PROCEEDINGS

XXXII Annual Group Meeting of AICRP-National Seed Project (Crops)

Technical Programme
(2017-18)

held at
Swami Keshwanand Rajasthan Agricultural University
Bikaner
(22-24 April, 2017)

ICAR-Indian Institute of Seed Science
(Indian Council of Agricultural Research)
Mau 275 103, Uttar Pradesh, India
(ISO 9001:2008 Certified Institute)

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Session I

Inaugural Session

Date : 21.04.2017 **Time : 09:30-10:45**

Chief Guest	:	**Dr. M. Bhaskaran**, Vice Chancellor, TNOU, Chennai
Chairman	:	**Dr. D.K. Yadava**, ADG (Seed), ICAR, New Delhi
Co-chairman	:	**Dr. I. J. Gulati**, Dean, CoA, SKRAU, Bikaner
Rapporteurs	:	**Dr. S.K. Yadav**, PS, DSST, ICAR-IARI, New Delhi
		Dr. N.K. Gupta, Prof., SKNAU, Jobner

The programme started with welcome address by Dr. R.S. Yadava, Associate Director Research, SKRAU, Bikaner. Dr. S. Rajendra Prasad, Ex-Director, ICAR-IISS, Mau gave the opening remarks, wherein he emphasized on appreciable results received by storage of seed in 40% CO_2 and also by super grain bags to store pulses and oilseed crops. He acknowledged the role of 127 seed testing lab in the country in seed quality assurance. Highlighted the impact of NSP programme in terms of availability of sufficient quantity of seed in most of the crops and stressed for creation of seed hubs particularly for pulses. In the era of changing climate, he emphasized to develop climate smart seeds and planting windows.

Dr. D.K. Agarwal, Director (Acting), ICAR-IISS, Mau presented the annual progress report of AICRP-NSP (Crops) for 2016-17. Dr. Agarwal highlighted that ICAR through NSP has achieved significant progress by enhancing total quality seed production from 35 lakh quintals in 1980-81 to 343.52 lakh quintals in 2015-16, by making available sufficient quantity of breeder seed. He also stressed upon the need for harnessing rice fallows for seed production of pulses and oilseeds. In the course of presentation, he pointed that scientists engaged in project have developed solutions to many problems related to seed; seed polymer coating increased rice and wheat yield by 10 to 20 per cent. Similarly, nipping of terminal bud in *Dhaincha* and sunhemp at 20 days after sowing enhanced seed yields; mitigation of heat stress in wheat and mustard can be achieved with external application of salicylic acid @ 100 ppm are few to mention. Three books were released in this occasion by the dignitaries *viz*. Dr. R.P. Singh *et al.*: Varietal and Seed Replacement in the Era of Climate Change; Dr. R.D. Jat *et al.*: विभिन्न फसलों की उत्पादन तकनीकें and Dr. A.K. Singh: खीरे की पॉलीहाउस मे खेती**.** Dr. I. J. Gulati, Dean, College of Agriculture, Bikaner in his special remarks emphasized the importance of healthy soil for good quality seed production.

Dr. D.K. Yadava, ADG (Seeds), made elaborate remarks covering many issues related to seeds. He expressed concern over declining share of Government sector in seed production, which is24% only and stressed the need to increase the contribution of Government sector for quality seed supply. Maintenance breeding is an important component of quality seed production and he mentioned that ICAR-IARI RS, Karnal center is leading the maintenance breeding programme and asked for its replication in other centers by undergoing training. He also expected that quality seed production activity will gain an impetus after each KVK, as per the new proposal, have the seed production officers in position. Dr. Yadava mentioned that currently we are producing sufficient seed but there is need to look at its proper distribution and to check the malpractices by various

agencies including private stake holders. He highlighted the need for formulation of experiments under STR based on urgent issues and it is very much required that all the seed material as per the requirement of technical programme of the project should be made available in time by concerned scientists. He emphasized that rapid analytical tools should be developed for seed quality assessment and land mark outcomes from the STR experiments should be published and circulated to SAUs for including them in packages of practices. There is a need to revisit the Indian Minimum Seed Certification Standards and hybrid purity standards of each crop are required to be worked out, afresh. He categorically made a mention of validation period for certification and isolation distance requirements of new crops to be considered for inclusion as new experiments under STR and alternate areas for diseases free seed production needs to be identified. He asked for recommendations of seed quality enhancement treatments found suitable for cultivation under rainfed situation to the farmers with special emphasis to north eastern regions. He emphatically pointed out the need for participation of private sector, farmers and even students while formulating the experiments under STR.

Dr. M. Bhaskaran, Vice Chancellor, TNOU in his address emphasized on the need of proper and futuristic planning of seed production activity and STR experiments in each centre. He specifically mentioned proper integration of all the 5 components of STR and requested all the scientists to avoid duplication of the work. He mentioned about judicious use of resources under situation of budget cut. In the last he stressed to take up practical utility based programmes and document recommendations of experiments crop wise, discipline wise and center wise to make available for all concern with seed sector.

The session ended with formal vote of thanks by Dr. R.D. Jat, ADR (Seeds), SKRAU, Bikaner.

Session II

Discipline wise Presentation of Progress Report

Date: 22.04.2017 **Time: 11:00- 16.30**

Chairman	:	**Dr. M. Bhaskaran, Vice Chancellor, TNOU, Chennai**
Co-chairman	:	**Dr. D.K. Yadava**, ADG (Seed), ICAR, New Delhi
Rapporteurs	:	**Dr. (Mrs.). Sharmila D. Deka,** PS, STR Unit, AAU, Jorhat **Dr. Sripathy K.V.**, Scientist, ICAR-IISS, Mau

The discipline wise presentations were made by the respective Principal Investigators.

1. **Seed Production and Certification: Dr. L.V. Subba Rao, Principal Scientist, ICAR-IIRR, Hyderabad**

The total numbers of experiments designed were 10, out of which all experiments were conducted and recommendations were prepared in few experiments concluded during 2016-17. Under experiment standardization of isolation distance in wheat, castor and cumin; the isolation distance recommendation for wheat hybrid seed production may be proposed as 6 to 8 m and house opined that finalization of recommendation will be done in consultation with the concerned crop coordinator. The Principal Investigator expressed that the experiments on standardization of isolation distance for hybrid seed production in castor was not conducted during 2016-17 because of non-supply of seed material from SDAU, SK Nagar and similarly for cumin crop the seed was not supplied by SDAU, SK Nagar. In this context, Dr. D.K. Yadava, ADG (Seed) suggested that concerned scientist entrusted with responsibility for seed supply shall invariably make arrangement for the same. Further he also opined that the isolation distance identified for standardization in castor is not followed correctly and isolation treatments like 100, 150 and 200 m needs to be revised as either 400, 500 and 600 m including the recommended 300 m (as per IMSCS). Dr. Rajendra Prasad, former Director, IISS, Mau suggested that experiment on mitigating climate change in various crops, experiment shall be carried out by only those centres that are having the climate chamber or phytotron facility. House opined that experiment for maximization of seed yield in millets, the experiment is too much complex and hence priming or planting method treatment shall be dropped from the technical programme. House suggested discontinuing the experiment on seed encrustation (INCOTEC sponsored experiment). The P.I. also pointed out that seed encrustation reduced germination in crops like onion, mustard, rape seed and carrot. For the experiment on validation of UTLIEF based genetic purity, the P.I. informed the house that results have not yet been received from INCOTEC for comparison and all centres have completed their two years of experiments as per the technical programme. Director, IISS, Mau suggested that, in all sponsored experiments only regular centres shall implement the experiment as per the basic plan. The ADG (Seed) suggested to conclude all the sponsored experiment were the company is not responding and also suggested that all private agencies sponsoring experiment shall be invited and their presence shall be ensured in AGM. Dr. M. Bhaskaran, opined that all centres to follow the technical programme strictly without any deviation and no centre shall report the data with deviation from

technical programme especially in storage studies. Further, scientist shall thoroughly analyze the data with proper conclusion.

2. Seed Physiology, Storage and Testing: Dr. P.C. Nautiyal, Principal Scientist, DSST, ICAR-IARI, New Delhi

There were total of seven experiments and one demonstration on priming. In experiment on identification of seed vigour traits PI requested all centres to correlate the data with seed longevity for some meaningful conclusion. Dr. Bhaskaran suggested that the SSR marker used across the centres should be uniform in number and sequence for all varieties available in seed chain (notified) in concerned state and further identified marker need to be validated by some lead centres (IISS, Mau). ADG (Seed) and Director, IISS, Mau suggested to merge the experiment on kernel storage (experiment 3) and experiment on desiccant beads (experiment 4) for consolidation of technical programme. The ADG (Seed) opined that the coordination between centres, PI's and IISS, Mau need to be strengthened for betterment of STR component.

3. Seed Pathology: Dr. Mohan S. Bhale, Professor, JNKVV, Jabalpur

There were 21 main experiments and 8 sub experiments conducted in 15 centres (including three lead centres *viz*. AAU, Anand, OUAT, Bhubaneswar and MPKV, Rahuri). Survey was conducted for monitoring of diseases (false smut and bunt in rice) to find out emerging new diseases of seed borne nature and also to study seed health status of farmer own saved seeds of wheat, rice, soybean, groundnut and chickpea; out of 3686 samples tested, 37.14% infected samples were recorded and for the first time rice bunt was intercepted in Tamil Nadu. In this context, the Dr. Bhaskaran insisted to come up with crop protection advisory that may be submitted to respective state Government so that prophylactic measures can be instituted for management of seed borne diseases. Dr. Karuna Vishunawat, GBPUAT, Pantnagar suggested that before giving recommendations for detection method of seed borne diseases, the method must be validated at 3 to 4 lead centres. PI seed pathology Dr. Bhale informed the house that, out of 21 experiments seven will be terminated this year and recommendations will be compiled and submitted to ICAR and also to other stakeholders (SAU's and SSC's) for inclusion in package of practices. Dr. S.K. Rao suggested preparing a detailed report on occurrence of these seed borne diseases in a report form for its submission to MoA&FW for further necessary action.

4. Seed Entomology: Dr. Amit Bera, Scientist, ICAR-CRIJAF, Barrackpore

Under experiment on quality seed production using bee pollination, berseem seed yield was enhanced significantly through bee pollination and Chairman asked PI to come up with recommendation along with details of factor responsible for enhanced seed yield and also requested all PI to finalize the recommendation of concluded experiments and all recommendations should be informative and not to be inconclusive. Dr. D.K. Yadava suggested concluding the sponsored experiment on Zerofly bags after completion of two years of testing and final results may be submitted to sponsoring agency (M/s Vestergaard Frandsen India Pvt. Ltd). The Director, IISS, Mau suggested to record initial moisture content of all seed lots employed in storage studies.

5. Seed Processing: Dr. J.P. Sinha, PS, Division of Agri. Engineering, ICAR-IARI, New Delhi

Under seed processing, there were two experiments. Suitable sieve sizes have been standardized for different varieties of crops like wheat, pigeonpea, field bean, chickpea and paddy. Dr. Bhaskaran suggested that only notified varieties that are present in seed chain need to be considered for the study.

Chairman's Remarks

- Stressed to glue the missing link between PI's and centres and asked all PI's to act proactively for the success of STR component under AICRP-NSP (Crops)
- Opined to integrate and reduce experiments under seed pathology
- Asked all nodal officers to conduct a meeting with concerned scientist at their centres to plan the implementation of each experiment and he shall review the experiment on regular basis and inform the constraints to concerned PI's and Director, ICAR-IISS, Mau

Co-Chairman's Remarks

- Suggested the house to bring a publication on glimpses of STR recommendations during XII plan (2012-13 to 2016-17)

The Session ended with thanks to the Chairman and Co-Chairman by the Director, ICAR-IISS, Mau.

Session III

Expert Talk on Thrust Areas of Seed Research

Date : 22.04.2017 **Time : 16.30–18.00**

Chairman	:	**Dr. S.K. Rao, Former Director Research Services, JNKVV, Jabalpur**
Co-chairman	:	**Dr. S. Rajendra Prasad,** Former Director, ICAR-IISS, Mau & SO (Seeds), UAS, Bengaluru
Rapporteurs	:	**Dr. T. Ramanadane**, Professor (SST), PAJANCOA&RI, Karaikal **Dr. Govind Pal**, Senior Scientist, ICAR-IISS, Mau

Session started with the talk by Dr. Mukesh Rana, Principal Scientist, ICAR- NBPGR, New Delhi on "Harnessing Molecular Tools in Seed Quality Assurance". He presented the basic information about all molecular tools and relative efficiency of different methods in seed quality assurance. He suggested that molecular tools can play important role in seed genetic purity testing, enforcement of PPVFRA, testing of parentage of varieties, efficiency of DUS, etc. Though the cost benefit analysis of the molecular tools is weak but for timely result it is important. He pointed that choice of markers is very important in authenticating a technology. Further he opined that there is a need to develop an advisory body for implementing quality control & networking, to develop quality standards and monitoring protocols for seed quality assurance. He stressed to establish a national data base of DNA profiles and also informed that as on date DNA finger printing is done for 5606 accessions. He also emphasized to develop a common standard for selection of markers and statistical support for the claim if any made.

Mr. Manoj Gilda, Ex VJTI, Mumbai and Mr. Suresh Navandar, Lead Innovator, IDC, IIT, Mumbai delivered a talk on "Modular Seed Storage System for Pulses" and informed that the grain storage loss occurs to the tune of 30-40% every year and needs to be reduced. They explained the technical details of the various modular storage structures developed for grain storage especially molded bins and flexible bins. They also shown the various modular grain storage structures and equipments used commercially.

Dr. P.K. Singh, Principal Scientist, CPCT, ICAR-IARI, New Delhi gave a talk on "Seed production of vegetable crops under protected cultivation" and emphasized the need for seed production under protected condition. He briefed about various types of protected structures suitable for seed production. He also suggested that seed production in high value crops would be profitable enterprise under protected cultivation.

In their concluding remarks, both the Chairman and Co-Chairman opined that molecular testing is an important area for seed quality assurance and various molecular tools may be used for the same. They also emphasized the importance of modular storage techniques (molded bin & flexible bin) for effective storage of cereals and pulses seed with reduced storage loss even though they are high in cost. The Co-Chairman also suggested that the trolley developed by the firm for transporting LPG gas cylinders may also be used for the movement of seed bags in seed processing unit. He also opined that seed production under hydroponics resulted with 4-5 times higher yield than normal method of seed production. Further he observed that seed production under protected cultivation is important in terms of saving land, water and labour. The Chairman of the session

requested to assess the requirement of the farmers in seed sector especially on seed storage. He also emphasized the house to consider the outcome of the three expert talks while formulating the STR experiments for the year 2017-18.

The session ended with the formal vote of thanks to Chair and Co-chair.

Session IV-A

Centre-wise Presentation of Progress Report for Seed Technology Research

Date : 23.04.2017 **Time : 09:00 - 10:30**

Chairman	:	**Dr. MalavikaDadlani, Former JDR, ICAR-IARI, New Delhi**
Co-chairman	:	**Dr. N.S. Yadava,** Director, DHRD, SKRAU, Bikaner
Rapporteurs	:	**Dr. Nethra. N.,** ASRO, UAS, Bengaluru
		Dr. V. Vakeswaran, Asst. Professor, TNAU, Coimbatore

The centre-wise seed technology research progress report was presented by the Nodal Officers of Southern and Western Zones (PJTSAU, Hyderabad; PAJANCOA&RI, Karaikal; UAS, Bengaluru; UAS, Dharwad; TNAU, Coimbatore; SKNAU, Jobner; JAU, Jamnagar; AAU, Anand; ICAR-CAZRI, Jodhpur). The salient points, which emerged are listed below:

- The seed treatment chemicals labeled as suitable for seed treatment may be employed in the study (seed entomology).
- The issues raised by the centers were on increasing cost on electricity, labour, irrigation, input cost and logistics as constraints and placed demands for additional grants under contingency.
- The seed supplied to other centers for conducting experiments needs to have good germination and to be supplied timely for implementation of experiments.
- Fevicol (sticker) can be used as an adhesive agent in chickpea for seed treatments and powder of sweet rhizome can be used to enhance the viability during chickpea storage.

At the end, the Chairman Dr. Dadlani summarized the session by congratulating all the centers for their nice presentations and

- Suggested to design the experiments by keeping the cost involved in imposing the treatments.
- For genetic purity testing selection of markers has to be specific and revalidated in some lead centres.
- For conducting any experiments there should be minimum variants from center to center.

The session ended with vote of thanks to the Chair and Co-Chair.

Session IV-B

Centre-wise Presentation of Progress Report for Seed Technology Research

Date : 23.04.2017 **Time : 10:45 - 12:30**

Chairman	:	**Dr. M. Bhaskaran, Vice- Chancellor, TNOU, Chennai**
Co-chairman	:	**Dr. D.K. Yadava**, ADG (Seed), ICAR, New Delhi
Rapporteurs	:	**Dr. Vijay R.Shelar,** SRO, MPKV, Rahuri
		Dr. S.P. Jeevan Kumar, Scientist, ICAR-IISS, Mau

The nodal officers from 07 centres representing north zone (HPKVV, Palampur, SKUAST, Srinagar, PAU, Ludhiana, CCSHAU, Hisar, IARI, New Delhi and GBPUAT, Pantnagar) presented the progress made in Seed Technological Research component of AICRP-NSP (Crops) during 2016-17. The salient points which emerged are listed below.

The Chairman and Co-Chairman have appreciated the efforts made by all the centres. However, in CSKHPKV, Palampur, it was observed that the breeder seed production is not meeting the DAC indent and advised to take the indent as per their capacity, insufficient produce will hamper the downstream seed multiplication. In SKUAST, Srinagar centre, chairman lauded the development of entomology and pathology maps for Jammu and Kashmir. He also suggested for creating awareness among farmers and coming up with some prophylactic measures for management of *karnal* bunt in farmer's fields of Punjab (PAU, Ludhiana). House applauded the efforts of GBPUAT, Pantnagar for developing diagnostic kit for identification of bacterial wilt in tomato.

Remarks of Co- chairman:

- Seed health map should be prepared by all centres in respect of their jurisdictions.
- Identification of pest infestation, surveying and prophylaxis has to be taken in *Mera Gaon Mera Gaurav* extension programme.
- The experiment concerning with INCOTEC firm should be discontinued due to non-supply of seeds.
- The indents for breeder seed production of varieties should not be taken, which are susceptible to certain diseases at their respective locations.

Remarks of Chairman:

- Minimum 100 farmer saved seed samples should be collected from their jurisdiction of respective centre for each crop in order to study the status of farmer saved seed.
- Soon after receiving the breeder seed production indent, in case of non-availability of varieties the programme should be either discontinued or it may be intimated to the DAC&FW/ coordination unit to ensure smooth functioning of breeder seed production.
- Unique set of crop-wise SSR markers should be developed at individual centers and revalidation has to be taken care of.
- Prior to conducting the experiments, the characterization of organic compounds (botanicals) should be done in order to draw reasonable inference.

The session ended with thanks to the chair and co-chair.

Session IV-C

Centre-wise Presentation of Progress Report of Seed Technology Research

Date : 23.04.2017 **Time : 12:00-13:30**

Chairman	:	**Dr. Malavika Dadlani, Former JDR, ICAR-IARI, New Delhi**
Co-chairman	:	**Dr. N.S. Yadava,** Director, DHRD, SKRAU, Bikaner.
Rapporteurs	:	**Dr. C.S. Kar,** Principal Scientist, ICAR-CRIJAF, Barrackpore.
		Dr. Somasundaram, G., Scientist, ICAR-IISS, Mau

The nodal officers from 7 centres (CSAUAT, Kanpur; NDUAT, Faizabad; RPCAU, Pusa; JNKVV, Jabalpur; MPKV, Rahuri; VNMKV, Parbhani and OUAT, Bhubaneshwar) presented the progress made in seed technological research component of AICRP-NSP (Crops) during 2016-17. The salient points which emerged are listed below.

- All the centres except PDKV, Akola presented the progress report. Chairman directed to send a letter to Vice Chancellor, PDKV, Akola regarding absence of nodal officer / his representative in the session.
- Chairman suggested presenting only the results of the experiments of Seed Technological Research (STR) component. The results of other than STR experiments (or) already concluded experiments need not to be presented.
- ADG (Seed) emphasized the timely sowing of seeds for experiments to avoid flowering and sterility related problems.
- Chairman appreciated the efforts taken by the centres to test all the seed lots of breeder seed produced for seed health and instructed the other centres also to follow the seed health testing of all breeder seed lots.
- Chairman expressed displeasure on non-conduct of experiments in some centres which has adequate staff strength.
- Chairman opined that the scientific outcome of VNMKV, Parbhani should be improved as the centre was not conducted two experiments out of 13 experiments allotted even though four scientists were in position.
- ADG (Seeds) emphasized the pro-active role of PIs to get the information from centres in proper format within the stipulated time, ensuring the supply of seeds to the centres, etc. Further, he suggested the centres to submit the pooled data after proper statistical analysis to the PIs once the experiment was conducted for three years and PIs will analyze the report of each centres and finalize the recommendation. The chairman expressed concern about the voluminous annual report of the project. She stressed upon inclusion of properly analyzed summarized data only for annual report.
- Chairman raised the concern on supply of pesticides / chemical fertilizers under Tribal Sub Plan (TSP) for tribal farmers. Instead, she suggested taking some experiments for screening of lance races / varieties of tribal region for yield to strengthen local seed supply system in tribal areas.

The session ended with thanks to the chair and co-chair.

SESSION V

Finalization of Recommendations/Technical Programme Formulation for2017-18

A. Seed Production and Certification

Chairman	:	**Dr. S.K. Rao, Former Director Research Services, JNKKV, Jabalpur.**
Co-chairman	:	**Dr. D.K. Yadava,** ADG (Seed), ICAR, New Delhi
Convener	:	**Dr. L.V. Subba Rao,** Principal Scientist, ICAR-IIRR, Hyderabad

The scientists involved in the conduct of experiments in seed production and certification participated in the deliberations. The progress, bottlenecks and performance of centres along with experiments conducted were discussed and points for improvement were also suggested. The observations, decisions, recommendations and technical programme for 2017-18 were finalized and are reported hereunder:

Observations

- The delay in receipt of data and reports is being observed and it should be avoided. Data should be reported uniformly in the standard format and should be sent in time. The deviations and vitiations in conduction of experiments including difficulties should be communicated well in advance to the concerned PI and Director, ICAR-IISS, Mau.

Decision taken:

1. Centres should follow the technical programme strictly without any alterations.
2. Reporting of the data in the format provided after proper statistical analysis should be followed.
3. Deadline given in the calendar of events given in the proceedings, should be strictly followed.

Experiment 1: Standardization of isolation distance for hybrid seed production of Mustard.

MUSTARD

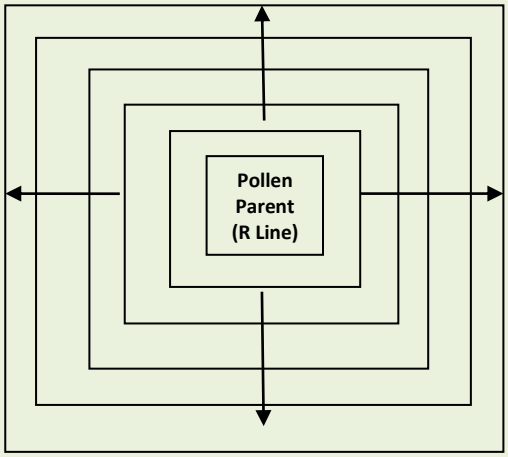
(Both pollen parent (R line) and female parent (CMS line) will supplied by Dr. S.K. Lal (Mobile: 09811048932), Principal Scientist, ICAR-IARI, New Delhi,)

Year of start: 2017-18

Centres: IARI, New Delhi; PAU, Ludhiana; GBPUAT, Pantnagar; JNKVV, Jabalpur and NDUAT, Faizabad

Methodology

- Restorer line/pollen parent to be surrounded in all the four sides by CMS line (female parent) at different distances viz. 50, 75 and 125 and 150 meters as shown in the diagram.
- Pollen parent: plot size of 3m X 3m with spacing of 45 X 15 cm to be grown in the center;
- Pollen parent to be surrounded by the CMS line at different distances mentioned above (as depicted in the diagram below). Two rows of female line



Observations

- Recording pollen flow at different distances by hanging slides smeared with glycerine and estimating pollen at 10x magnification.
- Seed setting percentage in CMS line to be recorded from all four directions at all distances.
- Per cent seed set in the CMS line should be recorded and submitted in the format given below

Direction	% Seed Set				
	50 m	75 m	100 m	125 m	150 m
West					
East					
North					
South					

Experiment 2: Seed quality, health, yield, storability as affected by pre-sowing seed priming treatments in kabuli chickpea, field pea and lentil

Year of start: 2014-15

Crops	Centres
Kabuli Chickpea	PAU, Ludhiana; JNKVV, Jabalpur; UAS, Raichur; MPKV, Rahuri; SKNAU, Jobner (Durgapura) and PDKV, Akola; CCS HAU, Hisar.
Field pea	CSAUAT, Kanpur; JNKVV, Jabalpur; ICAR-IISS, Mau
Lentil	JNKVV, Jabalpur; NDUAT, Faizabad and CSAUAT, Kanpur

(Each center can use the seeds of any popular variety of their locality)

Objective

- Standardization of seed priming technique for assured filed emergence in kabuli chickpea, field pea and lentil (*Utera* system)

Treatments

1. Seed Priming with *Trichoderma harzianum* @ 1.5 %
2. Seed Priming with Vitavax Power @ 0.25 %

3. Seed Priming with Gibberellic Acid @ 50 ppm
4. Seed Priming with Gibberellic Acid @ 50 ppm + Seed coating with *T. harzianum* @ 15 g / kg seed
5. Seed Priming with Sodium Molybdate @ 500 ppm
6. Seed Priming with Sodium Molybdate @ 500 ppm + Seed coating with *T. harzianum* @ 15 g / kg seed
7. Seed Priming with leaf extract of *Lantana camara* @ 10 %
8. Seed hydration for 8 hrs.
9. Chemical check – seed treatment with Bavistin @ 3g/ kg seed
10. Control

Duration of Soaking: Eight hours

Observations to be recorded:

(A) Seed physiology

I. Root nodulation (No's)
II. Seed quality parameters (Germination % and SVI-I&II)
III. Root and shoot length (cm)

(B) Seed pathology

I. Incidence of wilt / root rot (%)
II. Incidence and severity of Ascochyta blight (%)
III. Seed mycoflora

(C) Seed production

I. Plant biomass (40 DAS) (t/ha)
II. No. of pods / plant
III. 100 seed weight (g)
IV. Seeds / pod (No's)
V. Seed yield (kg/ha)
VI. Harvest Index

Experiment 3: Standardization of seed production technology in green manure crops.

(Dr. T. Pradeep from PJTSAU, Hyderabad will supply seeds of Dhaincha, Pillipesara and Sunhemp to all centers)

Crops and centres

Daincha (*Sesbania aculeata*)	TNAU, Coimbatore; AAU, Jorhat; MPKV, Rahuri; UAS, Dharwad; PJTSAU, Hyderabad; RPCAU, Pusa; BCKV, Nadia, PAJANCOA&RI, Karaikal; JAU, Junagadh; OUAT, Bhubneswar; HPKV, Palampur and CCSHAU, Hissar
Sunhemp (*Crotolaria juncea*)	TNAU, Coimbatore; AAU, Jorhat; MPKV, Rahuri; UAS, Dharwad; ANGRAU, Guntur; BCKV, Nadia, JAU, Junagadh (Jamnagar).
Pillipesara (*Vigna trilobata)*	TNAU, Coimbatore; MPKV, Rahuri; UAS, Dharwad; ANGRAU, Guntur; JAU, Junagadh (Jamnagar).

Objectives

- ❖ To study the influence of nipping or pinching of terminal buds on the number and intervals of pod pickings, seed shattering loss, seed yield and quality.
- ❖ To study the influence of phosphorous application on seed yield and quality.
- ❖ To study the effect of DAP 2% as foliar spray to enhance seed yield and quality.

Methodology

1. Nitrogen application: 30 kg/ha
2. Phosphorous application : 50 kg/ha as basal
3. Foliar spray: Two sprayings of the following nutrients as detailed below.
4. Effect of nipping or pinching of tendrils

- ❖ Being an indeterminate crop, pinching or nipping of terminal buds may have influence on seed yield and quality. Nipping should be done on *Sesbania aculeate* at 60 DAS, *Vigna trilobata* at 30 DAS. In sunhemp, the main stem of sunhemp when attains a height of 90 cm to break apical dominance and more branching.
- ❖ However a control may be maintained without nipping and cutting in all crops.

Treatments

Main plot: Pinching

M_1: With pinching

M_2: Without pinching

Sub plot: Foliar application

T_1 - Foliar spray with DAP @ 2%

T_2 - Foliar spray with MN Mixture ($ZnSO_4$ @ 0.5% + Boric acid @ 0.3%)

T_3 - Foliar spray with NAA @ 40 ppm

T_4 - Foliar spray with DAP 2% + MN Mixture (Zn+B) + NAA @ 40ppm

T_5 – Control

- The total fertilizer application should be split into two doses, one as basal and other as top dressing.
- Foliar spray should be done at flowering. In addition, the recommended agronomic packages and plant protection practices should be followed.

Design	:	Split plot
Replications	:	4
Spacing	:	Dhaincha - 60 x 20 cm Sunhemp - 30 x 30 cm Pillipesara - 60 x 30 cm
Plot size	:	20 m^2 (5 x 4 $m^{2)}$

Observations to be made

1. No. of pods / plant
2. No. of seeds / pod (excluding shrivelled and under developed seeds)
3. Pod yield / plant & plot
4. Seed yield / plant, plot and ha.
5. Seed recovery (%)
6. No. of pods shattered / plant before each pickings (Shattering loss)

7. No. of pickings made
8. 100 seed weight (g)
9. Seed germination (%)
10. Seedling vigour (length, dry weight and vigour index)
11. Cost Benefit ratio
12. Weather data should be recorded

Experiment 4: Integrated approach for enhancing seed yield and quality in millets.

Objectives

- To standardize suitable seed quality enhancement techniques to enhance the production potential of millets.

Crops and centres

1. **Finger millet:** UAS, Bangalore; ANGRAU, Guntur; UAS, Dharwad; KKV, Dapoli; HPKV, Palampur and IGKV, Raipur.
2. **Foxtail millet:** ANGRAU, Guntur; TNAU, Coimbatore and UAS Dharwad.
3. **Kodo millet:** JNKVV, Jabalpur; TNAU, Coimbatore and ANGRAU, Guntur.
4. **Proso millet:** ANGRAU, Guntur and UAS, Bangalore.
5. **Little millet:** JNKVV, Jabalpur and TNAU, Coimbatore

SMALL MILLETS TREATMENT DETAILS	
No of treatments	**Main plots** (Nutrient management): **04** **Sub-plots** (Seed priming): **04**
Sowing method	
Finger millet: Transplanting with spacing of 30 X 10 cm (raising a nursery and transplanting at 21 days in wet field capacity of soil) **Other four millets:** Direct sowing – 30 x 10 cm – sown at 3-4 cm depth	
Note 1. Only one method of planting should be followed for each crop as mentioned above. 2. Nursery management and Transplanting (Finger millet) for one ha. Of main field: • Select 12.5 cents (500 m2) of nursery area n ear a water source, where water does not stagnate. Mix 37.5 kg of super phosphate with 500 kg of FYM or compost and spread the mixture evenly on the nursery area. • Plough two or three times with a mould board plough or five times with a country plough form raised beds by marking units of 6 plots each of size 3m x 1.5 m. • Provide 30 cm space between plots for irrigation. • Excavate the soil from the interspace and all around to a depth of 15 cm to form channels and spread the soil removed from the channels on the bed and level it. 4-5 days before removing plants, spray the nursery with the fungicide Mancozeb 75% W.P @ 2 gm /liter • Transplant the seedling from the nursery into the man field when they are only 15-25 days old. • Before transplanting, irrigate the nursery for approximately 2 hours in advance, to moisten and loosen the soil for removing the plants easily if the soil is dry in that time.	
• Carefully uproot the seedlings, keeping the soil intact around the roots; if possible lift them out with a trowel or spade as this gives support to the soil and helps to keep it intact with the roots. • Transfer the uprooted seedlings to the main plot within the next 30 minutes, before the roots and soil can dry out. The spacing will be 10 x 10 inches by using a rope or a marker. • Transplant the seedlings at shallow depth in the pits; do not press or inure the roots while placing the seedlings at the intersection of planting lines. **3.** Micronutrients: magnesium (20 kg per acre) and calcium (6 kg per acre) or dolomite / limestone (40 kg per acre). Apply these micronutrients, 20-25 days before transplantation in the field.	
Treatment details	
I. Main –Plot treatments (Nutrient management)	
N_1 – No fertilizer	
N_2 – 125 kg Neem + 1250 kg Vermi compost per ha or 12.5 tons FYM/ha	
N_3 – 50 kg Urea + 50 kg Super phosphate and 50 kg Muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spay at flowering	

N_4 - 125 kg Neem + 1250 kg Vermicompost (or) 12.5 tons FYM/ha + 50 kg Urea + 50 kg super phosphate and 50 kg Muriate of potash per ha + Top dressing urea at 3-4 weeks after transplanting + 2% Borax spay	
II. Sub-sub-plot treatments (Priming)	
P_1 – Control - No priming	
P_2 - Hydropriming for 6 h (Finger millet, Kodo millet), 8 h (Foxtail millet, Proso millet, and Little millet) by adopting seed to solution ratio of 1:1 and then mixing in 2.5-3 gm / kg of Carbendazim (Bavistin) with the seeds and leaving the mixture for 24 hours before sowing	
P_3 – Seed priming with 2 % KH_2PO_4 for 6 h (Finger millet and Kodo millet), 8 h (Foxtail millet, Proso millet and Little millet) by adopting seed to solution ratio of 1:1 and then mixing in 2.5-3 gm / kg of Carbendazim (Bavistin) with the seeds, and leaving the mixture for 24 hours before sowing	
P_4 – Seed priming with 20 % liquid *Pseudomonas fluoresces*	
Design	Split Plot Design
No. of replications	3
Plot size — **Gross plot size**	2 m × 5.0 m (10.0 m^2)
Space between plots	60 cm
Recommended dose of fertilizer (NPK)	75 kg P_2O_5 and 25 kg K_2O per ha or best recommended fertilizer dosage for your state, region or zone.
Cultivar	Any recommended (bunch or spreading type) cultivar appropriate for seed production season.
Source fertilizers	
1. Nitrogen	Urea (46 % N)
2. Phosphorus	Single super phosphate (SSP) (16 % P_2O_5)
3. Potassium	Muriate of potash (MOP) (60 % K_2O)
OR	
1. Nitrogen and Phosphorus	Diammonium Phosphate (DAP) (18 % N and 46 % P_2O_5)
2. Potassium	Muriate of potash (MOP) (60 % K_2O)
Pest / disease control ▪ **Blast:** Seed treatment, mixing 2.5 gm/kg of Carbendazim (Bavistin) for at least 30 minutes. ▪ **Seedling blight:** Spray Mancozeb 75 % WP @ 2 gm per liter in the nursery 15 days before sowing or 15 days after transplantation. ▪ **Downy mildew:** Spray the crop with Mancozeb 75 % W.P. @ 2 gm per liter of water at the onset of the disease, or when symptoms are seen in 5-10% of the plants. ▪ **Stem borer:** Use regent granules or its liquid form in the amount of 7 kgs / acre. 1 ml of the chemical should be mixed with 2 liters of water.	

Observation

- Field emergence
- Plant height at 30 days and at harvest

- Chlorophyll content (DMSO method)
- Days to first flowering
- Days to 50% flowering
- No. of tillers plant^{-1}
- Seed yield plant^{-1}
- Seed yield per ha.
- 100 seed weight
- Seed recovery percent
- Resultant seed quality - seed germination and vigour index

Experiment 5: Planting windows for quality seed production of soybean in offseason

Centres and varieties

1. UAS- Dharwad (Dharwad and Haveri) - DB 21 (Oct. to January end)
2. UAS, Bangalore - JS 335 (Mandya) (in paddy fallows Nov. to Jan.)
3. MAU, Parbhani - MAUS 162 (Oct. to January end)
4. PJTSAU, Hyderabad - JS 335 (Andhra and Telangana) (Oct. to January end)
5. JNKVV, Jabalpur - JS 20-34 and JS 20-29 (Nov. to Jan. End)
6. MPKV, Rahuri - JS 335 and MAUS 162 (Sept. to January)

(Note: Record climatological data in it and one sowing in normal season and remaining in off season with 5-6 plantings at fortnight interval)

Objectives

1. To standardize best planting date off season soybean seed production and to assess seed quality.

Experimental details

Design	**:**	**FRBD**	**Replication**	**:**	**Three**
Plot size	**:**	**3.6 m × 5.0 m**	**Sowing**	**:**	**Ridges and furrow sowing**
Spacing	**:**	**45×5 cm**			

Fertilizer & Micro nutrients

50% higher dose than RDF 20:80:40 kg/ha (415kgDAP /ha), Ridge sowing + soil application of ZnSo4 @ 30 kg/ha along with foliar spray @ 0.5% at 48 and 56 days after sowing

Season: Best date of sowing for off season crop- centres will decide based on their data

Observations to be recorded

A. Growth and yield parameters

1. Field emergence (%)
2. Plant height (cm)
3. Number of primary branches per plant
4. Days to 50% flowering
5. Days to maturity
6. Number of pods per plant

7. Number of seeds per pod
8. Seed yield per ha.
9. Harvest index (%)

B. Flowering and Pod characteristics

1. Days to flower initiation
2. Days to 50% flowering
3. Days to pod maturity
4. Length of pod (cm)
5. Diameter of pod (cm)
6. Shattering (%)

C. Seed Morphometry (Image Analysis)

1. Length of seed (mm)
2. Width of seed (mm)
3. Area of seed (mm^2)
4. Seed Diameter (mm)
5. Seed perimeter (mm)
6. Seed roundness

D. Biochemical parameters

1. Protein content (%)
2. Oil content (%)

Storage study

The seeds from offseason production will be evaluated for seed quality parameters at monthly interval.

1. Germination (%)
2. Moisture content
3. Seed vigour
4. Dry matter production
5. Seed mycoflora
6. Electrical conductivity

Experiment 6: Efficacy of hydrogels (Pusa hydrogel and herbal hydrogel) on seed yield, quality and water use efficiency on wheat

(Dr. Sudipta Basu, Principal Scientist, ICAR-IARI, New Delhi will supply seeds)

Centers: ICAR-IARI, New Delhi and ICAR-IISS, Mau

Objective:

- To evaluate the efficacy of hydrogels in improving seed yield and quality under limited irrigation condition in wheat.

Treatment Details:

Main Plot: Irrigation (Treatments-4)

S_1 - Sowing under normal moisture + Skip irrigation (3 irrigations)

S_2 - Sowing under normal moisture + Normal irrigation (6 irrigations)
S_3 - Sowing under restricted moisture + Skip irrigation (3 irrigations)
S_4 - Sowing under restricted moisture + Normal irrigation (6 irrigations)

Sub Plots: Hydrogels (Treatments-3)

T_0 - Control
T_1 - Soil application of Pusa hydrogel developed by Dr. Anupama, Division of Agricultural Chemicals, IARI, New Delhi
T_2 - Seed coated with Herbal hydrogel developed by Dr. V.S. Lather, IARI, RS, Karnal

Sub-sub Plot: Varieties (Treatments-2)

V_1 - HD2967 (Suitable for normal irrigation)
V_2- HD 3043 (Suitable for limited irrigation)

Total Plots: 72
Spacing: 20 X 10 cm
Design: Split Plot

Observations to be recorded:

Seed quality of treated seed

- Germination (%)
- Seedling length
- Seedling dry weight
- Vigour index
- Speed of germination

Soil Parameters

- Soil Moisture at 15 days interval
- Soil structure and texture analysis

Yield Parameters

- Field emergence
- Seedling fresh and dry weight
- Plant height
- Days to 50% flowering
- No. of tillers and effective tillers per unit area
- No. of filled seeds per panicle
- 1000 seed weight
- Seed yield / ha

Experiment 7: Optimization of seed rate in Soybean

Year of start: 2017-18

Centers:

Centers	Variety	
	Medium maturity	**Early Maturity**
JNKVV, Jabalpur	JS 20-29	JS 20-34
RVSKVV, Gwalior	JS 20-29	JS 20-34

VNMKV, Parbhani	MAUS 162	JS 20-34
UAS, Dharwad	Dsb 21	JS 93-05
MPKV, Rahuri	KDS 344	JS 93-05
AU, Kota	RKS 45	JS 20-34
IISR, Indore	NRC 86	JS 20-34
PDKV, Akola	NRC 86	JS 20-34
PJTSAU, Hyderabad	Any suitable variety	-do-
UAS, Bengaluru	Any suitable variety	-do-

Objectives

Soybean crop is highly sensitive to climatic factors and supply of quality seeds is becoming a critical problem due to climatic uncertainties. Study need to be conducted on reduction of seed requirement with following objectives

- To increase the Productivity with reduced seed rate
- To study the effect of less plant population on control of insect and disease infestation
- To enhance the Interaction of early and medium maturing varieties to reduced seed rate
- To find out economic viability of low seed rate and production

Treatment Details

T_0 - Recommended seed rate @ 70 kg/ha
T_1 - Reduced seed rate @ 60kg/ha
T_2 - Reduced seed rate @ 50kg/ha
T_3 - Reduced seed rate @ 40kg/ha
T_4 - Reduced seed rate @ 30kg/ha

Technical Details

- Plot size: 6 rows of 6m for each treatment
- Uniform seed treatment: 2g Xelora + 1.5 g Vitavax power + 2 g Thiomethoxam + 5 ml water per kg seed.
- Weed management: Due to less plant population weed may be more. Pre (Diclosulam @ 26g/ha) and post emergence (Imazythopyr @ 1 l/ha) herbicides may be followed.
- Sowing by dibbling of single seed per spot as per spacing at uniform depth of 3-5 cm.
- No. of replications: 4
- Experimental design: RBD

Observations to be recorded

1. Plant population per sq. meter
2. Plant height at maturity
3. Plant canopy diameter
4. Number of branches per plant
5. Number of pods per plant
6. Yield per plant
7. Yield per ha.
8. 100 seed weight
9. Seed quality parameters (Germination % and SVI-I & II)

10. Storability of seeds at monthly interval (Germination %; seedling length; Seed Vigor; Dry matter production; Seed health)
11. Information on pests & diseases during crop growth.

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Seed Processing

(Merged with Seed Production and Certification from 2017-18)

Chairman : **Dr. J.P. Sinha,** Principal Investigator/ Principal Scientist, SPU, DSST, ICAR-IARI, New Delhi

Convener : **Dr. K.V. Sripathy**, Scientist, ICAR-IISS, Mau.

Technical programme

1. Under experiment no. 1 (optimization of sieve sizes) the seed recovery (%) shall be calculated using standard formulae considering the seed physical and engineering properties across crop/varieties and only notified varieties (existing in seed chain) shall be chosen for the study
2. Experiment no. 2 on management of mechanical damage during harvesting and threshing will be dropped
3. The seed processing discipline will be merged with seed production and certification and Co-PI will be nominated by national coordinator for seed production and certification who will be jointly working with PI seed production and certification

Experiment 1 : Optimum sieve size and type of screen for grading seeds of different crop varieties and hybrids including their parents.

Objective :
1. Crop-wise classification of varieties in seed chain with respect to their seed size (small, medium and bold)
2. To standardize the size and type of grading sieve.

Crop		Centres
Chickpea	:	CSAUAT, Kanpur; MPKV, Rahuri; UAS Dharwad and UAS, Raichur
Pigeon pea	:	UAS, Bangaluru and UAS, Raichur.
Soybean	:	UAS, Dharwad; UAS, Raichurand MPKV, Rahuri
Paddy	:	ICAR-IARI, RS, Karnal; UAS, Raichur; NDUAT, Faizabad and TNAU, Coimbatore
Maize	:	TNAU, Coimbatore; UAS, Bengaluru
Mustard	:	CSAUA&T, Kanpur
Field bean	:	UAS, Bengaluru
Fingermillet	:	UAS, Bengaluru

Treatments

1. Crop : As above
2. Machine : Standard sieve shaker (specifications as per ISTA)
3. Sieve sizes : Grading sieve:
   a. Recommended sieve (as per IMSCS)
   b. Two sieves above the recommended sieve
   c. Two sieves below the recommended sieve

Procedure

Unprocessed seed of the each crop variety will be procured from reliable source. Specified quantity of unprocessed seed material will be sieved using sieve shaker for 10 minutes at the rate of 25 strokes per minutes. Seed material retained over each grading sieve will be tested for observation on seed quality. The screen that retains maximum seeds with superior seed quality will be considered as optimum.

Observations

1. Recovery (%) and rejection (%)
2. Seed size: Length, breadth and thickness (mm)
3. Germination (%)
4. Vigour index
5. Physical purity (%)
6. 1000 seed weight (g)
7. Moisture content (%)
8. Processing efficiency (%)

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Seed Physiology, Storage and Testing

Chairperson : **Dr. (Mrs) Malavika Dadlani,** Former JDR, ICAR-IARI, New Delhi
Convener : **Dr. P. C. Nautiyal,** Principal Scientist, ICAR-IARI, New Delhi

There were total of eight experiments in Seed Physiology, Storage and Testing during 2016-17. Experiments number 1 and 3 were concluded while experiments 4 and 5 were dropped based on the recommendation of the Chairperson and experts present in the house, and experiments 6 and 7 were continued. Demonstration of "On-farm technology in Seed Priming" is proposed to be concluded after completion of data of ongoing season. It is also recommended that data collected in this programme from 2008-09 till date will be compiled and published. In addition, two new experiments were proposed, one on "Revalidation of leftover seeds in field crops including their hybrids for use in the seed system", and another on "Influence of terminal heat stress on seed set, seed yield and quality in field crops".

Recommendations

- Soybean seeds can be stored with Zeolite beads (1:0.35) or Silica gel (1:0.30) for more than nine months with 80% germination and higher vigour potential.
- Groundnut seeds (off-shell) could be stored for more than six months with 86% germinability and vigour with silica gel (1:0.30) or Zeolite beads (1:0.35) in 700 gauge polythene bags.

Experiment 1: To revalidate the seeds of field crops including hybrids for use in seed system
Date of Start : 2017
Objective

1. To study the vigour status of seeds for consideration to revalidate the leftover seed lots for sowing purpose.

Crops		Centres
Wheat	:	ICAR-IARI, New Delhi; GBPUAT, Pantnagar; VNMKV, Parbhani; SKNAU, Durgapura; MPKV, Rahuri; NDUAT, Faizabad; CSAUAT, Kanpur; CSKHPAU, Palampur
Rice	:	ICAR-IARI, New Delhi; PJTSAU, Hyderabad; TNAU, Coimbatore; PAJANCOA&RI, Karaikal; UAS, Bengaluru; KAU, Thrissur; AAU, Jorhat and OUAT, Bhubaneswar.
Maize	:	ICAR-IARI, New Delhi; TNAU, Coimbatore; PAU, Ludhiana
Sorghum	:	ICAR-IARI, New Delhi; VNMKV, Parbhani; MPKV, Rahuri; UAS, Dharwad
Cotton	:	ICAR-CICR, Nagpur; PJTSAU, Hyderabad; UAS, Dharwad.
Soybean	:	ICAR-IARI, New Delhi; JNKVV, Jabalpur; VNMKV, Parbhani; MPKV, Rahuri; UAS, Dharwad.
Chickpea	:	ICAR-IARI, New Delhi; JNKVV, Jabalpur; VNMKV, Parbhani; SKNAU, Jobner, CSAUAT, Kanpur

Technical Programme

Seed lots

Minimum of three seed lots of different storage period of two varieties in a crop may be directly procured from Seed Agencies preferably the Foundation or Certified class. Samples may be collected at three different time intervals to avoid the storage of seeds in the laboratory conditions.

Vigour tests to be employed

As per the ISTA guidelines including seed moisture content (%), radicle emergence, 1st count, final count and seedling dry mass.

Laboratory evaluation

Four replications with 100 seeds in each may be tested for germination.

Field performance

- Field emergence in 5 rows 6 m length or in 3 x 2 m plots (expressed in per $m^{2)}$.
- Days to 50% emergence i.e. 7, 8, 9, 10 days (as per crop requirement) after sowing upto five consecutive days.
- Days to flowering
- Days to maturity
- Number of productive tillers
- Seed yield
- 1000 / 100 seed weight (Test weight)

Experiment 2 : **Identification of variety and hybrid specific SSR makers in field crops**
Year of Start : **2011- 2012**
Objective : To identify unique markers for varietal identification and maintenance of genetic purity.

Crops	:	**Centres**
Rice	:	PJTSAU, Hyderabad; UAS, Bangalore; TNAU, Coimbatore; CSKHPAU, Palampur; ICAR-IISS, Mau; JNKVV, Jabalpur, AAU, Jorhat, KAU, Thrissur.
Maize	:	UAS, Dharwad; PAU, Ludhiana.
Pearl millet	:	SKNAU, Jobner.
Soybean	:	VNMKV, Parbhani; JNKVV Jabalpur.

Methodology

Crop varieties which are present in seed chain and available at the respective centers may be studied for DNA fingerprinting and electrophoresis/PCR analysis for identification of polymorphic markers unique for hybrid/ cultivar/ variety/ parental lines using SSR microsatellite marker.

Note:

i) *Each centre will search for the literature on use of primers in each crop and will use the most important one.*

ii) The set of identified crop specific markers will be validated between the Centres and information will be shared among them, and with NBPGR, New Delhi.

Experiment 3 : **Basic studies for developing priming technology in crop plants**
Objective : To improve field emergence under sub-optimal conditions in different field crops.
Crop : Pigeonpea, Chickpea, Rice (direct seeded)
Centre : Pigeonpea - IARI, New Delhi
Chickpea - ICAR-IISS, Mau
Rice - AAU, Jorhat
Year of start : 2016

Technical programme for each crop will be developed by each Centre as mentioned above, and will be submitted to the PI with a copy to the Director, ICAR-IISS, Mau as early as possible.

A. IARI, New Delhi - Development of priming technology in pigeonpea.

Activities during Year II (2017-18)

1. Standardization of seed priming technology under soil moisture-deficit stress.
2. Standardization of seed priming technology under salinity condition.

Plant materials

Two varieties preferably one tolerant and another susceptible for each of above mentioned abiotic stresses.

Treatments

1. **Control**- Untreated seeds of all varieties.
2. **Moisture Stress** (To be given by soaking in PEG 6000 solution at 30^0C)**:**
   i. Soaking in water stress equivalent to PWP (-1.5MPa) and drying.
   ii. Soaking in available water equivalent to 75% of FC (-0.39MPa) and drying.
   iii. Soaking in available water equivalent to 50% of FC (-0.76MPa) and drying.
   iv. Soaking in available water equivalent to 25% of FC (-1.15MPa) and drying.
3. **Salt Stress** (To be given with soaking in NaCl solution at 30^0C):
   a. Soaking in NaCl solution having 2dsm^{-1} EC and drying.
   b. Soaking in NaCl solution having 4dsm^{-1} EC and drying.
   c. Soaking in NaCl solution having 6dsm^{-1} EC and drying.
   d. Soaking in NaCl solution having 8dsm^{-1} EC and drying.
   e. Soaking in NaCl solution having 10dsm^{-1} EC and drying.
   f. Soaking in NaCl solution having 12dsm^{-1} EC and drying.

Methodology:

Moisture Stress: Testing of control and primed seeds at 30^0C between germination papers soaked as follows:

a. PEG 6000 solution equivalent to PWP (-1.5MPa).
b. PEG 6000 solution equivalent to 75% of FC (-0.39MPa).
c. PEG 6000 solution equivalent to 50% of FC (-0.76MPs).
d. PEG 6000 solution equivalent to 25% of FC (-1.15MPa).
e. Water (Without PEG 6000 solution)

Salt Stress: Testing of control and primed seeds at 30^0C between germination papers soaked as follows:

a. NaCl solution having 2dsm^{-1} EC.
b. NaCl solution having 4dsm^{-1} EC.
c. NaCl solution having 6dsm^{-1} EC.
d. NaCl solution having 8dsm^{-1} EC.
e. NaCl solution having 10dsm^{-1} EC.
f. NaCl solution having 12dsm^{-1} EC.
g. Water (Without NaCl solution).

Observations: Germination percentage (ISTA) and vigour parameters

B. ICAR – IISS, Mau - Standardization of Priming Technology in chickpea under sodic soil (II Year-2017-18)

Plant material

Two varieties of chickpea

1. BGD-72
2. Kabuli Shubhra

Treatments

- Control-Unprimed
- Hydropriming for 6 h under sand.
- Priming with KNO_3 @ 0.2% for 6 h under sand.
- Priming with GA_3 @ 100ppm for 6 h under sand.

The sodicity level including ESP and pH will be measured before sowing and harvesting of crop.

Methodology

The seeds of both the varieties of chickpea will be primed with above set of treatments keeping one set as control. The experiment will be conducted in field with recommended package of practices. Observations on seed quality parameters including germination percentage and vigour, growth, yield and its attributes will be recorded periodically. Storability of seeds would also be evaluated after harvesting of crop.

C. AAU, Jorhat - Bio priming for upland direct seeded rice in organic condition.

- Crop : Direct seeded Rice
- Replication : 4
- Plot size : 3 X 2 m^2
- Spacing : 20 x 15cm
- Experimental Design : RBD
- Sowing time : recommended sowing time

Treatments:

1. Seed priming with *Org-Trichojal* @ 5ml/lit of water
2. Seed priming with *Org-Trichojal* @ 10ml/lit of water
3. Seed Priming with Org-Beauverijal @ 5ml/water
4. Seed Priming with Org-Beauverijal @ 10ml/water
5. Seed Hydration for 8 hrs (Control).
6. Absolute Control without hydration.

Observations:

(A) Laboratory tests

i. Germination first and final count
ii. Seedling length
iii. Seedling dry weight

(B) Pre sowing field test

i. Soil microbial population before sowing and at harvest

(C) Field Observations

i. Field emergence
ii. Root and shoot length
iii. Seedling height
iv. Chlorophyll content

(Observations will be recorded on 30 days old seedling)

(D) Seed Production

i. Number of effective tillers / plant
ii. No. of panicle / plant
iii. Seeds / panicle
iv. Seed yield / plant
v. Seed yield / plot
vi. 1000 seed weight

(E) Seed Pathology

i. Incidence of diseases

(F) Bio Chemical parameters

- Alpha amylase activity
- Peroxidase activity

Experiment 4: Use of nano-particles in enhancing seed quality and storability of Pigeonpea (*Cajanus cajan)*

Centre: TNAU, Coimbatore; UAS, Bengaluru

Year of start: 2016

Objectives:

1. To standardize the optimum concentration of different nanoparticles for seed treatment in pigeon pea.
2. To know the effect of different nano-particles on seed quality and storability of pigeonpea.

Crop: Pigeon pea cv. BRG 2 and BRG4

Treatments:

Nano-particles: Zinc oxide, Silver, Silicon dioxide (both bulk and nano form).

Dosage: Control (no treatment); 100 ppm, 250 ppm, 500 ppm, 750 ppm and 1000 ppm

Formulation: Dry form

Treatment combinations: Nanoparticle x bulk x concentration (3 x 3 x 5) = 45

Replication: Three **Design:** FCRD

Sub. Experiment I: Standardization of optimum concentration of different nanoparticles for seed treatment in pigeon pea

Methodology

- Freshly harvested seeds of pigeon pea are dried to safer and uniform moisture level (8 to 9 %).
- The seeds are directly treated with the selected chemicals (bulk &nano form) in a plastic or glass jar by mixing thoroughly for even distribution.
- Thereafter, the treated seeds shall be evaluated for various seed quality attributes like moisture content (SMC), germination and vigour, electrical conductivity (EC) and total dehydrogenase activity (TDH) etc.

Observations to be recorded

1. Seed germination (%) (ISTA, 2014)- first count, final count and T_{50} value
2. Mean root and shoot length (cm)
3. Mean seedling length (cm)
4. Mean seedling dry weight (mg)
5. Seedling vigor index I and II (Abdul Baki and Anderson, 1973)
6. Electrical conductivity of seed leachate (µS/cm/g)
7. Total dehydrogenase activity (A_{480} nm).
8. Seed health (infection and infestation)

Sub. Experiment-II: Studies on effect of selected nano-particles on seed quality and storability in pigeon pea

The best treatment (s), which responded positively to nano-particles in Experiment-I shall be selected to study their influence on seed quality and storability. The treated pigeon pea seeds are to be packed in cloth bag and stored under ambient conditions. Storage studies will be conducted up to 10 months and the following observations are to be recorded at monthly interval including weather data of storage conditions.

Observations to be recorded

1. Seed germination (%) (ISTA, 2014)
2. Mean root and shoot length (cm)
3. Mean seedling length (cm)
4. Mean seedling dry weight (mg)
5. Seedling vigor index I and II (Abdul Baki and Anderson, 1973)
6. T_{50} value
7. Seed health (infection and infestation)
8. Electrical conductivity of seed leachate (µS/cm/g)
9. Total dehydrogenase activity (A_{480} nm)

Experiment 5: Influence of terminal heat stress on seed set, seed yield and quality in field crops

This experiment was shifted from Seed production and certification programme and the

respective centres as mentioned in that programme are retained.

Objectives: To evaluate the adverse effect of heat stress during reproductive phase in selected field crops and its mitigation.

Year of start: 2017

Crop	Centre
Wheat	ICAR-IARI, New Delhi; JNKVV, Jabalpur; PAU, Ludhiana; GBPUAT, Pantnagar; CCSHAU, Hisar; VNMKV, Parbhani; CSAUAT, Kanpur; MPKV, Rahuri and NDUAT, Faizabad.
Sorghum	VNMKV, Parbhani and PDKV, Akola.
Rice	ICAR-IIRR, Hyderabad; PJTSAU, Hyderabad; UAS, Bengaluru; TNAU, Coimbatore; ICAR RC NEH Region - Manipur Centre; OUAT, Bhubaneswar; BSKKV, Dapoli; KAU, Thrissur; PAJANCOA&RI, Karaikal.
Mustard	ICAR-CAZRI, Jodhpur; ICAR-IARI, New Delhi and CSAUAT, Kanpur.

Methodology

Experiment will be conducted with normal date of sowing and thereafter with 15 days intervals for 1½ months.

Set 1: in open field conditions

Set 2: in growth chamber with 5°C elevated temperature from anthesis onwards.

Mitigation treatments

Spraying of chemicals during the anthesis with

1. Glycine betaine (600 ppm);
2. Cytokinin (100 ppm);
3. Salicylic acid (400 ppm);
4. Ascorbic acid (10 ppm);
5. KCl (1%);
6. Citric acid (1.5 %);

Observations to be made

- 1000 seed weight
- Evaluation of seed quality following ISTA protocol.

Experiment 6: Demonstration of technology: On farm demonstration of seed priming technology.

Year of Start : 2008-09

Objective: To demonstrate seed priming technology in the farmers field for easy adoption.

This experiment may be concluded after collecting the data for ongoing season in each crop conducted since 2008, and will be compiled by the following centres / persons:

Wheat	:	GBPUAT, Pantnagar (Dr. (Mrs.) Omvati)
Pearl millet	:	SKNAU, Jobner(Dr. N.K. Gupta)
Sorghum	:	MPKV, Rahuri (Dr. S.K. Ramsingh)
Chickpea	:	JNKVV, Jabalpur (Dr. R.K. Samaiya)

Note: *The above mentioned persons will make a common data sheet for the crop mentioned against their name and will supply it to other centres as mentioned below. The data will be compiled in the form of Technical Bulletin, which may be presented in the next workshop.*

Crop		Centre
Wheat	:	NDUAT, Faizabad; RPCAU, Pusa; PAU, Ludhiana; GBPUAT, Pantnagar; HPKVV, Palampur; CCSHAU, Hisar; CSAUT, Kanpur.
Pearlmillet	:	RAU, Durgapura; CCSHAU, Hisar.
Sorghum	:	PJTSAU, Hyderabad; UAS, Dharwad; MPKV, Rahuri, VNMKV, Parbhani
Chickpea	:	JNKVV, Jabalpur

List of Participants

S.No.	Name	Designation	Centre	Email
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17	Dr. (Mrs). Sharmila Dutta Deka	Pr. Scientist	AAU, Jorhat	sharmila9368@gmail.com 09435351698
18	Dr. N.K. Gupta	Professor	RARI, Durgapura	nkgupta69@yahoo.co.in 09460987039

Seed Pathology

Chairman : **Dr. S.L. Godara**, Professor & Head, SKRAU, Bikaner
Conveners : **Dr. Karuna Vishunavat** , GBPUAT, Pantnagar
Dr. M.S. Bhale, JNKVV, Jabalpur

Recommendations:

- Effective management of cumin blight (*Alternaria burnsii*) may be achieved by three foliar application of Azoxystrobin-23SC @ 0.025% at 10 day interval after appearance of blight disease along with the basic seed treatment with Thiram3.0 g per kg of seed, prior to sowing. The treatment resulted in minimum disease intensity (18.01%) with highest seed yield (592 kg/ha) and consequently minimum post association (3.95) of *Alternaria burnsii* in harvested cumin seeds as compared to control with disease intensity (57.04%) and seed yield (178kg /ha) and 62.25 % post association of the fungus.
- Effective management of pod blight caused by *Colletotrichum dematium* of soybean may be achieved through two applications of Carbendazim + Mancozeb (0.30%) first at pod formation (R3) and second at pre-harvest stage (R5).It resulted in 76.3% disease control over check under conditions of Maharashtra and Madhya Pradesh. Basic seed treatment with Thiram and Carbendazim each 1.5g per kg seed, prior to sowing results in higher seed emergence.
- Effective management of seed rot, seedling blight, die-back and fruit rot of chilli caused by *Colletotrichum capsici* and *Alternaria alternata* may be achieved through seed dressing with *Trichoderma harzianum* @10g or *Trichoderma viride* @ 5g + *Pseudomonas fluorescence* @ 5g per kg seed. Treatment resulted in maximum seed germination (79.0%) & vigour index (718.9) with least disease (2.0%) as compared to untreated control with seed germination (63%) & vigour index (472.5) with maximum disease (20%).
- Effective management of tomato blight caused by *Alternaria solani* is achievement by seed treatment with *Trichoderma harzianum* @ 5g + *Pseudomonas fluorescence* @ 5g that resulted in maximum (96.33%) seed germination with least seed rot and fruit rot (6.33%).

Advisory Recommendation:

- As per the Indian Seed Act, bunt caused by *Tilletia barclayana* is the designated objectionable seedborne pathogen in rice seed production programme with certification standards 0.10 & 0.50 % in foundation &certified seed, respectively. Continued monitoring in 15 states covering 89 districts and after testing 3686 seed samples of different varieties, 37.14 % samples have been found infected with rice bunt pathogen. Maximum 87.6 % samples infected are recorded from Punjab, with highest incidence and association of 6.25% in seed sample from Patiala. The pathogen has also been recorded from Telangana, Haryana, Himachal Pradesh, Madhya Pradesh Uttar Pradesh and Odisha. There is a need to create awareness for the trans-state movement and management of the pathogen with strict adoption of prescribed Seed Certification procedures.
- Investigations on analysis of seed health status of farmers-saved-seeds, re-indicated the alarming association of Karnal bunt of wheat (*Tilletia indica*) in Punjab (70.8% infected samples), Haryana (74.35%), Himachal Pradesh (13.5%) and Uttarakhand. There is a need to create awareness for the trans-state movement and management of the pathogen with strict adoption of prescribed Seed Certification procedures.

- Seed Health Testing should be done for the entire seed production programme to ensure the movement of disease free seeds.

Significant observations

- Transmission of pathogens from seed to plant and plant to seed was determined in 12 crops and 17 pathogens. Greater the development of disease in the form of seed and seedling mortality was noticed as higher degree of seed infection & surface area covered. Degree of seed germination decreased with increase in seed infection area.
- More than 50% seed surface area discolored due to infection of *Helminthosporium oryzae*, species of *Drechslera, Fusarium, Curvularia,* and *Alternaria* in rice resulted in drastic reduction of seed germination, below to minimum seed certification standards (MSCS).
- Cumin Seed Wash Examination technique is identified as a relatively quick method for the detection of surface adhered spores of *Alternaria burnsii*, the causal agent of devastating blight of cumin.
- Among the non-chemical treatment for the management of bean (*Phaseolus* sp.) anthracnose, seed dressed with Panchgavya with *Trichoderma viride* @10g per kg seed, exhibited promising results with 80% seed germination, 21.67 % disease incidence resulting in 66.67% disease control over check. In untreated control seed germination was 46.67% and 65% disease incidence.

List of Experiments

Exp. No.	Title of experiment
01	Monitoring and detection of rice bunt , false smut and bacterial leaf blight in processed , unprocessed and farmers seed sample
02	Monitoring of emerging new diseases of seedborne nature
3	Studies on seed health status of farmers own saved seeds
3A	Studies on seed health status of farmers own saved seeds (Wheat)
3B	Studies on seed health status of farmers own saved seeds (Soybean)
3C	Studies on seed health status of farmers own saved seeds (Rice)
3D	Studies on seed health status of farmers own saved seeds (Groundnut)
3E	Studies on seed health status of farmers own saved seeds (Chickpea)
3F	Studies on seed health status of farmers own saved seeds (Saffron)
04	Standardization of detection methods for seedborne pathogens of significance
5	Non chemical management of seed borne infection of bean anthracnose
6	Detection and molecular characterization of BCMV of mungbean
7	Monitoring of seedborne viruses in soybean and pulses and standardization of methods for detection through serological and molecular techniques
8	Standardization of bio-priming technique for management of *Fusarium* wilt of safflower
9	Standardization of bio-priming technique for management of *Alternaria helianthi* associated with sunflower seeds
10	Management of *Alternaria solani* through seed treatment and foliar application of new fungicides

11	Impact of different storage conditions and longevity on seed associated mycoflora of green gram / black gram
12	Detection, location and transmission of seed borne *Macrophomina phaseolina* in sesame
13	Management of purple blotch / *Stemphylium* blight of onion through fungicide and plant based products
14	Detection, location and transmission of seed borne *Alternaria sesami* in sesame

Experiment 1 : **Monitoring and detection of rice bunt, false smut and bacterial leaf blight in processed, unprocessed and farmers seed sample**

Objective : (i) To determine the status of pathogen in seed sample from farmer and processing plant
(ii) To prepare the distribution map in different locations

Year of start : 2002 (Concluded up to 2012-13)

Status : To be continued during 2017-18

Centre : All centres (AAU, Anand; AAU, Jorhat; NDUAT, Faizabad; GBPUA&T, Pantnagar; OUAT, Bhubaneswar; , PJTSAU, Hyderabad; PAU, Ludhiana; CCSHAU, Hissar; CSKHPAU, Palampur; TNAU, Coimbatore; JNKVV, Jabalpur; MPKV, Rahuri; VNMKV, Parbhani; SKUAST, Srinagar; PAJANCOA&RI, Karaikal; ICAR-IARI, New Delhi; CSAUAT, Kanpur; KAU, Pattambi and RPCAU, Pusa)

Methodology

- **Detection Technique:** Standard NaOH seed soak be followed for bunt in rice seed samples. Minimum seed sample size is 100 from all the sources, covering the popularly grown rice varieties. Report the range.
- Observations at growth stage 9 for rice bunt and false smut pathogen.
- Standard rating scale 0-9 to be followed for false smut infected rice florets
- Minimum number of fields to be visited is 50 per location and plants to be observed are 100 for false smut and bacterial blight.
- For BLB rating scale is 0-9.Record the disease in farmer's field and seed production plots.
- Meteorological data should be incorporated for correlation studies.

Note : *Already supplied data sheet to be followed.*

Experiment 2 : **Monitoring of emerging new diseases of seed borne nature**

Objective : To record the prevalence of new diseases and seed associated plant pathogens

Year of start : 2013-14

Status : Continued during 2016-17

Centre : All Centres (AAU, Anand; AAU, Jorhat; NDUAT, Faizabad; GBPUAT, Pantnagar; OUAT, Bhubaneswar; PJTSAU, Hyderabad; PAU, Ludhiana; CCSHAU, Hisar; CSKHPAU, Palampur; TNAU, Coimbatore; JNKVV, Jabalpur; MPKV Rahuri; VNMKV, Parbhani; SKUAST, Srinagar; PAJANCOA&RI, Karaikal; ICAR-IARI, New Delhi; CSAUAT, Kanpur , KAU, Pattambi, RPCAU, Pusa and SKNAU, Jobner

Note:

- *The incidence of unreported new pathogens and diseases of seedborne nature should be observed.*
- *Information on symptoms, causal organism and factors affecting development of the particular diseases (all about epidemiology) is to be supplemented with photographs.*

Experiment 3 : Studies on seed health status of farmers own saved seeds
Objective : To determine the health status of seed samples from the farmers own saved seeds
Year of start : 2000
Status : Continued during 2017-18
Crops : Wheat, Rice, Soybean, Groundnut, Chickpea, Saffron

Note:

- For each crop, respective centre will compile and prepare the disease distribution map of the state based upon the last 5 years data.
- Sensitization drive of farmers shall be made at hot spots for the management of rice bunt and Karnal bunt of wheat with awareness for safe storage and significance of replacement of varieties.

Experiment 3A : Studies on seed health status of farmers own saved seeds
Year of start : 2000
Status : To be continued during 2017-18
Crop : Wheat
Centre : PAU, Ludhiana; CCSHAU, Hisar; GBPUAT, Pantnagar; CSKHPAU, Palampur; SKNAU, Durgapura; ICAR-IARI, New Delhi; RPCAU, Pusa; AAU, Anand; CSAUAT, Kanpur and MPKV, Rahuri

Methodology

- **Detection Technique:** Standard NaOH seed soak be followed for bunt in seed samples. Minimum seed sample size is 100 from all the sources, covering the popularly grown wheat varieties.
- For ear cockle, visual observation and standard water soak be followed.
- Incidence of loose smut is to be recorded under field conditions by GOT.

Note: *Prepare a map depicting the selected locations; Provide the photographs showing the associated seedborne pathogens.*

Experiment 3B : Studies on seed health status of farmers own saved seeds
Year of start : 2000
Status : To be continued during 2017-18
Crop : Soybean
Centre : SKNAU, Durgapura; JNKVV, Jabalpur; MPKV, Rahuri; VNMKV, Parbhani and PJTSAU, Hyderabad

Methodology

- Seed health be determined by employing standard blotter method (ISTA, 1996) and visual inspection of seeds
- Minimum seed sample size is 100 from all the sources, covering the popularly grown varieties. Report the range. Target pathogen may include *Macrophomina phaseolina, Fusarium oxysporum, Colletotrichum dematium* (*C. truncatum*), *Cercospora kikuchii, Fusarium* spp., *Aspergillus* spp., *Diaporthe* spp. and SMV induced symptoms.
- Impact on germination, normal and abnormal seedling and seed rot be reported.
- Correlation with association of pathogen with seed germination, normal, abnormal seedling be specified separately

Note: *Prepare a map depicting the selected locations; Provide the photographs showing the associated pathogens; Provide the information that farmers used their own saved seeds or of any public or private agency/company.*

Experiment 3C : Studies on seed health status of farmers own saved seeds
Year of start : 2000
Status : To be continued during 2017-18
Crop : Rice
Centre : OUAT, Bhubaneswar; AAU, Jorhat; SKUAST, Srinagar; TNAU, Coimbatore; CSKHPAU, Palampur; NDUAT, Faizabad; PAJANCOA&RI, Karaikal; MPKV, Rahuri; ICAR-IARI, New Delhi; RPCAU, Pusa; PAU Ludhiana and PJTSAU, Hyderabad

Methodology

- **Detection Technique:** Standard NaOH seed soak be followed for bunt in rice seed samples. Minimum seed sample size is 100 from all the sources, covering the popularly grown rice varieties. Report the range.
- Seedborne pathogens responsible for seed discoloration be reported.
- Impact on germination, normal and abnormal seedling and seed rot be reported.
- Correlation with association of pathogen with seed germination, normal, abnormal seedling be specified, separately.

Note: *Prepare a map depicting the selected locations; Provide the photographs showing the associated pathogen; Provide the information of the crop (upland or lowland); Information of storage conditions.*

Experiment 3D : Studies on seed health status of farmers own saved seeds
Year of start : 2000
Status : To be continued during 2017-18
Crop : Groundnut
Centre : AAU, Anand; MPKV, Rahuri; SKNAU, Durgapura and JNKVV, Jabalpur

Methodology

- Seed health is to be determined by employing standard blotter method (ISTA, 1996) and visual inspection of seeds. Minimum seed sample size is 100 from all the sources, covering the popularly grown varieties.
- Impact on germination, normal and abnormal seedling and seed rot be reported.

- Correlation with association of pathogen with seed germination, normal, abnormal seedling be specified, separately.

Note: *Prepare a map depicting the selected locations; Provide the photographs showing the associated pathogen*

Experiment 3E : **Studies on seed health status of farmers own saved seeds**
Year of start : 2000
Status : To be continued during 2017-18
Crop : Chickpea
Centre : MPKV, Rahuri; SKNAU, Durgapura

Methodology

- Seed health be determined by employing standard blotter method (ISTA, 1996) and visual inspection of seeds
- Minimum seed sample size is 100 from all the sources, covering the popularly grown varieties. Report the range.

Note: *Prepare a map depicting the selected locations; Provide the photographs showing the associated pathogen.*

Experiment 3F : **Studies on seed health status of farmers own saved seeds**
Year of start : 2017
Crop : Saffron
Centre : SKUAST, Srinagar

Methodology

- Corm health be determined by employing standard method and visual inspection; Minimum sample size is 100 from all the sources, covering the popularly grown varieties.

Note: *Prepare a map depicting the selected locations; Provide the photographs showing the associated pathogen*

Experiment 4 : **Standardization of detection methods for seed borne pathogens of significance**
Objective : To work out the efficacy of different techniques for the detection of seed borne pathogens of significance prevalent in a particular region
Year of start : 2008
Status : To be continued during 2017-18
Centre : All Centers (AAU, Anand; AAU, Jorhat; NDUAT, Faizabad; GBPUAT, Pantnagar; OUAT, Bhubaneswar; PJTSAU, Hyderabad; PAU, Ludhiana; CCSHAU, Hissar; CSKHPAU, Palampur; TNAU, Coimbatore; JNKVV, Jabalpur; MPKV, Rahuri; VNMKV, Parbhani; SKUAST, Srinagar; ICAR-IARI, New Delhi; CSAUAT, Kanpur and RPCAU, Pusa)

Note:

- *Provide the photographs showing the associated pathogen.*

- *The protocol found effective should be documented step by step with critical information on temperature, humidity, light cycles, substrate, incubation period, identification under stereoscopic binocular and characteristics of pathogen, to draw the conclusions.*
- *The effective protocol by the respective centre would be circulated among other selected centers with reference seed sample for internal validation.*
- *Focus on serological and nucleic acid based techniques.*

Experiment 5 : **Non chemical management of seed borne infection of bean anthracnose**
Objective : To manage seed borne infection and seed health through bio-agents and organic inputs

Year of start : 2015 -16
Status : To be continued during 2017-18
Crop : Bean (*Phaseolus* spp.)
Pathogen : *Colletotrichum* spp.
Centre : CSKHPAU, Palampur and SKUAST, Srinagar

Note: *Information on statistical data, Cost: Benefit ratio (economics); yield data and correlation with meteorological data should be supplemented*

Experiment 6 : **Detection and molecular characterization of BCMV of mungbean**
Objective : (i) To determine the location of virus pathogen in parts of seed
(ii) To characterize the pathogen using molecular techniques
Year of start : 2015 -16
Status : To be continued during 2017-18
Crop : Mungbean
Pathogen : Bean common mosaic virus (BCMV)
Centre : AAU, Anand

Experiment 7 : **Monitoring of seedborne viruses in soybean and pulses and standardization of methods for detection through biological, serological and molecular techniques**
Objective : (i) To identify the seed associated viruses in the samples obtained from various parts of the country.
(ii) To develop and standardize the nucleic acid based techniques for detection of seed associated viruses.
Year of start : 2009
Status : Continued during 2016-17 (Title refined in 2016-17) and later in 2017-18
Pathogen : Molecular techniques for Soybean Mosaic Virus be developed
Centre : AAU, Anand

Note:

- *For identification of seedborne viruses in different crops, the other cooperating Centers are directed to supply the samples to AAU, Anand.*

- *Samples of leaves and /or seeds may be sent, for determination of viruses.*
- *Information on sampling and dispatch procedure may be enquired from AAU, Anand prior to submission.*

Experiment 8 : Standardization of bio-priming technique for management of Fusarial wilt of Safflower

Objective : To standardize the procedure for bio-priming
Year of start : 2015 -16
Status : To be continued during 2017-18 (modified 2017-18)
Crop : Safflower
Pathogen : *Fusarium oxysporum*
Centre : MPKV, Rahuri
Methodology : Bio-priming of seeds with bio-pesticides + soil application (amended in technical programme in 2017-18)

Treatments

Seed Treatment

T_1 - *Trichoderma viride* @ 10 g/kg of seed
T_2 - *Trichoderma harzianum* @ 10 g/kg of seed
T_3 - *Pseudomonas fluorescence* @ 10 g/kg of seed
T_4 - *Bacillus subtilis* @10 g/kg of seed
T_5 - *Trichoderma viride*+ *Pseudomonas fluorescence* @ 5 g each / kg of seed
T_6 - *Trichoderma harzianum* + *Pseudomonas fluorescence* @ 5 g each / kg of seed
T_7 - *Trichoderma viride*+ *Bacillus subtilis*@ 5 g each / kg of seed
T_8 - *Trichoderma harzianum* + *Bacillus subtilis* @ 5g each / kg of seed

Seed treatment and soil application

T_9 - *Trichoderma viride*+ *Pseudomonas fluorescence* @ 125 g each / ha (FYM 50kg)
T_{10} - *Trichodermaharzianum* + *Pseudomonas fluorescence* @ 125 g each / ha (FYM 50kg)
T_{11} - Untreated control

Note: *Information on statistical data, Cost: Benefit ratio (economics); yield data and correlation with meteorological data should be supplemented.*

Experiment 9 : Standardization of bio-priming technique for management of *Alternaria helianthi* associated with sunflower seeds

Objective : To standardize the procedure for bio-priming
Year of start : 2015 -16
Status : To be continued during 2017-18
Crop : Sunflower
Pathogen : *Alternaria helianthi*
Centre : MPKV, Rahuri

Methodology : Bio-priming of seeds with bio-pesticides + foliar application (amended in technical programme in 2017-18)

Treatments

Seed treatment

T_1 - *Trichoderma viride* @ 10 g / kg of seed
T_2 - *Trichoderma harzianum* @ 10 g / kg of seed
T_3 - *Pseudomonas fluorescence* @ 10 g / kg of seed
T_4 - *Bacillus subtilis* @ 10 g / kg of seed
T_5 - *Trichoderma viride*+ *Pseudomonas fluorescence* @ 5 g each / kg of seed
T_6 - *Trichoderma harzianum* + *Pseudomonas fluorescence* @ 5 g each / kg of seed
T_7 - *Trichoderma viride*+ *Bacillus subtilis*@ 5 g each / kg of seed
T_8 - *Trichoderma harzianum* + *Bacillus subtilis* @ 5 g each / kg of seed
T_9 - Untreated control

Foliar application

- Two application of Mancozeb(0.25%): I appearance of disease; II 15 days after I.

Note: *Information on statistical data, Cost: Benefit ratio (economics); yield data and correlation with meteorological data should be supplemented.*

Experiment 10 : **Management of *Alternaria solani* through seed treatment and foliar application of new fungicides (in tomato)**

Objective : (i) To determine the transmission of pathogen from seed to plant.
(ii) To determine the influence of fungicide application on the quality of harvested seeds and fruits.

Year of start : 2016 -17

Status : To be continued during 2017-18

Crop : Tomato

Pathogen : *Alternaria solani*

Centre : AAU, Anand; PAU, Ludhiana; SKUAST, Srinagar; MPKV, Rahuri and GBPUAT, Pantnagar

Methodology : 1. Basic seed dressing with Thiram and
2. Subsequent 2 or 3 foliar application of fungicides after first appearance of disease

Treatment: **Fungicide: 9+1, Replication: 3, Design: RBD**

T_1 - Carbendazim (25 %) + Mancozeb (50 %)
T_2 - Azoxystrobin (11 %) + Tebuconazole (18.3 %)
T_3 - Hexaconazole (4 %) + Zineb (68 %)
T_4 - Azoxystrobin (18.2 %) + Difenconazole (11.4 %)
T_5 - Trifloxysytrobin (25 %) + Tebuconazole (50 %)
T_6 - Metiram (55 %) + Pyraclostrobin (5 %)
T_7 - Famoxadone (16.6 %) + Cymoxanil (22.1 %)
T_8 - Pyraclostrobin
T_9 - Azoxystrobin
T_{10} - Untreated

Observation: Disease development; yield and impact on seed quality

Note: *Information on statistical data, Cost: Benefit ratio (economics); yield data and correlation with meteorological data should be supplemented. Selection of fungicides, dosages, application may be refined by AAU, Anand considering the crop label as per recommended and approved list and data sheet will be supplied among the centers.*

Experiment 11	**:**	**Impact of different storage conditions and longevity on seed associated pathogen of green gram / black gram**
Objective	**:**	i) To determine the extent of association of pathogen with freshly harvested seeds. ii) To determine the influence of fungicide treatment on development of pathogen and its impact on seed quality parameters under different storage conditions and periods
Year of start	**:**	2016
Status	**:**	To be continued during 2017-18
Crop	**:**	Green gram / Black gram
Source of seed		(i) Farmer (ii) Seed production / Research Fields
Pathogen	**:**	*Macrophomina phaseolina, Colletotrichum dematium*, *Cercospora* spp., *Fusarium* spp.
Centre	**:**	TNAU, Coimbatore, PAJANCOA&RI, Karaikal and MPKV, Rahuri

Storage container: (i) Gunny bags (ii) Poly lined gunny bags and (iii) Cloth bags

Methodology

- 1. Basic seed dressing with Thiram @ 0.25% (prior to storage);2. Subsequent storage in different containers; 3.Untreated seeds will serve as check.
- Freshly harvested seeds will initially be tested for extent of mycoflora and other seed quality parameters and designated as zero stage evaluation.
- Later at 30 day interval sample(s) will be withdrawn from the lot and tested for associated mycoflora by standard blotter method, determination for seed moisture by universal seed moisture meter, seed germination by standard paper towel method, seed emergence by GOT (in pots / trays filled with natural field soil /sterile soil), seedling vigour by standard method (root /shoot elongation technique).
- The investigation will be terminated when any of the sample exhibit the value of seed germination below the Indian Minimum Seed Certification Standard

Note: *Information on storage condition including temperature, moisture should be provided.*

Experiment 12	**:**	**Detection, location and transmission of seed borne *Macrophomina phaseolina* in sesame**
Objective	**:**	To determine the transmission of seed borne target pathogen
Year of start	**:**	2016
Crop	**:**	Sesame
Pathogen	**:**	*Macrophomina phaseolina*
Centre	**:**	TNAU, Coimbatore

Methodology

- **Source of seeds** – Sesame seeds of different varieties will be collected from farmers, seed production fields, processing plants at different locations.
- **Detection**– Association of *Macrophomina phaseolina* will be determined by employing standard techniques (visual inspection; examination on Diaphanoscope; standard blotter method, standard agar plate method, test tube water agar technique).
- **Investigation on location of the pathogen in seeds**– by standard seed component plating technique
- ***Transmission***

  (i) – Seed to plant transmission will be confirmed through standard paper towel method and subsequently by sowing the seeds with known infection, in sterile soil /sand and concurrent isolation and confirmation of the target pathogen from developing young plant(s);

  (ii) – Plant to seed transmission will be confirmed by (a) artificial inoculation of developing sesame pods and later extraction of seeds from maturing the pod, plating the seeds and confirmation of association (b) extraction of seeds from naturally infected pods and confirmation by plating , isolation of the fungus.

Experiment 13 : **Management of purple blotch / *Stemphylium* blight of onion through fungicide and plant based products**

Objective : To determine the influence of fungicide application on the quality of harvested seed and development of diseases.

Year of start : 2016

Status : To be continued during 2017-18

Crop : Onion

Pathogen : *Alternaria porri / Stemphylium vesicarium*

Centre : PAU, Ludhiana; SKUAST, Srinagar and MPKV, Rahuri

Methodology : (i) Basic seed dressing with Captan / Thiram

(ii) Subsequent 2 or 3 foliar applications after first appearance of disease at 10 days interval (iii) amended with sticker agent.

Treatment : Fungicide: 9+1, Replication: 3, Design: RBD

		Application combination	Periodicity
T_1	:	Seed Treatment with Captan / Thiram @ 3 g / kg seed + 4 spray of Mancozeb @ 0.3% + 0.11% Triton / Linseed oil as sticker	At 10 day interval after disease appearance
T_2	:	Seed Treatment with Captan / Thiram @ 3 g / kg seed + 4 spray of Copper oxy chloride @ 0.25 % + 0.11 % Triton / Linseed oil as sticker	At 10 day interval after disease appearance
T_3	:	Seed Treatment with Captan / Thiram@3 g / kg seed + 2 spray of Propiconazole @ 0.1% + 0.11 % Triton / Linseed oil as sticker	At 10 day interval after disease appearance
T_4	:	Seed Treatment with Captan / Thiram @ 3 g / kg seed +	At 10 day interval after

		2 spray of Hexaconazole @ 0.1% + 0.11 % Triton / Linseed oil as sticker	disease appearance
T_5	:	Seed Treatment with Captan / Thiram @ 3 g/ kg seed + 2 spray of Tebuconazole @ 0.1% + 0.11% Triton / Linseed oil as sticker	At 10 day interval after disease appearance
T_6	:	Seed Treatment with Captan / Thiram @ 3 g/ kg seed + 4 spray of crude leaf extract of *Azadirachta indica* @ 0.5% + 0.11% Triton / Linseed oil as sticker	At 10 day interval after disease appearance
T_7	:	Seed Treatment with Captan / Thiram @ 3 g / kg seed + *Lantana camara* @ 0.3 % + 0.11 % Triton / Linseed oil as sticker	At 10 day interval after disease appearance
T_8	:	Seed Treatment with Captan / Thiram @ 3 g/ kg seed + *Pongamia pinnata*@ 0.3 % + 0.11 % Triton / Linseed oil as sticker	At 10 day interval after disease appearance
T_9	:	Seed Treatment with Captan / Thiram @ 3 g / kg seed + 4 spray of Mancozeb @ 0.3 % + 0.11 % Triton / Linseed oil as sticker	At 10 day interval after disease appearance
T_{10}	:	Check (No spray)	-

Observation: Disease development; yield; impact on seed quality parameters including seed germination, emergence, vigour

Note: *Information on statistical data, Cost: Benefit ratio (economics); yield data and correlation with meteorological data should be supplemented. Selection of fungicides, dosages, application may be refined by PAU, Ludhiana considering the crop label as per recommended and approved list and data sheet will be supplied among the centers.*

Experiment 14 : Detection, location and transmission of seed borne *Alternaria sesami* in sesame

Objective : To determine the transmission of seed borne target pathogen

Year of start : 2016

Crop : Sesame

Pathogen : *Alternaria sesami*

Centre : ANGRAU, Hyderabad

Methodology

- ***Source of seeds:*** Sesame seeds will be collected from farmers, seed production fields, processing plants different locations, varieties.
- ***Detection***: Association of *Alternaria sesami* will be determined by employing standard techniques (visual inspection; examination on Diaphanoscope; standard blotter method, standard agar plate method, test tube water agar technique)
- ***Investigation on location of the pathogen in seeds***– by Standard seed component plating technique
- ***Transmission***

  (i) Seed to plant transmission will be confirmed through standard paper towel method and subsequently by sowing the seeds with known infection, in sterile soil /sand and

concurrent isolation and confirmation of the target pathogen from developing young plant(s);

(ii) Plant to seed transmission will be confirmed by (a) artificial inoculation of developing sesame pods and later extraction of seeds from maturing pod, plating the seeds and confirmation of association (b) extraction of seeds from naturally infected pods and confirmation by plating, isolation of the fungus.

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Seed Entomology

Chairman : **Dr. A. R. Naqvi**, Professor, Entomology, SKRAU, Bikaner
Convener : **Dr. Amit Bera,** Scientist (SS), ICAR-CRIJAF, Barrackpore

Recommendations:

1. Supplementary pollination using honey bees (4-7 no. 8 frame honey bee colonies/ha) could increase seed yield of berseem up to 66% over open pollinated crop.
2. Modified atmosphere storage at 50% CO_2 concentration could provide effective management of pulse beetle in red gram seeds up to 6-9 months of storage without affecting seed quality.

Experiment 1: Survey and evaluation of seed health status of farmers' saved seed with respect to insect infestation (to be combined with pathology / storage).

A known amount of the sample should be taken from pathology/physiology group for detecting insect damage in seed, type of insect infesting seed as being done earlier under the experiment. Farmer's practice to store/protect seed should also be recorded.

Objectives

- To know the type and level of infestation by insects under storage conditions.
- Impact of insect infestation on seed quality.
- Farmer's practice, if any, to store / protect seeds from insect damage.

Year of start: 2006

Centres: All NSP centers including voluntary centers will do the experiment.

Methodology

About 500 g of seeds of crop/ variety will be collected from farmers / seed producers before sowing on payment or gratis. Each centre should collect seed samples of three major crops of that area and minimum 100 samples from each crop should be collected. Samples should be collected following appropriate sampling procedure so that entire zone can be covered within 2-3 years. While collecting seed, a questionnaire will also be filled to know crop / variety, period and conditions of storage, treatments, if any, source of seed, if it is not farmers - saved one. The following observations are to be recorded.

1. Storage period
2. Seed moisture content (%)
3. Live insect, its species
4. Damage in 400 seeds including internal infestation
5. Germination (%)
6. Vigour test.

Experiment 2: Effect of carbon dioxide (CO_2) treatment on the control of storage insect pests and the seed quality attributes under ambient conditions.

Year of Modification: 2017

Objectives

- To assess the effect of carbon dioxide (CO_2) treatment on the mortality/survival of storage insect pest under ambient conditions.

- To monitor effect of carbon dioxide (CO_2) treatment on seed quality attributes particularly seed viability and vigour after 3, 6, 9 and 12 months of storage under carbon dioxide (CO_2) atmosphere.

Crops	Centre
Sorghum	TNAU, Coimbatore, (*Sitophilus sp.*)
Pearl millet	JAU, Jamnagar (*Rhyzopertha sp.*)

Treatment

A. Treatment

T_1 - Normal air treatment (untreated control)
T_2 - Carbon dioxide (CO_2) @ 30% of the volume
T_3 - Carbon dioxide (CO_2) @ 40% of the volume
T_4 - Carbon dioxide (CO_2) @ 50% of the volume

B. Exposure period (P) in months

P_1 - 03
P_2 - 06
P_3- 09
P_4 - 12

Replication: 3 **Design:** FCRD

Materials

1. 48 air tight plastic containers with provision for air/gas inlet/outlets.
2. Carbon dioxide (CO_2) gas cylinder with metering device.
3. CO_2 / O_2 measuring device.

Methods

Seed of a popular crop variety with high germination and free from insect infestation (fumigate prior to use to ensure complete kill of field infestation, if any) should be used in the experiment. Fabricate or purchase airtight plastic containers of 1 kg capacity with rubber septa on its lid to insert syringe to remove air and add (CO_2) in proportion to give-desired level of concentration in the containers by flushing method with an inlet and an outlet, which will be sealed after release of CO_2.

Fill 500 g of seed in each container and put 10 pairs of test insects few days (20days) prior to CO_2 treatment. To create a particular concentration (%, v/v) for each treatment, calculated volume of CO_2 is injected by opening the inlet for specified time. Turn the containers twice upside down to mix intra-granular gases with CO_2 thoroughly. After completion of treatment, check the concentration of CO_2 with the metering device. Also check the concentration periodically to confirm any leakage, if so, plug it. Normally, a properly airtight container retains desired concentration of the gas. The temperature and RH will be recorded on weekly basis.

Observations to be recorded at the end of each storage period

- Percent damaged seed (insect infestation).
- Germination of undamaged seed.
- Seed moisture content.
- Number of live/dead insects in the representative sample.

Experiment 3: Efficacy of insecticides and botanicals against storage insects of seeds and their influence on seed viability during storage under ambient conditions

Crop	Centre
Wheat	SKNAU, Durgapura; ICAR-IISS, Mau; NSRTC, Varanasi
Maize	TNAU, Coimbatore
Rice	OUAT, Bhubaneshwar; AAU, Jorhat; PJTSAU, Hyderabad; PAJANCOA&RI, Karaikal.
Pigeon pea	NDUAT, Faizabad; PDKV, Akola.
Cowpea	UAS, Bangalore.
Chick pea	PJTSAU, Hyderabad; JAU, Jamnagar.
Black gram	TNAU, Coimbatore; PAJANCOA&RI, Karaikal.
Field pea	CSAUAT, Kanpur

Objectives

- To evaluate insecticides/ botanicals against major storage insect-pests damaging seeds.
- Study of the storability of treated seeds.

Treatments

A. Insecticides/botanicals

1. Emamectin benzoate @ 2ppm (40 mg/kg of seed)
2. Deltamethrin @ 1ppm (0.04 ml/kg of seed)
3. NeemAzal 10000ppm @ 1.5ml/kg seed (=15 mg Azadirachtin/kg seed)
4. Karanj *(Pongamia pinnata)* oil @5ml/kg seed
5. Citronella oil @ 5 ml/kg of seed
6. *Acorus calamus* TNAU Formulation @10ml/kg of seed
7. Untreated control

B. Packaging Material: Gunny bag-lets of 2 kg capacity

Replications: 3 **Design:** CRD

Method

One kg of freshly harvested certified seed with very high percentage of germination and low moisture content (<10%) will be taken for each treatment. Required quantity of insecticides will be diluted in 5 ml water to treat 1 kg of seed for proper coating. Botanicals will be directly mixed with seed for coating. After drying in shade, seeds will be packed and kept in room under ambient temperature. The temperature and relative humidity of the room will be recorded on standard weekly basis.

Observations

Residual toxicity

Take out 100 g of treated seed, release 10 adult insects *Rhizopertha dominica / Callosobruchus chinensis* or important insects depending upon the crop and record mortality after 3,7 and 15 days and thereafter, every 3 months for a total period of 12 months or loss of germination below IMSCS, whichever is early.

Observation to be recorded

- Seed germination, seed moisture
- Insect infestation (% kernel damage and types of insect)
- Presence / Absence of insects (live and dead)

Experiment 4: Management of groundnut pod borer (*Caryedon serratus*) in groundnut pods

Objectives

1. To know the sources of infestation and alternate host plants existing in groundnut growing areas of different states.
2. Management by pod treatments with new insecticides molecules.

Centres: JAU, Jamnagar; PDKV, Akola; MPKV, Rahuri and PJTSAU, Hyderabad

Treatments

1. Emamectin benzoate (Proclaim 5 SG) @ 2ppm (40mg/kg of pod)
2. Spinosad (Tracer 45 SC)@2ppm (4.4mg/kg of pod)
3. Thiodicarb (Larvin 75 WP)@ 2ppm (2.7 mg/kg of pod)
4. Rynaxypyr (Coragen 20 SC) @2ppm (0.01 ml/kg of pod)
5. Profenofos (Curacron 50 EC) @2ppm (0.004 ml/kg of pod)
6. Novaluron (Rimon 10 EC)@ 5ppm (0.05 ml/kg of pod)
7. Deltamethrin 2.8EC @ 1ppm (0.04 ml/kg of pod)
8. Untreated control

Packaging material: Gunny baglets of 2 kg capacity

Replications: 3 **Design:** CRD

Methodology

- Survey the groundnut areas at the time of harvest by collecting the samples before storage in the godowns and observe for the emergence of adults.
- Collect and observe the plants that bear pods like tamarind etc. to find out the host plants that attract pod borer.
- One kg of freshly harvested certified pod with high percentage of germination and low moisture content (< 10%) will be taken for each treatment. Required quantity of pesticides will be diluted in 15ml water to treat 1 kg of pod for proper coating. After drying in shade, seeds will be packed and kept in room under ambient temperature. The temperature and relative humidity of the room will be recorded on standard weekly basis.

Observations

Residual toxicity

Take out 100 g of treated pod. Release 10 adult *Caryedon serratus* insects depending upon the crop and record mortality after 3, 7 and 15 days interval and thereafter, every 3 months for a total period of 12 months or loss of germination below IMSCS, whichever is early.

Observations to be recorded

1. Seed germination, seed moisture.
2. Insect infestation (% pod damage).
3. Presence/ Absence of insects (live and dead).

Experiment 5: Evaluation of pre-harvest spraying of insecticides for management of pulse beetle (*Callosobruchus* sp.)

Objective

- To evaluate efficacy of pre-harvest spray of insecticides for management of field infestation of pulse beetle.

Crop	Centre
Pigeon pea	UAS, Bangalore; PJTSAU, Hyderabad and PDKV, Akola
Green gram	OUAT, Bhubaneshwar and JAU, Jamnagar
Chickpea	MPKV, Rahuri; RAU, Durgapura and NDUA&T, Faizabad
Black gram	TNAU, Coimbatore; PAJANCOA, Karaikal and AAU, Jorhat

Treatments

A. Insecticides/Botanicals

1. Emamectin benzoate @0.3ml/L
2. Malathion dust @10kg/acre
3. Profenofos 50EC @1ml/L
4. Neemazal 10000ppm @1ml/L
5. Control

B. Spraying schedule

1. Spraying at 50% pod maturity
2. Spraying at maturity
3. Spraying at 50% pod maturity and maturity

Replication: 3 **Design:** Strip plot

Methodology

Seed crop should be grown with standard package of practices. For each treatment, plot size should be 5m x 3m. Harvest the crop leaving border rows. After threshing, seed should be kept in cloth bag ensuring protection from cross infestation during storage. Observations on adult emergence should be taken at 7 days interval up to two months.

Observation: No. of exit hole

Experiment 6: Effect of new packaging material (insecticide incorporated polypropylene bags - Zerofly) on storability of seed under ambient condition.

Objectives

- To study the effect of new packaging material (insecticide incorporated polypropylene bags) on storability of seed.
- To evaluate the effectiveness of new packaging material (insecticide incorporated polypropylene bags) against major storage insect-pests damaging seed.

Year of Start: 2015

Crop Centre

Crop	Centre
Paddy	OUA&T, Bhubaneswar; UAS, Bangalore and ICAR-IISS, Mau
Mungbean	OUA&T, Bhubaneswar and UAS, Bangalore
Sunflower	OUA&T, Bhubaneswar and UAS, Bangalore
Wheat	RAU, Durgapura and ICAR- IISS, Mau
Chickpea	RAU, Durgapura and ICAR- IISS, Mau

Treatments

A. Seed treatments

1. Treated with Emamectin benzoate @ 2 ppm (40 mg/kg of seed)
2. Untreated seed

B. Packaging material

1. Insecticide incorporated polypropylene storage bag
2. Untreated bag (same fabric i.e. PP Bag)
3. Gunny bag (control)

Replication: 3 **Design:** FCRD

Method

Required quantity of freshly harvested certified seed (Wheat, Rice - 10 Kg each; Chickpea, Sunflower, Green gram – 5 Kg each) with very high percentage of germination and low moisture content (<10%) will be taken for each treatment. Required quantity of pesticide will be diluted in 5 ml water to treat 1 kg of seed for proper coating. After drying in shade, seeds will be packed and kept in room under ambient temperature. Temperature and relative humidity of the room will be recorded weekly.

Observations

Every two months for a total period of 12 months or loss of germination below IMSCS whichever is early.

i. Seed germination.
ii. Seedling vigour.
iii. Seed moisture content.
iv. Natural insect infestation (% kernel damage and types of insect).
v. Presence / absence of insects (live and dead).

Proceedings of the meeting held at SKRAU, Bikaner on 23rdApril, 2017 to finalize technical programme of Seed Entomology for the year 2017-18.

Dr. Amit Bera, PI, Seed Entomology convened the session with a warm welcome to the Chairman, Dr. A. R. Naqvi, Professor, SKRAU, Bikaner. Dr.Arulprakash R., Asst. Prof., TNAU, Coimbatore acted as rapporteur. Ten seed entomologists from different centres participated in this session.

- Experiment No. 1 on "Studies on the effect of insecticidal seed treatment on seed viability during storage under ambient condition" will be concluded with the conclusion that Profenofos (50 EC) @2ppm (0.004ml/kg seed), Chlorfenapyr (10 EC)@2ppm (0.02ml/kg seed), Rynaxypyr (20 SC) @ 2ppm (0.01ml/kg seed) and Novaluron (10 EC) @ 5ppm (0.05ml/kg seed) were significantly better than control but were not as effective as recently recommended insecticides (Emamectin benzoate and Spinosad).
- Experiment No. 2 on 'Survey and evaluation of seed health status of farmers' saved seed' will be continued in its existing format. Survey should be done following proper sampling procedure. The data should also be sent to the PI, Seed Pathology.
- Experiment No. 3 on "Quality seed production through insect pollination" will be concluded with proposed recommendation for berseem crop.
- Experiment No. 4 on 'Effect of carbon dioxide (CO_2) treatment on the control of storage insect pests and the seed quality attributes under ambient conditions' will be continued in its existing format on sorghum seed. Experiment on red gram will be concluded with proposed recommendation. New crop pearl millet is allotted to JAU, Jamnagar centre.

- Experiment No. 5 on "Demonstration of efficacy of CO_2 treatment for management of insect pests of stored seeds in large capacity storage bin" will be concluded.
- Experiment No. 6 on "Efficacy of insecticides and botanicals against storage insects of seeds and their influence on seed viability during storage under ambient condition" will be continued in the existing format. PAJANCOA&RI, Karaikal centre will send karanj oil and TNAU, Coimbatore will send *Acorus calamus* formulation and citronella oil to all centres.
- Experiment No. 7on "Management of groundnut pod borer (*Caryedon serratus*) in groundnut pods" will be continued in existing format.
- Experiment No. 8 "Evaluation of pre-harvest spraying of insecticides for management of pulse beetle (*Callosobruchus* sp)" will be continued in existing format.
- In experiment No. 9 on "Effect of new packaging material (insecticide incorporated polypropylene bags - Zerofly) on storability of seed under ambient condition", no further set of treatments will be initiated. Recording of observation will be continued up to 12 months of storage on all treatments, which was initiated during 2016.

The session ended with thanks to the delegates.

List of Participants

S. No	Name	Designation	Address	Telephone No. & Email. address
1	Dr. U. K. Kadam	ASRO (Ent.)	MPKV, Rahuri	kadamuk2010@rediffmail.com 09273531557, 07588604246
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3	Dr. M.D. Khanpara	Research Scientist (Pearl Millet)	JAU, Jamnagar	rspearlmillet@jau.in 09429501621
4	Dr. D. Das	ASRO (Seed Ento.)	OUA&T, Bhubaneswar	dash_691961@yahoo.com 09437919435
5	Dr. R. B. Singh	ASRO, STR	NDUAT, Faizabad	rbsinghnduat@gmail.com 09415717971
6	Mr. B. V. Patoliya	ASRO, STR, NSP	JAU, Jamnagar	patoliyabv@jau.in 08238040604
7	Smt. A. Padmasri	Scientist, Entomology	PJTSAU, Hyderabad	padmasri_1972@rediffmail.com 09000791123
8	Dr.R. Arulprakash	Asstt. Prof. (Agri. Ento.)	TNAU, Coimbatore	avrarulprakash@gmail.com 09597481060

Session VI

General Discussion, Issues on Breeder Seed Production, AUCs/Finances and Monitoring Reports

Date : 24.04.2017 **Time : 09:00-10:30**

Chairman	:	**Dr. S.K. Rao, Former Director Research Services, JNKVV, Jabalpur**
Co-chairman	:	**Dr. D.K. Agarwal**, Director (Acting), IISS, Mau
Rapporteurs	:	**Dr. T.N. Tiwari**, Senior Scientist, ICAR-IISS, Mau
		Dr. (Mrs). Faseela Jafar, Assistant Prof., KAU, Thrissur

The centers opened the issues on non-lifting of breeder seed and Dr. D.K. Mishra, JNKVV, Jabalpur has suggested that state government may be contacted in this regard and seed may be disposed off locally if not lifted after cut off dates. The Chairman pointed out that proper planning is required to produce as per state and GoI indent and short fall or excess supply of seed may be avoided. Mechanism may be developed within the institution for smooth disposal of the seed.

Scientist from OUAT, Bhubaneshwar reported two indented varieties were not lifted in 2015-16 for which indent were received again in 2016-17. It was suggested by the chairman that Orissa State Seeds Corporation may be contacted by the Vice- Chancellor / University. Scientist from Pusa has informed that details of indenters were not communicated properly upon which Dr. D.K. Agarwal, Co-chairman has pointed out that address of indenter were asked from DAC&FW and provided to the centres.

Dr. L.V. Subba Rao, ICAR-IIRR, Hyderabad has suggested that modalities need to be workout clearly for advance payment of breeder seed. Mr. Chauhan from NSC, Jodhpur informed that breeder seeds are produced from breeder seed instead of nucleus seed. The Chairman suggested that in emergency cases breeder seed may be produced from breeder seed itself with necessary permission from concerned crop coordinators. The chairman suggested that funds are available under seed programme for maintenance breeding from DAC&FW.

Dr. D.K. Agarwal explained the position of budget and liabilities under BSP and STR and also expressed his displeasure in not providing the information timely. The chairman stressed that AUC should be submitted in time for further release of funds from ICAR. Dr. Megha Chandra Singh from NEH Region has requested to revalidate the funds released under non-recurring contingency during XII plan for 2017-18. Dr. D.K. Agarwal, Director, ICAR-IISS, Mau suggested to obtain a special permission from council by quoting genuine reasons. Further, he informed the house about the position of the budget provided by the council and ensured that funds will be released immediately after receiving from ICAR.

Dr. Sripathy insisted timely submission of AUC from SAU's. The Chairman pointed out that letter should be sent to the comptroller regarding release of the fund with a copy to nodal officer of the center. Scientist from ANGRAU requested budget for STR and the chairman suggested that proposal may be sent immediately for consideration of the same by the council. Scientist from the KAU, Thrissur asked for STR regular center being the only one center in Kerala state. The chairman suggested that the proposal will be considered while re-organization of the programme.

Dr. Somasundaram informed the house about the review of AICRP- NSP (Crops) by the Hon'ble DDG (CS), ICAR. He requested to provide details of staff working in BSP and STR and status of fund utilization in the format which will be sent to each center very soon. He also informed that vacant position should not be filled in any cadre because the funds will be released only against filled posts as per the direction of the council. Dr. Sripathy informed that monitoring reports does not indicate the actual fact regarding the center. The chairman pointed out that monitoring team should evaluate the weaknesses and strength of each center. Dr. Karuna Vishunawat suggested while evaluation marks to be given for each activities separately by individual members of team.

On concluding remark, the chairman pointed out that non-lifting of breeder seed is pyramiding issue and mechanism should be developed in each center for its disposal. The committed seed quantity should be supplied by the producer and maintenance breeding programme to be displayed to the monitoring team while evaluating the breeder seed plot. He also suggested to ensure breeder seed tag and related documents while lifting breeder seed.

The session ended with thanks to the delegates.

Session VII
Plenary Session

Date : 24.04.2017 **Time : 10:45-13:30**

Chief Guest	:	**Dr. B.R. Chhipa**, Vice Chancellor, SKRAU, Bikaner
Chairman	:	**Dr. S.K. Rao**, Ex-Director Research Services, JNKVV, Jabalpur
Co-chairman	:	**Dr. D.K. Agarwal**, Director (Acting), ICAR-IISS, Mau
Rapporteurs	:	**Dr. I. Meghachandra Singh**, PS, ICAR RC NEH, Manipur
		Dr. R.S. Shukla, PS, JNKVV, Jabalpur

The house felicitated ten superannuating scientists; Dr. S.K. Rao, Dr. V. Devdas, Dr. O.S. Dahiya, Dr. P.C. Nautiyal, Dr. D.K. Mishra, Dr. A.K. Karg, Dr. Rame Gowda, Dr. G. Reddy, Dr. G. Singh and Dr. J.K. Sharma for their priceless contributions rendered towards AICRP-NSP (Crops).

The recommendations of all the technical sessions and technical programme for year 2017-18 were presented, discussed and finalized. Proceedings of session I (inaugural session) was presented by Dr. S.K. Yadav, Principal Scientist, ICAR-IARI, New Delhi. Similarly, proceedings of all technical sessions were presented by concerned rapporteurs. Technical programme for 2017-18 for Seed Production and Certification was presented by Dr. L.V. Subbarao, Principal Scientist & PI (SPC), ICAR-IIRR, Hyderabad; Seed Storage and Physiology by Dr. P.C. Nautiyal, Principal Scientist & PI (Seed Physiology), ICAR-IARI, New Delhi; Seed Entomology by Dr. Amit Bera, Scientist & PI (Seed Entomology), ICAR-CRIJAF, Barrackpore; Seed Pathology by Dr. M.S. Bhale, Professor & PI (Seed Pathology), JNKVV, Jabalpur and Seed Processing by Dr. Sripathy K.V., Scientist, ICAR-IISS, Mau. During 2017-18, house decided to merge seed processing experiments with the seed production and certification. The Chairman concluded the session with the following remarks.

1. All AICRPs PIs should participate in future NSP Annual Group Meetings.
2. Private parties, students and farmers representatives should be invited in future AGMs.
3. Researchable issues in seed science and technology to be brought out by arranging brain storming session in AGM.
4. Seed quality enhancement through treatments to reach out to the Farmers of North East India.

The plenary session of 32nd Annual Group Meeting of AICRP- National Seed Project (Crops) 2017 ended with vote of thanks by Dr. Dinesh K. Agarwal, Director (Acting), ICAR-IISS, Mau and Dr. R.D. Jat, Associate Director of Research (Seed), SKRAU, Bikaner.

Constitution of Monitoring Teams for 2017-18

***Kharif* season: Sept. / Oct. 2017; Rabi season: Feb. / Mar. 2018**

Zone / NSP centres	Name/ Address/ Convener & Member		Email	Mobile No.
Northern Zone: Group I SKUA&T, Srinagar; SKUA&T, Jammu; HPKV, Palampur; PAU, Ludhiana	Dr. Laxmikant, VPKAS, Almora	Convener	lkant_vpkas@yahoo.com	09412044391
	Dr. V.P.S. Sangwan, CCSHAU, Hisar	Member	vpsangwan@hau.ernet.in	09416796346
	Dr. S.K. Lal, IARI, New Delhi	Member	skl_nsp@yahoo.com	09811048932
Northern Zone: Group II HAU, Hisar; GBPUAT, Pantnagar; IIWBR, Karnal; VPKAS, Almora; DSST,IARI, Delhi/ Karnal; SVBPUA&T, Meerut; IIMR, Delhi	Dr. P.N. Sharma, HPKVV, Palampur	Convener	pns1960@gmail.com	09418161835
	Dr. G.K. Koutu, JNKVV, Jabalpur	Member	gk_koutu@yahoo.co.in	09424676726
	Dr. A.L. Jatav, CSAUAT, Kanpur	Member	aljatav@rediffmail.com	09452527898
Western Zone I SKRAU, Bikaner / CAZRI, Jodhpur; IGFRI, Jhansi; ARS, Jaipur; DRMR, Bharatpur	Dr. Venkatesh Bhat, IIMR, Hyderabad	Convener	bhatv@millets.res.in	09440644040
	Dr. R.G. Parmar, AAU, Anand	Member	rgparmar@aau.in	09638034617
	Dr. K.M. Boraiah, IISS, Mau	Member	bors_km@yahoo.co.in	08005258190
Western Zone II JAU, Junagadh /Jamnagar; DGR, Junagarh; AAU, Anand; SDAU, SK Nagar; AU, Kota; NAU, Navasari	Dr. S.K. Yadav, IARI, New Delhi	Convener	skysst@gmail.com	09868273684
	Dr. N.K. Gupta, SKNAU, Durgapura	Member	nkgupta69@yahoo.co.in	09460987039
	Dr. Bhojaraja Naik K., IISS, Mau	Member	bharana.naik@gmail.com	09452559649
Eastern Zone: Group I NDUAT, Faizabad; IISR, Lucknow; CSAUAT, Kanpur / IIPR, Kanpur; BHU, Varanasi; IISS, Mau	Dr. Rakesh Seth, IARI RS Karnal	Convener	rseth101@gmail.com	09896096296
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	Dr. Ravi Kant, RAU, Pusa	Member	ravikantrau@gmail.com	09234577183
Eastern Zone: Group II RPCAU, Pusa; BAU, Sabour, BAU, Ranchi; CRIJAF, Barrackpore; BCKV, Nadia	Dr. P.K. Katiyar, IIPR, Kanpur	Convener	goldikatiyar@yahoo.com	09005688164
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Central Zone I IISR, Indore, PDKV, Akola; MAU, Parbhani; MPKV, Rahuri, VSI, Pune; KKV, Dapoli	Dr. T. Pradeep, PJTSAU, Hyderabad	Convener	srtcpjtsau@gmail.com	08008333783
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Central Zone II JNKVV, Jabalpur; CICR, Nagpur; IGKVV Raipur; OUAT, Bhubaneswar; NRRI, Cuttack	Dr. Vijay Shelar, MPKV, Rahuri	Convener	vijayrshelar@yahoo.co.in	07588604252
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Southern Zone I ICAR-CCARI, Goa; UAS, Dharwad/ Raichur; PJTSAU, IIRR, IIMR, IIOR, Hyderabad;	Dr. Narayankutty, KAU, Pattambi	Convener	rarsptb@kau.in	09447624591
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	Dr. Sripathy K.V., IISS, Mau	Member	kudekallu2@gmail.com	08005202449
Southern Zone II UAS, Bangalore; TNAU, Coimbatore; PAJANCOA & RI, Karaikal and KAU, Thrissur / Pattambi	Dr. Basave Gowda, UAS, Raichur	Convener	so.seeduasr@gmail.com	09480696343
	Dr. K. Kanaka Durga, PJTSAU, Hyderabad	Member	kanakakilaru@yahoo.com	09246243226
	Dr. T.R. Shashidhar, UAS, Dharwad	Member	shashidhartr@uasd.in	09448497366
	Dr. Ramesh K.V., IISS, Mau	Member	rameshiari@gmail.com	08005202098

Address and Details of Principal Investigators of AICRP-NSP (Crops)

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Seed Pathology **Dr. M.S. Bhale** Professor, Dept. of Plant Breeding & Genetics, JNKVV, Jabalpur, 482004 MP E-mail: mohanbhale@yahoo.co.in	0761-2681021	09993211413	0761-2681021 / 2681706
Seed Entomology **Dr. Amit bera** Scientist, CRIJAF, Barrackpore 743 101 Email: amitbera.iari@gmail.com	0343-2512255	09732709874	0343-2512255

Calendar of Events

S. No.	Event	Last date for completion of action	
Calendar of Events for Breeder Seed Production		***Kharif***	***Rabi***
1.	Placement of breeder seed indents to Director of Agriculture by the State Government & State Public Seed Producing Agencies.	15th December of previous year	31st May of year
2.	Submission of indents to DoAC&FW & SAU's	15th January	15th June
3.	Communication of indents by DoAC&FW to ICAR Headquarters.	28th February	15th July
4.	Communication of Breeder Seed Production Plan in BSP-1 by Project Coordinator (Crop) to DoAC&FW and ADG (Seed), ICAR	15th may	15th October
5.	Communication of the BSP-2 by the concerned Breeder to DoAC&FW and ADG (Seed), ICAR	After 15 days of the actual planting	After 15 days of the actual planting
6.	Communication of the BSP-3 by the concerned breeder to DoAC&FW and ADG (Seed), ICAR	After 15 days of actual inspection by the Joint Monitoring team	After 15 days of actual inspection by the Joint Monitoring team
7.	Communication of the final production figures of breeder seed by the ICAR in BSP-4 to DoAC&FW	15th February	15th July
8.	Communication of the Allocation of Breeder seed by DoAC&FW to Director of Agriculture and concerned indentors	31st March	15th September
9.	Lifting of Breeder Seed Production by indenters	30th May	30th October
10.	Communication of the lifting details of breeder seed against the GOI allotment to DoAC&FW by states and other agencies	After 15 days of the cut-off-date	After 15 days of the cut-off-date
11.	Submission of Breeder Seed Production activity to ICAR-IISS, Mau	30th June	30th January

12.	Monitoring of Breeder Seed Production by ICAR-IISS team	Month of Sept. / Oct.	Month of Feb. / Mar.
13.	Submission of Monitoring Team Report to ICAR-IISS, Mau	31st March	
14.	Communication of yearly Breeder Seed Production status to ICAR-IISS, Mau (production, shortfall / mismatch & non-lifting)	30th December	
15.	Annual Breeder Seed Review Meeting by ICAR Seed Division	3rd week of January	
Calendar of Events for Seed Technology Research Experiments under AICRP-NSP (Crops)			
1.	Communication of technical programme for STR experiment to centres	15th May	
2.	Submission of status report of experiments	15th of August	15th of December
3.	Monitoring status of experiments by ICAR-IISS team	Month of Sept. / Oct.	Month of Feb. / Mar.
4.	Submission of yearly experimental results to PI's and ICAR-IISS, Mau	30th December	
5.	Submission of Monitoring Team Report to ICAR-IISS, Mau	First week of March	
6.	Annual Group Meeting of AICRP-NSP (Crops)	2nd or 3rd week of April	

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