



Theme 3: Maintenance breeding, seed research and quality seed production

3.1 Project Name: ICAR Seed Project Seed Production in Agricultural Crops

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Importance of the study: Supply of quality seed is essential to popularize varieties. The project thus aims to produce sufficient quantity of breeder seeds, foundation seeds, certified seeds and TFL seeds of released,

notified crop varieties of cotton as well as other major crops popular in the region.

Salient findings

A total of 156.48 q seeds was produced which includes breeder seed & truthfully labeled seeds of cotton varieties (*tetraploid* and *diploid*), certified seeds of wheat cv. HD 2967, certified seeds of Gram cv. Jaki 9218, certified seeds of Redgram cv. BSMR-736 and foundation seeds of Linseed cv. NL 260 (Table 3.1.1).

Table 3.1.1: Seed production of cotton and other crop varieties

Crop	Variety	Stage	Seed Yield (q)
Cotton	Non Bt Varieties - Parents of CICR-2 hybrid, CISA310 (<i>G.arboreum</i>) and CSH3075, CSH 2931 (<i>G.hirsutum</i>)	Breeder Seed	7.45
	Bt Varieties namely, ICAR-CICR Suraj Bt, ICAR-CICR PKV-081 Bt, ICAR-CICR PKV Rajat Bt and ICAR-CICR GJHV 374 Bt	Truthfully labeled seeds	5.87
	Stock seed - 89 popular cotton varieties (<i>G. hirsutum</i> , <i>G. arboreum</i> & <i>G. barbadense</i>)	Truthfully labeled seeds	1.0
	Non Bt varieties released from ICAR-CICR namely, Suraj, Surabhi, CNA 1003 and CNA 1028	Truthfully labeled seeds	6.16
Other Crops			
Wheat	HD 2967	Certified seeds	58
Red gram	BSMR-736	Certified seeds	48.12
Gram	Jaki 9218	Certified seeds	28.40
Linseed	NL 260	Certified seeds	1.48

Study on effect of foliar supplements in enhancing seed yield: An experiment on application of various foliar supplements was taken up in the breeder seed production field of ICAR-CICR for the Suraj variety in RBD design. The data analysis revealed significant difference among the treatments. The boll number per plot was highest for neem kernel foliar treatment (1525 bolls) followed by RPP supplemented with KNO₃ (1460). The boll

weight was maximum for mepiquat chloride treatment (4.72g) followed by RPP supplemented with KNO₃ (4.60g) and micronutrient treatment (4.58g). The seed cotton yield and final delinted seed recovery was also highest for neem kernel extract spray followed by micronutrient and RPP supplemented with KNO₃ (Table 3.1.2). There was no significant difference for seed index among the treatments.

Table 3.1.2 Effect of foliar supplements on economic traits of *G. hirsutum* Cv Suraj

Treatments	Boll Numbers per plot (area of 21.6m ²)	Boll Weight (g)	Seed Cotton Yield (Kg/ plot area of 21.6m ²)	Final Seed Yield (Kg/ plot area of 21.6m ²)
Recommended Package of Practice (RPP)	1285	4.15	4.41	1.65
RPP + KNO ₃	1460	4.6	5.14	1.97
RPP+DAP+KNO ₃	1290	4.33	4.71	1.79
RPP+DAP	1377	4.23	4.95	1.95



Mepiquat Chloride	1337	4.72	5.18	1.82
Micronutrients	1399	4.58	5.25	1.97
Neem kernel extract	1525	4.31	5.40	2.06
Cow Urine	1411	4.33	5.16	1.72
Water treated Control	1249	4.22	4.69	1.18
SEm±	49.6	0.11	0.18	0.07
CV (%)	6.3	4.23	6.36	7.10
CD (0.05)	148.6	0.32	0.55	0.22

3.2 Project Name: Seed characterization based on protein quantification and profiling in Cotton

Dr. V. Santhy (PI), Co-PI- Dr. Pooja Verma

Importance of the study: Seed protein characterization helps in identification of hybrids and genetic purity analysis, diversity analysis of germplasm accessions, and can be used as a genetic marker for seed vigor and viability analysis.

Salient findings

The SDS-PAGE (15%) profiling of tris soluble protein fraction extracted from seeds of four ICAR-CICR released hybrids and their parents was performed. There was no conspicuous difference for the profile among the set of hybrids studied except for parents of CICR-2 F1 hybrid. The female and male parent of CICR-2 F1 hybrid differed with respect to the presence and absence of 29 kDa fragment respectively. However, the hybrid profile was similar to that of the female parent. The artificially aged (40° C and 100% RH) seeds along with their fresh counterparts were characterized for seed protein content by Bradford method in 15 varieties. The protein content significantly reduced as seed viability decreased in all the varieties. The comparison of tris soluble seed protein content among four cultivated species revealed *G. hirsutum* varieties to have relatively higher protein content (45 - 50 µg/g seed) than varieties of *G. barbadense*,

G. arboreum and *G. herbaceum* (20-30 µg/g seed).

3.3 Project Name: Strategies to augment quality and storability of cotton seed under different environmental conditions

Dr. Sunil S. Mahajan, (PI); Co-PIs- Dr. V. Santhy, Dr. PR Vijayakumari

Importance of the study: Scientific storage is an essential component for small holder farmers, researchers, gene bank holders and commercial seed industry to supply quality seed. The knowledge of cotton seed storability is essential to avoid loss of valuable genetic stocks, unsold commercial seed stocks, carry over seed stock and unused breeding cultures to be sown in subsequent sowing season.

Salient findings

Freshly harvested seeds (*kharif* 2019) were stored in different packaging materials, different storage conditions and modified gas atmosphere. The results indicated that, after one year of storage, the per cent seed germination of *G. arboreum* was higher than the *G. hirsutum*. Overall, higher seed germination was maintained in cold storage as compared to ambient storage. Seed stored in modified atmospheric gaseous condition or vacuum container exhibited higher seed germination as compared to their non vacuum counter parts. Seed stored in air tight container containing zeolite

beads showed higher seed germination as compared to without zeolite beads.

3.4 Project Name: Implementation of PVP legislation and DUS testing of cotton under ICAR and SAU system

Dr.K.Rathinavel (PI); Co-PI- Dr.V.Santhy

Importance of the study: The project is a centrally sponsored and funded by PPV &FRA with an objective to establish and maintain database of extant cotton varieties, conduct DUS test of new candidate, varieties of common knowledge, farmers varieties and essentially derived varieties, maintenance breeding of reference cotton varieties, morphological characterization of extant cotton varieties and also Registration of extant cotton varieties under this act.

Salient findings

Distinctiveness Uniformity and Stability (DUS) testing of cotton genotypes was done at ICAR-CICR Regional Station, Coimbatore; ICAR- CICR, Nagpur; NSP Unit, UAS Dharwad; Department of Cotton CCSHAU, Hisar; RRS, PAU, Bathinda and Department of Cotton, MPKV, Rahuri. The data base on extant and notified cotton varieties has been updated. Data base of registered tetraploid and diploid cotton varieties was acquired from PPV&FRA, New Delhi. Maintenance breeding and characterization also performed for 186 extant cotton varieties viz. 141 of *G. hirsutum*, 35 of *G. arboreum*, 3 of *G. herbaceum* and 7 of *G. barbadense*. Monitoring of DUS trials at the participating centers have been done through online meetings.

3.5 Project Name: National Seed Project (Crops)

Dr.K.Rathinavel (PI);

Co-PI- Dr.P.R.Vijayakumari

Importance of the study: This project envisages to study the planting values of seeds to examine the prescribed periods of validity of fresh and revalidated certified

seed lots of some major field crops. The project also aims at development of priming technologies for enhanced planting value of seed under sub-optimal conditions in field crops

Salient findings

Validity periods of certified seeds of field crops (as per IMSC regulations) have been assessed for fresh and revalidated seed lots of cotton. Fresh seed lots of NH 615 and Roja (CNA1003) varieties were assessed for initial viability and moisture content. They were stored in polythene bag and gunny bag under ambient condition. Bimonthly observations on seed moisture content (ISTA), Germination % (ISTA), Vigor index-I & II (Abdul Baki and Anderson, 1973) and dry matter production of seedlings revealed that the performance of seed lots are well above the minimum seed certification standards. Seeds of NH 615 maintained germination above IMSC regulations beyond 15 months of ambient storage.

An experiment was conducted on priming technologies for enhanced planting value of seeds under sub-optimal conditions using two cotton varieties Surabhi (V₁) and Suraj (V₂) with old (L₁-2018-19) and fresh (L₂ - 2019-20) seed lots. Following treatments were imposed under lab conditions. T₁- Control, T₂- Hydro-priming (12h @ 25°C), T₃- Seed coating with *Trichoderma harzianum* (15g/kg), T₄- Seed coating (on hydro primed seeds) with Biophos, T₅- Seed coating (on hydro primed seeds) with DAB + BioNPK, T₆- Halo-priming with KH₂PO₄ @ 0.5% and T₇- Halo-priming with KNO₃ @0.3%. Results revealed that seed soaking in KH₂PO₄ @ 0.5%, Seed coating with Biophos, *T. harzianum*, drought alleviating bacteria + BioNPK have enhanced the quality in both varieties. The quality enhancement was more prominent in aged seed lots.