Sr. No.	Cross	SIET Raipur	Dhamtari (Irrigated)		Bemetara (Rainfed)		Raipur, PMBB (Irrigated)	
			Yield Kg/ha.					
		Yield Kg/ha.	R1	R2	R1	R2	R1	R2
DH-16-4	S17 X RPBIO (1246)	3642	4750	4250	2113	2845	6904	4035
DH-16-6	S17 X RPBIO (235)		4900	1950	3092	2030	5331	5331
DH-16-3	S17 X IR64 (600)	3547.8	5150	4100	1635	2757	4432	4672
DH-16-13	Check Swarna		6100	6150	265	0	5884	5620
DH-16-5	S17 X RPBIO (1353)	5095.4	3700	5550	0	0	6002	6505
DH-16-16	Check Safri 17		5150	5300	0	0	5264	5300
DH-16-10	S17 X IR64 (203)		3850	3850	1674	2203	4007	3606
DH-16-7	S17 X RPBIO (112A)		1050	600	3165	2578	4570	4494
DH-16-14	Check MTU1010		3950	3950	2145	850	3350	3356
DH-16-12	S17 X IR64 (185)		1300	3550	1965	1835	3550	3780
DH-16-8	S17 X IR64 (78)		450	3000	3052	2375	2437	2818
DH-16-9	S17 X PB3 (717)		1100	1450	2068	2558	2982	3250
DH-16-2	S17 X PR122 (150)	3477.7	400	650	1097	2155	3846	3960
DH-16-1	S17 X RYT3275, 185	3491.5	750	750	947	1497	3904	4300
DH-16-11	S17 X IR64 (114)		1450	300	2530	2038	1840	2850
DH-16-15	Check Danteshwari		1150	1150	785	657	2406	2904

DH - MLT Data

Yield and Stability Index

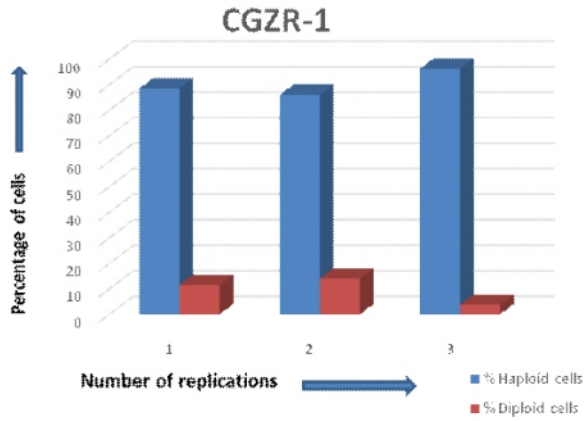
Overall	Irrigated	Rainfed
20.10137	13.68388	6.417485
16.54583	9.623156	6.922671
13.86412	9.600983	4.263134
11.48351	23.22848	-11.745
8.093024	20.84082	-12.7478
3.951067	16.69886	-12.7478
3.652127	1.416349	2.235778
3.398545	-5.95176	9.350308
-2.22846	-0.9349	-1.29357
-2.97803	-4.87029	1.892269
-6.19707	-14.3228	8.125732
-7.99408	-13.1145	5.120464
-11.2532	-11.117	-0.13618
-12.0962	-8.80911	-3.28705
-14.6195	-19.4469	4.827327
-23.7108	-16.5129	-7.19785

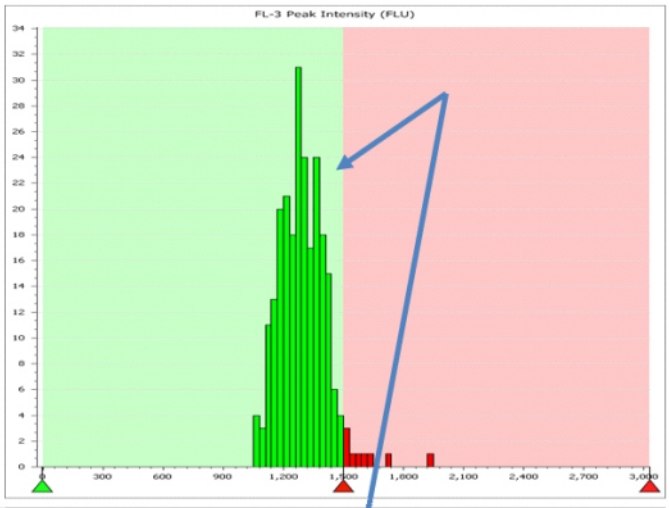
MLT of 13 different DH lines

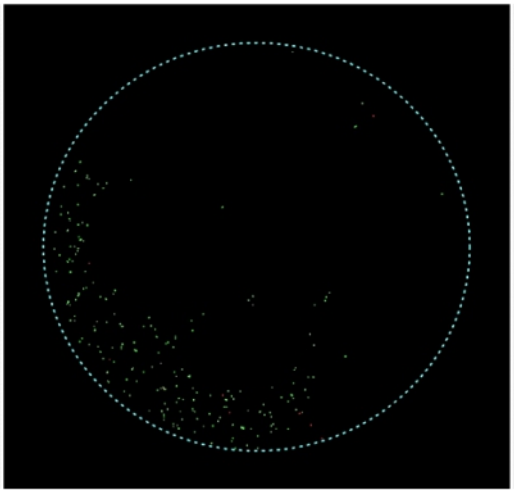
****DH line were developed, Screened and MLT performed within one year time this**

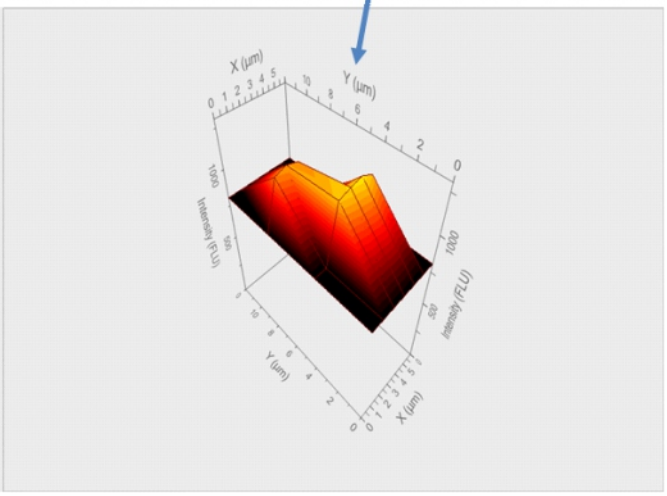
DH-16-4 is performing better than Swarna as analyzed by stability index calculations.

Out of 275 lines of 7 different –crosses , 13 lines were selected for MLT at 4 locations(Bemetara, Raipur, Dhamtari and SIET Raipur) – 2 Years







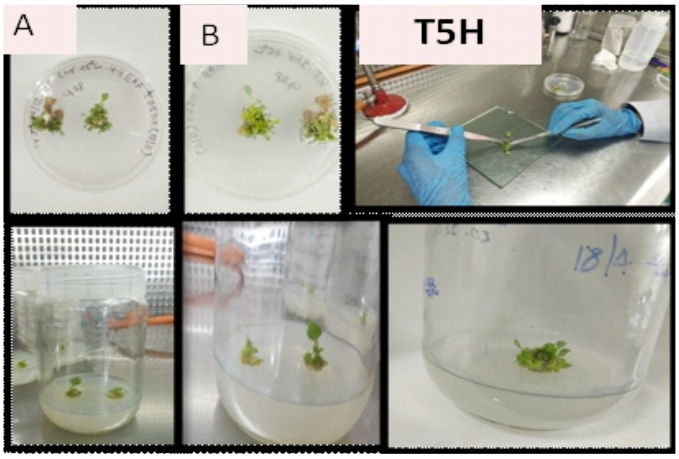


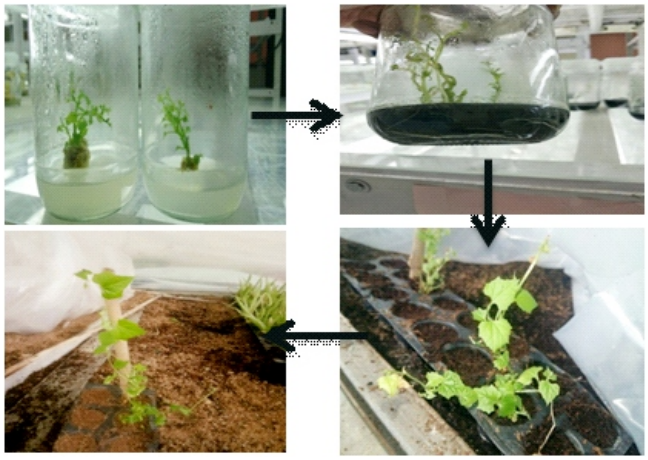
Tissue Culture

1. Initiated for Brinjal Dihaploid production

No of sub cultures:1
Day taken for initiation: 16 days
No of shoot initials: 23

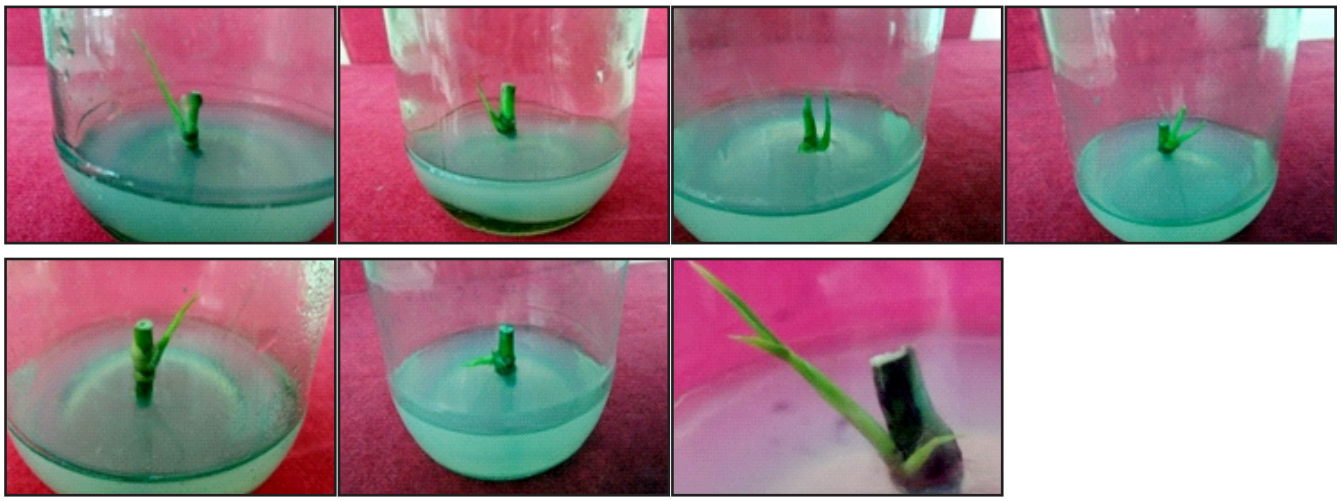
2. Tissue Culture (Kakoda)





Variety Indira kankoda , RMD 15-3

TC protocol standardized for both male and female plants

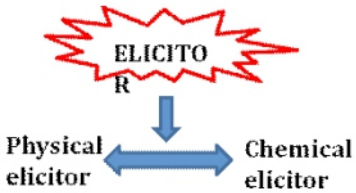


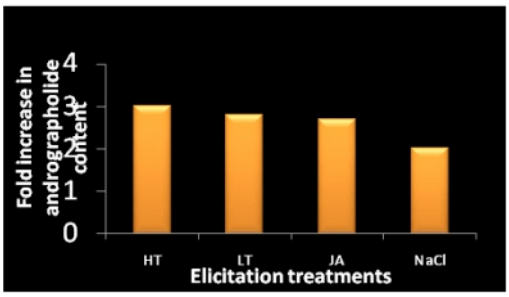
Tissue Culture Bamboo:

B. nutans, Dendrocalamus strictus, B. Balccoa

PMBB 15"Production of andrographolide from hairy root cultures of *Andrographis paniculata*"

Elicitation of andrographolide in hairy root cultures and its estimation using HPLC





High temperature (^{0}C)	Low temperature (^{0}C)	Jasmonic acid (µM)	Sodium chloride (mM)
25 35 40 45 50	25 0 -20	**75** **100** **125**	50 70 90
Akula ramakrishna *et al.* 2011, Julia *et al.* 2012	Akula ramakrishna *et al.* 2011	**Zenu Jha and Nile Smita 2013**	Herman A. *et al.* 2016

- Elicitation with different temperatures, chemicals and physical method led to increase in the secondary metabolite concentration.
- Higher temperature increased the secondary metabolite concentration by 3 fold.

Identification of Functional Markers for Grain Aroma and Yield PMBB 17

Total 14 regions of Aroma gene was sequenced in 4 genotypes

Name of Gene segment	Segment amplified	Reference	
INS3	E13	Designed by us	
DEL8	E7	Vanavichit et al.2008	
BADH 1	5'U-12	Kovach et al.2009	
BADH 2	I2-E3	Kovach et al.2009	
BADH 3	E3-E4	Kovach et al.2009	
BADH 4	E4-E5	Kovach et al.2009	
BADH 5	E5-I6	Kovach et al.2009	
BADH 6	E7-E8	Vanavichit et al.2008	
BADH 7	E8-E9	Vanavichit et al.2008	
BADH 8	E9-E10	Vanavichit et al.2008	
BADH 9	E10-I13	Vanavichit et al.2008	
BADH 10	E14-3'U	Vanavichit et al.2008	
BADH 11	I11-E12	Designed by us	
BADH 12	E13-E14	Designed by us	

S.N.	Genotypes Used
1	Basmati 370
2	Lohandi
3	Dubraj Selection 1

Sequence of BADH2 genes (>8 Kb long Aromatic rice genotypes of C.G.

>Contig-1 From Exon 7 Genotype- Lohandi
GTGATTTGATAACTGGAGGCAGGTCCTGTTGCCCTT
GCTGTTGCAGCTGTGGCTCGCTGCCTGCACTGCAG
TGACGCTGACGCCCTCTCCCTCCCCGCAAGCACTGT
GCTCCAAAGATGACTGGCCTTGCTGCTGCTCCTCCA
TCGGTAGCAGCACACTATTCCTACGAGCATCTCTAGT
AGCCTATCCACATACCAGGGTTTTTTAAACCGTCGG
TACCGGGGTTACCGCGCTCCGGCGGTAAGCACGGT
TCCCGCGGTAACCACGGTAATTGTAAAAAATCATGC
AAAATTTATCAAAAATTTAAATTATTTTTTAAATTTAA
GGAGGTTACCGCGGTATTTATATTACCTTATCCCCGC
GGTAAGCCCGATAACCGTGGTAACCGCGCGGTTAC
CGGCGGTAAGGGAAACCCTGCCACATACTACTCTAC
CCTGCCACATACTACTCTACGCCAAAATTTTAGTAAC
AATTATAGCAAAGAAAAATCTCACTCTAGTACACTCT
CCAACTGGATGGCCATGCCATCTAGCTGGCC

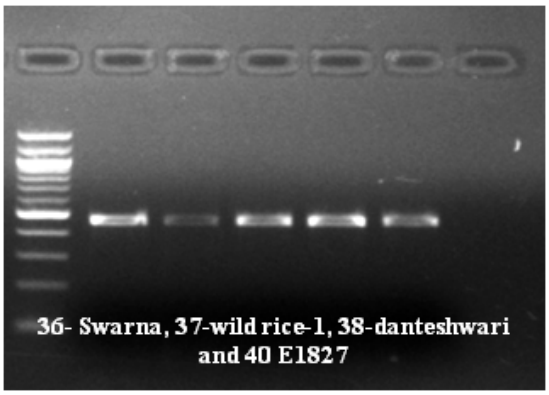
Variation in DNA sequence was observed in selected aromatic rice genotypes in all 14 regions of gene.

Allele Mining for known yield related major effect QTLs in rice using Functional DNA markers"

Allele Mining of 9 yield related genes in 17 contrasting rice genotypes using Amplicon DNA sequencing

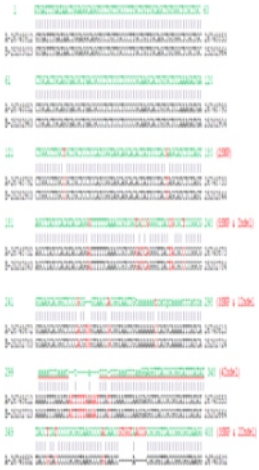
	QTLs/Gene	Trait	Line no.	Phenotypic measurement
1	GS5	Grain Size	E1703, E1827, E2010,E2312, E2367, M4628, E1857, E2526, M114, M184, M1051, M1433, M 2260, 2298,M2463,	GL-8.79mm/8.7mm and GW-2.7mm
2	GW2	Grain width and weight	E2367, M2298	2.9mm/ 2.8mm 25.17gm 23.85gm
3	Gn1a	Grain number	E1703, E1827 and Present in all the lines except wild accessions and six donors	106-120 grains
4	qLSCHLs4	Flag leaf length, spike number	E1703	1.5-2.3cm

Gene - SPL14 (Panicle branching and grain no./panicle)
Cultivar – E1702
Chromosome - 8
Product - 538bp
Marker – SPL14-F1-R1
Refernance sequence - A- Shuhui498 and B- Nipponbare



Sequence variation was obtained in all accessions of Chhattisgarh.

- **Superior alleles were identifies.**
- **Sequences were submitted to NCBI**



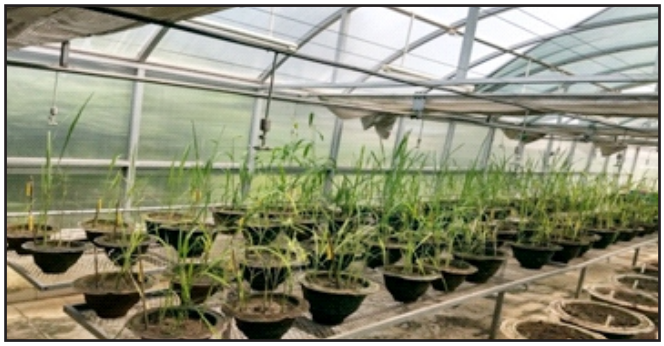
Primers were designed for all Candidate SNPs and Indels for validation into mapping population.

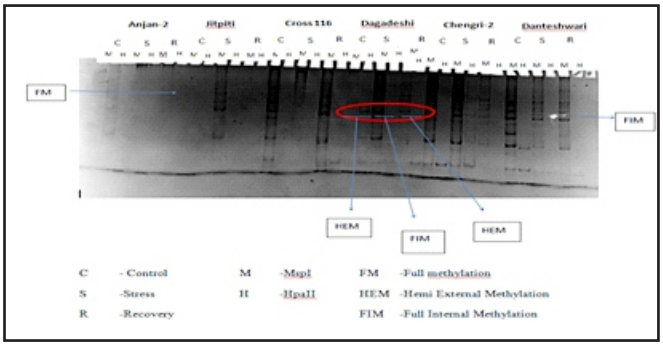
Identified of Alleles of yield related genes in Local Germplasm lines to be used for Functional Marker Based Screening of Germplasm

RPF-28 - High-throughput Genome wide profiling of DNA methylation to unveil the regulatory mechanism of drought tolerance in rice

18 selected drought tolerant and susceptible Rice genotypes

1.	Anjan 2	10.	Bhataphool
2.	Jitpiti	11.	Bhatajhooli
3.	Cross 116	12.	Deshi-Lal-Dhan
4.	Dagadeshi	13.	Safri-17
5.	Chengri-2	14.	Swarna
6.	Danteshwari	15.	Vandana
7.	Oryza officinalis	16.	IR-64
8.	Abhya	17.	Chaptigurumatiya
9.	Laloo -14	18.	Shabhagidhan

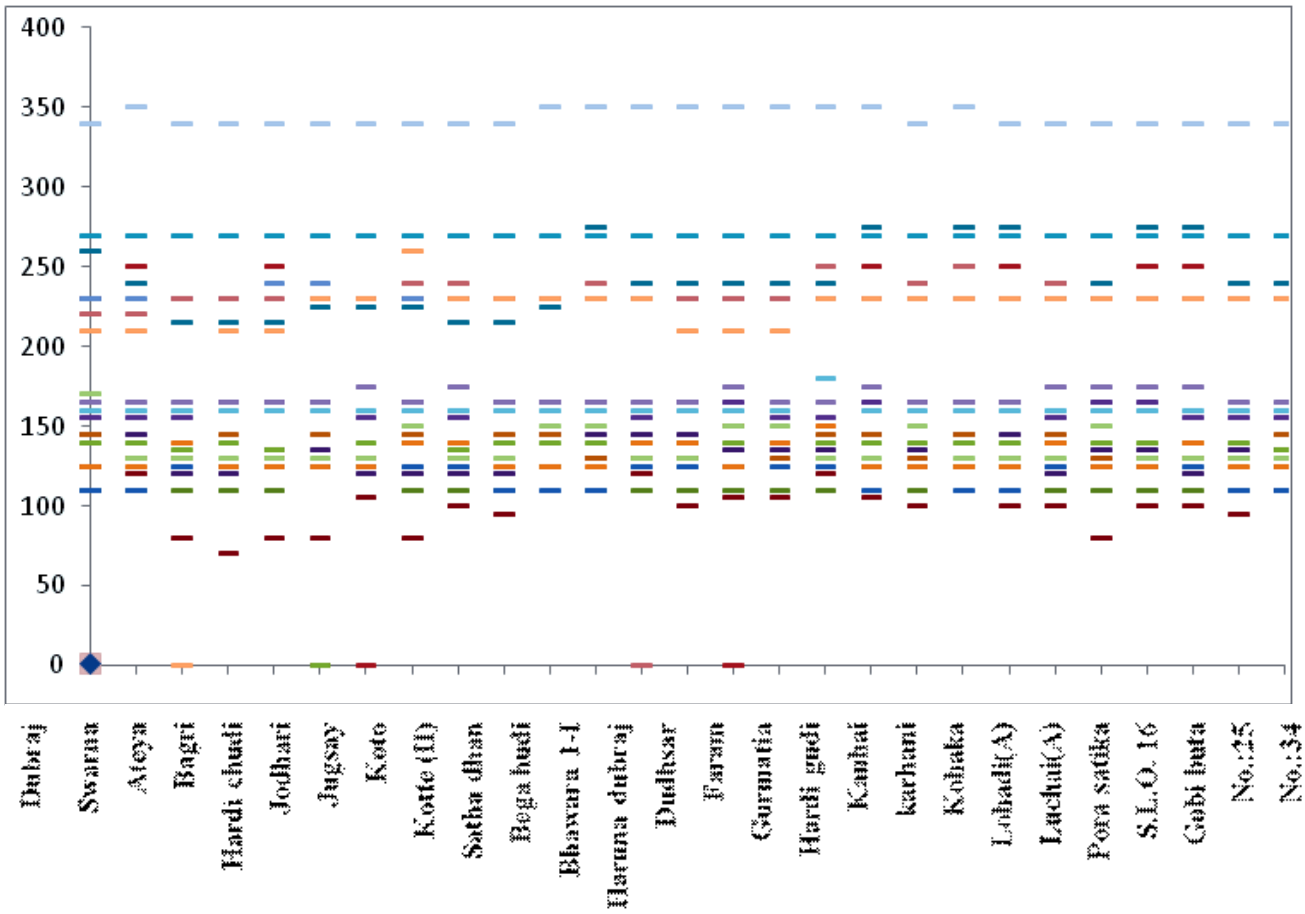




- Epigenetic changes was observed among the contrasting rice genotypes.
- The tolerant genotypes rapidly modulated their performance under onset of drought compared to susceptible genotypes.
- Drought adaptive genotypes were identified using MSAP analysis.

DNA Fingerprinting of Rice Germplasm

TILL DATE FINGERPRINTING OF ~9500 GENOTYPES HAVE BEEN COMPLETED BASED ON 24 SELECTED SSR PRIMERS (covering all the 12 chromosomes)



Representative DNA fingerprint

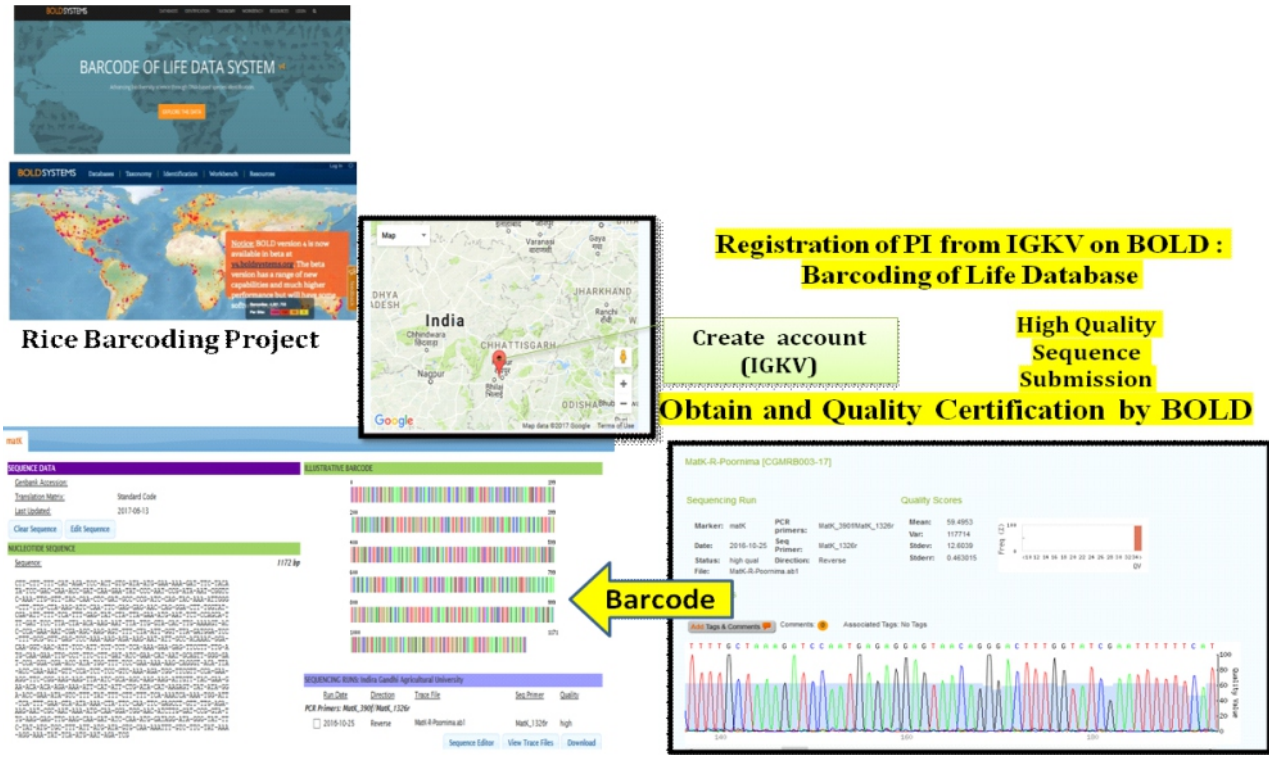
Trait Associated Primers Used For Fingerprinting of 400 Core GROUP GENOTYPES – Association Mapping Panel

APPROXIMATELY **200 PRIMERS** including

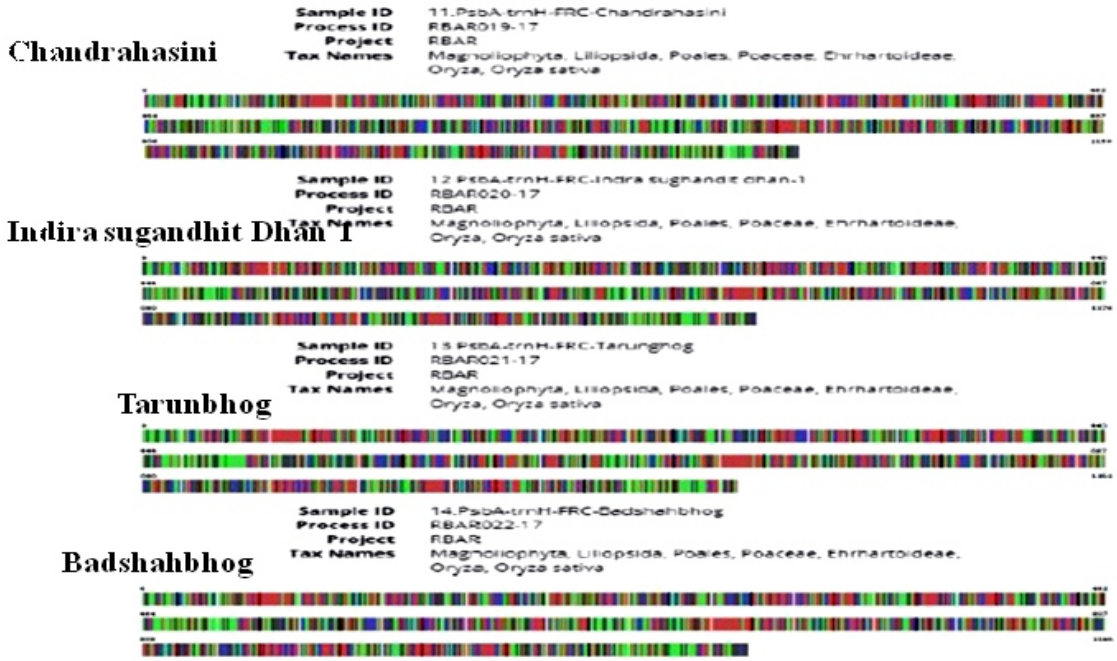
- **SSR PRIMERS** (~75 RM PRIMERS covering all the 12 chromosomes)
- **ISSR, DAMD PRIMERS**
- **Biotic Stress Related Primers**
- BLB (xa5, xa13, Xa4, Xa7, Xa31, Xa38), BLAST (Pi1, Pi2, Pi9, Pi57)
- Gall Midge (Gm4, Gm8), BPH (Bph3, Bph9, Bph17)
- **Abiotic Stress Related Primers**
- Drought, DREB, SALTOL, DYT 1.1, DYT2.2, DTY3.1, DYT4.2, DYT12.1, Cold tolerance
- **Nue Primers** (Glutamine synthetase, glutamate synthetase, nitrogen transporter -full length, Exonic primer, Ammonium transporter genes etc
- **Pepc Specific Primers**
- **Aroma Related Primers**
- **Root Trait Related Primer** (lateral root development, root angle, root hair development, root elongation etc)
- **Grain Character Related Primer** (grain length, grain no., grain size, grain width etc)
- **Nodulation Specific Primers**

PMBB 12: Generation of DNA Barcodes of 24 rice genotypes Barcode Of Life Data Systems (BOLD) platform (FIRST REPORT IN RICE)

- **DNA Barcode a UNIQUE ID to a Living Species – based on DNA sequence**
- **Consortium for the Barcode of Life (CBOL) includes more than 120 organizations from 45 nations.**
- **Intra Species – VARIETAL ID is not reported in plants**
- **DNA LOCI (MARKERS) Identified for Barcoding Of Rice**



psbA-trnH loci – Highly Informative for Barcoding of Rice



231 Rice lines with 31 makres (chloroplast specific) led to Identification of 4 Loci Based on 3 years Data

- ***variability***
- ***nucleotide divergence***
- ***haplotype discrimination***

PsbA-trnH and trnK loci *in combination with* ***Rbcl and Matk loci*** *were found most suitable for development of DNA barcodes in rice*

Conclusion of the Project

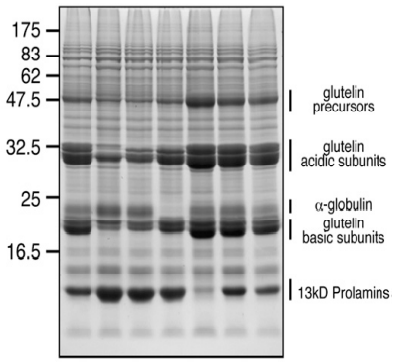
- ***Identification of 4 loci for DNA Barcding in rice***
- ***Barcodes Developed for 24 rice genotypes with 4 loci combinations***
- **DNA barcoding of rice genotypes have potential use part of "variety registration and IPR protection program (Policy matter)**

PsbA-trnH, Matk, Rbcl & trnK

PMBB 26: Analysis of Seed Protein in Rice for Protein Quality Enhancement

Protein Fractions Store in Protein Bodies and can be separated on Solubility Basis

Rice Protein Quality can be Enhanced by Increasing Glutelin and Decreasing Prolamin

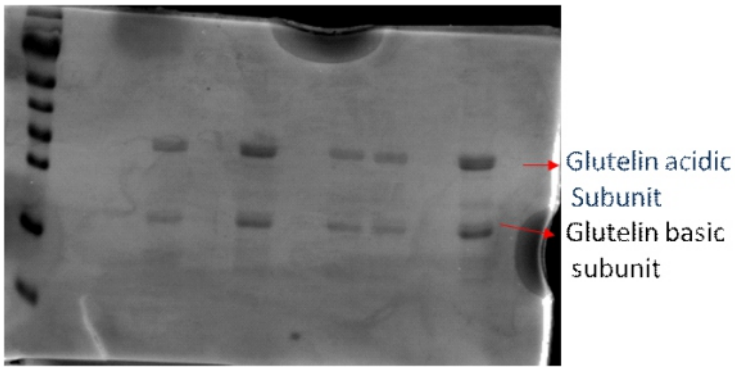


Protein Body II

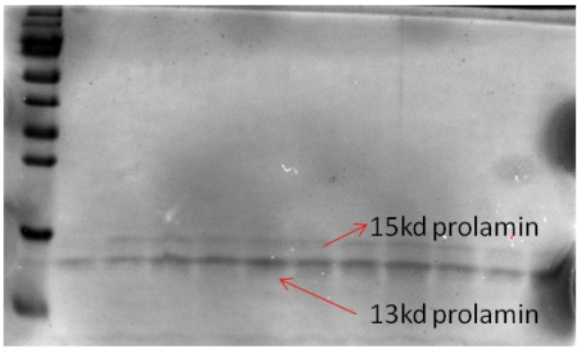
→ **Globulin**, salt soluble
~5-10% of rice grain,

→ **Glutelin**, dilute acid/alkali soluble
~ 65-80% of rice grain
Contain more lysine **Protein Body I**
→ **Prolamin**, alcohol soluble, poorly digested
10-20% of rice grain,

SDS PAGE of fractionated protein



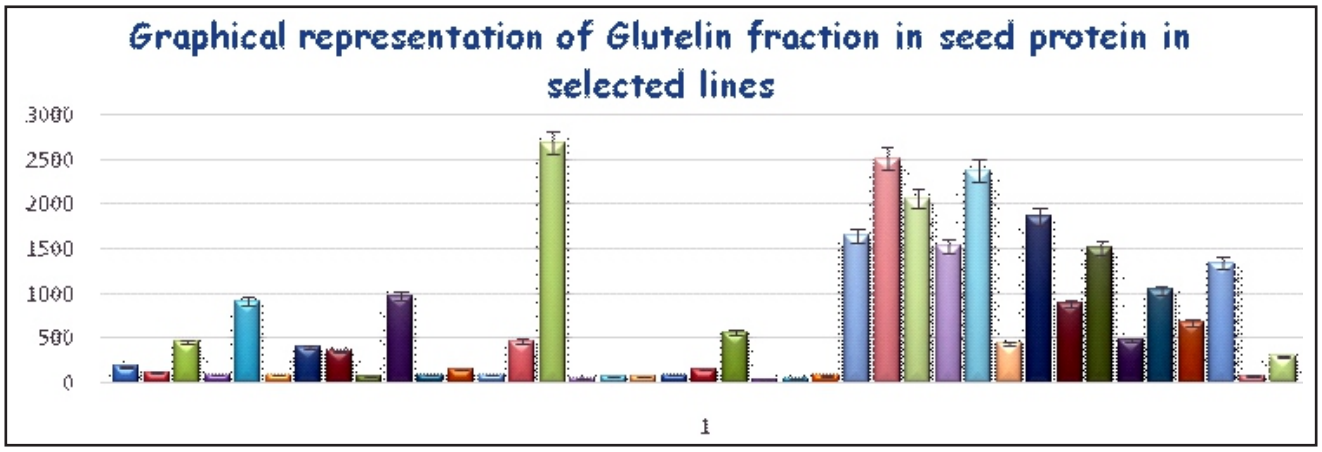
Glutelin

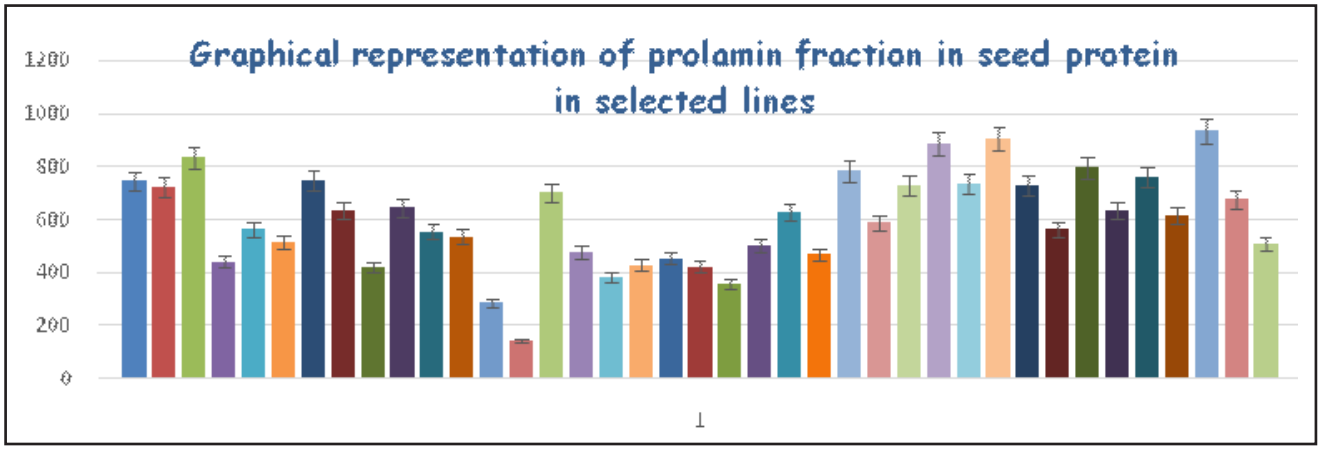


Prolamin

Cultivars selected on the basis of high total seed protein

Kalocuchi	Karmamasuri	WR-3	R-RHP-IH-86
BadaGadakhurata	M-1433	WR-32	R-RGM-AS-40
Niwari	Botaki Gurmatia	WR-132	GP-145-48
M-114	Mani Gurmatia	Malpa	GP-145-66
RR-149	Chepti Gurmatia	Surmatia	R-RGM-AS-41
Jaldubi	R-RGM-AS-45	Elychi	R-RHP-IN-87
Dubraj	IC-116076	GP-145-70	R-RHP-IM-84
WR-73	KalamGurmatia	IR-64	R-RGM-ATN-47
WR-1	Moti Basmati	CGR-1539	IET-24780
WR-2	Nunki Gurmatia	R-56	SWARNA





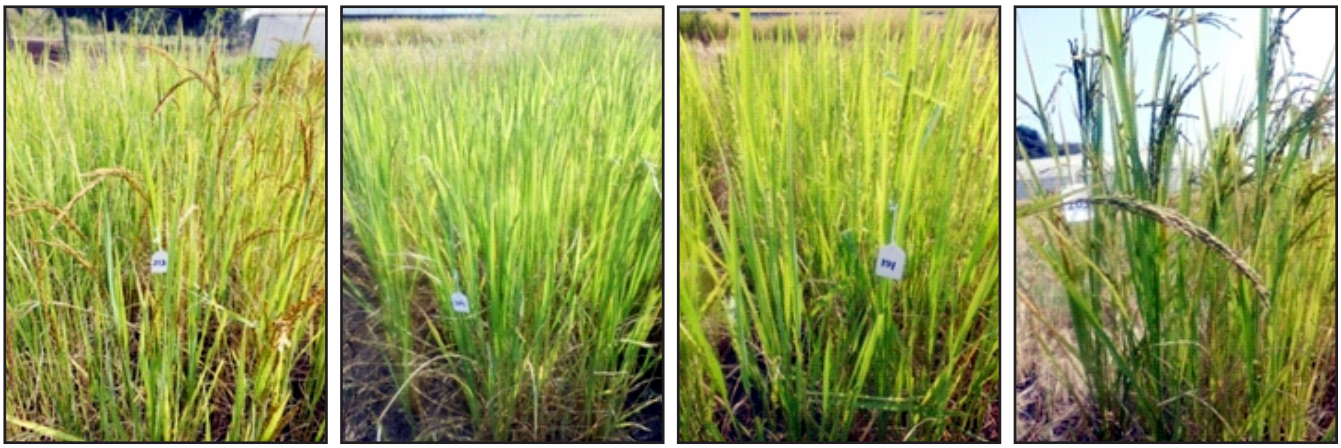
PLANT PHYSIOLOGY,

AGRIL. BIOCHEMISTRY, MEDICINAL AND AROMATIC PLANTS

Achievements and technology dissemination from Department

Entries identified for low light stress condition: Jaldubi, Swarna sub 1, IGKV R-1 (RAJESHWARI), DXD(124)-17-192.

2. Identification of donor parent for WUE: GP-145-136, **2)** DXD(124)-11-118, **3)** DXD(124)-3-44, **4)** DXD(124)-17-19.



GP -145-136 **D*D-(124)-11-118** **D*D(124)-3-44** **D*D(124)-17-191**

3. Facility developed for quality evaluation of essential oils

Gas Chromatography System

Polarimeter

Refractometer

Vis and UV-Vis
Spectrophotometer

Water purification system

4. Proposal for release of lemon grass (Cymbopogon flaxousus) strain (IC-620637) 'Chattishgarh lemongrass-1'

Entry	Average over location			
	Biomass yield (T/ha.)	Oil-yield (kg/ha.)	Citral content %	Citral yield kg/ha.
Chhattisgarh Lemongrass-1	22.51	178.40	81.43	**14527.11**

Submitted to university varietal identification committee

5. Registration of farmers variety in PPV&FR

- Crop betelvine (*Piper betle* L.)
- Denomination –Chuikhadan desi kapuri pan.
- Alternate denomination-Kasita kapoori pan.

Traditional knowledge:

- Keeping quality :up to one month.
- Leaf: easily dissolve in mouth.
- Medicinal use: keep cool during summer.
- Other use: Pooja and Marriage.

6. Agro technique for maximization of growth and yield of Pachouli (Pogostemon cablin)

S.N.	Treatment	Herbage yield (q /ha)	Oil yield (kg /ha)	Net return (Rs. /ha)	B : C ratio
01	100:50:50, NPK kg/ha + 2.5 t Vermicompost /ha with 20 ppm GA /ha	15.63	35.18	90720.00	2.81

7. Betel vine cultivation and technology dissemination at farmers field

8. Gum extraction technology for babool and karaya developed

Chromatographic fingerprinting and spectroscopic characterization of secondary metabolites of Hadjod (*Cissus qudrangularis*), the healer of bone fractures used by traditional healers

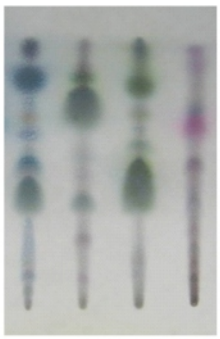
- **Preparation of extracts by suing Soxhlet apparatus:**

Green Herb

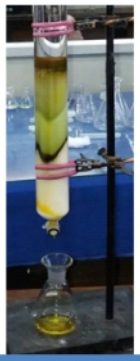
Dry Powered sample

Soxhlet apparatus: Extraction of compounds [non-polar to polar] using solvents [Pet. Ether, Benzene, Ethyl acetate, Ethanol]

- Repeated Chromatographic technique using adsorbent Alumina, silica gel for isolation of pure compound from clinically active extract/isolate or similar to existing tested drug available in market having same extract.



TLC of extracts



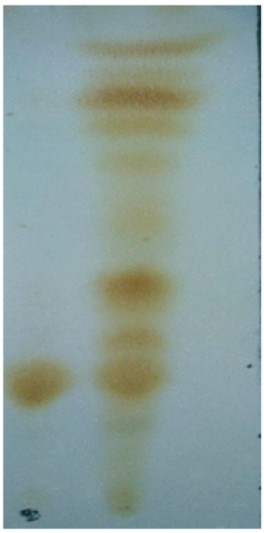
Column Chromatography

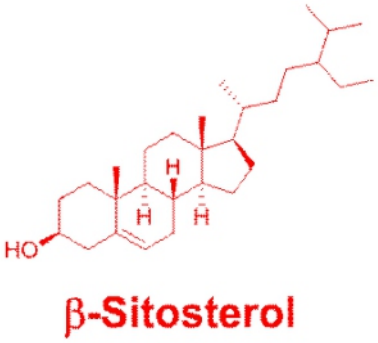
Isolation & then molecular characterization [using UV, IR, NMR , MS] for identification of unknown molecules.

- **Clinical trial [as approved by ethical committee] of extract/isolate for their clinical effectiveness on bone healing.**

Drilling of bone 1.5 mm

Isolation and Characterization of molecule





β-Sitosterol

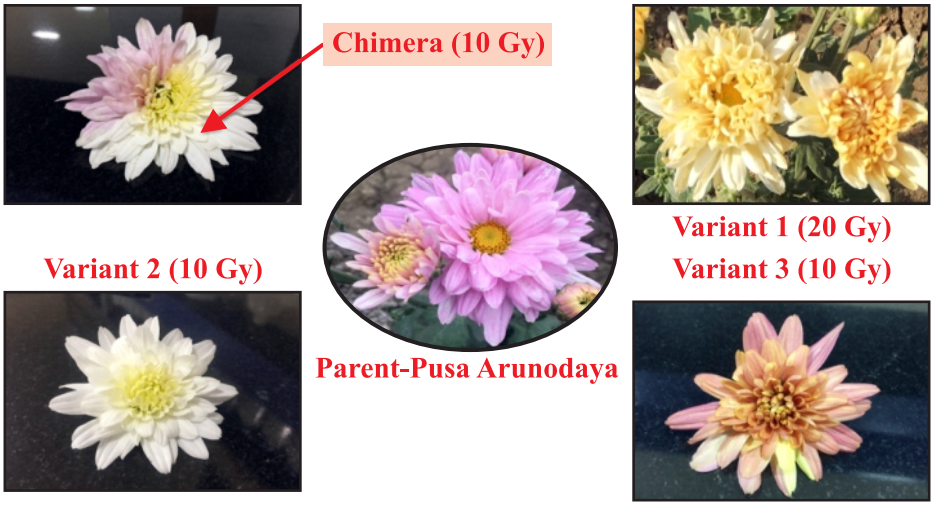
β-sitosterol: Single molecule

Studies of herbs used by Traditional Healers for bone healing

S. No.	Name & Address of Bone Healers	Plant used for Bone healing	Patient cured (Nos)	% of Success
1	Shri Jagish Yadav Village Manki, Rajnandgaon	*Alternanther philoxiroides*	>5000	>85%
2	Shri Raghuvir Pradhan Village Bordih,Saraipali	*Cissus repanda*	>8000	>90%
3	Shri Laduraam Vishwakarma, Village Kapsi, Balod	Unknown Plant	>8000	>90%

Floriculture and Landscape Architecture

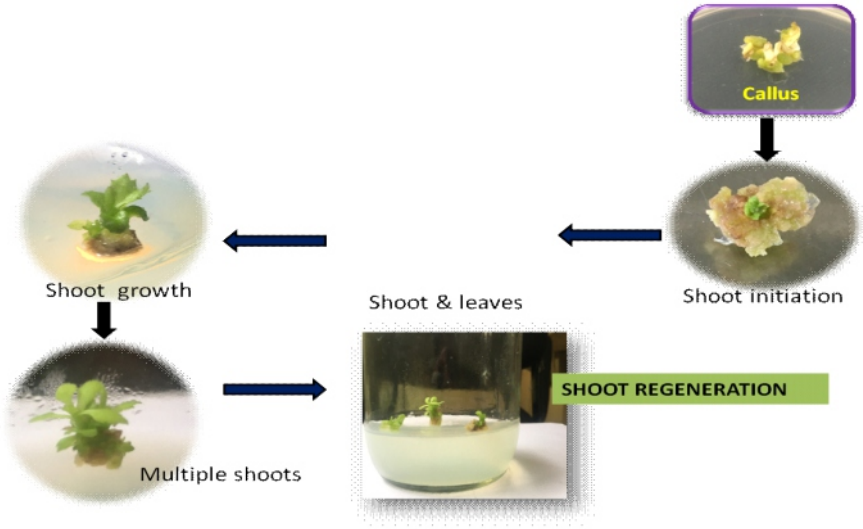
Innovations-Findings/Observation Induced mutagenesis in Chrysanthemum for flower traits



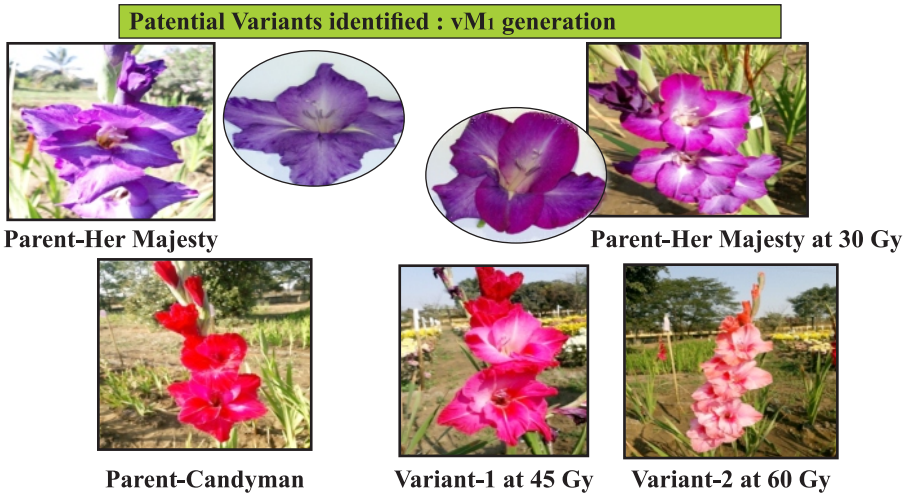
Developing Plant from single Petal (floret) of Chimera

Callus Culture : MS + BAP (4.0 mg/l) + NAA (0.5 mg/l)

Shoot Regeneration : MS + Kinetin (10 mg/l) + NAA (0.1 mg/l) + GA3 (0.2 mg/l)



Induced mutagenesis in Gladiolus through gamma rays



New Initiatives

Establishment of Dry Flower & Foliage Lab for value addition

- Dry flower crafts
- Dry flower pots
- Dry flower handicrafts
- Poster frames
- Greetings
- Wall-hangings

41 species of flowers, weeds palms, shrubs, trees, cereals, pulses of Issed, collected & identified for dry products.

Crop Improvement

MLT of selected French Marigold Genotype (First Year 2017-18)

Genotype CGFM-1 recorded maximum number of flowers under all the three agro-climatic conditions

Genotypes	No. of flowers/plant				
	Raipur	Korea	Kanker	Jagdalp	Mean
CGFM-1	223.33	212.70	244.60	197.80	**219.61**
CGFM-2	220.66	208.60	231.40	187.40	212.02
CGFM-3	189.00	198.80	200.80	166.60	188.80
CGWM-4	52.66	-	64.00	-	58.35
Chaindani (Local Chk)	189.33	196.40	185.30	159.70	182.68
Pusa Arpita (Nat. Chk)	210.33	186.50	212.70	148.60	190.53

On-going research for technology development

Allied Enterprises

Tinting (colouring) of flowers: Value addition for florists

Standardization of type of dyes and dying time for colouring of various flowers

Tuberose

Dye colour	Time required (hrs)
Yellow	10
Orange	10
Red	8
Green	8
Mix1	12
Mix2	12
Mix 3	12

Fruit Science

- Under this development programme, mother orchard of dryland fruit crops is now being established in various KVKs as well as at College of Agriculture and College of Horticulture.
- Among research projects, AICRP on Fruit Crops (Mango and Guava) at Raipur and Cashewnut and Palms at Jagdalpur have been undertaken.
- Performance of Grapes varieties was studied at mainpat. Flame seedless had highest yield and yield contributing characters under northern hill zone of Chhattisgarh.
- Anna a low chilling apple cultivar had maximum growth and yield at mainpat.
- Genotype CARS-6 has been found suitable for RTS and Jam preparation.

New initiatives

Development of Crop Specific Research and Demonstration on Various Fruit Crops

S. No.	Centres	Fruit Crops
1.	CARS, Bilaspur	Mango, Guava, Avocado, New hybrids of Mango & Mother orchard of fruits,
2.	CARS, Bemetara	Ber, Dragon fruit, Bael, Karonda
3.	CARS, Bhatapara	Pomegranate, Mango and Mother orchard of fruits plants
4.	CARS, Ambikapur	Mango, Litchi, Rambutan, Acid lime, Jackfruit
5.	CARS, Kanker	Custard Apple, Jamun, Bael, Mahua, Lasora
6.	CARS, Koria	Strawberry, Jackfruit, Peach, Plum, Litchi
7.	CHRS, Jagdalpur	Cashewnut, Coconut, Tamarind, Chironjee, Jamun
8.	CHRS, Rajnandgaon	Sweet orange, Mandarin, Kinnow, Grapes, Strawberry, Pineapple, Persimmon
9.	Deptt. of Fruit Science, Raipur	Guava, Mango, Mulberry, Gooseberry, Acid lime, Lemon, Custard apple, Kinnow, Grapefruit
1.	KVK, Balrampur	Peach, Pear, Plum, Litchi
2.	KVK, Bijapur	Mango, Cashewnut, Kinnow, Mandarin , Acid lime
3.	KVK, Kawardha	Guava, Custard Apple, Ber, Mango

Development of new fruit crop based centers at various colleges

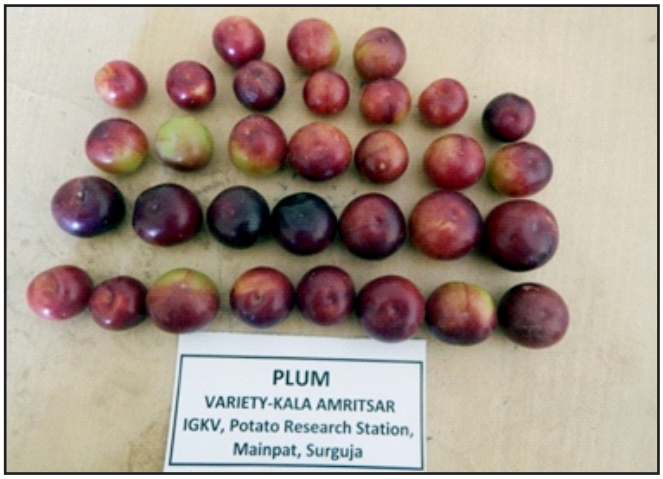




- Varietal Screening of Strawberry Cultivars in Chhattisgarh (Raipur, Koria andRajnandgaon)
- Effect of foliar feeding of calcium and micro-nutrients on growth, yield and quality of strawberry cv. Nabila under net tunnel
- Study of different levels of irrigation and fertigation in the cultivation of Dragon Fruit genotypes Red into Red.
- Evaluation of low chilling peach cultivars in northern hill zone of Chhattisgarh.
- Performance of Plum cultivars under northern hill zone of Chhattisgarh.
- Performance of Low chilling Apple varieties under northern hill zone of Chhattisgarh.

Low chill Apple cv. Anna

Testing and evaluation of Low chilling Apple cultivars



Performance of Grapes varieties under northern hill zone of Chhattisgarh

Grape-Punjab Purple

Grape-Flame Seedless

Grape-Punjab Purple

Hon'ble VC visit on 23.05.2017

Study of different levels of irrigation and Fertigation in the cultivation of Dragon Fruit cv. Red into Red Dragon fruit

Technology Recommended

A. Crop management and yield maximization

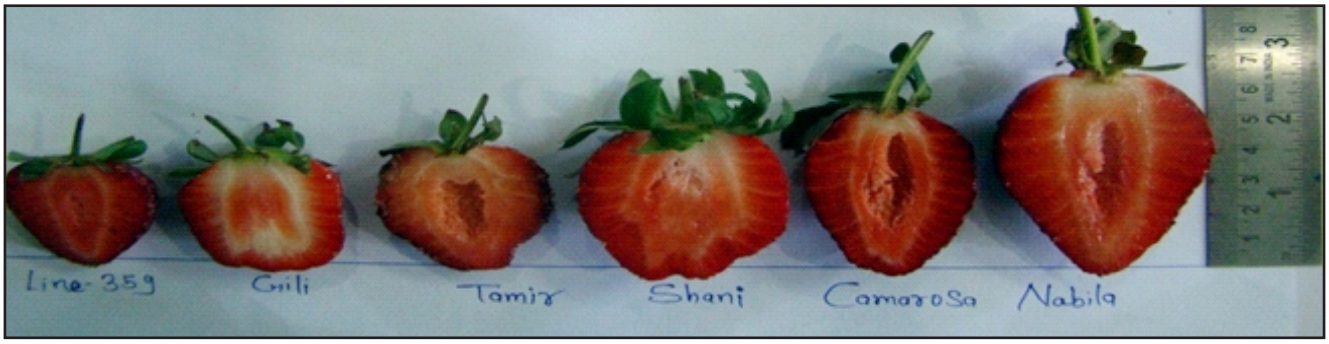
1. 12 varieties of strawberry has been evaluated under net house condition at COE PCPF. Among these varieties Nabila and Shabrina has been found suitable for cultivation in Chhattisgarh Plain region.

Fruits of different strawberry varieties

2. 14 varieties of strawberry has been evaluated under open condition at CoA, Koria. Among these varieties Sabrina and Sweet Charli has been found suitable for cultivation in Northern hill regions of Chhattisgarh.
3. Two foliar spray of $ZnSO_4$ @ 0.6 % at 30 and 60 days after transplanting respectively has been reported to improve yield and quality of strawberry cv. Nabila with highest benefit cost ratio under net house condition.

Varietal Screening of Strawberry Cultivars in Chhattisgarh(Plain region-Raipur)

Varietal difference of strawberry



Fruits of Sabrina cultivar in cluster form at Koria

Best performance of Sweet Charlie Cultivar

Screening of strawberry cultivars in Rajnandgaon

NABILA

RANIA

KAMILA

CAMAROSA

FLAVIA

FLAMINIA

Treatment $ZnSO_4$ reported best for fruit yield and quality

4. Seven low chilling cultivars of peach have been evaluated at Mainpat. Early Grand performed well as compared to all other cultivars and has been found suitable for Northern hill zone of Chhattisgarh.

Crop improvement

Outcome – Varieties developed and proposed for identification

1. Development and multiplication of new strains of Mango Proposal for release of following five mango strains was submitted to the state varietal release committee

- Chhattisgarh Swarnaprabha (IM-1002)
- Chhattisgarh Achar (IM -1007)
- Chhattisgarh Pawan (IM -1001)
- Chhattisgarh Raj (IM-1004)
- Chhattisgarh Gaurav (IM-1003)

Chhattisgarh Gaurav

January 2018: Visit of Hon'ble Vice-Chancellor and faculty members of IGKV to the new strains of mango orchard

2. Augmentation and evaluation of germplasm of guava (AICRP on Fruits)

- Achievement: One elite strain of guava collected and after multiplication the plants are sent for multi-locational trial
- 3. Selection of new genotypes of Mulberry

- Achievement: One elite strain of mulberry was collected and after multiplication the plants are sent for multi-locational trial
- Survey, documentation, collection and *in-situ* evaluation of promising genotypes of major/minor/underutilized fruit crops including Jamun, Lasoda, Jackfruit,
- Tamarind, Mahua, Bael, Ketha at Kanker district

Jamun

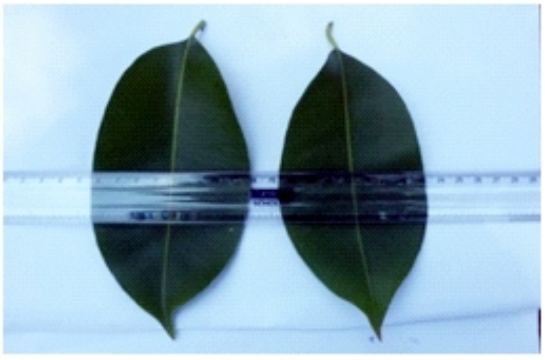
Lasoda

Goma Prateek (Tamarind)

Bael

Mahua

Kaitha



In-situ Jamun genotypes with their GPS Location

Indira Jamun-55 N 20°18.295 E 081° 32.436 396M Pharasgoan

Indira Jamun-16 20°16.686 E 081° 39.241 415M Sarona Narharpur

***In-situ Bael** (Aegle marmelos)* **genotypes**



N 20°17.565 E 081° 28.714 409M bhirawahi Kanker



N 20°11.350 E 081° 31.936 414M Parsoda Charama

***In-situ* Lasoda genotypes and their GPS Location**

Indira Lasoda-7 (N 20°15.240 E 081° 33.087 426 Barrebeda Antagarh)


Indira Lasoda-10 (N 20°21.766 E 081° 19.050 410 Parsoda Charama
Indira Lasoda-16 (N 20°18.297 E 081° 31.477 393 Mula, Bhanupratappur)

Indira Lasoda-8 (N 20°11.548 E 081° 31.933 431M Sarangpal Narharpur)

Precocious genotypes of Mahua located in Kanker

Normally Mahua takes about 10 years for bearing. This genotypes started bearing since 3 years of age and the present age is 6 years it is under observation

***In-situ* Kaitha genotypes and their GPS Location**

S. No.	Genotypes	Latitude	Longitude	Mean Sea Level (metre)	Location	
					Village	Block
1.	Kaith-1	[illegible]	E 081° 19.145	410	Kodagoan	Charam
2.	Kaith-2	N 20°18.355	E 081° 31.474	356	Parodi	Koylibeda
3.	Kaith-3	N 20°11.549	E 081° 31.919	435	Rampur	Narharpur
4.	Kaith-4	N 20°19.279	E 081° 32.486	380	Hotkondal	Durgkondal
5.	Kaith-5	N 20°19.310	E 081° 32.489	383	Pardal	Durgkondal
6.	Kaith-6	N 20°18.295	E 081° 32.436	396	Karremad	Bhanupratappur
7.	Kaith-7	N 20°11.558	E 081° 31.925	433	Parsoda	Charama
8.	Kaith-8	N 20°14.125	E 081° 31.363	411	Mohpur	Kanker
9.	Kaith-9	N 20°14.130	E 081° 31.452	399	Kokpur	Kanker
10.	Kaith-10	N 20°14.157	E 081° 31.375	403	dadargah	Kanker



Genotypes of Custard Apple in Chhattisgarh plains and Baster-Plateau of Chhattisgarh

Number of genotypes collected: 60 (Custard apple genotypes)


8 genotypes IGCA-1, IGCA-2, IGCA-4, IGCA-10, IGCA-11, IGCA-19, IGCA-21 and GCA-22 were found promising for yield and quality traits.

Selected Elite genotypes of Custard Apple

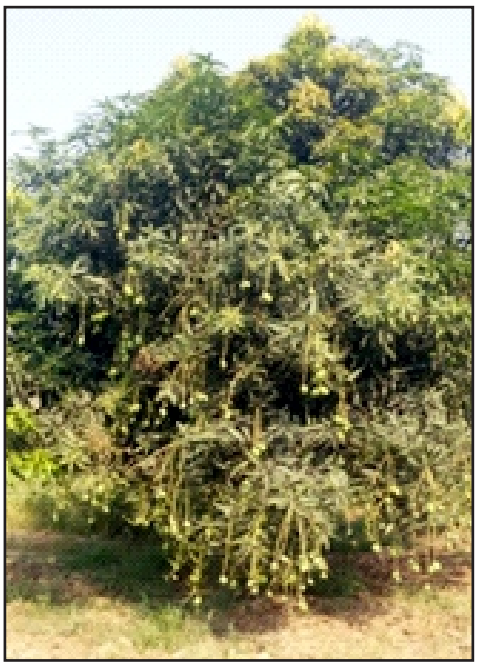
IGCA-1 IGCA-2 IGCA-4

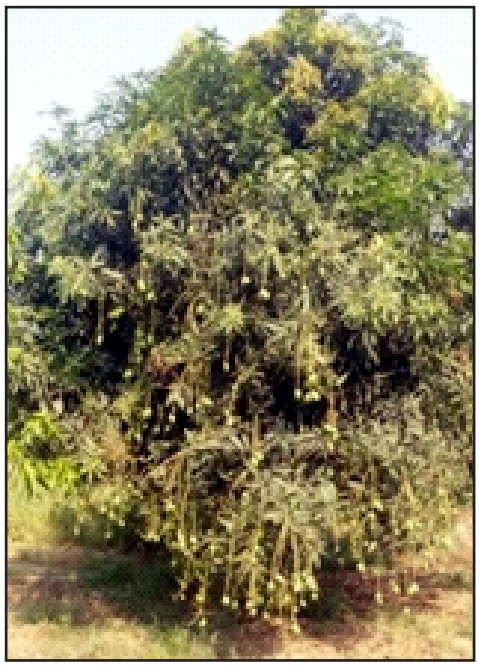
IGCA-21 IGCA-3 IGCA-5

IGCA-6

IGCA-7

Fruiting in rejuvenated trees of mango





Vegetable Science

Innovations- Findings/ Observations

Demonstration of Makhana cultivation:

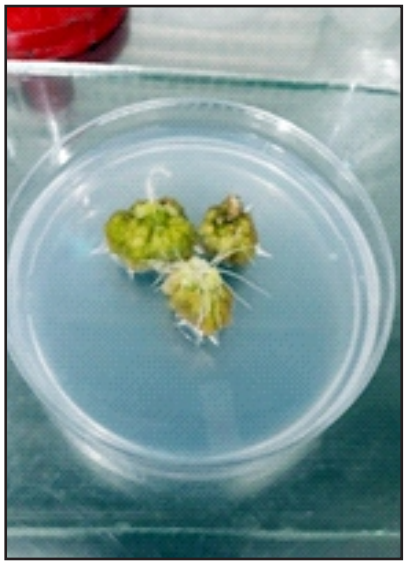
- Makhana is possible twice a year under Chhattisgarh wetland condition as compared to other states.

New Initiatives

Haploid production through anther culture in brinjal (protocol)

Successful callusing was achieved by

- C4 – MS+ BAP @1mg/l + NAA @1mg/l
- Successfully haploid plant was produced



Tissue culture protocol for propagation of spine gourd

Got success for callus induction

Shoot initiation was also achieved

New Initiatives

Development of low cost aero phonic system for potato seed tuber production

Development of low cost semi-hydroponic system for potato seed tuber production

Technology Recommended

Crop management & yield maximization

Effect of seed size on vegetative growth and yield of turmeric:

5.0 cm length of seed rhizome recorded maximum 333.93 q/ha turmeric yield with net profit

Crop Improvement

Collection and Characterized:

Crops	No. of genotypes	Promising genotypes
Bottle gourd	68	(06) IBG-11, IBG-43,IBG-45, I BG-60, IBG-66 & IBG-67
Cowpea	60	ICP-38 & ICP-39
Dolichos	100	Pole Type (06)
		Bush Type (05)


Collection, conservation, characterization and utilization of Dolichos germplasm

Sr. no.	Characters	Promising lines of Dolichos
01	Early flowering and fruiting	Pole type:- IS-32, IS-51, Bush Type:- IS-105-3, IS-105-4
02	Long poded	IS-12, IS-15, IS-17, IS-48, IS-96
03	Stringless pods	IS-2, IS-12, IS-38, IS-48
04	High yielding	IS-1, IS-2, IS-11, IS-12, IS-14, IS-18, IS-28, IS-38, IS-48, IS-54, IS-96, IS-104 , IS-105-4

IS-96

IS-14

IS-106

Crop improvement

Collection, purification and development of Brinjal varieties (pre breeding) (VEG -07-started from 2015-16)

Germplasm collected : **88**

S N	Characters	Promising lines
01	Early flowering and fruiting	IGB-7, IGB-8, IGB-9, IGB-15, IGB-20, IGB-97, IGB-68, IGB-105
	Early-mid flowering	IGB-17, IGB-54, IGB-GL, IGB-55
	Late flowering and fruiting	IGB-92, IGB-72, IGB-64, IGB-68
02	Long fruit	IGB-1, IGB-22, IGB-36, IGB-51, IGB-73, IGB-106, IGB-14
	Round fruit	IGB-1, IGB-2, IGB-55, IGB-45, IGB-30, IGB-88
	Oblong fruit	IGB-54, IGB-92, IGB-62, IGB-47, IGB-48, IGB-3, IGB-97
03	Average fruit weight	IGB-92, IGB-48
04	Cluster fruiting	IGB-2, IGB-20, IGB-49
05	Yield (t/ha)	IGB-6, IGB-7, IGB-9,IGB-11, IGB-17, IGB-23, IGB-26, IGB-25, IGB-44, IGB-54, IGB-55

IBG-7

IBG-97

IBG-11

IBG-20

IBG-49

Collection & Characterization **Leafy vegetables**

Leafy vegetables

1. Amaranthus : Red- 20
2. Amaranthus : Green 30

3. Khedha : 25
4. Chench : 46
5. Water spinach : 25
6. Sweet potato : 11
7. Gogu (Ambadi) : 05
8. Khatta Bhajee : 12
9. Bathua : 05

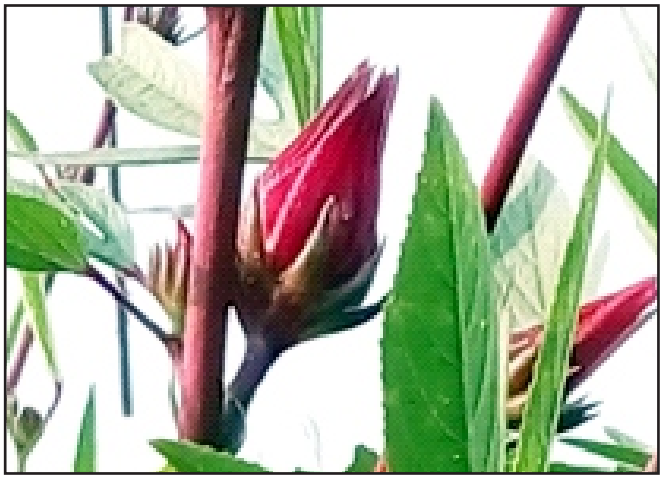
Green Amaranthus IGA 2014-53

Red Amaranthus IGA 2013-01

Sweet potato

Gogu

Water spinach



Gogu

Collection and Characterized :Dhamtari

Lotus

Dark Pink

Light Pink

Dark Pink double floret

White

White double

Vegetable crop improvement through crossing

Development of β carotene rich tomato lines:

Genotype	β carotene (µ/100 g)	Fruit wt. (g)	Yield/plant (Kg)
IChT-4 x PT-3—11-1-2	1.98	60	5.85
IChT-4 x PT-3--11-1-3	1.58	62	4.63
IChT-4 x PT-3--11-1-4	1.50	67	4.90
IChT-4 x PT-3--11-1-5	1.10	45	5.00
IChT-4 x PT-3--11-1-7	1.15	45	4.80

Development of heat tolerant tomato lines:

Genotype			
Co-3 x IChT-1-11-1-3	Co-3 x IChT-2-11-1-1	Co-3 x IChT-1-11-1-4	Co-3 x IChT-2-11-1-4
Co-3 x IChT-1-11-2-2	Co-3 x IChT-2-11-1-2	Co-3 x IChT-1-11-3-1	Co-3 x IChT-2-11-1-3

Some promise crosses

Fruit set over 42^{0}C

Some promise crosses

IChT-4x PT-3-11-1-2

Vegetable crop improvement through crossing

Development of tomato OP lines for high TSS and keeping quality:

- EC-620410 contains the highest TSS 7.13 %
- ITOM-11-12 X KASHI ANUPAM yields maximum TSS 6.80%

Genotypes	
S - 12	EC-620375
EC- 620435	EC-620374
EC- 620424	EC-620370
EC-620410	97/ 754
EC- 620407	D-1-1
EC-620402	BT- 12
EC-620400	EC-620434
EC-620401	CH-155
EC-620396	TYPE-1
EC-620383	SANSKRITI
EC-535580	VLTOMATOR - 4
EC- 620378	ARKA VIKAS

Crosses	
ITOM-11-1 X PUSA RUBY	ITOM-11-11 X PUSA RUBY
ITOM-11-1 X KASHI ANUPAM	ITOM-11-11 X KASHI ANUPAM
ITOM-11-1 X PANT T-3	ITOM-11-11 X PANT T-3
ITOM-11-1 X CT-1	ITOM-11-11 X CT-1
ITOM-11-3 X PUSA RUBY	ITOM-11-12 X PUSA RUBY
ITOM-11-3 X KASHI ANUPAM	ITOM-11-12 X KASHI ANUPAM
ITOM-11-3 X PANT T-3	ITOM-11-12 X PANT T-3
ITOM-11-3 X CT-1	ITOM-11-12 X CT-1
ITOM-11-6 X PUSA RUBY	ITOM-11-14 X PUSA RUBY
ITOM-11-6 X KASHI ANUPAM	ITOM-11-14 X KASHI ANUPAM
ITOM-11-6 X PANT T-3	ITOM-11-14 X PANT T-3
ITOM-11-6 X CT-1	ITOM-11-14 X CT-1

Outcome- Varieties developed and proposed

Genotype	Found promising over check
MLT on Garlic	IG-M-1
MLT on Chilli	Indira Chilli-3
MLT on Bottle gourd (Tumba Type)	IBG-66
MLT on Bottle gourd	IBGR-2011-1
MLT of Brinjal	IBGL-2010-2

All India Coordinated Research Project on Potato

A. CROP IMPROVEMENT			
S. No.	**Title of trial**	**No. of genotypes evaluated**	**Promising genotype**
1.	AVT on MEDIUM MATURING HYBRIDS	9	AICRP-P-9
2.	IVT on medium maturing white skinned hybrids	8	AICRP-P- 9
3.	IVT on early maturing hybrids	8	AICRP-P- 9
4.	IVT on red skinned hybrids	10	AICRP-P-14
5.	AVT II on processing (french fries) hybrid	4	AICRP-P- 4
6.	IVT on processing (chips) hybrids	8	AICRP-P- 8
7.	Trial for heat tolerance	7	K. Surya
8.	Evaluation of water stress tolerant hybrid	4	AICRP-P-32

PUBLIC PRIVATE PARTNERSHIP (PPP) trials

Public Private Partnership Multi Location Trial on Maize *Kharif*-2017 at IGKV, Raipur (C.G.)
Status of Company & Total Entries

S. No	Name of Company/ Institution	No. of Entries	Name of Entries	Serial No. In Trial
1.	Advanta India Pvt.Ltd	1	ADV-9293	30
2.	Bisco Bio Science Pvt.Ltd	3	L.G.35.02, L.G.34.06 & L.G.34.05	1,18 & 27
3.	Dhanya Seeds Pvt.Ltd	1	MM-9333	28
4.	Indo-American Hybrid Seeds Pvt.Ltd	1	INDAM-1122(11 Co 22)	16
5.	JK Agri Genetics Pvt.Ltd	1	JKMH-502 Super	26
6.	Monsanto India Pvt. Ltd.	5	HISHELL(C), DEKALB-9182, DEKALB-9178, DEKALB-9185, & DEKALB-8161	2,3,5,7 & 11
7.	Nuziveedu Seeds Pvt. Ltd	2	NMH-731(C),NMH-1247(Dragan)	10 & 29
8.	Pioneer Seeds Pvt.Ltd	2	P-3436 & P-3505	9 & 14
9.	Rasi Seeds Pvt.Ltd	2	Pro-4212(C), & 4595	8, & 23
	TOTAL	30		

TOP 10 Entries Trial In Raipur

S. No.	Decoded Entries	Grain yield Q/ha	Rank	% increase over best check C1 (Hishell)
1.	**L.G.34.05**	**95.0**	**1**	**22.58**
2.	**ADV-9293**	93.6	2	**22.77**
3.	**DEKALB-9182**	90.3	3	16.51
4.	**P-3505**	90.0	4	16.2

5.	**DEKALB-8161**	89.2	5	15.09
6.	**DEKALB-9178**	85.6	6	10.45
7.	**DEKALB-9185**	85.3	7	10.06
8.	**INDAM-1122(11 CO22)**	82.8	8	6.83
9.	**P-3436**	80.8	9	4.25
10.	**MM-9333**	79.2	10	2.19
	Mean	71.4		
	CD	13.08		
	CV(%)	11.12		

Field View of Plant stand in PPP-MLT on Maize Kharif-2017, at Raipur




TOP 10 Entries Trial In Ambikapur

S. No.	Decoded Entries	Days to 50% Tasseling	Days to 50% silking	Grain yield Q/ha	Rank
1.	L.G.34.05	52	55	113.6	1
2.	DEKALB-9185	55	57	106.4	2
3.	NK-30 (C1)	55	57	104.4	3
4.	ADV-9293	55	57	103.6	4
5.	DEKALB-9178			102.2	5
6.	IAHM-2016-35-2	55	57	101.7	6
7.	DEKALB-9182	53	56	101.1	7
8.	P-3505	53	55	100.0	8
9.	INDAM-1122(11 CO 22)	53	56	97.8	9
10.	NMH-731(C2)	52	54	97.2	10

S. No.	Decoded Entries	Days to 50% Tasseling	Days to 50% silking	Grain yield q/ha	Rank
1.	L.G.34.05	53	57	103.2	1
2.	L.G..34.05	53	56	102.0	2
3.	MM-9333	55	58	101.4	3
4.	IAHM-2016-23-1	55	60	98.0	4
5.	P-3505	57	61	97.5	5
6.	JKMH-502 Super	53	56	97.3	6
7.	DEKALB-8161	57	61	96.7	7
8.	HISHELL(C1)	55	61	94.7	8
9.	ADV-9293	53	57	93.7	9
10.	NMH-1247(Dragan)	53	57	93.2	10

Performance of Top High Yielding Entries Based on over all Mean of Grain Yield (q/ha)

S.No.	Decoded entries	Mean of three location (Q/ha	Overall Rank	%Superiority over best check NMH-731(C1)
1.	L.G.34.05	103.5	1	19.23%
2.	ADV-9293	98.0	2	13.74%
3.	P-3505	95.8	3	10.6%

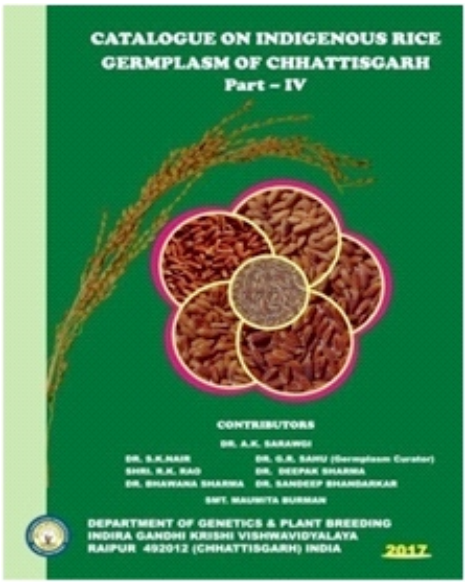
4.	DEKALB-8161	94.3	4	
5.	MM-9333	92.1	5	
6.	IAHM-2016-35-2	90.4	6	
7.	DEKALB-9178	90.2	7	
8.	DEKALB-9185	88.3	8	
9.	DEKALB-9182	88.0	9	
10.	L.G.34.06	87.6	10	

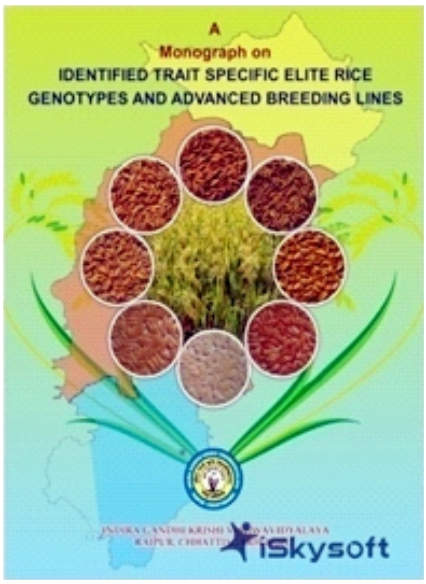
Results : Across the multi location (Raipur, Ambikapur & Jagdalpur) performance during *Kharif*-2017 of Maize entries LG-34.05 (103.5 q/ha) ranked first which is 19.23% superior over best check NMH 731 (86.8Q/ha), followed by second ranked maize entry ADV-9293 (98.0Q/ha) which is 13.74% superior over best check & maize entry P-3505(95.8 Q/ha) ranked third which is 10.6% superior over best check.

Performance of Maize Hybrids

Trials	Performance	Statistical Parameters
PPP Maize	L.G.34.05 (11361 kg/ha), DEKALB 9185 (10639 kg/ha), NK 30 (10444 kg/ha) - Check ADV 9293 (10361 kg/ha) DEKALB 9178 (10222 kg/ha) IAHM 2016-35-2 (10167 kg/ha) Other Checks – Hishell (8139 Kg/ha) Shaktiman 2 (6361 Kg/ha)	Mean – 8708 (kg/ha) CV % - 8.9 CD at 5% - 1265 kg/ha

Publications





Research Monitoring

















Crop Production

Testing of new crops

Quinoa

- Botanical Name : *Chenopodium quinoa*
- Family : *Amaranthaceae*
- Seed Rate : 20 kg ha^{-1}
- Spacing : 25 cm (Row to Row)
- Depth of Sowing : 3 cm
- RDN : 120:50:50::N:P:K (kg ha^{-1})
- Date of Sowing : 4th Nov, 2017
- Date of harvesting : 20th Feb, 2018 (107 days)
- Seed Yield : 15 (Q-1) & 10 (Q-2) q ha^{-1}

Performance of chia (*Salvia hiapanica*) under Chhattisgarh plain

Recommendations and Achievements

Agron-25:Challenge demonstration of high yielding rice varieties

Varieties		Treatments	Soil test value NPK, kg/ha	$NP_2O_5K_2O$ applied, kg/ha
V1-Mahamaya V2-AS 41 V3-IGKV R-1244		STCR (8t/ha)	200:37:443	155:10:114
		BFP		175:90:50
		RDF		100:60:40
V4	CGRH-102	STCR (8t/ha)	200:23:402	165:34:121
		BFP		175:90:50
		RDF		100:60:40
V5	Swarna (SRI)	STCR-I (10t/ha)	200:33:424	195:15:103
		STCR-II (10t/ha)		195:30:103
		BFP		175:90:50
		RDF		100:60:40

Table 1 (a): Grain yield of rice variety as influenced by nutrient management practices (Kharif 2017)

Treatments	NPK applied, Kg/ha	Grain yield, kg/ha	NR, Rs/ha	B:C Ratio
Variety: Mahamaya				
STCR	155:10:114	6387	75315	3.65
BFP	175:90:50	6233	70924	3.35
RDF	100:60:40	5824	66928	3.42
CD (P=0.05)		336		
Variety: AS-41				
STCR	155:10:114	5240	56838	3.00
BFP	175:90:50	4687	45976	2.52
RDF	100:60:40	4273	41699	2.51
CD (P=0.05)		233		

Table1 (b): Grain yield of rice variety as influenced by nutrient management practices (Kharif 2017)

Treatments	NPK applied, Kg/ha	Seed yield, kg/ha	NR, Rs/ha	B:C Ratio
Variety: IGKV R-1244				
STCR	155:10:114	4800	50341	2.77
BFP	175:90:50	3807	32309	2.07
RDF	100:60:40	4287	42720	2.54
CD (P=0.05)		382		
Variety: CGRH-102				
STCR	165:34:121	6167	67045	3.05
BFP	175:90:50	6513	72582	3.20
RDF	100:60:40	5787	63069	3.06
CD (P=0.05)		364		

CGRH-102 Hybrid under different treatments

Table 1 (c): Grain yield of rice variety as influenced by nutrient management practices (Kharif 2017)

Treatments	NPK applied, Kg/ha	Seed yield, kg/ha	NR, Rs/ha	B:C Ratio
Variety: Swarna				
STCR-I (SRI)	195:15:103	7040	76790	3.02
STCR-II (SRI)	195:30:103	7307	80235	3.08
BFP (NT)	175:90:50	6987	84063	3.79
RDF (NT)	100:60:40	5760	66325	3.40
CD (P=0.05)		303	-	-

Recommendation:

1. STCR based nutrient application enhanced yield and profit as compared to best farmers practice for rice varieties Mahamaya, AS 41 and IGKV R-1244.
2. The BFP found to be more economical for rice hybrid CG RH 102 and variety Swarna.

AGRON- 31: Effect of various irrigation methods and intercropping on yield and profitability of sugarcane

Location : Raipur, Ambikapur and Kawardha

(A) Methods of irrigation	(B) Intercropping
1. Flood furrow irrigation with soil application of 100 % RDF 2.Drip irrigation with soil application of 100 % RDF 3. Drip fertigation of 100 % RDF (RDF-200: 100: 120 NPK kg/ha + 10 t FYM/ha)	1. Sole cane 2. Sugarcane + Wheat/Spinach*(1:3) 3. Sugarcane + Onion (1:3) 4. Sugarcane + Potato (1:2) 5. Sugarcane + Cowpea (1:2) 6. Sugarcane + Coriander (1:3) grain# 7. Sugarcane +Chickpea (1:3)/cabbage* (1:2) 8. Sugarcane + Okra (1:2) * At Ambikapur # At Raipur

Sugarcane + coriander (1:3) Sugarcane + Spinach (1:3) Sugarcane + Potato (1:2) Sole sugarcane

BEST TREATMENT- Drip fertigation and onion intercropping at 1:3

Sugarcane + Onion (1:3) Drip fertigation

AGRON 38: Standardization of seed rate through Happy Seed Drill for different rabi crops under conservation agriculture

Location : Raipur, Ambikapur

Treatments
A. Crops: 3 1. **Wheat** 2. **Linseed** **3. Chickpea/Field pea**
B. **Seed rate : 3** **1. 100%** **2. 125%** **3. 150%** **Design: RBD Replications: 3**

Grain yield and economics of rabi crops grown through happy seed drill under conservation agri. (Mean of 2 yr.)

Crop	Seed rate %	Grain yield (q/ha)		Net Return (Rs000/ha)		B:C Ratio (Net)	
		RPR	AMB	RPR	AMB	RPR	AMB
Wheat	100	18.75	36.18	8.70	34.37	0.40	1.41
	125	21.95	40.23	13.36	40.40	0.60	1.62
	150	22.95	37.98	14.48	36.18	0.62	1.42
Linseed	100	10.75	8.40	18.97	9.18	1.05	0.49
	125	12.10	11.86	23.25	20.46	1.27	1.07
	150	11.95	11.53	22.22	19.02	1.19	0.97
Chickpea /Field Pea	100	15.22	6.93	44.20	4.01	2.33	0.21
	125	14.55	9.13	44.12	10.34	2.10	0.52
	150	15.12	10.81	43.56	14.94	2.07	0.72

Recommendation:

1. In Ambikapur, wheat sown with 125% seed rate through happy seeder after rice performed better followed by linseed with 125% seed rate.
2. In Raipur, chickpea sown after rice with seed rate 100% through happy seeder gave the highest net return and B:C ratio followed by linseed and wheat with 125% seed rate.

AGRON 39: Standardization of Aqua Seed drill for rainfed rabi crops under conservation agriculture

Scientist: M. C. Bhambri & Nitish Tiwari **Location :** Raipur

Treatments
A. Crops: 3 1. Chickpea 2. Lathyrus 3. Linseed
B. Sowing methods: 2 1. Aqua seed drill 2. Zero seed drill Design: RBD Replications: 3

Table: Yield, Net income and B:C ratio of different crops sown by aqua seed drill rabi 2017-18

Crop	Yield q/ha		Cost of cultivation (Rs 000/ha		Net Income (Rs 000/ha)		B:C ratio	
	Aqua	Zero	Aqua	Zero	Aqua	Zero	Aqua	Zero
Chickpea (Rs 4250/q)	15.49	15.15	19.00	18.00	46.83	46.39	2.46	2.58
Lathyrus (Rs 3000/q)	9.20	12.11	18.00	17.00	9.60	19.33	0.53	1.07
Linseed (Rs 3500/q)	7.05	6.89	16.00	15.00	8.68	9.11	0.54	0.61

Recommendation:

1. In rice based cropping system under rainfed situation sowing of chickpea found to be more profitable followed by lathyrus and linseed respectively.
2. The seeding of above crop through zero seed drill gave higher B:C ratio than aqua seed drill.

AGRON41: Assessment of drip fertigation and spacing on productivity and profitability of mustard

Locations: Raipur, Bilaspur and Ambikapur

Factor A: Drip fertigation

1. 75% RDF through drip
2. 100% RDF through drip
3. 125% RDF through drip
4. Control (Surface application of 100% RDF (100:60:40 kg/ha) + flood IRRI)

Factor B: Spacing, cm

1. 45x20
2. 60x20
3. 75x20

Design : Strip plot Replications : 3

Effect of drip fertigation and spacing on seed yield and net return of mustard (mean of 2 yr.)

Treatment	Seed yield (q/ha)			Net return (000'Rs/ha)		
	RPR	BSP	AMP	RPR	BSP	AMP
Drip fertigation						
75% RDF	19.53	17.06	18.78	42.09	34.89	41.77
100% RDF	21.43	19.06	20.82	48.85	39.44	46.43
125% RDF	23.34	21.27	23.11	52.98	44.72	52.08
Control	11.78	9.85	13.00	22.39	14.67	27.27
CD(0.05)	1.14	0.74	1.31			
Spacing (cm)						
45 x 20	20.01	17.71	20.19	44.54	36.34	46.26
60 x 20	19.55	16.89	19.52	43.86	33.74	44.26
75 x 20	17.50	15.84	17.82	36.34	30.21	38.13
CD (0.05)	1.24	0.96	2.51			

Recommendation:

1. The application of 125% RDF through drip fertigation produced highest seed yield and net return of mustard at Raipur, Bilaspur and Ambikapur.
2. The spacing of 45 x 20cm found to be more economical at Raipur, Bilaspur and **Ambikapur.**

Agron 42: Hi-tech permanent hydroponic fodder production system demonstration cum production unit at Raipur

(A) Construction cost area = 10' X12 'ft =120 ft^{-2} Rs.7920

S. No	Material	Specification	Total (Rs)
1	Structure	Outer structure made with Iron	14000
2	Flooring	Made with cement and sand	2000
3	Green Shade Net	(600 – 700 square feet) 90 %	1800
4	Tray stand structure	made with UPVC Pipe	18090
4	Hydroponic Tray	1.5 X2=3 ft^{-2} (Number 81) @ 210	17010
5	Water Tank, Electric pump Timer and Water filter	1000 lit -1, ½ HP -1 2 Electronic (Digital) and one Screen filter	11500
9	UV Tube light with choke	For water treatment against the microbes	1000
10	Lateral pipes and Sprinkler/Fogger	Drip pipe (50 m) and Number 36 Ra 100/unit	4200
12	Tank to Drip line pipe and Electric fittings	UPVC pipe and accessories and MCB and other electric fittings	2400
Total cost			72000
Miscellaneous and assembling cost 10 %			7200
Grand Total			79200

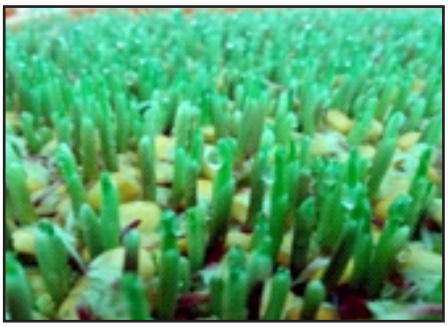
Component of hydroponic Structure

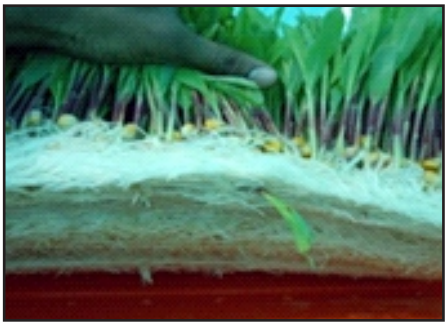
1. Outer stricture
2. Water Tank
3. Water Filter
4. UV Light
5. Timer
6. UPVC Rack
7. Fogger
8. Tray
9. Bucket

(B) Hydroponic green fodder Production calculation

S.No	Particular	Calculation
1	Area required (10x12)	120 square feet
2	Tray size andNo of tray accommodated in structure	1.5X2=3 square feet and 81
3	One cycle (Harvesting)	9-10 days
4	No of tray per day production	81/9= 9 tray /day
5	No of animal feed with this structure	2-3 animal / day
6	Seed requirement in one tray	Maize-900 g
		Barley -700 g and Oat-700 g
8	Conversion ratio	5 to 6 time
9	Green fodder production / tray	4.5 kg to 5.4 kg/tray
9	Per day production	4.5*9= 40.5 kg to 5.4*9=48.6 kg /Day
10	Per year production	40.5*365=14752 kg to 48.6*365=17739 kg / yaer
11	Production / Year (q/year)	147 to 177q /year





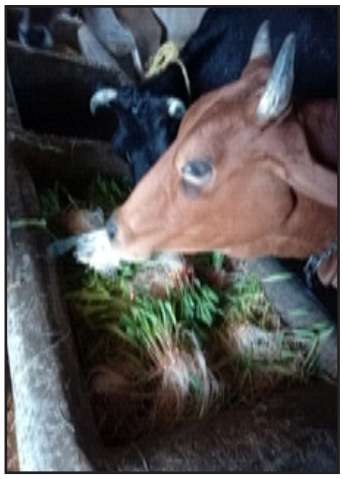



Methodology









S. No	Particular	Calculation
A.	Structural Cost	
1	Cost of Structural	Rs 79200
2	Life of the structure	15 year
3	Per year structure cost	79200/15= RS 5280
4	Per day structure cost	5280/365=Rs 14.46
B.	Operational Cost	
1	Seed cost /Tray	800g/tray (seed cost per kg Rs 12 to 14)
2	Seed cost /Tray	800*12=Rs 9.6/tray
3	Seed cost /Day	9.6*9= Rs 86.4 /day
C.	Electricity Cost	
1	Electricity Cost one unit/day @ Rs 4/unit	Rs 4/day
D.	Labour Cost	
1	Labour two hr / day @ Rs 200/day	Rs 50/day
E	Water cost	
1	400 litre water/day	Rs 10/day




(D) Economics of Production Cost Hi-Tech hydroponic fodder production system

S. No	Particular	Cost/Day (Rs)
A	Cost of Structural	14.46
B	Seed Cost	86.4
C	Electricity Cost	4
D	Labour Cost	50
E	Water cost	10
	Total Cost/Day	164.86
F	Green Fodder production / day	40.5 to 48.6 kg/day
G	Green Fodder production cost / kg	164.86/40.5 = Rs 4.07/kg
		164.88/48.6 = Rs 3.39/kg

(E) Summary Hi-Tech hydroponic fodder production system

A	Area requirement for structure	120 square feet
B	Structure cost	Rs79200
C	Green Fodder production / day	40.5 to 48.6 kg/day
D	No of animal feeded from structure	3 animal
E	Per day availability of green fodder / animal	13.5 to 16.2 kg/day
F	Green Fodder production cost / kg	Rs 3.39 to 4.07/kg

AGRON 43: Yield maximization of Lentil through application of irrigation, micronutrients and growth hormones

Location: Raipur

A. Irrigation Levels - 2:

(1) One irrigation (35 DAS) (2) Two irrigation (35 & 65 DAS)

B. Foliar Spray - 7:

1 Water Spray
2 Nitrobenzene @ 0.3 %
3 N:P:K:: 19:19:19 @ 1% solution
4 Multi Micro nutrients (Fe, Mn, Zn, B, Cu, Mo) @ 0.1 %
5 Plant Growth Hormones Mixture (Cytokinins and Enzymes) @ 0.15 %
6 N:P:K:: 19:19:19 @1% + Multi micronutrients (Fe, Mn, Zn, B, Cu, Mo)@ 0.1 %
7 N:P:K:: 19:19:19 + Multi Micro nutrients + Plant Growth Hormones

Variety: K-75 Fertilizer: 20:50:20:20 = N:P2O5:K2O:S
Design: RBD Replications : 3

Effect of irrigation nutrient and growth hormone on yield and economics of Lentil (Pooled of 2 year)

Treatment	Seed Yield (kg/ha)	Net Return (Rs/ha)	B:C Ratio
Main plot (Irrigation levels)			
One irrigation	1075	25736	1.39
Two irrigation	1233	31857	1.68
CD at 5 %	119	4793	0.26
Sub plot (Foliar spray)			
Water Spray	899	19830	1.16
N:P:K:: 19:19:19 @ 1%	1211	31612	1.74
N:P:K-19:19:19+ MMN+PG Hor	1357	35152	1.70
CD at 5 %	135	5402	0.30

Recommendation:

1. The higher seed yield of lentil (1233 kg/ha) net return (Rs. 31857/ha) and B:C ratio (1.68) were obtained with the application of two irrigations at 35 & 65 DAS.
2. Among the foliar spray, the seed yield (1357 kg/ha), net return (Rs. 35152/ha) and Benefit :Cost Ratio (1.70) were obtained under application of N:P:K:: 19:19:19 + Multi Micro nutrients + Plant Growth Hormones.

RPF : 2017-18

Agron-1: Developement of Agrotechniques for ratooning of Pigeonpea

Locations: Raipur & Bhatapara

Kharif 2017: Planting geometry (4)

1. 60 cm X 20 cm
2. 90 cm X 20 cm (Rec.)
3. 120 cm X 20 cm
4. 150 cm X 20 cm

Rabi 2017-18: Foliar nutrition (3)

1. Water spray
2. N:P:K::19:19:19 @ 1%
3. Plant growth hormones

(Cytokine and enzyme) @ 0.15%

(Note: Total 3 spray - 1st spray at 10 days after emergence of leave and remaining spray 20 days interval)

Design: Split plot design Replication: 3

Seed Yield of Pigeonpea as influenced by crop management practices (Kharif 2017)

Treatment	Seed Yield (q/ha) Kharif	Seed Yield (q/ha) Rabi ratoon	Total Productivity (K+R), q/ha	NR (Rs in lakh/ha)
Kharif (Planting geometry)				
60 cm X 20 cm	20.9	13.6	34.6	1.47
90 cm X 20 cm	17.9	10.4	28.3	1.16
120 cm X 20 cm	16.5	8.5	25.1	0.99
150 cm X 20 cm	15.9	7.6	23.5	0.91
CD at 5 %	1.89	0.82	1.87	0.09
Rabi (Foliar nutrition)				
Water spray	17.8	9.0	26.8	1.09
N:P:K::19:19:19 @ 1%	17.8	11.2	28.9	1.18
Plant growth hormones @ 0.15%	17.9	10.0	27.9	1.13
CD at 5 %	NS	0.87	1.04	0.05

Achievement:

1. During kharif season (20.9 q/ha), and rabi season (13.6 q/ha) which was significantly higher with 60 cm X 20 cm than other spacing.
2. The foliar application of N:P:K::19:19:19 @ 1% found to be beneficial for increasing seed yield.

Agron 2: Yield maximization of sugarcane under drip fertigation (on going in field)

Locations: Raipur

Main plot : Nutrient levels	
F1	75% RDF
F2	100% RDF
F3	125% RDF
Sub plot : Spacing	
M1	Ring pit method
M2	SSI (Bud chip method)
M3	Spaced transplanting method
M4	Single set poly bag planting
M5	Rectangle pit method
M6	Farmers practice (Flat method-three budded set planting)

Design: Strip plot Replication: 3

Agron3: Performance of Gobhi Sarson under rice based cropping system for midland irrigated situation

Locations: Raipur and Ambikapur

kharif rice : Varieties (2)

1. Early duration (MTU1010)

2. Medium duration (Rajeshwari)

Rabi-Gobhi sarson

Factor 1: Method of sowing

1. Dibbling

2. Transplanting

Factor 2: Spacing (cm)

50x50, 70x70, 90x90

Design : Factorial RBD Rep.: 3

Seed yield of Gobhi sarso as influenced by method of sowing and spacing under rice based cropping system

Treatment	Seed yield (q/ha)		SP (R+GS) (q/ha)		NR (000'Rs/ha)	
	RPR	AMP	RPR	AMP	RPR	AMP
Ghobhi Sarso						
A. Method of sowing						
Dibbling	25.78	18.65	69.37	61.16	113.57	79.67
Transplanting	28.27	20.45	71.86	62.96	124.06	90.70
CD (P=0.05)	2.32	1.85	-	-	-	-
B. Spacing (cm)						
50x50	25.40	18.03	68.83	60.54	111.68	79.11
70x70	26.30	19.62	70.23	62.13	117.27	85.47
90x90	29.36	20.99	72.79	63.51	127.51	90.97
CD (0.05)	2.84	2.26	-	-	-	-

Agron-4: Effect of fertigation on Soybean-Mustard cropping system

Location: Raipur

Kharif – Soybean Treatment

T_1 : 75% RDF through fertigation
T_2 : 100% RDF through fertigation
T_3 : 125% RDF through fertigation
T_4 : 75% RDF (25 % Basal + 75 % through fertigation)
T_5 : 100% RDF (25 % Basal + 75 % through fertigation)
T_6 : 125% RDF (25 % Basal + 75 % through fertigation)
T_7 : 100% RDF through DSA
T_8 : Control

Rabi - Mustard Treatment

T_1 : 100% RDF with DSA
T_2 : 100% RDF through Fertigation
T_3 : 75% RDF (25%DSA+75% through Fertigation
T_4 : 75% RDF through Fertigation
T_5 : 100% RDF (25% DSA+ 75% through Fertigation)
T_6 : 125% RDF (25% DSA+ 75% through Fertigation)
T_7 : 150% RDF (25% DSA+ 75% through Fertigation)
T_8 : 0% Control


RDF: 20:60:40 Kg NPK /ha


RDF: 100:60:40 Kg NPK /ha