

## **SECTION-I: PROCEEDINGS OF THE 33<sup>RD</sup> GROUP MEETING**

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The 33<sup>rd</sup> Group Meeting of the All India Coordinated Research Project on Potato [AICRP (Potato)] was organized at GB Pant University of Agriculture and Technology, Pantnagar from September 19-21, 2015. The programme of the Group Meeting and List of Participants are attached at **Annexure-I** and **Annexure-II**, respectively.

### **INAUGURAL SESSION (September 19, 2015)**

**Chief Guest** : Dr NK Krishna Kumar, DDG (Horticulture Sciences), ICAR, New Delhi  
**Guests of Honour** : Dr T Janaki Ram, ADG (Horticulture Sciences), ICAR, New Delhi  
Dr MB Chetti, ADG (HRD), ICAR, New Delhi  
Dr Bir Pal Singh, Director, CPRI, Shimla  
**Rapporteurs** : Drs. VK Gupta (CPRIC, Modipuram) and Raja Shankar (CPRI, Shimla)

The program started with lighting of the lamp, ICAR song and University song.

Dr JB Singh, Director Research, GBPUA&T, Pantnagar welcomed all the dignitaries and participants for their benign presence at the 33<sup>rd</sup> group meeting of potato.

Dr PM Govindakrishnan, PC, AICRP (Potato) presented the Project Coordinator's report. In his report, he highlighted the significant achievements made during the year 2014-15 viz. characterization of potato growing regions based on available thermal time, developed heat stress index for screening germplasm across locations, identified suitable growing regions and suitable genotype yielding higher proportion of baby potatoes, identified P use efficient varieties for hills (Kufri Swarna and Kufri Neelima) etc. validations of INDO BLIGHTCAST model for late blight forecasting, management schedules for late blight and mites etc.

Dr DS Pandey, Dean (College of Agriculture) praised the efforts of AICRP (Potato) and CPRI for overall development of potato in the country, but he expressed concern over the low price for the produce in the market.

Dr T Janaki Ram, ADG (Horticulture Sciences) explained the value of potato in Indian food system. He appreciated the significant achievements made during the year 2014-15 in AICRP (Potato) by bringing out the Annual Report in a concise format along with two technical bulletins. He also appreciated the performance of variety K Gaurav, K Surya and K Lalit in the eastern region. Further he added that the INDO BLIGHTCAST advisory system is a highly useful for the farmers and it is very user friendly.

Dr BM Chetti, ADG (HRD) appreciated the role of CPRI and AICRP system in bringing potato to non-traditional areas. He emphasized the need to study impact of climate change in potato, Glycoalkaloids, post harvest management and energy efficient cold stores. He also commended aeroponics technology developed by the CPRI for seed multiplication chain in the country.

Dr BP Singh, Director, CPRI Shimla briefed about ongoing research activities and challenges in producing potato to meet the future demand in the country. He also suggested that the rice + potato crop sequence is an important window to increase area under potato for increasing potato production. Varieties for elevated temperatures are another opportunity to expand the area in non-traditional areas. Developing virus resistant genotypes with slow degeneration potential is priority area in potato research.

Dr NK Krishna Kumar, DDG (Horticulture Sciences) expressed his sincere thanks to the Hon'ble Vice Chancellor of the University for accepting and organizing the group meeting in a successful manner. He emphasized on developing short duration water stress tolerant varieties for areas where rainfall period is very short and varieties for West Bengal where soil moisture is high after rice harvesting. He also suggested that use of shade nets in producing virus free planting material need to be investigated at Pune and Mudigere. Investigation on cotton whitefly on virus spread in potato is very much essential. A linkage system for aphid and whitefly management thorough AICRP system should be developed. A system can be developed for breeder seed multiplication in SAU though a MOU system with CPRI to meet the seed requirement in the country. The effectiveness of P solubilising bacteria on P, N and K relation for replacing K and Boron on yield and quality of potato should be investigated systematically. The status report on potato production, supply chain, market price and location specific demand should be prepared on 6 monthly basis and presented. High tech bio-control lab should be established by CPRI as the large numbers of germplasm are being introduced from other countries. He also suggested that there is need to look at the opportunities for growing Indian potato varieties in different countries like Africa. Award may be instituted for best performing AICRP centers and student and innovative research may be encouraged in SAU's. Regarding organic farming, the focus on pesticide residue free farming is required initially. Residual effect of Dithane should be investigated even on the cold stored tubers. Potato is backbone of horticulture and its role should be increased further. He appreciated the systematic and concise preparation of annual report using multi location data and bringing out technical bulletins which is a eye opener for other AICRP's also in future.

Dr Manoj Ragav, Incharge AICRP (Potato), GBPUAT, Pantnagar presented the Vote of Thanks to all the dignitaries and participants.

#### **ACTION TAKEN REPORT (September 19, 2015)**

**Chairperson** : Dr NK Krishna Kumar, DDG, Horticulture Science, ICAR, New Delhi  
**Co- Chairperson** : Dr T Janaki Ram, ADG (Horticulture Science), ICAR, New Delhi  
**Rapporteurs** : Drs Raj Kumar (CPRS Jalandhar) and VK Gupta (CPRIC, Modipuram)

Dr PM Govindakrishnan, Project Coordinator, AICRP (Potato) presented the action taken report on the recommendations of 32<sup>nd</sup> Group Meeting held at UAS, Dharwad during September 20-22, 2014. The Chairman appreciated the achievements and after thorough discussions the recommendations were developed which are given under Plenary Session.

#### **TECHNICAL SESSION-I: CROP IMPROVEMENT (September 19, 2015)**

**Chairperson** : Dr NK Krishna Kumar, DDG, Horticulture Science, ICAR, New Delhi  
**Co- Chairperson** : Dr T Janaki Ram, ADG (Horticulture Science), ICAR, New Delhi  
**Rapporteurs** : Drs Raj Kumar (CPRS Jalandhar) and VK Gupta (CPRIC, Modipuram)

A summary presentation on achievement in Potato Improvement was presented by Dr Vinay Bhardwaj, Acting Head, Division of Crop Improvement, CPRI, Shimla.

Thorough discussions were held on the performance of different hybrids for yield and reaction to diseases as well as performance of germplasm accessions. Recommendations brought out are given under Plenary Session. Technical programme of Crop Improvement trials for 2015-16 was also presented, discussed and finalized in the session. The finalized technical programme is given in Section II.

### **TECHNICAL SESSION-II: CROP PRODUCTION (September 19, 2015)**

**Chairperson** : Dr MB Chetti, ADG (HRD), ICAR, New Delhi  
**Co- Chairperson** : Dr Ramesh Chandra, Jt. Director (Research), GBPUAT, Pantnagar  
**Rapporteurs** : Drs Sanjay Rawal (CPRIC, Modipuram) and SK Yadav (CPRS, Patna)

A summary presentation on achievement in Potato Production was presented by Dr VK Dua, Head, Division of Crop Production, CPRI, Shimla.

Recommendations brought out are given under Plenary Session. Technical programme of Crop Production for 2015-16 was also presented, discussed and finalized during the session. The finalized technical programme is given in Section II.

### **TECHNICAL SESSION-III: CROP PROTECTION (September 20, 2015)**

**Chairperson** : Dr Bir Pal Singh, Director, CPRI, Shimla  
**Co- Chairperson** : Dr BK Pandey, PS, Horticulture Science, ICAR, New Delhi  
**Rapporteurs** : Drs Sanjeev Sharma (CPRI, Shimla) and Dr S P Pathak (NDUA&T, Faizabad)

A summary presentation on achievement in Crop Protection was presented by Dr M Nagesh, Head, Division of Plant Protection, CPRI, Shimla.

Recommendations brought out are given under Plenary Session. Technical programme of Crop Protection for 2015-16 was also presented, discussed and finalized in the session. The finalized technical programme is given in Section II.

### **TECHNICAL SESSION-IV: PLENARY SESSION (September 20, 2015)**

**Chairperson** : Dr NK Krishna Kumar, DDG, Horticulture Science, ICAR, New Delhi  
**Co- Chairperson** : Dr T Janaki Ram, ADG, Horticulture Science, ICAR, New Delhi  
Dr B P Singh, Director, CPRI, Shimla  
**Rapporteurs** : Drs S P Singh (CPRS, Gwalior), EP Venkatsalam (CPRS, Ooty), V K Gupta (CPRIC, Modipuram) and R K Dubey (Pasighat)

Dr PM Govindakrishnan, Project Coordinator (Potato), welcomed the Chairperson of the plenary session Dr NK Krishna Kumar, DDG, Horticulture Science, ICAR, New Delhi; Co-Chairperson Dr T Janaki Ram, ADG, Horticulture Science, ICAR, New Delhi & Dr B P Singh, Director, CPRI, Shimla, dignitaries and participants to the plenary session of Group Meeting.

The proceedings of each session were presented by the PI's of the respective sessions and recommendations brought out in each session were again discussed thoroughly and finalized for implementation. The discipline-wise work plans for 2015-16 were also discussed at length in the plenary session and finalized for conducting trials during 2015-16 at different centers of AICRP (Potato). The finalized recommendations of the different technical session are given below and approved technical programmes are given in Section-II.

### **RECOMMENDATIONS**

#### **INAUGURAL SESSION AND ACTION TAKEN REPORT**

1. The nutrient requirement for different regions/centers should be worked out based on the DSS developed for the purpose. Nitrogen DSS should be published. Training for the scientist from

- different AICRP centers should be conducted by PC Unit, Shimla to train the scientists on the DSS for assessing of optimum nutrient requirement for their region. **(Action: Project Coordinator)**
2. Areas deficient in Zinc should be mapped or identified. **(Action: Head, Crop Production and All AICRP centers)**
  3. Qualitative losses in potatoes need to be studied under AICRP. **(Action: All AICRP centers)**
  4. Andaman and Nicobar Island should be part of evaluation of potatoes. A Scientist (Vegetable Science) of CARI should be involved. **(Action: Project Coordinator and Director, CARI)**
  5. Status report of potato leaf roll virus in country should be prepared. **(Action: Head, Crop Protection and All AICRP centers)**
  6. Bio-safety aspect should be taken into account while recommending any insecticides. **(Action: Head, Plant Protection and All AICRP centers)**
  7. Looking at the scarcity of water, evaluation trials on drip irrigation under AICRP at different centers need to be conducted to optimize water as much as possible. **(Action: Head, Crop Production and All AICRP centers)**
  8. Kalyani center should visit Burdwan area for having firsthand information on cultivation of transplanted onion after potato. **(Action: Incharge, AICRP Kalyani centers)**

### **TECHNICAL SESSION-I: CROP IMPROVEMENT**

#### **Recommendation for extension agencies**

A white cream skin and oval tuber, high yielding medium maturing advanced hybrid, MS/5-1543 having moderate resistance to late blight with good keeping quality is recommended for cultivation in Indo-Gangetic (Northern and Eastern) plains of India. **(Action: Director, CPRI and Head, Crop Improvement)**

#### **General recommendations**

1. Varietal evaluation trials should be conducted for two years, if the results are inconsistent then there should be third year evaluation. **(Action: Head, Crop Improvement)**
2. There is need to encourage seed supply of Kufri Khyati to gradually replace Kufri Pukhraj. Accordingly seed production of Kufri Khyati should be up-scaled. **(Action: Director, CPRI; Head seed Technology and Head, Crop Improvement)**
3. The hybrids of third parties for multiplication testing under AICRP under consultancy should invariably be evaluated at CPRI centers viz. Jalandhar, Modipuram, Shimla, Ooty, Gwalior and Patna apart from other AICRP centers as per the choice of parties. **(Action: Project Coordinator and Head, Crop Improvement)**

### **TECHNICAL SESSION-II: CROP PRODUCTION**

#### **Recommendation for extension agencies**

1. At Jorhat, Kufri Himalini gave significantly higher yield over control with 225 kg N/ha while Kufri Girdhari and Kufri Jyoti produced significantly higher yield over control at 150 kg N/ha, hence application of 225 kg N/ha for K. Himalini and 150 kg N/ha for Kufri Girdhari and Kufri Jyoti is recommended. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Assam and Incharge, AICRP Jorhat center)**
2. The pooled results showed that Kufri Surya at Deesa responded significantly to N application upto 150 kg N/ha. The net returns are also in favour of application of 150 kg N/ha, hence application of 150 kg N/ha for Kufri Surya is recommended. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Gujarat and Incharge, AICRP Deesa center)**

3. The cultivars Kufri Surya and Kufri Sadabahar responded significantly to N application upto 150 kg/ha. Hence application of 150 kg N/ha for Kufri Surya and Kufri Sadabahar is recommended for Faizabad. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Uttar Pradesh and Incharge, AICRP Faizabad center)**
4. Kufri Himalini and Kufri Shailja, responded significantly to N application upto 150 kg/ha at Kalyani. No significant yield increase was observed thereafter. Hence application of 150 kg N/ha for Kufri Himalini and Kufri Shailja is recommended for Kalyani. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of West Bengal and Incharge, AICRP Kalyani center)**
5. Significantly higher potato tuber yield was recorded with mulching. Irrigations at 20 mm CPE mulching with paddy straw @ 5 t/ha gave highest yield which was at par with irrigations at 25 and 30 mm CPE under mulching conditions. WUE and net returns were also higher with this treatment. Hence, application of paddy straw mulch @ 5 t/ha and irrigation at 30 mm CPE is recommended for Dohli. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Bihar and Incharge, AICRP Dholi center)**
6. There was no significant difference in the mean yield of different cultivars [Kufri Badshah (44.4 t/ha), Kufri Pukhraj (45.8 t/ha) and Kufri Pushkar (44.9 t/ha)]. All the drip irrigation fertigation treatments were significantly superior over conventional method and were equally effective in terms of tuber yield and water use efficiency. Hence application of N and K, 100% through fertigation is recommended for Deesa. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Gujarat and Incharge, AICRP Deesa center)**
7. Metribuzin @ 0.75 kg/ha either as pre-emergence or as post-emergence at 10% plant emergence was equally effective and comparable to manual hand weeding to control the weeds in the potato across the locations. Hence, application of Metribuzin @ 0.75 kg/ha either as pre-emergence or as post-emergence at 10% plant emergence can be recommended for effective weed control in potato for Dholi, Faizabad, Jorhat, Kalyani, Kanpur, Kota, Pantnagar, Raipur and Shillong. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Bihar, Uttar Pradesh, Assam, West Bengal, Rajasthan, Uttarakhand, Chhattisgarh & Meghalaya and Incharges, AICRP Dholi, Faizabad, Jorhat, Kalyani, Kanpur, Kota, Pantnagar, Raipur & Shillong centers)**

### **General recommendation**

1. Source of nitrogen applied in nitrogen trials should be specified and mentioned in report. **(Action: Head, Crop Production and all AICRP centers)**
2. Training has to be provided on ASNMP DSS for nitrogen management to AICRP workers for refining site specific nitrogen recommendations. **(Action: Project Coordinator and Head, Crop Production)**
3. In nitrogen experiments, effect of higher doses of nitrogen on potato quality parameters must be studied. **(Action: Head, Crop Production and all AICRP centers)**
4. The term LSD should be used instead of CD for presenting the experimental results. **(Action: Project Coordinator and All Head of the Divisions)**
5. Trial on organic potato production may be conducted at CPRS, Gwalior as the centre has higher soil fertility level. **(Action: Head, Crop Production)**

### **Discussion on Post Harvest Losses**

1. Post harvest losses are to be reported in AICRP Progress Report in prescribed proforma from next year. **(Action: Project Coordinator and All AICRP centers)**

2. A possibility of involving private stakeholders in breeder seed production is to be explored for enhancing production of quality planting material. **(Action: Director, CPRI and Project Coordinator)**

Chairman concluded the session by giving his valuable comments that the crop production trials and observations recorded by different centres should be uniform. He also suggested that work on precision farming, fertigation, organic farming and micro-nutrients ought to be carried out under AICRP domain.

### **TECHNICAL SESSION-III: CROP PROTECTION**

#### **Recommendation for extension agencies**

1. Prophylactic spray with mancozeb @0.2% followed by second spray of (fenamidone + mancozeb) @0.3% after seven days and a third spray with mancozeb @0.2% after seven days of the second spray is recommended for the control of late blight in Hassan and Pantnagar. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Karnataka & Uttrakhand and Incharges, AICRP centers Hassan & Pantnagar)**
2. Prophylactic spray with mancozeb @0.2% followed by second spray of (cymoxanil + mancozeb) @0.3% after seven days and a third spray with mancozeb @0.2% after seven days of the second spray is recommended for the control of late blight in Patna. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Bihar and Incharges, AICRP centers Patna)**
3. Prophylactic spray with mancozeb @0.2% followed by second spray of (dimethomorph + mancozeb) @0.3% after seven days and a third spray with mancozeb @0.2% after seven days of the second spray is recommended for the management of late blight in Srinagar and Shillong. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Jammu & Kashmir & Meghalaya and Incharges, AICRP centers Srinagar & Shillong)**
4. Spray with mancozeb (0.25%) followed by second spray of hexaconazole @0.05% after 10 days and a third spray with mancozeb @0.25% after 10 days of second spray is recommended for the management of early blight in Bhubaneswar. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Odisha and Incharges, AICRP centers Bhubaneswar)**
5. Spray with chlorothalonil (0.25%) followed by second spray of hexaconazole @0.05% after 10 days and a third spray with chlorothalonil @0.25% after 10 days of second spray is recommended for the management of early blight in Deesa and Pune. **(Action: Project Coordinator; Department of Horticulture/Agriculture, Govt. of Gujarat & Maharashtra and Incharges, AICRP centers Deesa and Pune)**

#### **General recommendations**

1. In monitoring of late blight incidence in kharif potatoes, Kolar region of Karnataka should be included. **(Action: Head, Plant Protection and AICRP Dharwad & Hassan centers)**
2. All concerned pathologists at AICRP (Potato) should send the photographs of virus infected plants for identification to CPRI, Shimla followed by samples for virus profiling. **(Action: Head, Plant Protection and all AICRP centers)**
3. A pictorial manual on symptoms of diseases is to be provided to AICRP workers by CPRI, Shimla. **(Action: Head, Plant Protection)**
4. Training programme for morphological identification of vectors for AICRP workers should be organized. **(Action: Project Coordinator and Head, Plant Protection)**
5. A note or handout on *Tuta absoluta* to be provided to AICRP workers. **(Action: Head, Plant Protection)**

#### **TECHNICAL SESSION-IV: PLENARY SESSION (September 21, 2014)**

Dr NK Krishna Kumar, DDG, Horticulture, ICAR, New Delhi chaired the plenary session and Dr T Janaki Ram, ADG (Horticulture Sciences), ICAR, New Delhi co-chaired the session. The recommendations of action taken report, technical session I, II and III were respectively presented by PIs namely Drs, Vinay Bhardwaj, VK Dua and M Nagesh. Following decisions were taken up during this session:

1. Dr NK Krishna Kumar, DDG, Horticulture, suggested that there is need to evaluate performance of new variety under drip irrigation. **(Action: Head, Crop Production)**
2. He also felt that our focus should be more on biotic and abiotic stress especially varieties having tolerance to heat, water stress and resistance to different viruses. **(Action: Head, Crop Production and Head, Plant Protection)**
3. Kufri Himalini and Kufri Khyati are doing well in many areas therefore these varieties should be popularized by augmenting seed supply as per the demand. **(Action: Director, CPRI, Shimla)**
4. Factors contributing to post-harvest losses should be worked out. **(Action: Project Coordinator)**
5. Specific experiments on seed quality under drip irrigation/fertigation should be carried out to have package of practices for seed production. **(Action: Head, Crop Production and Head, Seed Technology)**
6. There are different recommendations for similar agro ecological region falling in different states. These recommendations should be looked into to have uniform recommendations for potato production in hills/Gangetic plains/plateau region. **(Action: All Heads, CPRI, Shimla)**
7. CPRI should establish a Food safety laboratory. **(Action: Director, CPRI, Shimla)**
8. Study on heavy metals (lead, mercury and chromium) in potato tubers specially harvested from Kanpur and Patna may be determined. **(Action: Incharge Kanpur and Patna)**
9. Project Coordinator should send sailent recommendations to Krishi portal. **(Action: Project Coordinator)**
10. Documents related to new hybrid MS/5-1543 recommended for release need to be prepared so that the same can be put up to CVRC for its notification. They expect that the meeting will be held about after 3 months. **(Action: Director, CPRI, Shimla and Head, Crop Improvement)**

The session ended with remarks of the Chairman that ICAR has great expectations from AICRP on Potato and we have to work hard to meet its expectations.

In the end he congratulated the scientists for the good work done but cautioned that the future is more difficult due to international competition and we have to strengthen ourselves and be vigilant.

The 33<sup>nd</sup> Group Meeting of AICRP (Potato) ended with vote of thanks proposed by Dr PM Govindakrishnan, Project Coordinator (Potato).

## SECTION-II: TECHNICAL PROGRAMME FOR 2015-2016

### SUMMARY OF TRIALS ALLOTTED TO DIFFERENT AICRP (POTATO) CENTERS

| Sl. No | Name of the Center | Crop Improvement                    | Crop Production         | Crop Protection                   | Total |
|--------|--------------------|-------------------------------------|-------------------------|-----------------------------------|-------|
| 1.     | Bhubaneshwar       | Genet.4,5,7,8,9A,9B,12,13,16,17     | Agron.2,3,5,6,10        | Path. 2,5,6,<br>Ent.1,2,          | 20    |
| 2.     | Chhindwara         | Genet. 4,5,7,8,9A,9B,12,13,17       | Agron.2,3,5,6,10        | Path. 2,6<br>Ent. 1,2             | 18    |
| 3.     | Deesa              | Genet. 4,5, 7,8,9A,9B,12,16         | Agron.2,3,4,5,6,10      | Path. 2,4,5,6<br>Ent. 1,2         | 20    |
| 4.     | Dharwad            | Genet.1,4,5,6,7,8,9A,9B,12,13,14,17 | Agron.2,3,5,6,10        | Path. 2,6<br>Ent. 1               | 20    |
| 5.     | Dholi              | Genet. 4,5, 7,8,12                  | Agron. 2,3,4,5,6,7,9,10 | Path. 1,2,3,6,9<br>Ent. 1,2       | 20    |
| 6.     | Faizabad           | Genet. 4,5, 7,8,12,16               | Agron. 2,3,4,6,7,9,10   | Path. 1,2,3,6,9<br>Ent. 1         | 19    |
| 7.     | Gwalior            | Genet. 4,5, 7,8,12,14,16            | Agron. 2,3,4,6,9,10     | Path. 6<br>Ent. 1                 | 15    |
| 8.     | Hassan             | Genet.1,4,5,6,7,8,9A,9B,10,12,14,   | Agron.2,3,5,6,10        | Path. 1,2,3,4,6,7,8<br>Ent. 1,2,4 | 26    |
| 9.     | Hisar              | Genet.1,3,4,5,7,8,9A,9B,12,15,16,   | Agron. 2,3,6,8,9,10     | Path. 2,4,6<br>Ent. 1             | 21    |
| 10.    | Jalandhar          | Genet. 4,5, 7,8,12,15               | Agron. 3,4,6,10         | Path. 1, 2, 3, 6, 9,<br>Ent. 1,   | 16    |
| 11.    | Jorhat             | Genet.1,4,5, 7,8,10,12              | Agron. 2,3,6,9,10       | Path. 1, 2, 6,<br>Ent. 1          | 16    |
| 12.    | Kalyani            | Genet. 4,5,7,8,9A,9B,12,15          | Agron.2,3,5,6,7,10      | Path. 1,2,3,4,6<br>Ent. 1,2       | 21    |
| 13.    | Kanpur             | Genet. 4,5, 7,8,12,15               | Agron. 3,4,6,10         | Path. 1,2,6,9<br>Ent. 1           | 15    |
| 14.    | Kota               | Genet. 4,5, 7,8,9A,9B,12,16         | Agron.2,3,5,6,10        | Path. 1,2,6<br>Ent. 1             | 17    |
| 15.    | Kufri (Shimla)     | Genet.2,6                           | --                      | Ent. 1,3                          | 4     |
| 16.    | Modipuram          | Genet.2,4,5, 7,8,9A,9B,12,15,16     | Agron. 3,6,10           | Path. 2,6,9<br>Ent. 1,2           | 18    |
| 17.    | Ooty               | Genet. 6,11,12                      | Agron. 3,6,9            | Path. 1,2,6<br>Ent. 1,3,4,5       | 13    |
| 18.    | Pantnagar          | Genet. 4,5, 7,8,12,15               | Agron. 3,4,6,10         | Path. 1,2,3,6<br>Ent. 1           | 15    |
| 19.    | Pasighat           | Genet. 4,5, 7,8,12                  | Agron. 2,3,6,9,10       | Path. 1,2,6<br>Ent. 1             | 14    |
| 20.    | Patna              | Genet. 4,5, 7,8,10,12,14,15         | Agron. 2,3,6,7,10       | Path. 1,2,3,6,9<br>Ent. 1,2       | 20    |
| 21.    | Pune               | Genet. 4,5,6,7,8,9A,9B,12,13,14,17  | Agron. 2,3,6,10         | Path. 1,2,4,5,6<br>Ent. 1,2,4     | 23    |
| 22.    | Raipur             | Genet. 4,5,7,8,9A,9B,12,13,15,16,17 | Agron.1,2,3,5,6,10      | Path. 2,4,6<br>Ent. 1,2           | 22    |
| 23.    | Ranichauri         | Genet. 6,12                         | --                      | --                                | 2     |
| 24.    | Shillong           | Genet. 6,10,12,14                   | Agron. 3,6,10           | Path. 1,2,3,6<br>Ent. 1,3         | 13    |
| 25.    | Srinagar           | Genet.3,6,7,8,12,15                 | Agron. 2,3,4,6,9,10     | Path. 1,2,3,6<br>Ent. 1           | 17    |

## CROP IMPROVEMENT

### GENET. 1: EVALUATION OF GERMPLASM

Location : Dharwad, Hassan, Hisar and Jorhat

#### a) Evaluation for adaptability in Kharif season

Locations: Dharwad and Hassan

|             |   |   |
|-------------|---|---|
| Design      | : | RBD   |
| Replication | : | 2   |
| Plot size   | : | 5 tubers row  |
| Material    | : | 100 <i>tuberosum</i> accessions supplied by CPRS, Jalandhar |
| Controls    | : | AICRP-C-13, AICRP-C-16, AICRP-C- 17, AICRP-C-24             |

#### Observations to be recorded:

1. Plant emergence (%) at 30 days after planting
2. Foliage senescence (%) at haulms cutting (Rating of canopy for yellowing of leaves 1-10 scale where 1= 10% leaf yellowing and 10= 100% leaf yellowing)
3. Yield per plant (90 days harvest)
4. No. of tubers per plant (90 days harvest)
5. Incidence of any major diseases (final score).

#### b) Evaluation for Bacterial wilt resistance

Location : Hassan

|             |   |   |
|-------------|---|---|
| Design      | : | RBD   |
| Replication | : | 2   |
| Plot size   | : | 5 tubers row                                |
| Material    | : | 80 wild species clones from CPRIC Modipuram |

#### Observations to be recorded:

1. Plant emergence (%) at 30 days after planting.
2. Wilt incidence in each accession at 10 days interval after emergence.
3. Days to wilting

#### c) Evaluation for Potato Apical Leaf Curl Disease (PALCD):

Locations : Hisar

|             |   |  |
|-------------|---|--|
| Design      | : | RBD  |
| Replication | : | 2  |
| Plot size   | : | 5 tubers row   |
| Material    | : | 100 germplasm accessions from CPRS Jalandhar                                     |
| Controls    | : | AICRP-C-5, AICRP-C-6, AICRP-C-13, AICRP-C-14, AICRP-C-17, AICRP-C-18, AICRP-C-19 |

**Observations to be recorded:**

1. Plant emergence (%) at 30 days after planting
2. Incidence of PALCD at 10 days interval after emergence to haulms cutting
3. No. of tubers per plant (90 days harvest)
4. Yield per plant (90 days harvest)

**d) Evaluation for late blight resistance:**

Locations : Jorhat

|             |   |  |
|-------------|---|--|
| Design      | : | RBD  |
| Replication | : | 2  |
| Plot size   | : | 10 tubers row                                |
| Material    | : | 100 germplasm accessions from CPRS Jalandhar |
| Controls    | : | AICRP-C-13, AICRP-C-23, AICRP-C-24           |

**Observations to be recorded:**

1. Plant emergence(%) at 30 days after planting
2. Incidence of LB at 10 days interval after 1<sup>st</sup> appearance of disease.
3. No. of tubers per plant (90 days harvest)
4. Yield per plant (90 days harvest)

**GENET.2: MULTIPLICATION OF GENETIC MATERIAL**

Multiplication of recently introduced hybrids, 3 early maturing (J/7-5, J/7-15, J/7-37), 1 medium maturing (MS/9-2196), 1 red skin (PS/8-31) and 1 processing (MP/08-1900). Other hybrids viz., J/6-182, J/2-14, MS/7-645, PS-05/75, PS/06-24, MP/04-816, MS/06-819, MS/06-1947, MS/8-1148, MS/8-1565, PS/06-88, MP/04-578, MP/9-723, MP/0\*-\*\*, HT/07-1105, SM/00-120, SM/00-42, VMT5-1. WS/05-146, J/100-152, PS/04-05, MS/04-2261, PS/03-02, 2002-P-14, MP/01-916, D-150 and 92-PT-27 (both parents) under AICRP and control varieties will be done at Seed Preparatory Units (SPUs) located at Modipuram and Kufri for supply to the AICRP centers in the plains and hills, respectively.

**GENET.3: REGION SPECIFIC BREEDING PROGRAMMES AT SAU BASED CENTERS**

| Sr. No. | AICRP location (s) | Affiliated CPRI centre (s) | Regional/variatal requirements                                      |
|---------|--------------------|----------------------------|---|
| 1       | Srinagar           | CPRS, Kufri                | High yield & Late Blight resistance                                 |
| 2*      | Hisar              | CPRI Campus Modipuram      | Virus resistance, Moderate resistance to late blight and high yield |

Besides above,

- F1C2 produce, from Modipuram, Jalandhar and Patna will be shared with the AICRP centre, **Hisar**.
- F1C4 produce, from Modipuram, Jalandhar and Patna will be shared with the AICRP centre, viz., **DES (processing); BHN and RPR** (heat tolerance & red hybrids), besides.

**GENET.4: ON-FARM TRIAL WITH EARLY AND MEDIUM MATURING HYBRIDS**

Location : All locations in the plains  
 Plot size : 96 m<sup>2</sup> (40 rows of 20 tubers each)  
 Spacing : 60 x 20 cm  
 Cultural practices : As recommended for the region.

**Treatments**

|                  |  |
|------------------|--|
| <b>Hybrids:</b>  | <b>AICRP-P-9, AICRP-P-7: 1<sup>st</sup> year</b>           |
| <b>Controls:</b> |  |
| Northern plains  | AICRP-C-14, AICRP-C-17, AICRP-C-6, AICRP-C-19 & K Gaurav   |
| Central plains   | AICRP-C-14, AICRP-C-17, AICRP-C-16, AICRP-C-6 & K Garima   |
| Eastern plains   | AICRP-C-14, AICRP-C-17, AICRP-C-4, AICRP-C-15 & K Lalit    |
| Plateau region   | AICRP-C-17, AICRP-C-20, AICRP-C-24, AICRP-C-13, AICRP-C-16 |

**Observations to be recorded:**

1. Seed wt./plot (Kg)
2. Plant emergence (%) at 30 days after planting.
3. Incidence of any major diseases, final score.
4. Tubers rot in the plot (weight) at the time of harvesting.
5. Foliage senescence and total & marketable tuber yield (t/ha) at 60, 75, 90 days crop and at senescence (75% foliage maturity)\*.
6. Tuber dry matter (%) at 60, 75, 90 and senescence. Corresponding haulm dry wt. (%) should also be recorded. Final haulms weight (Fresh weight and dry weight) is to be recorded at start of senescence. Dry matter estimation in tuber should be done within a week after harvest.
7. Meteorological data.
8. Total weight loss after 75 days storage at ambient temperature.
9. Storage losses in heaps (at respective CPRI stations).

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

**GENET.5: TRIAL WITH TABLE POTATO HYBRIDS (1<sup>st</sup> & 2<sup>nd</sup> year)**

Location : All locations in the plains  
 Design : RBD  
 Replication : 4 (each for 75 & 90 days crop)  
 Plot size : 3.0 m x 2.4 m (5 rows of 12 tubers)

**Treatments**

|                 |  |
|-----------------|--|
| Zone            | Hybrids/Varieties  |
|                 | <b>AICRP-P-6, AICRP-P-12 (old hybrids), AICRP-P-20, AICRP-P-22, AICRP-P-15 (new hybrids)</b> |
| Northern plains | AICRP-C-14, AICRP-C-17, AICRP-C-6, AICRP-C-19 & K Gaurav                                     |
| Central plains  | AICRP-C-14, AICRP-C-17, AICRP-C-16, AICRP-C-6 & K Garima                                     |
| Eastern plains  | AICRP-C-14, AICRP-C-17, AICRP-C-4, AICRP-C-15 & K Lalit                                      |
| Plateau region  | AICRP-C-17, AICRP-C-20, AICRP-C-24, AICRP-C-13, AICRP-C-16                                   |

### Observations to be recorded:

1. Seed wt. per plot (Kg)
2. Plant emergence (%) at 30 days after planting.
3. Incidence of any major diseases, final score.
4. Tuber rottage in the plot (weight) at the time of harvesting.
5. Foliage senescence and total & marketable tuber yield (t/ha) at 60, 75, 90 days crop and at senescence (75% foliage maturity)\*.
6. Tuber dry matter (%) at 60, 75, 90 and senescence. Corresponding haulm dry wt. (%) should also be recorded. Final haulms weight is to be recorded at start of senescence. Dry matter estimation in tuber should be done within a week after harvest.
7. Total weight loss after 75 storage at ambient temperature
8. Mean Canopy Cover<sup>#</sup> at 10 days interval till senescence (75% foliage maturity) with digital camera or by Burstall & Harris (1983) method (Grid method).
9. Meteorological data.

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

### Note:

- An additional replication will be planted to record data on <sup>#</sup> Mean Canopy Cover.
- Sufficient tubers should be multiplied and kept to conduct 2<sup>nd</sup> year trial (600-800 tubers for new hybrids) and on-farm trials (3500-4000 tubers for old hybrid) during the next year.

### GENET. 6: TRIAL WITH HILL & KHARIF POTATO HYBRIDS

|                    |   |  |
|--------------------|---|--|
| Locations          | : | Dharwad, Hassan & Pune (Plain <i>Kharif</i> centres)<br>Kufri, Srinagar, Ranichauri, Ooty, Shillong (Hill <i>Kharif</i> centres) |
| Design             | : | RBD  |
| Replications       | : | 3 each for 75 and 90 days crop   |
| Plot size          | : | 3.0 m x 2.4 m (5 rows of 12 tubers)  |
| Spacing            | : | 60 X 20 cm   |
| Cultural practices | : | As recommended for the region.   |

### Treatments

### Treatments

|                            |            |            |            |                        |            |
|----------------------------|------------|------------|------------|------------------------|------------|
| <b>Hybrids</b>             | AICRP-P-15 | AICRP-P-16 | AICRP-P-17 | AICRP-P-18             | AICRP-LB-4 |
| <b>Controls for Kharif</b> | AICRP-C-24 | AICRP-C-13 | AICRP-C-16 | AICRP-C-17             | AICRP-C-20 |
| <b>Controls for Hills</b>  | AICRP-C-23 | AICRP-C-24 | AICRP-C-13 | AICRP-C-27 (Ooty only) |            |

### Observations to be recorded:

1. Seed wt. per plot (Kg)
2. Plant emergence (%) at 30 days after planting.
3. Incidence of LB at 10 days interval after 1<sup>st</sup> appearance of disease.
4. Incidence of any major diseases, final score.
5. Tuber rot in the plot at the time of harvesting (by weight and numbers).
6. Foliage senescence and total & marketable tuber yield (t/ha) at 60, 75, 90 days crop and at senescence (75% foliage maturity)\*.

7. Tuber dry matter (%) at 60, 75, 90 and senescence. Corresponding haulm dry wt. (%) should also be recorded. Final haulms weight is to be recorded at start of senescence. Dry matter estimation in tuber should be done within a week after harvest.
8. Total weight loss at 75 days after storage at ambient temperature.
9. Meteorological data.

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

**Note:**

- No spray of fungicides against late blight incidence
- Sufficient tubers should be multiplied and kept to conduct 2<sup>nd</sup> year trials (3500-4000 tubers) during the next year.
- In case of shortage of tubers, the rows and tubers/row may be adjusted appropriately.

**GENET. 7: TRIAL WITH PROCESSING HYBRIDS**

Location : All AICRP centers  
 Design : RBD  
 Replication : 4  
 Plot size : 3x3 m (6 rows of 15 tubers)  
 Spacing : 60 X 20 cm  
 Cultural practices : As recommended for the region.

**Treatments**

|            |            |            |                          |
|------------|------------|------------|--------------------------|
| AICRP-P-11 | AICRP-P-24 | AICRP-P-19 | AICRP-PH-3 (dummy check) |
| AICRP-C-1  | AICRP-C-8  | AICRP-C-10 |                          |

**Observations to be recorded:**

1. Seed wt. per plot (Kg)
2. Plant emergence (%) at 30 days after planting.
3. Incidence of any major diseases, final score.
4. Tubers rot in the plot (weight) at the time of harvesting.
5. Foliage senescence and total & process grade yield (t/ha) at 75, 90, 110 days and at senescence (75% foliage maturity)\*.
6. Total weight loss 75 days after storage at ambient temperature
7. Tuber dry matter (%), chip colour and reducing sugar at 75, 90 and 110 days harvest at selected centres (Jalandhar and Modipuram). **Other centers to supply 5-8 tubers to Jt Director, CPRIC, Modipuram immediately after harvest.**
8. Mean Canopy Cover<sup>#</sup> at 10 days interval till senescence (75% foliage maturity) with digital camera or by Burstall & Harris (1983) method (Grid method).
9. Meteorological data.

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

**Note:**

- An additional replication will be planted to record data on <sup>#</sup> Mean Canopy Cover.

- Sufficient tubers should be multiplied and kept to conduct 2<sup>nd</sup> year/ on-farm trials (3500-4000 tubers) during the next year.
- In case of shortage of tubers, the rows and tubers/row may be adjusted appropriately.

#### **GENET. 8: ON-FARM TRIAL WITH PROCESSING HYBRIDS**

Location : All AICRP centers  
 Design : RBD  
 Plot size : 96 m<sup>2</sup> (40 rows of 20 tubers each)  
 Spacing : 60 X 20 cm  
 Cultural practices : As recommended for the region.

#### **Treatments**

|           |           |           |            |            |
|-----------|-----------|-----------|------------|------------|
| AICRP-P-4 | AICRP-C-1 | AICRP-C-8 | AICRP-C-10 | AICRP-C-11 |
|-----------|-----------|-----------|------------|------------|

#### **Observations to be recorded:**

1. Seed wt. per plot (Kg)
2. Plant emergence (%) at 30 days after planting.
3. Incidence of any major diseases, final score.
4. Tubers rot in the plot (weight) at the time of harvesting.
5. Foliage senescence and total & French fry grade yield (t/ha) at 90 & 110 days and at senescence (75% foliage maturity)\*.
6. Total weight loss 75 days after storage at ambient temperature
7. Tuber dry matter (%), French fry colour and reducing sugar at 90 and 110 days harvest at selected centres (Jalandhar and Modipuram). **Other centres to supply 5-8 tubers to Jt Director, CPRIC, Modipuram immediately after harvest.**
8. Mean Canopy Cover<sup>#</sup> at 10 days interval till senescence (75% foliage maturity).
9. Storage losses in heaps (at respective CPRI stations).
10. Meteorological data.

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

#### **Note:**

- An additional replication will be planted to record data on <sup>#</sup> Mean Canopy Cover.
- Sufficient tubers should be multiplied and kept to conduct 2<sup>nd</sup> year/ on-farm trials (3500-4000 tubers) during the next year.
- In case of shortage of tubers, the rows and tubers/row may be adjusted appropriately.

#### **GENET.9A: TRIAL FOR HEAT TOLERANCE (1<sup>st</sup> year) [Nodal Scientist: Dr VK Gupta, CPRIC, Modipuram]**

Location : Bhubaneswar, Chhindwara, Deesa, Kalyani, Raipur, Hisar, Modipuram, Kota  
**(Rabi crop). Dharwad, Hassan & Pune (Kharif crop)**  
 Design : RBD  
 Replication : 4 (each for 75 & 90 days crop)  
 Plot size : 3.0 m x 2.4 m (5 rows of 12 tubers)  
 Spacing : 60 x 20 cm  
 Treatments : **AICRP-P-23**

## Controls

### Rabi crop

| Center         | Variety                |
|----------------|------------------------|
| Bhubaneshwar   | : K Surya, K Khyati    |
| Chhindwara     | : K Surya, K Khyati    |
| Deesa (Ladol)  | : K Badshah, K Pukhraj |
| Kalyani        | : K Jyoti              |
| Raipur         | : K Surya, K Khyati    |
| Hisar (Karnal) | : K Surya, K Bahar     |
| Modipuram      | : K Bahar              |

\* including the controls of the region.

### Kharif crop

| Center  | Variety                         |
|---------|---------------------------------|
| Dharwad | : K Surya, K Laukar, K Himalini |
| Hassan  | : K Surya, K Laukar, K Himalini |
| Pune    | : K Surya, K Laukar, K Himalini |

Cultural practices : As recommended for the region.

### Observations to be recorded:

1. Seed wt. per plot (Kg)
2. Plant emergence (%)
3. Plant vigor 60 days after planting (1-5 scale)
4. Foliage senescence and total & marketable tuber yield (t/ha) at 60, 75, 90 days and at senescence (75% foliage maturity)\*.
5. Tuber rottage in the plot (weight) at the time of harvesting
6. Total weight loss at 75 days after storage at ambient temperature.
7. Incidence of any major diseases.
8. Tuber dry matter (%) at 60, 75 and 90 days harvest. Corresponding haulm dry wt. (%) should also be recorded. Dry matter estimation in tuber should be done within a week after harvest.
9. Meteorological data.
10. Storage losses in heaps (at respective CPRI station)

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

### Note:

- Sufficient tubers should be multiplied and kept to conduct on-farm trials (3500-4000 tubers) during the next year.
- In case of shortage of tubers, the rows and tubers/row may be adjusted appropriately.

**GENET.9B: ON FARM TRIAL FOR HEAT TOLERANCE [Nodal Scientist: Dr VK Gupta, CPRIC, Modipuram]**

Location : Bhubaneshwar, Chhindwara, Deesa, Kalyani, Raipur, Hisar, Modipuram, Kota  
(**Rabi crop**). Dharwad, Hassan & Pune (**Kharif crop**)

Design : RBD

Plot size : 96 m<sup>2</sup> (5 rows of 12 tubers)

Spacing : 60 x 20 cm

Treatments : **AICRP-C-28**

**Controls**

**Rabi crop**

| Center         | Variety                |
|----------------|------------------------|
| Bhubaneshwar   | : K Surya, K Khyati    |
| Chhindwara     | : K Surya, K Khyati    |
| Deesa (Ladol)  | : K Badshah, K Pukhraj |
| Kalyani        | : K Jyoti              |
| Raipur         | : K Surya, K Khyati    |
| Hisar (Karnal) | : K Surya, K Bahar     |
| Modipuram      | : K Bahar              |

**Kharif crop**

| Center  | Variety                         |
|---------|---------------------------------|
| Dharwad | : K Surya, K Laukar, K Himalini |
| Hassan  | : K Surya, K Laukar, K Himalini |
| Pune    | : K Surya, K Laukar, K Himalini |

\* including the controls of the region.

Cultural practices : As recommended for the region.

**Observations to be recorded:**

1. Seed wt. per plot (Kg)
2. Plant emergence (%)
3. Plant vigor 60 days after planting (1-5 scale)
4. Foliage senescence and total & marketable tuber yield (t/ha) at 60, 75, 90 days and at senescence (75% foliage maturity)\*.
5. Tuber rottage in the plot (weight) at the time of harvesting
6. Total weight loss at 75 days after storage at ambient temperature.
7. Incidence of any major diseases.
8. Tuber dry matter (%) at 60, 75 and 90 days harvest. Corresponding haulm dry wt. (%) should also be recorded. Dry matter estimation in tuber should be done within a week after harvest.
9. Meteorological data.
10. Storage losses in heaps (at respective CPRI station)

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

**Note:**

- Sufficient tubers should be multiplied and kept to conduct on-farm trials (3500-4000 tubers) during the next year.
- In case of shortage of tubers, the rows and tubers/row may be adjusted appropriately.

**GENET.10: ON FARM EVALUATION OF TPS POPULATION (1<sup>ST</sup> year) [Nodal Scientist: Dr Shambhu Kumar, CPRS, Patna]**

Location : Patna, Jorhat, Hassan and Shillong for seedling transplant crop (2 populations)  
Design : RBD (50x10 cm)  
Plot size : 96/ m<sup>2</sup> (16 rows of 120 seedlings/row each)

**Treatments**

TPS population : AICRP-TPS-2  
Controls : AICRP-TPS-1

**Observations to be recorded:**

For seedling transplant crop

1. Seedling survival(%), 30 days after transplanting
2. Seedling vigour (30 days after transplanting) on 1-5 scale, 1=V Poor, 5=V Good.
3. Grade-wise tuber yield at 75 days, 90 days and at senescence (75% foliage maturity) after transplanting.
4. Tuber uniformity (colour and shape, separately) on 1-5 scale 1=V Poor to 5=V Good.
5. Tuber dry matter (%) at 75 and 90 days harvest.
6. Tuber rottage in the plot (weight) at the time of harvesting
7. Total weight loss 75 days after storage at ambient temperature
8. Storage losses in heaps (at respective CPRI station).

**Note:** In case of shortage of tubers, the rows and tubers/row may be adjusted appropriately. Retain sufficient tubers at harvest for next year trial.

**GENET.11: ON-FARM TRIAL WITH HYBRIDS HAVING COMBINED RESISTANCE TO LATE BLIGHT AND CYST NEMATODES (2<sup>nd</sup> year trial) [Nodal Scientist: Dr Sudha, CPRS, Ooty]**

Location : Ooty  
Plot size : 7.6 m<sup>2</sup> (5 rows of 15 tubers each)  
Spacing : 50 x 20 cm  
Cultural practices : As recommended for the region.

**Treatments**

|                      |  |
|----------------------|--|
| OS/01-516, OS/01-497 | K Swarna, K Neelima, K Jyoti, K Girdhari, K Himalini |
|----------------------|--|

**Observations to be recorded:**

1. Seed wt. per plot (Kg)
2. Plant emergence (%) at 45 days after planting.
3. Incidence of late blight and cyst nematode.
4. Tuber rottage in the plot (weight) at the time of harvesting.
5. Foliage senescence and total & marketable tuber yield (t/ha) at 75, 90, 120 days and at senescence (75% foliage maturity)\*.
6. Total weight loss after 75 days storage at ambient temperature
7. Total weight loss after 30 days in the tuber material in big heap of rejected tubers(1 to 2 m height) covered by straw etc in field.

8. Tuber dry matter (%) at 75, 90 and 120 days harvest.
9. Meteorological data.
10. Storage losses in heaps

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

**GENET.12: VARIETAL EVALUATION TRIAL TO IDENTIFY TOP THREE PROMISING VARIETIES OF THE REGION (repeat)**

Location : All regions.  
 Plot size : 3x3 m (6 rows of 15 tubers)  
 Replication : 4  
 Design : RBD  
 Spacing : 60 x 20 cm  
 Cultural practices : As recommended for the region.

North : (T) : K Jyoti, K Bahar, K Sadabahar, K Gaurav, K Garima, K Pushkar  
 : (C) : K Khyati, K Pukhraj  
 Central : (T) : K Jyoti, K Bahar, K Badshah, K Gaurav, K Garima, K Pushkar, K Surya  
 : (C) : K Khyati, K Pukhraj, K Lauvkar  
 Eastern : (T) : K Jyoti, K Himalini, K Shailja, K Gaurav, K Garima, K Pushkar, K Lalima,  
 : (C) : K Khyati, K Pukhraj, K Ashoka  
 Plateau : (T) : K Jyoti, K Bahar, K Gaurav, K Garima, K Himalini, K Pushkar, K Lauvkar, K  
 Badshah, K Khyati  
 : (C) : K Pukhraj, K Surya, K Ashoka  
 Hills : K Girdhari, K Himalini, K Shailja, K Kanchan, K Megha, K Jyoti (Sprayed), K Jyoti  
 (Unsprayed)

**Observations to be recorded:**

1. Seed wt. per plot (Kg)
2. Plant emergence (%).
3. Plant vigor 60 days after planting (1-5 scale).
4. Foliage senescence and total & marketable tuber yield (t/ha) at 60, 75, 90 days and at senescence (75% foliage maturity)\*.
5. Tuber rottage in the plot (weight) at the time of harvesting.
6. Total weight loss at 75 days after storage at ambient temperature.
7. Incidence of any major diseases.
8. Tuber dry matter (%) at 60, 75 and 90 days.
9. Mean Canopy Cover<sup>#</sup> at 10 days interval till senescence (75% foliage maturity) with digital camera or by Burstall & Harris (1983) method.
10. Meteorological data.

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

**Note:**

- An additional replication will be planted to record data on <sup>#</sup>Mean Canopy Cover.

**GENET.13: VARIETAL EVALUATION FOR PRODUCTION OF BABY/ SALAD POTATOES (SPECIALTY POTATO) [Nodal Scientist: Dr VK Gupta, CPRIC, Modipuram]**

Location : Bhubaneswar, Raipur, Chhindwara, Pune and Dharwad  
Plot size : 3x3 m (6 rows of 15 tubers)  
Spacing : 60 x 20 cm  
Cultural practices : As recommended for the region.  
Varieties : K Himsona, K Shailja, K. Khyati  
Controls : Recommended varieties of the region.

North : K Khyati, K Pukhraj, K Bahar, K Sadabahar, K Pushkar & K Badshah  
Central : K Khyati, K Pukhraj, K Lauvkar, K Pushkar, K Bahar, K Badshah  
Eastern : K Khyati, K Pukhraj, K Ashoka, K Pushkar, K Jyoti  
Plateau : K Pukhraj, K Surya, K Ashoka, K Pushkar, K Jyoti, K Lauvkar  
Hills : K Girdhari, K Himalini, K Jyoti

**Observations to be recorded:**

1. Seed wt. per plot (Kg)
2. Plant emergence (%)
3. Per cent baby tubers (10-25 gm; 25-50 gm and >50 gm) at different dates of harvest.
4. Foliage senescence and total & grade-wise yield (t/ha) at 60, 75, 90 days and at senescence (75% foliage maturity).
5. Organo-leptic test by about 20 volunteers at harvest at each location.
6. Tuber rottage in the plot (weight) at the time of harvesting
7. Total weight loss at 75 days after storage at ambient temperature
8. Incidence of any major diseases.
9. Tuber dry matter (%) at 60, 75 and 90 days
10. Meteorological data.

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

**GENET.14: STANDARDIZATION OF TPS TECHNOLOGY [Nodal Scientist: Dr Shambhu Kumar, CPRS, Patna]**

**Location** : Pune, Hassan, Dharwad (Kharif) Patna, Gwalior and Shillong (Rabi)  
**Plot size** : a) 1.0 x 1.0 m nursery bed for seedling tuber production  
b) 3.0 x 3.0 m (6 rows of 15 tubers) for seedling tuber crop  
**Design** : RBD  
**Cultural practices** : As recommended for the region.  
**Varieties** : D-150, 92-PT-27 (Both parents)  
**Controls** : Recommended varieties of the region (ware crop only)

**Treatments**

- a) For seedling tuber production: Pune, Dharwad, Gwalior and Patna (Rabi) Shillong (Spring)
  1. Brick bed method
  2. Normal nursery bed method
- b) Ware potato production using seedling tubers: Pune, Hassan, Dharwad and Shillong (Kharif) Patna, Gwalior (Rabi)

c) For TPS production: Patna (Rabi)

1. Total berries produced
2. 4 berries retained/bunch
3. All flower flushes retained
4. Retaining 1<sup>st</sup> and 2<sup>nd</sup> flower flush

**Observations to be recorded:**

a) For seedling tuber production:

1. No of plant emerged/sqm
2. Seedling vigour (30 days after transplanting) on 1-5 scale, 1=V Poor, 5=V Good.
3. Grade-wise tuber yield in 3 grades at maturity.
4. Tuber uniformity (colour and shape) on 1-5 scale 1=V Poor to 5=V Good.
5. Tuber rottage in the plot (weight) at the time of harvesting
6. Total weight loss after storage at ambient temperature till planting.

b) Ware potato production using seedling tubers

1. Plant emergence (%) at 30 DAP
2. Plant vigor 40 days after planting (1-5 scale) 1=V Poor to 5=V Good.
3. Foliage senescence (%) at haulms cutting.
4. Incidence of any major diseases
5. Total and marketable tuber yield (t/ha) at senescence (75% foliage maturity).
6. Tuber rottage in the plot (weight) at the time of harvesting.
7. Tuber uniformity (colour and shape) on 1-5 scale 1=V Poor to 5=V Good.
8. Tuber dry matter (%) at harvesting.
9. Organoleptic test (1-5 scale) 1=V Poor to 5=V Good.
10. Meteorological data.

c) For TPS production

1. Average berry weight (Total berries/No of berries produced per plant)
2. 100 TPS weight
3. Germination (%) in lab condition.

**GENET. 15: TRIAL WITH SPECIALTY POTATO HYBRIDS [Nodal Scientist: Dr Shambhu Kumar, CPRS, Patna]**

|                    |   |   |
|--------------------|---|---|
| Locations          | : | Hisar, Jalandhar, Kalyani, Kanpur, Modipuram, Pantnagar, Patna, Raipur and Srinagar |
| Design             | : | RBD   |
| Replications       | : | 3 each for 75 and 90 days crop  |
| Plot size          | : | 3.0 m x 2.4 m (5 rows of 12 tubers)   |
| Spacing            | : | 60 X 20 cm  |
| Cultural practices | : | As recommended for the region.  |

**Treatments**

|            |            |            |         |
|------------|------------|------------|---------|
| AICRP-P-14 | AICRP-C-15 | K Sindhuri | K Lalit |
|------------|------------|------------|---------|

### Observations to be recorded:

1. Seed wt. per plot (Kg)
2. Plant emergence (%) at 30 days after planting.
3. Incidence of LB at 10 days interval after 1<sup>st</sup> appearance of disease.
4. Incidence of any major diseases, final score.
5. Tubers rot in the plot (weight) at the time of harvesting.
6. Foliage senescence and total & marketable tuber yield (t/ha) at 75 and 90 days and at senescence (75% foliage maturity)\*.
7. Total weight loss at 75 days after storage at ambient temperature.
8. Organoleptic test (1-5 scale) 1=V Poor to 5=V Good.
9. Meteorological data.

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

### Note:

- No spray of fungicides against late blight incidence
- Sufficient tubers should be multiplied and kept to conduct 2<sup>nd</sup> year trials (3500-4000 tubers) during the next year.
- In case of shortage of tubers, the rows and tubers/row may be adjusted appropriately.

### **GENET.16: EVALUATION OF WATER STRESS TOLERANT HYBRID (1<sup>ST</sup> YEAR). [Nodal Scientist: Dr Name Singh, CPRIC, Modipuram]**

|                          |   |   |
|--------------------------|---|---|
| <b>Locations</b>         | : | Bhubaneswar, Deesa, Faizabad, Gwalior, Hisar, Kota, Raipur, Modipuram |
| <b>Design</b>            | : | Split-plot design   |
| <b>Replications</b>      | : | 4 each for 75 and 90 days crop  |
| <b>Plot size (Gross)</b> | : | 4.2 m x 3.4 m   |
| <b>Plot size (Net)</b>   | : | 3.0 m x 3.0 m   |
| <b>Total plots</b>       | : | 4 x 2 x 4 = 32  |
| <b>Spacing</b>           | : | 60 X 20 cm  |

### **Treatments : a). Main-plot treatments : Irrigation levels – Four**

**Treatment A:** Gwalior, Hisar, Modipuram

**Treatment B:** Bhubaneswar, Deesa, Faizabad, Kota, Raipur

- |   |                |   |   |
|---|----------------|---|---|
| A | l <sub>1</sub> | : | 2.5 IW : CPE ratio (6, adequate irrigations)                                    |
|   | l <sub>2</sub> | : | 2.0 IW : CPE ratio (5, sub-optimal irrigations)                                 |
|   | l <sub>3</sub> | : | 1.5 IW : CPE ratio (4, irrigations at critical stages viz. SF, TI, ETES & LTES) |
|   | l <sub>4</sub> | : | l <sub>3</sub> + paddy straw mulch @ 5 t/ha at planting                         |

**OR**

- |   |                |   |  |
|---|----------------|---|--|
| B | l <sub>1</sub> | : | Irrigation at 20 mm CPE (6, adequate irrigations)                                    |
|   | l <sub>2</sub> | : | Irrigation at 25 mm CPE (5, sub-optimal irrigations)                                 |
|   | l <sub>3</sub> | : | Irrigation at 30 mm CPE (4, irrigations at critical stages viz. SF, TI, ETES & LTES) |
|   | l <sub>4</sub> | : | l <sub>3</sub> + paddy straw mulch @ 5 t/ha at planting                              |

**Note :** Depth of irrigation = 50 mm. The first irrigation at 7-10 days after planting should be given to all the plots, thereafter, irrigation treatments will be started.

### **b). Sub- plot treatments: Potato varieties – Two**

V1 : AICRP-P-21

V2 : K. Sindhuri, K Pukhraj, K Jyoti or Recommended variety for the respective area (control)

**Observations to be recorded:**

1. Initial fertility status of the soil (p<sup>H</sup>, Organic carbon and available N, P & K).
2. Plant emergence at 30 days.
3. Plant growth, number of shoots and leaves per plant at 60 days after planting.
4. Yield and number of tubers in each grade (0-25 g, 25-75 g and above 75 g)
5. Nutrient (N P K) removal by the crop.
6. Amount of water applied in each irrigation under different treatments.
7. Periodical soil moisture observations (at stolon formation, tuber initiation & bulking stage) from 0 to 45 cm depth in 15 cm depth-wise from different treatments.

**Note:**

- No spray of fungicides against late blight incidence
- Sufficient tubers should be multiplied and kept to conduct 2<sup>nd</sup> year/ on-farm trials (3500-4000 tubers for old hybrid) during the next year.

**GENET.17: STANDARDIZATION OF PRODUCTION TECHNOLOGY OF BABY POTATOES  
[Nodal Scientist: Dr VK Gupta, CPRIC, Modipuram]**

Location : Bhubaneswar, Raipur, Chhindwara, Pune and both *kharif* and *Rabi* in Dharwad  
Plot size : 3x3 m (6 rows of 15 tubers)  
Spacing : 60 x 20 cm  
Cultural practices : As recommended for the region.  
Varieties : V1: K. Khyati, V2: K Pukhraj (or as recommended for the region)

**Treatments**

| Variety | Seed size                    | Fertilizers               | Irrigation                |
|---------|------------------------------|---------------------------|---------------------------|
| V1      | S <sub>1</sub> : Large size  | F <sub>1</sub> : 100% RDF | I <sub>1</sub> : 20mm CPE |
|         | S <sub>2</sub> : Medium size | F <sub>2</sub> : 75% RDF  | I <sub>2</sub> : 30mm CPE |
| V2      | S <sub>1</sub> : Large size  | F <sub>1</sub> : 100% RDF | I <sub>1</sub> : 20mm CPE |
|         | S <sub>2</sub> : Medium size | F <sub>2</sub> : 75% RDF  | I <sub>2</sub> : 30mm CPE |

**Observations to be recorded:**

1. Seed wt. per plot (Kg)
2. Plant emergence (%)
3. Per cent baby tubers (10-25 gm; 25-50 gm and >50 gm) at different dates of harvest.
4. Foliage senescence and total & grade-wise yield (t/ha) at 60, 75, 90 days and at senescence (75% foliage maturity)\*.
5. Organo-leptic test by about 20 volunteers at harvest at each location.
6. Tuber rottage in the plot (weight) at the time of harvesting
7. Total weight loss at 75 days after storage at ambient temperature
8. Incidence of any major diseases.
9. Tuber dry matter (%) at 60, 75 and 90 days
10. Meteorological data.

**\* If 75% foliage senescence is earlier to any of the harvest dates mentioned then its date should be recorded and final harvest recorded at that date.**

Controls for various trials of AICRP  
(Based on decision of AICRP Workshop 2011)

A. For Trials with early maturing hybrids

| <u>Zone</u>     | <u>Control</u>                     |
|-----------------|------------------------------------|
| Northern plains | AICRP-C-14, AICRP-C-17             |
| Central plains  | AICRP-C-14, AICRP-C-17, AICRP-C-16 |
| Eastern plains  | AICRP-C-14, AICRP-C-17, AICRP-C-4  |
| Plateau region  | AICRP-C-17, AICRP-C-20, AICRP-C-24 |

B. For Trials with medium maturing hybrids

| <u>Zone</u>     | <u>Control</u>                                 |
|-----------------|--|
| Northern plains | AICRP-C-6, AICRP-C-19 & K. Gaurav              |
| Central plains  | AICRP-C-6 & K. Garima                          |
| Eastern plains  | AICRP-C-14, AICRP-C-17                         |
| Plateau region  | AICRP-C-17, AICRP-C-24, AICRP-C-13, AICRP-C-16 |

C. For Trials in hills

AICRP-C-23, AICRP-C-13 and AICRP-C-24

D. For Trials with Red Cultures

AICRP-C-15 and K Lalit

E. For Trials with Processing hybrids

Early: AICRP-C-1. AICRP-C-10

Med.: AICRP-C-8

FF: AICRP-C-11, AICRP-C-8

## CROP PRODUCTION

### **AGRON.1: INTERCROPPING STUDIES IN POTATO.**

Locations : Raipur  
Design : RBD  
Replication : 3  
Plot-size : Gross: 3.6m x 3.6 m (5 rows of 15 plants)  
Net: 2.4m x 3.2 m

| <u>Crop</u>   | <u>Variety</u> | <u>Spacing</u> |
|---------------|----------------|----------------|
| Potato        | K. Pukhraj     | 60 x 20 cm     |
| Cluster beans | Pusa Navbahar  | 30 x 7.5 cm    |
| Cabbage       | Golden Acre    | 60 x 60 cm     |

#### Treatments

T1 : Sole Potato  
T2 : Sole Maize  
T3 : Sole Cabbage  
T4 : Potato+ Maize (1:1 ratio)  
T5 : Potato+ Cabbage (1:1 ratio)  
T6 : Potato+ Maize (2:1 ratio)  
T7 : Potato+ Cabbage (2:1 ratio)

#### **Observations to be recorded**

- 1 Soil fertility status of the experimental plot before and after experiment (pH, organic carbon and available NPK).
- 2 Per cent emergence at 30 days after planting.
- 3 Incidence of diseases/pests.
- 4 Grade-wise yield of potato tubers (0-25g, 25-50g, 50-75g and >75g) and total yield of other crops (q/ha).

#### **Note:**

- (1) All calculations should be made with net plot size only.
- (2) Recommended varieties of different crops should be used and same varieties should be used during 2014-15.

### **AGRON.2: NITROGEN REQUIREMENT OF NEWLY RELEASED POTATO CULTIVARS (Testing/validating of ASNMP). [Nodal Scientist-Dr SP Singh, CPRS, Gwalior]**

Locations : Bhubaneshwar, Chhindwara, Deesa, Dharwad, Dholi, Faizabad, Gwalior, Hassan, Hisar, Jorhat, Kalyani, Kota, Pasighat, Patna, Pune, Raipur and Srinagar  
Design : RBD  
Spacing : 60 cm x 20 cm  
Replications : 4 (Four)  
Plot size : Gross: 4.8 m x 3.4 m  
Net : 3.6 m x 3.0 m

## Treatments

### **Recently released potato Varieties:** Varieties to be tested at different AICRPP Centers

|     | Name of the Center | Varieties                                      |
|-----|--------------------|--|
| 1.  | Bhubaneshwar       | Kufri Surya                                    |
| 2.  | Chhindwara         | Kufri Surya                                    |
| 3.  | Deesa              | Kufri Surya                                    |
| 4.  | Dharwad            | Kufri Surya                                    |
| 5.  | Dholi              | Kufri Surya                                    |
| 6.  | Faizabad           | Kufri Surya and Kufri Sadabahar                |
| 7.  | Gwalior            | Kufri Surya                                    |
| 8.  | Hassan             | Kufri Surya, Kufri Girdhari and Kufri Himalini |
| 9.  | Hisar              | Kufri Surya and Kufri Sadabahar                |
| 10. | Jorhat             | Kufri Himalini and Kufri Girdhari              |
| 11. | Kalyani            | Kufri Shailja and Kufri Himalini               |
| 12. | Kota               | Kufri Surya                                    |
| 13. | Pasighat           | Kufri Surya                                    |
| 14. | Patna              | Kufri Surya                                    |
| 15. | Pune               | Kufri Surya                                    |
| 16. | Raipur             | Kufri Surya                                    |
| 17. | Srinagar           | Kufri Himalini and Kufri Girdhari              |

### **5 Nitrogen levels (kg/ha):**

N0: 0, N1: 75 kg/ha, N2: 150 kg/ha, N3: 225 kg/ha and N4: 300 kg/ha

### **Observations to be recorded**

1. Initial fertility status of soil (pH, organic carbon, soil texture and available N, P and K).
2. Plant emergence at 30 days.
3. Plant height and number of shoots per plant at 50 days after planting.
4. Yield of tubers in each grade (0-25g, 25-50g, 50-75g and >75g).
5. Nutrient (NPK) removal and the effect on soil fertility behavior, pH, organic carbon, available N, P and K status of soil.
6. Dry matter content of tubers (%) and tuber yield on dry weight basis (kg/ha) to be determined within a week of harvest
7. Halum yield on dry weight basis (kg/ha) to be recorded at start of senescence.

### **Note:**

- a) All calculations should be made with Net plot size only.
- b) Soil, tuber and plant samples (dried samples) may also be sent to Dr SP Singh, CPRS, Gwalior.
- c) Do not use paper tags in soil samples.

### **AGRON.3: DEVELOP SITE SPECIFIC NPK REQUIREMENTS [Nodal Scientist-Dr SK Yadav, CPRS, Patna]**

Locations: Bhubaneshwar, Chhindwara, Deesa, Dharwad, Dholi, Faizabad, Gwalior, Hassan, Hisar, Jalandhar, Jorhat, Kalyani, Kanpur, Kota, Modipuram, Ooty, Pantnagar, Pasighat, Pune, Patna, Raipur, Srinagar and Shillong (Dharwad and Hassan will conduct this experiment in *kharif*)

Replications : Four  
Design : RBD

Spacing : 60 cm x 20cm  
Replications : 4 (Four)  
Plot size : Gross: 4.8m x 4.0m  
Net: 3.6m x 3.6m

#### Treatments of N, P, and K fertilizers

T1 50% RDF of NPK  
T2 100% RDF of NPK  
T3 150% RDF of NPK  
T4 Without N fertilizer (PK)  
T5 Without P (NK)  
T6 Without K (NP)  
T7 Without NPK (Absolute control)

#### Observations to be recorded:

1. Initial fertility status of soil (pH, organic carbon, soil texture and available N, P and K).
2. Plant emergence at 30 days.
3. Plant height and number of shoots per plant at 50 days after planting.
4. Yield of tubers in each grade (0-25g, 25-50g, 50-75g and >75g).
5. Nutrient (NPK) removal and the effect on soil fertility behavior, pH, organic carbon, available N, P and K status of soil.
6. Dry matter content of tubers (%) and tuber yield on dry weight basis (kg/ha) to be determined within a week of harvest
7. Halum yield on dry weight basis (kg/ha) to be recorded at start of senescence.
8. Diseases development.

#### Note:

- d) All calculations should be made with Net plot size only.
- e) Soil, tuber and plant samples (dried samples) may also be sent to Dr SK Yadav, CPRS, Patna.
- f) Do not use paper tags in soil samples.

#### AGRON 4: OPTIMIZING PHOSPHORUS REQUIREMENTS OF POTATO UNDER CURRENT SCENARIO OF P USE BY THE FARMERS.

Locations : Farmers' field at Faizabad, Deesa, Dholi, Gwalior, Jalandhar, Kanpur, Pantnagar and Srinagar  
Design : RBD  
Replications : 4  
Plot-size : Minimum 5 rows and 15 plants/row  
Variety : Recommended of the region (most popular variety of the region)

#### Treatments

|   |   |
|---|---|
| T1 : Farmer's practice (to be explained)      | T1 : Farmer's practice (to be explained)      |
| T2 : Zero P ( control)                        | T2 : Zero P ( control)                        |
| T3 : 30 kg P <sub>2</sub> O <sub>5</sub> /ha  | T3 : 60 kg P <sub>2</sub> O <sub>5</sub> /ha  |
| T4 : 60 kg P <sub>2</sub> O <sub>5</sub> /ha  | T4 : 80 kg P <sub>2</sub> O <sub>5</sub> /ha  |
| T5 : 90 kg P <sub>2</sub> O <sub>5</sub> /ha  | T5 : 100 kg P <sub>2</sub> O <sub>5</sub> /ha |
| T6 : 120 kg P <sub>2</sub> O <sub>5</sub> /ha | T6 : 120 kg P <sub>2</sub> O <sub>5</sub> /ha |
|   | T7 : 140 kg P <sub>2</sub> O <sub>5</sub> /ha |

### Observations to be recorded:

1. Farmers' practice must be defined and reported.
2. Soil fertility status of the experimental field before and after experiment (pH, soil texture, organic carbon, EC and available NPK).
3. Dry matter content and nutrient composition of manure.
4. Final emergence count.
5. Graded and total tuber number and yield (0-25g, 25-50g, 50-75g and >75g).
6. NPK uptake by tubers.

### Note:

1. P to be applied as DAP and balance N requirement to be met through urea.
2. In T2 to T6, recommended NK + FYM should be applied.

### AGRON 5: ROLE OF BORON IN REDUCING TUBER CRACKING IN PROCESSING VARIETY KUFRI CHIPSONA-3

|              |   |  |
|--------------|---|--|
| Locations    | : | Bhubaneshwar, Chhindwara, Deesa, Dholi, Kalyani, Kota and Raipur (Dharwad and Hassan will conduct this experiment in <i>kharif</i> ) |
| Design       | : | RBD  |
| Replications | : | 4  |
| Plot-size    | : | Minimum 5 rows and 15 plants/row   |
| Variety      | : | Kufri Chipsona-3   |

### Treatments (No FYM may be applied in all the treatments)

|    |   |   |
|----|---|---|
| T1 | : | RDF of NPK only   |
| T2 | : | RDF of NPK+2.0 kg B/ha as soil application  |
| T3 | : | RDF of NPK+0.1% boric acid as foliar application at 40 DAP                              |
| T4 | : | RDF of NPK+0.1% boric acid as foliar application in two equal splits at 40 and 60 DAP   |
| T5 | : | RDF of NPK + 0.1% boric acid as foliar application in three times at 40, 50 and 60 DAP. |

### Observations to be recorded:

1. Soil fertility status of the experimental field before and after experiment (pH, soil texture, organic carbon, EC and available NPK and B).
2. Final emergence count.
3. Graded and total tuber (including cracked) number and yield (0-40g, 40-100g, 100-150g and >150g) per plot.
4. Number and yield of cracked tubers/plot.
5. Dry matter content of tubers (%) and tuber yield on dry weight basis (kg/ha)
6. Halum yield on dry weight basis (kg/ha) to be recorded at the start of senescence.
7. **Soil Organic Carbon and cracking relationships.**

### Note:

- a) **B to be applied as sodium tetraborate. Amount to be calculated to supply 2 kg B/ha.**
- a) **Soil, tuber and plant samples (dried) to be sent to Dr AN Ganeshamurthy, Division of Soil Science, IIHR, Bengaluru.**
- b) **Do not put paper tags inside soil samples.**

## **AGRON 6: RESPONSE OF POTATO TO ZINC APPLICATION**

|                     |   |   |
|---------------------|---|---|
| Locations           | : | All centers   |
| Design              | : | RBD   |
| Replications (Min.) | : | 4   |
| Plot-size (Min.)    | : | Minimum 5 rows and 15 plants/row  |
| Variety             | : | Recommended of the region (most popular variety of the region may be tried) |

### **Treatments (No FYM may be applied in all the treatments)**

|    |   |                           |
|----|---|---------------------------|
| T1 | : | RDF of NPK                |
| T2 | : | RDF of NPK + 1.5kg Zn/ha  |
| T3 | : | RDF of NPK + 3.0 kg Zn/ha |
| T4 | : | RDF of NPK + 4.5 kg Zn/ha |
| T5 | : | RDF of NPK + 6.0 kg Zn/ha |

### **Observations to be recorded:**

1. Soil fertility status of the experimental field before and after experiment (pH, soil texture, organic carbon, EC and available NPK and Zn).
2. Final emergence count.
3. Graded and total tuber number and yield (0-25g, 25-50g, 50-75g and >75g) per plot.
4. Dry matter content of tubers (%) and tuber yield on dry weight basis (kg/ha)
5. Halum yield on dry weight basis (kg/ha) at the start of senescence
6. Diseases development.

### **Note:**

- a) Zinc to be applied as zinc sulphate.
- b) Soil, tuber and plant samples (dried) to be sent to Dr AN Ganeshamurthy, Division of Soil Science, IHR, Bengaluru.
- c) Do not use paper tags in soil samples.

## **AGRON 7: EVALUATION OF POTATO - TRANSPLANTED ONION SEQUENCE. [Nodal Scientist- Dr Sanjib Kumar Das BCKV, Kalyani]**

|                     |   |  |
|---------------------|---|--|
| Locations           | : | Dholi, Faizabad, Patna and Kalyani     |
| Design              | : | RBD                                    |
| Replications (Min.) | : | 4                                      |
| Plot-size (Min.)    | : | Minimum 5 rows and 15 plants/row       |
| Variety             | : | Recommended and popular of the region. |

Both the crops to be raised with the recommended package of practices.

### **Treatments: combinations of planting and harvesting dates of potato**

|                     |   |   |
|---------------------|---|---|
| Dates of planting   | : | 3 (optimum, 10 days before and 10 days after optimum) |
| Dates of harvesting | : | 2 (80 and 90 days after planting)                     |

**Onion is to be transplanted immediately after harvesting of potato.**

**Observations to be recorded:**

1. Final emergence (%) of both the crops.
2. Grade-wise yield of potato tubers (0-25g, 25-50g, 50-75g and >75g) and total yield of onion.
3. Dry matter content and nutrient composition of manure.
4. NPK uptake by potato and onion.

**Note:** Onion and potato will be raised under standard package of practices except for date of planting.

**AGRON 8: EFFECT OF DRIP FERTIGATION ON GROWTH AND YIELD OF POTATO  
[Nodal Scientist-Dr Name Singh, CPRIC, Modipuram].**

|                     |   |  |
|---------------------|---|--|
| Locations           | : | Hisar                                  |
| Design              | : | RBD                                    |
| Replications (Min.) | : | 4                                      |
| Plot-size (Min.)    | : | 50 m <sup>2</sup>                      |
| Variety             | : | Recommended and popular of the region. |

**Treatments:** N doses (%) of recommended

- T1 : 60%  
T2 : 80%  
T3 : 100%  
T4 : 120%  
T5 : 140%  
T6 : RDF N as basal dose in Furrow irrigation

-- PK should be applied as basal, as recommended.

-- N should be applied 50% as basal and 50% through fertigation in treatments T1 to T5 in 6 equal splits at weekly interval, starting from 21 days of planting.

**Observations to be recorded:**

1. Soil fertility status of the experimental field before and after experiment (pH, soil texture, organic carbon, EC and available NPK).
2. Dry matter content and nutrient composition of manure.
3. Final emergence count.
4. Graded and total tuber number and yield (0-25g, 25-50g, 50-75g and >75g) per plot.
5. NPK uptake by potato.
6. Weekly CPE

**AGRON. 9: DEVELOPMENT OF POTATO BASED ORGANIC FARMING SYSTEM  
[Nodal Scientist-Dr AK Bhatia, CCSHAU, Hisar]**

|              |   |  |
|--------------|---|--|
| Locations    | : | Dholi, Faizabad, Gwalior, Hisar, Jorhat, Ooty, Pasighat and Srinagar         |
| Design       | : | RBD  |
| Replications | : | 4  |
| Plot size    | : | Gross : 4.8m x 4.0m<br>Net : 3.6m x 3.6m                                     |
| Cropping     | : | Paddy-Potato OR Maize-Potato [Any sequence as per importance for the region] |

sequence

**Varieties** : Promising varieties of the region: K Khyati, K Garima, K Anand, K Pushkar, K Bahar, K Chipsona-3. [K Swarna, K Neelima, for Ooty only] Likewise recommended varieties of sequential crop

### Treatments

- T1 : Absolute control  
T2 : Inorganic practices standard technology  
T3 : Crop residue based: compositing of available cheaper crop/weed residues (like NADEP method) + Crop residue incorporation (Main crop/catch/green manuring/bio-fumigation crop) + biofertilizer (*Azotobacter* and *Phosphobacteria*) + microbial culture to decompose crop residues  
T4 : T3 + FYM @ 25 t/ha  
T5 : T3 + Vermicompost 7.5 t/ha

### Observations to be recorded

1. Initial fertility status of the experimental plot (pH, organic carbon & available N, P and K) and fertility status at annual basis.
2. Crop emergence/growth parameters.
3. Yield attributes and yield i.e tubers marketable and non- marketable (<25 g and >25 g) of potato and sequential crops.
4. Nutrient (NPK) removal by component crops and nutrient balance sheet.
5. Quality parameters of economic produce
6. Economics- variable cost, gross and net return and B:C ratio.
7. Diseases development.

### Notes

- Experiments are to be laid out on fixed plots. Organic farming system treatments are to be managed as per NPOP, Ministry of Commerce, GOI, guidelines.
- Quantity of organics/residues should be constant in treatments and recorded.
- Locally available organic inputs should be used to make organic farming economically feasible.
- Pest and diseases should be managed culturally or through approved chemicals for organic farming.

### AGRON. 10: DEVELOPMENT OF MICRONUTRIENT FORMULATION FOR POTATO

**Locations** : Bhubaneswar, Chhindwara, Deesa, Dharwad, Dholi, Faizabad, Gwalior, Hassan, Hisar, Jalandhar, Jorhat, Kalyani, Kanpur, Kota, Modipuram, Pantnagar, Pasighat, Pune, Patna, Raipur, Srinagar and Shillong (Dharwad, Hassan, Srinagar and Shillong will conduct this experiment in *kharif*)

**Design** : RBD

**Replications** : 4

**Plot size** : Gross : 4.8m x 4.0m  
Net : 3.6m x 3.6m

**Variety** : Recommended varieties of the area

### Treatments

- Treatment Treatment  
T1 : Recommended fertilization practices followed in the region  
T2 : T1+ Foliar spray of boron as per details given below

|    |   |  |
|----|---|--|
| T3 | : | T1+ Foliar spray of zinc as per details given below                                |
| T4 | : | T1+ Foliar spray of zinc + boron as per details given below                        |
| T5 | : | T1 + Foliar vegetable special of IIHR, Three sprays at different growth stages     |
| T6 | : | T1 + Potato Specific nutrient formulation, Three sprays at different growth stages |

**Spray schedule:** Spray schedule is common to all the treatments

|              |   |  |
|--------------|---|--|
| First spray  | : | Plant establishment stage(Vegetative growth stage) |
| Second spray | : | Tuber initiation stage                             |
| Third spray  | : | Tuber bulking stage                                |

If the duration of variety exceeds 80 days then one more spray can be given between second and third stage of the crop

**Spray concentrations:** Foliar vegetable special of IIHR @ 5 grams per litre with pH adjustment to 6.2-6.5 using either citric acid or lime juice and suitable sticker

Potato Specific nutrient formulation @ 4 grams per litre with pH adjustment to 6.2-6.5 using either citric acid or lime juice and suitable sticker

**For boron alone treatment:** Use boric acid at 50ppm concentration (50mg per litre).

**For zinc alone treatment:** Use  $ZnSO_4 \cdot 7H_2O$  at 150ppm concentration (150mg per litre). Adjust the pH to 6.2 to 6.5 using citric acid/ lime juice or sodium hydroxide as the case may be.

**Observations to be recorded:**

1. Soil samples should be collected before application of FYM and basal fertilizer application
2. Final emergence count.
3. Grade-wise (0-25g, 25-50g, 50-75g and >75g) tuber number (no/ha) and yield (t/ha) per plot.
4. Dry matter content of tubers (%) and tuber yield on dry weight basis (kg/ha)
5. Halum yield on dry weight basis (kg/ha) at the start of senescence
6. Tuber uniformity (colour and shape) on 1-5 scale 1=V Poor to 5=V Good.
7. Photographic documentation of treatment differences at different stages of the crop.
8. Standard potato quality parameters followed by the AICRP

**Note:**

a) **Soil, tuber and plant samples (dried) to be sent to Dr AN Ganeshamurthy, Division of Soil Science, IIHR, Bengaluru.**

b) **Do not use paper tags in soil samples.**

## CROP PROTECTION

### **PATHOLOGY**

**PATH.1:**        **MONITORING OF LATE BLIGHT AND A2 MATING TYPE OF *PHYTOPHTHORA INFESTANS* IN STANDING CROP AND TUBERS AT HARVEST AND AFTER COLD STORAGE.**

Locations:        Dholi, Faizabad, Hassan\*, Jalandhar, Jorhat, Kalyani, Kanpur, Kota, Ootacamund, Pantnagar, Pasighat, Patna, Pune, Shillong and Srinagar.

**Experimental details:** Plant an area of 0.1 ha with K Chandramukhi/K Bahar or any other recommended late blight susceptible variety at three different dates at each center at an interval of 15 days (early, optimum and late). The crop is not to be sprayed with any fungicide.

**\* One planting date at optimum time.**

#### **Observations to be recorded**

1. Daily metrological data of the year to be uploaded in INDO-BLIGHTCAST model for validation.
2. Use of thermo-hygrographs is important in such studies to find out correlation between late blight appearance and weather data. The graphs may be sent to the Head, Plant Protection, Central Potato Research Institute, Shimla-171 001 (HP) under intimation to the Project Coordinator along with the report.
3. Date of first appearance of disease in the crop.
4. Diseases severity incidence and intensity of late blight in foliage at 7, 14, 21 and 28 days after disease appearance.
5. Incidence of disease in tubers at harvest.
6. Incidence of disease in tubers after cold storage.
7. Send late blight inoculated/infected tuber samples to the Head, Division of Plant Protection, CPRI, Shimla for determining A2 mating type.

**Important:** Tubers showing late blight infection at harvest may be discarded and only apparently healthy tubers sufficient to plant 0.3 ha next year to be cold stored.

**PATH.2:**        **SURVEILLANCE OF IMPORTANT POTATO PESTS IN THE REGION (PEST CAPTURE PLOTS)**

Locations:        All centers (except Gwalior, Kufri and Ranichauri).

**Experimental details:** Plant two sets on an area of 10 m<sup>2</sup> in hills and 20 m<sup>2</sup> in plains of each variety. Use 4-5 commercial varieties of the region. One set is not to be sprayed with any pesticide. Another set may be sprayed against late blight or prevalent devastating pest of the area for allowing the crop to remain green till maturity so that appearance of other pests can be recorded. These plots are used to monitor the appearance of new disease or pest, if any, over the years. The data on incidence of diseases and pests will be recorded in the farmers' fields which can represent the region.

#### **Observations to be recorded**

1. Incidence and intensity of diseases and insect pests (all foliar diseases/wilts/insect pests etc.) occurring on standing crop.

2. Incidence of soil and tuber borne diseases recorded at harvest.
3. For virus only mosaic and leaf roll may be recorded. The infected leaf samples embedded in blotting sheets may be sent to Head, Plant Protection, CPRI, Shimla. While recording the viruses the source of seed should be noted.
4. The common scab incidence should be separated as russet and pitted types.

**PATH.3: SCHEDULING OF FUNGICIDE APPLICATION FOR THE MANAGEMENT OF LATE BLIGHT**  
**[Nodal Scientist-Dr Sanjeev Sharma, CPRI, Shimla]**

Locations : Dholi, Faizabad, Hassan, Jalandhar, Kalyani, Pantnagar, Patna, Shillong and Srinagar.

Replications : 5 (Five)

**Treatments**

- T1 : Prophylactic spray (just at the time of canopy closure) with chlorothalonil @ 0.25% followed by two more sprays at weekly intervals.
- T2\* : Prophylactic spray (just at the time of canopy closure) with chlorothalonil @ 0.25% followed by cymoxanil/dimethomorph/fenamidone+mancozeb @ 0.3% and one more spray with chlorothalonil @ 0.25% .
- T3 : Prophylactic spray (just at the time of canopy closure) with mancozeb @0.2% followed by dimethomorph/fenamidone/cymoxanil + Mancozeb @ 0.3% followed by mancozeb.
- T4 : Control.
- \* Choose best fungicide as per the recommendation for particular location

Varieties: Use one resistant and one susceptible variety of the region.

**Note:** If disease presence is high on additional spray may be given as per treatment and no of spray communicated in the results.

**Observations to be recorded**

1. First appearance of late blight.
2. Further, diseases build up at weekly intervals.
3. Yield t/ha.
4. Late blight in tubers (replication-wise no. of tubers and weight, percent incidence) at harvest.

**PATH.4: STUDIES ON SEED DEGENERATION**

Locations : Deesa, Raipur, Hassan, Hisar, Kalyani and Pune

Replications : 5

Design : RBD

Viruses : PLRV, PVY, PALCV, Mild and Severe Mosaic

**Varieties**

|         |                              |
|---------|------------------------------|
| Deesa   | Kufri Badshah, Kufri Khyati* |
| Raipur  | Kufri Surya, Kufri Khyati    |
| Hassan  | Kufri Surya, Kufri Khyati    |
| Hisar   | Kufri Bahar, Kufri Khyati    |
| Kalyani | Kufri Jyoti, Kufri Khyati    |
| Pune    | Kufri Surya, Kufri Khyati    |

\* Kufri Khyati is a common variety in all the locations for comparison.

### **Treatments**

- T1 : Fresh breeder seed every year  
T2 : Previous seed produce using seed plot techniques  
T3 : Previous seed produce without seed plot techniques

### **Observations to be recorded**

1. Initial source of seed should be same for all centers—virus free seed materials & seed with primary infection.
2. Plant emergence after 30 days and 40 days.
3. Experiments should be carried out without insecticides spray in all the centers.
4. Observation should be made uniformly at 45, 60 & 75 days after planting in all the centers visually and also through further confirmation using lab diagnostic techniques.
5. Sampling for virus testing – uniform number of random samples covering the whole plot should be tested in all the centers. Example: ten samples from each variety/each plot.
6. Information on other tuber borne pathogens and late blight incidence. Proper management practice for late blight incidence (Fungicide spray etc.,)
7. Information on temperature, rainfall and vector incidence (whiteflies, aphids and thrips etc) should be recorded in all the centers.
8. The rate of increase in virus incidence and reduction in yield should be compared with previous years i.e. results should be presented always in comparison to previous years and Comparison should also be made between the AICRP centers.
9. The infected leaf samples embedded in blotting sheets may be sent to Head, Plant Protection, CPRI, Shimla.
10. Dates of planting/haulm cutting/harvest.

### **PATH. 5: MANAGEMENT OF EARLY BLIGHT [Nodal Scientist-Dr Sanjeev Sharma, CPRI, Shimla]**

- Locations : Bhubaneswar, Deesa and Pune  
Design : RBD  
Replication : 4  
Spacing : 60 x 30 cm  
Gross plot size : 6 sq m (5 rows of 10 tubers each)

### **Treatments**

- T1 : Control  
T2 : Spray of urea (1%) + mancozeb @0.25% at 40-45 days crop age and repeat at 8-10 days interval  
T3 : Spray of urea (1%) + mancozeb @0.25% at 40-45 days crop age and repeat at 8-10 days interval followed by one more spray of mancozeb  
T4 : First spray of mancozeb 75WP (0.25%), second spray of hexaconazole 5EC (0.05%) and third spray of mancozeb 75WP (0.25%) at 10 days interval

**\* Start spraying with first appearance of disease**

**Observations to be recorded:**

1. Disease severity at 10 days interval
2. Yield at harvest (t/ha)

**PATH. 6: ESTIMATION OF POST HARVEST LOSSES IN POTATO**

**Locations :** All centers

**Observations to be recorded****Survey of the losses at different stages as below:**

1. Losses during removal from cold store/country store to planting
2. Losses during harvesting till cold storage (Harvesting → heap making → cold storage)
3. Losses in cold store/country store
4. Losses during disposal (whole saler → retailer → consumer)

**The survey may be conducted at a minimum of 3 sites as per schedule given below.**

**ALL INDIA COORDINATED RESEARCH PROJECT ON POTATO  
ICAR-CENTRAL POTATO RESEARCH INSTITUTE, SHIMLA-171001  
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)**

**Sample Survey for Assessment of Harvest and Post Harvest Losses in Potato  
Losses during harvesting, heap making and left over produce**

**A. Identification:**

| S. No. | Particulars             |  |
|--------|-------------------------|--|
| i      | Location (Lat. & Long.) |  |
| ii     | State                   |  |
| iii    | District                |  |
| iv     | Tehsil/Taluk            |  |
| v      | Block/Mandal            |  |
| vi     | Village                 |  |
| vii    | Name of the farmer      |  |
| viii   | Total land holding (ha) |  |
| ix     | Area under potato       |  |
| x      | Date of visit           |  |

**B. Details of potato crop grown by farmer:**

| S. No. | Particulars                 |  |  |  |
|--------|-----------------------------|--|--|--|
| i      | Variety                     |  |  |  |
| ii     | Purpose (seed/ware crop)    |  |  |  |
| iii    | Area under each variety     |  |  |  |
| iv     | Date of planting            |  |  |  |
| v      | Date of harvesting/ heaping |  |  |  |
| vi     | Method of harvesting        |  |  |  |

**C. Losses due to left over of produce from randomly selected plots (5x5m):**

| S. No | Particulars                       | Total wt. in a plot (kg) | Diseased (kg) | Cut/crack (kg) | Bruised (kg) |
|-------|-----------------------------------|--------------------------|---------------|----------------|--------------|
| i     | Plot 1                            |                          |               |                |              |
| ii    | Plot 2                            |                          |               |                |              |
| iii   | Plot 3                            |                          |               |                |              |
| iv    | Average wt (kg)                   |                          |               |                |              |
| v     | Wt. of good & poor quality potato |                          |               |                |              |

**D. Losses during heaping**

| S. No. | Particulars   | Total sample wt. (kg) | Diseased(kg) | Cut/crack (kg) | Bruised (kg) |
|--------|---|-----------------------|--------------|----------------|--------------|
| i      | Sample 1  |                       |              |                |              |
| ii     | Sample 2  |                       |              |                |              |
| iii    | Sample 3  |                       |              |                |              |
| iv     | Average wt (kg)   |                       |              |                |              |
| v      | Wt. of good& poor quality potato                          |                       |              |                |              |
| vi     | Address of cold store                                     |                       |              |                |              |
| vii    | Date of produce sent to cold store                        |                       |              |                |              |
| viii   | Probable date/months of produce taken out from cold store |                       |              |                |              |

**PATH. 7: MANAGEMENT OF BACTERIAL WILT OF POTATO**

Locations : Hassan  
 Design : RBD  
 Replications : Four (4)  
 Plot size : 3m x 2m (5 rows of 10 tubers each)

**Treatments**

| Treatment details  | Source                       |
|--|------------------------------|
| T1 : Soil application of <i>Bacillus megaterium</i> @ 5 kg/ha                    | NBAII, Hebbal, Bangaluru     |
| T2 : Furrow application of <i>Bacillus megaterium</i> @ 5 kg/ha                  | NBAII, Hebbal, Bangaluru     |
| T3 : Streptomycin sulphate 0.5g/lit in furrow drenching                          |                              |
| T4 : Soil application of <i>Pseudomonas fluorescens</i> @ 5 kg/ha                | IIHR, Hesaragatta, Bangaluru |
| T5 : Bacterinasak (2 Bromo-2 Nitro Propane-1,3,Diol) 0.5g/lit for soil drenching |                              |
| T6 : Control   |                              |

**Observations to be recorded**

1. Germination (%).
2. Bacterial wilt incidence (%).
3. Tuber infection (%) at harvest to be observed by cutting of tuber.
4. Root knot nematode population before the treatment and at harvest.

## **PATH. 8: MANAGEMENT OF LATE BLIGHT BY USING LEACHATES, BOTANICALS OIL AND BIO AGENTS**

Locations : Hassan  
Design : RBD  
Replications : Four (4)  
Plot size : 3m x 2m (5 rows of 10 tubers each)

### **Treatments**

T1 : Pongamia cake leachates @ 10g/lit  
T2 : Pongamia cake leachates @ 15g/lit  
T3 : Pongamia cake leachates @ 20g/lit  
T4 : Neem cake leachates @ 10g/lit  
T5 : Neem cake leachates @ 15g/lit  
T6 : Neem cake leachates @ 20g/lit  
T7 : Pongamia cake leachates @ 10g/lit + mancozeb @ 2.5g  
T8 : Neem cake leachates @ 20g/lit + mancozeb @ 2.5g  
T9 : Pongamia oil  
T10 : Neem oil  
T11 : CSR bio formulation  
T12 : Mancozeb @ 0.25%  
T13 : Prophylactic spray (just at the time of canopy closure) with mancozeb followed by cymoxanil + mancozeb @ 0.3% and one more spray with mancozeb  
T14 : Control

### **Observations to be recorded**

1. First appearance of late blight.
2. Further, diseases build up at weekly intervals.
3. Yield t/ha.
4. Late blight in tubers (replication-wise no. of tubers and weight) at harvest.

### **Note:**

Need based spray after canopy closure depending upon diseases pressure and weather condition (Minimum 4 spray)

## **PATH.9: MANAGEMENT OF COMMON SCAB**

Locations : Dholi, Faizabad, Jalandhar, Kanpur, Modipuram and Patna  
Design : RBD  
Replications : Four (4)  
Plot size : 3m x 2m (5 rows of 10 tubers each)

### **Treatments**

T1 : Untreated diseased tubers (Control)  
T2 : Tuber dip treatment with 3% boric acid for 20 minutes before storage  
T3 : Biofumigation by incorporating one month old Indian Mustard crop (seed rate 5 kg/ ha) just before the planting of potato crop  
T4 : T3 + compost culture to decompose Biofumigant

- T5 : T3 + Tuber dip treatment with 1.5% boric acid for 20 minutes before storage  
T6 : Pyrites @ 2.0 t/ha (soil application)  
T7 : T3 + Pyrites @ 2.0 t/ha

**Varieties: Most common variety of the region**

**Note:** Common scab infected (adequately infected) tubers to be used in the experiment.

**Observations to be recorded**

1. Percent disease incidence (number of tubers infected by common scab).
2. Percent disease index (tuber surface area covered by common scab) following standard methods.

## **ENTOMOLOGY**

### **ENT 1. MONITORING OF APHIDS, WHITEFLIES, THRIPS HOPPERS AND MITES IN UNSPRAYED CROP [Nodal Scientist-Dr J Sridhar, CPRI, Shimla]**

Aphid species : *Myzus persicae* and *Aphis gossypii*  
Whiteflies : *Bemisia tabaci*  
Thrips : *Thrips palmi*  
Hoppers : *Empoasca devastans*  
Mites : *Polyphagotarsonemus latus*

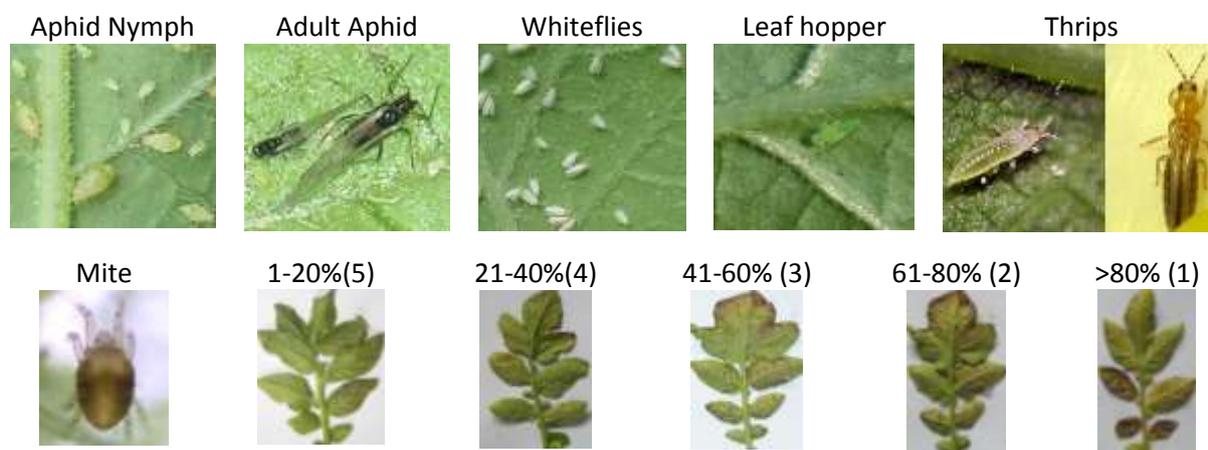
Locations : All AICRP centers (except Ranichauri)  
Plot size : 4.0 X 5.0 m<sup>2</sup> (6 plots)  
Variety : Recommended for the region

#### **Observations to be recorded**

1. Aphid population to be recorded per 100 compound leaves (top, middle and bottom leaves of 34 plants) at weekly intervals soon after plant emergence till harvest.
2. Whiteflies and leafhoppers populations may be counted on three fully expanded compound leaves (top, middle and bottom) per plant in 10 fixed plants in each plot at weekly intervals. Data on whiteflies may preferably be recorded in the early morning hours when the whitefly activity is very low.
3. Thrips population may be recorded and counted at weekly intervals by shaking 10 fixed (tagged) plants/plot so that the thrips fall onto sticky traps.
4. First appearance of mites and buildup of infestation over a period of time is to be recorded (Scale for mite damage is presented below).
5. Meteorological data to be recorded during crop period.
6. Incidence of viruses (no. of plants with viral symptoms/ total no. of plants observed).

#### **Note:**

Insect samples (aphids, whiteflies, leaf hoppers, thrips and mites) may be collected into cryo-vials containing 70% alcohol separately using fine camel hair brush (cryo-vials shall be provided). The vials may be packed carefully and sent to Head, Division Plant Protection, CPRI, Shimla for their identification at species level and also to determine their viruliferous nature under intimation to Project Coordinator (Potato). The insect photographs are presented below for their visual identification. The observations on insect population at weekly intervals may be recorded as per standard week (Data sheet will be provided).



**Scale for rating mite infestation:** 5- Low infestation; 1- Severe infestation

## ENT 2: USE OF PARTICLE FILM TECHNOLOGY FOR THE MANAGEMENT OF APHIDS AND WHITEFLIES IN POTATO [Nodal Scientist-Dr J Sridhar, CPRI, Shimla]

|                            |   |
|----------------------------|---|
| Locations                  | : Bhubaneswar, Deesa, Dholi, Chhindwara, Hassan, Kalyani, Modipuram, Patna, Pune and Raipur |
| Design                     | : RBD   |
| Replications               | : Four  |
| Plot size                  | : 4.0 m X 4.8 m (8 rows of 20 tubers each)  |
| Date of planting           | : Planting date recommended for the region  |
| Application of insecticide | : First spray at the time aphid appearance followed by second spray after a fortnight.      |
| Kaolin application         | : 3 sprays starting from 30 DAP at 15 days interval.  |

### Treatments details

#### **Treatments**

T<sub>1</sub> : Control  
T<sub>2</sub> : Imidacloprid 17.8SL @0.03%  
T<sub>3</sub> : Kaolin @1.25%  
T<sub>4</sub> : Kaolin @2.5%  
T<sub>5</sub> : Kaolin @3.75%

#### **Mulching**

X M<sub>0</sub>: No mulch  
M<sub>1</sub>: Mulching with black polythene

Variety : Recommended variety of the area (Good quality Seed)

### **Observations to be recorded**

1. Aphid population to be recorded per 100 compound leaves at weekly intervals soon after plant emergence till harvest as in Ent 1.
2. Whiteflies and leafhoppers population may be counted on three fully expanded compound leaves per plant in 10 fixed plants in each plot at weekly intervals. Data on whiteflies may preferably record in the early morning hours when the whitefly activity is very low as per procedure in Ent 1.
3. Incidence of viruses (no. of plants with viral symptoms/ total no. of plants observed).
4. Meteorological data to be recorded during crop period.
5. Yield data to be recorded at normal harvesting time.

## ENT 3: BIOLOGICAL CONTROL OF SOIL PESTS IN POTATO [Nodal Scientist-Dr Aarti, CPRS, Ooty]

|                  |  |
|------------------|--|
| Locations        | : Shimla, Shillong and Ooty                        |
| Design           | : RBD  |
| Replications     | : Five   |
| Plot size        | : 4.0 m X 4.8 m (8 rows of 20 tubers each)         |
| Date of planting | : Planting date recommended for the region         |
| Variety          | : Recommended variety of the area (Breeders' Seed) |

### Treatments

T1 : Untreated control  
T2 : EPN formulation  
T3 : *Metarhizium anisopliae*

T4 : Chlorpyrifos 20EC@0.02% (standard control)

Note: Two applications in total crop period. First application at the time of sowing and second application during weeding time (30 days after sowing).

#### **Observations to be recorded**

1. Incidences of healthy root grubs in different treatments at monthly intervals during trial period.
2. Percent tuber and plant damage due white grubs and cutworms respectively in different treatments. Weight of infected tubers may be recorded.
3. Yield to be recorded in different treatments.
4. Soil samples at 45 days after planting from Shimla and Shillong may be sent to Head, Plant Protection under intimation to Project Coordinator (Potato) for analysis.

#### **ENT 4: MANAGEMENT OF POTATO TUBER MOTH USING BIOLOGICAL CONTROL AGENTS IN STORES [Nodal Scientist-Dr Vishnuvardhana, Hassan]**

Locations : Hassan, Pune and Ooty  
Design : CRD  
Replications : Five  
Plot size : 4.0 m X 4.8 m (8 rows of 20 tubers each)  
Variety : Recommended variety of the area  
Date of planting : Planting date recommended for the region  
Method : The tubers will be dipped in insecticidal solution for 20 minutes and shade dried before storage. These treated tubers will be kept in stores and observed for tuber moth infestation and damage (per cent) over a period of time.

#### **Treatments**

- T1 : Untreated control  
T2 : Dip treatment of tubers with neem oil @1%  
T3 : Dip treatment of tubers with neem oil @2%  
T4 : Dip treatment of tubers with Bt formulation @1%  
T5 : Dip treatment of tubers with Bt formulation @2%  
T6 : Dip treatment of tubers with CSR bio formulation

#### **Observations to be recorded**

1. Tuber damage due to PTM larvae over a period of time to be recorded.
2. Meteorological data to be recorded.

#### **ENT 5: BIOMANAGEMENT OF POTATO CYST NEMATODES [Nodal Scientist-Dr Aarti, CPRS, Ooty]**

Location : Ooty (Multilocational trials to be conducted in farmers' fields)  
Replications : 4  
Plot size : 2.4 x 2.4m  
Design : RBD  
Variety : Kufri Jyoti

#### **Treatments**

- T1 : *Paecilomyces lilacinus* @ 20 kg/ha talc formulation (10<sup>8</sup> spores/g)  
T2 : *Pochonia chlamydosporia* @ 20kg/ha talc formulation (10<sup>8</sup> spores/g)  
T3 : *Trichoderma viride* @ 20kg/ha talc formulation (10<sup>8</sup> spores/g)

- T4 : *Pseudomonas fluorescens* 20kg/ha talc formulation ( $10^9$  cfu/g)  
T5 : Carbofuran @ 2 kg a.i./ha  
T6 : Untreated control

**Observations to be recorded**

**Nematode:**

1. Initial cyst population in soil before planting
2. Final cyst population in soil after harvest
3. Number of eggs and juveniles per cyst
4. Percent reduction in cyst population in treated plants

**Plant:**

1. Per cent germination
2. Plant growth parameters
3. Yield/plot (t/ha)

**ALL INDIA COORDINATED RESEARCH PROJECT ON POTATO**  
**33<sup>rd</sup> GROUP MEETING OF AICRP (Potato)**  
**September 19-21, 2015**

**VENUE:** GB Pant University of Agriculture and Technology, Pantnagar (Uttarakhand)

**PROGRAMME OF THE MEETING**

| <b>SEPTEMBER 19, 2015</b>  |  |   |
|--|--|---|
| 09.00-10.30 hr   | Registration   |   |
| <b>INAUGURATION</b>  |  |   |
| <b>Chief Guest</b>   | Dr NK Krishna Kumar, DDG, Horticulture Sciences, ICAR, New Delhi   |   |
| <b>Guests of Honour</b>  | Dr T Janaki Ram, ADG, Hort Sciences, ICAR, New Delhi<br>Dr MB Chetti , ADG, HRD, ICAR, New Delhi<br>Dr Bir Pal Singh, Director, CPRI, Shimla |   |
| <b>Rapporteurs</b>   | Dr VK Gupta (Modipuram) and Dr Raja Shankar (Shimla)   |   |
| 10.30 hr   | ICAR and University Song   |   |
| 10.35 hr   | Welcome  |   |
| 10.40 hr   | Lighting the lamp  | All dignitaries   |
| 10.45 hr   | Welcome Address  | Director of Research, GBPUA&T, Pantnagar                          |
| 10.55 hr   | Release of Publications  | Dr NK Krishna Kumar, DDG (Horticulture Sciences), ICAR, New Delhi |
| 11.00 hr   | Project Coordinator's Report   | Dr PM Govindakrishnan, PC, Potato                                 |
| 11.15 hr   | Remarks by Dean, COA   | Dr J Kumar, Dean, COA   |
| 11.20 hr   | Remarks of the Guest of Honour   | Dr T Janaki Ram, ADG, Hort Sciences, ICAR, New Delhi              |
|  |  | Dr MB Chetti , ADG, HRD, ICAR, New Delhi                          |
|  |  | Dr Bir Pal Singh, Director, CPRI, Shimla                          |
| 11.35 hr   | Inaugural address by Chief Guest   | Dr NK Krishna Kumar, DDG (Horticulture Sciences), ICAR, New Delhi |
| 11.45 hr   | Vote of Thanks   | Dr Manoj Raghav, I/C AICRP (Potato), Pantnagar                    |
| 11.50 hr   | Tea  |   |
| <b>SEPTEMBER 19, 2015</b>  |  |   |
| <b>TECHNICAL SESSION I: ACTION TAKEN REPORT AND CROP IMPROVEMENT</b> |  |   |
| <b>Chairperson</b>   | Dr NK Krishna Kumar, DDG, Horticulture, ICAR, New Delhi  |   |
| <b>Co- Chairperson</b>   | Dr T Janaki Ram, ADG, Hort Sciences, ICAR, New Delhi   |   |
| <b>Rapporteurs</b>   | Dr Raj Kumar (Jalandhar)and Dr VK Gupta (Modipuram)  |   |
| 12.15 hr   | Action Taken Report  | Dr PM Govindakrishnan   |
| 13.00 hr   | Lunch  |   |
| 14.00-16.00 hr   | Summary presentation, Discussions and finalization of Technical Programme  | Dr Vinay Bhardwaj, Actg Head, Crop Improvement                    |
| 16.00-16.15 hr   | Tea  |   |
| <b>TECHNICAL SESSION II: CROP PRODUCTION</b>                         |  |   |
| <b>Chairperson</b>   | Dr M B Chetti , ADG, HRD, ICAR, New Delhi  |   |
| <b>Co- Chairperson</b>   | Dr Ramesh Chandra, Joint Director (Research), GBPUA&T, Pantnagar   |   |

|  |  |                                     |
|--|--|-------------------------------------|
| <b>Rapporteurs</b>                                     | Dr Sanjay Rawal (Modipuram) and Dr S K Yadav (Patna)   |                                     |
| 16.30-18.30 hr   | Summary presentation, Discussions and finalization of Technical Programme                                    | Dr V K Dua, Head, Crop Production   |
| 18.30-19.30 hrs  | Discussions on Post-harvest loss, Interaction between scientist and stakeholders and breeder seed production |                                     |
| 20.00 hr   | Dinner   |                                     |
| <b>SEPTEMBER 20, 2015</b>                              |  |                                     |
| <b>TECHNICAL SESSION III: CROP PROTECTION</b>          |  |                                     |
| <b>Chairperson</b>                                     | Dr B P Singh, Director, CPRI, Shimla   |                                     |
| <b>Co- Chairperson</b>                                 | Dr B K Pandey, PS, ICAR, New Delhi   |                                     |
| <b>Rapporteurs</b>                                     | Dr Sanjeev Sharma (Shimla), Dr Rahul Bakade (Patna) and Dr S P Pathak (Faizabad)                             |                                     |
| 08.30-10.00 hr   | Summary presentation, Discussions and finalization of Technical Programme                                    | Dr M Nagesh, Head, Crop Protection  |
| 10.00-11.00 hr   | Discussions and finalization of Technical Programme of all disciplines                                       |                                     |
| <b>TECHNICAL SESSION IV: PLENARY SESSION</b>           |  |                                     |
| <b>Chairperson</b>                                     | Dr N K Krishna Kumar, DDG, Horticulture, ICAR, New Delhi   |                                     |
| <b>Co- Chairperson</b>                                 | Dr T Janaki Ram, ADG, Hort. Sciences, ICAR, New Delhi<br>Dr B P Singh, Director, CPRI, Shimla                |                                     |
| <b>Rapporteurs</b>                                     | Dr S P Singh (Gwalior), Dr Venkatsalam (Ooty), Dr V K Gupta (Modipuram) and Dr R K Dubey (Pasighat)          |                                     |
| 11.00 -12.30 hr  | Presentation of recommendations by the PI's of the respective sessions                                       |                                     |
| 12.30 -13.30 hr  | Discussions and finalization of Proceedings and Technical Programmes of various sessions                     |                                     |
| 13.30-14.00 hr   | Remarks of the Chairman & Co-Chairmen  |                                     |
| 14.00 hr   | Vote of thanks by Dr PM Govindakrishnan  |                                     |
| 14.00 hr   | Lunch  |                                     |
| <b>SEPTEMBER 21, 2015</b>                              |  |                                     |
| <b>Potato Breeding -Way forward (Panel Discussion)</b> |  |                                     |
| <b>Chairperson</b>                                     | Dr Bir Pal Singh, Director, CPRI, Shimla   |                                     |
| <b>Co- Chairperson</b>                                 | Director Research, GBPUA&T, Pantnagar  |                                     |
| <b>Rapporteurs</b>                                     | <b>Dr M Nagesh (Shimla), Dr Brajesh Singh (Shimla) and Dr Sanjay Rawal (Modipuram)</b>                       |                                     |
| 10.00 hr   | Welcome with bouquet   |                                     |
| 10.05 hr   | Introductory remarks of the Chairman and Co-Chairman   |                                     |
| 10.10 hr   | Lightning of lamp  | All dignitaries                     |
| 10.15 -10.45 hr  | Conventional breeding approach in potato for productivity enhancement  | Dr S K Luthra, PS, CPRIC, Modipuram |
| 10.46-11.15 hr   | Bio technological approaches for increasing breeding efficiency in potato                                    | Dr Prashant Kawar, CPRI, Shimla     |
| 11.16 hr   | Tea  |                                     |
| 11.30-12.00 hr   | Yield gaps and possibilities of bridging yield gap   | Dr P M Govindakrishnan              |
| 12.00-12.30 hr   | Potato Breeding: Way Forward   | Dr Vinay Bhardwaj                   |
| 12.31-13.15 hr   | Discussions  |                                     |
| 13.15-13.30 hr   | Remarks of the Chairman & Co-Chairman  |                                     |
| 13.30 hr   | Lunch  |                                     |

**ALL INDIA COORDINATED RESEARCH PROJECT ON POTATO**

**33<sup>rd</sup> GROUP MEETING OF AICRP (Potato)**

September 19-21, 2015

**VENUE:** GB Pant University of Agriculture and Technology, Pantnagar (Uttarakhand)

**LIST OF PARTICIPANTS**

| <b>Sl. No.</b> | <b>Name of Institute/ Organization</b>  | <b>Name of participant</b> | <b>Designation</b>                                     |
|----------------|---|----------------------------|--|
| 1.             | Indian Council of Agricultural Research, New Delhi  | 1. Dr NK Krishna Kumar     | Deputy Director General (Horticulture Sciences)        |
|                |   | 2. Dr T Janakiram          | Assistant Director General (Horticulture Sciences)     |
|                |   | 3. Dr MB Chetti            | Assistant Director General (HRD)                       |
|                |   | 4. Dr BK Pandey            | Principal Scientist, Division of Horticulture Sciences |
| 2.             | Central Potato Research Institute, <b>SHIMLA</b> (HP)                                       | 5. Dr BP Singh             | Director   |
|                |   | 6. Dr NK Pandey            | Head, Social Sciences                                  |
|                |   | 7. Dr VK Dua               | Head, Crop Production                                  |
|                |   | 8. Dr Brajesh Singh        | Head, CPB&PHT  |
|                |   | 9. Dr KK Pandey            | Head, Seed Technology                                  |
|                |   | 10. Dr M Nagesh            | Head, Plant Protection                                 |
|                |   | 11. Dr Vinay Bhardwaj      | Actg. Head, Crop Improvement                           |
|                |   | 12. Dr Sanjeev Sharma      | Sr Scientist, Plant Protection                         |
| 3.             | All India Coordinated Research Project on Potato [AICRP (Potato)], CPRI, <b>SHIMLA</b> (HP) | 13. Dr PM Govindakrishnan  | Project Coordinator                                    |
|                |   | 14. Dr Raja Shankar        | Sr Scientist   |
|                |   | 15. Mr Dharminder Verma    | Sr Technical Officer                                   |
|                |   | 16. Mrs Nirmala Chauhan    | LDC  |
|                |   | 17. Mr Sita Ram            | T-1  |
|                |   | 18. Dr MS Kadian           | Agronomist   |
| 4.             | Central Potato Research Institute Campus, <b>MODIPURAM</b> , (UP)                           | 19. Dr SK Kaushik          | Joint Director   |
|                |   | 20. Dr (Mrs) Kamlesh Malik | Principal Scientist                                    |
|                |   | 21. Dr Sanjay Rawal        | Principal Scientist                                    |
|                |   | 22. Dr SK Luthra           | Principal Scientist                                    |
|                |   | 23. Dr VK Gupta            | Senior Scientist                                       |
| 5.             | Central Potato Research Station, <b>KUFRI</b> (HP)  | 24. Dr Vinod Kumar         | Principal Scientist and Acting Head                    |
| 6.             | Central Potato Research Station, <b>JALANDHAR</b> (Punjab)                                  | 25. Dr JS Minhas           | Head   |
|                |   | 26. Dr Raj Kumar           | Principal Scientist                                    |
|                |   | 27. Dr Prince              | Scientist (Agronomy)                                   |
| 7.             | Central Potato Research Station, <b>PATNA</b> (Bihar)                                       | 28. Dr Manoj Kumar         | Head   |
|                |   | 29. Dr Shambhu Kumar       | Principal Scientist                                    |
|                |   | 30. Dr SK Yadav            | Scientist  |
| 8.             | Central Potato Research Station, <b>GWALIOR</b> (MP)  | 31. Dr Satyajit Roy        | Head   |
|                |   | 32. Dr SP Singh            | PS, Agronomy   |
| 9.             | Central Potato Research Station, <b>SHILLONG</b> (Meghalaya)                                | 33. Dr TK Bag              | Head   |
| 10.            | Central Potato Research Station <b>OOTACAMUND</b> (Tamil Nadu)                              | 34. Dr EP Venkataslam      | Actg. Head   |
|                |   | 35. Dr Sudha               | Scientist  |

|     |   |                              |  |
|-----|---|------------------------------|--|
|     |   | 36. Dr Aarti Bairwa          | Scientist  |
| 11. | Orissa University of Agriculture and Technology, <b>BHUBANESHWAR</b> (Orissa)                       | 37. Dr Ashok Kumar Mishra    | Potato Breeder                                   |
|     |   | 38. Mr Debasis Ghosal        | Junior Agronomist                                |
| 12. | JNKVV Regional Agricultural Research Station, <b>CHHINDWARA</b> (MP)                                | 39. Dr SN Singh              | Principal Scientist                              |
|     |   | 40. Dr DN Nandekar           | Senior Scientist                                 |
| 13. | Potato Research Station, Sardarkrushinagar Dantiwada Agriculture University, <b>DEESA</b> (Gujarat) | 41. Dr RN Patel              | Plant Breeder                                    |
|     |   | 42. Dr Sunil Kumar Chongtham | Agronomist                                       |
|     |   | 43. Sh JK Patel              | Plant Pathologist                                |
| 14. | University of Agricultural Sciences, <b>DHARWAD</b> (Karnataka)                                     | 44. Dr PR Dharmatti          | Associate Professor                              |
| 15. | Rajendra Agricultural University, TCA Campus, <b>DHOLI</b> (Bihar)                                  | 45. Dr LM Yadav              | Chief Scientist                                  |
|     |   | 46. Dr DK Dewedi             | Senior Scientist                                 |
|     |   | 47. Dr Birendra Kumar        | Senior Scientist                                 |
| 16. | ND University of Agriculture and Technology, <b>FAIZABAD</b> (UP)                                   | 48. Dr SP Pathak             | Professor  |
| 17. | Argil Research Station, <b>HASSAN</b> (Karnataka)   | 49. Dr Vishnuvardhana        | Associate Professor                              |
|     |   | 50. Dr B Prasad              | Assistant Professor                              |
| 18. | CCS Haryana Agricultural University, <b>HISAR</b> (Haryana)   | 51. Dr AK Bhatia             | Principal Scientist                              |
|     |   | 52. Dr Anil Gupta            | Plant Pathologist                                |
| 19. | Assam Agricultural University <b>JORHAT</b> (Assam)   | 53. Dr PC Bhagawati          | Principal Scientist                              |
|     |   | 54. Dr Md Zafar Ullah        | Senior Scientist                                 |
|     |   | 55. Dr Mitul Kumar Saikia    | Senior Scientist                                 |
| 20. | BC Krishi Vishwa Vidyalaya <b>KALYANI</b> (West Bengal)   | 56. Dr Ashis Chakraborty     | Associate Professor                              |
|     |   | 57. Dr Anirban Sarkar        | Assistant Professor                              |
|     |   | 58. Dr Sanjib Kumar Das      | Assistant Professor                              |
| 21. | CSA University of Agriculture and Technology, <b>KANPUR</b> (UP)                                    | 59. Dr UC Mishra             | Agronomist                                       |
|     |   | 60. Dr Ramesh Singh          | Assistant Professor                              |
| 22. | Agriculture University, <b>KOTA</b> (Rajasthan)   | 61. Dr SK Trivedi            | Associate Professor                              |
| 23. | GB Pant University of Agriculture and Technology, <b>PANTNAGAR</b> (Uttarakhand)                    | 62. Dr Manoj Raghav          | Professor  |
|     |   | 63. Dr RP Singh              | Professor  |
|     |   | 64. Dr Dhirender Singh       | Professor  |
| 24. | College of Horticulture and Forestry, <b>PASIGHAT</b> under CAU, (Imphal)                           | 65. Dr RK Dubey              | Assistant Professor                              |
| 25. | NARP, Ganesh Khind, <b>PUNE</b> under MPKV (Rahuri)   | 66. Dr MR Deshmukh           | Junior Scientist                                 |
|     |   | 67. Dr SA More               | Junior Scientist                                 |
| 26. | IG Krishi Vishwavidhyalaya, <b>RAIPUR</b> (Chhattisgarh)  | 68. Dr PK Joshi              | Senior Scientist                                 |
|     |   | 69. Dr Pravin Kumar Sharma   | Scientist  |
| 27. | SK University of Agricultural Sciences and Technology, <b>SRINAGAR</b> (J&K)                        | 70. Dr Shabir Hussain Khan   | Associate Professor                              |
|     |   | 71. Dr Faheema Mustaq        | Potato Agronomist                                |
| 30  | <b>SPECIAL INVITEES</b>   | 72. Dr JB Singh              | Director Research, GBPUA&T, Pantnagar            |
|     |   | 73. Dr DS Pandey             | Dean, College of Agriculture, GBPUA&T, Pantnagar |
|     |   | 74. Dr Ramesh Chandra        | Jt. Director (Research), GBPUA&T, Pantnagar      |
| 31  | <b>Representatives from private sector</b>  | 75. 8-10 representatives     |  |