improved varieties and bringing out several recommendations for efficient potato production and protection in the country during last 35 years, since its inception in 1970. Presently the AICRP-Potato operates with 21 centres located in distinct agro-ecological regions of the country. Fourteen of these centers are located in State
Agriculture Universities (SAUs), six at CPRI regional research stations and one voluntary center at Ranichauri in Uttarakhand. Besides, there are two seed preparatory units located at Kufri for hills and Modipuram for the plains. There are 7 breeders, 8 horticulturists, 10 agronomists, 10 pathologists and 2 entomologists positioned under the project at 14 SAU based centers.

The meeting was inaugurated by Dr. SL Mehta, Vice Chancellor, MPUA&T, Udaipur and attended by dignitaries from ICAR, CPRI, MPUA&T, AICRP delegates, farmers and representatives from potato based industries. In addition to 3 technical sessions on potato improvement, potato production and potato protection, there were two special sessions on ICAR Adhoc projects and interface with farmers and industries.

Two improved potato hybrids viz., MP/97-583 for cultivation in Indo-gangetic plains and suitable for chipping and another SM/91-1515 possessing resistance to late blight and suitable for cultivation in hills were recommended for commercial release. Besides several cultural practices and plant protection measures were recommended for efficient potato production in different parts of the country.

RAC Meeting held at Shimla

The twelfth meeting of the Research Advisory Committee (RAC) was held at Central Potato Research Institute, Shimla on 25th and 26th July, 2005 under the chairmanship of Dr. Kirti Singh, Ex-Chairman, ASRB, New Delhi. The following RAC members were present – Dr. MN Khare, Prof. PK Gupta, Dr. Brajesh Rai, Sh. Kedar Singh Chauhan, Sh. Ram Krishna Singh Patel, Dr. SK Pandey and Dr. R. Ezekiel. Dr. Kirti Singh, Chairman, RAC in his opening remarks said that CPRI has done very good work in all areas of potato research but research is a continuous process and as problems continue to increase, they need to be addressed and solutions found. Dr. R. Ezekiel, Member Secretary, RAC presented the action taken report on the recommendations of the previous RAC meeting held last year. Program leaders of the 22 ongoing research programs presented progress report for the year 2004-2005 and the plan of work for the next year. The chairman in his closing remarks appreciated the presentations of programme leaders and the quality of work being done in the Institute.

Staff Research Council Meeting at Shimla

The staff research council meeting, 2005 was held at CPRI, Shimla during 28-30 July, 2005. Seventy six scientists attended it from the headquarters and stations. The basic objective of this meeting was to review the achievements of 2004-2005 and formulate future plan of work for 2005-2006 of different research programmes.

Dr. SK Pandey, Chairman, SRC and Director, CPRI, Shimla in his opening remarks emphasized that DG, ICAR is very particular regarding performance-scoring of scientists, randomly going through six-monthly reports and monitoring it carefully. This requires sincere experimentation and data recording by all the scientists. He expressed his concern about involvement of scientists in non-scientific duties / work. Besides, he said that as recommended by RAC, some of the programmes that require
recasting are: (i) True Potato Seed technology, (ii) Biotechnology, (iii) Programmes in Social Sciences. During three-day meeting lot of suggestions were obtained by the chairman and the senior scientists of the Institute for making improvements in the ongoing research programmes.

Meeting on National Seed Production programme

A meeting to streamline the National seed production programme and to finalize the seed production through tissue culture was held at CPRS, Jalandhar, on September 24, 2005 under the chairmanship of Dr. SK Pandey, Director, CPRI, Shimla. The meeting was attended by Dr. KC Garg, ADG(VC), ICAR, New Delhi, Dr. BP Singh, Joint Director, CPRIC, several heads and scientists of CPRI campus, Modipuram, CPRS, Jalandhar and other stations of CPRI. It was decided to initially start the seed production through tissue culture (micro tuber / plant) to cater to the requirement of 25 percent area in stage-IV and then expand it depending upon the availability of resources and facilities at CPRS, Jalandhar and CPRIC, Modipuram.

Deepawali Mela

Deepawali Mela is organized every year by the staff welfare association, CPRI, Shimla to have get together and to promote harmony among the staff members. This year also Deepawali mela was organized on October 22, 2005 by SWA, which was inaugurated by Mrs. Neerja Pandey. Nine stalls were put up in the Institute lawn for the entertainment and refreshment of the visitors and participants. Large number of people including staff of CPRI and their family members participated in this mela. Sports and cultural competitions were held for the children. These included 100 meter and 200 meter race, needle and thread race, drawing competition, fancy dress competition etc. for different age group of children. Musical chair race for ladies and tug of war for the staff members were also held, which were the main attraction of the fair. Mrs. Tarvinder Kochhar won the musical chair race and the Division of Social Sciences group won the tug of war. The winners of all these events were honoured with prize by the chief guest.

Kolkata visited the Institute and delivered a lecture on “Issues of Food Security in India” on 13th October 2005.

- Dr. SK Khanna from Organo-Phos APMC compost plant, New Delhi delivered a talk on “Integrated Management using city compost for enhancing production and productivity of Indian soils” during his visit to the Institute on 20th October 2005.

- Dr. SK Goel of Indian Institute of Advance Studies, Shimla gave a talk on “Know others by knowing yourself” on 9th December 2005 during his visit.

Other visitors & sale of publications

Scientists, teaching staff, students and farmers from different colleges, Institutes and universities of the country make visit to CPRI for acquaintance with potato research and for purchase of CPRI publications. A total of 33 scientists/teaching staff, 385 students of UG and PG and 305 farmers from different parts of the country visited CPRI during July-December 2005. The division of social sciences, which recently took the responsibility of sale of Institute’s publications sold them for worth Rs. 4000/- during November-December, 2005 to the visitors.

Human Resource

Appointments

1. Dr. PS Naik, Principal Scientist (Genetics/ Biotechnology) appointed as Project Coordinator for five years tenure w.e.f. 01.07.2005 (FN).

Invited lectures & Visitors

- Dr. Madhura Swaminathan from Indian Institute of Scatistics,
2. The tenure of Dr. BP Singh as Joint Director, CPRIC, Modipuram has been renewed for a further period of five years w.e.f. 03.10.2005.
3. Dr. R. Ezekiel, appointed as Head, CP & PHT for five years tenure w.e.f. 16.09.2005 (FN).

Promotions

<table>
<thead>
<tr>
<th>Technical</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 persons</td>
<td>T-1</td>
<td>T-2</td>
</tr>
<tr>
<td>2 persons</td>
<td>T-3</td>
<td>T-4</td>
</tr>
<tr>
<td>20 persons</td>
<td>T-4</td>
<td>T-5</td>
</tr>
<tr>
<td>1 person</td>
<td>T-5</td>
<td>T-6</td>
</tr>
<tr>
<td>1 person</td>
<td>T-6</td>
<td>T(7-8)</td>
</tr>
</tbody>
</table>

Administrative

<table>
<thead>
<tr>
<th>Administrative</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sh. AS Keprate</td>
<td>Asstt</td>
<td>AAO</td>
</tr>
<tr>
<td>Sh. LR Verma</td>
<td>UDC</td>
<td>Asstt.</td>
</tr>
<tr>
<td>Sh. Surinder Singh</td>
<td>Clerk</td>
<td>Sr. Clerk</td>
</tr>
<tr>
<td>Sh. Rakesh</td>
<td>Clerk</td>
<td>Sr. Clerk</td>
</tr>
<tr>
<td>Sh. RS Yadav</td>
<td>Asstt.</td>
<td>AAO</td>
</tr>
<tr>
<td>Sh. SD Chaturvedi</td>
<td>UDC</td>
<td>Assit.</td>
</tr>
<tr>
<td>Sh. RR Das</td>
<td>UDC</td>
<td>Asstt.</td>
</tr>
<tr>
<td>Sh. S Prasad</td>
<td>SSG-III</td>
<td>LDC</td>
</tr>
<tr>
<td>Sh. Chaada Ram</td>
<td>Jr. Clerk</td>
<td>Sr. Clerk</td>
</tr>
</tbody>
</table>

Supporting

<table>
<thead>
<tr>
<th>Supporting</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 persons</td>
<td>SS Gr. III</td>
<td>SS Gr. IV</td>
</tr>
<tr>
<td>2 persons</td>
<td>SS Gr. II</td>
<td>SS Gr. III</td>
</tr>
<tr>
<td>3 persons</td>
<td>SS Gr. I</td>
<td>SS Gr. II</td>
</tr>
</tbody>
</table>

Transfers

<table>
<thead>
<tr>
<th>Name</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. KK Sharma</td>
<td>Shimla</td>
<td>NRCPP, Sholapur</td>
</tr>
<tr>
<td>Dr. RK Singh</td>
<td>Gwalior</td>
<td>NRCS, Ajmer</td>
</tr>
<tr>
<td>Sh. Ishlam Ahmad</td>
<td>Shimla</td>
<td>Modipuram</td>
</tr>
<tr>
<td>Sh. Suresh Kumar</td>
<td>Kufri</td>
<td>Shimla</td>
</tr>
<tr>
<td>Sh. P Rajendran</td>
<td>Shimla</td>
<td>Patna</td>
</tr>
<tr>
<td>Smt. Kumlesh Sharma</td>
<td>CSWCRITI, Dehradun</td>
<td>CPR, Shimla</td>
</tr>
</tbody>
</table>

Retirements

<table>
<thead>
<tr>
<th>Name</th>
<th>Post</th>
<th>Retired on</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sh. JC Chopra</td>
<td>AAO</td>
<td>30.4.2005</td>
</tr>
<tr>
<td>Sh. Gopal Singh</td>
<td>T-3</td>
<td>31.7.2005</td>
</tr>
<tr>
<td>Sh. JP Uniyal</td>
<td>T (7-8)</td>
<td>31.8.2005</td>
</tr>
<tr>
<td>Sh. Hardev Singh</td>
<td>T-4</td>
<td>30.9.2005</td>
</tr>
<tr>
<td>Sh. Ranjit Singh</td>
<td>Asstt.</td>
<td>1.10.2005</td>
</tr>
<tr>
<td>Sh. Joginder Kumar</td>
<td>SS Gr. IV</td>
<td>30.11.2005</td>
</tr>
<tr>
<td>Sh. Sukh Ram</td>
<td>SS Gr. IV</td>
<td>30.11.2005</td>
</tr>
</tbody>
</table>


**IJSC Elections Held**

IJSC elections for 2005-06 were held on 7th November 2005 in CPRI. From Technical side Sh. Naresh Chand Sharma, Sh. Munna Lal Bharati and Dr. YP Singh were elected. Sh. DD Kashyap and Sh. Roshan Lal were elected from Administration and Sh. Mansha Ram, Sh. Attar Singh and Sh. Raghurib Singh were elected amongst the Supporting Staff.

**Awards & Honours**

**Best Hindi Implementation Award**

- CPRS, Muthurai has been awarded with the “Best Hindi Implementation award” by the town official language implementation committee of Nilgiris held in cordite factory, Aruvankadu on 19.10.2005.

- Dr. SK Pandey, Director, CPRI, Shimla bagged the prestigious Dr. JC Anand Gold medal for his contribution and leadership in Post-harvest technology of Horticultural Crops for the year 2005. His research contribution includes the development of 12 high yielding potato varieties. He was the first to develop two indigenous potato processing varieties, viz., Kufri Chipsona-1 and Kufri Chipsona-2, which revolutionized the potato processing industry in India. Recently, he has also developed a processing variety, viz., Kufri Chipsona-3. The award was presented on 18th Nov. 2005 in
NAAS Auditorium, New Delhi.

- Dr. SK Pandey, Director, CPRI, Shimla was appointed as one of the members of the Advisory Committee on Agro Biodiversity Authority. The duration of the advisory committee will be for a period of three years.

- Director General, ICAR nominated Dr. SK Pandey, Director, CPRI, Shimla as representative of the ICAR for the board of management of Dr. YS Parmar University of Horticulture & Forestry, Nauni, Solan. This nomination is for the tenure of three years w.e.f 19.07.2005.

- His excellency Sh. VS Kokje, Governor of Himachal Pradesh nominated Dr. SK Pandey, Director, CPRI, Shimla as Member of Governing body of Himachal Pradesh State Seed and Organic Produce Certification Agency for two years w.e.f 29.07.2005.

- Dr. SK Pandey along with Dr. RS Marwaha and Dr. SV Singh has been honoured by Indian Farm Forestry Development Cooperative Ltd, for his excellent contribution in developing India's first ever potato processing varieties Kufri Chipsona-1 and Kufri Chipsona-2.

- IPA Kaushalya Sikka Memorial Award was bagged by the research team consisting of Drs. Parveen Kumar, SV Singh, SK Pandey and Dinesh Kumar.

- Dr. S Ramanujam Memorial Lecture Award was given to Dr. PC Gaur, Retd. Head, Crop Improvement, CPRI, Shimla.

- Best Paper Award of Potato Journal for 2002 was bagged by Drs. Ashoo Sharma, JS Minhas, PS Basu and Jitendra Mohan. For 2003, Drs. SV Singh, Dinesh Kumar and SK Pandey bagged the Award.

- Best Poster Award during Symposium at Udaipur was bagged by Drs. SV Singh, Dinesh Kumar, SK Pandey, NH Patel, Parveen Kumar, P Manivel and RS Marwaha. The commendation certificate was given to Drs. KC Thakur, P Manivel, PH Singh, SK Pandey, PS Naik, Vinod Kumar, Jai Gopal and KR Dhiman.

- Indian Potato Association selected Drs. PS Naik, KC Garg, SV Singh and RB Singh as Distinguished Fellow.

Achievements in Sports

CPRI participated in ICAR Inter-zonal sports meet held at NDRI, Karnal during 27-30 September, 2005. The Institute team of Table Tennis consisting of Sh. CM Bisht, Dr. Vinay Bhardwaj, Sh. Gurjeet Singh, Sh. Roshan Lal and Dr. NK Pandey won the Inter-zonal team championship. Athlete Smt. Shyam Lata Bekta won Gold medal in Shot Put, Silver in Discuss throw and Bronze in Javelin throw. Smt. Tarvinder Kocchar won three Bronze medals in High Jump, 100 and 200 mts race.

Future Activities

Potato Workshop in Uttarkashi

The Himalayan Action Research Centre, an NGO working in Uttarakhand, is going to organize potato workshop at its annual farmers’ fair on January 8-9, 2005. They have invited CPRI scientists for the workshop. Accordingly, 3 scientists of CPRI are going to attend the workshop. An exhibition stall of potato will also be put up at the fair.

Two of the extension officers of HARC were trained by CPRI in the model-training course held in August 2005. After that, a linkage has been developed with HARC and this workshop is a part of the follow-up activities of training.

Potato Facts

Potato Remedy

Boiled potato peel could be an effective dressing material for burn injuries. "Wounds dressed with the peel bandages healed faster than the conventional dressing" says Dr. PV Narayanan, plastic surgeon at Thrissur’s Jubilee Memorial Mission Hospital. A 2.5 m long and 11 cm wide roll of potato peel bandage costs about Rs.5.5, much less than conventional dressing material. The added advantage is that its removal is not painful, unlike adhesive bandages.

Source: India Today
Beer – Battered fries unite beer and chips

No one would argue that chips and beer aren’t a great combination, but products manufacturer lamb Weston Meijer is taking the union a step further. They have come up with Beer-battered fries, ideal for pubs looking to extend their snack sales or add an unusual side dish to main meals such as seafood. The fries have a unique coating which seals the flavour inside a crispy exterior. Served upright in a beer mug, they can be shared with friends enjoying a beer. They can be eaten as an appetizer or just as enjoyable at any time in the day or evening. Beer-battered fries are easy to prepare using either the oven or the deep-fat dryer.

Source: United Advertising publications

New research found unexpected benefit of potatoes

UK scientists have identified previously unknown compounds in the potato that are also found in a herbal used to lower blood pressure. The natural chemicals, called kukoamines, also selectively affect a chemotherapeutic target for trypanosomes and similar diseases such as sleeping sickness, said the team from the Institute of Food Research.

Source: BBC News

Storage of Potatoes at Higher Temperatures with CIPC Treatment

Introduction

Record levels of production during the last two decades has resulted in several post-harvest problems and the major one is that of storage. About 90% of the total potato production comes from the Indo-Gangetic plains, where harvesting is done in February-March. Therefore, the arrival of potatoes in the market during this period are huge creating gluts resulting in distress sale by the farmer. Storage helps in regulating the arrival in the market and reduces transport bottlenecks at the peak period of production.

Cold storage

Potatoes stored in cold store at 2-4°C and 90-95% RH, do not sprout and lose weight. The conditions maintained in cold stores are ideal for storing seed potatoes for 6-8 months. But, for the storage of table and processing potatoes, storage at 2-4°C is not ideal since sugar accumulation takes place at this temperature and potatoes become sweet in taste. Cold stored potatoes are especially unsuitable for processing since higher sugar levels (Fig. 1) result in unacceptable, dark brown chips (Fig. 2).

Need for storage at 10-12°C

The problem of low temperature induced sweetness can be overcome by storing table and processing potatoes at higher storage temperature of 10-12°C instead of 2-4°C. However, the RH should be maintained at 85-90% to minimize weight loss during storage. When stored at 10-12°C, sugar accumulation is minimum therefore, potatoes do not taste sweet and hence are better than the cold stored potatoes for consumption. Since the sugar accumulation is minimum, they are also quite suitable for processing. However, when stored at 10-12°C, potatoes sprout and it is necessary to check sprout growth to reduce storage losses. To check sprout growth, sprout suppressants have to be used and the most commonly used sprout suppressant is CIPC (Isopropyl N-(3-chlorophenyl) carbamate).

CIPC treatment

Table potatoes can be treated with CIPC dust @ 25 mg a.i./tonne of tubers (commercial preparation of CIPC dust contains 1% active ingredient) at the time of storage. For treating small quantity of potatoes, powder form of CIPC is convenient but for treating large quantity of potatoes, powder form is not convenient due to the
practical problems in handling, since powder treatment is done manually in India. For large-scale treatment of potatoes with CIPC, liquid formulation is preferred as it can be applied in the form of a fog using a fogging machine without disturbing the stored potatoes. Chlorpropham is being marketed in India by United Phosphorus Ltd., Mumbai in the name of “Oorja”. This commercial preparation contains 50% a.i. and 30-35 ml of this preparation is required for fogging one tonne of potatoes. However, this dose can vary depending upon the loss of fog during treatment due to leakage, the pore size of the bags used, the quantity of potatoes stored etc. After the CIPC treatment, the store should be kept airtight for 24-48 hours. First fogging is done at the first sign of sprout growth. Second fogging is done at about 45 days after the first fogging. The timing of first fogging is important. If it is done at the right time, CIPC is most effective in suppressing sprout growth (Fig. 3). If the first fogging is delayed and sprout growth has progressed considerably and if the concentration of CIPC applied is inadequate, then the CIPC treatment will not be very effective and there is the risk of internal sprout growth. Fig. 4 shows a tuber showing internal sprout growth after insufficient application of CIPC. When internal sprout growth takes place, tubers become useless and have to be discarded.

**Processing quality of potatoes stored at 10-12°C in commercial cold stores**

Processing quality of potatoes was monitored in 16 commercial cold stores located in four states. Out of these, seven cold stores were in Uttar Pradesh (UP), six were in Madhya Pradesh (MP), two were in Gujarat and one was in West Bengal (WB). In these cold stores, well-cured potatoes were stored at 10-12°C and 85-95% RH and, CIPC was applied twice as a thermal aerosol (fog). Samples were collected randomly from each cold store periodically and were analysed for dry matter content, reducing sugar content and chip colour. Processing quality varied considerably amongst locations. At Meerut, in one cold store where the variety was Kufri Jyoti (Tubers were grown at Indore and brought to Meerut and stored), the chip colour was acceptable due to low reducing sugar content. The dry matter content was also above 20%. But in another cold store where the variety was Kufri Jyoti grown at Meerut, reducing sugar content was high and chip colour was unacceptable after 93 days of storage (DOS). In the third cold store where the variety was Kufri Bahar, the reducing sugar content was high and chip colour was unacceptable. Two cold stores at Sambhal, one at Balna and one at Agra had stored variety Kufri Bahar and in all the four cases reducing sugar content was quite high and chip colour score was unacceptable even after 45 days of storage. The dry matter content was less than 20% except at Balna (Dry matter content of 20% and more is desirable for processing).

At Indore, all the four cold stores monitored had variety Kufri Jyoti. The reducing sugar content was within the acceptable limit (The upper acceptable limit of reducing sugar content is 150 mg/100g fresh weight (f. wt)), the chip colour score was quite acceptable (Colour score up to 4 is considered acceptable and 5 and above are unacceptable) and the dry matter content ranged from 20.6 to 26.3%. At Ujjain, the variety was Kufri Lauvkar. Here also the reducing sugar content was within the acceptable limit and the chip colour was quite acceptable. Only at later stages of storage i.e. after 133 days the reducing sugar content showed an increase. The dry matter content was quite high and ranged from 23.7 to 25.7.

At Deesa, the variety was Kufri Chandiramukhi. The sugar content and chip colour were acceptable in one cold store but in the other, although the reducing sugar content was low, the chip colour was on the higher side after 175 days of storage. The dry matter content was above 20%. At Sainthian, the variety was Kufri Jyoti. The reducing sugar content was within the acceptable limit but the chip colour score was
on the borderline. The dry matter content ranged from 16.3 to 17.6%.

The above results indicate that potatoes (Var. Kufri Jyoti and Var. Kufri Lauvkar) grown and stored at Indore and Ujjain had acceptable processing quality. Potatoes (Var. Kufri Chandramukhi) grown and stored at Deesa also had acceptable processing quality. Potatoes (Var. Kufri Bahar) grown and stored in different cities/towns of UP had poor processing quality.

Storage at different temperatures

The above-mentioned results show that even when stored at 10-12°C, processing quality can deteriorate after a few months, especially in varieties like Kufri Bahar. Therefore, it is important that information on the storage behaviour of popular potato varieties at different storage temperatures should be collected. With this objective, an experiment was conducted at CPRI and the results are given below.

Weight loss in tubers stored at different temperatures with CIPC treatment

Twelve popular potato varieties were stored in walk-in-chambers maintained at 4, 8, 12, 16 and 20°C. The RH was 90-95% at 4°C and around 85% at 8°C and above. After 180 days of storage (DOS), the mean weight loss was 6.1, 6.4, 9.9, 13.1 and 21.3% at 4, 8, 12, 16 and 20°C, respectively. Even after 180 DOS, weight loss was within the acceptable limit at the storage temperature of 12°C but at 16°C and 20°C, weight loss was very high. Weight loss up to 10% is considered acceptable because no visible shrivelling takes place up to this level. When the weight loss exceeds 10%, shrivelling takes place which reduces the table value of potatoes. Further, peeling losses increase with increased weight loss affecting the processing value of potatoes. Among the varieties, maximum weight loss was observed in Kufri Chipsona-2 followed by Kufri Ashoka. At 12°C, Kufri Jyoti, Kufri Chandramukhi, Kufri Sindhuri, Kufri Lauvkar and Kufri Pukhraj showed less than 8% weight loss.

Rottage in tubers stored at different temperatures with CIPC treatment

After 160 days of storage, at 4°C, only two varieties viz. Kufri Chipsona-2 and Kufri Pukhraj showed slight rottage of 0.7%. At 8°C, no rottage was observed in Kufri Anand, Kufri Bahar and Kufri Lauvkar. The remaining nine varieties showed rottage, which was minimum in Kufri Lalima (0.2%) and maximum in Kufri Chipsona-2 (2.2%). At 12°C, again, minimum rottage was observed in Kufri Lalima (0.23%) and maximum rottage was observed in Kufri Chipsona-2 (2.6%). Generally, it was less than 1%. At 16°C, minimum rottage of 1.4% was observed in Kufri Chipsona-1 and a maximum of 11.6% was observed in Kufri Sindhuri. The rottage in Kufri Chipsona-2 was 6.5%. At 20°C, 100% rottage was observed in Kufri Chipsona-2. Next highest rottage of 58.8% was observed in Kufri Sindhuri. Kufri Lauvkar, which did not show any rottage at 4, 8, 12 and 16°C, showed 13.4% rottage at 20°C. Generally rottage was unacceptably high at 20°C.

Since CIPC inhibits cell division, which is necessary for the formation of wound periderm during wound healing, rottage can be unacceptably high if immature tubers are stored or if sufficient time is not allowed for wound healing before storage. However in this case, the tubers were fully matured and sufficient time was given for wound healing before storage. Therefore, rottage was within the acceptable limit at 8 and 12°C but it was on the higher side in some varieties at 16°C and in all the varieties at 20°C.

Processing quality of potatoes grown at different locations and stored at different temperatures with CIPC treatment

Changes in dry matter, chip colour and reducing sugar were determined in tubers of different varieties grown at different locations and stored for 100 days at Shimla in walk-in-chambers maintained at 4, 8, 12, 16 and 20°C (The RH was 90-95% at 4°C and 85-90% at other four temperatures). The number of varieties included were 9 from Modipuram, 7 from Jalandhar, 3 from Gwalior and 4 from Patna. Tubers stored at 8, 12, 16 and 20°C were treated with CIPC twice to check sprout growth.

Dry matter: In potatoes grown at Modipuram, the mean dry matter content was 16.7% when stored at 4°C for 100 days and it increased at higher storage temperatures. There was little difference in the dry matter content among tubers stored at 8, 12, 16 and 20°C. In potatoes grown at Jalandhar, the dry matter content was 18.6% when stored for 100 days at 4°C and it increased to around 20% at higher storage temperatures. Similar trend was observed also in potatoes grown at
Gwalior and Patna and stored at different temperatures. Generally, the dry matter content was higher in potatoes grown at Gwalior and Patna compared to other two locations.

**Chip colour:** In potatoes grown at Modipuram and stored at 4°C for 100 days, the chip colour score was 9.1 and hence highly unacceptable. The chip colour did not improve at higher storage temperatures but reached acceptable level of 4 or less in only two varieties and that too at 20°C. Out of the seven varieties grown at Jalandhar, no variety produced chips of acceptable colour after 100 days of storage at different temperatures. In potatoes grown at Gwalior, acceptable chip colour could be obtained only in case of Kufri Jyoti stored for 100 days at 20°C and the chip colour was unacceptable in all other cases. Kufri Chipsona-1 and Kufri Jyoti from Patna produced chips of acceptable colour after 100 days of storage at 16 and 20°C and the chip colour was unacceptable in other two varieties.

**Reducing sugar:** After 100 days of storage, the reducing sugar content of potatoes grown at Modipuram was unacceptably high at 330 mg/100 g f. wt. With the increase in storage temperature, it decreased and at 20°C, it was as low as 81-mg/100 g f. wt. Similar trend was observed in potatoes grown at Jalandhar also. In potatoes grown at Gwalior and Patna, the reducing sugar content was less than 100 mg/100 g f. wt in most of the varieties tried when stored at 12, 16 and 20°C for 100 days.

It was found that Kufri Jyoti, Kufri Lauvkar, Kufri Chandramukhi, Kufri Chipsona-1 and Kufri Chipsona-2 could be used for processing up to 120 days of storage at 10-12°C with CIPC as the sugar level was within the acceptable limit. All the other varieties could be used for table purpose only. Though the sugar level in these varieties was higher than the acceptable level for processing, still they were much lower than that in potatoes stored at 2-4°C. Thus, these potatoes were not sweet in taste and therefore, better than the cold stored potatoes for table purpose.

**Effect of type of storage bag on CIPC efficacy**

Potatoes are stored in cold stores either in hessian cloth bags or leno bags. To determine the effect of type of bag in which potatoes are stored on the penetration of CIPC fog into the bag and its subsequent distribution within the bag, potatoes were stored in three types of bags differing in their pore size. The types of bags used were; Normal hessian cloth bag with very small pores (pore size: 1mm²), onion bags with pore size of 4mm² and leno bags with pore size of 8 mm². Observations on length of the longest sprout were recorded 45 days after CIPC treatment (at 57 days of storage) in potatoes stored at 12 and 16°C.

When stored at 12°C, sprouts were observed in jute and onion bags but not in leno bags. The length of the longest sprout was 0.3 cm in onion bags and 0.7 cm in jute bags. Leno bags with their larger pore size, allowed greater amount of CIPC fog to enter the bag and even distribution within the bag leading to better suppression of sprout growth. Onion bags with pores of 4 mm² size allowed lesser amount of CIPC fog to enter the bag and as a result sprout suppression was incomplete with tubers showing sprouts of 0.2 to 0.6 cm length. Whereas, in jute bags, the pore size was too small (1mm²) which hindered the entry of CIPC fog.

This was also reflected in the quantity of CIPC deposited on the tubers. In normal jute bags, the CIPC concentration in the peel of potatoes, 65 days after second treatment, was 0.287 µg/g. Whereas, in potatoes stored in leno bags, the CIPC concentration in the peel of potatoes was 3.68 µg/g. When stored at 16°C, even in leno bags, 0.3 to 1.3cm long sprouts were observed indicating that although the entry of CIPC fog into the bag was better in leno bags, due to volatilization at higher temperature, CIPC was less effective in suppressing sprout growth. Even in onion and normal hessian cloth bags, sprouts were longer compared to those at 12°C.

**CIPC residue level in potatoes treated with CIPC aerosol (fogging) during storage in commercial cold stores**

Residue level of chemicals in treated foods has been a health concern. Therefore, CIPC residue levels were monitored in commercial cold stores (Two at each location) located at Indore and Ujjain in Madhya Pradesh and Meerut in Uttar Pradesh. On comparing the overall residues of CIPC in potatoes from two cold stores at Indore and two cold stores at Ujjain, it was found that the mean
CIPC residues in potato peels ranged from 8.1 to 14.7 \( \mu g/g \) f. wt. and in unpeeled whole tubers they ranged from 0.6 to 2.5 \( \mu g/g \) f. wt. The highest concentration of residue observed at any date in peels was 14.7 \( \mu g/g \) f. wt., whereas, the residues in unpeeled whole tubers and peeled tubers were much below this level at all the sampling dates.

The maximum permissible limit for CIPC residues in potato tubers for human consumption is 30 \( \mu g/g \) (or 30 mg/kg) of tubers. In none of the samples, residues were above this permissible limit. Thus, the CIPC treated tubers were found to be safe for human consumption. To be on the safer side, it is recommended that CIPC treated tubers should be consumed only after 3-4 weeks of treatment.

**Economics of potato storage at 10-12°C with CIPC treatment**

Economics of storing potatoes at 10-12°C with CIPC treatment was worked out by collecting information from eight cold store owners from Indore, Ujjain, Agra, Hathras, Deesa and Sainthian. The normal cold store rent varied from Rs. 0.60-0.65 per kg whereas, for CIPC treated potatoes, the rent charged varied from Rs. 1.0 -1.16 per kg. The most common modifications required for using an existing cold store for storing potatoes at 10-12°C with CIPC treatment are as follows. (i) The existing chamber size is generally too big for CIPC treatment therefore, partitioning is normally required. (ii) Ducts may have to be installed to facilitate flushing out of accumulated carbon dioxide (iii) Humidifiers are needed to maintain the R.H. around 85%. The additional expenditure incurred by the cold store owners in making these modifications ranged from Rs. 0.01 to 0.11 per kg of potatoes. The cost of CIPC treatment varied from Rs. 0.11 to 0.33 per kg of potatoes. Such large variation in the cost of treatment was observed because some cold store owners used higher dosage of CIPC to account for leakage during treatment. Farmers and traders who stored their potatoes at 10-12°C with CIPC treatment were able to increase their profit by 37 to 58% in some places but in other places they incurred losses because there was a fall in potato prices at the time of selling. As a result, the cost of storage was higher than the increase in sale price of potatoes after storage. Only those, whose potatoes were of acceptable quality to the processors were able to make profit.

**CIPC fog treatment during storage in heap**

Efforts are being made at CPRI to determine the commercial potential of CIPC for use as sprout inhibitor of potatoes under traditional methods of storage. Preliminary studies conducted on the efficacy of CIPC fog (Oojra) application in four potato varieties viz. Kufri Chandramukhi, Kufri Jayoti, Kufri Lauvkar and Kufri Chipsona-1 twice during storage in heaps @ 35 ml/tonne of potatoes showed promising results. CIPC fog was applied using a fogger and the heaps were kept airtight with a plastic sheet during fogging and for 48 h after the treatment. Final observations on total weight loss, rotting, sprout weight and sprouting index recorded after 100 days of storage revealed that even single application of CIPC fog significantly reduced sprouting index and sprout weight in tubers. Double application, in addition reduced the weight loss in tubers also. It reduced weight loss by 31-49%, sprouting index by 35-72% and sprout growth in tubers by 92-98% in different cultivars as compared to control. Rottage was however, increased in single treatment. Kufri Chandramukhi and Kufri Chipsona-1 showed the best results with minimum total losses and rottage in tubers even in CIPC-I treatment.

**Consumers’ response towards CIPC treated potatoes**

The success of any technology depends on its acceptance by the end users and therefore to know the acceptance of CIPC treated potatoes by consumers for table purpose, a study was conducted at (i) Meerut city in Uttar Pradesh, (ii) Indore & Ujjain towns in Madhya Pradesh and (iii) Deesa town in Gujarat and at Sainthian town in West Bengal. In each city, three locations were selected randomly and from each locality, households were selected at random in such a way that it incorporates all the social groups and economic class. A total of 329 households were selected for this study.

CIPC treated potatoes were perceived as less sweet in taste than the cold stored potatoes in every case. Cold stored potatoes were perceived to be better in appearance in majority of households; 90% in Deesa, 52% in Indore & Ujjain, 55% in Sainthian, 40% in Meerut and 56% on overall basis. About 37% of the households found CIPC treated potatoes better in appearance and
6% did not find any difference in appearance of the two kinds of potatoes. About 37% of consumers on overall basis found cold stored potatoes easy in peeling whereas, 31% were of the opinion that CIPC treated potatoes peel easily. The rest 31% either did not observe or could not find any difference in peeling of both kinds of potatoes. On overall basis about 44% households preferred the texture of CIPC treated potatoes whereas, 34% preferred texture of cold stored potatoes, the rest could not make out a difference. On overall basis, about 62% of sample households preferred taste of CIPC treated potatoes while 38% preferred cold stored potatoes. This indicates that the potatoes, which were perceived as better in taste, were also perceived as better in texture. CIPC treated potatoes appeared to be preferred by majority of the households in Meerut (94%), Indore & Ujjain (65%), and Sainthian (65%) whereas, cold stored potatoes were preferred by most of the sample households in Deesa (96%) and substantial proportion of sample households in Sainthian (34%) and Indore & Ujjain (35%) according to the preference of taste.

The differences in preference on regional basis may be due to the fact that Gujarati’s like sweet taste and they even put Gur/Jaggery/sugar in most of the vegetable and curry preparations. Due to this reason they preferred cold stored potatoes over CIPC treated potatoes. Similar was the case among sampled households in MP and West Bengal, where some households preferred sweetness in potatoes. This indicates that the regional pattern of preference of CIPC treated potatoes against cold stored potatoes is similar to that of seasonal pattern of potato consumption. The CIPC treated potatoes were preferred in the areas where potato consumption declines during summer and rainy season, whereas, cold stored potatoes were preferred in the areas where potato consumption declines during winter season.

**Adoption of the technology**

It is now very common to see packets of CIPC treated potatoes at vegetable shops and even with thella wala (hand cart) in Meerut region. People are buying it although it is being sold at higher price in comparison to cold stored potatoes. This technology has become very popular and at present it is benefiting both the farmer as well as the cold store owner. The consumer is benefited by the availability of good quality potatoes (unlike cold stored potatoes) in the market during the summer and rainy seasons at a lesser price than the pahari-potatoes.

**Can CIPC treated potatoes be called “diet potatoes”?**

There is a wrong notion prevailing in some places that potatoes stored at 10-12°C with CIPC treatment contain low level of reducing sugars therefore, they are better for diabetic patients. For this reason, some people even call these potatoes “diet potatoes ” (Fig. 5).

It is wrong to call these potatoes “diet potatoes” and to claim that these potatoes are better than other potatoes for diabetic patients. The reducing sugar content in potatoes stored at 10-12°C can vary from less than 100 to 300 mg/100g f. wt, whereas the reducing sugar content in cold stored (2-4°C) potatoes can vary from less than 1000 to 3000 mg/100g f. wt. Because of the difference in storage temperatures, the sugar content is lower and starch content is higher in potatoes stored at 10-12°C. For the diet of diabetic patients, not only the free sugar level but also the total carbohydrate content of the food is to be considered. Therefore, if we consider the total carbohydrate content, there is little difference between cold stored potatoes stored at 2-4°C and those stored at 10-12°C with CIPC treatment. Further, the reducing sugar content in potatoes stored at 10-12°C is comparable to freshly harvested potatoes. Therefore, they are as good as freshly harvested potatoes in taste. Nutrition wise - barring the small loss in free sugars which are used up in respiration during storage—there is not much difference in the carbohydrate level of fresh potatoes, potatoes stored at 10-12°C with CIPC treatment and cold stored (2-4°C) potatoes. However, after eating potatoes that are high in starch and low in sugar, it takes a longer time for the blood glucose to increase. The current belief is that more complex carbohydrates that require more energy and time to digest are better than simple sugars.
Diabetic patients can consume both fresh and stored potatoes provided the total carbohydrate intake does not exceed the level recommended by the physician. Several studies carried out in Europe have clearly shown that potatoes do not cause or worsen diabetes.

**Conclusions**

Storage of potatoes at 10-12°C with CIPC treatment is becoming popular in India. However, the storage technique being practised at present is not satisfactory. Only potatoes of varieties Kufri Jyoti and Kufri Lauvkar grown at Indore and Ujjain and to some extent Kufri Chandramukhi grown at Deesa seem to store well at 10-12°C with acceptable processing quality.

Potatoes grown and stored at other parts of the country were suitable only for table purpose and not for processing. Choice of variety is very important. For example, Kufri Bahar stored at 10-12°C is not at all suitable for processing due to higher sugar content. Greater awareness about suitability of a potato variety for storage at 10-12°C, maximum duration of storage for a given variety at this temperature without affecting the processing quality, right time of application of CIPC, maintaining high RH, proper ventilation to flush out accumulated CO₂ etc. will help in getting the maximum benefit. Farmers, traders and cold store owners can gain from this storage technology only if the processing quality of potatoes stored is acceptable to potato processors in the country. Selling these potatoes in the market for table purpose gives only a marginal profit. Consumers prefer CIPC treated potatoes stored at 10-12°C to cold stored potatoes and are even willing to pay more for them. Processing quality of potatoes can be maintained better by storing at 16 and 20°C but excessive weight loss and higher rotting do not permit storage at these temperatures for more than 2 to 3 months. CIPC can be useful in checking sprout growth even under non-refrigerated storage conditions like heap.

-R. Ezekiel, A. Mehta, Brajesh Singh, Dinesh Kumar, N. R. Kumar
संकर एसएम/91-1515 : पहली इलाकों के लिए आलू की नई संभावना

पिछले पांच वर्षों से हादसों इंस्टालेशन की नवीनता प्रणालियों के विकास के परिणामस्वरूप विशेषकर देश के पहली इलाकों में आलू की प्रकाशन पर निषेधा लगाने गेंद के बाद-बाद आने के गति के विकास में बढ़ोतर हुई है। इन प्रणालियों में भारतीय नस्ल के विशेषकर कुकरी जीवों तथा कुकरी मिश्रित किस्मों में भी पिछले इलाकों का प्रतिशोधो होता है। यद्यपि पहली इलाकों के लिए कुकरी इलाकों कि विशेषता कर जाने की गई है, किन्तु रोगवासी का बुद्धि से यह किष्किष लगने आता तक नहीं दिख रही है।

इस नयी प्रणाली संबंधित खजना में विशेष भावना देने के लिए पिछली इलाकों पर कई किष्में किस्में किस्में किराये करने की आवश्यकता है। इस प्रयास में केंद्रीय आलू अनुसंधान संस्थान द्वारा आलू का एक या दो संकर एसएम/91-1515 विकसित किया गया है।

हालांकि प्रदेश कृषि एवं प्रौद्योगिकी संस्थान, उदयपुर में 8-10 सितंबर, 2005 के दौरान आयोजित अनुसंधान संस्थान सम्मानित अनुसंधान परियोजना—आलू की पदोंती वर्कशेफ्ट की दुर्ग मीटिंग में वाणिज्य वोटर करने के उद्देश्य से इस संकर को जारी करने की संधियों वाशिस्त है।

इस संकर से उत्तरी आलू के वाले मानक आकार के अंदाज तक सब कक्ष के लिए उपलब्ध होता है। 110 से 120 रिट्रो की गति पर फलक पर नियमानुसार रोज़ के बाद-बाद आने के गति से तीव्र दर में बढ़ोतर हुई है। इस प्रकार भारतीय गति प्रणालियों के साथ संयुक्त किस्मों के लिए भी वर्तमान स्थिति रही है।

हिंदी कार्यालया एवं प्रशिक्षण पाठ्यक्रम
संस्थान के मुख्यालय में हिंदी डिप्लोमा का उद्घाटन 14 सितंबर, 2005 से चार दिनों का हिंदी कार्यालया एवं प्रशिक्षण पाठ्यक्रम का आयोजन किया गया। कार्यालया का उद्घाटन हिंदी भाषा प्रदेश प्रशिक्षण संस्था के द्वारा आयोजित किया गया।

प्रथम दिन पर उन्होंने राजस्थानी हिंदी पर एक फेस तोड़ दी। उनका कहना था कि आज़ादी के समय से हमारे देश में विशेषकर तमिलनाडु में हिंदी का लेखन ही राजनीति होने रहा है और हम भी हिंदी उसके प्रति नहीं हो सकते। उनका कहना था कि हिंदी में अंदाज साहित्य के बाद नहीं ऐसा हुआ। हिंदी साहित्य का कुछ इस प्रकार का है कि हम हिंदी पढ़ने, बोलने व लिखने वाले व्यक्ति को अंदरूनी ध्यान देने वाले के मुख्ता में कहा गया लिखा जा सकता है। इससे वार्तालाप में हिंदी भाषा का प्रचार प्राप्त औपनिवेशिक प्रकार रहा।

कार्यालय की आयोजन करते हुए संस्थान के विदेशी आलू के साथ साथ हिंदी कार्यालया के मुख्य कार्यालय में हिंदी भाषा का काम इसके साथ लगातार जारी रखा। इस संस्थान के साथ राजस्थान की प्रतिभा के कारण हिंदी भाषा का काम इस संस्थान के साथ राजस्थान की प्रतिभा के कारण हिंदी भाषा का काम इस संस्थान के साथ राजस्थान की प्रतिभा के कारण हिंदी भाषा का काम इस संस्थान के साथ राजस्थान की प्रतिभा के कारण हिंदी भाषा का काम इस संस्थान के साथ राजस्थान की प्रतिभा के कारण हिंदी भाषा का काम।
हिंदी चेतना मास आयोजित

13 अक्टूबर, 2005 को संस्थान द्वारा आयोजित हिंदी चेतना मास पारंपरिक वितरण एवं राजभाषा समाजवाद के साथ समान्य हुआ। इस अवसर पर जनने माने साहित्य एवं कलाज्ञान प्रो. कृतीनाथ रॉय का मुख्य अध्यक्ष अभिमानित थे। प्रो. कृतीनाथ रॉय ने अपने संवेदनार्थ में कहा कि हिंदुस्तान में केवल दो प्रतिष्ठित लोगों द्वारा किया जाने वाली भाषा अंग्रेजी को हम अपनी भाषा नहीं कहा जाएगा। उन्होंने उनकी, प्रतिनिधि, रुसी, जीन आदि के राजनीतिक द्वारा वार्तावादियों का लिखकर कहा कि अति केवल इन दोनों के लोगों को अंग्रेजी में बाटली करते या भाषा देते हमने नहीं खुदा गया। इन दोनों के लोग हम्मेने अपनी मानविकी में ही बोलते हैं। उन्होंने इसके लिए कहा कि हम भारतीयों में अंग्रेजित का है।

नरकास, सिमला की प्रतियोगिता में पुरुषार

संस्थान के मुख्याधिकारी के तीन अन्य राकम एवं श्री चंद दहन सिंह ने नागरिक राजभाषा कार्यकर्ता-पहुंच समिति, सिमला द्वारा आयोजित प्रशिक्षण प्रतियोगिता में प्रतिष्ठित पुरुषार प्राप्त किया। इस अवसर पर संस्थान के साहित्यिक चित्रकार (आर्मी) श्री श्रीनाथ अंबेकर को समर्पित जनता की उद्देश्य संस्थान के लिए समर्पित किया गया। राजस्थानी कलाविदों के अन्य समर्पन के नाम अंग्रेजी द्वारा आयोजित संस्थान के वार्षिक समारोह में इस समारोह में उच्च अवार्ड संस्थान की निदेशक सुश्री गुरु चंदले ने पुरस्कार किया।

हिंदी में कम्प्यूटर प्रशिक्षण

राजस्थान संस्थान, गुड नंदनालय के तत्कालीन में संस्थान के मुख्याधिकारी में 14–19 नवंबर, 2005 के दौरान हिंदी में कम्प्यूटर प्रशिक्षण कार्यक्रम का आयोजन किया गया। इस प्रशिक्षण कार्यक्रम में संस्थान के 20 कर्मचारियों ने माहित किया। पारंपरिक कार्यक्रम में चलने वाले इस कार्यक्रम में प्रशिक्षणाध्यापकों के हिंदी में कम्प्यूटर का आधारभूत ज्ञान विषय से संबंधित जानकारी देने के राजस्थान संस्थान के साहित्यिक श्री धीरेन्द्र महात्मा और अक्षय राजस्थानी द्वारा दिया गया। कार्यक्रम का समाप्त कार्य संस्थान के सहायक निदेशक (राजभाषा) श्री प्रभु चंदले ने किया।

कर्मचारियों ने ली शपथ

संस्थान के मुख्याधिकारी के निर्देशनकार डा. सुधाराम कुमार पांडेय की उपस्थिति में आयुक्त विषेष दिवस, सदस्य रिविजिट संवक्तक एवं निर्देशक एवं आयुक्त असिस्टेंट विषेष दिवस आयुक्त असिस्टेंट विषेष दिवस आयुक्त असिस्टेंट विषेष दिवस आयुक्त असिस्टेंट विषेष दिवस आयुक्त असिस्टेंट विषेष दिवस आयुक्त असिस्टेंट विषेष दिवस आयुक्त असिस्टेंट विषेष दिवस आयुक्त असिस्टेंट विषेष दिवस आयुक्त असिस्टेंट श्रीकुमार चंदले का कार्यक्रम की शपथ ली। संस्थान एवं उनके क्षेत्रीय केंद्रों में साइबरस्पेक्ट्रा जनता का अनन्त विद्यालय वेबसाइट चलाने के लिए उद्देश्य संस्थान के साहित्यिक श्री धीरेन्द्र महात्मा और अक्षय राजस्थानी द्वारा दिया गया। कार्यक्रम का समाप्त कार्य संस्थान के सहायक निदेशक (सर्वसाधारण) श्री प्रभु चंदले ने किया।

Printed : December 2005 (1000 copies)
Editorial Committee : Brajesh Singh, Anil Kumar, Avnish Atrey
Published by : Dr. S.K. Pandey, Director,
Central Potato Research Institute
Shimla-171 001, Himachal Pradesh, India
Phone: 0177-2625073, Fax: 0177-2624460
E-mail: director@cpri.ernet.in
dircpni@sancharnet.in
Website: http://cpri.ernet.in

Printed at : Nirmal Vipai Printers, B-62/8, Naraina Industrial Area, Phase-II, New Delhi-110 028. Tel.: 41418526, 25891449 Mobile : 9810089097

December - 2005