



# Central Potato Research Institute Newsletter

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## *From the Director's Desk*



The potato is an ideal host to a large number of soil- and tuber-borne diseases. Since the same tubers, which are catered predominantly in a raw state to the consumers, are also used as seeds, these diseases play havoc in economic and sustainable potato production. Pesticides are used, I would say often injudiciously, to control these diseases, but emerging issues of food and environmental safety are making their uses more and more challenging against strong public debates. Even if these issues are yet to occupy the centre stage in our country, the public have become practically hysteric over these issues in developed, especially European countries and North America. Therefore, environment-friendly management of soil- and tuber-borne diseases of potato is a challenging task to

the scientists in our country, if we are to sell our produce, tubers as well as seeds, in the international markets in this era of trade liberalization and globalization. The thematic article of this issue of the CPRI News Letter has, therefore, rightly dealt with various aspects of environment-friendly management of soil- and tuber-borne diseases in potato. It is indeed assuring that our scientists have succeeded in developing alternative methods, including bio-control agents, for controlling diverse soil- and tuber-borne diseases. Of various methods, the simple cost-effective boric acid formulation needs worth mentioning, as it is increasingly getting popular with our farming community. In this context, I would like to point out that nanotechnology is an emerging field for future disease and pest management. Nanotechnology devices for "Smart Field Systems" to detect, locate, report and apply pesticides as and when needed, and "Smart Delivery Systems" to deliver insecticides and pesticides in a spatially targeted and self-regulated manner hold the key to successful environment-friendly management of soil- and tuber-borne diseases. In addition, there is an enormous opportunity for "Nanoparticle pesticides", which can be easily taken up by plants and can also be programmed to be time-released. The multinationals like Monsanto, Syngenta and BASF are already in the process of developing pesticides enclosed in nanocapsules or made up of nanoparticles. Research in this direction will be highly rewarding for potato disease and pest management in the long run.

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## Minister of State Visits CPRS, Gwalior

Hon'ble Minister of State for Agriculture and Food Supply, Govt. of India, New Delhi, Dr. Akhilesh Pratap Singh visited CPRS, Gwalior on 09.05.2006. He was formally welcomed by the scientists of the station Drs. AK Somani, SP Singh, Birbal and Vinod Kumar and was informed about the various activities of the station including its mandate



Minister visiting the Gwalior campus.

and seed production programme. Minister enquired about the distribution of seed to the farmers and he was informed that breeder seed is meant for supply to various state Govts, National Seed Corporation and other agencies as per the allotment made by the Ministry of Agriculture, GOI. However, excess seed is supplied to individual farmers (2-3q per farmer) after ascertaining that he shall be preparing seed from it for his own use as per the technique explained

to him and he shall not be selling the produce in *mandi* for table purpose at least for next 3-4 years.

During visit to the Station, Minister offered few suggestions like increasing production of breeder seed, more seed should be given to farmers and station scientists should have more interactions with them, development of laboratories and other infrastructural facilities.

## Research Highlights

### Transgenic potato for eco-friendly management of late blight

Potato late blight caused by the oomycete fungus *Phytophthora infestans* is the most dreaded disease of potato causing an annual loss of approximately US\$ 3 billion worldwide. In India itself, management of late blight through host resistance would save around US\$ 250-350 million annually. Moreover, heavy dose of fungicides (Metalaxyl and Mancozeb) is sprayed on potato crop to save it from this devastating disease thus creating serious environmental hazard. Development of potato cultivars with durable late blight resistance is, therefore, a major objective of the Institute. The diploid potato species, *S. bulbocastanum* from Mexico and Guatemala, known for its high level of late blight resistance for decades, could not be utilized to transfer the resistance into cultivated tetraploid varieties by classical breeding because of differences in ploidy and endosperm balance number (EBN). Recently, the *R* gene responsible for

race non-specific, broad-spectrum resistance in *S. bulbocastanum* has been cloned at the University of Wisconsin, Madison, USA. Transgenic lines of the potato cultivar Katahdin expressing this gene (*RB*) defended the onslaught of late blight at the Toluca valley of Mexico, the center of origin of *P. infestans*.



Late blight response of *RB*-transgenic Katahdin (left) and non-transgenic control (centre) with and without (right) inoculation of *P. infestans*.

The Institute is running a collaboration project with Agricultural Biotechnology Support Project II (Cornell University, USA) for utilization of the *RB* gene in development of late blight resistant potato varieties. Indian Council of Agricultural Research signed a Material Transfer Agreement (MTA) with the Wisconsin Alumni Research Foundation (WARF) in July 2005 for utilizing the *RB* gene in development of late blight resistant variety. Central Potato Research Institute, Shimla received *RB*-transgenic lines of Katahdin as well as the *RB* gene construct from the University of Wisconsin in the month of August-September 2005. Research work to utilize this valuable technology is now going at full swing at CPRI, Shimla. Scientists from India, USA, Indonesia and Bangladesh regularly engage into teleconferencing to share their experiences and achievements on fortnightly basis.



Visit of scientists to CPRI, Shimla

The progress of this global project was recently monitored by a group consisting of Dr. S.N. Pandey, ADG (Hort.), ICAR, New Delhi; Dr. Ronnie William Coffman, Director, International Programme, Cornell University, USA; Dr. Kandukuri Venkat Raman, Assoc. Director, ABSP II, Cornell University, USA; Dr. S.K. Pandey, Director, CPRI, Shimla; Dr. B.P. Singh, Joint Director, CPRIC, Modipuram & others. The team visited the poly-house at CPRIC, Modipuram where transgenic Katahdin lines were being grown for induction of flowering so that crossing work with the Indian potato cultivars Kufri Jyoti and Kufri Bahar can be carried out. The team also visited the molecular biology and the tissue culture laboratories at CPRI, Shimla where genetic transformation work with the RB gene was being carried out. So far about 12 putative transgenic lines each of Kufri Bahar and Kufri Jyoti have been regenerated. The team expressed satisfaction over the pace of the work being carried out in India as well as in Indonesia. The team unanimously agreed that efficacy of RB gene against the local strains of *P. infestans* should be evaluated on priority basis latest by September 2006.

- SK Chakrabarti and SK Pandey

### Multiplication of in-vitro planting material of potato (micro-tubers)

Potato is an important crop grown worldwide and is generally grown from seed tubers. Therefore disease free seed of potato plays important role in maintaining yield potential of potato cultivars. Successive multiplications of seed tubers in field carries the risk of infection and build up of various bacterial, fungal, nematode and viral pathogens. Hence, ideally, seed tuber multiplication is restricted to areas, which are free from virus spreading insect vectors. Even in such areas, viral and fungal infection has to be



Net house at CPRS Jalandhar

prevented by repeated pesticide and insecticide sprays and adopting standard agronomic practices. Conventional seed production is totally dependent upon elite tubers. To obtain economic yields, it is desirable to replace seed stock of the farmers after every three years. For the purpose, micro-tubers developed through meristem tip culture under controlled conditions are multiplied on a large scale under net house for maintaining desirable health standards.

### Production of micro-tuber

Meristem tip culture technique is used in the development of micro-tubers under aseptic conditions. For

virus elimination from systematically infected potato cultivars, apical meristems (0.1-0.2 mm in size) are removed from terminal bud and cultured in a suitable medium for plant regeneration. This tissue, termed as "mericlone" is tested against virus with ELISA. When a potato clone is made free of viruses through meristem culture, it is rapidly multiplied by shoot cutting under aseptic conditions. Disease free micro-propagated plants are either directly transplanted in field for production of mini-tubers or are grown in laboratory under controlled conditions to provide micro-tubers. Micro-tubers are miniature tubers (average weight 100-200mg) produced in a suitable medium. These are produced in flask or in special culture boxes and are harvested after protracted period of



(a) Nursery beds



(b) Healthy tuber material

Multiplication of *In-vitro* (micro-tubers) planting material in net house

incubation. Before harvesting, the micro-tubers are greened under light for minimizing storage loss due to shrinkage and drying. These small dormant tubers are particularly convenient for handling, storage and distribution, and may be used for large scale mechanized planting in field.

### Production of mini-tubers under net house

Sprouted micro-tubers are planted in the nursery beds under aphid proof net house at 10 x 30 cm on a mixture of FYM, soil and sand in the ratio of 1: 1: 1. Earthing up is done when plant height reaches 20-25 cm and N is applied @ 50kg/ha. Micro-tuber crop is allowed to mature in the nursery beds and harvesting of mini-tubers is done at the end of crop season. The resultant mini-tubers are cold stored for field planting during next season.

### Steps for production of mini-tubers in first field multiplication

- Fine tilth is required for proper emergence.
- Ratio of soil: sand: FYM (1:1:1) is maintained before soil solarization.
- Soil solarization for 4 weeks (15<sup>th</sup> May to 15<sup>th</sup> June) is carried out.
- Pre sowing irrigation is done 3-4 days before planting.
- Raised beds having provision for side irrigation are prepared.
- Alternate day irrigation is provided by watering can for the first fortnight. After that, weekly irrigation interval is followed.
- Micro-tuber need to be placed more than 3-4 cm below soil level.

- After planting the micro-tubers are properly covered with soil.
- Earthing up is done at 40-45 days @ 50 kg/ha nitrogen when plants reach 20-25 cm height.
- After 60 days, composite samples of leaf is tested with ELISA.
- Spacing of 30 x10 cm inter and intra row is followed.
- Three different inspections are carried out to rogue out off type and infected plants.
- Mini-tubers so produced are multiplied next year in second field condition.
- Produce of 2<sup>nd</sup> field multiplication is called Breeder's seed.

### Merits of In-vitro planting materials

- Micro-tubers are free from viruses (PVX, S, Y, A and M), soil and tuber borne diseases, bacterial and fungal infections
- Multiplication is faster than conventional method
- Saves storage space for seed
- Maintains yield potential of potato cultivars
- Technique is used to maintain healthy seed stocks of newly developed cultivars
- Seed rate per unit area is less
- Easy transportation owing to less volume

-*RK Singh, Jyotsana Sharma, GS Kang and Sarjeet Singh*

### Recent potato varieties released by the Central Potato Research Institute

CPRI has developed six new potato varieties for cultivation in different agro-ecological zones. The Central Sub-committee on Crop Standard

Notification and Release of Varieties for Horticultural Crops, Ministry of Agriculture, Govt. of India, New Delhi has recommended these varieties. The description of these varieties is as follows:

**Kufri Arun:** It is a medium maturing variety producing medium size, oval, red tubers with medium deep eyes and creamy flesh. The variety is field resistant to late blight. Kufri Arun is suitable for cultivation in plains of Uttar Pradesh, Punjab, Haryana and Bihar.



Characteristics of Kufri Arun

**Kufri Pushkar:** It is a medium maturing variety having medium



Characteristics of Kufri Pushkar

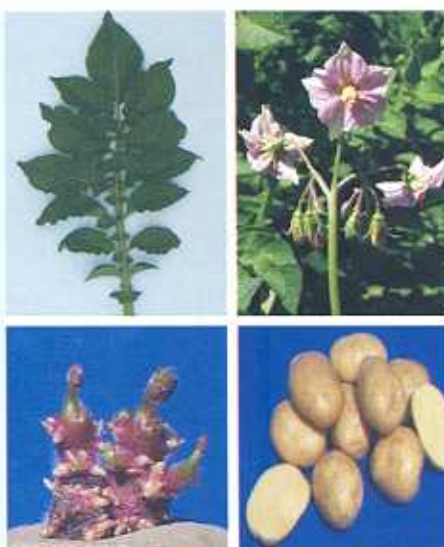
size, round-oval, white tubers with fleet to medium deep eyes and light yellow flesh. The variety is resistant to late blight and early blight. It is recommended for cultivation in Haryana, Rajasthan, Punjab, Uttar Pradesh and Maharashtra.

**Kufri Surya:** It is an early maturing variety producing medium to large size, oblong, white tubers with shallow eyes and pale yellow flesh. It is a heat tolerant variety and is field resistant to hopper burn. This variety also possesses some resistance to mite damage and late blight. It has been recommended for cultivation in Karnataka, Punjab and western Uttar Pradesh.



Characteristics of Kufri Surya

**Kufri Shailja:** It is a medium maturing variety and has been recommended for cultivation in Himachal Pradesh, Uttranchal and hilly regions of Tamil Nadu. It possesses high level of field resistance to late blight both in foliage and tubers. The tubers are white, round-oval and of medium size with shallow eyes and pale yellow flesh. The variety has better



Characteristics of Kufri Shailja

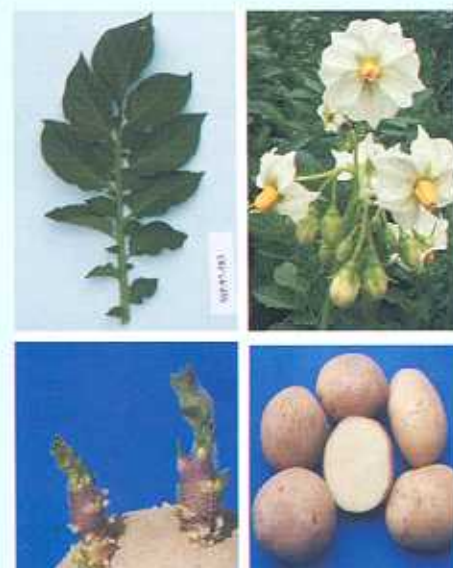
keeping quality than Kufri Giriraj, which is also recommended for cultivation in hills.

**Kufri Himalini:** This variety has been recommended for cultivation in Himachal Pradesh, Uttranchal, Meghalaya and Nigiris hills in Tamil Nadu. It is a medium maturing variety and produces oval-oblong, white tubers of medium size with shallow eyes and pale yellow flesh. It possesses field resistance to late blight in foliage and moderate resistance in tubers.



Characteristics of Kufri Himalini

**Kufri Chipsona-3:** This is a processing variety suitable for preparation of chips because of its high tuber dry matter, low reducing sugar and negligible glycoalkaloid



Characteristics of Kufri Chipsona-3

content. This medium maturing variety has round-oval white tubers of medium size with shallow eyes. The variety also possesses field resistance to late blight. It is suitable for cultivation in Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal and Madhya Pradesh.

*-Vinay Bhardwaj, Jai Gopal, SK Pandey, P Manivel and SK Kaushik*

### Training & Technology Transfer

#### Kisan Mela at Shillong

Central Potato Research Station (CPRS) Shillong, Meghalaya, one of the regional stations of Central Potato Research Institute (CPRI), Shimla (Himachal Pradesh) organized two days Kisan Mela on 26-27<sup>th</sup> April, 2006, under the aegis of Mini-Mission-I on the Integrated Development of Horticulture in

North Eastern region of India, Sikkim, Himachal Pradesh, J & K and Uttaranchal. The theme of the Kisan Mela was **“Towards improving potato productivity in north eastern (NE) states.** It is apt to mention here that potato crop occupies significant space in the rural agrarian economy and dietary regime of the people of NE region. The poor potato productivity of the region (about 10 t/ha as against the national average of 19 t/ha) is a matter of concern for all the potential stakeholders working for potato R & D in this region. The above facts also supported the genesis of the Kisan Mela wherein potato farmers from various states of this region and representatives from processing industries, seed industries, fertilizer companies and voluntary organizations shared the common platform.



Inauguration of Kisan Mela

While inaugurating this Mela, Sh. H.S. Shylla, Chief Executive member of Khasi hill autonomous district council stated that the potato farmers of the region must be supported with organized/formal potato marketing institutions in order to get them rid of the middlemen. He strongly advocated for strengthening potato cultivation in farming system mode by giving emphasis on livestock production so that farmyard manure generated in this way could be utilized for potato cultivation.

In the presidential remarks, Dr. B.P. Singh, Joint Director, CPRI Campus, Modipuram stated the significance of CPRS, Shillong in the effort of generation and dissemination of technologies for production, protection and post harvest handling of potato among the farmers of this region. He specifically highlighted reasons for the location of this station, which was established in the year 1959 in the erstwhile Assam state. Dr. KM Bujarbaruah, Director, ICAR, Research Complex for NEH Region, Barapani (Umiam), Meghalaya and Shri Oris Lyngdoh, Headman of the locality also addressed the gathering of the farmers and delegates.



Participants of Kisan Mela

More than 400 potato farmers from all the potato growing circles of East Khasi hill, Ribhoi and West Khasi hill districts of Meghalaya, and farmers from Nagaland and Assam participated in this Kisan Mela. Similarly, there were about 120 delegates from various departments and companies like Indofil Chemical Company, Kolkata; Kislay Food and Snakes, Guwahati (Assam); Chambal Agritech Pvt. Ltd., Chandigarh and Pepsico India Holding Pvt. Ltd. (Fritolays division), Kolkata participated and displayed their products and technologies for the benefit of the farmers of this region.

Fertilizer companies like MECOFED, Shillong; IFFCO, Guwahati unit and IPL, Guwahati also displayed their products. The representatives from financial and other supporting institutions like NABARD, Shillong region; Meghalaya co-operatives Apex Bank Ltd., Shillong and APEDA, Guwahati deliberated their schemes and other provisions for the potato farmers of this region in the parallel session. Similarly, there was deliberation by a reputed NGO like Rural Resources and Training Centre (RRTC), Umran (Meghalaya), who focused on the organic agriculture for better sustainability in this region. The state department of horticulture, Govt. of Meghalaya also displayed their products and production technologies.

Besides, there were stalls and exhibits by private enterprises like Stanley Roy Construction, Shillong; Anderson Bio-tech Pvt., Ltd., Shillong; Bethany society, Shillong and St. Peter Convent, West Khasi Hills, Meghalaya. State Marketing Board and Directorate of Marketing Intelligence (DMI), Govt. of India also displayed their live-in marketing portal in this Kisan Mela and explained to the interested groups of farmers about the best possible use of such web based portal.

In the technical session of this Mela, resource persons from CPRI, Shimla namely Drs. PH Singh, KR Dhiman, JS Minhas and NK Pandey deliberated upon different aspect of scientific potato cultivation including high yielding potato varieties, TPS technologies, management of various diseases and insect pests and storage of potatoes. Prior to that, Dr. BP Singh, Joint Director, CPRIC, Modipuram

presented the overall scenario of potato research and development in India *vis-à-vis* North Eastern region. In the same technical session, Dr. M.S. Kadian from CIP, South West and Central Asia, New Delhi shared with the audience about their effort for potato development in this region with particular focus on dissemination of TPS technology.

The other attractions of this Kisan Mela were live and standing crop of various potato varieties and a comprehensive stall of CPRS, Shillong depicting the entire aspects of potato technologies. Farmers took immense interest in these features. Scientists of this station coordinated the practical demonstration on scientific method of fertilizer application and potato planting. Further, a panel of scientists also evaluated all the stalls and best three stalls were given the award and certificate of merit. The best stall award was bagged by the District Horticulture Office, Department of Horticulture, Govt. of Meghalaya. The second and third best stall award was adjudged to Kislay Food and Snacks, Guwahati (Assam) and jointly to Department of Marketing and Directorate of Marketing Intelligence (DMI), Govt. of India, respectively.

### Farmers meet at Palampur

A potato farmers and scientists meet was organized at Rice and Wheat Research Station, Malan near Palampur, HP on 10.03.2006. Around 400 potato farmers of the neighboring areas participated in this meet, which was organized by HPKVV, Palampur and its station with the support of State Department of Agriculture and KVK.



Farmers at Potato Meet

Various scientists including Drs. VK Chandla and Brajesh Singh of CPRI delivered their talk on aspects related to potato production, protection and post harvest management. This belt of the region is known for quality production of processing grade potatoes and therefore, the major emphasis was given on potato production for processing purpose.

### Potato Workshop in Uttarkashi

The Himalayan Action Research Center (HARC), an NGO working in Uttaranchal organized Rawain Farmers' Fair on January 8-9, 2006 at Naugaon, Uttarkashi. They invited CPRI scientists for organizing Potato Workshop in the fair. The Himalayan Action Research Center is involved in promoting agriculture and rural agri-business in fruits and vegetables. Two of its extension officers were trained by CPRI in the Model Training Course organised in August, 2005 at Shimla. After that a linkage has been developed with HARC and this workshop was a part of follow-up activities of the training. Accordingly, Drs. KR Dhiman, NK Pandey, Anil Kumar and Sh. Rakesh Kumar of CPRI attended this workshop and put up an exhibition stall in the fair. The scientists delivered lecture on potato and discussed different issues with the farmers of the area, which is by and large backward in terms of



Potato Exhibition in Uttarkashi

technology adoption. The farmers were ignorant about the improved techniques of potato cultivation. The major problems of the farmers were non-availability of healthy seed and marketing of the produce.

### Training of Level-I experts of Kisan Call Center

The Kisan Call Center (KCC) for Himachal Pradesh is working since May 2005 at Chandigarh to answer the queries of farmers pertaining to agriculture. The Level-I experts based at Chandigarh answer the queries. If they are not able to answer the queries, the phone call is directed to Level-II experts. CPRI, Shimla has been identified as one of the Level-II expert center for potato in Himachal Pradesh and the Directorate of Wheat Development, Ministry of Agriculture, Govt. of India is the nodal agency for HP. The Directorate organises one-day training course every month for the Level-I experts of KCC. On January 31, 2006 a training course was organized at CPRI, Shimla in which the Level-I experts were trained with respect to potato production, storage and plant protection practices by CPRI, Shimla scientists.

### Live Phone-in Programme on Doordarshan

The Shimla Doordarshan has started live phone-in programme of 'Krishi

Darshan' in collaboration with various organizations concerned with agricultural development. The programmes of various organizations are discussed in the monthly meetings and are telecasted every Monday and Thursday as per schedule. In this programme burning issues related to crop, animal husbandry, fishery, etc. are discussed by the expert and the viewers (farmers) can ask questions from the expert by dialling the phone number announced just before the start of the programme. Drs. SK Pandey, MC Sood and NK Pandey participated in the programme during the month of January 2006 to discuss various aspects of potato production. Dr. Sarjeet Singh participated in this programme on 16-3-2006, Dr. S S Lal on 8-5-2006 and Drs. PH Singh and VK Chandla on 15-6-06.

### Exhibition in Krishi Expo-2006

CPRI campus, Modipuram put up potato exhibition stall in the Krishi Expo-2006 held during March 8-12, 2006 at Pragati Maidan, New Delhi that was organized by Ministry of Agriculture, Govt. of India. Various potato varieties for ware and processing purposes were displayed in the stall and two new varieties, viz. Kufri Surya and Kufri Chipsona-3 were also displayed for publicity.

### Training programmes of NHRDF at Patna

A one-day farmers training programme on potato cultivation & seed production was organized at Patna on 20-03-2006. A group of 50 farmer's of district Sasaram, Bihar participated in the programme. Drs. RP Rai and Barsati



Potato exhibition stall of CPRS, Patna

Lal of CPRS, Patna imparted this training programme, which was sponsored by NHRDF, Patna.

Another one-day training programme on "Scientific Potato Cultivation and Seed production" was organized at CPRS, Patna on 27.04.2006. A group of 100 farmers (40 female and 60 male) of district Hazaribagh, Jharkhand, sponsored by NHRDF Patna participated in the programme. Drs. RP Rai, SN Singh, B. Prasad, Manoj Kumar and Barsati Lal delivered lectures and imparted training to this group on latest technologies of potato cultivation.

### Participation in Krishak Goshti

Scientists of CPRS, Patna participated and arranged exhibits in farmers fair and Krishak Goshti organized by IIVR, Varanasi on 7.01.2006 at Motihari (W. Champaran), Bihar.

### Important Meetings

#### Golden Jubilee year (GJY) of CPRS, Ooty

Central Potato Research Station, Muthorai, the Nilgiris organized the inaugural function of Golden

Jubilee year (1957 to 2006) on 7.04.2006 at Central Potato Research Station, Mutorai. About 35 lead farmers of the Nilgiris and Coonoor districts attended the function. The programme was well covered by the Media and All India Radio.



Inauguration of Golden Jubilee Year

Mr. C. Vijayarajkumar, IAS, Collector, Nilgiris presided over the inaugural function while Mr. R. Karpoorasundarapandian, IAS, Special Commissioner, Horticulture and Plantation crops, Chennai was the chief Guest. The function was followed by Golden Jubilee year tree planting by the dignitaries in front of the building.

Dr. KS Krishna Prasad, in his welcome address explained about the establishment, activities and future thrust of Central Potato Research Station. He stressed the need of involvement of State Government in improving seed production and its distribution of farmers.



Potato planting by farmers at Ooty



Sh. Vijayraj Kumar, IAS, Collector of Nilgiris in his presidential address, appreciated the work of the station and its achievements. He urged the Scientist to develop disease resistant high yielding varieties. He offered to release funds for the purpose of training local farmers and field staff in Co-ordination with Hill Area Development Programme.

Sh. Jatak Chiru, IAS, Project Director, Hill Area Development Programme in his address termed it as a landmark function and told that the popularity and demand of potato is increasing day by day. He requested the scientists to develop good farming techniques to grow potato.

After that three progressive farmers (Mr. Krishna Kumar, Mr. Palanisamy and Mr. Nanjan) talked about the importance of potato crop in vegetable cultivation, role of Central Potato Research Station in improving the productivity of potato in this area, performance of potato varieties released by Central Potato Research Station in this area, etc. They requested that seed production should be increased by growing potato in the State Government farms and farmers fields under the guidance and supervision of Central Potato Research Station to supply the seeds to more farmers. They also requested local district administration to intervene in marketing and auction sale of their produce, as there are no facilities available for the same in the Nilgiris.

Mr. Rajkumar from MYRADA (an NGO) stressed that CPRS, Ooty should concentrate on providing good quality seed, education the farmers and on post harvest technology.

Dr. Nayum, Head, IARI Regional Station, Wellington gave suggestions for improvisation of tissue culture techniques for faster multiplication of seed. Dr. Durairaj, UPASI emphasized on the need for utilization of damaged and left over potatoes in the village level processing for value addition to the crop.

The function ended with tree planting by dignitaries at CPRS, Ooty and the first planting of potato for this year in the field.

### Mini Mission-I meeting held

The Annual meeting of MM-I was organized by Nodal Officer, CPRI, Shimla at Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan on 4<sup>th</sup> and 5<sup>th</sup> January 2006. The Govt. of India was represented by Dr. Shiva Ram Reddy, Deputy Commissioner, Horticulture. All PI's of different institutions involved in implementation and monitoring were present. Dr. D.S. Thakur, Vice Chancellor, CSK HPKV Palampur and Dr. Jagmohan Singh Chauhan, Vice Chancellor of Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan chaired different sessions. The inaugural function was attended by Directors of Research, Extension and Heads of departments / institutions located in the state. The PIs/Co-PIs of the ongoing projects

presented the progress report of the first year and the newly approved projects under Mini-Mission-I. Dr. SK Pandey, Director cum Nodal Officer highlighted the importance of Horticulture in Indian economy and explained the main aims of Mini-mission. He said that the development of hilly region in mission mode to foster the rapid growth of the region and to improve socioeconomic status of all hilly farmers in Himachal Pradesh is the main aim of the mission. Annual progress report of 21 ongoing projects was presented in the meeting and the progress was considered satisfactory. The Nodal officer congratulated the PIs and the institutions that exceeded the physical targets fixed for the 1<sup>st</sup> year. The VCs of the two universities also expressed their happiness in accepting challenges of achieving the physical targets. They also suggested that the crops which are economically important should be prioritized and the planting material be produced accordingly. The utilization of funds was slow due to procedural delays but all PIs assured to utilize the funds by 31<sup>st</sup> March 2006. In all, 28 newly approved project proposals covering the objectives of MM-I received from 4 institutions located in the state were presented and suggestions were given so that the MM-I is able to follow clear cut road map and other details.

### CPRI participated in sports meet

CPRI participated in ICAR Inter-Institutional Sports meet (North Zone) held at NDRI, Karnal between 7<sup>th</sup> to 10<sup>th</sup> March 2006 and won the overall runner up trophy.



Mini mission-I meeting at Solan

The major achievements include:

- Mrs. Shyamlata Begta was adjudged the Best Women Athlete.
- CPRI won the Trophy for Table Tennis (Men). The players were: Dr. Vinay Bhardwaj, Sh. CM Bist, Sh. Gurjeet Singh, Sh. Roshan Lal and Dr. NK Pandey.
- Runner up trophy in Volleyball shooting event.
- Mrs. Shyam Lata Begta got Gold Medals in Discus Throw, Javelin Throw and Shot Put Throw. She also got bronze medal in long Jump.
- Mrs. Tarvinder Kocchar got Gold Medals in 100 mt race, 200 mt race and Long Jump and Bronze Medal in High Jump.
- CPRI won the TT (Women Doubles event) and received the Gold Medal – The players were Mrs. Shyam Lata & Mrs. Poonam Sood.
- Sh. Vijay Kumar won the Silver Medals in Long Jump (men) and Shot put throw (men).



CPRI sports team at Karnal

### Participation of CPRI Scientists in RAU, Pusa programme

A team of potato scientists namely, Drs. RP Rai, RS Marwaha, Manoj Kumar and SK Singh lead by Dr. SK Pandey, Director, CPRI, visited RAU campus at Pusa (Distt. Samastipur) and participated in seminar on "Promoting entre-

preneurship in potato by farm and household women". The above seminar was held during 29<sup>th</sup> to 31<sup>st</sup> January, 2006. Dr. SK Pandey delivered a lecture on "Potato development in the country" and promised to extend full support to the university for all kind of research know-how. He also proposed the technical work plan to the university authority as how to proceed with the cultivation of processing potato varieties and its utilization by local women to saturate important towns like Muzaaffarpur and Samastipur with products like chips, lachhas, etc.

The team of potato scientists visited a large number of potato fields. The Director gave suggestions for using healthy seed of popular varieties from CPRS, Patna for multiplication and then further distribution to local growers. Dr. RP Rai delivered a talk on "Potato scenario in Bihar" and suggested improvements in the potato productivity by switching over to new potato varieties like Kufri Ashoka and Kufri Pukhraj. He also offered to spare breeder seed of these two varieties to the university for multiplication programme. Dr. RS Marwaha presented a full view of processed products of potato. He elaborated on the methodology involved in processing of different products. He also offered technical help in training RAU staff at CPRS, Jalandhar.

As an extension of the above programme Agri-expo was also held at RAU, Pusa for a period of four days w.e.f. 2<sup>nd</sup> to 5<sup>th</sup> March, 2006. Drs. RP Rai, S Kumar, Manoj Kumar and B Lal participated in the

above programme and arranged an exhibition displaying live samples of fifteen varieties and other display materials. Forty kg of Kufri Chipsona-2 was also provided to RAU for chip making and its popularization.

### Workshop on Electron Microscopy

Division of Plant Protection, CPRI, Shimla participated in the organization of 26<sup>th</sup> Workshops on Electron Microscopy organized by Sophisticated Analytical Instrumentation Facility (SAIF), Punjab University, Chandigarh between April 26-May 3, 2006. Trainees of the workshop had a full day lecture-cum-training in Electron Microscopy and Immuno-Electron Microscopy for plant virus diagnosis.



Trainees of EM workshop

### Participation in Expert working group

Dr. ID Garg, Head, Division of Plant Protection, CPRI, Shimla participated as expert in the Expert Working Group constituted by International Plant Protection Convention (IPPC), FAO, Rome to frame guidelines for the movement of micropropagated material and minitubers of potato in International trade between September 12-16, 2005 at Edingurgh (Scotland).

## Invited lectures & Visitors

### DDG visits CPRS, Patna

Dr. G. Kalloo, DDG, Horticulture, ICAR, New Delhi visited CPRS, Patna on 29<sup>th</sup> and 30<sup>th</sup> December 2005. During the visit he interacted with the scientists of the station and supervised the on-going research work of the station. He suggested improvements in the present activities of seed production and infrastructural facilities for laboratories, office and fields.



Visit of DDG to CPRS, Patna

### DG CIP visits CPRI

**Dr. Pamela Anderson**, Director General, International Potato Centre, Lima Peru visited CPRI, Shimla on 22<sup>nd</sup> February, 2006. She was accompanied by Dr. Sarath Ilangantileke, Regional Director, CIP from New Delhi office. During her visit she was shown the facilities available at the institute. She also discussed the various activities of the institute and the possibilities of mutual cooperation. During her meeting with the Heads of Divisions of the Institute she evinced keen interest on the work on inducing late blight resistance through incorporation of RB gene in Kufri Bahar and Kufri Jyoti in collaboration with Wisconsin University. She also briefed the



Dr. Pamela and Dr. Sarath at CPRI

scientists of CPRI about the work being carried out in this regard at CIP.

Another area of mutual interest was the introduction of cold chipping gene into processing varieties to avoid enhancement of sugars during cold storage of potatoes. She informed us that CIP is also working on this aspect and discussed the possibilities of exchange of expertise. She showed keen interest in the work on traditional methods of potato storage. She wanted to know about the places in India where farmers are practicing heap and pit methods of potato storage, the maximum storage period and total storage losses. She was informed that storage of potatoes in heap is popular throughout India and potatoes can be stored on-farm, in heaps for 90-110 days with total storage losses of less than 10%.

Dr. Pamela was also eager to know about the IPM schedule adopted by CPRI for control of PTM. She suggested introduction of eco-friendly component using Granulosis Virus, etc.

She also addressed the Scientist's meet of CPRI. She informed that under the new funding policies of the international funding agencies, more funds are being given to address the health, poverty

alleviation and nutrition of regions with high population densities. Thus, in the near future CIP is going to expand its activities in Africa and India and especially so in North East India where the problems are more acute.

### CIP Scientists visit CPRI

**Ms Guruswamy**, GIS Specialist, International Potato Centre, Lima, Peru visited CPRI, Shimla between 18<sup>th</sup> to 19<sup>th</sup> January 2006 to appraise herself of the work being carried out at CPRI, Shimla on use of Remote Sensing and GIS for potato acreage estimation in the Indo Gangetic Plains. The methodology of acreage estimation was explained to her in detail, viz., criteria for selection of study area i.e. States and districts, procedure and periods for ground truth (GT) data collection in different states. The study is being carried out in five major potato growing states of India i.e. Punjab, Haryana, UP, Bihar and West Bengal. These five states account for about 75% of potato acreage and 85% of potato production in the country. Complete enumeration is done for Punjab and Haryana states, while for other states cluster based approach is adopted. The ground truth data (GT) is collected during the active growth phase of the potato in different states. GT data is also collected for the other crops, which are in active growth phase during the period and likely to interfere with the signatures of potato crop. These crops include sugarcane and wheat in Punjab and Haryana, sugarcane, mustard and wheat in UP, mustard, sugarcane and maize in Bihar and rice and mustard in West Bengal. During 2001-02 to 2003-04 crop seasons,



Ms Guruswamy at CPRI

WiFS data of 180 resolutions were used for acreage estimation, however, during 2004-05 crop season, Awifs data of 56m resolutions were used for the study.

Ms Guruswamy was also shown the satellite images of Punjab for the current crop season. She also delivered a talk on "GIS applications in International Agricultural Development" in the scientists meet at CPRI, Shimla.

**Dr. Jurgen Krochel**, Head, IPM, CIP, Lima visited CPRI between June 2- 4, 2006. He discussed with CPRI scientists about the various IPM schedules being followed at present under Indian conditions. He delivered a lecture in the Scientist Meet on "Agro-ecological research at CIP for reducing poverty and hunger in potato and sweet potato based cropping systems in developing countries" and emphasized on the use of eco-friendly components like Granulosis virus, *Bacillus Thuringiensis* (Bt) and PTM parasites like *Copidosoma kohleri* and *Apanteleus subidinus* tested by the International Center against PTM. He also visited more than 20 farmers stores in Kangra Valley to assess the PTM problem on the spot and suggested having collaborative programmes among CIP-CPRI, CSKHPKV and Plant Protection Lab. (Directorate of

Agriculture, H.P.); training of 1-2 PTM scientists in India or CIP, Lima under sponsored programmes, on-farm trial against PTM with farmers participation in Kangra valley and testing of GV, Bt formulations in talc powder after ascertaining LD 50 dose of these bio-pesticides in fields and stores.

### Egyptian scientist visits CPRI

**Dr. Mahmoud Ibrahim Al-Omeiry**, Director, Field Crop Research Institute (FCRI), Cairo, Egypt visited CPRI, Shimla on 6<sup>th</sup> & 7<sup>th</sup> June 2006. On 6<sup>th</sup> June he interacted with all Heads of Divisions. He was given a brief account of CPRI and its activities and this was followed by discussions with Heads of Divisions. He showed keen interest in the activities of the Institute and was particularly interested in the work on breeding and plant



Egyptian scientist with CPRI scientists

protection being carried out at CPRI. He visited the Divisions of Crop Improvement and Plant Protection, saw the facilities and interacted with the Scientists. On 7<sup>th</sup> June he visited CPRS, Kufri. He was shown the potato seed crop and the seed production programme was explained to him in detail. He also interacted with the Scientists at CPRS, Kufri. At the end of the visit, Dr. Mahmoud Ibrahim Al-Omeiry expressed his appreciation of the work being done at CPRI.

**Dr Jonathan Snape**, Commercial Director, SCRI delivered a talk on "Overview of research being done at SCRI and possible areas of collaboration" during his visit in the Institute on 17.03.2006.

**Mr. Alok Sharma** from TLS Pvt Ltd. gave a talk on "Introduction about EJ server: Its functions and facilities for online library searching" on 15.05.2006.

### Activities of ATIC

Scientists, teaching staff, students and farmers from different parts of the country visit CPRI for acquaintance with potato research and for purchase of CPRI publications. A total of 16 scientists/ teaching staff, 146 students of UG and PG and 106 farmers visited the Institute at Shimla during the year. The visitors saw a film on potato and the Institute museum. They were also acquainted with the mandate and R & D activities of the Institute through lectures, delivered by the social scientists. Technical bulletins worth Rs. 10,970/- were sold to the visitors through ATIC during January to May 2006. Besides, a number of extension bulletins were also supplied free of cost to the visiting farmers, students and extension officers.

### Scientist meet at CPRI, Shimla

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

Speaker	Topic	Date
SJ Gawande	Advances in molecular based diagnostics	13.01.2006
PM Govindkrishnan	Developing models and decision support systems and their role in standardizing agro-techniques	27.01.2006
ID Garg	Guidelines for micropropagated material and minitubers of potato in the International trade	03.02.2006
MK Jatav	Liming of acid soils for crop production	10.02.2006
Priyanka Koundal	Molecular aspects of virus transmission by plasmophorids, aphids, thrips and white flies	10.03.2006
Nimisha Kaushal	Contributions of TMV investigation in plant biology	24.03.2006
P Manivel	Breeding for processing-where do we stand	31.03.2006
Anil Kumar	Information and communication technologies for rural development	21.04.2006
Neelam	Genetic engineering of chloroplast genome of higher plants	28.04.2006
Arun Pandit	Contract farming: Pros and cons	04.05.2006
Shashi Rawat	GIS and developing spatial decision support system with special reference to agro-ecological zoning	19.05.2006
RK Rana	Future trading in commodities implications for potato	26.05.2006
Sandhya Agarwal	An introduction to DNA microarray technology	2.06.2006

### Awards & Honours

**Dr. Jai Gopal**, Principal Scientist was awarded the prestigious 'Invitation Fellowship' by the Japan Society for Promotion of Science for 10 months to work as Visiting Professor at Faculty of Agriculture, Hokkaido University, Sapporo, Japan. He returned to India in May, 2006 after availing fellowship. He worked in Japan on "In-vitro selection for drought tolerance" in the laboratory of Prof. Kazuto Iwama.

**Dr. Mohinder Singh Kadian** an Agronomist with the International Potato Center (CIP), has been honored as a "Scientist of the CGIAR-Peace and potatoes" for working two years as one of the

principal players of the consultative Group for International Agricultural Research (CGIAR) who's efforts were to rehabilitate the farming economy of Afghanistan. Dr. Kadian assisted in introducing into Afghanistan fresh supplies of certified seed and provided training to local agricultural technicians and farmers on multiplication and maintenance of quality seed at the farm- level and introduction



Working of CIP scientist at Afganistan

of potato cultivation for the first time in the autumn season in Afghanistan.

**Drs. SK Pandey**, Director and **P Manivel**, Sr. Scientist (Plant breeding) of the Institute have been enrolled as the Life Members of National Academy of Sciences (M.N.A.Sc), Allahabad, India from May 2006. They will be receiving the bi-monthly Journal "National Academy of Science letters" and "Proceedings of the National Academy of Science, India: Section B- Biological Science" free of cost.

### Potato Facts

#### Frozen French fries will be produced in India

Exporters to India's fast-growing market aim to super-size their offerings, which include potato products. McCain Foods Ltd. has been sending frozen potato products to India since 1998, but years earlier the company began planting test patches of potatoes around the country.

Gujarat province produced the best potatoes for processing, and later this year a frozen French fry and potato specialty plant is expected to open there, eventually employing 100 to 125 people. Not many people know that potatoes are a staple in India, Mr. Bird, Vice President of McCain Foods Ltd. says. The new plant will produce French fries, but McCain also plans to develop and make frozen versions of traditional Indian potato-based foods. Mr. Bird says these local products will eventually be the company's biggest sellers.

Source: Global Potato News

## Human Resource

### Promotions

Scientific		
	From	To
Dr. D Pattanayak	Scientist (SS)	Sr. Scientist
Dr. NR Kumar	Scientist (SS)	Sr. Scientist
Dr. P Kumar	Scientist (SS)	Sr. Scientist
Dr. Dhruv Kumar	Scientist (SS)	Scientist (SG)
Dr. SK Singh	Scientist (SS)	Sr. Scientist
Dr. VP Chimote	Scientist	Scientist (SS)
Administrative		
Smt. Heera Verma	AAO	AO
Sh. IS Negi	Asstt.	AAO
Smt. Bindra Gupta	UDC	Asstt.
Smt. Chandni Bhagta	Jr. Clerk	Sr. Clerk
Sh. RS Mehta	Financial Up gradation	

### Transfers

Name	From	To
Dr. Jyotsana Sharma	CPRS, Jalandhar	NRCP, Sholapur
Sh. SK Dey, T-5	CPRI, Shimla	ICAR, New Delhi

### Retirements

Name	Post	Retired on
Dr. DS Singh	Sr. Scientist	31.01.2006
Sh. M Janardhan	T-5	01.03.2006
Sh. Pampoo Ram	SS Gr.III	05.01.2006
Sh. Jagdish Rai	SS Gr.II	31.01.2006
Smt. Daivatha	SS Gr.I	31.01.2006
Sh. Dinu Ram	SS Gr. IV	28.02.2006
Sh. TA Subramaniam	SS Gr. III	28.02.2005
Sh. Seebu Ram	Tech. Off.	31.05.2006

## Vimal Oil and Food to enter snack zone

Vimal Oil and Foods is getting ready to enter the fast-growing national snack foods market under the umbrella brand of Vimal. The MD of the company, Jayesh Patel, said their main focus would be on branded potato chips as it accounts for 65% share of the snack foods market. It will also offer other products like fried, extruded, filled and unfilled snacks as well as wet

fried snacks. We will be the first company in India to introduce wet fried snacks claimed Patel. The organized snack foods market is estimated to be worth Rs. 10,000 crore plus and is growing at the rate of 30-35% per annum, said Patel. He feels that the market is big enough for new players. Vimal Oil is going to invest Rs. 42 crore in this project. In the first phase we will launch our snack foods in western and northern India. Thereafter, we will spread to other regions said Patel.

*Source: Economic Times of India*

## Call for new research into acrylamide in Korea

French fries and potato chips available in South Korea are higher in the carcinogenic chemical acrylamide than previously thought, said an environmental group. The group told the Korea Times that the quantity of acrylamide in one 114g bag of McDonald's fries was equivalent to the WHO-recommended amount in 580 liters of water. WHO recommends no more than 0.5 mcg of acrylamide per litre of drinking water.

*Source: AP Foodtechnology*

## Future Activities

Several important meetings of the Institute, viz., Staff Research Council (SRC), Research Advisory Committee (RAC), Institute Management Committee (IMC), etc, are to be held in the forthcoming months of the year. The next IJSC (Institute Joint Staff Council) meeting is to be held during September at CPRS, Shillong.

## Article on Potato

### Management of soil and tuber borne diseases in an environment friendly way

#### Introduction

The best way to protect our crops from pests without pesticides is to rely on the ecological methods of farming. Soil and tuber borne diseases greatly impair seed quality and market value of the produce. The pathogens causing such diseases are disseminated far and wide to new areas through seed tubers and



Fig. 1a. Black scurf



Fig. 1b. Common scab

soil. Diseases such as black scurf and common scab (Figs. 1a & b) make potato tubers ugly in appearance thereby reduce their market value whereas diseases such as soft rot and dry rots (Figs. 2 & 3) affect the produce directly causing economic losses. Russet scab, which closely resembles common scab disease in appearance is an emerging problem in potato production and is not controlled by seed treatment with boric acid or organomercurials (Fig. 4).



Fig. 2. Soft rot



Fig. 3. Dry rot



Fig. 4. Russet scab

### Need to reduce dependence on pesticides

Soil and tuber borne diseases are generally controlled through seed

treatment with organomercurials which are universal poisons and hazardous to human health and environment. With growing concern about quality of potato, human health and environment use of such hazardous chemicals is greatly discouraged. Organomercurials have already been banned in most of the developed countries. Use of organomercurials poisons the environment due to their non-degradation in the soil besides, the workers are also put to risk of mercury poisoning. Thus there is a great need to find safe and eco-friendly alternatives to manage the soil and tuber borne diseases. Management of soil and tuber borne diseases of potato without use of pesticides is a great challenge that requires identification of suitable alternative environment friendly control measures.

### Safe alternatives to pesticides

Research work carried out at CPRI has revealed that such diseases can successfully be managed in an environment friendly manner by practicing soil solarization, seed treatment with safe chemicals, use of bio-control agents and suitable cultural practices. An integrated approach involving one or more of these methods can greatly reduce our dependence on pesticides and improve quality of the produce.

### Soil solarization

Solar energy - a natural gift to mankind - is available in plenty in tropical and subtropical plains of our country. Antimicrobial properties of solar radiations had been realized by ancient Aryans as is evident from a sacred hymn from Atharvaveda "Ut Suryo Div Eti Puro Rakshansi

Nijurvan" (6.32.1) which means rising Sun destroys numerous germs causing diseases. Solar energy can successfully be trapped and targeted to clean the sick soil infested with pests and disease causing organisms by use of transparent polyethylene mulching (Fig. 5). It is an effective, simple, physical and non-hazardous method to control a variety of soil borne pathogens, pests and weeds.



Fig. 5. Soil solarization by polyethylene mulching

### Best period and method

Soil solarization is best carried out during period of high temperature and intense solar radiation, which in Indian plains are available during May - June. Experiments carried out in north-western plains have revealed that third week of May to second week of June is the best period for soil solarization when there is maximum elevation in soil temperature. The maximum temperatures recorded during this period in solarized plots at 5cm depth were between 45 to 61°C, which were 5 to 14°C higher than the un-mulched plots. Light irrigation given 48 h prior to mulching with polyethylene sheet traps heated water vapors below the sheet and increases thermal conductivity in the soil. It also increases sensitivity of resting structure of most of the soil borne pathogens and pests to heat and thus adds to the efficacy of soil solarization. The heat under the

sheets is retained in soil for much longer time causing an effective control of the soil-borne pathogens.

### Disease control

Soil solarization kills sclerotia of *Rhizoctonia solani* upto 5cm and *Sclerotium rolfsii* upto 15cm depth and results in clean produce with very low disease incidence. Soil solarization is distinctly superior to summer ploughing which is conventionally followed to control soil borne pathogens (Fig. 6). Russet Scab of potato has emerged as a major problem in seed potato production. Measures such as seed treatment with boric acid or organomercurials, which control common scab, do not control russet scab but soil solarization is a very effective method for control of russet scab (Fig. 7).

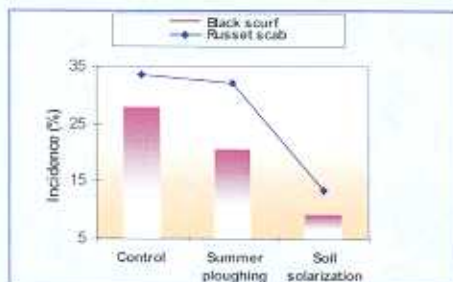


Fig. 6. Control of potato diseases by soil solarization



Fig. 7. Produce from soil solarized plots (right) and unsolarized plots (left)

### Additional benefits

In addition to the control of soil borne pathogens, soil solarization

also brings about a remarkable reduction (up to 98.5%) in weed population. It increases mineralization in top layer of soil bringing about up to 35.5% increase in nitrate nitrogen and up to 26.4% increase in available potassium up to 15 cm depth. Mineralization of soil caused by soil solarization thus helps in cutting down fertilizer requirement of potato crop. This could be a reason that yield equal or more to full dose of fertilizers (NPK 240:100:150) is observed in solarized soil applied with only 3/4<sup>th</sup> dose of NPK (Fig. 8).

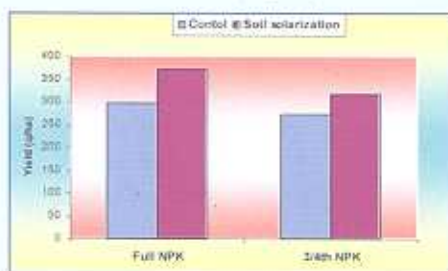


Fig. 8. Soil solarized plots require less fertilizer for same yield

### Package to be followed for soil solarization

- Carry out soil solarization during period of high temperature and intense solar radiation. A period of four weeks from mid May to mid June is quite effective in north western plains.
- Provide a light irrigation (around 50mm) to the field 48 hr before solarization. Thereafter, cultivate and level the field thoroughly before laying polyethylene sheet.
- To prevent tearing of polyethylene sheet level the field thoroughly so as to minimize any protrusions due to clods, stubble and stones.
- Use clear, transparent linear low density polyethylene (LLDPE) sheet 25 to 100um thick, about 3 m in width without any joints.

- For easy application, roll the polyethylene sheet over a pipe and unfold it in the field.
- Apply the sheet during less windy period of the day and keep it close to ground.
- Open about 4 inches deep furrows in field at 2.5 m apart for laying out sheet 3m in width. The distance between the furrows can be changed according to the width of the sheet available.
- Insert two edges of the polyethylene sheets about 3 inches deep in the furrow, bury the edges in soil and open the upper layer of sheet like page of a book. Align another sheet with free edge of the sheet now opened and repeat the process of burying the two edges and opening the new sheet till the required area is covered with the polyethylene sheets.
- Compact all free edges of the sheet with the soil around them so as to prevent escape of soil moisture and heated air from inside the area thus mulched.
- Place a few small (half to one kg capacity) plastic bags filled with soil as weights over the sheet where required to prevent flapping and tearing of polyethylene sheet by wind. The smooth edges of the bags do not cause tearing of the sheet.
- Avoid entry into plots covered with polyethylene to the extent possible. If entry is necessary such as for sealing the leaks etc, prefer to enter bare feet or with smooth soled shoes to prevent tearing. Holes appearing in the polyethylene sheet if any can be sealed with rubber solution adhesive.
- After the solarization period (4 to 6 weeks) remove the sheet



carefully from one end to another. If intact this may be used for another time, if torn dispose it off as scrap.

- To maintain disease free conditions in the solarized plot do not allow water to flow from contaminated area to the solarized plots and also do not plant infected or untreated seed in the solarized plots.

Increased mineralization results in a significant increase (15 to 25 per cent) in potato tuber yield. The beneficial effects of soil solarization persist even to the subsequent year. It is the only soil-friendly method of reclaiming the pest-infested patches in a fields used for seed potato production. The treatment is highly beneficial and cost effective in potato crop grown for seed purposes. For every rupee spent a benefit of up to four times was recorded when the seed crop was grown after solarization in previously sick plots.

### Safe Chemicals

Efforts to find substitutes to hazardous organomercurials (Methoxy Ethyl Mercuric Chloride - MEMC) have resulted in identification of some safe and effective chemicals such as acetic acid, zinc sulphate and boric acid.

**Boric acid:** Boric acid not only controls black scurf (*Rhizoctonia solani*) but also common scab (*Streptomyces scabies*), dry rots (*Fusarium* spp.) and soft rots (*Erwinia* spp.). Spraying or dipping of seed tubers in 3 per cent solution has been recommended for the control of these diseases. Boric acid is safe and as effective as organomercurials in control of tuber diseases (Fig. 9). Treatment given

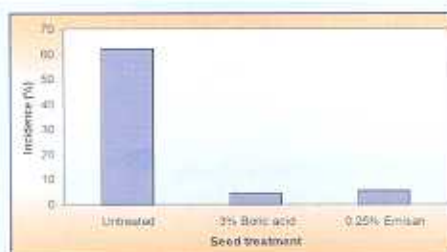


Fig. 9 Efficacy of boric acid in comparison with organomercurials in control of black scurf disease of potato

strictly before cold storage is safe to tubers and more effective than the treatment carried out after cold storage. Further work carried out to economize on the use of boric acid has revealed that spray application of 3% boric acid was economical and as effective as the dip treatment. Spray treatment can be carried out effectively using a manual sprayer or seed treatment device (Figs.10 & 11). Spray application is also much cheaper than the dip treatment as less amount of chemical is required for the treatment. The cost of good quality (laboratory grade 99.5% pure) boric acid comes to around Rs.110/kg (Rs. 5500/ per 50kg). Average cost of chemical required



Fig. 10 Potato seed treatment with boric acid through a manual sprayer



Fig. 11 Potato seed tuber treatment with boric acid through seed treatment device

to treat one quintal of seed by boric acid through spray is around Rs. 5.0 as against Rs. 12.0 with the organomercurials. Boric acid seed treatment has now completely replaced the use of hazardous organomercurials at all CPRI farms and is becoming popular with the farmers.

### Package for boric acid seed treatment for control of the tuber-borne diseases

- Seed potato tubers should be treated after harvest but before cold storage. Tubers should be properly cured, freed from bruises and dirt. If required wash the tubers in water and dry in shade before the treatment.
- To treat one quintal of seed potato by spray method prepare 3% boric acid by dissolving 45g of pure boric acid (laboratory grade 99.5% pure) in 1.5 liter of water. (total quantity of the chemical required for the seed to be treated should be worked out accordingly).
- To prepare the boric acid solution put the chemical in small quantity of warm water. Stir till it is fully dissolved and the solution becomes colourless. Now mix this solution with additional amount of water (at normal temperature) and make the required volume.
- Spread the seed tubers in a single layer over clean cemented floor or over a plastic sheet.
- Spray the boric acid solution on the seed tubers so as to cover entire surface of the tubers. For this, turn the tubers after first spray and repeat the spray till whole surface of the tubers is wet with the solution.

- Quick dip treatment (dip and remove immediately) with boric acid is equally effective. The same solution can be used up to 30 dips. However, cost in dip treatment will be almost double than the spray method since only half of the solution is used effectively by dip method. Dip treatment will also create problem of disposal of unused solution.
- Allow the treated tubers to dry completely in shade before filling these in gunny bags. Mark the bags with red ink as "Treated".
- Do not treat sprouted or chitted tubers as this may damage the sprouts and delay emergence.

### Biocontrol

Biocontrol of plant pathogens using naturally occurring antagonistic microorganisms is a safe and eco-friendly alternative to the use of chemicals. It has a great potential in control of soil and tuber borne diseases especially in organic farming. Efforts to identify beneficial natural microorganisms at CPRI have resulted in development of two ready to use bioformulations of *Trichoderma viride* ( $10^7$  c.f.u./g) effective against black scurf and *Bacillus subtilis* strain B5 ( $10^{10}$  c.f.u./g) effective against bacterial wilt. These bioformulations have been

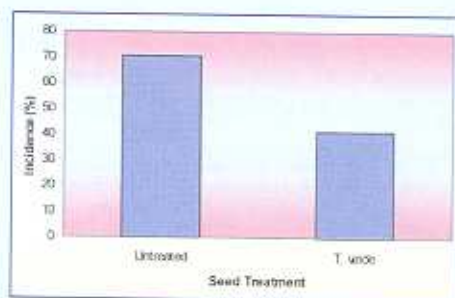


Fig. 12. Control of black scurf (*Rhizoctonia solani*) by *Trichoderma viride*

evaluated as seed tuber treatment in several field trials at different locations and found effective under field conditions (Figs. 12 & 13). Treatment with B5 also results in an increase in potato yield.

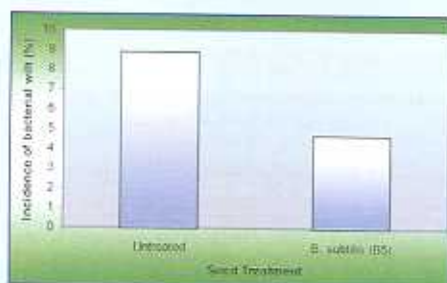


Fig. 13. Control of bacterial wilt by *Bacillus subtilis* (B5)

### Package for seed treatment with biocontrol agents

#### *Trichoderma viride*

- Seed potato tubers should be treated after cold storage and immediately before planting or at the most a day before planting.
- The tubers to be treated should be free from any soil / dirt. If required wash the tubers in water before treatment.
- The tubers should be made just wet by a light spray of water so that *T. viride* formulation sticks to the tubers. Normally one litre of water is sufficient to wet about one quintal of seed tubers.
- Spread the tubers to be treated in a single layer over clean cemented floor or over a plastic sheet.
- Sprinkle 0.45kg of the *T. viride* formulation evenly over 100 kg seed tubers and mix it thoroughly so that all the tubers are covered with it.

#### *Bacillus subtilis* (B5)

- One hundred gm of B5 formulation is required to treat 1.6 q of seed.

- Prepare 0.25% solution of B5 by dissolving 100g of the formulation in 40 l of water. Dip 80 kg of potato in the solution for 20 minutes. Treat a second lot of 80kg in the same solution.
- Plant the treated tubers on the same day or at the most the next day of the treatment with the bioformulations.
- The tubers to be treated with the bioformulations should not be treated with pesticides.

### Cultural practices

Cultural practices which deprive the pathogens from their natural host or reduce their build up in the soil helps in disease control. Depending upon the problem prevailing in the regions following practices can be adopted.

### Alteration in dates of crop planting / harvesting

- Delay in planting from October 10 to November 2 in north-western plains reduces russet scab of potato to one half.
- Advancing harvest of the crop from mid February to mid January significantly reduces black scurf disease in north-western plains.
- Harvesting the crop before February 15 when soil temperature does not cross 28°C results in a lower incidence of charcoal rot in Indo-Gangetic plains.

### Regulating soil moisture

- Avoiding high soil moisture and heavy soils reduces incidence of russet scab
- Irrigation at four to seven day interval at tuber initiation reduces common scab.

- Frequent irrigations to spring crop in Indo-Gangetic plains reduce charcoal rot.

### Crop rotations

- Rotation of paddy-wheat-potato or onion-maize-potato controls common scab.
- Rotation of potato with maize or sun hemp reduces black scurf and charcoal rot.
- Rotation of potato with pea and wheat reduces powdery scab in high hills.

### Soil amendments

- Soil amendments with neem or mustard cakes reduce black scurf.
- Soil amendment with groundnut cake reduces *Fusarium* wilt.

- Application of ammonium sulphate lowers soil pH and suppresses common scab.

### Proper handling of produce

- Avoiding bruises by careful handling of potato tubers minimizes dry and soft rots.

### Integrated Approach

Since most pathogens causing seed and soil borne diseases survive both in soil and on tubers, any single method of treatment is less likely to be effective for the complete control. An integrated schedule for disease management would be an ideal approach.

- Incorporation of wheat crop

residue as soil amendment together with summer irrigation followed by soil solarization reduces black scurf more effectively than a single method.

- A combination of soil solarization together with seed treatment with *Trichoderma viride* or 3 per cent boric acid controls black scurf in infested fields much better than the individual treatments.

Following some of the above eco-friendly strategies we can save our environment and grow potato free of pesticides for which there is a growing demand both in the national and international market.

- RK Arora

## News in Hindi

### उपमहानिदेशक का प्रक्षेत्र भ्रमण

दिनांक 23 जनवरी 2006 को उपमहानिदेशक (उद्यान) डॉ. गौतम कल्लू ने केन्द्रीय आलू अनुसंधान केन्द्र, ग्वालियर का भ्रमण किया। इस अवसर पर निदेशक, केन्द्रीय आलू अनुसंधान संस्थान, शिमला, डॉ. सुमन कुमार पाण्डेय भी उपस्थित थे। अनुसंधान केन्द्र पर लगाई गई आलू की विभिन्न किस्मों के प्रजनक बीज उत्पादन की विभिन्न अवस्थाओं को उपमहानिदेशक महोदय ने विशेष रूचि लेते हुये अवलोकन किया एवं अनुसंधान केन्द्र के विकास एवं इसकी संभावनाओं के बारे में निदेशक महोदय एवं अनुसंधान केन्द्र के अध्यक्ष, डॉ. व्ही. एस. कुशवाह से विशेष चर्चा की। इस अनुसंधान केन्द्र पर अनुसंधान के विकास हेतु विभिन्न प्रयोगशालाएं एवं उपकरण, पेड़ लगाने, सड़कें ठीक करने, खेतों को समतल करने व चहारादीवारी व बिल्डिंग की रंगाई, पुताई आदि के सम्बन्ध में निर्देश दिये। इस अवसर पर अनुसंधान केन्द्र के वैज्ञानिक डॉ. ए. के. सोमानी, डॉ. अनुज भटनागर, डॉ. एस. पी. सिंह, डॉ. बीरबल एवं डॉ. विनोद कुमार भी उपस्थित थे। उपमहानिदेशक महोदय ने कहा कि इस केन्द्र के विकास की अपार सम्भावनाएं हैं। अतः इस ओर विशेष ध्यान देने की आवश्यकता है तथा किसी भी विकास कार्य व



उपमहानिदेशक (उद्यान) का प्रक्षेत्र भ्रमण

अनुसंधान कार्य के लिए भरपूर अर्थिक मदद भारतीय कृषि अनुसंधान परिषद (केन्द्रीय आलू अनुसंधान संस्थान, शिमला), नई दिल्ली से दी जाएगी।

### कुफरी में किसान मेला आयोजित

केन्द्रीय आलू अनुसंधान संस्थान, शिमला के कुफरी केन्द्र में दिनांक 15 जून, 2006 को किसान मेले का आयोजन किया गया। इस मेले में हिमाचल प्रदेश के कई जिलों से लगभग 500 किसानों ने भाग लिया। मेले का उद्घाटन प्रदेश के कृषि मंत्री माननीय श्री राज कृष्ण गौड़ जी ने किया तथा समारोह के मुख्य अतिथि के रूप में मेले को सुशोभित किया। अपने उद्घाटन भाषण में कृषि मंत्री जी ने कहा कि केन्द्रीय आलू अनुसंधान संस्थान ने अपनी स्थापना के बाद पिछले 57 वर्षों में आलू अनुसंधान एवं विकास में अनेक उपलब्धियां हासिल की हैं। इनमें 41 किस्मों का विकास, बीज खेत

तकनीक का विकास, बीज उत्पादन में जैव प्रौद्योगिकी का प्रयोग, पिछेता झुलसा रोग नियंत्रण तकनीक तथा आलू के भण्डारण एवं प्रसंस्करण की तकनीक विकसित करना महत्वपूर्ण हैं। इनके अलावा संस्थान का किसानों के लिए कृषि विस्तार कार्यक्रम में भी महत्वपूर्ण योगदान रहा है। मंत्री महोदय ने आलू उत्पादन में कुछ प्रमुख समस्याओं तथा चुनौतियों को भी उजागर किया। इनमें प्रमुख हैं - अधिक उत्पादन क्षमता वाली किस्मों का विकास करना, पिछेता झुलसा रोग पर कारगर नियंत्रण का उपाय करना, संतुलित खाद के प्रयोग को बढ़ावा देना तथा किसानों को समय पर स्वस्थ बीज उपलब्ध करवाना।

संस्थान के निदेशक महोदय डॉ. सुमन कुमार पाण्डेय ने अपने भाषण में हिमाचल प्रदेश की बीज आलू उत्पादन में महत्ता को दर्शाया तथा आज के समय में आलू प्रसंस्करण के क्षेत्र में हिमाचल के कांगड़ा एवं उना क्षेत्र के महत्व को भी उजागर किया।



माननीय कृषि मंत्री का स्वागत



मुख्य अतिथि के साथ संस्थान के निदेशक और प्रदेश के अन्य उच्च अधिकारी

उन्होंने कहा कि हमें कम अवधि में तैयार होने वाली आलू की ज्यादा से ज्यादा किस्मों का विकास करने की आवश्यकता है। इसके अलावा गैर पारम्परिक क्षेत्रों में भी आलू के क्षेत्रफल को बढ़ाने की आवश्यकता है। इससे पहले अपने स्वागत भाषण में संस्थान के संयुक्त निदेशक डॉ. बीर पाल सिंह ने भारतीय कृषि अर्थव्यवस्था में आलू के महत्व को बताया तथा किसानों से आग्रह किया कि आलू की उन्नत तकनीकों को अपना कर ज्यादा से ज्यादा लाभ उठाएं।

मेले का मुख्य आकर्षण कृषि एवं बागवानी से संबंधित विभिन्न विभागों, बैंकों तथा निजी कम्पनियों द्वारा लगाई गई प्रदर्शनियां रही। इनमें मुख्यतः आलू प्रदर्शनी तथा बागवानी विभाग की प्रदर्शनी थी। इनके अलावा नाबार्ड, इफको, मार्कफेड, राष्ट्रीय बीज निगम तथा विभिन्न बैंकों की प्रदर्शनियां भी लगाई गई। इस बार के मेले में किसानों ने भी अपनी प्रदर्शनियां लगाईं। विभागों एवं किसानों की तीन उत्तम प्रदर्शनियों को पुरस्कार भी वितरित किए गए। मेले में किसान गोष्ठी का भी आयोजन किया गया जिसमें किसानों ने अपनी समस्याएँ विषय विशेषज्ञों के सामने रखीं तथा उनके समाधान के लिए विचार विमर्श किया। अंत में बीज प्रौद्योगिकी संभाग के अध्यक्ष डा. सरजीत सिंह ने मेले में आए सभी लोगों का धन्यवाद ज्ञापन किया।

## कृषक दिवस एवं कृषि प्रदर्शनी

जवाहर लाल नेहरू कृषि विश्वविद्यालय, जबलपुर के अन्तर्गत कृषि विज्ञान केन्द्र मुरैना में दिनांक 08 फरवरी 2006 को कृषक दिवस एवं कृषि प्रदर्शनी का आयोजन सम्पन्न हुआ। इस मेले में केन्द्रीय आलू अनुसंधान केन्द्र, ग्वालियर द्वारा प्रदर्शनी में आलू की विभिन्न किस्मों एवं छाया चित्रों द्वारा आलू की उन्नत तकनीकों एवं संस्थान के द्वारा प्रकाशित साहित्य का किसानों के लिये स्टाल के माध्यम से प्रदर्शन किया गया। इस कृषक दिवस में ग्वालियर केन्द्र के डॉ. व्ही. एस. कुशवाह, अध्यक्ष तथा डॉ. अनुज भटनागर, वारिष्ठ वैज्ञानिक ने भाग लिया एवं स्टाल के माध्यम से आलू की विभिन्न किस्में, प्रजनक आलू बीज उत्पादन तकनीक एवं संस्थान के द्वारा प्रकाशित साहित्य की जानकारी कृषकों को उपलब्ध कराई। केन्द्र के स्टाल का अवलोकन माननीय श्री नरेन्द्र सिंह तोमर, पंचायती एवं ग्रामीण विकास मन्त्री, मध्य प्रदेश शासन, श्री अशोक अर्गल, सांसद मुरैना एवं विधायक श्री गजराज सिंह के द्वारा किया गया। इस प्रदर्शनी में एक हजार से अधिक किसानों ने भाग लिया तथा ग्वालियर अनुसंधान केन्द्र के स्टाल में विशेष रूप से माननीय कुलपति डॉ. डी. पी. सिंह, डॉ. विजय सिंह तोमर, निदेशक अनुसंधान सेवाएं जवाहर लाल नेहरू कृषि विश्वविद्यालय ने विशेष रुचि दिखाई।

## प्रदर्शनी एवं कृषि मेला

केन्द्रीय कृषि मन्त्रालय, भारत सरकार और छत्तीसगढ़ राज्य शासन के संयुक्त तत्वाधान में पश्चिम क्षेत्रीय प्रदर्शनी एवं कृषि मेला दिनांक 14 फरवरी, 2006 से 17 फरवरी 2006 का आयोजन इन्दिरा गांधी कृषि विश्वविद्यालय, रायपुर में सम्पन्न हुआ। इस मेले में केन्द्रीय आलू अनुसंधान केन्द्र, ग्वालियर द्वारा प्रदर्शनी में, आलू की विभिन्न किस्मों एवं छाया चित्रों द्वारा आलू की उन्नत तकनीकों एवं

संस्थान के द्वारा प्रकाशित साहित्य का किसानों के लिये स्टाल के माध्यम से प्रदर्शन किया गया। इस मेले में केन्द्रीय आलू अनुसंधान केन्द्र, ग्वालियर के अध्यक्ष डॉ. व्ही. एस. कुशवाह एवं वरिष्ठ वैज्ञानिक डॉ. अनुज भटनागर ने सक्रिय रूप से भाग लिया। केन्द्र के द्वारा लगाये गये स्टाल का अवलोकन माननीय श्री ननकीराम कंवर कृषि, पशुपालन एवं खाद्य नागरिक आपूर्ति मन्त्री, छत्तीसगढ़ शासन ने दिनांक 14 फरवरी 2006 को किया तथा आलू की किस्मों में विशेष रुचि दिखाई। कृषि मन्त्री जी के अलावा छत्तीसगढ़ शासन के कई माननीय व्यक्तियों ने स्टाल का अवलोकन किया। माननीय कुलपति डॉ. चितरंजन हाजरा, इन्दिरा गांधी कृषि विश्वविद्यालय व अन्य विशिष्ट व्यक्तियों ने भी आलू स्टाल का अवलोकन किया एवं अनेक जिज्ञासापूर्ण प्रश्नों का अनुसंधान केन्द्र के वैज्ञानिकों के द्वारा उत्तर दिया गया। इस मेले में लगभग बीस हजार कृषकों का सम्मेलन हुआ। छत्तीसगढ़



कृषि प्रदर्शनी में केन्द्रीय आलू अनुसंधान केन्द्र, ग्वालियर का स्टाल

के कृषकों के द्वारा आलू की विभिन्न किस्मों के प्रजनक बीज की उपलब्धता के बारे में जानकारी चाही गई। दिनांक 14 फरवरी 2006 को इस मेले का उद्घाटन माननीय कृषि मन्त्री, छत्तीसगढ़ शासन द्वारा किया गया एवं इस मेले का समापन 17 फरवरी 2006 को माननीय वन मन्त्री छत्तीसगढ़ शासन द्वारा किया गया।

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आलू स्वादो अन्न बचाओ,  
भूख मिटाओ खुशियाँ लाओ।