प्रकाशन के लिए नहीं
केवल कार्यालयीन उपयोग हेतु

अखिल भारतीय समन्वित सोयाबीन अनुसंधान परियोजना
ALL INDIA COORDINATED RESEARCH PROJECT ON SOYBEAN

भाकृअनुप
ICAR

भारतीय कृषि अनुसंधान परिषद्
Indian Council of Agricultural Research

निदेशक का प्रतिवेदन एवं परीक्षणों की सारांश – तालिकाएं

DIRECTOR'S REPORT AND SUMMARY TABLES OF EXPERIMENTS

2018-2019

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Director's Report

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(भारतीय कृषि अनुसंधान परिषद्)
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Director's Report

SOYBEAN SCENARIO AND RESEARCH HIGHLIGHTS

1. Global Scenario

Soybean (*Glycine max* (L.) Merril) has a prominent place among modern agricultural commodities, as the world's most important seed legume, which contributes about 25% to the global edible oil production, about two thirds of the world's protein concentrate for livestock feeding and is a valuable ingredient in formulated feeds for poultry and fish. It is also an important commodity for food manufacturers, pharma industry and many more industrial uses. It is therefore no surprise that global soybean demand is increasing rapidly. Global production of soybean continue to increase and a record world production of soybean is expected this year to 364.33 million tones from an area of 127.19 million hectares, an increase of 3.3 per cent and 2.9 per cent, respectively over 2017-18. The increased global soybean production is mainly due to increase in production in USA, Brazil, China and India, although soybean production is expected to marginally decline in Argentina on weather woes. The global soybean productivity is also expected to marginally increase from 2854 kg/ha in 2017-18 to 2864 kg/ha in 2018-19 (Table 1). Among the major soybean growing countries, India ranks fourth in terms of area under soybean and fifth in terms of production as per AMIS, FAO estimates (Table 1). World soybean prices firmed up during February-May period to 415-430 US$/T and mostly trading steady thereafter in the range 360-390 US$/T on account of record global supply and slow pace of exports of soybean from US and soya oil from Argentina mainly on account of reduced import by China. Contrasting trends in soybean prices at major producers were observed. On the underlying demand strength from China, soybean prices in Brazil firmed up, even though there was pressure from weak currency. While on higher estimated production and low export demand, bearish sentiments prevails in US Gulf export prices. In Argentina, FOB prices were higher supported from tight availabilities and fresh export interest countered the influence of currency movements.

2. National Scenario

Near record production of soybean in the country is expected this year at 13.46 million tones from an area of 10.96 million hectares with 1228 kg/ha productivity. The country has achieved maximum production of 14.67 million tons of soybean during *kharif* 2012. After the continuous decline in the production of soybean from 2013 to 2015 on account of weather aberrations led biotic and abiotic stresses, soybean production has increased to 13.16 million tones from an area of 11.4 million hectares with the productivity of above 1154 kg/ha. Although, area under soybean has declined slightly during *kharif* 2017 mainly due to price concerns (Table 2), but increased again during *kharif* 2018. Production and productivity of soybean during 2017-18 was low due to uneven distribution of rainfall and drought conditions at critical stages of crop growth in major soybean growing regions. Madhya Pradesh, Maharashtra and Rajasthan contribute about 92-93% of area and production of soybean in India, however, cultivation of soybean is fast expanding in the states of Telangana, Karnataka and Gujarat. Soybean production in three major producing states is expected to increase significantly this year. Onset of monsoon in major soybean growing regions was timely and the rainfall was mostly well distributed, particularly in July and August months (crop establishment and growth phases). No major outbreak of diseases or insect-pest attack was reported from soybean growing areas except sporadic reports of biotic stresses at some places.

Minimum support prices of soybean increased to Rs. 3399 per quintal for the marketing season 2018-19 from Rs 3050 per quintal for previous year. Higher production estimates of soybean in the country from this *kharif* season harvest coupled with higher global supplies expected to put pressure on prices. Soybean prices ruled mostly below minimum support prices during harvest season this year. Soybean traded in the range of Rs. 2500 to 3300 per quintal during June to December 2018 in all major markets. Whereas, the hope of reviving soymeal export opportunities, particularly on expected resumption of exports to China, can help boost the trade sentiments. This has led to increase in prices of soybean to the level of Rs. 3600 to 3900 per quintal during January- February, 2019 in all major markets.

Drastic decline in export of soybean de-oiled cake (DOC) from India during 2014-15 and 2015-16, on account of low domestic production led higher domestic prices and higher global production led slump in international prices, has been arrested. The export of DOC has picked up to 12.76 lakh tonnes during 2016-17 valued at Rs. 3731.69 Crores (US$ 554.89 million) as compared to 4.13 lakh tonnes valued at Rs. 1520.2 Crores (US$ 233.34 million) in the year 2015-16. During 2017-18, the country exported 18.95 lakh tones of soybean meal valued at Rs. 5130.42 Crores (US$ 796.42 million). In the current financial year, the export of soybean meal was to the tune of 15.77 lakh tonnes during April-Dec 2018-19 valued at Rs. 5047.23 Crores (US$ 720.73 million). The price parity of Indian soybean DOC with international prices is improving due to higher production of soybean. The country also exports other soybean products such as soy sauce, soy protein, oil, soy flour and soybean milk drinks.

The abiotic and biotic stresses have serious influence on soybean production and have also affected our seed production programme. During 2017 our breeder seed production was only 40% of the DAC indent. Though the breeder seed production was satisfactory this year (2018) as production was 14865.4 q against the DAC indent of 14740.4 q. However, there was large varietal mismatch as the production of breeder seed was far below the DAC indent for varieties JS 20-34 (578.8 q against target of 2547.4 q) and JS 20-29 (887.2 q against the target of 2227.6 q). The major failure was at JNKVV, Jabalpur and off season soybean breeder seed production programme has been taken up at JNKVV for JS 20-29 and JS 20-34 at 38 and 26 ha, respectively. There is a need to strengthen seed production programme and the infrastructure in terms of farm implements, BBF planters, irrigation facilities need to develop at all our breeder seed production centres. The point was also reiterated by Hon'ble Secretary, DARE and Director General, ICAR during the meeting convened to discuss failure of soybean breeder seed production at NASC complex, New Delhi on 1.08.2018.

The climate change is apparent and is a challenge to soybean production. We need to evolve varieties which can withstand the climatic variability such as delayed monsoon, drought conditions, water logged conditions and high temperature. Also, the management of crop from biotic stresses such as stem fly, girdle beetle, white fly and YMV should be our priority. For this we need to explore untapped research areas and usher in novel research methodologies. There is need to strengthen extension activity and the front line demonstration programme so that our technologies go to the farmers. Soybean is going to remain as leading oilseed crop in India and improvement in its productivity would not only lead to self sufficiency in edible oil but would also help millions of small and marginal farmers who depend for their lively hood on this crop.

Table 1: World Area, Production & Productivity of Soybean

A = Area (m ha), P = Production (m t), Y = Yield (kg/ha)

Country	2015-16 [A]			2016-17 [A]			2017-18 [A]			2018-19 [B]		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
USA	33.12	106.95	3229	33.47	116.92	3494	36.23	119.52	3299	35.74	125.18	3503
Brazil	32.18	97.46	3029	33.18	96.39	2905	33.94	114.60	3377	35.76	117.50	3286
Argentina	19.35	61.45	3175	19.50	58.80	3015	17.34	54.97	3171	17.50	53.50	3057
China	6.51	11.79	1811	7.09	12.79	1803	7.34	13.15	1791	8.45	16.00	1893
India	11.67	8.57	734	11.50	13.16	1144	10.60	10.98	1036	10.80	12.10	1120
World	120.79	323.20	2676	121.85	335.51	2753	123.55	352.64	2854	127.19	364.33	2864

Source: A. FAO Database, B. AMIS, FAO February, 2019.

Table 2: State wise Area, Production & Yield of Soybean in India during *Kharif* 2015-2018

A = Area (m ha), P = Production (m t), Y = Yield (kg/ha)

	2015 Kharif[1]			2016 Kharif[1]			2017 Kharif [2]			2018 Kharif [2]		
State	**A**	**P**	**Y**	**A**	**P**	**Y**	**A**	**P**	**Y**	**A**	**P**	**Y**
Madhya Pradesh	5.91	4.91	831	5.40	6.65	1231	5.01	5.32	1062	5.24	6.73	1285
Maharashtra	3.70	2.06	557	3.84	4.59	1194	3.84	3.89	1012	3.93	4.39	1117
Rajasthan	1.20	1.00	829	1.06	1.13	1072	0.89	1.07	1207	0.93	1.16	1244
Karnataka	0.26	0.14	543	0.32	0.24	745	0.28	0.42	1611	0.34	0.34	1000
Telangana	0.24	0.25	1037	0.28	0.32	1162	0.15	0.25	1624	0.15	0.24	1586
Gujarat	0.08	0.05	675	0.12	0.09	717	0.15	0.12	791	0.14	0.17	1247
India	11.60	8.57	738	11.40	13.16	1154	10.47	10.98	1049	10.96	13.46	1228

Sources: 1. DAC&FW, GoI, 2. State-wise area, production and yield data from State Agricultural Department estimates.

3. Accomplishments for the year 2018-19

3.1 Breeding and Genetics

The data on yield and other characters of test entries in different breeding trials conducted in *Kharif* 2018 are presented in Table 1.1.1 to 1.6.10.

3.1.1 Initial Evaluation Trial

Thirty four entries were evaluated at 31 AICRP centres of six AICRP zones. The promising entries showing yield advantage over highest yielding check are presented in Table 3.No entry could out yield check variety VLS 59 in Northern Hill Zone. In Northern Plain Zone only JS 21-71 could surpass the best check. In North Eastern Hill Zone two entries out yielded the best check RKS 113. In Eastern Zone seven entries and in Central zone two entries could out yield the best check. In Central Zone two entries NRC 138 and NRC 146 had less than 90 days of maturity but were marginally lower in yield than the early maturing check (JS 20-34). Only one test entry DSb 33 could out yield the best check DSb 23 in Southern Zone.

Table 3: Promising entries for different zones in IVT

S. No	Entry	Northern Plain Zone		North Eastern Hill Zone		Eastern Zone		Central Zone		Southern Zone	
		Yield	**Rank**	**Yield**	**Rank**	**Yield**	**Rank**	**Yield**	**Rank**	**Yield**	**Rank**
1.	JS 21-71	2247	I								
2.	MACS 1620			3506	I						
3.	MAUS 732			3383	II						
4.	PS 1637					2304	I				
5.	MACS 1566					2222	II				
6.	Himso 1689					2214	III				
7.	RSC 11-17					2197	IV				
8.	MACS 1620					2148	V				
9.	DSb 33,					2139	VI				
10.	RSC 11-15					2123	VII				
11.	RVSM 2011-35							2034	I		
12.	Himso 1689							2010	II		
13.	DSb 33									2905	I
14.	RSC 10-46 (c)					1992	XII				
15.	RKS 113			2914	IV						
16.	JS 335 (c)							**1817**	VII		
17.	DSb 23									**2830**	II
18.	PS 24 (c)	2091	VI								

In Vegetable Soybean trial four entries were tested in NHZ, CZ and SZ. Harasoya was the best check in NHZ and none of the entries could surpass it in green pod yield. In CZ and SZ, Karune was the best vegetable soybean entry for green pod yield and its green seed weight was also maximum (60g in CZ and 73g in SZ).

3.1.2 Advanced Varietal Trial – I

The results of mean performance of AVT-I entries over two years are presented in summary report of plant breeding trials. Table 4 shows performance of superior AVT-I entries in different zones. NRC 147 a high oleic acid line was directly introduced in AVT I of all zones to minimize its release time to two years if it performs well. MACSNRC 1667 was an Essentially Derived Variety of MACS 450 for null KTI and was introduced directly in AVT I of Southern Zone. In Northern Hill Zone only NRC 147 was there and it could not compete with the best check VLS 59. In Northern Plain Zone PS 1613, PS 1611 and NRC 128 were better than the best check PS 1347. In North Eastern Hill Zone two entries out yielded the best check. In Eastern Zone nine entries and in Central Zone AMS 100-39 out yielded the best check. NRC 130 and NRC 131 were the early maturing entries and NRC 130 had 7% yield advantage over and NRC 131 was at par with early maturing check JS 20-34. In Southern Zone 9 entries could out perform the best check DSb 21. MACSNRC 1667 had equivalent yield to that of MACS 450 and NRC 147 out yielded the best check JS 335.

Table 4: Promising entries for different zones in AVT-I

S. No.	Entry	Northern Plain Zone		North Eastern Hill Zone		Eastern Zone		Central Zone		Southern Zone	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1.	PS 1613	2502	I	1749	I						
2.	PS 1611	2487	II								
3.	NRC 128	2282	III			1993	II				
4.	DS 3108			1678	II						
5.	RSC 11-07					2045	I			2602	IV
6.	AMS 2014-1					1932	III				
7.	NRC 136					1852	IV				
8.	NRC 132					1735	VIII				
9.	MACS 1493					1849	V			2679	II
10.	RSC 11-03					**1797**	VI				
11.	NRCSL 1					**1766**	VII			2487	VI
12.	NRC 137					1710	IX				
13.	AMS 100-39							**2066**	I	2494	V
14.	DSb 34									2693	I
15.	KDS 992									2663	III
16.	BAUS 102									2463	VII
17.	AMS 2014-1									2457	VIII
18.	SKF-SP-11									2443	IX
19.	NRC 147									2563**	I**
20.	MACSNRC1667									2325*	V*
21.	PS 1347 (C)	1941	IV								
22.	NRC 86 (C)							1804	II		
23.	DSb 21 (C)									2308	XI
24.	JS 335 (C)			1582	IV					2358**	III**
25.	MACS 450 (C)									2374*	II*
26.	RKS 18					1574	X				

***For EDV MACSNRC 1667; **For direct AVT I entry NRC 147**

3.1.3 Advanced Varietal Trial-II

Final stages of evaluation involved 9 entries in 4 zones. Table 5 shows promising entries with their yields. In Northern Hill and Southern Zones AVT II trials were not constituted. In Northern Plain Zone **SL** 1104 out yielded the best check PS 1347. In North Eastern Hill and Central Zones all of the three test entries and in Eastern Zone both of the entries out yielded the best check.

Table 5. Promising entries for different zones in AVT II

S. No.	Entry	Northern Plain Zone		North Eastern Hill Zone		Eastern Zone		Central Zone	
		Yield	Rank	Yield	Rank	Yield	Rank	Yield	Rank
1.	SL 1104	2301	I						
2.	DSb 32			1992	I				
3.	RSC 10-71			1789	II				
4.	KDS 921			1737	III				
5.	RSC 10-71					1899	I		
6.	RSC 10-52					1858	II		
7.	MACS 1520							2149	I
8.	RSC 10-52							2007	II
9.	AMS-MB5-18							2002	III
10.	PS 1347 (c)	2026	II						
11.	RKS 18 (c)			1600	IV				
12.	NRC 86 (c)							1850	IV
13.	JS 97-52					1645	III		

3.1.4 Off season nursery and National Hybridization Programme:

Off-season nursery is being actively utilized for generation advancement. Dharwad, Bangalore, Adilabad, Indore, Imphal centres have sent selected breeding material for off-season generation advancement. Total twenty five crosses were attempted under National Hybridization Programme. During 2018, IISR advance 108 F2s to F3s and number of F2 seeds varied from 60-1800 with a mean of 360. Bulks of these crosses would be distributed to all the centres for strengthening the hybridization programme and increasing diversity in Indian soybean varieties.

3.1.5 Multi-location Germplasm Evaluation

One hundred twenty five germplasm accessions were evaluated for 9 characters at Palampur (NHZ), Pantnagar (NPZ); Imphal (NEHZ); Raipur (EZ); Indore, Jabalpur and Parbhani (CZ); and Pune (SZ). Early maturing, high yielding, high 100 SW were identified and would be used in National Hybridization Programme for widening the genetic base of Indian soybean varieties.

3.2 Breeder seed production

The indent for soybean breeder seed for *Kharif* 2019, to be produced in 2018 was **14740.4** q. The indent comprised of 36 varieties. Major indent of 84% was given for seven (7) most important varieties namely JS 335 (17.3%), JS 20-34 (17.3%), JS 20-29 (15.1%), JS 95-60 (10.0%), JS 93-05 (10.0%), RVS 2001-4 (8%) and JS 20-69 (6.6%).

The largest indent was given for JS 335 and JS 20-34 i.e. **2550 and 2545 q** respectively which is **34.6 %** of total indent. Against these indents a target of **19309** q was allotted to different AICRP Soybean centres. The variety and centre wise production figures are shown in table **6**. A total of 14865.4q breeder seed was produced during *kharif* 2018. The production was marginally more than the indent.

There was major production failure at JNKVV centre. This centre could produce 1399q against the target of 6450q. Two newly released varieties namely JS 20-34 and JS 20-29 suffered maximum. 99.5% production was failed for JS 20-34 at JNKVV. RVSKVV failed to meet the target of production of JS 93-05 and JS 95-60. The shortage of production at RVSKVV for JS 93-05 was 80% and for JS 95-60 36%.

The off-season breeder seed production was taken up during Rabi 2017-18 to compensate the shortage of soybean breeder seed production during *kharif* 2017. Total 438.5q breeder seed was produced from 99 ha area against a target of 707q. The production details are given in table **7**.

Off season soybean breeder seed production during Rabi 2018-19 has been taken up at JNKVV for JS 20-29 and JS 20-34 at 38 and 26 ha respectively. IGKV has taken up off-season breeder seed production of JS 93-05 at 6 ha land to compensate the shortage of *Kharif* 2018 production.

Table 6. Breeder seed production *Kharif* 2018

Sl. No.	Variety	Year	Total Indent	Centres	BSP I Allotment (q)	Prod. (q)
1	JS-335	1994	2549.9	RVSKVV, Gwalior	100	70.0
				UAS, Dharwad	600	1066.0
				MPKV, Rahuri	500	640.0
				PJTSAU, Adilabad	400	410.0
				PDKV, Amravati	500	271.3
				ARI, Pune	200	138.0
				UAS, Bangalore	400	550.0
				UAS, Raichur	100	142.0
				Total	**2800**	**3287.3**
2	JS 20-34	2015	2545.4	JNKVV, Jabalpur*	1200	4.8
				RVSKVV, Gwalior	100	89.0
				AU, Kota	700	400.0
				MPUAT, Udaipur	100	55.0
				VNMKV, Parbhani	30	30.0
				Total	**2130**	**578.8**
3	JS 20-29	2014	2227.6	JNKVV, Jabalpur**	1230	219.2
				RVSKVV, Gwalior	200	241.0
				AU, Kota	300	115.0
				MPUAT, Udaipur	200	137.0
				VNMKV, Parbhani	80	105.0
				Lokbharti	100	70.0
				Total	**2110**	**887.2**
4	JS 95-60	2007	1470.4	RVSKVV, Gwalior	1500	964.0
				AU, Kota	200	80.0
				IISR, Indore	120	150.0
				HIL	300	240.8
				Total	**2120**	**1434.8**
5	JS 93-05	2002	1461.5	RVSKVV, Gwalior	200	41.0
				UAS, Dharwad	500	750.0
				AU, Kota	200	200.0

				MPKV, Rahuri	0	24.0
				VNMKV, Parbhani	300	100.0
				IGKV, Raipur***	200	113.2
				PDKV, Amravati	400	110.8
				IISR, Indore	250	250.0
				Total	**2050**	**1589.0**
6	JS 20-69	2016	967.0	JNKVV, Jabalpur	3675	1117.7
				RVSKVV, Gwalior		69.0
				Total	**3675**	**1186.7**
7	JS 20-98	2017	12.0	JNKVV, Jabalpur	315	14.8
8	JS 97-52	2008	515.1	JNKVV, Jabalpur	30	0.2
				IGKV, Raipur	500	503.2
				BAU, Ranchi	20	15.0
				Total	**550**	**518.4**
9	RVS 2001-4	2014	1187.0	RVSKVV	1250	1530.0
				JNKVV		40.8
				Total	**1250**	**1570.8**
10	Raj Soya 18	2017	10.0	RVSKVV, Gwalior	20	0.0
11	MAUS-71	2002	505.0	VNMKV, Parbhani	600	514.0
12	MAUS-162	2014	105.8	VNMKV, Parbhani	150	1037.6
13	MAUS 158	2010	537.3	VNMKV, Parbhani	700	261.0
14	MACS 1188	2013	125.4	ARI, Pune	150	297.0
15	MACS 1281	2016	10.0	ARI, Pune	10	39.0
16	DSB-21	2015	115.0	UAS, Dharwad	150	300.0
17	PhuleAgrani	2015	97.5	MPKV, Rahuri	125	108.0
18	PhuleKalyani	2006	37.8	MPKV, Rahuri	50	358.0
19	NRC-37	2001	30.0	IISR, Indore	40	25.0
				PDKV, Amravati	20	54.0
				AAU, Anand	0	61.5
				Total	**60**	**140.5**
20	NRC 86	2015	60.5	IISR, Indore	80	75.0
21	NRC-7	1997	20.0	IISR, Indore	10	1.0
22	PS-1225	2009	22.0	GBPUAT, Pantnagar	25	80.5
23	PS-1347	2008	9.5	GBPUAT, Pantnagar	15	42.9
24	PK-262	1984	0.6	GBPUAT, Pantnagar	2	0.1
25	Pratap Soya 45	2013	20.0	AU, Kota	30	30.0
26	RKS-113	2016	10.0	AU, Kota	15	20.0
27	RKS-24	2011	10.0	AU, Kota	25	25.0
28	CG Soya 1	2017	50.0	IGKV, Raipur	50	75.6
29	VL Soya-65	2010	3.0	VPKAS, Almora	4	5.0
30	VL SOYA 63	2008	3.0	VPKAS, Almora	4	3.0
31	HARA SOYA	2001	2.0	HPKV, Palampur	3	8.0
32	Palam Soya	2005	1.0	HPKV, Palampur	2	11.0
33	Birsa Soybean-1	1983	0.4	BAU, Ranchi	1	2.0
34	PUSA 12	2015	0.5	IARI, New Delhi	2	0.5
35	Basara		18.0	PJTSAU, Adilabad	25	68.0
36	SL 958	2015	0.4	PAU, Ludhiana	1	4.5
37	MAUS 612			VNMKV, Parbhani		25.0
38	MAUS 81			VNMKV, Parbhani		80.0
37	PhuleSangam			VNMKV, Parbhani		148.0
38	KDS 753			VNMKV, Parbhani		16.0
39	Him Soya			HPKV, Palampur		4.9
40	Shivalik			HPKV, Palampur		12.1
41	Palam Early Soya 1			HPKV, Palampur		4.4
			14740.4	**Grand Total**	**19309.0**	**14865.4**

Table 7. Off-season breeder seed production *Rabi* 2017-18

Variety	Centre	Area Target (ha)	Production Target (q)	Actual Production (q)
JS 93-05	UAS, Dharwad	30	200	120.0
	VNMKV, Parbhani	10	50	40.0
	MPKV, Rahuri	4	20	15.0
	PDKV, Amravati	10	50	15.0
	Total	**54**	**320**	**190.0**
JS 20-29	JNKVV, Jabalpur	23	230	110.0
JS 95-60	JNKVV, Jabalpur	10	50	-
JS 20-34	JNKVV, Jabalpur	2	20	18.0
JS 20-69	JNKVV, Jabalpur	6	60	110.0
JS 20-98	JNKVV, Jabalpur	-	-	8.0
NRC 86	IISR, Indore	3	20	2.0
NRC 37	IISR, Indore	1	7	0.50
	G. Total	**99**	**707**	**438.5**

3.3 Production technology and Front Line Demonstrations (FLDs)

All the trials were conducted during *kharif* 2018 at all Centres representing 6 zones of the country as per technical programme. Raipur centre did not submit the data hence it was not included in zonal average. The experiment-wise salient findings are given as under

Evaluation of AVT II entries under different sowing dates

The highest yield was noted with new entry SL 1104 (30.43%) followed by DS 31-06 (7.79%) as compared to check PS 1347 in north plain zone. New entry RSC 10-52 yielded higher (22.28%) than check variety JS 97-52 in north eastern zone. New entry DSb 32 and RSC 10-71 produced negligibly higher yield (19.38 and 3.18%) as compared to check- JS 97-52 in north eastern hill zone. The new entry i.e. RSC 10-51 yielded higher (2.69%) than check variety NRC 86 in central zone.

Invariably timely planted soybean yielded higher to the tune of 23.82, 30.83, 63.33, 56.77% than 20 days later planting in north plain, north eastern, north eastern hill and central zone, respectively.

Sustainable soybean production through crop rotation and tillage systems

Soybean-soybean-maize-soybean rotation yielded maximum in north plain, north eastern and southern zones.

Conventional tillage gave higher soybean, *Rabi* yield and SEY over minimum tillage in central and southern zone while just reverse was true with minimum tillage in north eastern zone.

Bridging yield gap of soybean through site specific nutrient management (SSNM)

The maximum yield gap was recorded in order of N, P and K in north plain and north eastern hill zone. The highest yield gap was due to omission of P in north eastern and central zone followed by K and N.

System intensification for soybean productivity augmentation under Ridge Furrow planting

Invariably planting geometry of 45 x 5 or 45 x 10 cm behaved identically and found superior over wider plant to plant spacing. The maximum yield was recorded with SL 958 in north plain, RSC 10-46 in north eastern, JS 97-52 in north eastern hill, and MACS 1188 in southern zone. The productivity potential of both the varieties was identical in central zone.

Evaluation of bio-efficacy of MACARENA (Bio-stimulant) on soybean

The two spray of MACARENA at pre flowering and pod initiation increased the soybean yield to the tune of 8.89% at Amravati and 19.98% at Adilabad as compared to recommended dose of fertilizer (RDF).

Frontline demonstrations (FLDs)

During the year, 25 centers have conducted a total of 1129 FLDs on farmer's fields against the target of 900 FLDs in plot of 0.4 ha each. Directors of Agriculture of respective states were requested to visit these FLDs. Many of these trials were monitored and generally found to be satisfactory. Yield as high as 30.43 q/ha could be obtained in some farmers' fields under the improved technology.

Of the 1136 FLDs, 74.89 and 25.11% were represented by man and farm women. While the representation of categories wise beneficiaries were 15.93% by SC, 8.63% by ST, 43.66% by OBC and 31.78% by general

Data accrued from 1147 FLDs on full package revealed that the adoption of research emanated improved soybean production technology led to an increase in yield and net returns to the tune of 26.19 and 40.17% over farmers practice which was achieved by the additional expenditure of only Rs. 3718/ha. The difference in gross returns due to improved technology and farmer's practice was 32.38%. The estimated yield gap II was 380 kg/ha.

A summary of FLDs over 30 years (Table 8) consistently shows the benefits of improved technology.

Table 8. Soybean yield (kg/ha) and yield gap II in Front Line Demonstrations

Sr. No.	Year	Improved technology	Farmers' practice	Yield gap II
1	1989-90	1951	901	1050
2	1990-91	1959	1280	679
3	1991-92	1991	1446	545
4	1992-93	1933	1427	506
5	1993-94	1899	1407	492
6	1994-95	1810	1360	450
7	1995-96	1839	1385	454
8	1996-97	1824	1501	323
9	1997-98	1852	1409	443
10	1998-99	1736	1245	491
11	1999-2000	1736	1292	444
12	2000-01	1540	1191	349
13	2001-02	1769	1420	349
14	2002-03	1646	1299	347
15	2003-04	1724	1444	280

16	2004-05	1743	1415	328
17	2005-06	1693	1344	349
18	2006-07	1755	1365	390
19	2007-08	1794	1439	355
20	2008-09	1702	1302	400
21	2009-10	1744	1320	424
22	2010-11	1688	1307	381
23	2011-12	1813	1438	375
24	2012-13	1881	1469	412
25	2013-14	1648	1335	313
26	2014-15	1778	1359	419
27	2015-16	1484	1061	423
28	2016-17	1848	1470	378
29	2017-18	1722	1388	384
30	2018-19	1831	1451	380

3.4 Entomology

Total seven field/laboratory trials were conducted during *kharif* 2018 by the coordinating centres. Twenty one different insect species were reported to infest soybean crop. Infestation of stem fly was observed at all the centers. Maximum stem tunnelling (44 %) due to stem fly maggots was reported from Sehore. White fly incidence was very low during the season as compared to previous years. In Central zone incidence of defoliators, girdle beetle and stem fly continued to be major pests. Girdle beetle infestation was highest at Kota (26.7%). Pod damage due to *Cydia ptychora* to the extent of 45.1 % was observed at Dharwad center. High incidence of aphids (24.8/plant), leaf webber (14.7 larvae/m) and Bihar Hairy caterpillar (107 larvae/m) was reported from Imphal. Among natural bio-control agents, entomopathogenic fungi viz. *Beauveria bassiana* and *Nomurea rileyi* caused severe infection of muscardine disease in lepidopteran defoliators during August-September. The larval mortality ranged from 11 to 50 %.

Soybean genotypes belonging to IVT, AVT-I, AVT-II of different zones were evaluated for insect resistance. Considering three years' data, 27 genotypes were found to be promising with respect to resistance against stem fly, defoliators, girdle beetle and pod borer. From IVT of *kharif* 2018, twenty five entries were found promising, which will be evaluated further during coming season.

To confirm the type of resistance, AVT-II entries were subjected to novel approaches, involving food consumption and utilization indices viz. Approximate Digestibility (AD), Efficiency of Conversion Index (ECI) and Efficiency of conversion of Digested food (ECD). At Pantnagar, among 8 genotypes tested, only SL 1104 exhibited **strong antixenosis** reaction against S. litura larvae. Entries viz. RSC 10-52 and DSb 32 exhibited good level of antibiosis with relatively lower AD, ECI and ECD as compared to other genotypes. All the Breeders should send their AVT-II entries to PI, Entomology for this trial.

A new formulation of *Bacillus thuringiensis* – Bt 127 SC developed by ICAR-IIOR, Hyderabad was evaluated for the third year for its efficacy against lepidopteran insects of soybean. The product, Bt 127 SC appears to be promising for managing lepidopteran defoliators including *Spodoptera litura* and on par with commercial Bt formulation.

The trial on effect of polymer coating on efficacy of seed treatment pesticides was continued for second year. Two years' results show that seed treatment with insecticides and fungicides and polymer coating helps in retaining the efficacy of pesticides and facilitates the operation much before the sowing time, thereby managing the sowing in narrow sowing-window.

Evaluation of germplasm is a regular process. This year also 50 germplasm lines were sent to the entomologists for screening against major insects at hot spots. As many as 20 lines exhibited insect resistance and good yield potential. These lines will also be tested further during next season.

3.5 Pathology

Nine Pathology field trials were conducted during *kharif* 2018 at 15 co-ordinated centres spread over five zones to generate the information on prevalence of diseases, their severity, sources of resistance to either a single disease or multiple diseases, screening of germplasm lines for identification of sources of multiple disease resistance, bioefficacy of zillon against YMV disease and assessment of polymer coating on efficacy of seed treating chemicals and inoculants. As reported by various centres, although a total of 18 diseases appeared across the country on soybean but only eight of them were wide spread occurring in 3 or more zones and four were zone specific. Following diseases were centre specific- FLS at Almora, Palampur, Sehore, Jabalpur, Ugarkhurd and Dharwad; YMV at Pantnagar, Ludhiana, Dholi and Delhi; Coll R and PB (Ct) at Pantnagar, Jabalpur and Amravati; SR at Jorhat; Coll R, CR and PB(Ct) at Jabalpur and Amaravati; rust and PB (Ct) at Ugar khurd, Dharwad and K. Digraj. Seed rot at Jorhat, BND at Delhi and ChLB at Ugarkhurd appeared in moderate to severe form, severity of other diseases was mild to moderate at most of the locations. Two disease viz., PB (Ct) and YMV were found in all the five zones which are the key diseases across the locations. FLS and ALS appeared in four zones except northern Plain zone BND appeared only at Delhi and Seed rotting at Jorhat and ChLB at Ugarkhurd in moderate to severe form. The other hemibiotrphic diseases at different locations appeared in mild to moderate form.

In general, the disease pressure differed at different locations across a zone which is mainly due to variation in congenial weather that prevailed across the different locations during the cropping period.Soybean genotypes belonging to IVT, AVT-I, AVT-II of different zones were evaluated for disease resistance. Considering the disease severity, genotypes found to be promising with respect to resistance against FLS, PB (Ct), RAB, YMV, Rust, TLS, SCV, IBB, CollR, CR and FW were identified. **In IVT trial**; entries PS 1637, GJS 3 and NRC 148 showed AR reaction over two locations for PB (ct) and DSb 33 showed HR reaction at Ugarkhurd, Dharwad and MR reaction at K. Digraj. The entries AMS MB 2014-1,CSB 10112, NRC128, NRC 132 and PS 1611 showed AR/HR reaction for PB (Ct) at Medziphema and Jorhat locations while the entries DS 3106 and SL 1104 showed AR/HR reaction for YMV at two or more centers and DSb 32 showed HR reaction to rust at Dharwad, Ugarkhurd and K. Digraj in advanced screening trials.

Disease specific resistant entries/varieties of past years were further evaluated to select those which are showing durable resistance status at various identified locations. In NPZ, at Pantnagar out of 32 previous entries, PS 1572, SL 979 maintained AR status and 10 maintained HR status to RAB.

In NHZ at Almora, out of 73 entries tested the entries NRC 88, VS 2005-40, VS 2006-17, Himso 1685, MACS 1407 and Shalimar maintained AR status to FLS. In CZ at Amravati, out of 82 entries, 42 maintained AR status to CR. At Jabalpur, out of 25 entries tested, 11 maintained HR reaction for CR. At Sehore, out of 40 entries tested 37 entries recorded AR reaction to CR. At Dharwad out of 24 entries tested, DSb 34, DSb 23, DSb 28-3 and DSb 21 maintained HR reaction to rust, EC 391336, EC 379152, EC 242104 the sources of resistance identified four years back maintained HR recation to rust at Dharwad and Ugarkhurd. At Ugarkhurd, out of 14 entries, 9 entries maintained HR reaction to rust and 10 entries MR reaction to PB (Ct). The variety DSb 21 maintained HR reaction to rust for the last nine years both at Ugarkhurd and Dharwad.

Fifty germplasm each were evaluated at Palampur, Jabalpur, Indore, Dharwad and Pantnagar centres for identification of sources of multiple disease resistance. At Palampur, JS 20-27(E), JS 20-23(E), AMS 56, AMS 34, AMS 60-2-3-4, AMS MB 5194 showed AR reaction to FLS. Nineteen entries showed AR and 12 HR reaction to PB(Ct). At Jabalpur, JS 20-23(E), JS 20-21(E), JMS 288, EC 547464, MAUS 142, AMS MB 51-94, JS 75-30,VLS 75, Trait Specific Harder(L) showed AR to CR. For RAB, 11 entries maintained AR reaction. At Dharwad EC 113778 showed MR to rust and 15 lines MR to PB(Ct). At Indore center, eight entries showed MR reaction for PB(Ct), 47 entries resistant to BP. At Pantnagar, nine entries showed HR reaction to RAB and 27 entries HR to PB(Ct). The entries that showed AR/HR reaction at three or more locations are Trait Specific Harder(L), EC 287754, AGS 102, JS 75-30, EC 309537 for PB(Ct) which can be used sources in resistance breeding programme.

In the bio-efficacy of Zillon against Yellow Mosaic Virus Disease trial, among the different treatments tested across the zones, spraying with Zillon at 4 to 6 ml/L at 15, 30 and 45 DAS was found effective in management of Yellow Mosaic Virus disease and enhancement of yield in soybean. Assessment of polymer coating on efficacy of seed treating chemicals and inoculants revealed significant reduction in severity of location specific diseases at Indore, Sehore and Dharwad.

3.6 Microbiology

Total five field/laboratory trials were conducted during *kharif* 2018 by the coordinating centres. Following are the results:

Isolation and screening of rhizobacteria capable of producing ACC deaminase activity, antioxidant potential and phytohormones for developing inoculants to mitigate abiotic stress in soybean

This experiment was initiated at various centres to explore fluorescent pseudomonads from the soybean rhizosphere soil so that it can be used as potential plant growth promoting rhizobacteria in soybean. At Indore centre, three fluorescent pseudomonads were selected and based on gradient of PEG concentration (0 to 40% PEG 6000 gradient in KB broth) one strain *Pseudomonas aeruginosa* (P1) was found to have higher growth at 20% PEG as compared to other two and found to possess PGP traits *viz.* Indole acetic acid (IAA), phosphate (P) solubilization, siderophore production and ACC deaminase activity assays. At Delhi centre, seven moisture tolerant fluorescent pseudomonad isolates (tolerant up to 30% PEG) were found to be positive for IAA and siderophore production. At Pantnagar centre, a total of 26 probable fluorescent *Pseudomonas* isolates were recovered from the soybean rhizosphere soil and roots and are being screened for moisture tolerance and PGP traits. At Ludhiana centre, two potential pseudomonads were selected based on having multifarious PGP traits *viz.* IAA, P-solubilization, siderophore, ACC deaminase and salt tolerance and also found positive for catalase and superoxide dismutase (SOD) assessed under abiotic stress *in vitro* condition. Pseudomonads *viz.* LSE-2 & LSE-3 showed excellent growth on DF medium containing ACC as nitrogen source. Further, two pseudomonads LSE-2 & LSE-3 were identified as *P. oryzihabitans* and *P. fluorescence* by 16 S rRNA sequencing.

Development of multi trait soybean rhizobia and their evaluation under *in vitro*

This trial was initiated to develop and select potential rhizobia having multiple PGP traits (IAA production, Nitrate reduction, P solubilization, siderophore production and ACC deaminase production) for utilization in soybean. At Delhi centre, three soybean rhizobia recovered from field grown soybean and all were found to be positive for ACC deaminase activity. Whereas Indore centre from the 18 soybean rhizobia, 04 strains were well characterized/identified and acquired NCBI accession numbers. These strains were able to grow in YEM broth amended up to 30%

PEG6000 (0 to 30%; 0 to -0.73 mPa osmotic stress). From these one novel rhizobia identified as *Bradyrhizobium daqingense* (isolated from drought-tolerant variety PK-472) has been reported for the first time from soybean nodules. At Ludhiana centre, one potential soybean rhizobia recovered capable to grow under moisture, salt and temperature stress conditions simulated through gradient of PEG, NaCl and temperature up to 35°C under *in vitro* and found to be positive for ACC deaminase activity.

Evaluation of promising soybean rhizobia for conferring drought tolerance in soybean under pot conditions

This trial was conducted in unsterilized soil in pots under moisture stress conditions. Two potential soybean rhizobia (*B. daqingense* and *B.liaoningense*) recovered from soybean nodules by Indore centre were tested under moisture stress conditions. With these strains, a commercial/local soybean *Rhizobium* culture was also included in the trial. Across all the centres, inoculation of *B. daqingense* was found to be the superior strain in terms of having higher nodulation, biomass, nutrient uptake and physiological traits than the other combinations. Moreover, inoculation also improved plant fitness against stress. In conclusion, treatment of *B. daqingense* performed better under both the conditions than the all other strains which signify the role of inoculants in stress tolerance of soybean plants**.**

Field evaluation of AMF and *Paenibacillus polymyxa* microbial combination at farmer's field

Across all the centres, combined inoculation of *Paenibacillus polymyxa* (HKA 15) with AMF increased the nodule number, nodule dry mass as well as yield over farmer's practices. On the basis of four years trials, it is concluded that co-inoculation of *Paenibacillus polymyxa* (HKA 15)+AM fungi at 75% RDF not only have comparable response with 100% RDF/farmers (20, 40,60 Kg NPK/ha) practice but also enhanced yield and cost: benefit ratio which becomes soybean production more economic. Hence, application of biofertilizers improves the crop stand and increases the yield in soybean and signifies reduction in fertilizer inputs by microbial intervention.

Nodulation ability of AVT-II entries at respective centres

In the central zone, across two centres (Sehore and Indore) all the three entries (MACS 1520, AMS-MB 5-18 and RSC 10-52) performed better in terms of producing higher nodules per plant, nodule dry weight and leghaemoglobin content in the fresh nodules than the check (NRC 86). However amongst the all the entries, RSC 10-52 was found to be the best entry for having higher compatibility with native homologous rhizobia. In the north plain zone, across three centres (Delhi, Ludhiana and Pantnagar), when compared to check (PS 1347), both the entries (SL 1104 and DS3106) performed better in terms of having higher nodulation parameters. However when compared to check, DS 3104 entry did not have higher nodulation at Ludhiana centre. Overall, entry SL 1104 was found to be the best entry for having higher compatibility with native homologous rhizobia and produced higher nodulation, nodule dry weight and leghaemoglobin content in nodules.

3.7 Soybean Processing and Value Addition

To develop nutraceutical/ functional food from fermented soybean-*hawaijar*

ACE inhibitory activity was found to increase during fermentation and exhibited higher ACE inhibition percent in starter culture strain (H) than starter culture strain (S) of both the soybean used (local small variety and JS-335). The fermentation by different starter cultures seemed to affect the fatty acid contents. Five fatty acids were identified in the fermented samples (palmitic, stearic, oleic, linoleic and α-linolenic acid). Interestingly, our data showed that starter culture strain H inoculation in soybean fermentation contributed to an increase in concentration of unsaturated fatty acids (oleic, linoleic and α-linolenic) in both the soybean variety. The NEH region of India also has similar traditional fermented soy products which could be exploited for the ever expanding nutraceutical and functional food industries.

Extraction of Poly-Glutamate (PGA) from fermented soybean

The production of PGA was confirmed qualitatively by hydrolysis of polymer and detection of the monomers by Thin Layer Chromatography (TLC), and thus can be concluded that the mucilaginous mass/ slimy texture in the fermented soybean-*hawaijar* was polymer of glutamate and hence it is Poly-Glutamate (PGA). It is evident from Thin Layer Chromatography (TLC) plate that the extracted sample containing crude PGA has been broken down to glutamate. PGA has several applications as foods as well as non-foods.

Formulation and development of soy okara cookies by blending with different levels of wheat flour and black scented rice flour

Fortification of cookies may be achieved through incorporation of protein-rich ingredients from soybean, wheat flour and black scented rice. According to the total sensory scores, the samples exhibited great acceptable sensory characteristics among consumer panel members. The overall acceptability scores for all treatment remains the same. So fortification of cookies can be done by replacing wheat flour with soy *Okara* powder up to 10-25% and black scented rice flour (10%) with good storage stability.

परीक्षणों की सारांश – तालिकाएँ
Summary Tables of Experiments

पादप प्रजनन
Plant Breeding

Principal Investigator	**Dr. Sanjay Gupta, IISR, Indore**

Northern Hill Zone

Palampur (Himachal Pradesh)	Dr. (Mrs.) Vedna Kumari
Almora (Uttarakhand)	Dr. Anuradha Bhartiya
Majhera (Uttarakhand)	Dr. Anjuli Agarwal / Dr. J.P. Purwar
Srinagar (J&K)	Dr. M.N. Khan / Dr. Ashraf Bhat
Sopore (J&K)	Dr. Ashraf Bhat

Northern Plain Zone

Pantnagar (Uttarakhand)	Dr. Pushpendra /Dr. P.S. Shukla / Dr. Kamendra Singh
New Delhi	Dr. S.K. Lal
Ludhiana (Punjab)	Dr. B.S. Gill

Eastern Zone

Ranchi (Jharkhand)	Dr. Nutan Verma
Raipur (Chattisgarh)	Dr. S.K. Nag
Bhawanipatna (Orissa)	Dr. Susanta Kumar Mohanty
Dholi (Bihar)	Dr. Anil Pandey

North Eastern Hill Zone

Jorhat (Assam)	Dr. Prasanta Goswami
Imphal (Manipur)	Dr. Heisnam Nanita Devi
Umiam (Meghalaya)	Dr. Amit Kumar

Central Zone

Indore (Madhya Pradesh)	Dr. Rajkumar Ramteke
Sehore (Madhya Pradesh)	Dr. S.R. Ramgiri
Nagpur (Maharashtra)	Shri S.K. Dhapke
Kota (Rajasthan)	Dr. B.L. Meena
Jabalpur (Madhya Pradesh)	Dr. Manoj Kumar Shrivastav
Amravati (Maharashtra)	Dr. G.D.Chandankar
Morena (Madhya Pradesh)	Dr.V.K. Tiwari
Parbhani	Dr.S.P. Mehtre
Lokbahrti (Gujarat)	Dr. C.P. Singh
Anand (Gujarat)	Dr. Girish Patel

Southern Zone

Dharwad (Karnataka)	Dr. G.T. Basavaraja
Bidar (Karnataka)	Dr. Sidramappa
Pune (Maharashtra)	Dr. Philips Verghese
Bangalore (Karnataka)	Dr. Jayrame Gowda and Dr. Onkarappa T.
K. Digraj (Maharashtra)	Dr. M.P. Deshmukh
Adilabad (Telangana)	Dr. M. Rajendra Reddy

Table 1.1.1

Initial Varietal Trial-IVT
Zone: Northern Hill Zone
Character: Yield (Kg/ha)

S.No	Entries	Almora	Majhera	Palampur	Mean	Rank
1	DS 3109	2049	2272	1086	1802.33	VII
2	NRC 146	1358	2222	617	1399.00	XXIV
3	PS 1634	1901	1951	1111	1654.33	XIV
4	JS 21-71	889	1975	864	1242.67	XXX
5	MACS 1566	2617	2272	914	1934.33	V
6	SL 1191	1432	2074	914	1473.33	XXI
7	Himso 1688	2222	1802	1235	1753.00	VIII
8	**VLS 59(C)**	**2840**	**2691**	**914**	**2148.33**	**I**
9	RSC 11-17	1580	1185	889	1218.00	XXXII
10	MAUS 734	1259	1580	1086	1308.33	XXVI
11	DSb 33	1975	1605	790	1456.67	XXII
12	NRC 138	1457	2099	1160	1572.00	XVII
13	JS 21-72	617	2074	938	1209.67	XXXIII
14	PS 1637	2272	1111	1259	1547.33	XVIII
15	AUKS 176	864	2123	914	1300.33	XXVII
16	**VLS 63(C)**	**3111**	**1605**	**1284**	**2000.00**	**III**
17	GJS 3	2222	1704	1062	1662.67	XII
18	NRC 139	1062	1506	790	1119.33	XXXIV
19	DS 3110	1605	3012	815	1810.67	VI
20	SL 1171	1704	2049	1432	1728.33	X
21	MACS 1620	2296	2469	1062	1942.33	IV
22	MAUS 732	1778	2148	1037	1654.33	XIV
23	KS 113	1383	1333	1160	1292.00	XXVIII
24	**PS 1092(C)**	**1728**	**2469**	**914**	**1703.67**	**XI**
25	NRC 148	1556	2321	1111	1662.67	XII
26	RSC 11-15	1704	2123	1012	1613.00	XV
27	RVS 2011-10	1062	1802	815	1226.33	XXXI
28	Himso 1689	2321	2840	1160	2107.00	II
29	CAUMS 1	1235	2494	988	1572.33	XVI
30	RVSM 2011-35	1901	2074	1012	1662.33	XIII
31	VLS 97	1580	2346	1284	1736.67	IX
32	TS 59	1753	1235	1210	1399.33	XXIII
33	RVS 2007-4	1556	1481	716	1251.00	XXIX
34	KDS 1073	1852	1432	1235	1506.33	XX
35	NRCSL 2	2099	1383	1111	1531.00	XIX
36	KDS 1009	1605	1531	889	1341.67	XXV
37	BAUS 100	914	1284	840	1012.67	XXXV
	Mean	**1712.41**	**1937.22**	**1017.03**		
	N.P.S.(Sqm)	**4.05**	**4.05**	**4.05**		
	DOS	**16/06/2018**	**29/06/2018**	**16/06/2018**		
	CD (5%)	**197.53**	**271.60**	**246.91**		
	CV	**7.15**	**8.61**	**14.47**		

Table 1.1.2

Initial Varietal Trial-IVT
Zone: Northern Hill Zone
Character: Days to Flower

S. No	Entries	Almora	Majhera	Palampur	Mean	Rank
1	**DS 3109**	56	53	62	57.00	IV
2	**NRC 146**	51	42	60	51.00	I
3	**PS 1634**	70	60	80	70.00	XXIV
4	**JS 21-71**	62	51	70	61.00	XIV
5	**MACS 1566**	56	50	66	57.33	V
6	**SL 1191**	62	53	70	61.67	XV
7	**Himso 1688**	63	51	74	62.67	XVIII
8	**VLS 59(C)**	**57**	**52**	**66**	**58.33**	**VI**
9	**RSC 11-17**	64	54	80	66.00	XXI
10	**MAUS 734**	61	51	66	59.33	IX
11	**DSb 33**	57	50	70	59.00	VIII
12	**NRC 138**	48	49	62	53.00	II
13	**JS 21-72**	69	54	76	66.33	XXII
14	**PS 1637**	67	55	74	65.33	XX
15	**AUKS 176**	61	53	74	62.67	XVIII
16	**VLS 63(C)**	**61**	**53**	**66**	**60.00**	**XI**
17	**GJS 3**	56	52	70	59.33	IX
18	**NRC 139**	57	54	76	62.33	XVII
19	**DS 3110**	57	53	66	58.67	VII
20	**SL 1171**	60	53	67	60.00	XI
21	**MACS 1620**	57	53	66	58.67	VII
22	**MAUS 732**	64	55	74	64.33	XIX
23	**KS 113**	66	57	79	67.33	XXIII
24	**PS 1092(C)**	**61**	**51**	**67**	**59.67**	**X**
25	**NRC 148**	62	55	70	62.33	XVII
26	**RSC 11-15**	64	55	80	66.33	XXII
27	**RVS 2011-10**	59	54	69	60.67	XIII
28	**Himso 1689**	60	52	70	60.67	XIII
29	**CAUMS 1**	59	53	69	60.33	XII
30	**RVSM 2011-35**	62	52	67	60.33	XII
31	**VLS 97**	51	49	62	54.00	III
32	**TS 59**	69	58	85	70.67	XXV
33	**RVS 2007-4**	61	55	70	62.00	XVI
34	**KDS 1073**	63	55	70	62.67	XVIII
35	**NRCSL 2**	60	54	67	60.33	XII
36	**KDS 1009**	71	63	84	72.67	XXVI
37	**BAUS 100**	63	53	80	65.33	XX
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	16/06/2018	29/06/2018	16/06/2018		

Table 1.1.3

Initial Varietal Trial-IVT
Zone: Northern Hill Zone
Character: Days to Maturity

S.No	Entries	Almora	Majhera	Palampur	Mean	Rank
1	**DS 3109**	116	110	125	117.00	V
2	**NRC 146**	108	109	123	113.33	I
3	**PS 1634**	117	124	133	124.67	XVIII
4	**JS 21-71**	118	109	120	115.67	IV
5	**MACS 1566**	120	117	129	122.00	XIII
6	**SL 1191**	121	119	130	123.33	XVI
7	**Himso 1688**	119	118	130	122.33	XIV
8	**VLS 59(C)**	**118**	**116**	**132**	**122.00**	**XIII**
9	**RSC 11-17**	121	124	133	126.00	XX
10	**MAUS 734**	115	110	119	114.67	III
11	**DSb 33**	112	103	125	113.33	I
12	**NRC 138**	109	104	129	114.00	II
13	**JS 21-72**	119	109	132	120.00	X
14	**PS 1637**	121	125	133	126.33	XXI
15	**AUKS 176**	118	119	125	120.67	XI
16	**VLS 63(C)**	**119**	**118**	**130**	**122.33**	**XIV**
17	**GJS 3**	118	114	131	121.00	XII
18	**NRC 139**	114	119	123	118.67	VIII
19	**DS 3110**	114	108	120	114.00	II
20	**SL 1171**	126	118	130	124.67	XVIII
21	**MACS 1620**	117	117	128	120.67	XI
22	**MAUS 732**	120	118	125	121.00	XII
23	**KS 113**	122	118	132	124.00	XVII
24	**PS 1092(C)**	**122**	**116**	**125**	**121.00**	**XII**
25	**NRC 148**	122	117	129	122.67	XV
26	**RSC 11-15**	116	117	130	121.00	XII
27	**RVS 2011-10**	118	111	129	119.33	IX
28	**Himso 1689**	115	109	130	118.00	VII
29	**CAUMS 1**	118	110	130	119.33	IX
30	**RVSM 2011-35**	117	117	129	121.00	XII
31	**VLS 97**	114	108	134	118.67	VIII
32	**TS 59**	119	123	134	125.33	XIX
33	**RVS 2007-4**	114	109	129	117.33	VI
34	**KDS 1073**	120	110	132	120.67	XI
35	**NRCSL 2**	119	118	125	120.67	XI
36	**KDS 1009**	121	125	133	126.33	XXI
37	**BAUS 100**	122	121	133	125.33	XIX
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	16/06/2018	29/06/2018	16/06/2018		

Table 1.1.4

Initial Varietal Trial-IVT
Zone: Northern Hill Zone
Character: Plant Height (cm)

S.No	Entries	Almora	Majhera	Palampur	Mean	Rank
1	**DS 3109**	75.00	69.98	37.33	60.77	XXIX
2	**NRC 146**	65.33	69.53	29.00	54.62	XXXVI
3	**PS 1634**	80.00	126.21	48.00	84.74	I
4	**JS 21-71**	70.33	106.66	41.67	72.89	XII
5	**MACS 1566**	78.00	87.22	41.33	68.85	XXI
6	**SL 1191**	84.67	100.44	42.33	75.81	IX
7	**Himso 1688**	85.00	94.44	34.67	71.37	XV
8	**VLS 59(C)**	**69.67**	**70.11**	**30.00**	**56.59**	**XXXIV**
9	**RSC 11-17**	86.67	100.78	38.33	75.26	XI
10	**MAUS 734**	57.00	71.33	36.00	54.78	XXXV
11	**DSb 33**	70.67	76.33	32.33	59.78	XXXI
12	**NRC 138**	52.33	75.22	35.33	54.29	XXXVII
13	**JS 21-72**	74.33	99.55	44.67	72.85	XIII
14	**PS 1637**	88.33	101.66	48.00	79.33	III
15	**AUKS 176**	79.67	90.11	38.00	69.26	XX
16	**VLS 63(C)**	**72.00**	**76.77**	**33.67**	**60.81**	**XXVIII**
17	**GJS 3**	95.67	80.11	33.00	69.59	XIX
18	**NRC 139**	84.67	86.99	41.33	71.00	XVI
19	**DS 3110**	87.00	85.66	38.33	70.33	XVII
20	**SL 1171**	83.00	85.40	48.33	72.24	XIV
21	**MACS 1620**	82.67	69.77	34.00	62.15	XXVI
22	**MAUS 732**	100.33	94.87	41.67	78.96	IV
23	**KS 113**	86.33	101.22	43.67	77.07	VIII
24	**PS 1092(C)**	**87.33**	**77.21**	**40.33**	**68.29**	**XXIII**
25	**NRC 148**	87.33	103.55	44.67	78.52	V
26	**RSC 11-15**	82.67	87.44	36.33	68.81	XXII
27	**RVS 2011-10**	78.00	71.00	40.33	63.11	XXV
28	**Himso 1689**	74.33	76.00	34.33	61.55	XXVII
29	**CAUMS 1**	62.33	77.00	37.33	58.89	XXXII
30	**RVSM 2011-35**	69.33	71.22	34.00	58.18	XXXIII
31	**VLS 97**	68.33	79.33	33.00	60.22	XXX
32	**TS 59**	87.67	101.67	37.33	75.56	X
33	**RVS 2007-4**	79.67	98.20	32.33	70.07	XVIII
34	**KDS 1073**	90.33	108.44	48.00	82.26	II
35	**NRCSL 2**	79.33	80.11	38.00	65.81	XXIV
36	**KDS 1009**	89.67	100.55	43.33	77.85	VI
37	**BAUS 100**	85.33	103.77	43.67	77.59	VII
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	16/06/2018	29/06/2018	16/06/2018		

Table 1.1.5

Initial Varietal Trial-IVT
Zone: Northern Hill Zone
Character: 100 seed weight (g)

S.No	Entries	Almora	Majhera	palampur	Mean	Rank
1	**DS 3109**	15.08	12.26	14.05	13.80	X
2	**NRC 146**	15.58	11.95	20.36	15.96	II
3	**PS 1634**	10.65	12.13	10.54	11.11	XXXIII
4	**JS 21-71**	12.78	14.42	12.56	13.25	XIV
5	**MACS 1566**	12.47	13.49	12.45	12.80	XVIII
6	**SL 1191**	12.48	12.81	16.40	13.90	VIII
7	**Himso 1688**	12.92	9.36	12.17	11.48	XXIX
8	**VLS 59(C)**	**15.28**	**13.76**	**13.41**	**14.15**	**VI**
9	**RSC 11-17**	10.05	10.75	12.95	11.25	XXXI
10	**MAUS 734**	11.08	12.07	13.83	12.33	XXII
11	**DSb 33**	11.23	11.36	13.40	12.00	XXIV
12	**NRC 138**	11.20	12.67	11.64	11.84	XXVI
13	**JS 21-72**	12.85	12.11	13.52	12.83	XVI
14	**PS 1637**	10.32	12.28	11.06	11.22	XXXII
15	**AUKS 176**	11.52	13.59	8.82	11.31	XXX
16	**VLS 63(C)**	**16.06**	**11.93**	**18.31**	**15.43**	**IV**
17	**GJS 3**	12.07	11.94	13.47	12.49	XX
18	**NRC 139**	9.56	11.02	9.83	10.14	XXXV
19	**DS 3110**	10.22	14.26	14.01	12.83	XVI
20	**SL 1171**	13.33	15.28	13.70	14.10	VII
21	**MACS 1620**	15.19	17.34	15.45	15.99	I
22	**MAUS 732**	12.48	13.10	12.89	12.82	XVII
23	**KS 113**	16.23	11.86	13.27	13.79	XI
24	**PS 1092(C)**	**14.54**	**16.12**	**13.63**	**14.76**	**V**
25	**NRC 148**	11.51	12.81	11.41	11.91	XXV
26	**RSC 11-15**	10.52	11.21	11.33	11.02	XXXIV
27	**RVS 2011-10**	12.47	13.76	13.77	13.33	XIII
28	**Himso 1689**	10.43	13.33	12.40	12.05	XXIII
29	**CAUMS 1**	11.41	15.85	10.12	12.46	XXI
30	**RVSM 2011-35**	12.30	13.89	13.21	13.13	XV
31	**VLS 97**	15.37	17.45	14.77	15.86	III
32	**TS 59**	14.23	15.86	11.45	13.85	IX
33	**RVS 2007-4**	10.85	12.76	11.81	11.81	XXVII
34	**KDS 1073**	10.96	10.82	12.79	11.52	XXVIII
35	**NRCSL 2**	11.06	12.23	10.38	11.22	XXXII
36	**KDS 1009**	11.29	13.65	12.73	12.56	XIX
37	**BAUS 100**	14.61	13.35	12.07	13.34	XII
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	16/06/2018	29/06/2018	16/06/2018		

Table 1.1.6

Trial: Vegetable Soybean Trial
Zone: NHZ
Trait: Green Pod Yield (Kg/ha)

S. No.	Entry	Palampur	Almora	Mean	Rank
1	Harasoya (c)	-	3700	3700	I
2	NRC 105	-	-	-	
3	MACS 1508	-	543	543	III
4	Karune	-	-	-	
5	Himso 1685	-	2467	2467	II
	Mean	-	2236.7		
	NPS	-	6.75		
	DOS	-	23/06/2018		
	CD(5%)		172.8		
	CV		4.9		

Table 1.1.7

Trial: Vegetable Soybean Trial
Zone: NHZ
Trait: Grain Yield (Kg/ha)

S. No.	Entry	Palampur	Almora	Mean	Rank
1	Harasoya (c)	1071	1125	1098	I
2	NRC 105	-	-	-	-
3	MACS 1508	544	222	383	IV
4	Karune	457	-	457	III
5	Himso 1685	1094	666	880	II
	Mean	791.5	671		
	NPS	7.2			
	DOS	30/06/2018			
	CD(5%)	103	128		
	CV	8.1	12.1		

Table 1.1.8

Trial: Vegetable Soybean Trial
Zone: NHZ
Trait: Days to Flower

S. No.	Entry	Palampur	Almora	Mean	Rank
1	Harasoya (c)	65	57	61	I
2	NRC 105	-	-	-	-
3	MACS 1508	64	59	61.5	II
4	Karune	63	-	63	III
5	Himso 1685	74	59	66.5	IV

Table 1.1.8

Trial: Vegetable Soybean Trial
Zone: NHZ
Trait: Days to Picking at R6 stage

S. No.	Entry	Palampur	Almora	Mean	Rank
1	**Harasoya (c)**	108	-	108	II
2	**NRC 105**	-	-	-	-
3	**MACS 1508**	103	-	103	III
4	**Karune**	96	-	96	IV
5	**Himso 1685**	114	-	114	I

Table 1.1.9

Trial: Vegetable Soybean Trial
Zone: NHZ
Trait: Days to Maturity

S. No.	Entry	Palampur	Almora	Mean	Rank
1	**Harasoya (c)**	117	108	112.5	II
2	**NRC 105**	-	-	-	
3	**MACS 1508**	115	118	116.5	III
4	**Karune**	106	-	106	I
5	**Himso 1685**	129	115	122	IV

Table 1.1.10

Trial: Vegetable Soybean Trial
Zone: NHZ
Trait: Plant Height

S. No.	Entry	Palampur	Almora	Mean	Rank
1	**Harasoya (c)**	65	56	60.5	II
2	**NRC 105**	-	-	-	
3	**MACS 1508**	58.3	51	54.65	III
4	**Karune**	36.8	-	36.8	IV
5	**Himso 1685**	70.8	59	64.9	I

Table 1.1.11

Advanced Varietal Trial I
Zone: Northern Hill Zone
Character: Yield (Kg/ha)

S.No	Entries	Almora	Majhera	Palampur	Mean	Rank
1	**NRC 147**	1304	1451	910	1221.67	IV
2	**PS 1092(C)**	1896	2600	965	1820.33	II
3	**VLS 59(C)**	1600	2747	1142	1829.67	I
4	**VLS 63(C)**	1541	2647	1057	1748.33	III
	Mean	**1585.25**	**2361.25**	**1018.50**		
	N.P.S.(Sqm)	**6.75**	**12.96**	**12.96**		
	DOS	**29/06/2018**	**29/06/2018**	**19/06/2018**		
	CD (5%)	**148.15**	**339.51**	**146.60**		
	CV	**6.51**	**10.54**	**10.22**		

Table 1.1.12

Advanced Varietal Trial I
Zone: Northern Hill Zone
Character: Days to Flower

S.No	Entries	Almora	Majhera	Palampur	Mean	Rank
1	**NRC 147**	57	52	63	57.33	III
2	**PS 1092(C)**	50	51	59	53.33	I
3	**VLS 59(C)**	51	49	65	55.00	II
4	**VLS 63(C)**	50	54	71	58.33	IV
	N.P.S.(Sqm)	6.75	12.96	12.96		
	DOS	01/01/1900	29/06/2018	19/06/2018		

Table 1.1.13

Advanced Varietal Trial I
Zone: Northern Hill Zone
Character: Days to Maturity

S.No	Entries	Almora	Majhera	Palampur	Mean	Rank
1	**NRC 147**	105	102	123	110.00	I
2	**PS 1092(C)**	106	115	140	120.33	IV
3	**VLS 59(C)**	105	115	121	113.67	II
4	**VLS 63(C)**	105	117	131	117.67	III
	N.P.S.(Sqm)	6.75	12.96	12.96		
	DOS	01/01/1900	29/06/2018	19/06/2018		

Table 1.1.14

Advanced Varietal Trial I
Zone: Northern Hill Zone
Character: Plant Height (cm)

S.No	Entries	Almora	Majhera	palampur	Mean	Rank
1	**NRC 147**	95.60	120.46	45.40	87.15	I
2	**PS 1092(C)**	52.80	88.66	43.40	61.62	II
3	**VLS 59(C)**	46.40	85.13	36.60	56.04	IV
4	**VLS 63(C)**	52.20	93.41	34.00	59.87	III
	N.P.S.(Sqm)	6.75	12.96	12.96		
	DOS	01/01/1900	29/06/2018	19/06/2018		

Table 1.1.15

Advanced Varietal Trial I
Zone: Northern Hill Zone
Character: Seed Weight (g)

S.No	Entries	Almora	Majhera	palampur	Mean	Rank
1	**NRC 147**	12.01	12.71	12.56	12.43	IV
2	**PS 1092(C)**	15.13	15.33	16.02	15.49	III
3	**VLS 59(C)**	17.45	16.26	14.90	16.20	I
4	**VLS 63(C)**	17.24	14.98	15.52	15.91	II
	N.P.S.(Sqm)	6.75	12.96	12.96		
	DOS	01/01/1900	29/06/2018	19/06/2018		

Table 1.2.1

Initial varietal Trial-IVT
Zone: Northern Plain Zone
Character: Yield (Kg/ha)

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**DS 3109**	1259	568	2198	1341.67	XXI
2	**NRC 146**	0	0	1481	493.67	XXXII
3	**PS 1634**	494	0	2963	1152.33	XXII
4	**JS 21-71**	1235	2790	2716	2247.00	I
5	**MACS 1566**	0	0	2148	716.00	XX
6	**SL 1191**	1259	1531	1852	1547.33	VII
7	**Himso 1688**	0	0	1901	633.67	XXIV
8	**PS 24(C)**	**3136**	**1037**	**2099**	**2090.67**	**II**
9	**RSC 11-17**	0	0	2716	905.33	XVI
10	**MAUS 734**	0	0	741	247.00	XXXV
11	**DSb 33**	0	0	1728	576.00	XXIX
12	**NRC 138**	0	0	1975	658.33	XXII
13	**JS 21-72**	864	1926	1778	1522.67	VIII
14	**PS 1637**	889	494	2914	1432.33	X
15	**AUKS 176**	568	543	1309	806.67	XIX
16	**PS 1347(C)**	**1926**	**1852**	**2222**	**2000.00**	**IV**
17	**GJS 3**	0	0	1481	493.67	XXXII
18	**NRC 139**	543	0	2025	856.00	XVIII
19	**DS 3110**	2321	1852	1852	2008.33	III
20	**SL 1171**	1012	1654	1852	1506.00	IX
21	**MACS 1620**	0	0	1975	658.33	XXII
22	**MAUS 732**	0	0	1654	551.33	XXX
23	**KS 113**	0	0	420	140.00	XXXVI
24	**SL 958(C)**	**1778**	**1531**	**2469**	**1926.00**	**V**
25	**NRC 148**	0	0	1778	592.67	XXVII
26	**RSC 11-15**	420	691	2222	1111.00	XIII
27	**RVS 2011-10**	0	0	1901	633.67	XXIV
28	**Himso 1689**	0	0	2593	864.33	XVII
29	**CAUMS 1**	0	0	2840	946.67	XV
30	**RVSM 2011-35**	0	519	2469	996.00	XIV
31	**VLS 97**	0	0	198	66.00	XXXVII
32	**TS 59**	0	420	1481	633.67	XXIV
33	**RVS 2007-4**	0	0	1111	370.33	XXXIV
34	**KDS 1073**	0	0	1556	518.67	XXXI
35	**NRCSL 2**	1556	889	2469	1638.00	VI
36	**KDS 1009**	0	0	2049	683.00	XXI
37	**BAUS 100**	0	0	1778	592.67	XXVII
	Mean	**1284**	**1219.8**	**1916.59**		
	N.P.S.(Sqm)	**4.05**	**4.05**	**4.05**		
	DOS	**07-07-18**	**18-06-18**	**29-06-18**		
	CD (5%)	**24.69**	**123.46**	**345.68**		
	CV	**4.31**	**14.86**	**11.27**		

Table 1.2.2

Initial varietal Trial-IVT
Zone: Northern Plain Zone
Character: Days to Flower

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**DS 3109**	45	58	51	51.33	VIII
2	**NRC 146**	-	-	44	44.00	II
3	**PS 1634**	52	-	59	55.50	XVII
4	**JS 21-71**	47	59	51	52.33	X
5	**MACS 1566**	-	-	49	49.00	V
6	**SL 1191**	48	58	52	52.67	XI
7	**Himso 1688**	-	-	53	53.00	XII
8	**PS 24(C)**	**46**	**56**	**52**	**51.33**	**VIII**
9	**RSC 11-17**	-	-	56	56.00	XVIII
10	**MAUS 734**	-	-	47	47.00	IV
11	**DSb 33**	-	-	49	49.00	V
12	**NRC 138**	-	-	41	41.00	I
13	**JS 21-72**	49	61	54	54.67	XV
14	**PS 1637**	52	67	56	58.33	XX
15	**AUKS 176**	50	59	55	54.67	XV
16	**PS 1347(C)**	**55**	**65**	**58**	**59.33**	**XXII**
17	**GJS 3**	-	-	52	52.00	IX
18	**NRC 139**	51	-	53	52.00	IX
19	**DS 3110**	44	57	49	50.00	VI
20	**SL 1171**	50	57	55	54.00	XIII
21	**MACS 1620**	-	-	50	50.00	VI
22	**MAUS 732**	-	-	55	55.00	XVI
23	**KS 113**	-	-	55	55.00	XVI
24	**SL 958(C)**	**50**	**60**	**53**	**54.33**	**XIV**
25	**NRC 148**	-	-	54	54.00	XIII
26	**RSC 11-15**	52	62	54	56.00	XVIII
27	**RVS 2011-10**	-	-	52	52.00	IX
28	**Himso 1689**	-	-	54	54.00	XIII
29	**CAUMS 1**	-	-	52	52.00	IX
30	**RVSM 2011-35**	-	59	52	55.50	XVII
31	**VLS 97**	-	-	46	46.00	III
32	**TS 59**	-	66	60	63.00	XXIII
33	**RVS 2007-4**	-	-	54	54.00	XIII
34	**KDS 1073**	-	-	54	54.00	XIII
35	**NRCSL 2**	46	58	49	51.00	VII
36	**KDS 1009**	-	-	59	59.00	XXI
37	**BAUS 100**	-	-	57	57.00	XIX
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	07/07/2018	18/06/2018	29/06/2018		

Table 1.2.3

Initial varietal Trial-IVT
Zone: Northern Plain Zone
Character: Days to maturity

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**DS 3109**	110	136	112	119.33	XV
2	**NRC 146**	-	-	109	109.00	III
3	**PS 1634**	121	-	121	121.00	XVII
4	**JS 21-71**	109	131	107	115.67	IX
5	**MACS 1566**	-	-	120	120.00	XVI
6	**SL 1191**	124	135	125	128.00	XXVI
7	**Himso 1688**	-	-	115	115.00	VIII
8	**PS 24(C)**	**119**	**131**	**118**	**122.67**	**XX**
9	**RSC 11-17**	-	-	117	117.00	XII
10	**MAUS 734**	-	-	111	111.00	V
11	**DSb 33**	-	-	100	100.00	II
12	**NRC 138**	-	-	99	99.00	I
13	**JS 21-72**	108	131	105	114.67	VII
14	**PS 1637**	120	135	118	124.33	XXII
15	**AUKS 176**	111	133	112	118.67	XIV
16	**PS 1347(C)**	**120**	**134**	**125**	**126.33**	**XXIV**
17	**GJS 3**	-	-	118	118.00	XIII
18	**NRC 139**	112	-	110	111.00	V
19	**DS 3110**	108	130	111	116.33	XI
20	**SL 1171**	124	134	124	127.33	XXV
21	**MACS 1620**	-	-	117	117.00	XII
22	**MAUS 732**	-	-	116	116.00	X
23	**KS 113**	-	-	111	111.00	V
24	**SL 958(C)**	**125**	**135**	**126**	**128.67**	**XXVII**
25	**NRC 148**	-	-	115	115.00	VIII
26	**RSC 11-15**	119	132	114	121.67	XVIII
27	**RVS 2011-10**	-	-	110	110.00	IV
28	**Himso 1689**	-	-	111	111.00	V
29	**CAUMS 1**	-	-	112	112.00	VI
30	**RVSM 2011-35**	-	133	112	122.50	XIX
31	**VLS 97**	-	-	110	110.00	IV
32	**TS 59**	-	131	115	123.00	XXI
33	**RVS 2007-4**	-	-	109	109.00	III
34	**KDS 1073**	-	-	109	109.00	III
35	**NRCSL 2**	111	132	115	119.33	XV
36	**KDS 1009**	-	-	125	125.00	XXIII
37	**BAUS 100**	-	-	120	120.00	XVI
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	07/07/2018	18/06/2018	29/06/2018		

Table 1.2.4

Initial varietal Trial-IVT
Zone: Northern Plain Zone
Character: Plant Height (cm)

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**DS 3109**	47.13	40.67	69.93	52.58	XXXVII
2	**NRC 146**	-	-	64.67	64.67	XXXIII
3	**PS 1634**	47.73	-	86.00	66.87	XXIX
4	**JS 21-71**	66.43	66.00	81.13	71.19	XXIV
5	**MACS 1566**	-	-	77.67	77.67	XI
6	**SL 1191**	69.93	87.67	91.00	82.87	VII
7	**Himso 1688**	-	-	79.67	79.67	IX
8	**PS 24(C)**	**60.40**	**56.33**	**75.00**	**63.91**	**XXXIV**
9	**RSC 11-17**	-	-	97.67	97.67	I
10	**MAUS 734**	-	-	70.60	70.60	XXVI
11	**DSb 33**	-	-	76.07	76.07	XII
12	**NRC 138**	-	-	71.67	71.67	XXI
13	**JS 21-72**	59.70	71.00	84.20	71.63	XXII
14	**PS 1637**	66.20	57.33	77.33	66.95	XXVIII
15	**AUKS 176**	59.67	71.00	85.20	71.96	XVIII
16	**PS 1347(C)**	**50.80**	**58.67**	**61.47**	**56.98**	**XXXVI**
17	**GJS 3**	-	-	83.53	83.53	VI
18	**NRC 139**	50.80	-	79.33	65.07	XXXII
19	**DS 3110**	63.53	77.00	79.60	73.38	XVI
20	**SL 1171**	59.53	86.00	70.13	71.89	XX
21	**MACS 1620**	-	-	70.67	70.67	XXV
22	**MAUS 732**	-	-	74.73	74.73	XIV
23	**KS 113**	-	-	80.47	80.47	VIII
24	**SL 958(C)**	**91.87**	**89.00**	**97.00**	**92.62**	**II**
25	**NRC 148**	-	-	85.13	85.13	V
26	**RSC 11-15**	49.93	54.00	91.93	65.29	XXXI
27	**RVS 2011-10**	-	-	79.07	79.07	X
28	**Himso 1689**	-	-	72.60	72.60	XVII
29	**CAUMS 1**	-	-	71.93	71.93	XIX
30	**RVSM 2011-35**	-	43.00	90.27	66.64	XXX
31	**VLS 97**	-	-	63.60	63.60	XXXV
32	**TS 59**	-	54.00	84.67	69.34	XXVII
33	**RVS 2007-4**	-	-	71.33	71.33	XXIII
34	**KDS 1073**	-	-	87.00	87.00	IV
35	**NRCSL 2**	64.67	71.33	85.40	73.80	XV
36	**KDS 1009**	-	-	75.00	75.00	XIII
37	**BAUS 100**	-	-	89.47	89.47	III
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	07/07/2018	18/06/2018	29/06/2018		

Table 1.2.5

Initial varietal Trial-IVT
Zone: Northern Plain Zone
Character: 100 seed weight

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**DS 3109**	6.53	6.17	9.82	7.51	XXX
2	**NRC 146**	-	-	14.83	14.83	I
3	**PS 1634**	4.73	-	7.37	6.05	XXXV
4	**JS 21-71**	9.10	10.27	11.31	10.23	IX
5	**MACS 1566**	-	-	10.04	10.04	XII
6	**SL 1191**	8.20	8.87	9.77	8.95	XXVI
7	**Himso 1688**	-	-	8.99	8.99	XXV
8	**PS 24(C)**	**11.20**	**8.77**	**12.24**	**10.74**	**VII**
9	**RSC 11-17**	-	-	8.53	8.53	XXVII
10	**MAUS 734**	-	-	11.62	11.62	V
11	**DSb 33**	-	-	10.19	10.19	X
12	**NRC 138**	-	-	9.81	9.81	XV
13	**JS 21-72**	8.73	10.07	13.03	10.61	VIII
14	**PS 1637**	6.03	6.43	9.40	7.29	XXXIII
15	**AUKS 176**	6.93	8.60	9.97	8.50	XXVIII
16	**PS 1347(C)**	**8.20**	**9.80**	**11.21**	**9.74**	**XVI**
17	**GJS 3**	-	-	9.39	9.39	XX
18	**NRC 139**	5.73	-	8.89	7.31	XXXII
19	**DS 3110**	7.87	7.73	8.84	8.15	XXIX
20	**SL 1171**	7.90	9.20	10.18	9.09	XXIII
21	**MACS 1620**	-	-	12.54	12.54	III
22	**MAUS 732**	-	-	11.10	11.10	VI
23	**KS 113**	-	-	9.85	9.85	XIV
24	**SL 958(C)**	**8.23**	**10.03**	**10.44**	**9.57**	**XVII**
25	**NRC 148**	-	-	10.03	10.03	XIII
26	**RSC 11-15**	5.43	6.50	8.51	6.81	XXXIV
27	**RVS 2011-10**	-	-	12.70	12.70	II
28	**Himso 1689**	-	-	9.30	9.30	XXII
29	**CAUMS 1**	-	-	10.03	10.03	XIII
30	**RVSM 2011-35**	-	7.57	11.41	9.49	XIX
31	**VLS 97**	-	-	11.66	11.66	IV
32	**TS 59**	-	7.67	10.23	8.95	XXVI
33	**RVS 2007-4**	-	-	10.12	10.12	XI
34	**KDS 1073**	-	-	7.38	7.38	XXXI
35	**NRCSL 2**	7.87	8.63	10.52	9.01	XXIV
36	**KDS 1009**	-	-	9.53	9.53	XVIII
37	**BAUS 100**	-	-	9.35	9.35	XXI
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	07/07/2018	18/06/2018	29/06/2018		

Table 1.2.6

Advanced varietal Trial - I + II
Zone: Northern Plain Zone
Character: Yield (Kg/ha)

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**NRC 128**	1751	278	1551	1193.33	X
2	**PS 1611**	2618	1847	2431	2298.67	III
3	**PS 1613**	2742	2838	2343	2641.00	I
4	**NRC 134**	507	0	2005	837.33	XI
5	**NRCSL 1**	1236	1255	1500	1330.33	IX
6	**NRC 147**	467	255	1389	703.67	XII
7	**SL 1104***	2511	2477	2292	2426.67	II
8	**DS 3106***	2244	1491	2213	1982.67	IV
9	**PS 1347(C)**	1627	2324	1940	1963.67	V
10	**SL 688(C)**	1404	1931	1963	1766.00	VII
11	**Pusa 97-12(C)**	1267	1727	1597	1530.33	VIII
12	**SL 958(C)**	2169	1583	1611	1787.67	VI
	Mean	**1711.92**	**1636.91**	**1902.92**		
	N.P.S.(Sqm)	**22.5**	**21.6**	**21.6**		
	DOS	**07-07-18**	**15-06-18**	**29-06-18**		
	CD (5%)	**93.33**	**203.7**	**180.56**		
	CV	**3.71**	**9.45**	**6.56**		

*AVT II entry

Table 1.2.7

Advanced varietal Trial - I + II
Zone: Northern Plain Zone
Character: Days to Flower

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**NRC 128**	52	68	55	58.33	VIII
2	**PS 1611**	47	57	52	52.00	I
3	**PS 1613**	49	60	53	54.00	IV
4	**NRC 134**	52	-	56	54.00	IV
5	**NRCSL 1**	48	62	52	54.00	IV
6	**NRC 147**	50	62	54	55.33	VII
7	**SL 1104***	50	63	52	55.00	VI
8	**DS 3106***	50	61	52	54.33	V
9	**PS 1347(C)**	55	67	57	59.67	IX
10	**SL 688(C)**	49	59	52	53.33	III
11	**Pusa 97-12(C)**	48	60	51	53.00	II
12	**SL 958(C)**	51	63	52	55.33	VII
	N.P.S.(Sqm)	22.50	21.60	21.60		
	DOS	07/07/2018	15/06/2018	29/06/2018		

*AVT II entry

Table 1.2.8

Advanced varietal Trial - I + II
Zone: Northern Plain Zone
Character: Days to Maturity

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**NRC 128**	116	131	112	119.67	III
2	**PS 1611**	115	136	115	122.00	IV
3	**PS 1613**	120	137	121	126.00	VIII
4	**NRC 134**	119	-	119	119.00	II
5	**NRCSL 1**	118	135	117	123.33	V
6	**NRC 147**	99	130	107	112.00	I
7	**SL 1104***	122	136	123	127.00	IX
8	**DS 3106***	119	138	124	127.00	IX
9	**PS 1347(C)**	122	133	123	126.00	VIII
10	**SL 688(C)**	120	131	122	124.33	VII
11	**Pusa 97-12(C)**	121	132	118	123.67	VI
12	**SL 958(C)**	125	139	124	129.33	X
	N.P.S.(Sqm)	22.50	21.60	21.60		
	DOS	07/07/2018	15/06/2018	29/06/2018		

*AVT II entry

Table 1.2.9

Advanced varietal Trial - I + II
Zone: Northern Plain Zone
Character: Plant Height (cm)

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**NRC 128**	71.90	50.00	97.55	73.15	III
2	**PS 1611**	54.00	60.75	73.25	62.67	X
3	**PS 1613**	53.40	65.25	74.85	64.50	VIII
4	**NRC 134**	58.10	-	77.25	67.68	VII
5	**NRCSL 1**	62.55	71.00	83.05	72.20	IV
6	**NRC 147**	66.40	57.75	123.10	82.42	II
7	**SL 1104***	55.20	77.00	81.50	71.23	VI
8	**DS 3106***	61.30	75.25	79.00	71.85	V
9	**PS 1347(C)**	56.70	65.75	60.50	60.98	XI
10	**SL 688(C)**	52.65	68.50	71.90	64.35	IX
11	**Pusa 97-12(C)**	46.05	64.00	72.45	60.83	XII
12	**SL 958(C)**	70.90	86.00	99.45	85.45	I
	N.P.S.(Sqm)	22.50	21.60	21.60		
	DOS	07/07/2018	15/06/2018	29/06/2018		

***AVT II entry**

Table 1.2.10

Advanced varietal Trial - I + II
Zone: Northern Plain Zone
Character: 100 seed weight

S.No	Entries	Delhi	Ludhiana	Pantnagar	Mean	Rank
1	**NRC 128**	9.93	8.48	11.71	10.04	III
2	**PS 1611**	10.03	8.35	11.01	9.80	IV
3	**PS 1613**	10.60	10.43	11.06	10.70	II
4	**NRC 134**	6.35	-	10.55	8.45	X
5	**NRCSL 1**	7.90	8.55	9.78	8.74	VIII
6	**NRC 147**	7.95	6.30	9.95	8.07	XI
7	**SL 1104***	11.22	10.07	12.73	11.34	I
8	**DS 3106***	8.00	8.28	9.25	8.51	IX
9	**PS 1347(C)**	7.78	9.08	10.57	9.14	VII
10	**SL 688(C)**	7.17	9.17	11.10	9.15	VI
11	**Pusa 97-12(C)**	7.05	7.45	9.38	7.96	XII
12	**SL 958(C)**	8.60	9.53	9.43	9.19	V
	N.P.S.(Sqm)	22.50	21.60	21.60		
	DOS	07/07/2018	15/06/2018	29/06/2018		

*AVT II entry

Table 1.3.1

Initial varietal Trial- IVT
Zone: North Eastern Hill Zone
Character: Yield (Kg/ha)

S.No	Entries	Imphal	Jorhat*	Umiam**	Mean	Rank
1	**DS 3109**	1556	533	667	1556.00	XXIII
2	**NRC 146**	2173	667	1042	2173.00	XIV
3	**PS 1634**	1778	711	500	1778.00	XIX
4	**JS 21-71**	2272	489	667	2272.00	XIII
5	**MACS 1566**	1975	533	792	1975.00	XVII
6	**SL 1191**	1556	578	708	1556.00	XXIII
7	**Himso 1688**	1407	489	1792	1407.00	XXIV
8	**JS 97-52(C)**	**1901**	**578**	**792**	**1901.00**	**XVIII**
9	**RSC 11-17**	2148	756	2000	2148.00	XV
10	**MAUS 734**	2099	578	333	2099.00	XVI
11	**DSb 33**	2346	933	750	2346.00	XI
12	**NRC 138**	2296	578	1042	2296.00	XII
13	**JS 21-72**	2667	667	1333	2667.00	VII
14	**PS 1637**	1630	800	1833	1630.00	XXII
15	**AUKS 176**	1679	489	1667	1679.00	XX
16	**RKS 113(C)**	**2914**	**844**	**3125**	**2914.00**	**IV**
17	**GJS 3**	2543	622	583	2543.00	IX
18	**NRC 139**	2099	489	792	2099.00	XVI
19	**DS 3110**	2148	800	1583	2148.00	XV
20	**SL 1171**	2790	667	1500	2790.00	VI
21	**MACS 1620**	3506	844	833	3506.00	I
22	**MAUS 732**	3383	622	708	3383.00	II
23	**KS 113**	1654	711	375	1654.00	XXI
24	**JS 335(C)**	**2593**	**800**	**792**	**2593.00**	**VIII**
25	**NRC 148**	1284	844	1458	1284.00	XXVI
26	**RSC 11-15**	2840	578	1667	2840.00	V
27	**RVS 2011-10**	2469	667	1500	2469.00	X
28	**Himso 1689**	2790	756	1042	2790.00	VI
29	**CAUMS 1**	2963	889	1208	2963.00	III
30	**RVSM 2011-35**	2173	978	625	2173.00	XIV
31	**VLS 97**	1975	933	2958	1975.00	XVII
32	**TS 59**	2148	578	2000	2148.00	XV
33	**RVS 2007-4**	2173	711	2292	2173.00	XIV
34	**KDS 1073**	2667	444	1250	2667.00	VII
35	**NRCSL 2**	2593	667	1083	2593.00	VIII
36	**KDS 1009**	2173	889	1917	2173.00	XIV
37	**BAUS 100**	1358	711	1125	1358.00	XXV
	Mean	**2235.65**	**687.11**	**1252.27**		
	N.P.S.(Sqm)	**4.05**	**2.25**	**2.40**		
	DOS	**20/06/2018**	**21/09/2018**	**23/06/2018**		
	CD (5%)	**617.28**	**177.78**	**1833.33**		
	CV	**16.73**	**15.44**	**90.95**		

*Data not considered due to low mean yield. **Data not considered due to high CV.

Table 1.3.2

Initial varietal Trial- IVT
Zone: North Eastern Hill Zone
Character: Days to Flower

S.No	Entries	Imphal	Jorhat	Umiam	Mean	Rank
1	**DS 3109**	44	36	70	50.00	X
2	**NRC 146**	39	25	65	43.00	I
3	**PS 1634**	55	41	64	53.33	XX
4	**JS 21-71**	45	37	68	50.00	X
5	**MACS 1566**	45	39	62	48.67	VII
6	**SL 1191**	47	28	67	47.33	IV
7	**Himso 1688**	50	25	66	47.00	III
8	**JS 97-52(C)**	**47**	**38**	**67**	**50.67**	**XII**
9	**RSC 11-17**	53	40	68	53.67	XXI
10	**MAUS 734**	44	36	67	49.00	VIII
11	**DSb 33**	43	37	64	48.00	VI
12	**NRC 138**	40	27	66	44.33	II
13	**JS 21-72**	45	43	60	49.33	IX
14	**PS 1637**	56	38	66	53.33	XX
15	**AUKS 176**	48	43	67	52.67	XVIII
16	**RKS 113(C)**	**50**	**37**	**69**	**52.00**	**XVI**
17	**GJS 3**	44	38	68	50.00	X
18	**NRC 139**	40	41	66	49.00	VIII
19	**DS 3110**	46	30	67	47.67	V
20	**SL 1171**	46	35	65	48.67	VII
21	**MACS 1620**	45	44	64	51.00	XIII
22	**MAUS 732**	52	42	67	53.67	XXI
23	**KS 113**	57	43	66	55.33	XXII
24	**JS 335(C)**	**44**	**42**	**70**	**52.00**	**XVI**
25	**NRC 148**	49	41	64	51.33	XIV
26	**RSC 11-15**	50	46	65	53.67	XXI
27	**RVS 2011-10**	43	45	66	51.33	XIV
28	**Himso 1689**	45	44	66	51.67	XV
29	**CAUMS 1**	42	41	71	51.33	XIV
30	**RVSM 2011-35**	43	44	67	51.33	XIV
31	**VLS 97**	41	46	66	51.00	XIII
32	**TS 59**	55	44	68	55.67	XXIII
33	**RVS 2007-4**	46	46	65	52.33	XVII
34	**KDS 1073**	51	39	69	53.00	XIX
35	**NRCSL 2**	43	44	64	50.33	XI
36	**KDS 1009**	58	39	63	53.33	XX
37	**BAUS 100**	54	41	64	53.00	XIX
	N.P.S.(Sqm)	4.05	2.25	2.40		
	DOS	20/06/2018	21/09/2018	23/06/2018		

Table 1.3.3

Initial varietal Trial- IVT
Zone: North Eastern Hill Zone
Character: Days to Maturity

S.No	Entries	Imphal	Jorhat	Umiam	Mean	Rank
1	**DS 3109**	100	81	135	105.33	VIII
2	**NRC 146**	92	70	136	99.33	I
3	**PS 1634**	109	85	131	108.33	XIV
4	**JS 21-71**	96	82	137	105.00	VII
5	**MACS 1566**	104	85	130	106.33	IX
6	**SL 1191**	108	72	134	104.67	VI
7	**Himso 1688**	105	70	133	102.67	IV
8	**JS 97-52(C)**	**101**	**82**	**137**	**106.67**	**X**
9	**RSC 11-17**	107	86	137	110.00	XVI
10	**MAUS 734**	95	79	135	103.00	V
11	**DSb 33**	101	82	133	105.33	VIII
12	**NRC 138**	97	72	134	101.00	II
13	**JS 21-72**	100	87	129	105.33	VIII
14	**PS 1637**	108	81	134	107.67	XII
15	**AUKS 176**	101	85	134	106.67	X
16	**RKS 113(C)**	**101**	**80**	**138**	**106.33**	**IX**
17	**GJS 3**	100	81	134	105.00	VII
18	**NRC 139**	102	85	132	106.33	IX
19	**DS 3110**	97	73	136	102.00	III
20	**SL 1171**	109	80	134	107.67	XII
21	**MACS 1620**	102	89	130	107.00	XI
22	**MAUS 732**	106	89	135	110.00	XVI
23	**KS 113**	109	90	134	111.00	XVII
24	**JS 335(C)**	**98**	**85**	**137**	**106.67**	**X**
25	**NRC 148**	108	86	132	108.67	XV
26	**RSC 11-15**	101	91	132	108.00	XIII
27	**RVS 2011-10**	101	90	135	108.67	XV
28	**Himso 1689**	101	89	135	108.33	XIV
29	**CAUMS 1**	100	82	138	106.67	X
30	**RVSM 2011-35**	101	88	137	108.67	XV
31	**VLS 97**	99	92	133	108.00	XIII
32	**TS 59**	111	89	136	112.00	XVIII
33	**RVS 2007-4**	100	77	132	103.00	V
34	**KDS 1073**	102	84	137	107.67	XII
35	**NRCSL 2**	105	88	133	108.67	XV
36	**KDS 1009**	117	85	131	111.00	XVII
37	**BAUS 100**	110	88	132	110.00	XVI
	N.P.S.(Sqm)	4.05	2.25	2.40		
	DOS	20/06/2018	21/09/2018	23/06/2018		

Table 1.3.4

Initial varietal Trial- IVT
Zone: North Eastern Hill Zone
Character: Plant Height (cm)

S.No	Entries	Imphal	Jorhat	Umiam	Mean	Rank
1	**DS 3109**	45.53	21.37	36.17	34.36	XXXVI
2	**NRC 146**	46.53	31.43	32.13	36.70	XXXIV
3	**PS 1634**	65.07	22.00	32.47	39.85	XXX
4	**JS 21-71**	70.27	30.60	36.13	45.67	X
5	**MACS 1566**	69.13	36.97	40.47	48.86	IV
6	**SL 1191**	67.47	30.53	30.67	42.89	XX
7	**Himso 1688**	50.33	34.70	46.07	43.70	XVI
8	**JS 97-52(C)**	**64.13**	**29.57**	**37.07**	**43.59**	**XVII**
9	**RSC 11-17**	66.67	33.37	27.30	42.45	XXIV
10	**MAUS 734**	56.27	27.67	28.00	37.31	XXXIII
11	**DSb 33**	58.67	28.13	32.87	39.89	XXIX
12	**NRC 138**	52.40	22.67	27.87	34.31	XXXVII
13	**JS 21-72**	76.27	36.10	30.47	47.61	VII
14	**PS 1637**	83.87	34.63	30.47	49.66	III
15	**AUKS 176**	76.73	29.40	37.93	48.02	V
16	**RKS 113(C)**	**75.00**	**32.73**	**35.93**	**47.89**	**VI**
17	**GJS 3**	69.93	30.10	36.37	45.47	XI
18	**NRC 139**	70.00	34.40	31.47	45.29	XII
19	**DS 3110**	60.27	28.10	39.60	42.66	XXIII
20	**SL 1171**	62.80	27.40	29.73	39.98	XXVIII
21	**MACS 1620**	63.47	33.20	32.33	43.00	XVIII
22	**MAUS 732**	75.60	30.07	29.03	44.90	XIII
23	**KS 113**	75.20	30.53	34.13	46.62	IX
24	**JS 335(C)**	**62.67**	**33.77**	**25.77**	**40.74**	**XXVI**
25	**NRC 148**	64.67	34.30	25.77	41.58	XXV
26	**RSC 11-15**	73.40	30.57	24.53	42.83	XXI
27	**RVS 2011-10**	72.67	26.90	32.87	44.15	XV
28	**Himso 1689**	57.53	25.07	30.53	37.71	XXXI
29	**CAUMS 1**	51.40	26.00	35.07	37.49	XXXII
30	**RVSM 2011-35**	55.60	20.50	33.33	36.48	XXXV
31	**VLS 97**	58.27	31.37	39.07	42.90	XIX
32	**TS 59**	71.20	21.70	40.53	44.48	XIV
33	**RVS 2007-4**	75.27	23.77	42.87	47.30	VIII
34	**KDS 1073**	72.20	34.83	47.13	51.39	II
35	**NRCSL 2**	60.40	22.13	39.40	40.64	XXVII
36	**KDS 1009**	76.33	24.07	27.67	42.69	XXII
37	**BAUS 100**	89.73	28.27	37.20	51.73	I
	N.P.S.(Sqm)	4.05	2.25	2.40		
	DOS	20/06/2018	21/09/2018	23/06/2018		

Table 1.3.5

Initial varietal Trial- IVT
Zone: North Eastern Hill Zone
Character: 100 seed weight (g)

S.No	Entries	Imphal	Jorhat	Umiam	Mean	Rank
1	**DS 3109**	8.61	11.40	12.80	10.94	XXXI
2	**NRC 146**	11.69	12.70	12.93	12.44	X
3	**PS 1634**	8.08	13.10	11.80	10.99	XXIX
4	**JS 21-71**	11.37	13.33	11.42	12.04	XVII
5	**MACS 1566**	9.95	14.47	11.11	11.84	XXII
6	**SL 1191**	11.32	11.53	14.07	12.31	XIII
7	**Himso 1688**	10.95	13.63	12.72	12.43	XI
8	**JS 97-52(C)**	**9.59**	**14.43**	**11.65**	**11.89**	**XX**
9	**RSC 11-17**	8.93	10.33	13.19	10.82	XXXII
10	**MAUS 734**	9.45	11.23	12.17	10.95	XXX
11	**DSb 33**	10.54	13.97	14.49	13.00	V
12	**NRC 138**	9.48	11.40	10.75	10.54	XXXIII
13	**JS 21-72**	12.69	15.63	11.98	13.43	IV
14	**PS 1637**	9.56	14.31	11.67	11.85	XXI
15	**AUKS 176**	11.41	12.20	11.84	11.82	XXIII
16	**RKS 113(C)**	**9.77**	**12.67**	**12.58**	**11.67**	**XXIV**
17	**GJS 3**	10.34	12.53	14.03	12.30	XIV
18	**NRC 139**	9.88	14.17	11.66	11.90	XIX
19	**DS 3110**	10.48	14.07	13.97	12.84	VI
20	**SL 1171**	12.80	12.57	12.41	12.59	VIII
21	**MACS 1620**	14.49	18.50	13.10	15.36	I
22	**MAUS 732**	12.05	15.90	13.49	13.81	III
23	**KS 113**	11.11	11.20	11.77	11.36	XXV
24	**JS 335(C)**	**9.80**	**14.58**	**13.94**	**12.77**	**VII**
25	**NRC 148**	10.30	18.43	12.95	13.89	II
26	**RSC 11-15**	9.11	11.60	13.25	11.32	XXVII
27	**RVS 2011-10**	10.70	11.57	14.58	12.28	XV
28	**Himso 1689**	9.97	13.50	12.64	12.04	XVII
29	**CAUMS 1**	10.23	11.23	12.50	11.32	XXVII
30	**RVSM 2011-35**	10.70	13.93	11.27	11.97	XVIII
31	**VLS 97**	12.57	10.70	13.78	12.35	XII
32	**TS 59**	13.17	12.17	11.96	12.43	XI
33	**RVS 2007-4**	11.46	8.97	12.93	11.12	XXVIII
34	**KDS 1073**	10.99	10.50	12.50	11.33	XXVI
35	**NRCSL 2**	9.92	10.56	12.35	10.94	XXXI
36	**KDS 1009**	12.21	11.60	13.76	12.52	IX
37	**BAUS 100**	11.45	10.53	14.70	12.23	XVI
	N.P.S.(Sqm)	4.05	2.25	2.40		
	DOS	20/06/2018	21/09/2018	23/06/2018		

Table 1.3.6

Advanced varietal Trial - I
Zone: North Eastern Hill Zone
Character: Yield (Kg/ha)

S.No	Entries	Imphal	Jorhat*	Umiam**	Mean	Rank
1	**NRC 128**	1300	556	583	1300.00	VII
2	**PS 1613**	1967	528	1250	1967.00	I
3	**NRCSL 1**	1661	500	583	1661.00	IV
4	**CSB 10084**	972	1111	750	972.00	XIV
5	**SL 1068**	1061	444	472	1061.00	XI
6	**SL 1123**	1633	389	389	1633.00	V
7	**NRC 137**	1200	389	444	1200.00	IX
8	**CSB 10112**	1044	389	333	1044.00	XIII
9	**DS 3108**	1850	528	667	1850.00	III
10	**VLS 95**	1389	-	472	1389.00	VI
11	**NRC 132**	1050	389	389	1050.00	XII
12	**NRC 147**	1222	-	528	1222.00	VIII
13	**JS 335(C)**	1867	333	333	1867.00	II
14	**JS 97-52(C)**	1144	389	194	1144.00	X
15	**RKS 18(C)**	1867	417	333	1867.00	II
	Mean	**1415.13**	**489.38**	**514.67**		
	N.P.S.(Sqm)	**18.00**	**3.60**	**3.60**		
	DOS	**21/06/2018**	**22/09/2018**	**09/07/2018**		
	CD (5%)	**211.11**	**83.33**	**444.44**		
	CV	**10.42**	**12.73**	**78.07**		

*Data not considered due to low mean yield. **Data not considered due to high CV and low mean yield.

Table 1.3.7

Advanced varietal Trial - I
Zone: North Eastern Hill Zone
Character: Days to Flower

S.No	Entries	Imphal	Jorhat	Umiam	Mean	Rank
1	**NRC 128**	51	33	63	49.00	V
2	**PS 1613**	44	36	58	46.00	III
3	**NRCSL 1**	43	34	60	45.67	II
4	**CSB 10084**	56	52	64	57.33	XIV
5	**SL 1068**	46	40	66	50.67	VIII
6	**SL 1123**	47	45	69	53.67	XIII
7	**NRC 137**	50	35	66	50.33	VII
8	**CSB 10112**	58	52	66	58.67	XV
9	**DS 3108**	43	31	59	44.33	I
10	**VLS 95**	37	-	65	51.00	IX
11	**NRC 132**	52	37	59	49.33	VI
12	**NRC 147**	48	-	57	52.50	XI
13	**JS 335(C)**	46	38	61	48.33	IV
14	**JS 97-52(C)**	54	38	66	52.67	XII
15	**RKS 18(C)**	45	46	65	52.00	X
	N.P.S.(Sqm)	18.00	3.60	3.60		
	DOS	21/06/2018	22/09/2018	09/07/2018		

Table 1.3.8

Advanced varietal Trial - I
Zone: North Eastern Hill Zone
Character: Days to Maturity

S.No	Entries	Imphal	Jorhat	Umiam	Mean	Rank
1	**NRC 128**	111	78	97	95.33	VII
2	**PS 1613**	108	82	93	94.33	VI
3	**NRCSL 1**	101	80	95	92.00	II
4	**CSB 10084**	112	96	98	102.00	XII
5	**SL 1068**	110	86	97	97.67	IX
6	**SL 1123**	111	90	99	100.00	XI
7	**NRC 137**	116	80	97	97.67	IX
8	**CSB 10112**	113	97	98	102.67	XIII
9	**DS 3108**	106	77	95	92.67	V
10	**VLS 95**	100	-	98	99.00	X
11	**NRC 132**	106	82	95	94.33	VI
12	**NRC 147**	92	-	93	92.50	IV
13	**JS 335(C)**	100	83	94	92.33	III
14	**JS 97-52(C)**	106	38	100	81.33	I
15	**RKS 18(C)**	99	91	99	96.33	VIII
	N.P.S.(Sqm)	18.00	3.60	3.60		
	DOS	21/06/2018	22/09/2018	09/07/2018		

Table 1.3.9

Advanced varietal Trial - I
Zone: North Eastern Hill Zone
Character: Plant Height (cm)

S.No	Entries	Imphal	Jorhat	Umiam	Mean	Rank
1	**NRC 128**	67.35	20.40	28.40	38.72	XI
2	**PS 1613**	55.45	27.70	27.40	36.85	XIV
3	**NRCSL 1**	62.50	25.35	41.40	43.08	VII
4	**CSB 10084**	80.55	46.42	48.20	58.39	III
5	**SL 1068**	61.65	35.42	33.53	43.53	V
6	**SL 1123**	62.65	32.73	25.33	40.24	X
7	**NRC 137**	79.78	32.25	34.60	48.88	IV
8	**CSB 10112**	95.15	54.10	32.13	60.46	I
9	**DS 3108**	51.55	25.80	24.13	33.83	XV
10	**VLS 95**	51.95	-	31.53	41.74	VIII
11	**NRC 132**	63.75	32.75	24.27	40.26	IX
12	**NRC 147**	87.60	-	31.40	59.50	II
13	**JS 335(C)**	55.65	29.05	27.13	37.28	XIII
14	**JS 97-52(C)**	75.10	29.15	25.87	43.37	VI
15	**RKS 18(C)**	56.35	32.75	26.60	38.57	XII
	N.P.S.(Sqm)	18.00	3.60	3.60		
	DOS	21/06/2018	22/09/2018	09/07/2018		

Table 1.3.10

Advanced varietal Trial - I
Zone: North Eastern Hill Zone
Character: 100 Seed Weight (g)

S.No	Entries	Imphal	Jorhat	Umiam	Mean	Rank
1	**NRC 128**	12.88	12.52	8.66	11.35	III
2	**PS 1613**	13.38	13.92	10.87	12.72	I
3	**NRCSL 1**	11.91	11.33	8.15	10.46	IX
4	**CSB 10084**	10.48	7.13	7.64	8.42	XV
5	**SL 1068**	11.52	9.68	9.17	10.12	XI
6	**SL 1123**	16.85	8.71	9.10	11.55	II
7	**NRC 137**	10.93	10.64	9.34	10.30	X
8	**CSB 10112**	11.11	11.48	7.12	9.90	XIII
9	**DS 3108**	11.57	11.45	9.66	10.89	VI
10	**VLS 95**	12.89	-	8.81	10.85	VII
11	**NRC 132**	9.53	12.18	8.40	10.04	XII
12	**NRC 147**	11.03	-	11.34	11.19	V
13	**JS 335(C)**	11.01	11.60	11.23	11.28	IV
14	**JS 97-52(C)**	8.92	11.16	9.10	9.73	XIV
15	**RKS 18(C)**	10.78	13.13	8.18	10.70	VIII
	N.P.S.(Sqm)	18.00	3.60	3.60		
	DOS	21/06/2018	22/09/2018	09/07/2018		

Table 1.3.11

Advanced varietal Trial - II
Zone: North Eastern Hill Zone
Character: Yield (Kg/ha)

S.No	Entries	Imphal	Jorhat*	Mean	Rank
1	**KDS 921**	1500	130	1500.00	V
2	**RSC 10-71**	1915	102	1915.00	II
3	**DSb 32**	2648	56	2648.00	I
4	**JS 335(C)**	1667	46	1667.00	III
5	**RKS 18(C)**	1637	74	1637.00	IV
6	**JS 97-52(C)**	1333	74	1333.00	VI
	Mean	**1783.33**	**80.33**		
	N.P.S.(Sqm)	**27.00**	**21.60**		
	DOS	**31/05/2018**	**23/09/2018**		
	CD (5%)	**181.48**	**13.89**		
	CV	**6.75**	**13.13**		

*Data not considered due to low mean yield

Table 1.3.12

Advanced varietal Trial - II
Zone: North Eastern Hill Zone
Character: Days to Flower

S.No	Entries	Imphal	Jorhat	Mean	Rank
1	**KDS 921**	63	36	49.50	V
2	**RSC 10-71**	58	34	46.00	II
3	**DSb 32**	53	38	45.50	I
4	**JS 335(C)**	51	45	48.00	III
5	**RKS 18(C)**	51	46	48.50	IV
6	**JS 97-52(C)**	60	45	52.50	VI
	N.P.S.(Sqm)	27.00	21.60		
	DOS	31/05/2018	23/09/2018		

Table 1.3.13

Advanced varietal Trial - II
Zone: North Eastern Hill Zone
Character: Days to Maturity

S.No	Entries	Imphal	Jorhat	Mean	Rank
1	**KDS 921**	138	81	109.50	VI
2	**RSC 10-71**	118	81	99.50	II
3	**DSb 32**	113	82	97.50	I
4	**JS 335(C)**	111	90	100.50	III
5	**RKS 18(C)**	112	91	101.50	IV
6	**JS 97-52(C)**	118	90	104.00	V
	N.P.S.(Sqm)	27.00	21.60		
	DOS	31/05/2018	23/09/2018		

Table 1.3.14

Advanced varietal Trial - II
Zone: North Eastern Hill Zone
Character: Plant Height (cm)

S.No	Entries	Imphal	Jorhat	Mean	Rank
1	**KDS 921**	67.45	36.70	52.08	I
2	**RSC 10-71**	70.60	33.17	51.89	II
3	**DSb 32**	52.65	39.65	46.15	IV
4	**JS 335(C)**	59.05	30.60	44.83	V
5	**RKS 18(C)**	48.40	24.32	36.36	VI
6	**JS 97-52(C)**	67.35	34.98	51.17	III
	N.P.S.(Sqm)	27.00	21.60		
	DOS	31/05/2018	23/09/2018		

Table 1.3.15

Advanced varietal Trial - II
Zone: North Eastern Hill Zone
Character: 100 Seed Weight (g)

S.No	Entries	Imphal	Jorhat	Mean	Rank
1	**KDS 921**	12.60	9.33	10.97	III
2	**RSC 10-71**	11.26	12.78	12.02	I
3	**DSb 32**	10.29	9.33	9.81	V
4	**JS 335(C)**	8.59	11.35	9.97	IV
5	**RKS 18(C)**	8.91	14.07	11.49	II
6	**JS 97-52(C)**	9.01	9.35	9.18	VI
	N.P.S.(Sqm)	27.00	21.60		
	DOS	31/05/2018	23/09/2018		

Table 1.4.1

Initial Varietal Trial-IVT
Zone: Eastern Zone
Character: Yield (Kg/ha)

S.No	Entries	Bhawanipatna	Raipur	Ranchi	Mean	Rank
1	**DS 3109**	1136	1975	1827	1646.00	XXIX
2	**NRC 146**	617	1852	1654	1374.33	XXXIV
3	**PS 1634**	815	2519	2889	2074.33	VIII
4	**JS 21-71**	840	1605	1704	1383.00	XXXIII
5	**MACS 1566**	1457	2370	2840	2222.33	II
6	**SL 1191**	741	1877	2642	1753.33	XXIII
7	**Himso 1688**	1012	1531	2395	1646.00	XXIX
8	**RKS 18(C)**	963	1852	2148	1654.33	XXVIII
9	**RSC 11-17**	938	2840	2815	2197.67	IV
10	**MAUS 734**	1037	1679	2420	1712.00	XXV
11	**DSb 33**	1086	2543	2790	2139.67	VI
12	**NRC 138**	988	1704	2420	1704.00	XXVI
13	**JS 21-72**	914	1679	1679	1424.00	XXXII
14	**PS 1637**	1136	2790	2988	2304.67	I
15	**AUKS 176**	741	1210	1358	1103.00	XXXV
16	**RSC 10-46(C)**	1086	2617	2272	1991.67	XII
17	**GJS 3**	1235	1704	2444	1794.33	XIX
18	**NRC 139**	1160	1630	1827	1539.00	XXXI
19	**DS 3110**	1284	2074	2370	1909.33	XV
20	**SL 1171**	1383	1383	2198	1654.67	XXVII
21	**MACS 1620**	1481	2494	2469	2148.00	V
22	**MAUS 732**	1111	1852	2346	1769.67	XXI
23	**KS 113**	1086	1086	3012	1728.00	XXIV
24	**JS 97-52(C)**	938	2173	2568	1893.00	XVII
25	**NRC 148**	1309	2272	2617	2066.00	IX
26	**RSC 11-15**	1062	2765	2543	2123.33	VII
27	**RVS 2011-10**	1037	2000	2395	1810.67	XVIII
28	**Himso 1689**	1457	2395	2790	2214.00	III
29	**CAUMS 1**	1012	1753	2099	1621.33	XXX
30	**RVSM 2011-35**	1086	2420	2346	1950.67	XIII
31	**VLS 97**	1111	1235	3037	1794.33	XIX
32	**TS 59**	1309	1778	2593	1893.33	XVI
33	**RVS 2007-4**	938	1951	2395	1761.33	XXII
34	**KDS 1073**	1506	1333	2593	1810.67	XVIII
35	**NRCSL 2**	1259	2123	2691	2024.33	XI
36	**KDS 1009**	1210	1654	2963	1942.33	XIV
37	**BAUS 100**	1136	1926	3062	2041.33	X
38	**JS 335(C)**	1160	2074	2123	1785.67	XX
	Mean	**1099.39**	**1966.26**	**2429.53**		
	N.P.S.(Sqm)	**4.05**	**4.05**	**4.05**		
	DOS	**22/08/2018**	**27/06/2018**	**24/06/2018**		
	CD (5%)	**197.53**	**320.99**	**518.52**		
	CV	**10.62**	**10.19**	**13.04**		

Table 1.4.2

Initial Varietal Trial-IVT
Zone: Eastern Zone
Character: Days to Flower

S.No	Entries	Bhawanipatna	Raipur	Ranchi	Mean	Rank
1	DS 3109	36	37	46	39.67	V
2	NRC 146	34	33	41	36.00	I
3	PS 1634	36	48	45	43.00	XV
4	JS 21-71	33	38	44	38.33	III
5	MACS 1566	40	39	44	41.00	IX
6	SL 1191	36	38	45	39.67	V
7	Himso 1688	43	44	44	43.67	XVII
8	RKS 18(C)	42	43	44	43.00	XV
9	RSC 11-17	44	44	47	45.00	XX
10	MAUS 734	40	38	43	40.33	VII
11	DSb 33	39	42	44	41.67	XI
12	NRC 138	43	37	41	40.33	VII
13	JS 21-72	43	41	42	42.00	XII
14	PS 1637	40	46	47	44.33	XIX
15	AUKS 176	38	44	44	42.00	XII
16	RSC 10-46(C)	41	46	45	44.00	XVIII
17	GJS 3	39	41	44	41.33	X
18	NRC 139	42	44	46	44.00	XVIII
19	DS 3110	36	39	38	37.67	II
20	SL 1171	33	39	45	39.00	IV
21	MACS 1620	37	42	44	41.00	IX
22	MAUS 732	39	44	48	43.67	XVII
23	KS 113	42	46	44	44.00	XVIII
24	JS 97-52(C)	44	42	44	43.33	XVI
25	NRC 148	43	45	43	43.67	XVII
26	RSC 11-15	41	44	48	44.33	XIX
27	RVS 2011-10	41	42	43	42.00	XII
28	Himso 1689	43	43	44	43.33	XVI
29	CAUMS 1	38	39	43	40.00	VI
30	RVSM 2011-35	40	41	41	40.67	VIII
31	VLS 97	41	39	40	40.00	VI
32	TS 59	41	46	41	42.67	XIV
33	RVS 2007-4	40	43	44	42.33	XIII
34	KDS 1073	41	45	46	44.00	XVIII
35	NRCSL 2	36	39	44	39.67	V
36	KDS 1009	38	55	48	47.00	XXI
37	BAUS 100	42	46	45	44.33	XIX
38	JS 335(C)	38	43	44	41.67	XI
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	22/08/2018	27/06/2018	24/06/2018		

Table 1.4.3

Initial Varietal Trial-IVT
Zone: Eastern Zone
Character: Days to Maturity

S.No	Entries	Bhawanipatna	Raipur	Ranchi	Mean	Rank
1	**DS 3109**	97	99	106	100.67	VIII
2	**NRC 146**	95	87	105	95.67	I
3	**PS 1634**	101	107	113	107.00	XXV
4	**JS 21-71**	97	94	107	99.33	VI
5	**MACS 1566**	92	99	114	101.67	XI
6	**SL 1191**	98	108	114	106.67	XXIV
7	**Himso 1688**	98	99	114	103.67	XVI
8	**RKS 18(C)**	92	101	115	102.67	XIII
9	**RSC 11-17**	97	102	114	104.33	XVIII
10	**MAUS 734**	99	93	113	101.67	XI
11	**DSb 33**	99	90	106	98.33	IV
12	**NRC 138**	100	90	106	98.67	V
13	**JS 21-72**	100	97	106	101.00	IX
14	**PS 1637**	99	103	114	105.33	XX
15	**AUKS 176**	99	101	114	104.67	XIX
16	**RSC 10-46(C)**	103	106	116	108.33	XXVI
17	**GJS 3**	98	97	107	100.67	VIII
18	**NRC 139**	100	97	114	103.67	XVI
19	**DS 3110**	97	97	106	100.00	VII
20	**SL 1171**	100	105	114	106.33	XXIII
21	**MACS 1620**	96	106	114	105.33	XX
22	**MAUS 732**	95	101	114	103.33	XV
23	**KS 113**	99	95	113	102.33	XII
24	**JS 97-52(C)**	99	97	106	100.67	VIII
25	**NRC 148**	96	106	116	106.00	XXII
26	**RSC 11-15**	98	97	114	103.00	XIV
27	**RVS 2011-10**	101	95	116	104.00	XVII
28	**Himso 1689**	96	89	107	97.33	II
29	**CAUMS 1**	97	97	108	100.67	VIII
30	**RVSM 2011-35**	97	97	111	101.67	XI
31	**VLS 97**	97	105	115	105.67	XXI
32	**TS 59**	95	96	113	101.33	X
33	**RVS 2007-4**	97	94	107	99.33	VI
34	**KDS 1073**	98	91	105	98.00	III
35	**NRCSL 2**	97	99	115	103.67	XVI
36	**KDS 1009**	97	110	114	107.00	XXV
37	**BAUS 100**	99	105	114	106.00	XXII
38	**JS 335(C)**	97	94	109	100.00	VII
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	22/08/2018	27/06/2018	24/06/2018		

Table 1.4.4

Initial Varietal Trial-IVT
Zone: Eastern Zone
Character: Plant Height (cm)

S.No	Entries	Bhawanipatna	Raipur	Ranchi	Mean	Rank
1	**DS 3109**	38.10	51.93	32.67	40.90	XXXVI
2	**NRC 146**	35.00	49.40	28.73	37.71	XXXVIII
3	**PS 1634**	38.67	70.13	49.80	52.87	VII
4	**JS 21-71**	37.00	56.13	37.93	43.69	XXX
5	**MACS 1566**	40.70	60.07	48.57	49.78	XV
6	**SL 1191**	37.90	64.67	47.73	50.10	XIV
7	**Himso 1688**	34.13	61.40	44.80	46.78	XXI
8	**RKS 18(C)**	35.30	56.80	38.47	43.52	XXXI
9	**RSC 11-17**	34.50	70.87	48.73	51.37	X
10	**MAUS 734**	38.53	51.80	41.53	43.95	XXVIII
11	**DSb 33**	42.43	58.07	46.53	49.01	XVI
12	**NRC 138**	36.13	54.93	37.53	42.86	XXXII
13	**JS 21-72**	36.17	59.80	37.93	44.63	XXVII
14	**PS 1637**	40.40	63.67	49.27	51.11	XI
15	**AUKS 176**	35.97	51.33	36.67	41.32	XXXV
16	**RSC 10-46(C)**	42.67	62.47	45.40	50.18	XIII
17	**GJS 3**	33.90	56.33	46.20	45.48	XXIV
18	**NRC 139**	36.33	61.73	55.07	51.04	XII
19	**DS 3110**	40.10	58.07	45.40	47.86	XX
20	**SL 1171**	36.33	55.93	45.73	46.00	XXIII
21	**MACS 1620**	42.47	70.27	47.53	53.42	V
22	**MAUS 732**	41.70	92.07	47.33	60.37	II
23	**KS 113**	51.20	83.87	70.33	68.47	I
24	**JS 97-52(C)**	43.43	60.67	41.53	48.54	XIX
25	**NRC 148**	43.73	68.80	45.80	52.78	VIII
26	**RSC 11-15**	40.77	66.07	47.40	51.41	IX
27	**RVS 2011-10**	37.80	49.27	37.47	41.51	XXXIV
28	**Himso 1689**	37.70	52.73	44.47	44.97	XXVI
29	**CAUMS 1**	32.87	49.47	38.13	40.16	XXXVII
30	**RVSM 2011-35**	37.40	52.27	42.00	43.89	XXIX
31	**VLS 97**	39.97	62.73	43.73	48.81	XVII
32	**TS 59**	35.83	57.67	42.47	45.32	XXV
33	**RVS 2007-4**	39.67	64.33	41.93	48.64	XVIII
34	**KDS 1073**	43.57	74.60	51.33	56.50	III
35	**NRCSL 2**	36.50	61.67	41.67	46.61	XXII
36	**KDS 1009**	43.67	64.73	50.60	53.00	VI
37	**BAUS 100**	42.47	70.33	53.13	55.31	IV
38	**JS 335(C)**	35.77	49.80	42.40	42.66	XXXIII
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	22/08/2018	27/06/2018	24/06/2018		

Table 1.4.5

Initial Varietal Trial-IVT
Zone: Eastern Zone
Character: 100 Seed Weight (g)

S.No	Entries	Bhawanipatna	Raipur	Ranchi	Mean	Rank
1	**DS 3109**	11.84	11.38	12.31	11.84	XXI
2	**NRC 146**	15.81	14.84	10.77	13.81	VI
3	**PS 1634**	11.17	8.94	11.52	10.54	XXXII
4	**JS 21-71**	15.68	12.17	14.62	14.16	III
5	**MACS 1566**	11.52	11.23	12.22	11.66	XXIV
6	**SL 1191**	15.06	11.42	13.31	13.26	X
7	**Himso 1688**	12.10	12.15	13.91	12.72	XIII
8	**RKS 18(C)**	12.17	12.07	13.12	12.45	XVIII
9	**RSC 11-17**	10.50	9.50	12.36	10.79	XXX
10	**MAUS 734**	13.16	12.23	13.18	12.86	XII
11	**DSb 33**	11.88	11.65	15.34	12.96	XI
12	**NRC 138**	10.57	10.72	11.75	11.01	XXVII
13	**JS 21-72**	14.38	13.65	14.31	14.11	IV
14	**PS 1637**	10.68	10.69	11.39	10.92	XXVIII
15	**AUKS 176**	11.01	10.24	11.30	10.85	XXIX
16	**RSC 10-46(C)**	11.86	10.55	13.09	11.83	XXII
17	**GJS 3**	12.72	10.69	12.41	11.94	XX
18	**NRC 139**	9.98	8.09	12.46	10.18	XXXIII
19	**DS 3110**	12.07	13.03	15.36	13.49	VIII
20	**SL 1171**	15.97	11.44	12.90	13.44	IX
21	**MACS 1620**	16.36	14.45	17.72	16.18	I
22	**MAUS 732**	12.93	11.09	13.37	12.46	XVII
23	**KS 113**	14.30	10.33	14.25	12.96	XI
24	**JS 97-52(C)**	10.98	10.25	8.66	9.96	XXXVI
25	**NRC 148**	11.35	10.90	7.93	10.06	XXXIV
26	**RSC 11-15**	9.89	9.55	9.89	9.78	XXXVII
27	**RVS 2011-10**	14.53	13.35	13.99	13.96	V
28	**Himso 1689**	11.08	10.29	12.96	11.44	XXV
29	**CAUMS 1**	12.51	11.06	13.86	12.48	XVI
30	**RVSM 2011-35**	14.23	13.33	13.41	13.66	VII
31	**VLS 97**	18.23	12.97	16.35	15.85	II
32	**TS 59**	12.45	12.43	12.62	12.50	XV
33	**RVS 2007-4**	10.67	11.30	8.09	10.02	XXXV
34	**KDS 1073**	9.85	9.04	13.13	10.67	XXXI
35	**NRCSL 2**	12.55	10.60	10.69	11.28	XXVI
36	**KDS 1009**	12.88	10.13	13.48	12.16	XIX
37	**BAUS 100**	12.98	12.28	12.72	12.66	XIV
38	**JS 335(C)**	12.49	10.72	12.24	11.82	XXIII
	N.P.S.(Sqm)	4.05	4.05	4.05		
	DOS	22/08/2018	27/06/2018	24/06/2018		

Table 1.4.6

Advanced Varietal Trial I
Zone: Eastern Zone
Character: Yield (Kg/ha)

S,No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	NRC 128	1481	1310	2417	2809	2004.25	I
2	NRCSL 1	1458	1296	1111	2508	1593.25	XII
3	NRC 137	1497	667	1878	2577	1654.75	IX
4	RSC 11-07	1250	1120	2311	3156	1959.25	IV
5	AMS 2014-1	1505	1356	1861	3202	1981	II
6	NRC 132	1373	1093	1250	2955	1667.75	VIII
7	RSC 11-03	1451	1176	1750	2863	1810	VI
8	MACS 1493	1520	1301	1828	3086	1933.75	V
9	NRC 136	1443	1194	2139	3079	1963.75	III
10	VLS 94	1304	787	1033	2330	1363.5	XIV
11	NRC 147	1366	-	1472	2106	1648	X
12	JS 335(C)	1150	1014	1194	2616	1493.5	XIII
13	RKS 18(C)	1273	1102	1822	2369	1641.5	XI
14	JS 97-52(C)	1019	1144	2156	2515	1708.5	VII
	Mean	1363.57	1120.00	1730.14	2726.5		
	N.P.S.(Sqm)	12.96	21.6	18	12.96		
	DOS	18-08-18	18-07-18	26-06-18	29-06-18		
	CD (5%)	208.33	148.15	194.44	470.68		
	CV	10.86	9.9	7.88	12.07		

Table 1.4.7

Advanced Varietal Trial I
Zone: Eastern Zone
Character: Days to Flower

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	NRC 128	38	46	44	45	43.25	IX
2	NRCSL 1	36	39	42	46	40.75	III
3	NRC 137	38	37	44	45	41.00	IV
4	RSC 11-07	36	43	42	43	41.00	IV
5	AMS 2014-1	37	44	42	42	41.25	V
6	NRC 132	40	43	44	45	43.00	VIII
7	RSC 11-03	43	44	45	43	43.75	X
8	MACS 1493	42	46	46	37	42.75	VII
9	NRC 136	43	43	35	41	40.50	II
10	VLS 94	35	39	46	44	41.00	IV
11	NRC 147	33	-	43	42	39.33	I
12	JS 335(C)	40	40	44	40	41.00	IV
13	RKS 18(C)	41	42	44	41	42.00	VI
14	JS 97-52(C)	44	41	49	45	44.75	XI
	N.P.S.(Sqm)	12.96	21.60	18.00	12.96		
	DOS	18/08/2018	18/07/2018	26/06/2018	29/06/2018		

Table 1.4.8

Advanced Varietal Trial I
Zone: Eastern Zone
Character: Days to Maturity

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	mean	Rank
1	**NRC 128**	98	110	106	114	107.00	X
2	**NRCSL 1**	100	105	104	112	105.25	VII
3	**NRC 137**	101	112	104	114	107.75	XII
4	**RSC 11-07**	92	104	90	115	100.25	II
5	**AMS 2014-1**	100	113	102	115	107.50	XI
6	**NRC 132**	97	106	105	104	103.00	IV
7	**RSC 11-03**	103	104	102	116	106.25	IX
8	**MACS 1493**	98	105	102	113	104.50	V
9	**NRC 136**	104	105	102	114	106.25	IX
10	**VLS 94**	93	107	104	116	105.00	VI
11	**NRC 147**	91	-	89	116	98.67	I
12	**JS 335(C)**	99	105	96	111	102.75	III
13	**RKS 18(C)**	99	106	104	115	106.00	VIII
14	**JS 97-52(C)**	104	107	107	116	108.50	XIII
	N.P.S.(Sqm)	12.96	21.60	18.00	12.96		
	DOS	18/08/2018	18/07/2018	26/06/2018	29/06/2018		

Table 1.4.9

Advanced Varietal Trial I
Zone: Eastern Zone
Character: Plant Height (cm)

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	**NRC 128**	45.20	55.60	65.21	67.75	58.44	III
2	**NRCSL 1**	39.25	56.45	47.42	58.95	50.52	X
3	**NRC 137**	48.90	63.50	49.86	75.17	59.36	I
4	**RSC 11-07**	39.60	52.80	52.51	55.75	50.17	XI
5	**AMS 2014-1**	40.85	60.15	56.83	66.90	56.18	VI
6	**NRC 132**	38.73	52.35	43.54	58.40	48.26	XII
7	**RSC 11-03**	38.25	47.80	58.44	59.10	50.90	IX
8	**MACS 1493**	39.60	64.70	60.64	62.15	56.77	V
9	**NRC 136**	52.67	40.35	70.64	69.65	58.33	IV
10	**VLS 94**	34.33	33.20	43.08	45.83	39.11	XIV
11	**NRC 147**	46.42	-	73.28	55.85	58.52	II
12	**JS 335(C)**	39.35	45.05	42.73	55.75	45.72	XIII
13	**RKS 18(C)**	39.15	46.50	64.81	58.45	52.23	VIII
14	**JS 97-52(C)**	42.33	41.05	66.66	61.80	52.96	VII
	N.P.S.(Sqm)	12.96	21.60	18.00	12.96		
	DOS	18/08/2018	18/07/2018	26/06/2018	29/06/2018		

Table 1.4.10

Advanced Varietal Trial I
Zone: Eastern Zone
Character: 100 Seed Weight (g)

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	**NRC 128**	13.64	9.07	11.37	11.14	11.31	IV
2	**NRCSL 1**	12.42	11.95	10.12	12.25	11.69	III
3	**NRC 137**	8.57	10.33	7.97	11.24	9.53	X
4	**RSC 11-07**	10.07	9.68	9.34	10.51	9.90	VIII
5	**AMS 2014-1**	10.10	9.95	8.20	11.34	9.90	VIII
6	**NRC 132**	10.78	7.62	9.66	10.09	9.54	IX
7	**RSC 11-03**	9.75	7.46	7.92	11.38	9.13	XIII
8	**MACS 1493**	11.26	7.29	11.38	12.63	10.64	VI
9	**NRC 136**	8.64	8.38	10.76	9.95	9.43	XI
10	**VLS 94**	15.21	7.51	14.70	12.94	12.59	II
11	**NRC 147**	12.21	-	13.28	13.33	12.94	I
12	**JS 335(C)**	11.46	8.49	8.38	12.26	10.15	VII
13	**RKS 18(C)**	11.66	8.53	10.29	12.43	10.73	V
14	**JS 97-52(C)**	9.29	8.45	8.63	10.28	9.16	XII
	N.P.S.(Sqm)	12.96	21.60	18.00	12.96		
	DOS	18/08/2018	18/07/2018	26/06/2018	29/06/2018		

Table 1.4.11

Advanced Varietal Trial II
Zone: Eastern Zone
Character: Yield (Kg/ha)

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	**RSC 10-71**	1421	1454	2419	2940	2058.50	I
2	**RSC 10-52**	1542	1245	2381	2301	1867.25	II
3	**JS 335(C)**	1204	1069	1178	2435	1471.50	V
4	**RKS 18(C)**	1333	1106	1985	2079	1625.75	IV
5	**JS 97-52(C)**	1088	1222	1889	2542	1685.25	III
	Mean	**1317.60**	**1219.20**	**1970.40**	**2459.40**		
	N.P.S.(Sqm)	**21.60**	**21.60**	**27.00**	**21.60**		
	DOS	**18/08/2018**	**21/07/2018**	**25/06/2018**	**29/06/2018**		
	CD (5%)	**208.33**	**199.07**	**100.00**	**365.74**		
	CV	**10.16**	**10.67**	**3.28**	**9.69**		

Table 1.4.12

Advanced Varietal Trial II
Zone: Eastern Zone
Character: Days to Flower

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	**RSC 10-71**	43	43	45	48	44.75	III
2	**RSC 10-52**	44	44	45	49	45.50	IV
3	**JS 335(C)**	43	48	45	40	44.00	II
4	**RKS 18(C)**	43	37	44	42	41.50	I
5	**JS 97-52(C)**	46	42	51	47	46.50	V
	N.P.S.(Sqm)	21.60	21.60	27.00	21.60		
	DOS	18/08/2018	21/07/2018	25/06/2018	29/06/2018		

Table 1.4.13

Advanced Varietal Trial II
Zone: Eastern Zone
Character: Days to Maturity

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	**RSC 10-71**	99	106	100	110	103.75	III
2	**RSC 10-52**	98	109	101	110	104.50	IV
3	**JS 335(C)**	98	112	97	102	102.25	I
4	**RKS 18(C)**	99	102	103	109	103.25	II
5	**JS 97-52(C)**	103	108	108	110	107.25	V
	N.P.S.(Sqm)	21.60	21.60	27.00	21.60		
	DOS	18/08/2018	21/07/2018	25/06/2018	29/06/2018		

Table 1.4.14

Advanced Varietal Trial II
Zone: Eastern Zone
Character: Plant Height (cm)

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	**RSC 10-71**	49.75	49.63	63.35	68.10	57.71	II
2	**RSC 10-52**	42.05	63.40	70.20	62.73	59.60	I
3	**JS 335(C)**	42.10	49.23	48.85	58.47	49.66	V
4	**RKS 18(C)**	44.25	35.85	76.60	54.84	52.89	III
5	**JS 97-52(C)**	44.05	35.63	62.90	63.25	51.46	IV
	N.P.S.(Sqm)	21.60	21.60	27.00	21.60		
	DOS	18/08/2018	21/07/2018	25/06/2018	29/06/2018		

Table 1.4.15

Advanced Varietal Trial II
Zone: Eastern Zone
Character: 100 Seed Weight (g)

S.No	Entries	Bhawanipatna	Dholi	Raipur	Ranchi	Mean	Rank
1	**RSC 10-71**	11.75	11.08	10.58	13.17	11.65	I
2	**RSC 10-52**	12.40	8.31	11.63	12.35	11.17	II
3	**JS 335(C)**	11.50	7.52	9.36	12.00	10.10	IV
4	**RKS 18(C)**	11.86	9.07	9.67	12.23	10.71	III
5	**JS 97-52(C)**	9.28	9.16	8.70	10.95	9.52	V
	N.P.S.(Sqm)	21.60	21.60	27.00	21.60		
	DOS	18/08/2018	21/07/2018	25/06/2018	29/06/2018		

Table 1.5.1

Initial varietal Trial- IVT
Zone: Central Zone
Character: Yield (Kg/ha)

S.No	Entries	Amravati	Amreli	Indore	Jabalpur*	Kota	Lok Bharti**	Nagpur	Parbhani	Sehore	Mean	Rank
1	**DS 3109**	1605	994	2123	642	1728	1255	1210	1827	1654	1591.6	XXI
2	**NRC 146**	1111	1345	2691	765	1531	1173	1259	1852	1185	1567.7	XXIV
3	**PS 1634**	1654	643	2519	1556	1704	1790	1333	2519	1531	1700.4	XV
4	**JS 21-71**	1136	1053	2025	2222	1753	1667	1852	2049	889	1536.7	XXIX
5	**MACS 1566**	1481	799	2543	1457	1877	1708	1580	2741	1926	1849.6	IV
6	**SL 1191**	765	741	2272	444	1654	1749	1235	1951	1062	1382.9	XXXIV
7	**Himso 1688**	1086	897	1877	-	1704	2675	988	1852	1160	1366.3	XXXV
8	**JS 20-98(C)**	**1333**	**994**	**2395**	**963**	**1901**	**1914**	**1679**	**1901**	**1704**	**1701.0**	**XIV**
9	**RSC 11-17**	1333	682	2667	617	1802	1790	2519	1951	1481	1776.4	VIII
10	**MAUS 734**	1210	1092	2000	-	1556	2407	741	2469	1284	1478.9	XXX1
11	**DSb 33**	1284	1326	1580	-	2370	2428	-	3037	1506	1586.1	XXII
12	**NRC 138**	1037	1131	2321	790	1926	2119	1531	1506	1704	1593.7	XX
13	**JS 21-72**	1852	1092	2617	2642	1407	2407	1926	2691	1432	1859.6	III
14	**PS 1637**	1802	702	2395	346	1951	3601	1630	1852	1654	1712.3	XI
15	**AUKS 176**	914	916	2247	370	1679	2037	790	2173	1111	1404.3	XXXIII
16	**JS 335(C)**	**1407**	**1189**	**2321**	**667**	**2025**	**2160**	**1235**	**2840**	**1704**	**1817.3**	**VI**
17	**GJS 3**	1284	1189	2444	247	1704	2387	1012	2642	1704	1711.3	XII
18	**NRC 139**	1432	702	2222	-	1926	2675	864	2296	1531	1567.6	XXV
19	**DS 3110**	1284	1423	2444	1012	1951	2572	1160	1877	1827	1709.4	XIII
20	**SL 1171**	494	1189	1802	-	1605	2325	765	1827	1012	1242.0	XXXVII
21	**MACS 1620**	988	1228	2765	1259	1802	2778	1358	2914	1457	1787.4	VII
22	**MAUS 732**	1037	858	1679	765	1679	2428	1037	3111	1407	1544.0	XXVII
23	**KS 113**	2247	877	2272	494	198	1502	741	2346	1259	1420.0	XXXII
24	**JS 20-34(C)**	**1432**	**1793**	**2099**	**1333**	**1630**	**1420**	**1259**	**1704**	**1531**	**1635.4**	**XIX**
25	**NRC 148**	1704	741	2889	222	1753	2222	963	2716	1531	1756.7	X
26	**RSC 11-15**	1753	702	2642	667	1802	1872	1506	2123	1284	1687.4	XVI
27	**RVS 2011-10**	1531	1267	2543	469	2025	3189	1111	1901	1975	1764.7	IX
28	**Himso 1689**	1358	1209	2617	2247	2494	2675	1481	2519	2395	2010.4	II
29	**CAUMS 1**	889	1053	1877	494	1827	2366	1185	2049	2025	1557.9	XXVI

Table 1.5.1 Contd…

Table 1.5.1 Contd…

S.No	Entries	Amravati	Amreli	Indore	Jabalpur*	Kota	Lok Bharti**	Nagpur	Parbhani	Sehore	Mean	Rank
30	**RVSM 2011-35**	1481	1228	2519	617	2519	2551	1309	2765	2420	2034.4	I
31	**VLS 97**	716	1404	1654	-	198	1770	-	2469	1185	1089.4	XXXVIII
32	**TS 59**	1259	897	2173	593	1630	2119	741	2543	1432	1525.0	XXX
33	**RVS 2007-4**	1531	858	1877	444	1704	1420	1753	2346	1605	1667.7	XVII
34	**KDS 1073**	1481	1072	1383	1333	1309	2119	1704	2370	1481	1542.9	XXVIII
35	**NRCSL 2**	1235	1189	2469	321	2444	1893	914	3012	1679	1848.9	V
36	**KDS 1009**	1679	780	2370	617	1407	2160	864	2321	1654	1582.1	XXIII
37	**BAUS 100**	593	760	1531	-	1975	2016	840	2469	864	1290.3	XXXVI
38	**NRC 86(C)**	**1556**	**897**	**2444**	**1259**	**1877**	**2305**	**1037**	**2222**	**1506**	**1648.4**	**XVIII**
	Mean	**1315.11**	**1024.00**	**2244.95**	**899.16**	**1737.55**	**2148.53**	**1253.11**	**2309.29**	**1519.76**		
	N.P.S.(Sqm)	**4.05**	**5.13**	**4.05**	**4.05**	**4.05**	**4.86**	**4.05**	**4.05**	**4.05**		
	DOS	**25/06/2018**	**18/07/2018**	**29/06/2018**	**05/07/2018**	**03/07/2018**	**04/07/2018**	**20/07/2018**	**22/06/2018**	**05/07/2018**		
	CD (5%)	**271.60**	**175.44**	**543.21**	**123.46**	**320.99**	**1008.23**	**222.22**	**419.75**	**469.14**		
	CV	**12.32**	**10.13**	**14.91**	**10.25**	**11.52**	**28.93**	**10.87**	**11.19**	**19.05**		

*Data not considered due to low mean yield. **Data not considered due to high CV

Table 1.5.2

Initial varietal Trial- IVT
Zone: Central Zone
Character: Days to Flower

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Nagpur	Parbhani	Sehore	Mean	Rank
1	**DS 3109**	41	35	39	39	39	43	37	40	42	39.44	VI
2	**NRC 146**	38	34	33	34	36	37	33	31	42	35.33	III
3	**PS 1634**	50	42	45	42	50	47	40	41	51	45.33	XXIX
4	**JS 21-71**	40	37	39	39	45	43	36	37	46	40.22	IX
5	**MACS 1566**	43	36	39	41	42	42	36	40	42	40.11	VIII
6	**SL 1191**	47	36	40	39	46	44	35	42	42	41.22	XV
7	**Himso 1688**	42	37	40	41	47	45	38	38	45	41.44	XVI
8	**JS 20-98(C)**	**45**	**36**	**40**	**40**	**49**	**43**	**37**	**40**	**44**	**41.56**	**XVII**
9	**RSC 11-17**	52	44	46	46	47	46	41	42	51	46.11	XXX
10	**MAUS 734**	43	35	40	39	41	40	35	39	44	39.56	VII
11	**DSb 33**	43	36	40	40	43	40	-	37	47	40.75	XIII
12	**NRC 138**	44	33	32	33	38	34	30	31	39	34.89	II
13	**JS 21-72**	45	37	40	39	42	42	36	37	44	40.22	IX
14	**PS 1637**	48	40	45	45	49	46	39	41	42	43.89	XXV
15	**AUKS 176**	45	39	41	42	47	43	39	40	47	42.56	XXI
16	**JS 335(C)**	**45**	**36**	**41**	**41**	**47**	**42**	**37**	**37**	**48**	**41.56**	**XVII**
17	**GJS 3**	46	38	39	41	45	42	37	39	48	41.67	XVIII
18	**NRC 139**	48	41	42	43	49	45	41	41	51	44.56	XXVII
19	**DS 3110**	44	35	36	39	42	41	34	35	43	38.78	V
20	**SL 1171**	44	36	40	39	45	43	36	35	47	40.56	XII
21	**MACS 1620**	47	38	40	42	45	43	39	40	50	42.67	XXII
22	**MAUS 732**	48	38	41	42	47	43	41	40	47	43.00	XXIV
23	**KS 113**	53	47	47	46	46	46	39	46	50	46.67	XXXII
24	**JS 20-34(C)**	**42**	**32**	**32**	**32**	**36**	**33**	**34**	**33**	**35**	**34.33**	**I**

Table 1.5.2 Contd…

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Nagpur	Parbhani	Sehore	Mean	Rank
25	**NRC 148**	47	40	41	42	43	44	39	39	47	42.44	XX
26	**RSC 11-15**	50	39	44	43	45	46	40	40	48	43.89	XXV
27	**RVS 2011-10**	42	37	40	40	43	41	36	31	46	39.56	VII
28	**Himso 1689**	42	37	41	42	41	41	37	38	45	40.44	XI
29	**CAUMS 1**	45	36	40	40	41	41	37	37	45	40.22	IX
30	**RVSM 2011-35**	43	37	40	40	42	41	37	36	47	40.33	X
31	**VLS 97**	43	31	39	36	36	37	-	34	41	37.13	IV
32	**TS 59**	47	41	45	46	47	47	40	42	48	44.78	XXVIII
33	**RVS 2007-4**	42	37	41	42	45	44	40	38	47	41.78	XIX
34	**KDS 1073**	42	39	41	42	47	46	40	41	48	42.89	XXIII
35	**NRCSL 2**	44	37	40	40	45	41	38	36	44	40.56	XII
36	**KDS 1009**	52	41	47	48	49	49	42	38	51	46.33	XXXI
37	**BAUS 100**	47	40	44	46	47	43	40	41	48	44.00	XXVI
38	**NRC 86(C)**	**42**	**36**	**40**	**41**	**45**	**41**	**37**	**41**	**44**	**40.78**	**XIV**
	N.P.S.(Sqm	4.05	5.13	4.05	4.05	4.05	4.86	4.05	4.05	4.05		
	DOS	25/06/2018	18/07/2018	29/06/2018	05/07/2018	03/07/2018	04/07/2018	20/07/2018	22/06/2018	01/01/1900		

Table 1.5.3

Initial varietal Trial- IVT
Zone: Central Zone
Character: Days to Maturity

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Nagpur	Parbhani	Sehore	Mean	Rank
1	DS 3109	85	75	106	94	99	107	91	103	99	95.44	XIX
2	NRC 146	84	73	96	91	91	95	82	88	92	88.00	II
3	PS 1634	99	80	105	96	102	111	91	102	101	98.56	XXVII
4	JS 21-71	86	76	96	93	95	102	85	97	92	91.33	V
5	MACS 1566	91	82	105	97	97	108	88	102	97	96.33	XXI
6	SL 1191	94	85	106	97	107	114	89	106	102	100.00	XXXI
7	Himso 1688	90	77	96	-	99	103	88	99	96	93.50	VII
8	**JS 20-98(C)**	**95**	**73**	**103**	**94**	**100**	**103**	**85**	**104**	**97**	**94.89**	**XV**
9	RSC 11-17	103	86	104	97	101	107	91	101	102	99.11	XXIX
10	MAUS 734	91	74	96	-	99	101	90	102	96	93.63	VIII
11	DSb 33	91	75	96	-	92	92	-	97	95	91.14	IV
12	NRC 138	95	72	96	88	92	97	82	92	92	89.56	III
13	JS 21-72	95	77	100	95	98	103	88	97	97	94.44	XI
14	PS 1637	98	84	105	95	106	112	88	102	99	98.78	XXVIII
15	AUKS 176	90	81	105	95	97	102	89	99	97	95.00	XVI
16	**JS 335(C)**	**96**	**78**	**103**	**95**	**99**	**101**	**89**	**95**	**98**	**94.89**	**XV**
17	GJS 3	96	77	102	94	99	102	87	102	97	95.11	XVII
18	NRC 139	98	80	103	-	99	101	82	101	98	95.25	XVIII
19	DS 3110	95	76	102	93	98	105	87	97	98	94.56	XII
20	SL 1171	96	79	103	-	102	111	89	97	98	96.88	XXIII
21	MACS 1620	96	80	104	97	100	106	88	101	97	96.56	XXII
22	MAUS 732	98	80	106	98	101	109	88	102	99	97.89	XXVI
23	KS 113	103	82	106	96	100	107	89	106	98	98.56	XXVII
24	**JS 20-34(C)**	**91**	**70**	**87**	**86**	**86**	**97**	**82**	**87**	**90**	**86.22**	**I**

Table 1.5.3 Contd…

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Nagpur	Parbhani	Sehore	Mean	Rank
25	**NRC 148**	97	83	103	92	103	113	86	102	98	97.44	XXIV
26	**RSC 11-15**	100	81	103	97	102	107	89	101	98	97.56	XXV
27	**RVS 2011-10**	95	79	102	90	100	113	82	88	98	94.11	X
28	**Himso 1689**	95	76	102	95	97	109	85	102	98	95.44	XIX
29	**CAUMS 1**	96	76	103	95	96	106	85	96	99	94.67	XIII
30	**RVSM 2011-35**	91	77	103	91	100	112	82	97	99	94.67	XIII
31	**VLS 97**	92	77	100	-	95	108	-	95	97	94.86	XIV
32	**TS 59**	95	85	104	94	102	106	82	101	98	96.33	XXI
33	**RVS 2007-4**	97	76	96	91	96	103	89	95	95	93.11	VI
34	**KDS 1073**	97	79	96	92	96	104	82	103	97	94.00	IX
35	**NRCSL 2**	93	77	103	92	100	112	89	97	99	95.78	XX
36	**KDS 1009**	103	86	106	94	108	115	88	99	102	100.11	XXXII
37	**BAUS 100**	95	85	107	-	104	112	89	103	101	99.50	XXX
38	**NRC 86(C)**	**96**	**75**	**103**	**92**	**97**	**111**	**82**	**101**	**97**	**94.89**	**XV**
	N.P.S.(Sqm)	4.05	5.13	4.05	4.05	4.05	4.86	4.05	4.05	4.05		
	DOS	25/06/2018	18/07/2018	29/06/2018	05/07/2018	03/07/2018	04/07/2018	20/07/2018	22/06/2018	01/01/1900		

Table 1.5.4

Initial varietal Trial- IVT
Zone: Central Zone
Character: Plant Height (cm)

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Nagpur	Parbhani	Sehore	Mean	Rank
1	**DS 3109**	38.60	46.13	64.00	47.94	38.20	28.67	46.53	33.53	41.33	42.77	XXXV
2	**NRC 146**	33.67	40.47	57.00	46.44	37.52	30.67	38.00	34.00	25.67	38.16	XXXVII
3	**PS 1634**	61.87	62.67	59.00	46.50	68.80	42.67	60.67	41.53	50.67	54.93	XII
4	**JS 21-71**	43.40	57.27	65.67	60.97	40.67	40.67	50.00	52.13	32.67	49.27	XXV
5	**MACS 1566**	51.67	64.13	77.33	69.30	56.67	47.33	56.60	52.13	46.33	57.94	VIII
6	**SL 1191**	43.20	60.00	67.67	62.87	58.37	38.00	52.93	34.93	40.00	50.89	XXI
7	**Himso 1688**	41.80	51.53	65.33	-	46.60	41.00	49.00	27.20	49.33	46.47	XXXIII
8	**JS 20-98(C)**	**40.40**	**60.07**	**61.00**	**60.83**	**50.00**	**39.00**	**44.60**	**30.40**	**37.00**	**47.03**	**XXXII**
9	**RSC 11-17**	48.67	68.47	73.33	58.67	50.73	44.33	59.27	37.13	49.67	54.47	XIV
10	**MAUS 734**	42.47	46.07	56.67	-	48.25	39.00	61.47	31.20	39.00	45.52	XXXIV
11	**DSb 33**	44.73	53.67	67.33	-	37.47	38.33	-	46.07	53.00	48.66	XXVII
12	**NRC 138**	34.40	46.93	41.67	44.50	36.33	30.00	44.47	42.47	39.33	40.01	XXXVI
13	**JS 21-72**	48.00	53.93	70.00	64.00	52.20	48.67	53.60	55.67	42.67	54.30	XV
14	**PS 1637**	53.73	62.73	76.00	62.63	58.77	55.00	62.53	54.67	47.33	59.27	VII
15	**AUKS 176**	41.07	57.20	61.67	60.43	54.40	46.00	47.80	56.27	36.33	51.24	XIX
16	**JS 335(C)**	**44.10**	**47.07**	**57.33**	**54.57**	**51.13**	**48.67**	**46.13**	**43.73**	**41.33**	**48.23**	**XXX**
17	**GJS 3**	46.07	46.60	55.67	60.13	42.95	45.00	46.60	43.73	50.00	48.53	XXVIII
18	**NRC 139**	42.67	53.13	62.00	-	46.27	56.00	55.40	44.93	41.33	50.22	XXII
19	**DS 3110**	41.53	50.13	59.33	53.90	47.27	44.33	63.53	49.20	38.33	49.73	XXIII
20	**SL 1171**	40.13	52.13	65.33	-	60.33	41.00	49.20	43.87	40.33	49.04	XXVI
21	**MACS 1620**	55.27	64.53	66.33	65.80	58.13	53.33	43.80	46.27	43.33	55.20	XI
22	**MAUS 732**	70.27	69.53	101.33	59.90	67.07	78.33	51.73	76.20	55.00	69.93	II
23	**KS 113**	52.27	70.27	104.67	93.83	70.13	75.67	66.53	62.87	52.33	72.06	I
24	**JS 20-34(C)**	**31.93**	**30.27**	**48.67**	**44.07**	**44.73**	**28.33**	**37.20**	**25.47**	**38.33**	**36.56**	**XXXVIII**

Table 1.5.4 Contd…

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Nagpur	Parbhani	Sehore	Mean	Rank
25	**NRC 148**	53.33	58.33	69.67	71.67	62.70	49.33	62.73	54.47	52.67	59.43	VI
26	**RSC 11-15**	47.20	61.60	65.33	64.60	57.73	35.33	66.13	55.80	47.33	55.67	X
27	**RVS 2011-10**	43.80	50.27	60.33	58.53	56.87	32.67	58.73	47.87	37.33	49.60	XXIV
28	**Himso 1689**	45.87	47.47	66.67	59.83	53.00	50.67	57.87	47.80	52.00	53.46	XVI
29	**CAUMS 1**	41.20	52.13	57.00	49.57	36.27	37.67	49.27	62.67	48.67	48.27	XXIX
30	**RVSM 2011-35**	44.87	51.00	65.00	55.00	47.07	41.67	60.93	58.93	52.00	52.94	XVII
31	**VLS 97**	43.13	51.73	61.67	-	38.67	40.00	-	53.27	46.67	47.88	XXXI
32	**TS 59**	52.47	62.73	67.33	49.50	56.13	40.33	56.80	57.93	50.67	54.88	XIII
33	**RVS 2007-4**	52.93	63.67	67.67	63.43	37.07	44.00	61.73	63.20	50.67	56.04	IX
34	**KDS 1073**	51.47	74.40	72.67	65.27	39.73	54.67	63.60	74.73	53.00	61.06	V
35	**NRCSL 2**	48.33	48.13	63.33	64.13	43.07	40.67	54.20	47.67	49.00	50.95	XX
36	**KDS 1009**	63.00	61.80	73.33	76.33	69.70	43.67	60.93	62.27	61.67	63.63	III
37	**BAUS 100**	56.53	70.60	74.67	-	66.07	49.67	58.47	67.73	55.67	62.43	IV
38	**NRC 86(C)**	**42.87**	**56.87**	**67.33**	**46.67**	**49.20**	**44.00**	**52.80**	**50.73**	**51.33**	**51.31**	**XVIII**
	N.P.S.(Sqm)	4.05	5.13	4.05	4.05	4.05	4.86	4.05	4.05	4.05		
	DOS	25/06/2018	18/07/2018	29/06/2018	05/07/2018	03/07/2018	04/07/2018	20/07/2018	22/06/2018	01/01/1900		

Table 1.5.5

Initial varietal Trial- IVT
Zone: Central Zone
Character: 100 Seed Weight

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Nagpur	Parbhani	Sehore	Mean	Rank
1	**DS 3109**	8.92	6.31	11.03	9.93	9.51	10.50	10.33	14.84	10.50	10.21	XVII
2	**NRC 146**	13.28	9.50	15.43	12.61	12.78	14.83	12.93	18.46	12.83	13.63	II
3	**PS 1634**	9.67	4.52	8.93	7.64	5.99	8.00	7.43	9.35	7.50	7.67	XXXVII
4	**JS 21-71**	11.42	7.97	10.63	14.21	11.18	11.33	15.10	15.62	8.50	11.77	VIII
5	**MACS 1566**	9.25	6.01	11.00	10.63	8.73	9.33	9.57	14.18	10.00	9.86	XXVII
6	**SL 1191**	10.88	5.97	11.57	9.59	9.49	10.67	9.50	15.03	374.50	50.80	I
7	**Himso 1688**	8.25	6.87	9.80	-	9.50	10.83	9.47	15.81	8.50	9.88	XXV
8	**JS 20-98(C)**	**9.42**	**5.85**	**10.83**	**11.41**	**9.71**	**8.33**	**10.13**	**14.20**	**11.50**	**10.15**	**XIX**
9	**RSC 11-17**	9.75	4.89	8.50	9.35	7.59	7.17	8.73	8.15	7.50	7.96	XXXVI
10	**MAUS 734**	9.83	6.95	9.40	-	10.44	11.00	11.30	16.32	9.50	10.59	XIII
11	**DSb 33**	10.17	7.31	9.60	-	11.02	12.17	-	15.93	9.83	10.86	X
12	**NRC 138**	8.58	6.36	9.83	10.95	8.67	9.00	11.97	12.45	10.50	9.81	XXVIII
13	**JS 21-72**	10.63	7.60	13.17	14.37	8.78	11.67	15.00	12.99	15.17	12.15	VI
14	**PS 1637**	9.63	5.46	10.33	9.33	10.38	7.83	8.63	10.20	8.50	8.92	XXXIV
15	**AUKS 176**	8.42	5.93	10.17	11.98	10.29	9.00	10.53	17.27	9.50	10.34	XVI
16	**JS 335(C)**	**9.50**	**6.31**	**10.67**	**10.89**	**9.16**	**9.17**	**11.17**	**15.45**	**8.85**	**10.13**	**XXI**
17	**GJS 3**	8.83	6.28	11.30	10.16	9.08	9.17	10.17	14.35	9.50	9.87	XXVI
18	**NRC 139**	8.58	4.42	9.17	-	8.26	7.17	9.00	10.83	8.83	8.28	XXXV
19	**DS 3110**	10.08	7.46	12.43	9.89	11.06	10.50	9.63	16.15	10.17	10.82	XI
20	**SL 1171**	8.13	6.67	10.97	-	10.85	10.17	8.60	12.51	9.33	9.65	XXIX
21	**MACS 1620**	11.00	8.17	13.57	13.29	11.35	13.67	13.97	17.08	11.50	12.62	IV
22	**MAUS 732**	10.42	7.15	9.57	10.23	10.11	10.67	9.77	12.87	9.50	10.03	XXII
23	**KS 113**	13.08	6.73	10.53	9.84	9.95	11.50	9.83	14.48	8.00	10.44	XV
24	**JS 20-34(C)**	**12.30**	**7.89**	**13.33**	**14.16**	**11.54**	**11.83**	**13.63**	**11.94**	**10.83**	**11.94**	**VII**

Table 1.5.5 Contd…

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Nagpur	Parbhani	Sehore	Mean	Rank
25	**NRC 148**	9.33	6.00	11.03	12.01	8.92	9.50	9.13	14.72	8.50	9.90	XXIV
26	**RSC 11-15**	9.38	5.04	9.63	9.52	7.60	8.17	9.33	12.39	13.50	9.40	XXXII
27	**RVS 2011-10**	10.93	7.99	13.13	10.52	9.59	13.17	9.37	18.01	8.33	11.23	IX
28	**Himso 1689**	8.58	6.98	9.97	10.74	9.65	10.83	9.70	14.27	10.50	10.14	XX
29	**CAUMS 1**	8.72	7.03	11.60	10.37	10.09	10.83	9.17	16.67	10.67	10.57	XIV
30	**RVSM 2011-35**	10.50	7.81	12.30	11.17	11.36	12.83	12.87	17.83	13.00	12.19	V
31	**VLS 97**	11.70	9.33	12.53	-	10.98	16.50	-	20.72	12.33	13.44	III
32	**TS 59**	11.50	6.60	11.97	13.20	8.68	10.83	9.07	14.71	9.50	10.67	XII
33	**RVS 2007-4**	8.67	6.92	10.03	10.47	10.13	10.17	11.70	14.25	9.50	10.20	XVIII
34	**KDS 1073**	9.00	6.57	8.77	10.01	8.94	10.33	10.13	12.58	9.33	9.52	XXX
35	**NRCSL 2**	8.92	6.23	10.43	9.69	10.98	11.00	9.17	14.11	9.50	10.00	XXIII
36	**KDS 1009**	11.92	5.95	9.97	9.39	8.70	10.50	8.83	9.60	9.00	9.32	XXXIII
37	**BAUS 100**	9.25	6.04	8.40	-	9.90	10.83	10.27	11.35	8.50	9.32	XXXIII
38	**NRC 86(C)**	**8.75**	**6.03**	**9.67**	**8.81**	**9.06**	**10.50**	**9.70**	**12.78**	**9.50**	**9.42**	**XXXI**
	N.P.S.(Sqm)	4.05	5.13	4.05	4.05	4.05	4.86	4.05	4.05	4.05		
	DOS	25/06/2018	18/07/2018	29/06/2018	05/07/2018	03/07/2018	04/07/2018	20/07/2018	22/06/2018	01/01/1900		

Table 1.5.6

Trial: Vegetable Soybean Trial
Zone: Central Zone
Trait: Green Pod Yield (Kg/ha)

S. No.	Entry	Indore	Kota	Parbhani	Mean	Rank
1	Harasoya (c)	7495	3341	4568	5134.7	IV
2	NRC 105	4584	-	3901	2828.3	VI
3	MACS 1508	6247	2778	6379	5134.7	IV
4	Karune	6560	2983	6963	5502.0	II
5	Himso 1685	5523	2642	5407	4524.0	V
6	JS 20-34 (C)	7276	3189	5761	5408.7	III
7	JS 95-60 (C)	7984	2551	6420	5651.7	I
	Mean	6523.9	2914	5628		
	NPS	4.05	4.05	4.05		
	DOS	29/06/2018	03/07/2018	28/06/2018		
	CD(5%)	1,637.8	NS	473.6		
	CV	13.9	12.5	4.67		

Table 1.5.7

Trial: Vegetable Soybean Trial
Zone: Central Zone
Trait: Grain Yield (Kg/ha)

S. No.	Entry	Indore	Kota	Parbhani	Mean	Rank
1	Harasoya (c)	2202	1411	2428	2013.7	III
2	NRC 105	607	-	897	501.3	VII
3	MACS 1508	1338	941	1975	1418.0	IV
4	Karune	1119	964	1605	1229.3	VI
5	Himso 1685	1106	870	1975	1317.0	V
6	JS 20-34 (C)	2783	1135	2181	2033.0	II
7	JS 95-60 (C)	3274	626	2979	2293.0	I
	Mean	1775.6	991.2	2006		
	NPS	4.05	4.05	4.05		
	DOS	29/06/2018	03/07/2018	28/06/2018		
	CD(5%)	684.1	277.5	314.3		
	CV	20.3	15.2	8.7		

Table 1.5.8

Trial: Vegetable Soybean Trial
Zone: Central Zone
Trait: Days to Flower

S. No.	Entry	Indore	Kota	Parbhani	Mean	Rank
1	Harasoya (c)	34	-	31	32.5	IV
2	NRC 105	32	-	31	31.5	II
3	MACS 1508	40	-	40	40	V
4	Karune	32	-	32	32	III
5	Himso 1685	41	-	39	40	V
6	JS 20-34 (C)	32	-	31	31.5	II
7	JS 95-60 (C)	32	-	30	31	I

Table 1.5.9

Trial: Vegetable Soybean Trial
Zone: Central Zone
Trait: Days to Picking at R6 stage

S. No.	Entry	Indore	Kota	Parbhani	Mean	Rank
1	Harasoya (c)	86	79	77	80.7	V
2	NRC 105	71	-	75	73.0	I
3	MACS 1508	88	81	83	84.0	VI
4	Karune	71	88	76	78.3	IV
5	Himso 1685	89	82	84	85.0	VII
6	JS 20-34 (C)	80	76	75	77.0	III
7	JS 95-60 (C)	69	77	75	73.7	II

Table 1.5.10

Trial: Vegetable Soybean Trial
Zone: Central Zone
Trait: Days to Maturity

S. No.	Entry	Indore	Kota	Parbhani	Mean	Rank
1	Harasoya (c)	97	94.33	92	94.4	IV
2	NRC 105	88	-	92	90.0	III
3	MACS 1508	98	99.67	99	98.9	VII
4	Karune	98	96.33	94	96.1	V
5	Himso 1685	99	98.33	99	98.8	VI
6	JS 20-34 (C)	89	89.33	89	89.1	I
7	JS 95-60 (C)	88	88.33	92	89.4	II

Table 1.5.11

Trial: Vegetable Soybean Trial
Zone: Central Zone
Trait: Plant Height

S. No.	Entry	Indore	Kota	Parbhani	Mean	Rank
1	Harasoya (c)	60	-	40.8	50.4	III
2	NRC 105	37	-	24.3	30.6	VII
3	MACS 1508	58	-	49.0	53.5	II
4	Karune	62	-	39.7	50.8	IV
5	Himso 1685	73	-	40.3	56.6	I
6	JS 20-34 (C)	49	-	26.9	37.9	V
7	JS 95-60 (C)	45	-	22.8	33.9	VI

Table 1.5.12

Trial: Vegetable Soybean Trial
Zone: Central Zone
Trait: 100 Green Seed Weight

S. No.	Entry	Indore	Kota	Parbhani	Mean	Rank
1	Harasoya (c)	26.5	32.7	43.82	34.3	III
2	NRC 105	68.6	0.0	83.02	50.5	II
3	MACS 1508	21.9	35.4	24.34	27.2	VII
4	Karune	65.7	38.6	76.40	60.2	I
5	Himso 1685	30.9	22.3	37.25	30.2	IV
6	JS 20-34 (C)	29.4	23.5	36.37	29.8	V
7	JS 95-60 (C)	27.7	18.8	36.93	27.8	VI

Table 1.5.13

Advanced Varietal Trial I
Zone: Central Zone
Character: Yield (Kg/ha)

S.No	Entries	Amravati	Amreeli	Indore	Jabalpur	Kota	Lok Bharti*	Parbhani	Sehore	Mean	Rank
1	**AMS 100-39**	2160	772	2037	2785	2099	3580	2840	1081	1967.71	I
2	**NRC 132**	795	748	2015	0	1867	2886	2315	1222	1280.29	IX
3	**MACSNRC 1575**	1281	1265	1904	0	293	316	2932	1104	1254.14	X
4	**NRC 130**	1744	1188	1926	772	995	1427	2307	1437	1481.29	V
5	**NRC 131**	2037	1281	1667	455	1165	2840	2593	926	1446.29	VI
6	**NRC 147**	2083	1142	1578	0	1235	2222	2014	1148	1314.29	VIII
7	**JS 335(C)**	1304	895	2207	1497	1651	2693	2261	1267	1583.14	IV
8	**JS 97-52(C)**	1690	579	1956	779	1574	2724	2230	1222	1432.86	VII
9	**NRC 86(C)**	1497	910	1963	1937	1528	2824	2230	1022	1583.86	III
10	**JS 20-34(C)**	2029	1319	1867	1937	1481	1914	1991	1178	1686.00	II
	Mean	**1662**	**1009.9**	**1912**	**1451.71**	**1388.8**	**2342.6**	**2371.3**	**1160.7**		
	N.P.S.(Sqm)	**12.96**	**12.96**	**13.5**	**12.96**	**12.96**	**12.96**	**12.96**	**13.5**		
	DOS	**25-06-18**	**18-07-18**	**29-06-18**	**04-07-18**	**03-07-18**	**14-07-18**	**26-06-18**	**06-07-18**		
	CD (5%)	**300.93**	**162.04**	**325.93**	**123.46**	**246.91**	**949.07**	**424.38**	**140.74**		
	CV	**12.46**	**11.01**	**11.67**	**8.26**	**12.32**	**27.98**	**12.31**	**8.4**		

*Data not considered due to high CV.

Table 1.5.14

Advanced Varietal Trial I
Zone: Central Zone
Character: Days to Flower

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Parbhani	Sehore	Mean	Rank
1	**AMS 100-39**	47	38	46	39	43	37	40	44	41.75	VIII
2	**NRC 132**	52	40	45	43	40	38	40	46	43.00	IX
3	**MACSNRC 1575**	46	31	36	31	44	33	32	35	36.00	IV
4	**NRC 130**	47	32	36	31	41	31	33	36	35.88	III
5	**NRC 131**	46	32	36	31	41	30	32	35	35.38	II
6	**NRC 147**	47	37	41	38	40	38	32	34	38.38	V
7	**JS 335(C)**	48	37	42	38	46	38	36	44	41.13	VII
8	**JS 97-52(C)**	49	43	46	50	50	43	42	46	46.13	X
9	**NRC 86(C)**	46	38	41	38	43	37	40	41	40.50	VI
10	**JS 20-34(C)**	43	31	31	29	35	30	28	31	32.25	I
	N.P.S.(Sqm)	12.96	12.96	13.50	12.96	12.96	12.96	12.96	13.50		
	DOS	25/06/2018	18/07/2018	29/06/2018	04/07/2018	03/07/2018	14/07/2018	26/06/2018	06/07/2018		

Table 1.5.15

Advanced Varietal Trial I
Zone: Central Zone
Character: Days to Maturity

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Parbhani	Sehore	Mean	Rank
1	**AMS 100-39**	100	76	101	96	93	93	103	96	94.75	VI
2	**NRC 132**	104	80	102	-	96	102	101	99	97.71	IX
3	**MACSNRC 1575**	98	70	96	-	93	99	88	87	90.14	III
4	**NRC 130**	99	75	97	87	91	90	92	89	90.00	II
5	**NRC 131**	98	77	96	89	99	91	91	89	91.25	IV
6	**NRC 147**	99	76	96	-	96	92	90	95	92.00	V
7	**JS 335(C)**	100	78	102	96	102	99	98	97	96.50	VIII
8	**JS 97-52(C)**	103	84	102	100	101	104	108	99	100.13	X
9	**NRC 86(C)**	98	76	102	95	100	101	100	94	95.75	VII
10	**JS 20-34(C)**	92	67	84	88	88	82	84	84	83.63	I
	N.P.S.(Sqm)	12.96	12.96	13.50	12.96	12.96	12.96	12.96	13.50		
	DOS	25/06/2018	18/07/2018	29/06/2018	04/07/2018	03/07/2018	14/07/2018	26/06/2018	06/07/2018		

Table 1.5.16

Advanced Varietal Trial I
Zone: Central Zone
Character: Plant Height (cm)

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Parbhani	Sehore	Mean	Rank
1	**AMS 100-39**	60.20	43.50	53.25	65.25	48.26	45.00	57.05	56.00	53.56	VI
2	**NRC 132**	38.30	63.15	58.25	-	53.98	51.00	56.88	55.00	53.79	V
3	**MACSNRC 1575**	38.10	59.60	73.00	-	43.50	33.25	52.20	51.25	50.13	VII
4	**NRC 130**	37.70	61.00	48.75	54.92	41.39	21.25	54.80	41.00	45.10	IX
5	**NRC 131**	40.85	55.90	74.25	63.85	52.00	48.25	56.10	65.50	57.09	III
6	**NRC 147**	48.25	83.35	96.00	-	47.80	62.25	69.75	64.00	67.34	I
7	**JS 335(C)**	42.10	42.15	60.50	65.52	54.52	32.50	44.75	53.00	49.38	VIII
8	**JS 97-52(C)**	49.05	72.60	69.00	70.70	61.53	40.25	63.00	55.50	60.20	II
9	**NRC 86(C)**	40.53	56.40	54.00	64.88	47.35	50.25	54.02	68.00	54.43	IV
10	**JS 20-34(C)**	28.40	24.60	39.50	49.65	29.23	14.00	29.25	41.75	32.05	X
	N.P.S.(Sqm)	12.96	12.96	13.50	12.96	12.96	12.96	12.96	13.50		
	DOS	25/06/2018	18/07/2018	29/06/2018	04/07/2018	03/07/2018	14/07/2018	26/06/2018	06/07/2018		

Table 1.5.17

Advanced Varietal Trial I
Zone: Central Zone
Character: 100 Sees Weight (g)

S.No	Entries	Amravati	Amreli	Indore	Jabalpur	Kota	Lok Bharti	Parbhani	Sehore	Mean	Rank
1	**AMS 100-39**	10.97	7.45	11.67	13.09	11.13	11.50	14.50	11.00	11.41	V
2	**NRC 132**	6.04	6.00	10.28	-	8.36	8.00	9.25	7.50	7.92	IX
3	**MACSNRC 1575**	10.88	9.89	12.75	-	8.05	15.50	16.64	10.57	12.04	III
4	**NRC 130**	12.29	10.24	14.05	13.57	10.01	13.00	18.51	10.68	12.79	I
5	**NRC 131**	10.95	10.01	13.02	12.87	9.31	12.88	16.45	10.43	11.99	IV
6	**NRC 147**	10.60	9.13	9.85	-	10.93	11.38	15.20	10.50	11.08	VI
7	**JS 335(C)**	8.00	7.50	11.50	10.16	7.92	10.25	14.49	9.75	9.95	VII
8	**JS 97-52(C)**	7.88	5.96	8.13	9.29	6.82	7.50	8.91	7.95	7.81	X
9	**NRC 86(C)**	8.50	8.01	9.82	9.92	7.42	9.88	12.66	9.13	9.42	VIII
10	**JS 20-34(C)**	11.63	8.20	13.55	13.61	11.98	11.00	14.53	12.43	12.12	II
	N.P.S.(Sqm)	12.96	12.96	13.50	12.96	12.96	12.96	12.96	13.50		
	DOS	25/06/2018	18/07/2018	29/06/2018	04/07/2018	03/07/2018	14/07/2018	26/06/2018	06/07/2018		

Table 1.5.18

Advanced Varietal Trial II
Zone: Central Zone
Character: Yield (Kg/ha)

S.No	Entries	Amravati	Indore	Jabalpur	Kota	Nagpur*	Parbhani	Sehore	Mean	Rank
1	**RSC 10-52**	1065	1884	1880	1648	917	2106	1356	1656.50	II
2	**MACS 1520**	1019	1947	1801	1875	1056	2468	1116	1704.33	I
3	**AMS-MB5-18**	1602	1631	2009	1051	1116	2329	982	1600.67	III
4	**JS 335(C)**	639	1636	1667	1574	639	2472	1280	1544.67	VI
5	**JS 97-52(C)**	1046	2022	995	1463	472	1875	1249	1441.67	VII
6	**NRC 86(C)**	1389	1804	1736	1380	759	2106	1173	1598.00	IV
7	**JS 20-34(C)**	810	1942	1681	1426	685	2153	1280	1548.67	V
	Mean	**1081.43**	**1838.00**	**1681.29**	**1488.14**	**806.29**	**2215.57**	**1205.14**		
	N.P.S.(Sqm)	**21.60**	**22.50**	**21.60**	**21.60**	**21.60**	**21.60**	**22.50**		
	DOS	**25/06/2018**	**29/06/2018**	**04/07/2018**	**02/07/2018**	**24/07/2018**	**26/06/2018**	**06/07/2018**		
	CD (5%)	**152.78**	**284.44**	**171.30**	**245.37**	**97.22**	**472.22**	**97.78**		
	CV	**9.45**	**10.39**	**6.87**	**11.10**	**8.25**	**14.33**	**5.55**		

*Data not considered due to low mean yield.

Table 1.5.19

Advanced Varietal Trial II
Zone: Central Zone
Character: Days to Flower

S.No	Entries	Amravati	Indore	Jabalpur	Kota	Nagpur	Parbhani	Sehore	Mean	Rank
1	**RSC 10-52**	48	47	42	48	36	42	46	44.14	V
2	**MACS 1520**	47	45	41	48	36	39	43	42.71	IV
3	**AMS-MB5-18**	46	37	40	46	35	39	43	40.86	II
4	**JS 335(C)**	48	40	38	46	36	37	42	41.00	III
5	**JS 97-52(C)**	51	47	48	51	39	44	47	46.71	VI
6	**NRC 86(C)**	45	42	38	46	35	37	43	40.86	II
7	**JS 20-34(C)**	44	31	29	35	30	27	30	32.29	I
	N.P.S.(Sqm)	21.60	22.50	21.60	21.60	21.60	21.60	22.50		
	DOS	25/06/2018	29/06/2018	04/07/2018	02/07/2018	24/07/2018	26/06/2018	06/07/2018		

Table 1.5.20

Advanced Varietal Trial II
Zone: Central Zone
Character: Days to Maturity

S.No	Entries	Amravati	Indore	Jabalpur	Kota	Nagpur	Parbhani	Sehore	Mean	Rank
1	**RSC 10-52**	100	106	96	104	93	108	84	98.71	V
2	**MACS 1520**	101	104	95	102	93	99	95	98.43	IV
3	**AMS-MB5-18**	97	104	96	101	94	100	97	98.43	IV
4	**JS 335(C)**	100	103	94	100	94	98	97	98.00	III
5	**JS 97-52(C)**	103	104	99	102	98	108	100	102.00	VI
6	**NRC 86(C)**	97	103	95	101	91	97	97	97.29	II
7	**JS 20-34(C)**	92	88	87	89	86	83	85	87.14	I
	N.P.S.(Sqm)	21.60	22.50	21.60	21.60	21.60	21.60	22.50		
	DOS	25/06/2018	29/06/2018	04/07/2018	02/07/2018	24/07/2018	26/06/2018	06/07/2018		

Table 1.5.21

Advanced Varietal Trial II
Zone: Central Zone
Character: Plant Height (cm)

S.No	Entries	Amravati	Indore	Jabalpur	Kota	Nagpur	Parbhani	Sehore	Mean	Rank
1	**RSC 10-52**	48.05	68.00	74.93	54.42	58.40	72.70	63.25	62.82	I
2	**MACS 1520**	43.15	50.75	71.00	58.55	50.70	62.50	54.00	55.81	IV
3	**AMS-MB5-18**	53.45	58.75	70.40	61.95	45.40	60.25	63.00	59.03	III
4	**JS 335(C)**	31.70	50.25	67.08	53.94	50.20	51.55	51.25	50.85	VI
5	**JS 97-52(C)**	45.95	72.75	69.03	59.40	46.10	60.75	65.25	59.89	II
6	**NRC 86(C)**	38.15	65.25	70.75	53.95	41.35	52.25	63.00	54.96	V
7	**JS 20-34(C)**	24.85	38.25	47.75	25.50	47.05	28.90	42.25	36.36	VII
	N.P.S.(Sqm)	21.60	22.50	21.60	21.60	21.60	21.60	22.50		
	DOS	25/06/2018	29/06/2018	04/07/2018	02/07/2018	24/07/2018	26/06/2018	06/07/2018		

Table 1.5.22

Advanced Varietal Trial II
Zone: Central Zone
Character: 100 Seed Weight (g)

S.No	Entries	Amravati	Indore	Jablapur	Kota	Nagpur	Parbhani	Sehore	Mean	Rank
1	**RSC 10-52**	9.50	12.03	10.75	9.74	12.07	13.70	10.63	11.20	II
2	**MACS 1520**	9.00	10.00	9.57	8.68	10.85	12.70	9.60	10.06	III
3	**AMS-MB5-18**	9.82	10.65	9.25	8.54	9.70	10.88	9.50	9.76	VI
4	**JS 335(C)**	7.38	10.82	10.18	8.26	9.05	13.26	9.75	9.81	V
5	**JS 97-52(C)**	6.88	9.00	9.27	7.32	8.45	9.51	7.50	8.28	VII
6	**NRC 86(C)**	9.66	9.85	9.82	7.48	10.32	12.60	9.00	9.82	IV
7	**JS 20-34(C)**	10.75	13.75	12.86	11.77	8.60	13.83	12.38	11.99	I
	N.P.S.(Sqm)	21.60	22.50	21.60	21.60	21.60	21.60	22.50		
	DOS	25/06/2018	29/06/2018	04/07/2018	02/07/2018	24/07/2018	26/06/2018	06/07/2018		

Table 1.6.1

Initial Varietal Trial – IVT
Zone: Southern Zone
Character: Yield (Kg/ha)

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	**DS 3109**	2667	2444	1455	2566	1778	3062	2328.67	XVI
2	**NRC 146**	1704	2099	1984	2434	2296	2049	2094.33	XXX
3	**PS 1634**	2543	2716	582	1984	1506	4395	2287.67	XIX
4	**JS 21-71**	1802	1704	1481	2090	2593	2519	2031.50	XXXII
5	**MACS 1566**	2346	3383	1270	2513	2593	4222	2721.17	V
6	**SL 1191**	1951	1802	1138	2169	1506	3432	1999.67	XXXV
7	**Himso 1688**	2568	2222	1296	2460	1753	3160	2243.17	XXIII
8	**DSb 23(C)**	**1654**	**3654**	**1455**	**2910**	**3407**	**3901**	**2830.17**	**II**
9	**RSC 11-17**	3012	2864	1270	2063	1778	3580	2427.83	X
10	**MAUS 734**	2099	2593	1852	2275	2148	2691	2276.33	XX
11	**DSb 33**	2617	3556	1693	2804	2938	3827	2905.83	I
12	**NRC 138**	1802	2025	1561	2354	1605	2272	1936.50	XXXVII
13	**JS 21-72**	2765	1259	1455	2354	1951	2815	2099.83	XXIX
14	**PS 1637**	1630	3086	926	2302	1877	4123	2324.00	XVII
15	**AUKS 176**	1235	2420	1561	2513	1679	2617	2004.17	XXXIII
16	**DSb 21(C)**	**1827**	**3506**	**1376**	**2831**	**3062**	**4000**	**2767.00**	**IV**
17	**GJS 3**	1975	2840	1693	2407	1802	3086	2300.50	XVIII
18	**NRC 139**	1753	2444	1190	1878	1901	2716	1980.33	XXXVI
19	**DS 3110**	2247	2173	1878	2407	1531	3111	2224.50	XXIV
20	**SL 1171**	2988	1901	1164	2381	1432	2864	2121.67	XXVII
21	**MACS 1620**	2321	3457	1508	2619	2642	4395	2823.67	III
22	**MAUS 732**	1679	2444	1296	2487	1432	3210	2091.33	XXXI
23	**KS 113**	2148	3951	794	2434	2543	3383	2542.17	VII
24	**KS 103(C)**	**1679**	**3185**	**1032**	**2672**	**2593**	**3926**	**2514.50**	**VIII**
25	**NRC 148**	1753	2420	873	2381	1778	3506	2118.50	XXVIII
26	**RSC 11-15**	1975	3185	1111	2566	1778	3630	2374.17	XI
27	**RVS 2011-10**	2543	2272	1323	2460	1802	3111	2251.83	XXI
28	**Himso 1689**	2765	3383	1455	2672	1951	3506	2622.00	VI
29	**CAUMS 1**	1580	2494	1481	2540	1506	2420	2003.50	XXXIV
30	**RVSM 2011-35**	3012	2074	1825	2619	2049	3259	2473.00	IX
31	**VLS 97**	2074	2543	1614	2434	1506	3333	2250.67	XXII
32	**TS 59**	2543	2667	1111	2646	1556	3704	2371.17	XII
33	**RVS 2007-4**	1802	2395	1164	2540	2667	2370	2156.33	XXVI
34	**KDS 1073**	1654	2765	926	2487	2642	3605	2346.50	XV
35	**NRCSL 2**	2691	2568	1720	2487	1605	3012	2347.17	XIV
36	**KDS 1009**	1185	2889	873	2460	2889	3802	2349.67	XIII
37	**BAUS 100**	**1358**	**3210**	**1058**	**2249**	**1778**	**3333**	**2164.33**	**XXV**
	Mean	**2106.68**	**2664.68**	**1336.32**	**2444.54**	**2050.08**	**3295.86**		
	N.P.S.(Sqm)	**4.05**	**4.05**	**3.78**	**3.78**	**4.05**	**4.05**		
	DOS	**22/06/2018**	**19/07/2018**	**03/07/2018**	**06/07/2018**	**12/07/2018**	**08/07/2018**		
	CD (5%)	**592.59**	**469.14**	**291.01**	**343.92**	**419.75**	**469.14**		
	CV	**17.41**	**10.89**	**13.16**	**8.74**	**12.24**	**8.74**		

Table 1.6.2

Initial Varietal Trial – IVT
Zone: Southern Zone
Character: Days to Flower

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	**DS 3109**	36	36	36	39	37	34	36.33	VI
2	**NRC 146**	36	34	33	32	35	32	33.67	I
3	**PS 1634**	43	39	44	47	42	41	42.67	XXVI
4	**JS 21-71**	36	36	36	37	39	37	36.83	VII
5	**MACS 1566**	35	37	37	41	39	37	37.67	X
6	**SL 1191**	35	34	35	34	37	35	35.00	II
7	**Himso 1688**	37	37	40	42	41	40	39.50	XVI
8	**DSb 23(C)**	**40**	**40**	**41**	**42**	**45**	**43**	**41.83**	**XXIII**
9	**RSC 11-17**	46	41	44	45	44	43	43.83	XXX
10	**MAUS 734**	45	39	38	35	39	37	38.83	XIV
11	**DSb 33**	45	40	42	38	42	40	41.17	XX
12	**NRC 138**	44	34	34	34	35	31	35.33	III
13	**JS 21-72**	37	36	36	38	40	37	37.33	VIII
14	**PS 1637**	41	41	43	44	44	43	42.67	XXVI
15	**AUKS 176**	39	39	39	43	43	41	40.67	XIX
16	**DSb 21(C)**	**38**	**42**	**43**	**40**	**45**	**42**	**41.67**	**XXII**
17	**GJS 3**	37	36	39	38	38	37	37.50	IX
18	**NRC 139**	42	41	38	43	43	41	41.33	XXI
19	**DS 3110**	37	35	36	38	36	34	36.00	IV
20	**SL 1171**	37	35	36	37	37	35	36.17	V
21	**MACS 1620**	40	36	39	44	39	37	39.17	XV
22	**MAUS 732**	39	37	40	43	43	41	40.50	XVIII
23	**KS 113**	43	47	45	49	48	47	46.50	XXXI
24	**KS 103(C)**	**44**	**41**	**45**	**44**	**43**	**41**	**43.00**	**XXVIII**
25	**NRC 148**	45	40	42	40	42	41	41.67	XXII
26	**RSC 11-15**	46	42	43	45	42	41	43.17	XXIX
27	**RVS 2011-10**	39	37	39	40	38	37	38.33	XII
28	**Himso 1689**	39	42	39	43	41	40	40.67	XIX
29	**CAUMS 1**	37	35	38	38	39	37	37.33	VIII
30	**RVSM 2011-35**	45	36	37	39	38	37	38.67	XIII
31	**VLS 97**	36	39	35	43	39	37	38.17	XI
32	**TS 59**	40	41	40	45	45	43	42.33	XXV
33	**RVS 2007-4**	44	40	41	41	39	37	40.33	XVII
34	**KDS 1073**	40	43	43	44	43	43	42.67	XXVI
35	**NRCSL 2**	44	34	39	36	38	35	37.67	X
36	**KDS 1009**	38	42	39	47	47	44	42.83	XXVII
37	**BAUS 100**	**44**	**39**	**43**	**44**	**43**	**40**	**42.17**	**XXIV**
	N.P.S.(Sqm)	4.05	4.05	3.78	3.78	4.05	4.05		
	DOS	22/06/2018	19/07/2018	01/01/1900	06/07/2018	12/07/2018	08/07/2018		

Table 1.6.3

Initial Varietal Trial – IVT
Zone: Southern Zone
Character: Days to Maturity

S.No	Varieties	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	**DS 3109**	99	84	88	88	98	93	91.67	IV
2	**NRC 146**	99	85	83	85	89	84	87.50	I
3	**PS 1634**	106	86	98	97	106	101	99.00	XXVIII
4	**JS 21-71**	97	87	85	89	99	94	91.83	V
5	**MACS 1566**	93	89	92	90	104	99	94.50	XIV
6	**SL 1191**	99	84	97	87	104	99	95.00	XVII
7	**Himso 1688**	99	85	88	91	103	98	94.00	XII
8	**DSb 23(C)**	**101**	**86**	**99**	**96**	**104**	**100**	**97.67**	**XXVI**
9	**RSC 11-17**	107	88	101	95	104	100	99.17	XXIX
10	**MAUS 734**	108	89	92	83	97	92	93.50	X
11	**DSb 33**	108	84	86	88	97	92	92.50	VII
12	**NRC 138**	106	84	83	85	90	85	88.83	II
13	**JS 21-72**	102	86	92	87	101	96	94.00	XII
14	**PS 1637**	103	87	99	92	104	100	97.50	XXV
15	**AUKS 176**	101	88	94	93	101	96	95.50	XVIII
16	**DSb 21(C)**	**100**	**92**	**89**	**92**	**97**	**92**	**93.67**	**XI**
17	**GJS 3**	99	84	89	87	99	94	92.00	VI
18	**NRC 139**	103	86	94	93	103	98	96.17	XXII
19	**DS 3110**	100	87	89	90	97	92	92.50	VII
20	**SL 1171**	99	89	91	88	103	98	94.67	XV
21	**MACS 1620**	100	84	93	95	104	99	95.83	XX
22	**MAUS 732**	103	85	89	96	104	99	96.00	XXI
23	**KS 113**	107	95	93	97	103	100	99.17	XXIX
24	**KS 103(C)**	**105**	**88**	**93**	**92**	**104**	**99**	**96.83**	**XXIII**
25	**NRC 148**	105	87	99	88	105	100	97.33	XXIV
26	**RSC 11-15**	108	84	88	90	101	98	94.83	XVI
27	**RVS 2011-10**	101	86	86	87	102	97	93.17	IX
28	**Himso 1689**	99	91	86	92	101	96	94.17	XIII
29	**CAUMS 1**	96	87	85	89	97	92	91.00	III
30	**RVSM 2011-35**	109	88	88	91	101	96	95.50	XVIII
31	**VLS 97**	95	85	92	93	101	96	93.67	XI
32	**TS 59**	94	90	98	90	101	96	94.83	XVI
33	**RVS 2007-4**	106	86	88	89	97	92	93.00	VIII
34	**KDS 1073**	101	89	88	95	97	92	93.67	XI
35	**NRCSL 2**	108	88	91	88	102	97	95.67	XIX
36	**KDS 1009**	103	86	99	93	105	100	97.67	XXVI
37	**BAUS 100**	**106**	**87**	**101**	**90**	**105**	**100**	**98.17**	**XXVII**
	N.P.S.(Sqm)	4.05	4.05	3.78	3.78	4.05	4.05		
	DOS	22/06/2018	19/07/2018	01/01/1900	06/07/2018	12/07/2018	08/07/2018		

Table 1.6.4

Initial Varietal Trial – IVT
Zone: Southern Zone
Character: Plant Height (cm)

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	DS 3109	36.93	26.07	34.60	34.60	35.19	40.33	34.62	XXXIV
2	NRC 146	49.20	22.00	27.20	27.20	31.06	24.00	30.11	XXXVI
3	PS 1634	54.67	38.93	46.60	45.80	45.98	50.67	47.11	XIV
4	JS 21-71	45.07	35.87	35.40	43.47	36.57	47.00	40.56	XXIII
5	MACS 1566	53.20	41.73	51.33	42.60	45.47	58.33	48.78	XII
6	SL 1191	54.13	28.33	34.80	32.67	31.88	50.00	38.64	XXIX
7	Himso 1688	56.20	31.60	44.67	41.40	39.83	47.67	43.56	XX
8	**DSb 23(C)**	**55.27**	**48.80**	**53.00**	**60.30**	**58.23**	**60.00**	**55.93**	**V**
9	RSC 11-17	56.40	44.40	55.40	51.20	50.87	52.67	51.82	X
10	MAUS 734	43.87	34.93	35.60	41.00	38.12	42.33	39.31	XXVII
11	DSb 33	44.67	42.47	44.07	54.07	50.57	47.33	47.20	XIII
12	NRC 138	40.80	29.93	34.20	44.07	30.33	26.67	34.33	XXXV
13	JS 21-72	49.27	27.53	32.07	33.07	32.17	45.33	36.57	XXXI
14	PS 1637	56.73	50.93	51.27	55.13	54.15	53.33	53.59	VII
15	AUKS 176	47.07	37.93	44.07	36.60	42.34	46.33	42.39	XXI
16	**DSb 21(C)**	**52.07**	**46.80**	**48.83**	**61.40**	**47.79**	**61.00**	**52.98**	**VIII**
17	GJS 3	48.20	27.33	37.13	44.87	36.35	44.33	39.70	XXVI
18	NRC 139	50.73	39.40	37.67	49.47	39.43	44.67	43.56	XX
19	DS 3110	47.07	31.67	40.93	39.67	39.21	45.33	40.65	XXII
20	SL 1171	40.40	25.47	36.53	35.80	30.45	40.33	34.83	XXXIII
21	MACS 1620	51.33	39.87	37.33	44.67	38.35	61.00	45.43	XVII
22	MAUS 732	55.33	43.93	51.20	61.33	56.01	79.33	57.86	IV
23	KS 113	77.00	71.80	55.80	86.13	70.99	90.00	75.29	I
24	**KS 103(C)**	**66.73**	**48.40**	**60.10**	**62.87**	**58.96**	**70.00**	**61.18**	**II**
25	NRC 148	52.07	46.40	52.73	52.53	44.70	56.00	50.74	XI
26	RSC 11-15	52.27	39.20	47.33	54.13	38.69	45.00	46.10	XV
27	RVS 2011-10	46.53	27.13	34.07	38.47	32.18	42.00	36.73	XXX
28	Himso 1689	48.93	36.47	52.60	44.67	36.07	50.00	44.79	XVIII
29	CAUMS 1	46.40	31.33	34.13	37.87	30.99	35.67	36.07	XXXII
30	RVSM 2011-35	49.07	30.20	35.00	41.27	30.81	53.00	39.89	XXV
31	VLS 97	44.53	36.80	40.93	33.20	35.48	49.67	40.10	XXIV
32	TS 59	47.80	39.60	44.87	48.07	39.77	54.33	45.74	XVI
33	RVS 2007-4	55.60	40.00	40.60	49.53	36.21	42.00	43.99	XIX
34	KDS 1073	60.67	57.27	52.27	58.07	47.13	72.00	57.90	III
35	NRCSL 2	49.80	29.33	37.20	32.13	34.00	51.33	38.97	XXVIII
36	KDS 1009	59.73	48.33	44.93	54.00	56.33	61.00	54.05	VI
37	**BAUS 100**	**53.53**	**48.20**	**53.13**	**62.13**	**43.01**	**51.33**	**51.89**	**IX**
	N.P.S.(Sqm)	4.05	4.05	3.78	3.78	4.05	4.05		
	DOS	22/06/2018	19/07/2018	01/01/1900	06/07/2018	12/07/2018	08/07/2018		

Table 1.6.5

Initial Varietal Trial – IVT
Zone: Southern Zone
Character: 100 Seed Weight (g)

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	**DS 3109**	12.67	12.97	9.27	12.41	14.63	13.73	12.61	XXI
2	**NRC 146**	12.43	19.23	14.77	17.13	15.52	17.20	16.05	I
3	**PS 1634**	11.00	10.70	7.23	9.45	10.65	12.07	10.18	XXXIII
4	**JS 21-71**	13.40	18.90	10.70	16.65	17.35	15.60	15.43	III
5	**MACS 1566**	12.57	12.53	9.37	12.48	10.54	14.10	11.93	XXV
6	**SL 1191**	13.60	16.50	10.73	12.68	13.90	16.20	13.94	X
7	**Himso 1688**	12.47	14.83	10.13	12.18	14.45	13.37	12.91	XVII
8	**DSb 23(C)**	**12.70**	**14.20**	**11.27**	**13.41**	**15.63**	**14.93**	**13.69**	**XII**
9	**RSC 11-17**	10.20	9.73	8.10	9.60	10.07	12.07	9.96	XXXIV
10	**MAUS 734**	11.63	13.23	11.13	11.43	11.33	12.70	11.91	XXVI
11	**DSb 33**	12.47	14.27	8.97	13.13	16.22	13.43	13.08	XIV
12	**NRC 138**	9.80	12.80	8.70	10.33	11.26	11.20	10.68	XXXI
13	**JS 21-72**	13.47	18.30	11.23	16.30	12.53	18.07	14.98	IV
14	**PS 1637**	11.07	11.90	10.17	9.52	16.40	12.50	11.93	XXV
15	**AUKS 176**	10.60	13.97	10.83	10.64	14.02	12.97	12.17	XXIII
16	**DSb 21(C)**	**10.13**	**11.57**	**7.63**	**13.46**	**12.18**	**12.40**	**11.23**	**XXIX**
17	**GJS 3**	9.33	13.50	10.37	11.80	11.61	13.17	11.63	XXVII
18	**NRC 139**	8.77	10.17	8.03	9.71	8.92	11.67	9.55	XXXV
19	**DS 3110**	12.30	17.00	12.60	13.14	13.05	14.87	13.83	XI
20	**SL 1171**	12.63	15.70	9.27	14.22	18.05	15.23	14.18	IX
21	**MACS 1620**	14.87	18.83	10.43	13.09	11.63	19.03	14.65	V
22	**MAUS 732**	14.03	13.43	9.20	11.56	13.16	15.20	12.76	XX
23	**KS 113**	12.37	12.80	9.53	12.74	18.75	14.80	13.50	XIII
24	**KS 103(C)**	**12.33**	**12.50**	**7.97**	**12.29**	**17.76**	**14.70**	**12.93**	**XVI**
25	**NRC 148**	12.37	11.63	7.93	11.25	12.29	14.13	11.60	XXVIII
26	**RSC 11-15**	11.10	10.87	8.17	11.30	9.66	11.50	10.43	XXXII
27	**RVS 2011-10**	15.53	14.73	11.33	14.35	13.80	15.70	14.24	VIII
28	**Himso 1689**	11.50	13.17	8.13	12.64	13.36	12.63	11.91	XXVI
29	**CAUMS 1**	9.83	14.87	9.17	13.42	14.45	15.00	12.79	XIX
30	**RVSM 2011-35**	15.37	14.80	11.97	14.12	14.23	15.27	14.29	VI
31	**VLS 97**	19.73	17.40	12.17	14.23	14.04	17.67	15.87	II
32	**TS 59**	16.13	15.30	10.17	13.20	14.36	16.43	14.27	VII
33	**RVS 2007-4**	9.93	14.73	9.77	11.80	17.90	13.27	12.90	XVIII
34	**KDS 1073**	10.93	13.33	6.90	10.39	12.63	11.90	11.01	XXX
35	**NRCSL 2**	12.40	13.58	9.47	11.47	13.46	12.07	12.08	XXIV
36	**KDS 1009**	13.57	12.47	9.27	11.23	17.02	14.80	13.06	XV
37	**BAUS 100**	**12.07**	**13.43**	**11.77**	**10.29**	**12.79**	**14.33**	**12.45**	**XXII**
	N.P.S.(Sqm)	4.05	4.05	3.78	3.78	4.05	4.05		
	DOS	22/06/2018	19/07/2018	01/01/1900	06/07/2018	12/07/2018	08/07/2018		

Table 1.6.6

Trial: Vegetable Soybean Trial
Zone: Southern Zone
Trait: Green Pod Yield (Kg/ha)

S. No.	Entry	Adialabad	Banglore	Pune	Mean	Rank
1	Harasoya (c)	5829	9404	12459	9230.7	III
2	NRC 105	1268	2342	10412	4674.0	VII
3	MACS 1508	2581	7111	13563	7751.7	V
4	Karune	7846	10952	12915	10571.0	I
5	Himso 1685	2825	8649	14230	8568.0	IV
6	JS 20-34	3542	5129	5466	4712.3	VI
7	KDS 726 (C)	7551	5272	15593	9472.0	II
	Mean	4491.7	6980	12091.0		
	NPS	4.05	4.05	4.05		
	DOS	23/06/2018	22/07/2018	12/07/2018		
	CD(5%)	714.76	1284.7	2331.14		
	CV	8.847	10.2	10.878		

Table 1.6.7

Trial: Vegetable Soybean Trial
Zone: Southern Zone
Trait: Grain Yield (Kg/ha)

S. No.	Entry	Adialabad	Banglore	Pune	Mean	Rank
1	Harasoya (c)	2079	2613	3547	2746.3	III
2	NRC 105	541	173	2284	999.3	VII
3	MACS 1508	1111	1539	3305	1985.0	VI
4	Karune	2815	2754	3501	3023.3	I
5	Himso 1685	1664	1473	3128	2088.3	IV
6	JS 20-34	1871	1564	1391	1608.7	V
7	KDS 726 (C)	2170	3128	3557	2951.7	II
	Mean	1750.1	1892	2959		
	NPS	4.05	4.05	4.05		
	DOS	23/06/2018	22/07/2018	12/07/2018		
	CD(5%)	465.751	318.1	352.93		
	CV	14.79	9.3	6.63		

Table 1.6.8

Trial: Vegetable Soybean Trial
Zone: Southern Zone
Trait: Days to Flower

S. No.	Entry	Adialabad	Banglore	Pune	Mean	Rank
1	**Harasoya (c)**	30	33	34	32.2	IV
2	**NRC 105**	25	32	32	29.6	I
3	**MACS 1508**	28	40	37	34.9	V
4	**Karune**	24	33	32	29.7	II
5	**Himso 1685**	25	40	43	36.1	VI
6	**JS 20-34**	31	32	30	31.1	III
7	**KDS 726 (C)**	32	44	43	39.6	VII

Table 1.6.9

Trial: Vegetable Soybean Trial
Zone: Southern Zone
Trait: Days to Picking at R6 stage

S. No.	Entry	Adialabad	Banglore	Pune	Mean	Rank
1	**Harasoya (c)**	73	-	79	76.0	V
2	**NRC 105**	62	-	78	70.0	II
3	**MACS 1508**	67	-	83	75.0	IV
4	**Karune**	63	-	78	70.5	III
5	**Himso 1685**	72	-	91	81.5	VI
6	**JS 20-34**	71	-	66	68.5	I
7	**KDS 726 (C)**	74	-	89	81.5	VI

Table 1.6.10

Trial: Vegetable Soybean Trial
Zone: Southern Zone
Trait: Days to Maturity

S. No.	Entry	Adialabad	Banglore	Pune	Mean	Rank
1	**Harasoya (c)**	100	79	90	89.7	V
2	**NRC 105**	90	75	86	83.7	III
3	**MACS 1508**	93	78	96	89.0	IV
4	**Karune**	88	70	90	82.7	II
5	**Himso 1685**	99	80	101	93.3	VI
6	**JS 20-34**	101	68	76	81.7	I
7	**KDS 726 (C)**	104	82	96	94.0	VII

Table 1.6.11

Trial: Vegetable Soybean Trial
Zone: Southern Zone
Trait: Plant Height

S. No.	Entry	Adialabad	Banglore	Pune	Mean	Rank
1	Harasoya (c)	43.6	29	41	37.9	V
2	NRC 105	33.0	15	35	27.7	VII
3	MACS 1508	49.1	30	44	41.0	III
4	Karune	45.1	31	39	38.4	IV
5	Himso 1685	61.0	33	49	47.7	II
6	JS 20-34	39.9	17	21	26.0	VI
7	KDS 726 (C)	60.6	44	61	55.2	I

Table 1.6.12

Trial: Vegetable Soybean Trial
Zone: Southern Zone
Trait: 100 Green Seed Weight

S. No.	Entry	Adialabad	Banglore	Pune	Mean	Rank
1	Harasoya (c)	32.5	34.38	42.7	36.5	V
2	NRC 105	75.0	59.34	81.7	72.0	II
3	MACS 1508	23.8	33.08	33.0	30.0	VI
4	Karune	74.3	64.80	80.7	73.3	I
5	Himso 1685	44.2	46.51	60.9	50.5	IV
6	JS 20-34	36.6	28.52	28.1	31.1	VII
7	KDS 726 (C)	26.7	33.18	68.4	42.8	III

Table 1.6.13

Advanced Varietal Trial I
Zone: Southern Zone
Character: Yield (Kg/ha)

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	**NRCSL 1**	3210	2222	1698	2423	1829	3634	2502.67	VI
2	**RSC 11-07**	3302	3215	1319	1960	1914	3627	2556.17	V
3	**AMS 2014-1**	3117	2281	1289	2029	1898	3573	2364.50	XI
4	**NRC 132**	3071	2593	1042	2207	1613	3110	2272.67	XV
5	**MACS 1493**	3495	2867	1073	2222	2307	3966	2655.00	III
6	**AMS 100-39**	2207	2622	1559	2207	2153	3704	2408.67	IX
7	**KDS 992**	3071	3111	1034	2593	2577	3873	2709.83	II
8	**DSb 34**	3287	3259	1582	2809	2253	3858	2841.33	I
9	**BAUS 102**	3194	2993	887	2184	1821	3681	2460.00	VII
10	**SKF-SPS-11**	3241	2533	1667	1836	2029	3279	2430.83	VIII
11	**MACSNRC 1667**	2785	2178	1651	2122	1998	3218	2325.33	XIV
12	**NRC 147**	3364	2785	1667	2091	2238	3233	2563.00	IV
13	**DSb 21(C)**	1914	2970	1435	2816	1975	2963	2345.50	XIII
14	**RKS 18(C)**	1844	3044	1505	2060	1752	3356	2260.17	XVI
15	**JS 335(C)**	2508	2763	1605	2230	1721	3318	2357.50	XII
16	**JS 93-05(C)**	2323	3081	1682	1860	1898	2654	2249.67	XVII
17	**MACS 450(C)**	3403	2837	957	2145	1651	3248	2373.50	X
	Mean	**2902.12**	**2785.53**	**1391.29**	**2223.18**	**1978.06**	**3429.12**		
	N.P.S.(Sqm)	**12.96**	**13.50**	**12.96**	**12.96**	**12.96**	**12.96**		
	DOS	**25/06/2018**	**22/07/2018**	**04/07/2018**	**06/07/2018**	**12/07/2018**	**11/07/2018**		
	CD (5%)	**385.80**	**340.74**	**254.63**	**231.48**	**285.49**	**177.47**		
	CV	**9.25**	**12.08**	**16.94**	**7.27**	**10.10**	**3.70**		

Table 1.6.14

Advanced Varietal Trial I
Zone: Southern Zone
Character: Days to Flower

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	NRCSL 1	41	33	38	36	39	35	37.00	II
2	RSC 11-07	43	40	38	37	39	38	39.17	VIII
3	AMS 2014-1	43	42	37	35	37	36	38.33	VII
4	NRC 132	43	46	41	35	38	37	40.00	XI
5	MACS 1493	43	41	42	39	36	39	40.00	XI
6	AMS 100-39	48	45	40	40	40	40	42.17	XIV
7	KDS 992	39	46	45	43	40	41	42.33	XV
8	DSb 34	41	41	41	38	38	40	39.83	X
9	BAUS 102	42	41	41	40	41	40	40.83	XII
10	SKF-SPS-11	42	37	38	34	41	35	37.83	V
11	MACSNRC 1667	42	36	36	35	39	37	37.50	IV
12	NRC 147	43	37	38	39	40	38	39.17	VIII
13	DSb 21(C)	41	44	41	41	41	41	41.50	XIII
14	RKS 18(C)	41	36	39	39	38	35	38.00	VI
15	JS 335(C)	40	36	37	38	36	36	37.17	III
16	JS 93-05(C)	34	46	36	35	34	36	36.83	I
17	MACS 450(C)	41	39	39	40	41	38	39.67	IX
	N.P.S.(Sqm)	12.96	13.50	12.96	12.96	12.96	12.96		
	DOS	25/06/2018	22/07/2018	04/07/2018	06/07/2018	12/07/2018	11/07/2018		

Table 1.6.15

Advanced Varietal Trial I
Zone: Southern Zone
Character: Days to Maturity

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K,Digraj	Pune	Mean	Rank
1	**NRCSL 1**	103	98	84	89	99	96	94.83	VII
2	**RSC 11-07**	105	99	78	90	100	93	94.17	IV
3	**AMS 2014-1**	105	101	82	89	99	93	94.83	VII
4	**NRC 132**	105	104	88	88	98	96	96.50	X
5	**MACS 1493**	103	100	84	89	97	94	94.50	V
6	**AMS 100-39**	112	105	86	91	99	91	97.33	XII
7	**KDS 992**	101	106	91	92	105	97	98.67	XIII
8	**DSb 34**	103	100	78	86	99	95	93.50	II
9	**BAUS 102**	105	100	93	90	99	97	97.33	XII
10	**SKF-SPS-11**	104	100	90	88	100	94	96.00	VIII
11	**MACSNRC 1667**	105	99	85	88	106	96	96.50	X
12	**NRC 147**	105	99	80	90	98	89	93.50	II
13	**DSb 21(C)**	99	103	89	91	99	96	96.17	IX
14	**RKS 18(C)**	100	100	88	88	99	93	94.67	VI
15	**JS 335(C)**	98	98	85	88	102	93	94.00	III
16	**JS 93-05(C)**	92	105	81	85	95	89	91.17	I
17	**MACS 450(C)**	103	103	85	90	106	96	97.17	XI
	N.P.S.(Sqm)	12.96	13.50	12.96	12.96	12.96	12.96		
	DOS	25/06/2018	22/07/2018	04/07/2018	06/07/2018	12/07/2018	11/07/2018		

Table 1.6.16

Advanced Varietal Trial I
Zone: Southern Zone
Character: Plant Height (cm)

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	NRCSL 1	46.05	23.00	41.73	45.90	45.00	51.25	42.16	XVI
2	RSC 11-07	57.20	54.35	50.13	46.40	47.25	51.00	51.06	VIII
3	AMS 2014-1	55.30	36.40	42.27	45.10	43.75	47.00	44.97	XII
4	NRC 132	62.20	54.05	42.13	46.80	41.50	35.50	47.03	XI
5	MACS 1493	56.60	48.85	50.33	51.15	45.75	49.25	50.32	IX
6	AMS 100-39	51.35	46.25	52.60	57.95	52.00	57.50	52.94	V
7	KDS 992	55.05	53.50	53.80	63.05	63.00	62.00	58.40	III
8	DSb 34	44.90	48.95	43.67	55.20	54.00	54.75	50.25	X
9	BAUS 102	69.40	61.70	52.60	64.85	54.25	57.25	60.01	II
10	SKF-SPS-11	46.20	33.10	36.93	38.45	40.00	38.00	38.78	XVII
11	MACSNRC 1667	70.67	47.70	57.67	52.25	49.75	53.75	55.30	IV
12	NRC 147	79.90	59.35	53.20	74.10	57.25	62.75	64.43	I
13	DSb 21(C)	41.70	53.50	45.67	60.25	52.75	58.75	52.10	VI
14	RKS 18(C)	46.05	42.20	39.80	43.90	35.75	46.25	42.33	XV
15	JS 335(C)	54.00	42.45	37.27	42.42	39.50	46.50	43.69	XIV
16	JS 93-05(C)	43.20	59.05	41.20	38.55	36.75	46.50	44.21	XIII
17	MACS 450(C)	54.50	53.30	42.73	61.05	53.75	45.50	51.81	VII
	N.P.S.(Sqm)	12.96	13.50	12.96	12.96	12.96	12.96		
	DOS	25/06/2018	22/07/2018	04/07/2018	06/07/2018	12/07/2018	11/07/2018		

Table 1.6.17

Advanced Varietal Trial I
Zone: Southern Zone
Character: 100 Seed Weight (g)

S.No	Entries	Adilabad	Bangalore	Bidar	Dharwad	K.Digraj	Pune	Mean	Rank
1	**NRCSL 1**	13.15	12.10	10.47	14.40	15.19	14.63	13.32	IX
2	**RSC 11-07**	12.30	11.88	8.67	11.35	15.09	11.60	11.82	XVI
3	**AMS 2014-1**	11.43	12.68	8.20	10.19	16.85	11.27	11.77	XVII
4	**NRC 132**	13.18	11.48	8.97	12.41	15.97	10.47	12.08	XV
5	**MACS 1493**	15.13	12.90	9.07	13.24	15.41	13.22	13.16	X
6	**AMS 100-39**	13.68	14.78	8.77	14.40	13.77	14.70	13.35	VIII
7	**KDS 992**	14.68	15.30	9.83	15.76	16.00	16.35	14.65	II
8	**DSb 34**	12.98	13.75	9.97	13.60	17.47	15.00	13.80	V
9	**BAUS 102**	13.40	12.58	10.77	12.32	15.22	13.55	12.97	XI
10	**SKF-SPS-11**	13.20	15.18	11.07	14.25	16.25	14.43	14.06	III
11	**MACSNRC 1667**	15.15	14.95	13.10	15.36	15.75	16.05	15.06	I
12	**NRC 147**	13.95	13.00	11.87	13.47	15.46	13.75	13.58	VI
13	**DSb 21(C)**	10.07	11.50	10.83	13.30	16.28	13.85	12.64	XIV
14	**RKS 18(C)**	11.15	15.80	9.93	13.77	12.63	14.23	12.92	XII
15	**JS 335(C)**	11.30	14.78	10.40	14.01	11.72	14.40	12.77	XIII
16	**JS 93-05(C)**	11.80	13.22	9.83	14.57	16.59	14.15	13.36	VII
17	**MACS 450(C)**	15.35	13.07	11.13	12.88	16.37	14.23	13.84	IV
	N.P.S.(Sqm)	12.96	13.50	12.96	12.96	12.96	12.96		
	DOS	25/06/2018	22/07/2018	04/07/2018	06/07/2018	12/07/2018	11/07/2018		

सस्य विज्ञान
Agronomy

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Almora (Uttarakhand)	Dr. Sher Singh

Northern Plain Zone

Pantnagar (Uttarakhand)	Dr. Ajay Shrivastava
Ludhiana (Punjab)	Dr. Harpreet Kaur / Dr. Guriqbal Singh
New Delhi	Dr. Anchal Das

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Kota (Rajasthan)	Dr. D.S. Meena
Amravati (Maharashtra)	Dr. M.S. Dandghe
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Southern Zone

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Pune (Maharashtra)	Dr. S.A. Jaybhay
Adilabad (Telangna)	Dr. Sreedhar Chauhan

Table 2.1.1.

ASP-1/18. Evaluation of AVT II entries under different sowing dates

Zone: Northern plain **Design:** Split plot **Replications:** Three

Character: Seed yield (kg/ha)

Treatment	**Ludhiana**			**Pantnagar**			**Zonal mean**		
	Sowing date								
Entry	**Normal ***	**Late****	**Mean**	**Normal**	**Late**	**Mean**	**Normal**	**Late**	**Mean**
SL 1104	2546	2030	2288	1778	1753	1765	2162	1892	2027
DS 3106	1691	1232	1461	1951	1827	1889	1821	1530	1675
PS 1347	1789	958	1374	1877	1593	1735	1833	1275	1554
Mean	2009	1407		1868	1724		1939	1566	
Date of sowing			260			NS			
Entries			137			NS			
Interaction			194			-			

*Normal (onset of monsoon), **Late20 days after normal sowing

Table 2.1.2.

ASP-1/18. Evaluation of AVT II entries under different sowing dates (Zonal mean)

Zone: Northern plain **Design:** Split plot **Replications:** Three

Characters: Dry matter, CGR, RGR, Plant height, No. of pods/plant, 100-seed weight, Straw yield, Harvest Index,

Grain production efficiency and RUE

Treatment	Dry matter at DAS (g/plant)			Mean CGR ($g/m^2/day$)		Mean RGR (g/g/day)		Bran-ches /plant	Pods/ plant	Seed Index (g)	Straw yield (kg/ha)	HI (%)	GPE (kg/ha/day)	RUE ($kgha^{-1}$ mm^{-1})
	30	45	60	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS							
Dates of Sowing														
Normal	4.14	10.24	18.82	23.73	32.58	0.801	0.456	4.25	72.65	11.10	5643	29.50	14.04	1.81
Late	2.32	7.01	17.78	8.62	25.35	0.264	0.316	3.70	62.95	10.46	4575	29.40	11.89	1.57
Entry														
SL 1104	2.97	9.34	17.85	19.12	25.39	0.653	0.326	4.50	76.65	11.51	5603	28.95	15.02	2.06
DS 3106	3.36	8.29	19.88	14.78	34.71	0.492	0.436	3.45	65.15	10.15	4847	29.90	12.36	1.56
PS 1347	3.36	8.24	17.17	14.62	26.74	0.448	0.401	3.97	61.70	10.68	4876	28.35	11.53	1.44

GPE- Grain production efficiency

Table 2.1.3.

ASP-1/18. Evaluation of AVT II entries under different sowing dates

Zone: North Eastern **Design:** Split plot **Replications:** Three
Character: Seed yield (kg/ha)

Treatment	Ranchi			Bhawanipatana			Raipur#			Zonal mean		
	Sowing date											
Entry	**Nor-mal**	**Late***	**Mean**	**Nor-mal**	**Late**	**Mean**	**Normal**	**Late**	**Mean**	**Nor-mal**	**Late**	**Mean**
RSC 10-71	1944	1352	1648	1332	1040	1186	2104	1170	*1670*	1638	1196	1417
RSC 10-52	2481	1889	2185	1534	1208	1371	2268	1202	*1735*	2008	1548	1778
JS 97-52	2200	1815	2007	1049	753	901	1734	857	910	1625	1284	1454
Mean	2209	1685		1305	1000		1078	1076		1757	1343	
CD (P=0.05)												
Date of sowing			308			295			254			
Entries			200			359			118			
Interaction			NS			NS			91			

*Normal (onset of monsoon), **Late20 days after normal sowing, # Data not included in mean

Table 2.1.4.

ASP-1/18. Evaluation of AVT II entries under different sowing dates (Zonal mean)

Zone: North Eastern**(Ranchi)** **Design:** Split plot **Replications:** Three

Characters: Dry matter, CGR, RGR, Plant height, Yield attributes, Straw yield, Harvest Index, Grain production efficiency and RUE

Treatment	Dry matter (g/plant)			Mean CGR ($g/m^2/day$)		Mean RGR (g/g/day)		Bran-ches /plant	Pods/ plant	Seed index (g)	Straw yield (kg/ha)	HI (%)	GPE (kg/ha/day)	RUE ($kgha^{-1}$ mm^{-1})
	30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS							
Dates of Sowing														
Normal	3.02	9.24	13.44	3.89	5.81	0.045	0.025	4.09	53.51	11.43	2509	41.04	16.92	1.82
Late	2.20	7.68	11.44	3.15	4.70	0.050	0.027	3.00	41.44	10.49	1995	40.43	13.70	1.88
Entry														
RSC 10-71	2.58	8.29	12.13	3.41	5.29	0.046	0.027	3.36	45.85	11.02	2163	40.01	14.19	1.71
RSC 10-52	2.74	8.80	13.13	3.97	5.96	0.049	0.026	3.92	53.14	11.98	2371	42.77	17.72	2.11
JS 97-52	2.51	8.29	12.06	3.22	4.46	0.049	0.025	3.36	43.44	9.89	2221	39.40	14.02	1.71

*Normal (onset of monsoon), **Late20 days after normal sowing

Table 2.1.4.a.

AGRON.1/18. Evaluation of AVT II entries under different sowing dates
Zone: Eastern **Centre:** Raipur
Character: Pods/plant, seed index, straw yield, harvest index and oil yield

Treatment	Branches/ plant	Pods/ plant	Seed Index (g)	Dry weight/plant (g)			CGR		RGR		Straw yield (kg/ha)	HI (%)	GPE (kg/ha/ day)	RUE
				30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS				
Sowing date														
Normal	4.88	58	11.5	1.21	12.67	46.85	0.742	2.322	0.0674	0.0365	3605	37.8	23.44	3.66
Late	3.56	39	9.7	0.94	6.97	30.24	0.448	1.598	0.0632	0.0411	2546	28.4	10.75	1.84
SEm	0.06	5	0.014	-	-	-	-	-	-	-	290	1.6	0.542	0.09
CD (P=0.05)	0.37	NS	0.042	-	-	-	-	-	-	-	NS	9.8	3.47	0.55
Entry														
RSC10-71	4.10	50	10.6	0.91	10.99	38.26	0.586	1.986	0.0642	0.0388	3186	30.6	16.12	2.64
RSC10-52	4.38	52	10.9	1.04	11.98	41.08	0.645	2.108	0.0664	0.0386	3352	33.5	17.84	2.86
JS-97-52 (C)	3.62	38	9.6	0.82	8.76	25.45	0.432	1.426	0.546	0.0394	2378	28.3	9.82	1.98
SEm	0.11	2	0.062	-	-	-	-	-	-	-	185	1.21	0.368	0.08
CD (P=0.05)	0.34	6	0.192	-	-	-	-	-	-	-	581	3.76	1.24	0.24

Table 2.1.5

ASP-1/15. Evaluation of AVT II entries under different sowing dates

Zone: North Eastern Hill **Design:** Split plot **Replications:** Three
Character: Seed yield (kg/ha)

Treatment	Imphal			Medziphema			Zonal mean		
	Sowing date								
Entry	**Normal**	**Late***	**Mean**	**Normal**	**Late**	**Mean**	**Normal**	**Late**	**Mean**
DSb-32	2248	1669	1958	1835	557	1196	2041	1113	1577
KDS-921	1156	1019	1088	1424	615	1020	1290	817	1054
RSC-1071	2037	1710	1874	1182	522	852	1610	1116	1363
JS-97 52	1877	1202	1540	1425	779	1102	1651	991	1321
Mean	1830	1400	-	1467	618		1648	1009	
CD (P=0.05)									
Date of sowing			251.44			106.20			
Entries			184.24			NS			
Interaction			260.57			NS			

*Normal (onset of monsoon), **Late20 days after normal sowing

Table 2.1.6.

ASP-1/15. Evaluation of AVT II entries under different sowing dates(Zonal mean)

Zone: North Eastern Hill **Design:** Split plot **Replications:** Three

Characters: Dry matter, CGR, RGR, Plant height, No. of pods/plant, 100-seed weight, Straw yield, Harvest Index, Grain production efficiency and RUE

Treatment	Dry matter (g/plant)			Mean CGR (g/m^2/day)		Mean RGR (g/g/day)		Bran-ches /plant	Pods/ plant	Seed index (g)	Straw yield (kg/ha)	HI (%)	GPE (kg ha/ day)	RUE (kgha^{-1} mm^{-1})
	30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS							
Dates of Sowing														
Normal	1.39	5.33	10.67	4.03	5.35	0.089	0.048	4.45	63.56	10.72	2642	38.40	14.00	7.23
Late	1.21	4.04	9.19	2.69	4.80	0.080	0.057	4.07	44.72	10.27	1947	34.16	9.18	4.00
Entry														
DSb-32	1.30	4.57	9.20	2.81	4.44	0.085	0.048	4.28	56.89	10.77	2461	37.60	14.03	6.56
KDS-921	1.27	5.24	10.59	3.82	5.51	0.096	0.046	4.42	45.11	11.70	2168	33.37	8.43	5.00
RSC-1071	1.33	4.46	9.74	3.35	5.10	0.079	0.056	3.99	51.70	10.22	2197	38.19	12.50	5.09
JS-97 52	1.31	4.47	10.19	3.48	5.26	0.080	0.060	4.33	63.86	9.28	2353	35.92	11.41	5.81

*Normal (onset of monsoon), **Late20 days after normal sowing

Table 2.1.7

ASP-1/15. Evaluation of AVT II entries under different sowing dates

Zone: Central **Design:** Split plot **Replications:** Three
Character: Seed yield (kg/ha)

Treatment	**Sehore**			**Amrawati**			**Kota**			**Zonal mean**		
	Date of sowing											
Entry	**Normal**	**Late**	**Mean**	**Normal**	**Late**	**Mean**	**Normal**	**Late**	**Mean**	**Normal**	**Late**	**Mean**
MACS 1520	1358	926	1142	1605	713	1159	1674	1019	1346	1546	886	1216
AMS-MB5-18	1029	1033	1031	1904	781	1343	1512	1142	1327	1482	985	1234
RSC 10-52	1584	1214	1399	1633	722	1177	1605	1157	1381	1607	1031	1319
NRC 86 (C)	1317	1204	1261	1789	657	1223	1645	1136	1391	1584	999	1292
Mean	1322	1094		1733	718		1609	1113		1555	975	
CD (P=0.05)												
Date of sowing			89.48			259.86			70.15			-
Entries			112.11			NS			NS			-
Interaction			158.55			NS			NS			-

*Normal (onset of monsoon), **Late20 days after normal sowing

Table 2.1.8

ASP-1/15. Evaluation of AVT II entries under different sowing dates (Zonal mean)

Zone: Central **Design:** Split plot **Replications:** Three

Characters: Dry matter, CGR, RGR, Plant height and yield attributes, Straw yield, Harvest Index, Grain production efficiency and RUE

Treatment	Dry matter (g/plant)			Mean CGR ($g/m^2/day$)		Mean RGR (g/g/day)		Bran-ches /plant	Pods/ plant	Seed index (g)	Straw yield (kg/ha)	HI (%)	GPE (kg/ha /day)	RUE ($kgha^{-1}$ mm^{-1})
	30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS							
Dates of Sowing														
Normal	2.01	5.77	9.79	10.12	9.75	0.062	0.021	3.28	42.18	9.54	2284	40.46	15.83	2.30
Late	1.83	4.49	8.17	6.99	9.11	0.050	0.027	2.61	28.99	9.04	1558	40.19	11.17	1.37
Entry														
MACS 1520	2.13	5.33	9.38	8.49	9.99	0.050	0.026	3.10	35.57	9.36	1920	39.43	12.83	1.77
AMS-MB5-18	1.81	4.97	8.63	8.45	8.97	0.058	0.024	2.71	37.44	8.84	2046	38.04	13.15	1.84
RSC 10-52	1.93	5.31	9.01	9.06	8.96	0.060	0.021	3.10	34.89	9.91	1974	40.66	14.05	1.87
NRC 86 (C)	1.80	4.90	8.89	8.22	9.81	0.058	0.026	2.86	34.45	9.06	1742	43.16	13.96	1.86

*Normal (onset of monsoon), **Late20 days after normal sowing

Table 2.2.1.

ASP-2/15. Sustainable soybean production through crop diversification and tillage systems

Zone: Northern plain **Design:** Strip plot **Replications:** Four
Character: Soybean seed yield (kg/ha)

Crop rotation	Pantnagar			Ludhiana			Zonal mean		
	Tillage								
	Mini^{m}	Conven^{l}	Mean	Mini^{m}	Conven^{l}	Mean	Mini^{m}	Conven^{l}	Mean
Soy-Soy-Soy-Soy	1663	1691	1677	2999	3070	3035	2331	2381	2356
Soy-Maize-Soy-Maize	1382	1456	1419	2889	3091	2990	2136	2274	2205
Soy-Soy-Maize-Soy	4324	4386	4355	6880	6928	6904	5602	5657	5630
Soy-Soy-Soy-Maize	1520	1478	1499	3047	3073	3060	2284	2276	2280
Mean	1503	1642		3954	4041		2729	2842	
CD (P=0.05)									
Tillage			NS			NS			
Crop Rotation			534			304			
Interaction			NS			NS			

Table 2.2.2.

ASP-2/15. Sustainable soybean production through crop diversification and tillage systems

Zone: Northern plain **Design:** Strip plot **Replications:** Four
Character: Rabi seed yield (kg/ha)

Crop rotation	Pantnagar			Ludhiana			Zonal mean		
	Tillage								
	Mini^{m}	Conven^{l}	Mean	Mini^{m}	Conven^{l}	Mean	Mini^{m}	Conven^{l}	Mean
Soy-Soy-Soy-Soy	5675	5142	5408	5346	5392	5369	5511	5267	5389
Soy-Maize-Soy-Maize	5505	5323	5414	5352	5625	5489	5429	5474	5452
Soy-Soy-Maize-Soy	5403	5550	5476	4868	5271	5069	5136	5411	5273
Soy-Soy-Soy-Maize	5369	5426	5397	5005	5208	5107	5187	5317	5252
Mean	5487	5360		5143	5374		5315	5367	
CD (P=0.05)									
Tillage			NS			NS			
Crop Rotation			NS			NS			
Interaction			NS			NS			

Table 2.2.3.

ASP-2/15. Sustainable soybean production through crop diversification and tillage systems

Zone: Northern plain **Design:** Strip plot **Replications:** Four
Character: Soybean Equivalent yield (kg/ha)

Crop rotation	Pantnagar			Ludhiana			Zonal mean		
	Tillage								
	Mini^{m}	Conven^{l}	Mean	Mini^{m}	Conven^{l}	Mean	Mini^{m}	Conven^{l}	Mean
Soy-Soy-Soy-Soy	1663	1691	1677	5847	5943	5895	3755	3817	3786
Soy-Maize-Soy-Maize	1382	1456	1419	5741	6088	5914	3562	3772	3667
Soy-Soy-Maize-Soy	2585	2435	2510	5860	6098	5978	4223	4267	4244
Soy-Soy-Soy-Maize	1520	1478	1499	5714	5848	5781	3617	3663	3640
Mean	1503	2334		5790	5994		3647	4164	
CD (P=0.05)									
Tillage			207.4			NS			
Crop Rotation			NS			NS			
Interaction			NS			NS			

Table 2.2.4.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2018-19)

Zone: Northern plain **Design:** Strip plot **Replications:** Four
Centre: Pantnagar **Character:** Yield and economical parameters

Treatment	Seed yield (kg/ha)	Straw yield (kh/ha)	HI (%)	SEY (kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
A. Tillage system								
Minimum	3384	5231	38.03	21815	30440	74138	43699	2.42
Conventional	3144	5046	36.90	2028	36380	68944	32564	1.89
SEm	129.0	118.4	1.23	92.1				
CD (P=0.05)	NS	NS	NS	NS				
B. Cropping system								
Soy-Soy-Soy-Soy	1907	3796	33.65	1907	32805	64851	32046	1.99
Soy-Maize-Soy-Maize	4500	6222	42.09	2250	34014	76499	42485	2.27
Soy-Soy-Maize-Soy	1870	4028	31.75	1870	32805	63592	30787	1.96
Soy-Soy-Soy-Maize	4778	6509	42.37	2389	34014	81222	47208	2.40
SEm	60.09	180.2	0.80	54.3				
CD (P=0.05)	192.2	576.6	2.57	173.9				

Table 2.2.5.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2017-18)

Zone: Northern plain **Design:** Strip plot **Replications:** Four
Centre: Ludhiana **Character:** Yield and economical parameters

Treatment	Seed yield (kg/ha)	Straw yield (kg/ha)	HI (%)	SEY (kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
A. Tillage system								
Minimum	3954	7488	34.3	5790	50410	176612	126201	3.51
Conventional	4041	7873	33.8	5994	54310	182819	128509	3.37
SEm	58	197	0.6	54		1667	1667	0.04
CD (P=0.05)	NS	NS	NS	NS		NS	NS	NS
B. Cropping system								
Soy-Soy-Soy-Soy	3035	5904	34.1	5895	51822	179798	126815	3.46
Soy-Maize-Soy-Maize	2990	5957	33.6	5914	51822	180386	126993	3.45
Soy-Soy-Maize-Soy	6904	12605	35.4	5978	46176	182351	135190	3.94
Soy-Soy-Soy-Maize	3060	6258	33.0	5781	51822	176327	124431	3.41
SEm	84	190	0.9	272		3975	3975	0.001
CD (P=0.05)	303	872	NS	NS		NS	NS	NS

Table 2.2.6.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2018-19)

Zone: Northern Eastern **Design:** Strip plot **Replications:** Four
Centre: Ranchi **Character:** Seed yield (kg/ha)

Cropping system	*Kharif*yield (kg/ha)			*Rabi* yield (kg/ha) (Wheat)			SEY (kg/ha)		
	Tillage system								
	Mini^m	Conven^l	Mean	Mini^m	Conven^l	Mean	Mini^m	Conven^l	Mean
Soy-Soy-Soy-Soy	2250	1944	2097	2199	2222	2211	2250	1944	2097
Soy-Maize-Soy-Maize	4272	3454	3863	2222	2118	2170	2136	1727	1932
Soy-Soy-Maize-Soy	2319	2056	2187	2569	2442	2506	2319	2056	2187
Soy-Soy-Soy-Maize	3912	3905	3909	2407	2384	2396	1956	1953	1954
Mean	3188	2840		2350	2292		2165	1920	
	SEm±	CD (P=0.05)			SEm±	CD (P=0.05)		SEm±	CD (P=0.05)
Tillage system	79.00	355.48			51.65	232.44		64.57	290.57
Cropping system	101.09	323.39			77.16	246.83		64.15	205.21
Interaction	121.66	NS			60.75	NS		113.77	NS

Table 2.2.7.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2018-19)

Zone: Northern Eastern **Design:** Strip plot **Replications:** Four
Centre: Ranchi **Character:**Yield and economical parameters

Treatment	Seed yield (kg/ha)	Straw yield (kg/ha)	HI (%)	SEY (kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
A. Tillage system								
Minimum	3188	4746.80	40.35	2165	23750	73622	49872	2.12
Conventional	2840	4682.77	37.93	1920	24750	65276	40526	1.65
SEm±	79.00	67.40	1.07	64.57	-	2195	2195	0.09
CD (P=0.05)	NS	NS	NS	NS	-	NS	NS	NS
B. Cropping system								
Soy-Soy-Soy-Soy	2097	3253	3909	2097	23050	71305	48255	2.10
Soy-Maize-Soy-Maize	3863	6263	38.01	1932	25450	65673	40223	1.59
Soy-Soy-Maize-Soy	2187	3203	40.57	2187	23050	74374	51324	2.23
Soy-Soy-Soy-Maize	3909	6139	38.89	1954	25450	66445	40995	1.61
SEm±	101.09	61.78	0.69	64.15	-	2181	2181	0.09
CD (P=0.05)	323.39	197.64	2.22	205.21	-	6977	6977	0.29

Table 2.2.8.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2017-18)

Zone: Northern Eastern **Design:** Strip plot **Replications:** Four **Centre:** Ranchi
Character: Soil parameters and nutrient uptake

Treatment	Bulk density	WHC	Porosity	Soil initial values (kg/ha)				OC (%)	Nutrient uptake(kg/ha		
				OC (%)	N	P	K		N	P	K)
A. Tillage system											
Minimum	1.45	20.31	40.00	0.444	240.99	14.31	181.95	0.431	153.33	19.67	104.50
Conventional	1.48	20.19	39.81	0.442	239.94	14.26	180.73	0.429	141.85	18.43	102.12
SEm±	0.01	0.15	0.26	0.002	0.42	0.02	0.46	0.001	2.540	0.255	0.218
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	11.43	1.15	0.98
B. Cropping system											
Soy-Soy-Soy-Soy	1.46	20.25	39.75	0.455	240.27	14.29	181.89	0.455	169.23	20.44	109.04
Soy-Maize-Soy-Maize	1.47	20.50	39.88	0.456	241.25	14.30	181.39	0.404	123.44	17.44	97.09
Soy-Soy-Maize-Soy	1.47	19.75	39.63	0.403	238.22	14.27	180.63	0.456	175.09	21.16	111.62
Soy-Soy-Soy-Maize	1.46	20.50	40.38	0.459	242.13	14.28	181.46	0.405	122.59	17.17	95.50
SEm±	0.02	0.31	0.48	0.002	0.64	0.04	0.42	0.002	3.073	0.48	0.91
CD (P=0.05)	NS	NS	NS	0.005	2.05	0.13	1.33	0.006	9.83	1.56	2.90

Table 2.2.9.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2017-18)

Centre: Raipur **Character:** Seed yield (kg/ha)

Cropping system	*Kharif* yield (kg/ha)			*Rabi* yield (kg/ha)			SEY (kg/ha)		
	Tillage system								
	Mini^{m}	Con^{l}	Mean	Mini^{m}	Con^{l}	Mean	Mini^{m}	Con^{l}	Mean
Soy-Soy-Soy-Soy	2284	1809	2047	1298	1108	1203	2284	1809	2047
Soy-Maize-Soy-Maize	2498	1894	2196	1354	1150	1227	2498	1894	2196
Soy-Soy-Maize-Soy	6829	6250	6539	1342	1094	1218	3415	3125	3270
Soy-Soy-Soy-Maize	2202	1853	2028	1316	1146	1226	2202	1853	2028
Mean	3453	2952	-	1328	1125	-	2600	2170	-
		SEm	CD (P=0.05)		SEm	CD (P=0.05)		SEm	CD (P=0.05)
Tillage system		91.21	425		12.84	59.89		31.36	148.19
Cropping system		121.8	364		30.47	N		50.74	NS
Interaction		182.4	NS		24.63	NS		61.58	NS

Table 2.2.10.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2017-18)

Centre: Raipur **Character:** Yield and economical parameters

Treatment	Seed yield (kg/ha)	Straw yield (kg/ha)	HI (%)	SEY (kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
A. Tillage system								
Minimum	3453	6309	35.37	2657	41152	135635	94483	2.29
Conventional	2952	6565	31.02	2223	45502	136652	91150	2.00
SEm	91.21	118.3	0.77	58.17	-	649	649	0.015
CD (P=0.05)	425	NS	3.58	271	-	NS	NS	0.068
B. Cropping system								
Soy-Soy-Soy-Soy	2047	4786	29.96	2047	43327	129071	85744	1.98
Soy-Maize-Soy-Maize	2196	4897	30.96	2196	43327	155928	112601	2.60
Soy-Soy-Maize-Soy	6539	11632	35.99	3489	43327	130388	87061	2.02
Soy-Soy-Soy-Maize	2028	4434	31.38	2028	43327	129189	85862	1.99
SEm	121.8	170.2	0.94	85.45	-	1375	1375	0.031
CD (P=0.05)	365	509	2.86	255	-	4118	4118	0.093

Table 2.2.11.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2017-18)

Centre: Raipur **Character:** Soil and uptake parameters

Treatment	Bulk density	WHC	Porosity	Initial values (Soil)				OC at harvest (%)
				Organic carbon (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	
A. Tillage system								
Minimum	1.33	44	55	0.58	222.4	13.91	364.1	0.49
Conventional	1.30	46	57	0.58	229.8	12.68	357.4	0.52
B. Cropping system								
Soy-Soy-Soy-Soy	1.32	44	56	0.58	227.4	13.74	365.3	0.48
Soy-Maize-Soy-Maize	1.31	44	56	0.58	214.3	11.03	350.8	0.47
Soy-Soy-Maize-Soy	1.31	44	56	0.58	226.5	14.42	362.8	0.49
Soy-Soy-Soy-Maize	1.31	44	56	0.58	226.9	13.96	361.2	0.50

Table 2.2.12.

ASP-2/15. Sustainable soybean production through crop diversification and tillage systems

Zone: Central **Design:** Strip plot**Replications:** Four **Character:** Soybean yield (kg/ha)

Crop rotation	**Kota**			**Amrawati**			**Zonal mean**		
	Tillage								
	Mini^{m}	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**
Soy-So-Soy-Soy	1137	1143	1140	1828	1981	1904	1483	1562	1522
Soy-Maize-Soy-Maize	1362	1190	1276	1746	1887	1817	1554	1539	1547
Soy-Soy-Maize-Soy	2150	1989	2069	1888	2195	2041	2019	2092	2055
Soy-Soy-Soy-Maize	1157	1163	1160	1781	1809	1795	1469	1486	1478
Mean	1451	1371		1811	1968		1631	1670	
CD (P=0.05)									
Tillage			NS				135.00		
Crop Rotation			104.02				NS		
Interaction			NS				NS		

Table 2.2.13.

ASP-2/15. Sustainable soybean production through crop diversification and tillage systems

Zone: Central **Design:** Strip plot **Replications:** Four
Character: *Rabi* Seed yield (kg/ha)

Crop rotation	**Kota**			**Amrawati**			**Zonal mean**		
	Tillage								
	Mini^{m}	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**
Soy-So-Soy-Soy	2254	2423	2338	1031	1567	1299	1643	1995	1819
Soy-Maize-Soy-Maize	2384	2149	2266	1037	1557	1297	1711	1853	1782
Soy-Soy-Maize-Soy	2235	2134	2184	1017	1407	1212	1626	1771	1698
Soy-Soy-Soy-Maize	2385	2394	2390	1022	1550	1286	1704	1972	1838
Mean	2314	2275		1027	1520		1671	1898	
CD (P=0.05)									
Tillage			NS			107.83			
Crop Rotation			NS			NS			
Interaction			NS			NS			

Table 2.2.14.

ASP-2/15. Sustainable soybean production through crop diversification and tillage systems

Zone: Central **Design:** Strip plot **Replications:** Four
Character: Soybean Equivalent Yield (kg/ha)

Crop rotation	Kota			Amrawati			Zonal mean		
	Tillage								
	Mini^{m}	Conven^{l}	Mean	Mini^{m}	Conven^{l}	Mean	Mini^{m}	Conven^{l}	Mean
Soy-So-Soy-Soy	4121	4351	4236	2927	3651	3524	4001	3763	3882
Soy-Maize-Soy-Maize	4517	4035	4276	2851	3546	3684	3791	3738	3765
Soy-Soy-Maize-Soy	4034	3819	3927	2971	3695	3503	3757	3630	3694
Soy-Soy-Soy-Maize	4315	4332	4323	2871	3461	3593	3897	3745	3821
Mean	4247	4134		2905	3588		3576	3861	
CD (P=0.05)									
Tillage			NS			207.94			
Crop Rotation			NS			NS			
Interaction			NS			NS			

Table 2.2.15

ASP-2/15: Sustainable soybean production through diversification and tillage systems

Zone: Central **Design:** Strip plot **Replications:** Four
Character: Yield and economical parameters

Treatment	Seed yield (kg/ha)	Straw yield (kh/ha)	HI (%)	SEY (kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
A. Tillage system								
Minimum	1631	2792	38.80	3576	35471	101944	66473	2.76
Conventional	1670	2848	38.59	3861	37982	102566	64584	2.61
B. Cropping system								
Soy-Soy-Soy-Soy	1523	1755	40.87	3762	35575	102797	67222	2.77
Soy-Maize-Soy-Maize	1547	1839	40.78	3737	35492	102073	66582	2.75
Soy-Soy-Maize-Soy	2055	5953	32.30	3630	40369	101620	61251	2.47
Soy-Soy-Soy-Maize	1478	1731	40.81	3744	35471	102529	67058	2.75

Table 2.2.16

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2017-18)

Centre: Kota **Character:** Soil parameters

Treatment	Bulk density	WHC	Porosity	Initial soil values (kg/ha)				OC at harvest (%)	Nutrient uptake(kg/ha)		
				OC (%)	N	P	K		N	P	K
A. Tillage system											
Minimum	1.477	48.61	44.09	0.682	321.62	23.13	307.88	0.684	140.05	13.23	94.57
Conventional	1.476	48.16	44.37	0.690	318.56	22.94	300.63	0.680	128.13	12.01	87.66
SEm±	0.003	0.17	0.10	0.001	2.04	0.37	3.48	0.002	3.19	0.30	2.34
CD (P=0.05)	NS	NS	NS	0.004	NS	NS	NS	NS	9.66	0.91	7.08
B. Cropping system											
Soy-Soy-Soy-Soy	1.481	48.49	44.34	0.686	320.13	22.73	304.38	0.679	109.17	10.27	72.85
Soy-Maize-Soy-Maize	1.480	48.39	44.26	0.686	319.25	23.02	298.38	0.680	123.65	11.62	83.74
Soy-Soy-Maize-Soy	1.476	48.25	44.14	0.685	319.25	23.48	305.88	0.685	193.48	18.25	132.92
Soy-Soy-Soy-Maize	1.471	48.41	44.19	0.688	321.75	22.93	308.38	0.685	110.06	10.35	74.95
SEm±	0.003	0.17	0.10	0.001	2.04	0.37	3.48	0.002	3.19	0.30	2.34
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	9.66	0.91	7.08

Table 2.2.17

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2017-18)

Centre: Amravati **Character:** Soil and uptake parameters

Treatment	Bulk density	Porosity	Initial soil values (kg/ha)				OC (%)	Nutrient uptake(kg/ha)		
			OC (%)	N	P	K		N	P	K
A. Tillage system										
Minimum	1.51	42.90	0.424	181.85	15.59	322.59	0.449	41.91	5.98	14.97
Conventional	1.51	42.90	0.421	179.01	15.37	320.24	0.439	64.85	10.61	24.85
SEm	0.01	0.002	0.002	0.93	0.10	4.14	0.003	0.95	0.16	0.38
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	4.28	0.72	1.72
B. Cropping system										
Soy-Soy-Soy-Soy	1.51	42.91	0.421	180.83	15.92	321.76	0.449	55.14	8.74	20.82
Soy-Maize-Soy-Maize	1.52	42.90	0.423	179.93	15.60	321.55	0.443	54.69	8.36	19.82
Soy-Soy-Maize-Soy	1.51	42.90	0.423	180.81	15.03	321.94	0.439	48.84	7.42	18.02
Soy-Soy-Soy-Maize	1.51	42.90	0.424	180.14	15.37	320.42	0.444	54.85	8.66	20.98
SEm	0.01	0.005	0.004	1.91	0.27	8.97	0.003	1.68	0.30	0.64
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	4.98	0.89	1.91
Interaction										
SE(m) +	0.01	0.007	0.005	2.70	0.38	12.69	0.004	2.37	0.42	0.91
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2.2.18.

ASP-2/15. Sustainable soybean production through crop diversification and tillage systems

Zone: Southern **Design:** Split plot **Replications:** Three **Character:** Soybean yield (kg/ha)

Crop rotation	**Pune**			**Dharwad**			**Adilabad**			**Zonal mean**		
	Mini^{m}	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**
	Tillage											
Soy-So-Soy-Soy	2978	2999	2988	1388	1477	1433	2593	2820	2706	2320	2432	2376
Soy-Maize-Soy-Maize	2888	2974	2931	1393	1505	1449	2274	2692	2483	2185	2390	2288
Soy-Soy-Maize-Soy	3291	3485	3388	4745	5866	5306	2033	2136	2084	3356	3829	3593
Soy-Soy-Soy-Maize	2980	3021	3000	1438	1527	1483	2283	2667	2475	2234	2405	2319
Mean	3034	3120		2241	2594		2295	2578		2523	2764	
CD (P=0.05)												
Tillage			NS			838.1			314.6			
Crop Rotation			126.67			829.9			289.9			
Interaction			NS			1157			NS			

Table 2.2.19.

ASP-2/ 15. Sustainable soybean production through crop diversification and tillage systems

Zone: Southern **Design:** Split plot **Replications:** Three **Character:** *Rabi* Seed yield (kg/ha)

Crop rotation	**Pune**			**Dharwad**			**Adilabad**			**Zonal mean**		
	Mini^{m}	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**	**Mini^{m}**	**Conven^{l}**	**Mean**
	Tillage											
Soy-So-Soy-Soy	5402	5927	5665	1244	1192	1218	3428	3794	3611	3358	3638	3498
Soy-Maize-Soy-Maize	5778	6051	5915	1141	1243	1192	3364	3655	3509	3428	3650	3539
Soy-Soy-Maize-Soy	6029	6314	6171	627	746	686	3587	4104	3846	3414	3721	3568
Soy-Soy-Soy-Maize	5985	6254	6120	1237	1239	1238	3528	3843	3686	3583	3779	3681
Mean	5799	6136		1062	1105		3477	3849		3446	3697	
CD (P=0.05)												
Tillage			206.48			82.3			258.1			
Crop Rotation			705.75			112.5			138.8			
Interaction			NS			148.1			NS			

Table 2.2.20.

ASP-2/ 15. Sustainable soybean production through crop diversification and tillage systems

Zone: Southern **Design:** Split plot **Replications:** Three **Character:** SEY(kg/ha)

Crop rotation	Pune			Dharwad			Adilabad			Zonal mean		
	Mini[m]	Conven[l]	Mean	Mini[m]	Conven[l]	Mean	Mini[m]	Conven[l]	Mean	Mini[m]	Conven[l]	Mean
	Tillage											
Soy-So-Soy-Soy	4444	4712	4578	1794	1718	1756	6021	6614	6317	4086	4348	4217
Soy-Maize-Soy-Maize	5613	5837	5725	1645	1792	1719	5637	6347	5992	4298	4659	4479
Soy-Soy-Maize-Soy	4718	5011	4865	903	1076	989	5620	6240	5930	3747	4109	3928
Soy-Soy-Soy-Maize	5783	5890	5836	1783	1787	1785	5811	6510	6160	4459	4729	4594
Mean	5139	5362		1531	1593		5772	6428		4147	4461	
CD (P=0.05)												
Tillage			NS			118.7			442.0			
Crop Rotation			425.60			162.2			NS			
Interaction			NS			213.6			NS			

Table 2.2.21.

ASP-2/15. Sustainable soybean production through diversification and tillage systems (2016-17)

Zone: Southern **Character:** Yield and economical parameters

Treatment	Seed yield (kg/ha)	Straw yield (kh/ha)	HI (%)	SEY# (kg/ha)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
A. Tillage system								
Minimum	2720	6621	23.94	4147	48479	109458	61701	1.12
Conventional	2955	6731	24.47	4461	53229	117241	64177	1.12
B. Cropping system								
Soy-Soy-Soy-Soy	2289	3287	27.22	4217	49891	103833	53570	1.19
Soy-Maize-Soy-Maize	2837	9110	21.67	4479	51817	121304	71042	1.16
Soy-Soy-Maize-Soy	3379	5046	26.49	3928	51817	105028	54174	0.94
Soy-Soy-Soy-Maize	2846	9261	21.45	4594	49891	123232	72970	1.19

Table 2.2.22.

AGRON 2/15: Sustainable soybean production through crop diversification and tillage systems (2018-19)

Zone: Southern Zone **Centre:** Pune **Character:** Soil physical and chemical properties (Balance sheet)

Treatment	Bulk density	WHC*	Porosity	Initial soil values (kg/ha)				OC (%)	Nutrient uptake (kg/ha)		
				OC (%)	N	P)	K		N	P	K
A. Tillage system											
Minimum	1.08	50.77	32.97	0.55	384	31.25	376	0.50	93.83	15.16	63.25
Conventional	0.98	48.83	46.36	0.58	394	27.88	283	0.54	101.75	15.63	73.82
SEm	0.07	0.43	4.79	0.05	39.73	0.95	17.80	0.06	5.65	2.95	6.84
CD (P=0.05)	NS	NS	NS	NS	NS	NS	56.93	NS	NS	NS	NS
B. Cropping system											
Soy-Soy-Soy-Soy	1.11	46.50	38.35	0.55	383	33.75	331	0.44	114.31	6.03	41.40
Soy-Maize-Soy-Maize	1.03	52.72	41.53	0.51	354	27.88	293	0.51	81.24	28.54	89.39
Soy-Soy-Maize-Soy	1.06	52.42	36.30	0.67	467	26.88	341	0.61	109.26	6.78	38.24
Soy-Soy-Soy-Maize	0.92	47.56	42.48	0.53	352	29.75	352	0.52	86.36	20.23	105.12
SEm	0.08	1.53	4.43	0.07	57.00	2.57	20.89	0.07	12.89	4.12	6.43
CD (P=0.05)	NS	4.90	NS	NS	NS	NS	NS	NS	NS	13.18	20.58

*WHC: Water holding capacity

Table 2.2.23.

AGRON.2/15: Sustainable soybean production through diversification and tillage systems (2017-18)

Centre: Adilabad **Character:** Before soybean crop

Treatment	Bulk density (Mg m^{-3})	WHC (%)	Porosity (%)	Initial soil values (kg/ha)				OC (%)	Nutrient uptake(kg/ha)		
				OC (%)	N	P	K		N	P	K
A. Tillage system											
Minimum	1.56	36.8	37.4	0.62	208.5	20.0	288.7	0.61	171.6	30.9	71.2
Conventional	1.54	36.7	36.1	0.57	221.1	21.3	290.1	0.60	163.1	30.1	68.1
SEm	0.02	0.72	0.53	0.03	3.10	0.23	15.3	0.02	1.87	1.30	2.83
CD (P=0.05)	NS	NS	NS	NS	NS	1.08	NS	NS	8.7	NS	NS
B. Cropping system											
Soy-Soy-Soy-Soy	1.53	36.8	36.5	0.63	206.2	20.5	291.7	0.65	177.8	28.8	73.1
Soy-Maize-Soy-Maize	1.50	35.4	37.5	0.59	220.3	22.3	282.8	0.57	170.2	31.0	73.7
Soy-Soy-Maize-Soy	1.57	37.6	36.2	0.59	216.3	19.1	292.7	0.61	162.0	29.6	67.3
Soy-Soy-Soy-Maize	1.61	37.4	36.7	0.56	216.5	20.6	290.5	0.56	159.6	32.7	64.5
SEm	0.02	0.71	0.45	0.04	7.4	1.40	11.1	0.03	5.99	1.65	3.72
CD (P=0.05)	0.07	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2.3.1.

ASP 3/17. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North-Plain **Character:** Yield and economics

Treatment	Seed yield (kg/ha)				Straw yield (kg/ha)	HI (%)	Pods/ plant	Seed index (g)	Cost of cultiva-tion (Rs/ha)	Net returns (Rs/ha)	B:C ratio
	Delhi	Pant-nagar	Ludh-iana	Mean							
SSNM*	1717	2469	1873	2020	5593	18.97	75.03	11.10	53448	43878	2.10
T1 – N omission	1434	2074	1847	1785	5236	17.77	71.67	10.94	48994	35482	1.80
T1 – P omission	1374	2123	1894	1797	5313	18.15	69.33	10.94	47879	38457	2.00
T1 – K omission	1636	2049	1556	1747	5588	16.12	69.03	10.89	48159	35847	1.90
RDF (NPKS)	1818	1481	1928	1742	5108	15.74	71.43	11.15	48672	35006	1.80
Farmers practice	1515	2247	1685	1816	5689	16.94	67.63	10.85	48330	39409	2.00
Absolute control	1192	1679	1528	1466	5107	14.98	70.77	10.49	41032	28615	1.70
CD (P=0.05)	235	326	204	-							

*SSNM basal recommendation through nutrient expert

Table 2.3.2.

ASP 3/17. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North-Plain **Character:** Yield and Yield gap

Treatment	Delhi			Ludhiana			Pantnagar		
	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)
SSNM*	1717	-	101	1873	-	55	2469	-	-
T1 – N omission	1434	283	384	1847	25	81	2074	395	-
T1 – P omission	1374	343	444	1894	-21	34	2123	346	-
T1 – K omission	1636	81	182	1556	317	372	2049	420	-
RDF (NPKS)	1818	-101		1928	-56	-	1481	988	-
Farmers practice	1515	202	303	1685	187	243	2247	222	-
Absolute control	1192	525	626	1528	345	400	1679	790	-

*SSNM basal recommendation through nutrient expert

Table 2.3.3.

AGRON. 3/17. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North Plain **Centre:** Ludhiana **Character:** Soil properties after harvest during *kharif* 2017

Treatment	pH	EC (μS/m)	OC (%)	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)
SSNM*	6.85	103.3	0.46	111.4	55.7	119.8
T1 – N omission	6.67	101.0	0.37	132.4	51.3	116.5
T1 – P omission	6.69	91.0	0.48	114.5	41.1	124.0
T1 – K omission	6.65	102.3	0.45	125.8	51.3	97.4
RDF (NPKS)	7.02	90.7	0.56	131.4	58.7	103.7
Farmers practice	6.67	81.7	0.29	117.6	49.9	102.6
Absolute control	6.79	90.3	0.57	142.7	44.0	102.5
SEm	0.12	5.26	0.09	19.20	4.86	7.51
CD (P=0.05)	NS	NS	NS	NS	NS	NS

*SSNM basal recommendation through nutrient expert

Table 2.3.4.

AGRON. 3/17. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North Plain **Centre:** Ludhiana

Character: Nutrient content and uptake in straw during *kharif* 2017

Treatment	Nutrient content in straw (%)			Nutrient uptake in straw (kg/ha)		
	N	**P**	**K**	**N**	**P**	**K**
SSNM*	0.76	0.04	1.31	35.6	1.8	61.1
T1 – N omission	0.76	0.04	1.17	34.0	1.6	52.8
T1 – P omission	0.77	0.04	1.26	38.4	1.8	63.4
T1 – K omission	0.79	0.04	1.25	38.6	2.0	61.1
RDF (NPKS)	0.82	0.05	1.25	40.1	2.2	61.1
Farmers practice	0.82	0.04	1.31	38.8	1.8	61.8
Absolute control	0.81	0.03	1.23	37.6	1.6	57.2
SEm	0.05	0.006	0.07	2.4	0.2	4.4
CD (P=0.05)	NS	NS	NS	NS	NS	NS

*SSNM basal recommendation through nutrient expert

Table 2.3.5.

AGRON. 3/17. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North Plain **Centre:** Ludhiana

Character: Nutrient content and uptake in seed during *kharif* 2017

Treatment	Nutrient content in seed (%)			Nutrient uptake in seed (kg/ha)			Total nutrient uptake (kg/ha)		
	N	**P**	**K**	**N**	**P**	**K**	**N**	**P**	**K**
SSNM*	4.83	0.23	1.88	150.9	7.05	58.94	186.5	8.9	120.0
T1 – N omission	4.92	0.23	1.85	133.4	6.2	50.1	167.5	7.9	102.8
T1 – P omission	4.78	0.23	1.88	135.4	6.5	53.3	173.8	8.3	116.7
T1 – K omission	4.98	0.22	1.85	149.6	6.5	55.6	188.2	8.5	116.7
RDF (NPKS)	4.89	0.23	1.86	151.8	6.9	57.7	191.9	9.2	118.8
Farmers practice	4.90	0.23	1.85	129.5	6.0	48.9	168.3	7.8	110.8
Absolute control	4.94	0.23	1.92	128.9	5.9	49.9	166.5	7.5	107.2
SEm	0.05	0.005	0.03	6.0	0.3	2.6	5.2	0.2	3.8
CD (P=0.05)	NS	NS	NS	NS	NS	NS	16.1	0.72	NS

*SSNM basal recommendation through nutrient expert

Table 2.3.6.

ASP 3/15. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North Eastern **Character:** Yield and economics

Treatment	Seed yield (kg/ha)				Straw yield (kg/ha)	HI (%)	Pods/ plant	Seed index (g)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
	Ranchi	Bhawani-patnam	Raipur	Mean							
SSNM*	2643	1270	2262	2058	2805	42.49	43.09	10.71	44419	39142	2.10
T1 – N omission	2303	927	1718	1649	2380	42.93	37.07	9.94	38788	28530	1.69
T1 – P omission	2143	1047	1604	1598	2387	41.51	37.09	10.17	37008	30245	1.98
T1 – K omission	2379	1110	1651	1713	2587	41.85	38.45	10.20	40402	33398	1.96
RDF (NPKS)	2439	1397	1987	1911	2775	42.45	43.77	10.50	45469	33879	1.80
Farmers practice	2012	1057	1571	1613	2395	40.33	36.52	10.08	36675	26751	1.72
Absolute control	1691	717	964	1124	2040	40.39	25.85	9.81	29584	19832	1.60
CD (P=0.05)	279	162	172	-							

*SSNM basal recommendation through nutrient expert

Table 2.3.7.

ASP 3/15. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North eastern **Character:** Yield and Yield gap

Treatment	Ranchi			Bhawanipatnam			Raipur		
	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)
SSNM*	2643	-	-205	1270	-	127	2262		-275
T1 – N omission	2303	340	136	927	343	470	1718	544	269
T1 – P omission	2143	501	296	1047	223	350	1604	658	383
T1 – K omission	2379	264	59	1110	160	287	1651	611	336
RDF (NPKS)	2439	205	--	1397	-127	-	1987	275	-
Farmers practice	2012	632	427	1057	213	340	1571	691	416
Absolute control	1691	952	748	717	553	680	964	1298	1023

*SSNM basal recommendation through nutrient expert

Table 2.3.8.

ASP 3/15. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North Eastern Hill **Character:** Yield and economics

Treatment	Seed yield (kg/ha)			Straw yield (kg/ha)	HI (%)	Pods/ plant	Seed index (g)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
	Imphal	Medzi-phema	Mean							
SSNM	1728	719	1223	2000	36.67	49.95	8.40	52666	41456	1.27
T1 – N omission	1278	738	1008	2020	33.23	40.22	7.97	44536	31910	1.08
T1 – P omission	1300	843	1072	1866	35.85	38.39	7.85	46574	35460	1.23
T1 – K omission	1355	493	924	1764	33.14	43.17	8.07	42024	26808	0.87
RDF (NPKS)	1633	1162	1397	2348	37.67	62.00	8.65	58765	50170	1.49
Farmers practice	1058	496	777	1805	29.69	39.39	7.99	35065	23149	0.93
Absolute control	857	463	660	1731	28.78	40.39	7.77	29847	19498	0.98
CD (P=0.05)	222	310								

*SSNM basal recommendation through nutrient expert

Table 2.3.9.

ASP3/15. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: North eastern Hill **Character:** Yield and Yield gap

Treatment	Imphal			Medziphema		
	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)
SSNM*	1728	-	-95	719		443
T1 – N omission	1278	450	355	738	-19	424
T1 – P omission	1300	428	333	843	-125	318
T1 – K omission	1355	373	278	493	226	669
RDF (NPKS)	1633	95	-	1162	-443	-
Farmers practice	1058	670	575	496	222	665
Absolute control	857	871	776	463	255	698

*SSNM basal recommendation through nutrient expert

Table 2.3.10.

ASP 3/15. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: Central **Character:** Yield and economics

Treatment	Seed yield (kg/ha)					Straw yield (kg/ha)	HI (%)	Pods/ plant	Seed index (g)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
	Sehore	Kota	Amrawati	Indore	Mean							
SSNM*	1379	1617	1502	3063	1890	2715	39.63	38.33	9.64	35873	26292	2.21
T1 – N omission	1214	1563	1488	2733	1750	2672	38.67	35.37	9.52	34585	24017	2.10
T1 – P omission	1173	1600	1296	2572	1660	2577	38.60	34.49	9.74	32599	23675	2.18
T1 – K omission	1193	1582	1517	2675	1742	2625	38.77	36.24	9.64	34492	24805	2.17
RDF (NPKS)	1296	1633	1718	2832	1870	2760	39.12	37.24	9.88	36991	27611	2.22
Farmers practice	1132	1343	1417	2257	1537	2578	37.33	33.80	9.38	32197	20578	1.98
Absolute control	967	1250	1161	2032	1353	2734	35.15	30.62	8.90	28182	17430	1.92
CD (P=0.05)	181	189	207	-								

*SSNM basal recommendation through nutrient expert

Table 2.3.11.

ASP 3/15. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: Central **Character:** Yield and Yield gap

Treatment	Sehore			Kota			Amrawati			Indore		
	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)
SSNM*	1379	-	-83	1617	-	17	1502	--	216	3063		-231
T1 – N omission	1214	165	82	1563	53	70	1488	14	230	2733	330	99
T1 – P omission	1173	206	123	1600	17	33	1296	206	422	2572	491	260
T1 – K omission	1193	186	103	1582	35	52	1517	-15	201	2675	388	157
RDF (NPKS)	1296	83	-	1633	-17	-	1718	-216	--	2832	231	-
Farmers practice	1132	247	164	1343	273	290	1417	85	301	2257	806	575
Absolute control	967	412	329	1250	367	383	1161	341	557	2032	1031	800
SEm	59	-	-	61.47						54.95		
CD (P=0.05)	181	-	-	189.47						169.33		

*SSNM basal recommendation through nutrient expert

Table 2.3.12.

ASP 3/15. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: Southern **Character:** Yield and economics

Treatment	Seed yield (kg/ha)				Straw yield (kg/ha)	HI (%)	Pods/ plant	Seed index (g)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
	Adilabad	Dharwad	Pune	Mean							
SSNM*	2645	2396	3166	2736	4008	29.20	66.77	13.37	38986	52810	1.13
T1 – N omission	1882	2452	2960	2431	3853	26.81	61.90	13.09	37430	44099	1.01
T1 – P omission	2148	2374	3012	2511	3846	28.24	58.30	12.99	35053	49172	1.17
T1 – K omission	2233	2409	2928	2523	3803	28.51	60.07	13.03	36471	48189	1.17
RDF (NPKS)	2804	2571	3044	2806	3885	29.82	70.80	13.24	37855	56366	1.28
Farmers practice	2313	2248	2808	2456	3890	28.14	60.33	13.37	32473	49968	1.35
Absolute control	1136	2398	2676	2070	3476	24.49	50.70	12.72	30893	38439	0.96
CD (P=0.05)	434	70	283	-							

*SSNM basal recommendation through nutrient expert

Table 2.3.13.

ASP 3/15. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Zone: Southern **Character:** Yield and Yield gap

Treatment	Dharwad			Pune			Adilabad		
	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)	Yield (kg/ha)	Yield gap (kg/ha)	Yield gap (kg/ha)
SSNM*	2396	-	-184	3166	-	-122	2645	0	158
T1 – N omission	2452	-80	104	2960	206	84	1882	763	921
T1 – P omission	2374	-18	166	3012	154	32	2148	498	656
T1 – K omission	2409	16	200	2928	238	116	2233	412	571
RDF (NPKS)	2571	-184	-	3044	122	-	2804	-158	0
Farmers practice	2248	166	350	2808	358	236	2313	332	490
Absolute control	2398	26	210	2676	490	368	1136	1509	1668
SEm	22.71	-	-	91.93			139.2	139.3	139.2
CD (P=0.05)	69.98	-	-	283.24			433.7	429.2	428.9

*SSNM basal recommendation through nutrient expert

Table 2.4.1.

ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Zone: North Plain **Character:** Yield and economics

Plant geometry (cm)	Ludhiana			Pantnagar			Zonal mean		
	Variety								
	PS 1092	SL 958	Mean	PS 1092	SL 958	Mean	PS 1092	SL 958	Mean
45x5	1405	1637	1521	2172	1925	2049	1789	1781	1785
45x10	1373	1597	1485	1975	1827	1901	1674	1712	1693
45x20	1333	1463	1398	1642	1604	1623	1488	1534	1511
45x30	1311	1343	1327	1382	1407	1395	1347	1375	1361
Mean	1356	1510		1793	1691		1574	1600	
CD (P=0.05)									
Variety			NS			NS			
Plant geometry			NS			428			
Interaction			NS			NS			

Table 2.4.2.

ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Zone: North Plain **Character:** Yield, yield attributes and economical parameters

Treatment	Branc-hes/ Plant	Pods/ plant	Seed index	Seed yield (kg/ha)	Straw yield (kg/ha)	HI (%)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
Variety										
PS 1092	5.40	72.14	9.92	1575	4261	13.19	29267	53524	24257	1.82
SL 958	5.81	70.98	10.82	1601	4514	12.79	29376	54413	25037	1.85
Plant geometry (cm)										
45 x 5	5.17	63.95	10.10	1785	4912	10.62	30230	60686	30456	2.00
45 x 10	5.18	67.05	10.31	1693	4557	11.51	29349	57558	28209	1.95
45 x 20	5.83	75.40	10.41	1511	4232	13.88	28908	51360	22452	1.78
45 x 30	6.23	80.05	10.67	1361	3850	15.96	28798	46268	17470	1.61

Table 2.4.3.

AGRON.4/18.System intensification for soybean productivity augmentation under ridge furrow planting

Zone: North Plain **Centre:** Ludhiana **Character:** Plant dry matter, CGR and RGR and RUE

Treatment	Ludhiana					Pantnagar							
	Plant dry weight (g)		CGR (g m^{-2} d^{-1})	RGR (g g^{-1} m^{-2} d^{-1})	RUE (kg$ha^{-1}$$mm^{-1}$)	Plant dry weight (g)			CGR (g m^{-2} d^{-1})		RGR (g g^{-1} m^{-2} d^{-1})		RUE (kg$ha^{-1}$$mm^{-1}$)
	30 DAS	60 DAS	30-60 DAS	30-60 DAS		30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS	
Variety													
PS 1092	1.03	9.39	24.77	0.0635	1.61	10.16	25.21	50.0	19.51	34.52	0.90	0.69	1.18
SL 958	1.02	6.82	17.19	0.0545	1.79	9.11	26.10	50.31	23.81	32.95	1.06	0.65	1.11
SEm	0.01	0.27	0.84	0.001	0.04	0.19	0.58	0.50	1.03	1.50	0.02	0.02	0.03
CD (P=0.05)	NS	1.67	5.10	0.008	NS	NS	NS	NS	NS	NS	0.15	NS	NS
Plant geometry (cm)													
45 x 5	0.94	6.43	16.29	0.0554	1.81	8.78	23.16	45.43	43.16	66.83	0.97	0.67	1.35
45 x 10	1.03	6.98	17.63	0.0548	1.76	8.21	23.31	48.23	22.36	36.85	1.04	0.73	1.25
45 x 20	1.05	8.78	22.90	0.0611	1.66	10.3	26.55	51.56	12.05	18.53	0.94	0.66	1.07
45 x 30	1.09	10.23	27.10	0.0646	1.58	11.21	29.61	55.40	9.08	12.73	0.97	0.62	0.92
SEm	0.01	0.13	0.39	0.001	0.06	0.53	0.91	1.19	1.96	2.85	0.07	0.04	0.05
CD (P=0.05)	0.04	0.42	1.21	0.002	0.17	1.65	2.81	3.69	6.05	8.78	NS	NS	0.18

Table 2.4.4.

AGRON 4/18.System intensification for soybean productivity augmentation under ridge furrow planting

Zone: North Eastern **Centre:** Ranchi **Character:** Yield (kg/ha)

Treatment	Ranchi			Raipur		
	Variety					
	JS 95-60	RSC 10-46	Mean	JS 95-60	RSC 10-46	Mean
Plant geometry (cm)						
45 x 5	1624	2107	1866	1665	1757	1711
45 x 10	1611	2243	1927	1949	2196	2073
45 x 20	1072	1909	1490	1302	1380	1340
45 x 30	961	1472	1217	1286	1312	1299
Mean	1317	1933		1551	1661	
	SEm±	**CD (P=0.05)**		**SEm±**	**CD (P=0.05)**	
Variety	12.80	77.93		104.56	112.49	
Plant Geometry	51.80	159.63		311.25	329.18	
Interaction	73.25	NS				

Table 2.4.5.

AGRON 4/18.System intensification for soybean productivity augmentation under ridge furrow planting

Zone: North Eastern **Centre:** Ranchi

Character: Yield, yield attributes and economical parameters

Treatment	Branches/ plant	Pods/ plant	Seed index	Seed yield (kg/ ha)	Straw yield (kh/ha)	HI (%)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
Variety										
JS 95 60	3.88	50.50	12.20	1317	2378	35.41	21147	44782	23635	1.10
RSC 10 46	4.18	60.33	11.29	1933	2787	40.76	21010	65711	44702	2.12
SEm±	0.05	0.72	0.10	12.81	18.84	0.07	-	435	435	0.02
CD (P=0.05)	0.32	4.36	0.63	77.93	114.66	0.45	-	2650	2650	0.14
Plant geometry (cm)										
45 x 5	3.77	51.67	11.59	1866	2903	38.94	22794	63435	40641	1.79
45 x 10	3.87	55.17	11.71	1927	2882	39.83	21147	65513	44366	2.10
45 x 20	4.14	56.17	11.84	1490	2348	38.23	20323	50673	30349	1.49
45 x 30	4.35	58.67	11.85	1217	2196	35.33	20049	41367	21318	1.06
SEm±	0.10	1.52	0.14	51.80	78.26	1.14	-	1761	1761	0.08
CD (P=0.05)	0.31	4.67	NS	159.63	241.17	3.51	-	5427	5427	0.25

Table 2.4.6.

AGRON.4/18.System intensification for soybean productivity augmentation under ridge furrow planting

Zone: North Eastern **Centre:** Ranchi **Character:** Plant dry matter, CGR and RGR and RUE

Treatment	Plant dry weight (g)			CGR		RGR		RUE
	30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS	
Variety								
JS 95 60	4.00	12.36	18.50	0.557	0.410	0.0326	0.0117	1.46
RSC 10 46	4.69	15.35	21.34	0.711	0.399	0.0343	0.0095	2.14
SEm±	0.02	0.13	0.13	0.009	0.010	0.0003	0.0003	0.01
CD (P=0.05)	0.14	0.82	0.76	0.055	NS	NS	NS	0.09
Plant geometry (cm)								
45 x 5	4.15	13.21	19.21	0.604	0.399	0.0335	0.0109	2.06
45 x 10	4.37	13.67	19.81	0.620	0.410	0.0330	0.0108	2.13
45 x 20	4.43	14.19	20.26	0.650	0.405	0.0337	0.0104	1.65
45 x 30	4.45	14.35	20.41	0.660	0.404	0.0339	0.0103	1.34
SEm±	0.09	0.15	0.27	0.012	0.015	0.0008	0.0004	0.06
CD (P=0.05)	0.27	0.47	0.83	NS	NS	NS	NS	0.18

Table 2.4.7.

ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Zone: North Eastern hill **Character:** Yield and economics

Plant geometry (cm)	Imphal			Medziphema			Zonal mean		
	Variety								
	JS 93 05	JS 97 52	Mean	JS 93 05	JS 97 52	Mean	JS 93 05	JS 97 52	Mean
45x5	1173	1515	1344	794	1839	1316	983	1677	1330
45x10	1300	1900	1600	604	1960	1282	952	1930	1441
45x20	1010	1421	1216	547	1613	1080	779	1517	1148
45x30	944	1165	1054	314	945	629	629	1055	842
Mean	1107	1500	-	565	1589		836	1545	
CD (P=0.05)									
Variety			NS			NS			-
Plant geometry			NS			502.21			-
Interaction			NS			NS			-

Table 2.4.8.

ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Zone: North Eastern hill **Character:**Yield, yield attributes and economical parameters

Treatment	Branches/ Plant	Pods/ plant	Seed index	Seed yield (kg/ha)	Straw yield (kg/ha)	HI (%)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
Variety										
JS 93 05	4.10	36.96	11.26	836	1651	34.30	33469	50146	16677	0.48
JS 97 52	4.76	74.55	8.43	1545	2588	37.44	33469	92673	59204	1.76
Plant geometry (cm)										
45 x 5	4.19	43.96	10.92	954	2197	32.35	35078	57255	22178	0.59
45 x 10	4.45	65.05	8.77	1595	2477	38.84	33615	95672	62056	1.84
45 x 20	4.49	46.96	10.81	890	1697	34.75	32738	53411	20674	0.63
45 x 30	4.59	67.05	8.89	1322	2107	37.54	32445	79299	46854	1.43

Table 2.4.9.

AGRON.4/18.System intensification for soybean productivity augmentation under ridge furrow planting

Zone: North Eastern hill **Character:** Plant dry matter, CGR and RGR and RUE

Treatment	Dry weight/plant (g)			CGR ($g/m^2/day$)		RGR (g/g/day)		RUE (kg/ha/mm)
	30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS	
Variety								
JS 93-05	1.07	3.05	8.54	2.04	4.35	0.063	0.074	1.59
JS97-52	1.20	4.07	10.28	2.96	5.39	0.071	0.066	2.73
Plant geometry (cm)								
45 x 5	1.09	3.02	8.53	4.66	9.00	0.061	0.076	2.38
45 x 10	1.18	3.58	9.60	2.62	5.57	0.070	0.068	2.63
45 x 20	1.13	3.78	9.67	1.59	2.89	0.072	0.067	2.07
45 x 30	1.14	3.85	9.85	1.12	2.01	0.068	0.069	1.58

Table 2.4.10.

ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Zone: Central **Character:** Yield and economics

Plant geometry (cm)	Amrawati			Kota			Sehore			Zonal mean		
	Variety											
	JS 20 34	RVS 24	Mean	JS 20 34	RVS 24	Mean	JS 20 34	RVS 24	Mean	JS 20 34	RVS 24	Mean
45x5	1241	907	1074	1759	2099	1929	1523	1481	1802	1508	1496	1602
45x10	1350	1185	1267	1667	1975	1821	1337	1543	1728	1451	1568	1605
45x20	1179	776	977	1636	1944	1790	1235	1337	1543	1350	1352	1437
45x30	1054	725	889	1427	1651	1539	1132	1235	1420	1204	1204	1283
Mean	1206	898		1622	1917		1568	1679		1465	1498	
CD (P=0.05)												
Variety			155.87			NS			11.07			-
Plant geometry			151.88			NS			83.38			-
Interaction			NS			NS			117.91			-

Table 2.4.11.

ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Zone: Central **Character:** Yield, yield attributes and economical parameters

Treatment	Branches/ Plant	Pods/ plant	Seed index	Seed yield (kg/ha)	Straw yield (kg/ha)	HI (%)	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B:C ratio
Variety										
JS 20 34	2.8	34.7	12.1	1595	1887	45.11	19393	47170	27777	1.92
RVS 24	3.7	44.6	10.1	1798	2646	38.43	19115	53575	34460	2.27
Plant geometry (cm)										
45 x 5	2.5	28.7	10.8	1602	2038	43.78	23041	48802	25761	1.89
45 x 10	2.9	33.2	10.8	1606	2093	42.86	22508	49131	26623	1.96
45 x 20	3.1	38.2	11.0	1437	1896	42.96	21996	43997	22002	1.79
45 x 30	3.4	43.9	10.9	1283	1722	42.26	21831	39151	17320	1.58

Table 2.4.12.

AGRON.4/18.System intensification for soybean productivity augmentation under ridge furrow planting

Zone: Central **Character:** Plant dry matter, CGR and RGR and RUE

Treatment	Dry weight/plant (g)			CGR ($g/m^2/day$)		RGR (g/g/day)		RUE (kg/ha/mm)
	30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS	
Variety								
JS 20 34	2.51	7.29	12.58	8.61	11.18	0.037	0.017	2.54
RVS 24	2.73	6.88	16.94	7.80	18.64	0.032	0.030	2.57
Plant geometry (cm)								
45 x 5	2.34	6.80	12.62	8.15	12.01	0.037	0.019	2.72
45 x 10	2.65	7.02	14.35	8.06	14.40	0.033	0.023	2.78
45 x 20	2.61	7.67	15.76	9.11	15.54	0.037	0.023	2.51
45 x 30	2.89	6.85	16.31	7.50	17.68	0.030	0.028	2.20

Table 2.4.13.

ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Zone: Southern **Character: Seed** Yield

Plant geometry (cm)	Dharwad			Pune			Adilabad			Zonal mean		
	Variety											
	JS 93 05	**MACS 1188**	**Mean**	**JS 93 05**	**MACS 1188**	**Mean**	**JS 93 05**	**MACS 1188**	**Mean**	**JS 93 05**	**MACS 1188**	**Mean**
45x5	2250	2218	2234	2590	3065	2827	2595	2867	2731	2478	2717	2597
45x10	2457	2480	2469	2455	2902	2678	2481	2664	2573	2464	2682	2573
45x20	2613	2514	2564	2149	2700	2425	2170	2564	2367	2311	2593	2452
45x30	2273	2379	2326	2058	2495	2276	2144	2385	2265	2158	2420	2289
Mean	2398	2398		2313	2791		2347	2620		2353	2603	
CD (P=0.05)												
Variety			***NS***			NS			205.3			
Plant geometry			NS			NS			382.1			
Interaction			NS			NS			NS			

Table 2.4.14.

ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Zone: : Southern **Character:** Yield, yield attributes and economical parameters

Treatment	**Branches/ Plant**	**Pods/ plant**	**Seed index**	**Seed yield (kg/ha)**	**Straw yield (kg/ha)**	**HI (%)**	**Cost of cultivation (Rs/ha)**	**Gross returns (Rs/ha)**	**Net returns (Rs/ha)**	**B:C ratio**
Variety										
JS 93 05	5.17	67.44	12.59	2353	3031	31.37	39822	79061	39237	1.06
MACS 1188	5.69	83.37	13.94	2603	3828	28.48	39822	87401	47579	1.13
Plant geometry (cm)										
45 x 5	5.04	71.88	12.94	2597	3757	29.52	40237	87216	46979	1.09
45 x 10	5.25	71.27	13.06	2573	3778	28.75	39961	86423	46463	1.14
45 x 20	5.65	78.59	13.34	2452	3340	30.08	39684	82372	42686	1.12
45 x 30	5.81	79.83	13.70	2289	2816	31.34	39407	76912	37505	1.04

Table 2.4.15.

AGRON.4/18.System intensification for soybean productivity augmentation under ridge furrow planting

Zone: Southern **Character:** Plant dry matter, CGR and RGR and RUE

Treatment	Dry weight/plant (g)			CGR ($g/m^2/day$)		RGR (g/g/day)		RUE (kg/ha/mm)
	30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS	
Variety								
JS 93 05	4.91	11.66	20.94	8.07	8.55	0.041	0.029	6.86
MACS 1188	5.82	14.79	24.02	11.57	8.56	0.047	0.025	8.17
Plant geometry (cm)								
45 x 5	5.26	11.78	21.87	10.73	13.65	0.043	0.028	8.31
45 x 10	5.24	12.38	21.77	8.93	9.69	0.044	0.029	7.87
45 x 20	5.60	13.94	22.89	9.03	6.67	0.044	0.026	7.14
45 x 30	5.37	14.75	23.33	10.60	4.23	0.348	0.027	6.73

Table 2.5.1.

AGRON. 5/18: Evaluation of bio-efficacy of MACARENA (Bio-stimulant) on soybean

Zone: Central **Variety:** RVS 24 **Character:** Seed yield (kg/ha)

Treatment	Seed yield (kg/ha)			
	Kota	Amrawati	Sehore	Mean
RDF (20:40:40:30 NPKS kg/ha)	1843	1676	1438	1652
RDF + MACARENA @ 625 ml/ha (2 spray) at pre flowering and pod initiation	1894	1825	1457	1725
T value	0.13	-2.39	0.537	-
Significance	NS	262	NS	-

Table 2.5.2.

AGRON. 5/18: Evaluation of bio-efficacy of MACARENA (Bio-stimulant) on soybean

Centre: Kota **Variety:** RVS 24 **Character:** Growth and yield attributes

Treatment	Plant dry weight (g/plant)		Straw yield (kg/ha)	Branches/ Plant	Pods/ Plant	Seed index (g)	HI (%)
	30 DAS	60 DAS					
RDF (20:40:40:30 NPKS kg/ha)	2.20	8.67	2472	2.87	31.23	10.14	40.45
RDF + MACARENA @ 625 ml/ha (2 spray) at pre flowering and pod initiation	2.26	8.97	2471	3.28	33.13	10.23	39.23

Table 2.5.3.

AGRON. 5/18: Evaluation of bio-efficacy of MACARENA (Bio-stimulant) on soybean

Centre: Sehore **Variety :** RVS-24

Character: Plant dry weight**,** Seed yield (kg/ha), Straw yield, Pods/plant, Seed Index and harvest Index

Treatment	**Plant dry weight (g/plant)**		**Straw yield (kg/ha)**	**Pods/ plant**	**Seed index (g)**	**HI (%)**
	30 DAS	**60 DAS**				
RDF (20:60:20:20 NPKS kg/ha)	1.68	4.53	2543	31.90	9.90	36.18
RDF + MACARENA @ 625 ml/ha (2 spray) at pre flowering and pod initiation	1.80	4.75	2296	32.06	9.85	32.63
T value	2.025	1.126	(-)0.164	0.245	(-)0.429	0.486
Significance	NS	NS	NS	NS	NS	NS

Table 2.5.4.

AGRON. 5/18: Evaluation of bio-efficacy of MACARENA (Bio-stimulant) on soybean

Centre: Amravati **Variety :** RVS 24 **Character:** Seed yield (kg/ha)

Treatment	**Plant dry weight (g/plant)**			**Straw yield (kg/ha)**	**Bran-ches/ plant**	**Pods/ plant**	**Seed index (g)**	**HI (%)**
	30 DAS	**60 DAS**	**At Harvest**					
RDF (30:75:30:20 NPKS kg/ha)	2.72	6.9	10.19	1896	2.08	21.90	10.36	46.93
RDF + MACARENA @ 625 ml/ha (2 spray) at pre flowering and pod initiation	2.60	7.17	10.85	2098	2.60	26.03	10.53	46.51
T value	0.542	-0.859	-1.218	-2.643	-2.16	- 3.141	- 1.174	--
Significance (0.05)	NS	NS	NS	2.262	NS	2.262	NS	--

Table 2.5.5.

AGRON. 5/18: Evaluation of bio-efficacy of MACARENA (Bio-stimulant) on soybean

Centre: Adilabad **Variety:** Basara (ASb-22) **Character:** Seed yield (kg/ha)

Treatment	**Plant dry weight at DAS (g/plant)**			**Seed yield (kg/ha)**	**Straw yield (kg/ha)**	**Branches/ plant**	**Pods/ plant**	**Seed index (g)**	**HI (%)**
	30	**45**	**60**						
RDF (50-60-40-20 NPKS kg/ha)	4.18	13.89	16.79	2237	4369	2.90	57.0	12.8	33.9
RDF + MACARENA @ 625 ml/ha (2 spray) at pre flowering and pod initiation	4.09	14.48	20.37	2684	4816	3.30	66.4	13.1	35.7
T value	0.42	1.58	5.63	4.12	2.75	2.76	2.36	1.05	2.79
Significance	NS	NS	2.20	2.26	2.26	2.26	2.26	2.26	2.26

Table 2.5.6.

AGRON. 5/18: Evaluation of bio-efficacy of MACARENA (Bio-stimulant) on soybean

Centre: Raipur **Variety:** JS 97-52

Treatment	Plant dry weight (g/plant)			Seed yield (kg/ha)	Straw yield (kg/ha)	Bran-ches/ Plant	Pods/ plant	Seed index	HI (%)
	30 DAS	45 DAS	60 DAS						
RDF (25,60,40,20,NPKS kg/ha)	1.152	12.40	50.98	1710	3162.6	3.46	52.68	9.59	35.07
RDF + MACARENA @ 625 ml/ha (2 spray) at pre flowering and pod initiation	1.154	13.26	67.88	2024	3885.2	3.84	56.58	9.88	34.25
T value	0.16	5.28	1.42	5.36	8.83	2.89	1.94	3.34	3.29
Significance	0.87	0.0008	0.19	0.0007	2.13	0.02	0.89	0.01	0.01

अग्रिम पंक्ति प्रदर्शन
Frontline Demonstrations

Principal Investigator	**Dr. S.D. Billore, IISR, Indore**
Northern Hill Zone	
Palampur (Himachal Pradesh)	Dr. (Mrs.) Vedna Kumari
Almora (Uttarakhand)	Dr. Anuradha Bhartiya
Northern Plain Zone	
Ludhiana (Punjab)	Ms. Harpreet Kaur / Dr. Guriqbal Singh
Pantnagar (Uttarakhand)	Dr. Ajay Kumar Srivastava
Eastern Zone	
Raipur (Chattisgarh)	Dr. Ram Mohan Savu
Ranchi (Jharkhand)	Dr. A.K. Singh
Dholi (Bihar)	Dr. Anil Pandey
North Eastern Hill Zone	
Imphal (Manipur)	Dr. (Mrs.) Toijam Sunanda Devi
Medziphema (Nagaland)	Dr. Engrala Ao
Central Zone	
Indore (Madhya Pradesh)	Dr. S.D. Billore / Dr.B.U. Dupare
Sehore (Madhya Pradesh)	Dr. M.D. Vyas
Kota (Rajasthan)	Dr. D.S. Meena
Parbhani (Maharashtra)	Dr. S.P. Mehtre
Amravati (Maharashtra)	Dr. M.S. Dandge
SOPA, Indore (Madhya Pradesh)	Shri. Jitendra Singh
Srijan (Rajasthan)	Shri Sharique Mahmood
Bharuch(Gujarat)	Dr. M.M. Patel
Karda (Maharashtra)	Dr. Ravindra Kale
Devgadh Baria (Gujarat)	G. J. Patel
Bhopal (Solidarided)	Dr. Suresh Motwani
Southern Zone	
Pune (Maharashtra)	Dr. S.A. Jaybhay / Philips Vargis
Adilabad (Andhra Pradesh)	Dr. C. Sreedhar
Dharwad (Karnataka)	Dr.Songshetty Balkunde
Ugarkhurd (Karnataka)	Mr. Jagadish S. Patwardhan
Sangli (Maharastra)	Dr. Dilip Kathmale /Dr. M.P. Deshmukh

Soybean Frontline Demonstration

Table 6.1.

Final Progress Report of Frontline Demonstrations (FLDs) of SOYBEAN crop

Name and Postal address of the ICAR Crop Improvement Project with Pin code	**ICAR-Indian Institute of Soybean Research**, Khandwa Road, Indore-452 001, Madhya Pradesh 452001
For the Year	2018-19

S. No.	**Name of implementing centre**	**Physical**				**Financial**
		Allocation		**Achievement**		**Allocation (Gross)**
		Number of FLDs	**Area in ha**	**Number of FLDs**	**Area in ha**	
1	Almora	10	4.00	222	4.86	30000
2	Palampur	10	4.00	42	4.30	30000
3	Ludhiana	10	4.00	10	4.00	30000
4	Pantnagar	10	6.00	11	4.40	30000
5	Sehore	10	4.00	10	4.00	30000
6	Indore	50	20.00	50	20.00	150000
7	Kota	20	8.00	20	8.00	60000
8	Parbhani	25	10.00	25	10.00	75000
9	Amravati	20	8.00	20	8.00	60000
10	Pune	20	8.00	20	8.00	60000
11	Sangli	25	10.00	25	10.00	75000
12	Adilabad	10	4.00	10	4.00	30000
13	Dharwad	10	4.00	10	4.00	30000
14	Raipur#	10	4.00	10	4.00	30000
15	Ranchi	10	4.00	20	4.00	30000
16	Imphal	15	6.00	15	6.00	45000
17	Medziphema	10	4.00	10	4.00	30000
18	Dholi (RAU)	15	6.00	18	6.20	45000
19	KVK, Karda	75	30.00	75	30.00	225000
20	Bharuch, Gujrat	15	6.00	14	6.00	45000
21	Devgarhbaria	10	4.00	10	4.00	30000
22	Ugarkhurd	50	40.00	50	20.00	150000
23	SOPA, Indore	250	100.00	250	100.00	750000
24	Soliddaridad, Bhopal	100	40.00	100	40.00	300000
25	Srijan, Rajasthan	110	44.00	110	66.04	3300000
	Total	**900**	**382**	**1147**	**379.8**	**2700000**

Data not included in summation

Table 6. 2.

Details of category wise beneficiaries of frontline demonstrations (FLDs)

Name and Postal address of the ICAR Crop Improvement Project with Pin code	**ICAR-National Soybean Research Institute**, Khandwa Road, Indore-452 001, Madhya Pradesh
For the Year	2018-19

S. no.	Centre	Man					Women					Total
		SC	**ST**	**OBC**	**Gen.**	**Total**	**SC**	**ST**	**OBC**	**Gen.**	**Total**	
1	Almora	43	-	-	55	**98**	56	-	-	68	**124**	**222**
2	Palampur	5	1	11	10	**27**	2	1	3	9	**15**	42
3	Ludhiana	-	-	-	10	**10**	-	-	-	-	**-**	10
4	Pantnagar	-	-	-	-	**11**	-	-	-	-	**-**	11
5	Sehore	-	-	8	1	**9**	-	-	1	-	**1**	10
6	Indore	5	5	25	13	**48**	-	-	2	-	**2**	50
7	Kota	4	2	10	1	**17**	-	3	-	-	**3**	20
8	Parbhani	-	-	9	14	**23**	1	-	-	1	**2**	25
9	Amravati	1	2	10	3	**16**	1	1	2		**4**	20
10	Pune	3	3	5	6	**17**	-	-	2	1	**3**	20
11	Sangli	-	1	8	16	**25**	-	-	-	-	**-**	25
12	Adilabad	1		1	6	**8**		2			**2**	10
13	Dharwad	2	1	-	7	**10**	-	-	-	-	**-**	10
14	Raipur#	-	-	10	-	**10**	-	-	-	-	**-**	10
15	Ranchi	-	14	6	-	**20**	-	-	-	-	**-**	20
16	Imphal	-	3	9	-	**12**	-	2	1	-	**3**	15
17	Medziphema	-	6	-	-	**6**	-	4	-	-	**4**	10
18	Dholi (RAU)	-	-	-	18	**18**	-	-	-	-	**-**	18
19	KVK, Karda	5	1	60	6	**72**		1	2		**3**	75
20	Bharuch, Gujrat	-	6	-	1	**7**	-	6	-	1	**7**	14
21	Devgarhbari a	-	-	10	-	**10**	-	-	-	-	**-**	10
22	Ugarkhurd	3	3	-	35	**41**	1	-	-	8	**9**	50
23	SOPA, Indore	7	3	185	39	**234**	1		13	2	**16**	250
24	Soliddaridad , Bhopal	13	-	62	20	**95**	-	-	1	4	**5**	100
25	Srijan, Rajasthan	1	3	19	2	**25**	26	24	31	4	**85**	110
	Total	**93**	**54**	**438**	**263**	**859**	**88**	**44**	**58**	**98**	**288**	**1147**
	Percentage	**10.97**	**6.37**	**51.65**	**31.01**		**30.60**	**15.30**	**20.17**	**34.11**		
	Total (men +women)	**181**	**98**	**496**	**361**	**1136**						
	Percentage	**15.93**	**8.63**	**43.66**	**31.78**							

Data not included in summation

Table 6.3.

Results of Frontline Demonstrations (FLDs) on WHOLE PACKAGE in SOYBEAN conducted at various locations on farmers fields

Name and Postal address of the ICAR Crop Improvement Project with Pin code	**ICAR- National Soybean Research Institute**, Khandwa Road, Indore-452 001, Madhya Pradesh
For the Year	2018-19

S. No.	**Implementing centre**	**No. of trial (1147)**	**Area (ha) (369.80)**	**Grain yield (kg/ha)**		**Gross Returns (Rs/ha)**		**Cost of cultivation (Rs/ha)**		**Net returns (Rs/ha)**	
				IP*	FP**	IP	FP	IP	FP	IP	FP
1	Almora	222	4.86	1753	1339	81437	63416	46469	44969	34969	18448
2	Palampur	42	4.30	1422	1114	73933	57953	38200	34540	35733	23413
3	Ludhiana	10	4.00	1655	-	56254	-	30110	-	26144	-
4	Pantnagar	11	4.40	1945	1480	66145	50326	30768	26362	35378	23964
5	Sehore	10	4.00	1605	1083	48135	32475	19214	17067	28921	15408
6	Indore	50	10.00	2074	1849	70316	62680	21900	21000	48416	41680
7	Kota	20	8.00	1719	1512	58266	51265	22089	19717	36177	31548
8	Parbhani	25	10.00	1753	1484	59591	50434	33154	31950	26437	18493
9	Amravati	20	8.00	1668	1511	55545	45783	27932	26683	27613	19101
10	Pune	20	8.00	2888	2350	95287	77550	33994	31699	61294	45854
11	Sangli	25	10.00	3043	2404	103459	39025	42143	39025	61316	42718
12	Adilabad	10	4.00	2343	1948	76264	63449	31350	25282	44914	38167
13	Dharwad	10	4.00	2335	1736	78915	58677	40300	31788	38615	26908
14	Raipur#	10	4.00	1635	1174	55580	39906	18595	14825	36985	25081
15	Ranchi	20	4.00	1527	1148	51908	39035	24370	20150	27538	18885
16	Imphal	15	6.00	1677	1040	100594	62383	34031	21445	66563	40938
17	Medziphema	10	4.00	1593	1085	95592	65100	30676	22828	64916	42272
18	Dholi (RAU)	18	6.20	1847	1427	73889	57078	24515	22956	49374	34121
19	KVK, Karda	75	30.00	2082	1786	71302	61164	31404	28923	39897	32241
20	Bharuch, Gujrat	14	6.00	1575	1377	43322	37871	18714	17552	24608	20319
21	Devgarhbaria	10	4.00	1457	967	43695	28043	21910	16250	21785	11793
22	Ugarkhurd	50	20.00	2066	1772	60869	52181	48337	43937	13646	9252
23	SOPA, Indore	250	100.00	1577	1162	53612	39519	17333	13950	36279	25569
24	Soliddaridad, Bhopal	100	40.00	1347	1133	45811	38517	21099	18771	24712	19746
25	Srijan, Rajasthan	110	66.04	993	664	28907	19308	11180	9620	17727	9688
	Mean			**1831**	**1451**	**66377**	**50141**	**29216**	**25498**	**37207**	**26545**
	T value			5.30664E-11		6.79571E-06		6.75163E-06		2.01266E-06	

*IT= Improved technology, **FP= Farmer's practice, *** Significant at 0.05 probability level, # data not included in mean

Table 6.4.

Performance of SOYBEAN varieties under whole package in FLDs conducted at various locations on farmers fields

Name and Postal address of the ICAR Crop Improvement Project with Pin code	**ICAR- National Soybean Research Institute**, Khandwa Road, Indore-452 001, Madhya Pradesh
For the Year	2018-19

S. No.	No. of trial	Variety	Grain yield (kg/ha)		Gross Returns (Rs/ha)		Cost of cultivation (Rs/ha)		Net returns (Rs/ha)		BC Ratio	
			(IP)	(FP)	IP	FP	IP	FP	IP	FP	IP	FP
1	445	JS 95 60	1314	996	43060	32799	13472	11413	25897	24229	2.18	2.14
2	111	VLBhatt 201	1275	854	90528	69146	50406	48906	40122	20240	1.80	1.41
3	86	VLS 77	1956	1555	80184	63757	45156	43656	35028	20101	1.78	1.46
4	70	MAUS 158	1807	1557	61621	53136	32277	30436	29343	22701	1.92	1.76
5	52	JS 93 05	1711	1481	55814	46733	29546	27047	26258	20153	2.13	1.99
6	30	JS 20 34	1532	1226	53141	43932	19643	17356	33499	26575	2.65	2.39
7	28	DSb 21	2192	1758	67986	55363	44319	37863	24900	17500	1.59	1.51
8	25	MAUS 162	2020	1706	68960	58215	32281	30437	36679	27777	2.14	1.92
9	23	Hara soy	1403	1112	72970	57833	38200	34540	34770	23293	1.91	1.67
10	23	JS 20 29	1560	1321	52952	44831	20908	19185	32045	25647	2.51	2.30
11	19	VLS 59	1875	1452	76864	59536	45156	43656	31708	15880	1.7	1.36
12	18	PUSA 97 12	1847	1427	73889	57078	24515	22956	49374	34121	3.01	2.49
13	17	KDS 344	3013	2358	102435	39025	42143	39025	60292	41160	2.43	2.05
14	15	JS 97 52	1651	1120	79362	52190	28740	22215	50623	29975	1.66	1.33
15	15	RKS 45	1672	1471	56692	49867	22089	19717	34603	30150	1.57	1.53
16	14	GJS 3	1575	1377	43322	37871	18714	17552	24608	20319	1.31	1.16
17	10	RKS 18	1863	1438	90384	65991	31227	23486	59157	42506	2.24	2.16
18	10	NRC 37	1457	967	43695	28043	21910	16250	21785	11793	2.00	1.54
19	10	SL 958	1655	-	56254	-	30110	-	26144	-	1.89	-
20	10	Basra	2343	1948	76264	63449	31350	25282	44914	38167	2.44	2.52
21	10	DSb 19	1624	1111	97416	66648	34031	23812	63385	42836	1.86	1.80
22	9	Him soy	1484	1141	77162	59309	38200	34540	38962	24769	2.02	1.72
23	8	BSS2	1543	1140	52454	38760	24370	20150	28084	18610	1.15	0.92
24	8	KDS 726	3107	2502	105633	39025	42143	39025	63490	46028	2.51	2.18
25	7	MACS 1188	2996	2411	98882	79554	34416	31694	64466	47860	2.85	2.51
26	7	MACS 1460	2596	2125	85682	70125	32888	31120	52794	39005	2.6	2.25
27	7	Palam soy	1403	1089	72949	56606	38200	34540	34749	22066	1.91	1.64
28	6	VLS 47	1907	1493	78173	61226	45156	43656	33017	17570	1.73	1.4
29	5	MACS 1281	3245	2600	107085	85800	35746	33159	71339	52641	3.01	2.6
30	5	JS 20 98	1947	1600	66081	54305	21687	19208	44394	35098	3.05	2.81
31	5	MAUS 612	1792	1514	60910	51461	33154	31950	27756	19511	1.83	1.61
32	5	RKS 113	1858	1636	62986	55460	22089	19717	40897	35743	1.85	1.81
33	4	PS1347	1863	1481	63325	50362.5	31325	26703	32000	23659.5	2.02	1.89
34	4	RVS 24	1734	1244	52013	37313	19214	17067	32799	20246	2.7	2.19
35	3	PS 24	2183	1536	74233	52213	31325	26703	42908	25510	2.37	1.96
36	3	JS 335	1576	865	94530	51900	34031	19046	60499	32854	1.78	1.72
37	3	RVS 2002 04	1558	992	46750	29750	19214	17067	27536	12683	2.43	1.74
38	3	RVS 18	1478	958	44350	28750	19214	17067	25136	11683	2.31	1.68
39	2	PS1225	1900	1475	64600	50150	31325	26703	33275	23447	2.06	1.88
40	2	JS 20 69	2330	2175	78987	73733	21900	21000	57087	52733	3.61	3.51
41	1	PS 1092	1550	1200	52700	40800	25196	22950	27504	17850	2.09	1.78
42	1	PS 23	2050	1600	69700	54400	31325	26703	38375	27697	2.23	2.04

Table 6.5.

Details of soybean cultivation cost under improved technology and farmers practice 2018-19

Centre		**Land preparation**	**Seed & Sowing**	**ST & Ino'n**	**Fertili. & appli'n**	**Herb'e & appli'n**	**Bird watching**	**Hand weeding / Iner-Culti'n**	**Insec'e & appli'n**	**Fungi'e &s appli'n**	**Harv-esting**	**Thres-hing**	**Any other**	**Total**
Palampur	IT	7000	9870	45	8840	3090	-	-	-	-	3640	3120	-	38200
	FP	7000	9000	-	4500	-	-	5200	-	-	3640	3120	-	34540
Ludhiana	IT	3375	4500	75	3120	1500	-	-	600	-	-	16640	-	30110
Pantnagar	IT	3960	5728	163	5366	2540	614	5000	3390	-	3070	1187	307	31325
	FP	3960	4978	113	4252	1893	614	4300	2443	-	2456	1187	307	26703
Indore	IT	4200	4150	100	3200	2000	-	-	1000	-	4000	2200	-	21900
	FP	3600	4500		2164	2054	-	-	1500	-	4000	2200	-	21000
Kota	IT	3500	4360	233	2164	2054	-	-	804	-	4824	2000	-	19939
	FP	3500	4200	-	-	1250	-	-	804	-	4824	2000	-	16578
Parbhani	IT	5500	5400	626	5392	2398	-	1100	3170	-	4700	3068	-	33154
	FP	5500	8000	-	3075	2398	-	1100	4580	-	4700	2597	-	31950
Adilabad	IT	1250	6500	50	4985	4446	1200	3150	3162	870	2400	2650	687	31350
	FP	1250	4810		5696	1115	-	6300	2125	730	2400	2650	206	25282
Sangli	IT	2300	3150	200	2457	1000	-	1000	1200	-	2000	3000	-	16857
	FP	2300	1960	150	1900	1000	-	1000	1200	-	2000	3000	-	15610
Pune	IT	8571	5599	183	6133	1882	-	2285	1452	-	3611	7121	1235	33994
	FP	8571	6200	-	5281	1842	-	3246	1151	-	3648	5805	1235	31710
Dharwad	IT	8900	5806	595	10993	1818	2544	4430	3040	-	1500	1500	-	40300
	FP	8900	5275	-	7050	-	2000	4800	668	800	1250	1250	-	31788
Amravati	IT	4200	5575	240	4385	2250	-	2900	1824	-	3500	1710	-	26584
	FP	4200	5850	-	3275	2250	-	1800	1890	-	3500	1425	728	24961
Ranchi	IT	3000	6135	550	6780	510	-	2295	510	-	1785	2040	-	24370
	FP	2400	5625	150	5600	-	-	2805	510	-	1275	1785	-	20150
Imphal	IT	3200	7625	300	7806	-	-	4500	450	450	1800	2700	-	34031
	FP	2400	7125	-	2631	-	-	3375	225	-	1800	2700	-	21256
Medziphema	IT	2500	5500	1291	7518	-	220	4400	440	-	1760	3300	-	33109
	FP	2500	6260	-	440	-	-	3520	-	-	2640	2200	-	20060
Bharuch	IT	5250	5100	59	2390	1600	-	-	320	-	-	3750	-	18719
	FP	5250	5460	-	1290	1600	-	-	400	-	-	3750	-	17550
Devgarhbaria	IT	7200	6550	420	3391	2080	-	-	670	-	1200	1200	-	22041
	FP	7200	1400	-	4716	-	-	1200	540	-	1200	1200	-	17456
Dholi	IT	2594	4476	455	11283	-	-	939	469	-	2035	1635	-	24263
	FP	2594	5958		8939	-	-	939	469	-	2035	1635	-	22843
Solidridad	IT	3335	4278	240	4360	988	590	1976	882	-	2964	1235	-	21242
	FP	2470	4826	200	4261	1289	-	-	1324	-	2964	1235	-	18616
Ugar khurd	IT	5500	5316	88	8649	-	-	9540	3183	1486	7950	4000	-	48337
	FP	5500	5200	-	8235	-	-	9540	-	-	7950	3400	-	43937
Srijan	IT	3225	1925	150	880	1000	-	500	400	-	1500	1500	-	11180
	FP	1600	2750	-	1420	500	-	-	250	-	1600	1600	-	9620
Raipur#	IT	1800	4845	460	3810	1840	-	-	1340	-	2500		1500	18095
	FP	1800	4845	370	3810	-	-	-	-	-	2500		1500	14825
Mean	**IT**	**4428**	**5377**	**303**	**5505**	**1947**	**1034**	**3144**	**1419**	**935**	**3013**	**3278**	**743**	**28050**
Percentage		**15.79**	**19.17**	**1.08**	**19.62**	**6.94**	**3.68**	**11.21**	**5.06**	**3.33**	**10.74**	**11.69**	**2.65**	**100.00**
Mean	**FP**	**4247**	**5230**	**153**	**4151**	**1563**	**1307**	**3509**	**1255**	**765**	**2993**	**2355**	**619**	**23769**
Percentage		**17.87**	**22.00**	**0.64**	**17.47**	**6.58**	**5.50**	**14.76**	**5.28**	**3.22**	**12.59**	**9.91**	**2.60**	

\# data not included in mean

Table 6.7.

Productivity potentials and profitability of whole package technologies (2018-19)

State	Centre	No of Demon (1147)	Mean yield (kg/ha)		Increase in yield (%)	Gross Returns (Rs/ha)		Cost of cultivation (Rs/ha)		Additi-onal net returns (Rs/ha)	B:C ratio	
			IT	FP		IT	FP	IT	FP		IT	FP
Uttarakhand	Almora	222	1753	1339	33.36	81437	63416	46469	44969	18021	1.75	1.41
HP	Palampur	42	1422	1114	27.45	73933	57953	38200	34540	12320	1.94	1.68
Punjab	Ludhiana	10	1655			56254		30110				
Uttarakhand	Pantnagar	11	1945	1480	31.42	66145	50326	30768	26362	15819	2.15	1.91
MP	Sehore	10	1605	1083	32.91	48135	32475	19214	17067	13513	2.51	1.90
MP	Indore	50	2074	1849	10.55	70316	62680	21900	21000	7636	3.21	2.99
Rajasthan	Kota	20	1719	1512	13.67	58266	51265	22089	19717	7000	1.64	1.60
Maharashtra	Parbhani	25	1753	1484	18.09	59591	50434	33154	31950	7944	1.79	1.57
Maharashtra	Amravati	20	1668	1511	9.61	55545	45783	27932	26683	8512	1.99	1.71
Maharashtra	Pune	20	2888	2350	22.87	95287	77550	33994	31699	15442	2.80	2.45
Maharashtra	Sangli	25	3043	2404	27.23	103459	39025	42143	39025	64434	2.45	2.09
Telengana	Adilabad	10	2343	1948	20.50	76264	63449	31350	25282	6748	2.44	2.52
Karnataka	Dharwad	10	2335	1737	35.00	78915	58677	40300	31788	20219	1.96	1.85
Chhattisgar	Raipur#	10	1527	1148	39.51	55580	39906	18595	14825	15674	2.99	2.69
Jharkhand	Ranchi	20	1527	1148	33.20	51908	39035	24370	20150	12872	1.13	0.94
Manipur	Imphal	15	1677	1040	63.60	100594	62383	34031	21445	22804	1.96	1.90
Meghalaya	Medziphema	10	1593	1085	47.74	95592	65100	30676	22828	22644	2.14	1.88
Bihar	Dholi (RAU)	18	1847	1427	29.45	73889	57078	24515	22956	15364	3.01	2.49
Maharashtra	KVK, Karda	75	2082	1786	16.60	71302	61164	31404	28923	7935	2.27	2.11
Gujrat	Bharuch	14	1575	1377	14.42	43322	37871	18714	17552	4289	1.31	1.16
Gujrat	Devgarhbaria	10	1457	967	33.60	43695	28043	21910	16250	9992	2.00	1.54
Karnataka	Ugarkhurd	50	2066	1772	16.59	60869	52181	48337	43937	8934	1.28	1.21
MP	SOPA, Indore	250	1577	1162	35.71	53612	39519	17333	13950	14093	3.09	2.83
MP	Soliddaridad, Bhopal	100	1347	1133	19.62	45811	38517	21099	18771	7294	2.17	2.05
Rajasthan	Srijan, Rajasthan	110	993	664	30.30	28907	19308	11180	9620	9599	1.30	1.54
	Mean		**1831**	**1451**	**26.19**	**66377**	**50141**	**29216**	**25498**	**14515**	**2.09**	**1.88**

Data not included in mean

कीट विज्ञान
Entomology

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Southern Zone	
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Table 3.1: Ent. 1 a. Seasonal incidence of insect-pests and their bio-control agents

SMW	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
DELHI (Var. JS 335)																
YMV	YMV rating 8.00 on a scale of 1 – 9															
White fly	Low incidence of White fly (maximum up to 2.8 flies per leaf.															
PANTNAGAR (Var. Bragg)																
White fly / 3 leaf	--	--	--	--	0.0	0.3	0.8	3.3	0.3	2.5	4.8	3.9	3.2	3.0	1.2	0.5
Stem fly % Infest.	--	--	--	--	16.7	43.3	76.7	83.3	83.3	86.7	90.0	90.0	90.0	93.3	100	100
Stem fly % Stem tunnelling	--	--	--	--	1.6	5.1	6.3	7.2	8.4	9.8	17.0	17.5	22.1	28.4	35.0	36.0
Aphids / 3 leaf	--	--	--	--	0.0	0.3	0.8	3.3	0.3	2.5	4.8	3.9	3.2	3.0	1.2	0.5
S. litura/m	--	--	--	--	0.0	0.0	0.0	0.0	1.2	3.3	4.3	3.1	1.1	0.7	0.6	0.0
% Defoliation	9.9 % at Flowering															
Minor insect pests	Girdle beetle, Semiloopers, *S. obliqua*, bugs															
SEHORE (Var. JS 335)																
Blue beetle/m	-	2.0	2.8	1.5	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	-	-
G. gemma/m	-	-	-	-	0.6	1.0	4.5	1.3	3.7	6.5	2.1	0.8	-	-	-	-
C. acuta/m	-	-	-	-	1.0	1.3	3.6	1.2	3.6	4.6	2.4	0.5	-	-	-	-
Defoliation (%)	9.0 % at flowering and 19.5 % at peak incidence															
Stem fly % Infest.	-	-	-	-	30.0	60.0	70.0	70.0	80.0	80.0	80.0	80.0	80.0	-	-	
Stem fly % ST	-	-	-	-	8.78	18.90	27.66	23.59	22.87	29.92	34.13	43.97	40.03	-	-	-
Girdle beetle %	-		-	0.3	1.3	2.5	4.2	5.4	8.5	11.2	12.5	13.5	14.8	-	-	-
Minor insect pests	Gray weevil *(Myllocerus sp.)*, Field crikets ,Jassid and white fly. Incidance of tobacco caterpiller and *Helicoverpa* was observed at negligible level															
PARBHANI (Var. MAUS 2)																
O. brevis % Infestation	--	0.00	0.00	1.94	1.94	1.94	5.88	9.76	9.82	10.44	**14.56**	14.56	14.56	**--**	**--**	--
Green semilooper larvae/mrl	--	0.00	0.00	0.00	0.00	0.33	1.67	2.33	2.66	4.66	2.67	2.00	1.33	--	--	--
Defoliation (%)	At flowering -2.93 %, at Peak larval incidence – 7.69%.															
M. sojae	35.42 % stem tunnelling at physiological maturity															
Minor insect pests	*H. armigera*, *Condica illecta*, *Spodoptera litura*, Jassids, White fly, Grey Weevil															
AMARAWATI (Var. JS 335)																
Minor insect pests	Semilooper, *S. litura*, Stem fly, Girdle beetle, White fly, Jassids															

SMW	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**
KOTA (Var. JS 335)																
Girdle beetle (%)	-	-	-	-	3.3	6.7	10.0	13.3	16.7	16.7	20.0	23.3	26.7	-	-	-
C. acuta / m	-	-	-	-	2.00	2.33	3.33	5.33	5.33	4.00	2.33	1.67	0.67	-	-	-
S. litura / m	-	-	-	-	-	-	3.00	3.67	4.00	3.33	2.67	1.33	0.33	-	-	-
White fly/plant	-	-	-	-	1.33	2.33	2.67	2.67	3.00	2.33	2.67	3.00	0.67	-	-	-
Jassids/plant	-	-	-	-	1.33	2.00	3.00	3.33	3.33	2.67	3.33	3.00	1.33	-	-	-
Defoliation (%)	10.0 % foliage damage was observed at flowering whereas, 30.0% foliage damage at 34 SMW.															
Minor insects	Grass hoppers, Field cricket, Hairy caterpillars & Grey weevil															
DHARWAD (Var. JS 335)																
S. litura /m	-	-	-	-	0.40	0.95	1.65	2.90	3.70	4.00	3.60	3.15	2.35	1.60	-	-
T. orichalcea/m	-	-	-	-	0.25	0.30	0.60	0.95	1.15	1.20	0.90	0.65	0.50	-	-	-
H. indicata Infestation (%)	-	-	-	-	-	10.75	13.80	16.75	19.90	22.35	19.25	17.60	15.75	-	-	-
O. brevis Infestation (%)	-	-	-	-	-	3.20	3.55	3.90	4.15	4.40	4.95	5.40	5.10	-	-	-
M. sojae Stem tunneling (%)	-	-	-	-	-	1.95	2.01	2.25	3.90	4.47	4.30	-	-	-	-	-
C. ptychora Pod damage (%)	-	-	-	-	-	-	-	-	-	33.15	34.50	36.90	40.35	43.55	45.08	-
% Defoliation	11.75% at Flowering and 28.20% at peak incidence of larvae															
Minor insect pests	*Spilarctia obliqua*, *H. armigera*, *N. viridula*, Myllocerous,															
IMPHAL (Var. JS 335)																
S. obliqua/m	37.3	30.7	66.7	**106.7**	70.	49.7	12.7	0.0	0.0	0.0	0.0	-	-	-	-	-
Leaf Weber /m	10.3	9.3	**14.7**	10.7	9.7	5.3	4.0	4.7	11.7	7.7	2.0	-	-	-	-	-
S. litura/m	0.0	0.0	0.7	6.7	7.0	**10.0**	9.7	5.0	6.7	9.0	1.3	-	-	-	-	-
Aphids / plant	10.0	11.9	13.4	14.1	12.5	**24.8**	22.0	17.9	15.50	7.2	0. 0	-	-	-	-	-
Stem fly	12.0 % seedling mortality; 5.68 % stem tunnelling at physiological maturity															
% Defoliation	16.3 % at Flowering and 22.1 % at peak incidence															
Minor insect pests	*H. armigera*, white fly, Thrips, Bean bug															

SMW	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
PALAMPUR (Him Soya)																
Bean bug (no. of bugs/m row)	2.5	3.2	4.0	4.3	3.4	4.2	4.4	3.8	3.5	3.0	2.4	2.2	2.0	1.5	0	0
Girdle beetle (%)	0	0	2.0	2.5	3.6	4.0	4.5	6.4	6.5	8.0	5.6	5.0	4.2	0	0	0
Jassids (no. on 3 leaves /plant)	0	0	6.5	8.4	12.0	12.4	15.4	16.0	16.5	15.0	10.5	5.4	4.0	0	0	0
White flies (no. 3 leaves/plant)	0	0	0	10.5	12.6	14.5	15.0	12.5	10.0	8.5	4.5	0	0	0	0	0
Minor insect-pests	Blister beetles, *Epicauta* species were also observed to feed on the flowering parts during first week of September															

Table 3.2: Ent. 1 b. Seasonal incidence of bio- control agents

SMW	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
SEHORE																
Bacterial infection	10 % larval mortality during 1st week of September															
B. bassiana infec.	4-5 % larval mortality during Auguat 3rd week															
PARBHANI																
Lady bird beetle/MRL	--	0.00	0.00	0.33	0.33	0.33	0.33	1.33	1.00	1.33	0.67	0.33	1.00	--	--	--
Spider/MRL	--	0.00	0.00	0.00	0.00	0.33	0.33	1.33	0.33	2.00	2.00	2.67	4.33	--	--	--
AMRAVATI																
Lady bird beetle	--	--	0.0	0.0	0.0	0.0	1.0	2.0	3.0	3.0	2.0	--	--	--	--	--
KOTA	10.00% parasitization of Cotesia was observed under laboratory condition, whereas maximum predatory bug (Cantheconidia) was observed on 34 (SMW).															
DHARWAD																
Coccinelid beetle/mrl	--	--	--	--	--	0.80	1.20	1.35	1.50	0.90	0.70	0.65	--	--	--	--
C. carnea /mrl	--	--	--	--	--	0.70	0.85	0.90	0.85	1.25	0.95	--	--	--	--	--
Spiders/plant	--	--	--	--	0.20	0.25	0.30	0.50	0.70	0.45	0.35	0.15	--	--	--	--
Spined soldier bug/plant (*Podisus maculiventris*)	--	--	--	--	--	--	0.60	0.75	1.15	0.90	0.65	--	--	--	--	--
Apanteles sp. Parasitization (%)	--	--	--	--	--	--	6.50	7.00	7.50	6.85	5.25	--	--	--	--	--
N. rileyi Infection (%)	--	--	--	--	--	6.70	6.95	7.25	8.30	8.85	9.95	10.85	--	--	--	--
IMPHAL																
Spiders/plant	0.9	0.8	0.8	0.6	1.0	0.9	0.9	0.7	0.6	0.6	0.4	--	--	--	--	--
Coccinelids/plant	0.5	0.9	0.7	0.6	1.3	1.1	0.7	0.7	0.4	0.3	0.3	--	--	--	--	--
Larval mortality %	10 to 20 % larval mortality due to *N. rileyi* and *B. bassiana* infection during late July to mid August															

Table 3.3: Ent. 2 a. Field screening of AVT entries (Central Zone) for resistance to major insect-pests (Defoliators)

S. No.	Entry	Defoliators larvae / m		Defoliation (%)	Reaction to Insect-Pest complex				Semiloopers		*S. litura* (larvae/m)
		Amrawati	Kota	Sehore	Amrawati	Kota	Sehore	Prabhani	Sehore	Prabhani	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1.	AMS 100-39	0.38 (1.10) MR	4.67 (2.38) – LR	12.50 R	R-HY	S-LY	R-LY	S-HY(T)	2.39 (1.73) LR	2.75 (1.80) MR	1.25 (1.29) MR
2.	AMS 2014- 1	0.38 (1.10) MR	-	12.75 R	R-HY	-	R-HY	S - LY	1.33 (1.34) MR	5.00 (2.34) HS	1.75 (1.49) LR
3.	AMS-MB5-18	0.25 (1.00) MR	5.50 (2.55) – LR	15.33 R	R-HY	S-HY	S-Ly	S - LY	0.83 (1.07) R	3.50 (2.00) LR	1.25 (1.31) MR
4.	BAUS 102	0.63 (1.25) LR	-	12.70 R	S-LY	-	S- LY	S - LY	2.16 (1.59) LR	5.25 (2.39) HS	2.00 (1.58) LR
5.	CSB 10084	0.13 (0.75) HR	-	14.25 R	S-LY	**-**	R-LY	S - LY	0.83 (1.08) MR	2.50 (1.72) MR	1.50 (1.41) MR
6.	CSB 10112	-	-	16.23 R	**-**	**-**	R-HY	S - LY	1.33 (1.34) MR	3.25 (1.93) LR	1.25 (1.31) MR
7.	DS 3106	0.63 (1.29) LR	-	11.50 R	S-LY	-	R-HY	S - LY	0.66 (1.03) R	2.50 (1.72) MR	1.25 (1.31) MR
8.	DS 3108	0.63 (1.29) LR	-	15.50 R	S-LY	-	R-LY	S - LY	0.83 (1.08) R	2.25 (1.64) MR	1.75 (1.47) LR
9.	DSb 32	0.88 (1.43) LR	4.00 (2.23) - MR	6.25 R	S-LY	S-HY	R-LY	S - LY	1.33 (1.34) MR	4.50 (2.23) S	1.75 (1.49) LR
10.	DSb 34	0.13 (0.75) HR	3.84 (2.20) - MR	8.50 R	S-LY	S-LY	R-HY	S-HY(T)	1.00 (1.14) MR	2.50 (1.70) MR	1.25 (1.31) MR
11.	KDS 921	0.63 (1.29) LR	-	10.55 R	S-LY	-	S-LY	S - LY	0.22 (0.82) HR	4.50 (2.23) S	2.25 (1.65) LR
12.	KDS 992	-	-	8.00 R	**-**	-	S-LY	S-HY(T)	1.22 (1.82) MR	3.75 (2.06) LR	1.75 (1.49) LR
13.	MACS 1493	0.50 (1.21) LR	5.17 (2.48) - LR	7.50	R-LY	S-LY	R-HY	R-HY	0.33 (0.87) HR	3.00 (1.86) LR	1.75 (1.47) LR
14.	MACS 1520	0.38 (1.10) MR	4.00 (2.23) - MR	11.73 R	S-LY	S-LY	R-LY	S - LY	2.66 (1.74) LR	2.50 (1.70) MR	1.75 (1.49) LR
15.	MACSNRC 1575	0.50 (1.18) LR	4.67 (2.38) - MR	6.00 R	S-LY	S-LY	S-LY	S - LY	0.83 (1.08) MR	1.75 (1.43) **R**	1.50 (1.41) MR
16.	MACSNRC 1667 (EDV)	-	4.00 (2.24) - MR	13.10 R	**-**	S-LY	R-LY	S - LY	0.66 (1.01) R	2.75 (1.80) MR	1.75 (1.49) LR
17.	NRC 128	0.13 (0.75) HR	-	12.50 R	R-LY	-	S-LY	S-HY(T)	0.66 (1.07) R	3.00 (1.86) LR	2.00 (1.58) LR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
18.	NRC 130	0.88 (1.43) LR	5.00 (2.45) - LR	11.10 R	S-LY	R-LY	R-LY	R-HY	0.99 (1.19) MR	2.75 (1.79) MR	1.75 (1.47) LR
19.	NRC 131	0.88 (1.43) LR	4.84 (2.42) - MR	8.50 R	S-LY	S-LY	S-HY	R-LY	2.00 (1.58) LR	2.25 (1.65) MR	1.50 (1.40) MR
20.	NRC 132	0.75 (1.35) LR	4.34 (2.31) - MR	9.50 R	S-LY	S-LY	R-HY	S - LY	3.66 (2.03) S	2.00 (1.57) MR	1.75 (1.49) LR
21.	NRC 134	0.38 (1.10) MR	-	21.00 MR	R-LY	-	S-LY	S - LY	3.33 (1.95) LR	3.00 (1.86) LR	1.50 (1.41) MR
22.	NRC 136	0.50 (1.18) LR	-	13.27 R	R-LY	-	R-HY	R-LY	1.33 (1.30) MR	4.75 (2.29) S	2.50 (1.73) LR
23.	NRC 137	0.50 (1.18) LR	5.17 (2.48) - LR	11.25 R	R-LY	S-LY	R-HY	S - LY	1.49 (1.41) MR	5.25 (2.39) HS	2.25 (1.65) LR
24.	NRC 147	0.25 (0.85) R	-	22.07 MR	R-HY	-	R-LY	S - LY	0.50 (0.96) R	2.25 (1.65) MR	1.75 (1.49) LR
25.	NRCSL 1	0.13 (0.75) HR	-	15.50 R	S-LY	-	R-LY	S-HY(T)	0.49 (0.99) R	3.25 (1.93) LR	1.50 (1.41) MR
26.	PS 1611	0.75 (1.35) LR	-	15.17 R	S-LY	-	R-HY	S-HY(T)	1.66 (1.47) MR	3.50 (1.98) LR	1.50 (1.41) MR
27.	PS 1613	0.38 (1.10) MR	-	10.83 R	S-LY	-	R-HY	S - LY	2.66 (1.75) LR	3.00 (1.87) LR	1.00 (1.22) MR
28.	RSC 10-52	0.38 (1.10) MR	5.17 (2.48) - LR	16.50 R	R-LY	S-LY	R-HY	S - LY	1.50 (1.40) MR	4.75 (2.29) S	1.75 (1.49) LR
29.	RSC 10-71	0.63 (1.29) LR	-	15.20 R	R-HY	-	R-LY	S - LY	1.99 (1.40) MR	2.50 (1.73) MR	1.25 (1.31) MR
30.	RSC 11-03	0.63 (1.29) LR	-	17.50 R	R-HY	-	R-LY	S-HY(T)	1.16 (1.19) MR	1.50 (1.41) HR	1.75 (1.47) LR
31.	RSC 11-07	0.38 (1.10) MR	-	12.50 R	R-LY	-	R-LY	R-HY	3.33 (1.95) LR	1.75 (1.49) R	1.50 (1.40) MR
32.	SKF-SPS-11	0.50 (1.18) LR	-	-	R-HY	-	-	S - LY	-	1.50 (1.41) HR	1.00 (1.20) MR
33.	SL 1068	0.38 (1.10) MR	-	14.25 R	R-LY	-	R-LY	S - LY	3.33 (1.94) LR	3.25 (1.93) LR	1.50 (1.41) MR
34.	SL 1104	0.75 (1.35) LR	-	7.75 R	S-LY	-	S-HY	S - LY	0.50 (0.96) R	4.25 (2.17) LR	1.25 (1.31) MR
35.	SL 1123	-	-	14.75 R	-	-	S-LY	S - LY	1.50 (1.40) MR	3.25 (1.93) LR	2.00 (1.57) LR
36.	VLS 94	0.63 (1.25) LR	-	15.00 R	S-LY	-	R-LY	S - LY	0.99 (1.19) MR	2.25 (1.65) MR	1.25 (1.31) MR
37.	VLS 95	-	-	17.75 R	-	-	R-LY	S - LY	1.66 (1.42) MR	1.75 (1.49) R	1.50 (1.40) MR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
38.	DSb21 (ZC)	-	-	-	-	-	-	S - LY	-	3.25 (1.93) LR	2.50 (1.72) LR
39.	JS 20-34 (ZC)	0.75 (1.35) LR	3.84 (2.20) - MR	16.50 R	S-LY	S-LY	S-HY	S - LY	0.99 (1.19) MR	1.25 (1.31) HR	1.00 (1.20) MR
40.	JS 335 (ZC)	0.63 (1.25) LR	-	12.57 R	S-LY	-	R-LY	S-HY(T)	4.49 (2.19) S	3.25 (1.93) LR	2.25 (1.65) LR
41.	JS 93-05 (ZC)	-	-		-	-	S-LY	S-HY(T)	4.66 (2.24) HS	2.25 (1.64) MR	2.00 (1.58) LR
42.	JS 97-52 (ZC)	0.75 (1.37) LR	8.34 (3.00) - S	25.20 MR	R-LY	S-LY	R-LY	S - LY	4.16 (2.13) LR	1.25 (1.31) HR	0.50 (1.00) R
43.	MACS 450 (ZC)	-	5.00 (2.45) – LR	17.02 R	-	S-LY	S-HY	S - LY	3.66 (2.04) S	3.00 (1.86) LR	1.75 (1.49) LR
44.	NRC 86 (ZC)	0.50 (1.18) LR	5.17 (2.48) - LR	18.00 R	R-LY	S-LY	R –HY	S - LY	2.66 (1.67) LR	3.00 (1.86) LR	1.25 (1.31) MR
45.	PS 1092 (ZC)	-	-	15.23 R	-	-	S-LY	S - LY	3.33 (1.95) LR	3.75 (2.06) LR	1.50 (1.41) MR
46.	PS 1347 (ZC)	-	-	12.57 R	-	-	R-LY	S - LY	2.66 (1.78) LR	2.75 (1.80) MR	1.50 (1.41) MR
47.	Pusa 97-12 (ZC)	-	-	-	-	-	-	S - LY	-	1.75 (1.49) R	2.25 (1.65) LR
48.	RKS 18 (ZC)	-	-	-	-	-	-	S - LY	-	3.00 (1.86) LR	1.25 (1.31) MR
49.	SL 958 (ZC)	-	-	-	-	-	-	S - LY		4.00 (2.11) LR	2.00 (1.57) LR
50.	VLS 59 (ZC)	-	-	21.00 MR	-	-	S-HY	S - LY	3.00 (1.85) LR	3.75 (2.06) LR	1.50 (1.41) MR
51.	VLS 63 (ZC)	-	-	7.75 R	-	-	R-LY	S-HY(T)	6.83 (2.70) HS	3.75 (2.06) LR	1.25 (.131) MR
52.	DSb 28-3	-	-	-	-	-	-	S - LY	-	3.25 (1.92) LR	1.75 (1.49) LR
53.	JS 20-71	-	-	-	-	-	-	S - LY	-	3.75 (2.06) LR	2.00 (1.58) LR
54.	KDS 753	-	-	-	-	-	-	S - LY	-	1.75 (1.49) R	1.25 (1.31) MR
55.	NRC 94	-	-	-	-	-	-	-	-	2.50 (1.73) MR	1.75 (1.49) LR
56.	RSC 10-46	-	-	-	-	-	-	S-HY(T)	-	4.25 (2.17) LR	2.50 (1.73) LR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
57.	RSC 10-70	0.38 (1.10) MR	-	-	R-LY	-	-	S-HY(T)	-	3.75 (2.05) LR	1.50 (1.36) MR
58.	RVS 2007-6	-	-	-	-	-	-	R-HY	-	4.25 (2.17) LR	2.00 (1.57) LR
59.	RVS 2009-9	0.75 (1.35) LR	-	-	R-LY	-	-	S-HY(T)	-	3.75 (2.05) LR	0.25 (0.85) HR
60.	RVS 2010-1	-	-	-	-	-	-	S-HY(T)	-	3.50 (1.98) LR	2.00 (1.54) LR
61.	JS 20-89	-	-	-	-	-	-	S - LY	-	3.25 (1.93) LR	1.25 (1.31) MR
62.	JS 20-96	-	-	-	-	-	-	S - LY	-	4.00 (2.11) LR	1.50 (1.41) MR
63.	JS 20-98	-	-	-	-	-	-	S - LY	-	2.50 (1.73) MR	0.75 (1.11) MR
64.	KDS 869	-	-	-	-	-	-	S-HY(T)	-	2.75 (1.80) MR	1.00 (1.20) MR
65.	MACS 1340	-	-	-	-	-	-	R-LY	-	3.75 (2.06) LR	1.00 (1.20) MR
66.	MAUS 61 (ZCh)	-	-	-	-	-	-	S - LY	-	2.50 (1.70) MR	1.25 (1.29) MR
67.	PS 1556	-	-	-	-	-	-	R-LY	-	4.50 (2.23) S	2.75 (1.80) S
68.	PS 1572	-	-	-	-	-	-	S - LY	-	4.25 (2.17) LR	2.00 (1.58) LR
69.	RVS 2001-18	-	-	-	-	-	-	S - LY	-	1.75 (1.47) R	1.50 (1.40) MR
70.	MAUS 2 (LC)	-	-	-	-	-	-	S - LY	-	3.75 (2.05) LR	1.75 (1.49) LR
71.	MAUS 158(LC)	-	-	-	-	-	-	R-HY	-	2.50 (1.73) MR	1.50 (1.41) MR
72.	DS 3105	0.38 (1.10) MR	-	-	R-LY	-	-		-		
73.	KDS 980	0.38 (1.10) MR	-	-	S-LY	-	-		-		
74.	KDS 1045	0.63 (1.29) LR	-	-	R-LY	-	-		-		

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
75.	NRC 125	0.50 (1.18) LR	-	-	S-LY	-	-		-		
76.	NRC 126	0.38 (1.10) MR	-	-	S-LY	-	-		-		
77.	NRC 127	0.38 (1.10) MR	-	-	R-LY	-	-		-		
78.	JS 95-60 (C)			21.25 MR			S-LY		1.49 (1.41) MR		
79.	SL 688 (C)			15.00 R	S-HY		S-HY		1.99 (1.56) LR		
	SEm ±	**(0.09)**	**(0.15)**	**-**					**(0.21)**	**(0.12)**	**(0.12)**
	CD at 1 %	**-**	**-**	**-**					**-**	**(0.34)**	**(0.34)**
	CD at 5 %	**(0.27)**	**(0.44)**	**-**					**(0.72)**	**(0.44)**	**(0.45)**
	CV	**(11.33)**	**-**	**-**					**-**	**(9.38)**	**(12.41)**

Table 3.4 :Ent. 2 b. Field screening of AVT entries (Central Zone) for resistance to major insect-pests (STEM BORERS)

S. No.	Entry	% Stem tunnelling due to stem fly			Girdle beetle infestation (%)			
		Amrawati	Parbhani	Sehore	Amrawati	Parbhani	Kota	Sehore
(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)
1.	AMS 100-39	4.00 (0.14) HR	25.65 (30.40)***R**	24.05 (29.24)MR	0.00 (0.71) **HR**	8.86 (16.90)* MR	18.34 (23.76) - LR	7.48 (15.98)MR
2.	AMS 2014- 1	7.00 (0.27) HR	20.44 (26.78) **HR**	19.08 (25.87) MR	0.00 (0.71) **HR**	2.56 (9.15) MR		8.04 (16.32) MR
3.	AMS-MB5-1 8	9.00 (0.30) HR	43.17 (41.07) HS	24.53 (29.37)MR	0.00 (0.71) **HR**	10.40 (18.68) LR	18.34 (23.76) - LR	4.35 (11.89)HR
4.	BAUS 102	19.00 (0.45) MR	28.78 (32.43) MR	31.16 (33.46)LR	0.00 (0.71) **HR**	10.48 (18.80) LR	-	6.51 (14.71)R
5.	CSB 10084	35.00 (0.63) LR	37.58 (37.79) LR	44.93 (42.07)LR	1.88 (1.53) LR	10.39 (18.70) LR	-	17.55 (24.60) LR
6.	CSB 10112	-	20.69 (27.04) **HR**	22.69 (27.99)MR	-	13.86 (21.82) LR	-	9.94 (18.32)MR
7.	DS 3106	19.00 (0.45) MR	44.01 (41.54) HS	11.90 (14.16) R	3.13 (1.90) HS	5.34 (13.32) MR	-	4.33 (11.89)HR
8.	DS 3108	58.00 (0.87) HS	50.05 (50.02) HS	16.82 (23.53)MR	1.25 (1.32) LR	5.49 (9.67) MR	-	13.01 (21.02) MR
9.	DSb 32	29.00 (0.57) LR	35.88 (36.75) LR	10.77 (19.03)R	3.13 (1.90) HS	14.46 (22.31) LR	8.34 (16.23) - HR	3.08 (9.91) HR
10.	DSb 34	13.00 (0.37) R	30.27 (33.37) MR	22.35 (28.17)MR	1.88 (1.53) LR	7.67 (15.24) MR	6.67 (14.63) - HR	9.80 (18.11) MR
11.	KDS 921	39.50 (0.68) LR	36.74 (37.29) LR	25.13 (30.01)MR	1.25 (1.32) LR	14.61 (22.38) LR	-	30.27 (33.11)HS
12.	KDS 992	-	16.21 (23.73) **HR**	15.37 (22.92)MR	-	11.29 (18.00) MR	-	21.59 (27.61)LR
13.	MACS 1493	26.00 (0.53) MR	20.76 (27.07) **HR**	34.03 (35.67)LR	1.88 (1.53) LR	5.14 (12.59) MR	15.00 (21.60) - MR	11.94 (20.08)MR
14.	MACS 1520	39.50 (0.68) LR	56.73 (48.90) HS	33.43 (35.22) LR	2.50 (1.73) HS	12.41 (20.57) LR	11.67(19.14) - MR	16.17 (23.63)LR
15.	MACSNRC 1575	20.00 (0.46) MR	43.31 (41.14) HS	31.24 (33.94) LR	1.25 (1.32) LR	4.42 (12.00) MR	18.34(23.76) - LR	11.30 (19.50)MR
16.	MACSNRC 1667 (EDV)	-	32.58 (34.80) MR	23.46 (28.33)MR	-	12.97 (20.19) LR	15.00(21.60) - LR	21.88 (27.73)LR

(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)
17.	NRC 128	34.50 (0.63) LR	44.68 (41.93) HS	11.90 (14.16) R	0.00 (0.71) **HR**	10.23 (18.58) LR	-	8.46 (16.57)R
18.	NRC 130	18.00 (0.44) MR	43.23 (41.09) HS	35.05 (36.17)LR	0.00 (0.71) **HR**	8.49 (16.93) MR	18.34(23.76) - LR	17.10 (24.30)LR
19.	NRC 131	31.00 (0.59) LR	32.73 (34.88) MR	27.47 (31.52)MR	1.88 (1.53) LR	9.00 (17.46) MR	15.17(21.73) - MR	14.71 (22.49)LR
20.	NRC 132	67.00 (0.96) HS	44.44 (41.80) HS	15.91 (22.58) MR	0.00 (0.71) **HR**	6.09 (14.27) MR	11.67(19.14) – HR	19.64 (26.23)LR
21.	NRC 134	29.00 (0.57) LR	39.66 (39.02) LR	46.65 (43.04) S	0.00 (0.71) **HR**	14.85 (22.29) LR	-	19.43 (26.14)LR
22.	NRC 136	29.00 (0.57) LR	16.93 (24.28) **HR**	47.46 (43.51)S	1.25 (1.32) LR	18.83 (25.56) LR	-	14.52 (22.39)LR
23.	NRC 137	20.00 (0.46) MR	31.43 (34.09) MR	22.17 (27.81)MR	0.00 (0.71) **HR**	12.34 (20.14) LR	18.34(23.76) – LR	4.67 (11.56) HR
24.	NRC 147	37.00 (0.65) LR	28.09 (31.99) MR	37.1 (37.50)LR	1.25 (1.32) LR	16.66 (23.99) LR	-	19.58 (26.24)LR
25.	NRCSL 1	46.00 (0.75) HS	32.98 (35.04) MR	14.56 (22.40)MR	0.00 (0.71) **HR**	10.97 (19.33) LR	-	15.67 (23.28)LR
26.	PS 1611	22.50 (0.49) MR	25.34 (30.22) **R**	13.53 (21.35)MR	0.00 (0.71) **HR**	7.05 (15.34) MR	-	13.43 (21.24) MR
27.	PS 1613	48.00 (0.77) HS	34.30 (35.82) LR	25.16 (29.98)MR	0.00 (0.71) **HR**	6.20 (14.40) MR	-	7.71 (16.03)MR
28.	RSC 10-52	2.00 (0.10)HR	27.34 (31.51) MR	50.06 (45.00)LR	1.88 (1.53) LR	7.60 (15.58) MR	18.34(23.76) – LR	10.89 (19.20)MR
29.	RSC 10-71	11.00 (0.32) HR	37.54 (37.77) LR	27.72 (31.68)MR	3.13 (1.90) HS	14.82 (22.61) LR	-	10.68 (19.05) MR
30.	RSC 11-03	3.00 (0.12) HR	30.32 (33.40) MR	25.06 (29.94)MR	2.50 (1.73) HS	14.65 (22.42) LR	-	5.12 (12.66)HR
31.	RSC 11-07	4.00 (0.14) HR	34.50 (35.96) LR	10.77 (19.03)R	0.00 (0.71) **HR**	18.12 (24.53) LR	-	11.71 (19.94) MR
32.	SKF-SPS-11	29.00 (0.57) LR	45.66 (42.50) HS	-	0.00 (0.71) **HR**	5.50 (13.29) MR	-	-
33.	SL 1068	66.50 (0.95) HS	50.05 (45.02) HS	19.01 (25.74)MR	0.00 (0.71) **HR**	11.23 (19.57) LR	-	21.64 (27.68) LR
34.	SL 1104	30.50 (0.59) LR	54.39 (47.52) HS	8.17 (16.58)R	0.00 (0.71) **HR**	10.25 (17.49) MR	-	10.97 (19.01) MR
35.	SL 1123	-	43.27 (41.10) HS	45.48 (42.39)LR	-	11.83 (19.73) LR	-	3.08 (9.91) HR

(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)
36.	VLS 94	48.00 (0.77) HS	45.75 (42.55) HS	19.60 (26.12) MR	0.00 (0.71) **HR**	9.40 (17.73) MR	-	16.59 (24.00) LR
37.	VLS 95	-	37.92 (38.00) LR	26.22 (30.64)MR	-	13.09 (21.17) LR	-	6.11 (14.19) R
38.	DSb21 (ZC)	-	36.65 (37.25) LR	-	-	1.67 (5.25) R	-	-
39.	JS 20-34 (ZC)	48.00 (0.77) HS	32.47 (34.73) MR	32.37 (34.54)LR	3.13 (1.90) HS	5.36 (12.68) MR	8.34(16.23) – HR	18.03 (25.01) LR
40.	JS 335 (ZC)	23.00 (0.50) MR	45.33 (42.25) HS	30.11 (33.27)LR	5.00 (2.35) HS	10.32 (17.21) MR	21.67(25.69) – S	21.23 (27.37)LR
41.	JS 93-05 (ZC)	-	30.68 (33.62) MR	50.06 (45.00)LR	-	1.25 (4.54) **R**		22.88 (28.49)S
42.	JS 97-52 (ZC)	58.00 (0.87) HS	46.86 (43.17) HS	35.38 (36.37)LR	3.75 (2.04) HS	14.43 (22.23) LR	16.67(22.62) -LR	19.53 (26.19) LR
43.	MACS 450 (ZC)	-	34.50 (35.92) LR	19.18 (22.95) MR	-	0.00 (0.00) **HR**	18.34(23.76) – LR	17.82 (24.95)LR
44.	NRC 86 (ZC)	49.00 (0.78) HS	43.92 (41.47) HS	24.51 (29.62)MR	3.13 (1.90) HS	8.87 (15.91) MR	16.67(22.75) – LR	16.21 (23.62) LR
45.	PS 1092 (ZC)	-	29.10 (32.62) MR	36.03 (36.62)LR	-	10.60 (18.91) LR	-	25.88 (30.54) HS
46.	PS 1347 (ZC)	-	48.54 (44.15) HS	22.54 (28.31)MR	-	6.25 (13.76) MR	-	11.41 (19.69) MR
47.	Pusa 97-12 (ZC)	-	28.73 (32.39) MR	-	-	14.52 (22.37) LR	-	-
48.	RKS 18 (ZC)	-	20.52 (26.80) **HR**	24.51 (29.62)MR	0.00 (0-	14.54 (21.74) LR	-	-
49.	SL 958 (ZC)	-	40.62 (39.53) S	-	-	12.78 (20.91) LR	-	-
50.	VLS 59 (ZC)	20.00 (0.45) **R**	39.85 (39.12) LR	40.29 (39.14)LR	0.00 (0.71) **HR**	9.14 (17.50) MR	-	10.16 (18.52) MR
51.	VLS 63 (ZC)	-	36.86 (37.38) LR	27.56 (31.56)MR	-	14.38 (22.08) LR	-	17.41 (24.53) LR
52.	DSb 28-3	-	21.12 (27.35) **HR**	-	-	7.03 (14.54) MR	-	-
53.	JS 20-71	-	23.18 (28.77) HS	-	-	12.90 (21.04) LR	-	-

(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)
54.	KDS 753	-	3.77 (10.88) **HR**	-	-	7.16 (14.66) MR	-	-
55.	NRC 94	-	25.89 (30.57) **R**	-	-	20.67 (26.67) LR	-	-
56.	RSC 10-46	-	20.67 (27.02) **HR**	-	-	8.93 (16.21) MR	-	-
57.	RSC 10-70	4.00 (0.14) HR	29.59 (32.94) MR	-	0.00 (0.71) HR	7.83 (16.12) MR	-	-
58.	RVS 2007-6	-	17.52 (24.74) **HR**	-	-	18.18 (25.22) LR	-	-
59.	RVS 2009-9	21.00 (0.48) MR	30.22 (33.31) MR	-	0.00 (0.71) **HR**	23.20 (28.09) LR	-	-
60.	RVS 2010-1	-	11.08 (19.43) **HR**	-	-	14.32 (22.17) LR	-	-
61.	JS 20-89	-	47.59 (43.60) HS	-	-	9.46 (17.72) MR	-	-
62.	JS 20-96	-	54.13 (47.36) HS	-	0.00 (0.71) **HR**	18.43 (25.42) LR	-	-
63.	JS 20-98	-	41.90 (40.31) S	-	-	12.40 (19.53) LR	-	-
64.	KDS 869	-	26.65 (31.01) MR	-	-	13.93 (21.81) LR		-
65.	MACS 1340	-	50.03 (45.01) HS	-	-	13.84 (21.60) LR		-
66.	MAUS 61 (ZCh)	-	18.05 (25.13) **HR**	-	-	19.74 (26.36) LR		-
67.	PS 1556	-	42.40 (40.60) S	-	-	17.27 (24.37) LR		-
68.	PS 1572	-	43.22 (41.06) HS	-	-	12.11 (19.95) LR		-
69.	RVS 2001-18	-	24.64 (29.71) **R**	-	-	13.17 (21.15) LR		-
70.	MAUS 2 (LC)	-	37.26 (37.61) LR	-	-	17.88 (24.76) LR		-
71.	MAUS 158(LC)	-	37.17 (37.54) LR	-	-	7.06 (15.00) MR		-

(1)	(2)	(3)	(4)	(5)	(7)	(8)	(9)	(10)
72.	DS 3105	61.00 (0.90) HS		-	4.38 (2.20) HS			-
73.	KDS 980	23.50 (0.51) MR		-	1.88 (1.53) LR			-
74.	KDS 1045	19.00 (0.45) MR		-	0.63 (1.01) MR			-
75.	NRC 125	32.50 (0.61) LR		-	0.00 (0.71) HR			-
76.	NRC 126	28.50 (0.56) LR		-	0.00 (0.71) HR			-
77.	NRC 127	29.00 (0.57) LR		-	3.75 (2.04) HS			-
78.	JS- 9560			17.93 (24.70) MR				31.70 (33.86)HS
79.	SL 688			32.35 (34.18)LR				16.69 (24.10) LR
80.	**SEm ±**	0.05	**(1.60)**	(4.89)	0.11	**(3.88)**	(1.20)	(2.05)
81.	**CD (P=0.05)**	0.15	**(4.44)**	(13.26)	0.33	**(10.74)**	(3.44)	(6.15))
82.	**CD at 1 %**	-	**(5.85)**	**-**	-	**(14.13)**	**-**	
83.	**CV %**	13.97	**(6.47)**	**-**	13.78	**(30.15)**	**-**	

Table 3.5 :Ent. 2 c. Field screening of AVT entries (Northern Plain Zone) for resistance to major insect-pests

S.No.	Entry	Stem tunnelling due to Stem fly (%)		Defoliators larvae / m (TC*)	% Visual rating defoliation at peak	White fly / 3 leaves	Aphids	Girdle beetle infestation (%)	White fly	YMV (1-9 Scale)	Reaction to Pest Complex	
		Pantnagar	Delhi	Pantnagar					Ludhiana	Delhi		Pantnagar
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.	AMS 100-39	15.13 (22.89)HR	-	6.75 (2.59)S	20.50 (26.91)LR	3.95 (1.96)MR	6.70 (2.58)	1.00 (5.55)HR	-	-	-	S-LY
2.	AMS 2014-1	11.47 (19.78)HR	30.38 (33.15)	5.25 (2.29)LR	20.00 (26.55)LR	6.95 (2.63)LR	5.20 (2.27)	1.10 (6.01)HR	-	0	RLY	R-LY
3.	AMS-MS5-18	22.16 (28.07)MR	-	6.00 (2.43)S	9.00 (17.43)HR	8.40 (2.89)LR	7.15 (2.67)	1.10 (6.01)HR	2.00 (1.69)	-	-	S-LY
4.	BAUS 102	15.45 (23.14)HR	-	3.25 (1.80)LR	9.75 (18.19)HR	7.75 (2.78)LR	4.85 (2.19)	1.05 (5.88)HR	-	7	-	R-LY
5.	CSB 10084	8.29 (16.71)HR	21.31 (27.47)	3.00 (1.73)HR	9.50 (17.95)HR	6.70 (2.58)LR	2.35 (1.53)	1.10 (6.01)HR	2.33 (1.81)	1	RLY	R-LY
6.	CSB 10112	9.89 (18.33)HR	-	2.25 (1.48)MR	10.50 (18.91)HR	6.55 (2.56)LR	1.65 (1.28)	1.10 (6.01)HR	1.91 (1.68)	-	-	S-LY
7.	DS 3106	17.77 (24.93)HR	-	2.25 (1.48)MR	9.25 (17.69)HR	7.05 (2.66)LR	6.50 (2.54)	6.00 (14.13)HR	3.67 (2.14)	-	-	R-LY
8.	DS 3108	9.80 (18.24)HR	-	1.00 (0.97)HR	12.25 (20.48)R	6.75 (2.60)LR	9.80 (3.13)	2.15 (8.43)HR		-	-	R-LY
9.	DSb 32	10.62 (19.00)HR	18.79 (24.97)	1.50 (1.21)HR	10.50 (18.90)HR	4.20 (2.04)MR	2.20 (1.47)	2.05 (8.23)HR	2.67 (1.88)	1	RLY	R-LY
10.	DSb 34	18.04 (25.11)R	23.88 (29.25)	2.20 (1.40)HR	16.50 (23.96)LR	2.00 (1.37)HR	5.15 (2.26)	1.00 (5.74)R	2.08 (1.74)	0	**SLY**	R-LY
11.	KDS 921	24.56 (29.70)LR	65.71 (54.18)	0.50 (0.71)HR	29.00 (32.58)S	2.00 (1.37)HR	12.20 (3.49)	2.15 (8.43)LR	1.67 (1.61)	3	**SLY**	S-LY
12.	KDS 992	34.25 (35.81)S	77.20 (61.56)	2.25 (1.48)HR	23.00 (28.64)S	2.85 (1.69)R	14.65 (3.81)	2.25 (9.05)S	**-**	7	RLY	S-LY
13.	MACS 1493	15.18 (22.92)HR	13.32 (21.39)	1.00 (0.97)HR	15.25 (22.97)MR	1.20 (2.08)MR	10.80 (3.29)	4.25 (11.79)HR	1.33 (1.51)	3	RLY	R-LY
14.	MACS 1520	9.76 (18.17)HR	24.61 (29.74)	2.25 (1.50)HR	21.00 (27.27)S	4.65 (2.16)MR	5.00 (2.22)	3.05 (9.93)HR	1.58 (1.57)	7	RLY	S-LY
15.	MACS NRC 1575	14.59 (22.43)HR	0.00 (01.28)	3.25 (1.80)LR	19.50 (26.19)LR	4.15 (2.04)MR	5.65 (2.38)	6.15 (14.30)S	1.50 (1.54)	7	**SLY**	R-LY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
16.	MACS NRC 1667	14.26 (22.17)HR	-	5.50 (2.34)LR	17.50 (24.71)LR	9.50 (3.08)S	12.80 (3.58)	3.20 (10.22)MR	2.58 (1.89)	-	RLY	S-LY
17.	NRC 128	10.59 (18.98)HR	-	3.50 (1.87)LR	12.50 (20.61)R	7.00 (2.65)LR	2.20 (1.47)	4.00 (11.54)LR	2.33 (1.80)	-	-	R-HY
18.	NRC 130	23.01 (28.66)MR	-	5.50 (2.34)LR	20.50 (26.92)LR	2.00 (1.39)HR	24.50 (4.90)	0.50 (4.06)HR	-	-	-	S-LY
19.	NRC 131	6.06 (14.21)HR	-	7.00 (2.64)S	26.50 (30.93)S	3.85 (1.95)MR	12.50 93.54)	1.10 (6.01)HR	-	-	-	S-LY
20.	NRC 132	25.85 (30.56)LR	-	2.75 (1.64)MR	29.00 (32.58)S	4.85 (2.19)MR	9.50 93.08)	0.50 (4.06)HR	-	-	**-**	R-LY
21.	NRC 134	41.01 (39.82)S	-	1.50 (1.23)MR	22.00 (27.92)S	6.80 (2.59)LR	2.65 (1.62)	3.10 (10.03)MR	-	-	**-**	R-LY
22.	NRC 136	15.64 (23.28)HR	-	6.00 (2.44)S	15.00 (22.78)MR	5.00 (2.24)MR	4.00 (2.00)	2.20 (8.52)MR	-	-	-	S-LY
23.	NRC 137	30.13 (33.29)S	-	1.50 (1.21)MR	20.50 (26.91))LR	4.35 (2.08)MR	5.15 (2.27)	1.05 (5.88)HR	-	-	-	R-LY
24.	NRC SL 1	16.09 (23.63)HR	21.93 (27.13)	2.75 (1.66)MR	17.00 (24.27)LR	6.35 (2.51)LR	6.50 (2.55)	2.20 (8.38)MR	-	3	RLY	S-LY
25.	PS 1611	27.32 (31.51)S	9.79 (17.84)	8.00 (2.82)S	23.00 (28.65)S	4.15 (2.03)MR	3.85 (1.96)	5.15 (13.04)LR	-	0	RLY	R-LY
26.	PS 1613	41.10 (39.87)S	-	8.25 (2.86)S	20.50 (26.92)LR	5.00 (2.34)MR	3.70 (1.61)	8.30 (16.73)S	-	-	-	S-LY
27.	RSC 10-52	19.19 (25.97)MR	7.74 (16.15)	3.50 (1.45)MR	10.00 (18.44)HR	5.85 (2.41)LR	4.85 (2.19)	5.15 (13.06)LR	2.41 (1.83)	7	RLY	R-LY
28.	RSC 10-71	43.26 (41.13)S	13.37 (21.38)	2.25 (1.50)MR	16.50 (23.91)MR	6.00 (2.45)LR	1.85 (1.36)	3.00 (9.83)MR	2.58 (1.86)	0	**SLY**	S-LY
29.	RSC 11-03	9.11 (17.50)HR	11.23 (19.49)	2.25 (1.48)MR	18.50 (25.46)MR	3.15 (1.76)R	4.20 (2.05)	3.15 (10.08)LR	2.50 (1.84)	0	RLY	R-LY
30.	RSC 11-07	21.57 (27.66)MR	-	8.50 (2.90)S	19.50 (26.20)LR	4.00 (2.00)MR	3.15 (1.74)	2.10 (8.33)MR	2.41 (1.83)	-	-	S-LY
31.	SKF–SPS-11	16.18 (23.70)HR	-	6.50 (2.54)S	18.00 (25.10)LR	6.45 (2.58)LR	3.00 (1.72)	1.10 (6.01)HR	-	-	-	S-LY
32.	SL 1068	32.23 (34.59)S	-	5.25 (2.29)LR	15.00 (22.78)MR	7.30 (2.70)LR	5.00 (2.22)	2.15 (8.43)MR	2.58 (1.86)	-	-	S-LY
33.	SL 1104	28.79 (32.43)S	-	2.25 (1.55)MR	14.50 (22.38)MR	5.30 (2.29)LR	3.85 (1.96)	1.10 (6.01)HR	3.41 (2.08)	-	-	R-LY
34.	SL 1123	23.30 (28.85)LR	-	1.75 (1.32)MR	15.50 (23.18)MR	8.65 (2.94)LR	1.50 (1.21)	5.30 (13.28)S	2.25 (1.77)	-	-	S-LY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
35.	VLS 94	74.40 (59.65)S	-	3.25 (1.80)LR	22.00 (27.97)S	10.30 (3.21)S	8.00 (2.82)	1.10 (6.01)HR	1.83 (1.66)	-	-	S-LY
36.	VLS 95	60.29 (50.96)S	-	1.75 (1.32)MR	25.00 (29.96)S	7.70 (2.77)LR	7.30 (2.68)	4.00 (11.45)LR	-	-	-	S-LY
37.	NRC 147	19.45 (26.17)MR	8.35 (16.80)	8.25 (2.87)S	26.50 (30.97)S	8.35 (2.89)LR	1.85 (1.36)	3.20 (10.30)LR	2.83 (1.94)	3	RLY	S-LY
38.	DSb 21 (C)	58.01 (49.62)S	-	1.50 (1.21) MR	37.00 (37.45)S	8.00 (2.83)LR	9.15 (3.02)	3.15 (10.22) MR	-	-	-	S-LY
39.	JS 20-34 (C)	13.58 (21.58)HR	-	1.00 (0.71)HR	14.00 (21.96)MR	6.65 (2.57)LR	6.80 (2.59)	1.00 (5.74)HR	3.00 (1.98)	-	-	S-LY
40.	JS 335 (C)	12.36 (20.54)HR	-	8.00 (2.81)S	21.50 (27.62)S	1.50 (1.22)HR	2.80 (1.67)	2.20 (8.53)HR	-	-	-	R-LY
41.	JS 93-05 (C)	22.13 (28.06)MR	-	0.75 (0.61)HR	20.00 (26.57)LR	6.15 (2.47)LR	2.00 (1.22)	1.10 (6.01)HR	2.58 (1.87)	-	-	R-LY
42.	JS 97-52 (C)	41.02 (39.83)S	-	1.75 (1.82)LR	22.50 (28.30)S	9.20 (3.02)S	4.25 (2.06)	6.20 (14.65)S	1.83 (1.65)	-	-	R-HY
43.	MACS 450 (C)	17.14 (24.45)R	11.31 (19.55)	2.75 (1.66)MR	16.50 (23.95)MR	8.15 (2.84)LR	5.15 (2.26)	4.10 (11.68)LR	2.66 (1.89)	7	RLY	R-LY
44.	NRC 86 (C)	26.45 (30.95)LR	-	2.50 (1.55)MR	10.00 (18.44)HR	8.35 (2.89)LR	3.15 (1.74)	4.35 (12.04)LR	-	-	-	S-LY
45.	PS 1347 (C)	37.28 (37.63)S	37.63 (37.78)	2.00 (1.40)MR	11.00 (19.35)HR	5.10 (2.25)LR	7.05 (2.65)	6.10 (14.26)S	3.41 (2.07)	3	RLY	R-LY
46.	PUSA 97-12 (C)	33.58 (35.41)S	19.96 (20.24)	2.50 (1.55)MR	20.50 (26.92)LR	5.05 (2.25)MR	12.65 (3.54)	8.25 (16.69)S	-	0	**SLY**	R-LY
47.	RKS 18 (C)	36.44 (37.13)S	-	3.00 (1.73)MR	19.50 (26.02)LR	8.50 (2.91)LR	3.15 (1.74)	2.10 (8.33)MR	1.92 (1.68)	-	-	R-LY
48.	SL 688 (C)	25.00 (30.00)LR	16.23 (23.4)	6.25 (2.50)S	19.75 (22.57)MR	6.45 (2.54)LR	0.65 (0.77)	8.10 (16.43)S	2.50 (1.84)	0	**SLY**	R-LY
49.	SL 958 (C)	15.88 (23.48)HR	17.33 (24.1)	2.75MR (1.66)	9.50 (17.95)HR	3.80 (1.92)MR	1.80 (1.33)	5.05 (12.92)LR	1.83 (1.65)	7	**RHY**	R-LY
50.	JS 20-71 R-HY	21.24 (27.42)MR	-	3.75LR (1.94)	10.00 (18.44)HR	7.50 (2.70)LR	1.80 (1.33)	3.25 (10.38)LR				S-LY
51.	JS 20-87 R-HY	23.16 (28.75)LR	-	1.50MR (1.21)	12.25 (20.48)R	5.15 (2.27)MR	2.65 (1.62)	8.25 (16.57)S				S-LY
52.	JS 20-89 R-HY	20.42 (26.86)MR	-	4.00 (2.00)LR	12.00 (20.25)R	4.75 (2.17)MR	1.65 (1.28)	6.45 (14.67)S				S-LY
53.	JS 20-98 R-HY	38.68 (38.46)S	-	5.25 (2.29)LR	12.75 (20.91)MR	8.95 (2.99)S	4.00 (1.99)	8.25 (16.57)S				R-HY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
54.	JS 20-116 R-HY	10.71 (19.10)HR	-	4.25 (2.04)LR	16.25 (23.77)MR	7.35 (2.71)LR	2.00 (1.37)	5.30 (13.23)S				S-LY
55.	KDS 726 R-HY	8.22 (16.66)HR	-	6.75 (2.58)S	12.50 (20.61)R	7.45 (2.30)MR	0.85 (0.92)	4.25 (12.58)LR				S-LY
56.	NRC 127 R-HY	36.16 (36.96)S	-	3.50 (1.85)LR	11.75 (19.57)R	7.90 (2.81)LR	3.30 (1.80)	5.80 (13.74)S				R-LY
57.	PS 1543 R-HY	11.27 (19.60)HR	-	2.00 (1.37)MR	18.00 (25.07)LR	4.75 (2.17)MR	4.00 (2.00)	4.25 (11.89)LR				R-LY
58.	PS 1550 R-HY	28.68 (32.37)S	-	2.25 (1.50)MR	15.85 (23.43)MR	6.40 (2.53)LR	3.15 (1.74)	1.00 (5.74)HR				S-LY
59.	SL 955 R-HY	22.93 (28.60)MR	-	4.75 (2.18)LR	16.75 (24.06)LR	7.15 (2.67)LR	4.15 (2.03)	8.25 (16.57)S				S-LY
60.	JS 20-69 S- HY (T)	22.06 (31.31)LR	-	6.75 (2.58)S	7.50 (15.68)HR	5.65 (2.37)MR	2.35 (1.52)	5.20 (13.10)LR				S-LY
61.	JS 20-94 S- HY (T)	59.66 (50.57)S	-	1.75 (1.32)MR	17.00 (24.34)LR	6.45 (2.54)LR	1.85 (1.36)	8.15 (16.59)S				S-LY
62.	RVS 2007-06 S- HY (T)	15.13 (22.89)HR	-	1.75 (1.32)MR	8.75 (17.16)HR	7.45 (2.72)LR	3.35 (1.79)	4.25 (11.89)LR				R-LY
63.	SL 1028	-	15.51 (22.84)							3	RLY	
64.	SL 1074	-	20.26 (26.41)							1	RLY	
65.	DS 3105								7.08 (2.83)			
66.	PS 1092 (Ch)								5.75 (2.59)			
	CD at 5 %	**(2.79)**	**(16.30)**	**(0.64)**	**(0.81)**	**(0.59)**	**-**	**(2.86)**	**(0.14)**	-	-	**-**
	CV%	**(4.87)**	**--**	**(18.04)**	**(54.82)**	**(13.85)**	**(114.66)**	**(13.94)**	**-**	-	-	**-**
	SEm±	**(0.98)**	**--**	**(0.22)**	**(0.28)**	**(0.20)**	**(0.30)**	**(1.01)**	**-**	-	-	**-**

Table 3.6 :Ent. 2 d. Field screening of AVT entries (<u>Southern Zone</u>) for resistance to major insect-pests (<u>DEFOLIATORS, STEM BORERS, POD BORER AND PEST COMPLEX</u>)

S. No.	Entry	Defoliator larvae / m	Pod borer damage (%)	Stem fly (% stem tunneling)	Defoliation (%)	Girdle Beetle % infest.	Reaction to Insect-Pest Complex
		Dharwad					
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	AMS 100-39	3.95 (2.11)LR	35.25 (36.41)LR	25.30 (30.19)LR	44.50 (41.83)MS	10.27 (18.68)MR	S-LY
2.	AMS 2014-1	4.15 (2.16)LR	31.65 (34.22)LR	30.21 (33.33)LR	42.25 (40.53)MS	9.75 (18.19)MR	S-LY
3.	BAUS 102	4.40 (2.21)LR	32.25 (34.59)LR	28.35 (32.16)LR	58.50 (49.87)S	14.29 (22.20)LR	S-LY
4.	CSB 10084	5.10 (2.37)S	32.18 (34.55)LR	27.44 (31.58)LR	55.50 (48.14)S	17.49 (24.71)S	S-LY
5.	CSB 10112	5.35 (2.42)HS	34.58 (36.00)LR	31.66 (34.23)S	60.25 (50.89)S	18.77 (25.66)HS	S-LY
6.	DS 3108	3.85 (2.09)LR	26.18 (30.76)MR	18.59 (25.53)MR	45.50 (42.40)MS	12.38 (20.59)LR	S-LY
7.	DSb 34	2.23 (1.65)R	28.15 (32.03)MR	8.67 (17.12)R	16.50 (23.96)LS	8.06 (16.49)MR	R-HY
8.	KDS 992	2.69 (1.79)MR	33.78 (35.52)LR	14.56 (22.42)MR	22.50 (28.31)LS	11.08 (19.44)LR	R-LY
9.	MACS 1493	2.40 (1.70)R	34.15 (35.74)LR	10.56 (18.96)MR	26.50 (30.97)MS	10.90 (19.27)LR	R-HY
10.	MACSNRC 1575	1.90 (1.55)R	29.64 (32.97)MR	7.49 (15.88)R	28.50 (32.25)MS	9.34 (17.79)MR	R-HY
11.	MACSNRC 1667 (EDV)	2.43 (1.71)R	32.51 (34.75)LR	8.62 (17.07)R	32.25 (34.59)MS	7.49 (15.88)MR	S-HY
12.	NRC 128	2.90 (1.84)MR	31.23 (33.96)LR	20.36 (26.81)LR	32.50 (34.74)MS	10.45 (18.85)MR	S-HY
13.	NRC 130	3.25 (1.94)MR	29.19 (32.69)MR	11.28 (19.62)MR	37.50 (37.75)MS	8.19 (16.62)MR	S-HY
14.	NRC 131	3.15 (1.91)MR	32.21 (34.56)LR	10.19 (18.61)MR	52.00 (46.13)S	9.64 (18.08)MR	S-HY
15.	NRC 132	3.55 (2.01)MR	28.16 (32.04)MR	22.37 (28.22)LR	48.50 (44.12)MS	9.56 (18.00)MR	S-LY
16.	NRC 134	3.70 (2.05)MR	32.16 (34.53)LR	21.28 (27.46)LR	52.50 (46.41)S	12.28 (20.51)LR	S-HY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
17.	NRC 136	2.41 (1.71)R	34.65 (36.05)LR	9.75 (18.19)MR	24.00 (29.32)LS	7.38 (15.76)MR	R-HY
18.	NRC 137	3.74 (2.06)MR	38.53 (38.35)LR	14.75 (22.58)MR	19.50 (26.19)LS	9.53 (17.97)MR	S-HY
19.	NRC 147	2.69 (1.79)MR	33.15 (35.14)LR	25.37 (30.23)LR	68.00 (55.53)S	12.23 (20.46)LR	S-LY
20.	NRCSL 1	3.20 (1.92)MR	31.18 (33.93)LR	16.15 (23.69)MR	30.50 (33.51) MS	8.11 (16.54)MR	S-HY
21.	PS 1611	4.65 (2.27)LR	35.23 (36.39)LR	27.13 (31.38)LR	62.00 (51.92) MS	15.39 (23.09)LR	S-LY
22.	PS 1613	3.90 (2.10)LR	32.57 (34.79)LR	25.46 (30.29)LR	69.50 (56.45)S	14.28 (22.19)LR	R-LY
23.	RSC 11-03	4.85 (2.31)LR	34.25 (35.81)LR	31.16 (33.92)S	65.00 (53.71)S	9.16 (17.61)MR	S-LY
24.	RSC 11-07	4.70 (2.28)LR	35.36 (36.47)LR	27.95 (31.90)LR	62.00 (51.92)S	11.08 (19.44)LR	S-LY
25.	SKF-SPS-11	5.60 (2.47)HS	33.17 (35.15)LR	32.14 (34.52)S	63.50 (52.81)S	17.16 (24.46)S	S-LY
26.	SL 1068	5.19 (2.39)S	33.68 (35.46)LR	23.59 (29.05)LR	42.50 (40.67)MS	9.47 (17.92)MR	S-LY
27.	SL 1123	4.92 (2.33)S	37.46 (37.72)LR	25.67 (30.43)LR	44.00 (41.54)MS	10.28 (18.69)MR	S-LY
28.	VLS 94	2.85 (1.83)MR	34.97 (36.24)LR	14.54 (22.41)MR	28.00 (31.94)MS	14.52 (22.39)LR	R-LY
29.	VLS 95	3.15 (1.91)MR	31.54 (34.15)LR	8.56 (17.01)R	30.50 (33.51)MS	7.86 (16.27)MR	R-LY
30.	AMS-MB5-18	4.30 (2.19)LR	32.17 (34.54)LR	14.58 (22.44)MR	65.00 (53.71)S	16.43 (23.90)LR	S-LY
31.	DS 3106	4.55 (2.25)LR	29.84 (33.10)MR	20.39 (26.83)LR	60.50 (51.04)S	8.16 (16.59)MR	S-LY
32.	DSb 32	2.49 (1.73)R	28.05 (31.97)MR	12.65 (20.83)MR	15.25 (22.98)LS	7.18 (15.54)MR	R-HY
33.	KDS 921	3.69 (2.05)MR	32.14 (34.52)LR	24.36 (29.56)LR	46.50 (42.98)MS	11.35 (19.68)LR	S-LY
34.	MACS 1520	2.80 (1.82)MR	26.28 (30.83)MR	16.48 (23.94)MR	24.00 (29.32)LS	7.34 (15.71)MR	S-HY
35.	RSC 10-52	5.19 (2.39)S	31.57 (34.17)LR	17.84 (24.97)MR	45.50 (42.40)MS	7.45 (15.83)MR	S-LY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
36.	RSC 10-71	5.10 (2.37)S	29.48 (32.87)LR	19.17 (25.96)MR	42.00 (40.38)MS	7.63 (16.03)MR	S-LY
37.	SL 1104	3.15 (1.91)MR	32.11 (34.50)LR	28.64 (32.34)LR	26.50 (30.97)MS	11.29 (19.63)LR	S-LY
38.	DSb 21 (C)	2.42 (1.71)R	29.01 (32.58)MR	12.76 (20.92)MR	30.00 (33.20)MS	5.13 (13.09)R	R-HY
39.	JS 335 (C)	2.95 (1.86)MR	35.58 (36.60)LR	11.89 (20.16)MR	35.00 (36.26)MS	6.39 (14.64)MR	S-HY
40.	JS 93-05 (C)	4.75 (2.29)LR	34.16 (35.75)LR	19.56 (26.24)MR	44.00 (41.54) MS	10.97 (19.33)LR	S-LY
41.	MACS 450 (C)	3.20 (1.92)MR	25.68 (30.44)MR	20.45 (26.88)LR	24.00 (29.32) LS	7.29 (15.66)MR	S-HY
42.	RKS 18 (C)	3.45 (1.99)MR	31.19 (33.94)LR	23.05 (28.68)LR	28.50 (32.25)MS	9.15 (17.60)MR	S-HY
43.	Bragg (C)	5.45 (2.44)HS	45.18 (42.22)S	32.18 (34.55)S	55.75 (48.28)S	17.27 (24.55)S	S-LY
44.	DSb 28 (C)	2.47 (1.71)R	22.16 (28.07)MR	13.57 (21.61)MR	18.50 (25.46)LS	8.19 (16.62)MR	S-HY
45.	JS 20-116 (C)	5.00 (2.35)S	39.57 (38.96)LR	26.87 (31.21)LR	64.00 (53.11)S	12.38 (20.59)LR	S-LY
46.	JS 20-34 (C)	4.95 (2.33)S	46.12 (42.76)S	26.49 (30.96)LR	48.00 (43.84)MS	17.27 (24.55)S	S-LY
47.	JS 20-94 (C)	3.75 (2.06)MR	37.45 (37.72)LR	31.24 (33.97)S	58.00 (49.58)S	12.15 (20.39)LR	S-LY
48.	JS 75-46 (C)	4.80 (2.30)LR	46.22 (42.81)S	32.17 (34.54)S	45.50 (42.40)MS	14.37 (22.27)LR	S-LY
49.	JS 97-52 (C)	4.85 (2.31)LR	45.29 (42.28)S	30.15 (33.29)LR	65.50 (54.01)S	17.45 (24.68)S	S-LY
50.	NRC 125 (C)	3.15 (1.91)MR	33.17 (35.15)LR	16.48 (23.94)MR	32.50 (34.74)MS	11.28 (19.62)LR	S-HY
51.	NRC 126 (C)	3.20 (1.92)MR	31.19 (33.94)LR	18.49 (25.46)MR	34.00 (35.65)MS	9.27 (17.72)MR	S-HY
52.	NRC 127 (C)	2.85 (1.83)MR	38.46 (38.31)LR	15.28 (23.00)MR	28.00 (31.94)MS	10.11 (18.53)MR	S-HY
53.	NRC 37 (C)	2.78 (1.81)MR	35.14 (36.34)LR	10.04 (18.47)MR	23.50 (28.99)LS	7.35 (15.72)MR	R-HY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
54.	NRC 86 (C)	3.05 (1.88)MR	30.42 (33.46)MR	13.54 (21.58)MR	36.50 (37.15)MS	10.95 (19.32)LR	S-HY
55.	PS 1092 (C)	4.75 (2.29)LR	37.85 (37.95)LR	26.71 (31.11)LR	56.00 (48.43)S	15.64 (23.29)LR	S-LY
56.	PS 1347 (C)	4.79 (2.30)LR	36.49 (37.15)LR	29.54 (32.91)LR	32.50 (34.74)MS	16.12 (23.66)LR	S-LY
57.	Pusa 97-12 (C)	5.28 (2.40)HS	46.18 (42.79)S	33.23 (35.19)S	64.50 (53.41)S	17.24 (24.52)S	S-LY
58.	RVS 2009-9 (C)	5.05 (2.36)S	45.59 (42.45)S	24.45 (29.62)LR	52.50 (46.41)S	14.27 (22.19)LR	S-LY
59.	SL 688 (C)	3.80 (2.07)LR	37.28 (37.62)LR	27.85 (31.84)LR	44.25 (41.68)MS	9.56 (18.00)MR	S-HY
60.	SL 958 (C)	3.25 (1.94)MR	39.16 (38.72)LR	28.96 (32.54)LR	40.50 (39.51)MS	11.21 (19.55)LR	R-HY
61.	VLS 59 (C)	3.10 (1.90)MR	34.15 (35.74)LR	22.34 (28.20)LR	34.50 (35.96)MS	14.28 (22.19)LR	S-HY
62.	VLS 63 (C)	2.90 (1.84)MR	36.27 (37.02)LR	25.21 (30.13)LR	38.25 (38.19)MS	13.27 (21.35)LR	S-HY
	SEm±	**0.36**	**4.45**	**3.55**	**1.44**	**1.94**	-
	CD @ 5%	**1.09**	**13.34**	**10.67**	**4.30**	**5.83**	-
	CD @ 1%	**1.47**	**17.85**	**14.24**	**5.77**	**7.23**	-

Table 3.7 :Ent. 2 e. Field screening of AVT entries for resistance to major insect-pests (Imphal)

S. No.	Entry	IMPHAL						
		No. of Bihar Hairy Caterpillar/m	**No. of leaf webber larvae/m**	**No. of tobacco caterpillar larvae/m**	**Percent defoliation at peak incidence/plant**	**No. of Aphids/plant**	**Stem tunnelling at physiological maturity (%)**	**Reaction to Insect-Pest Complex**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
1.	AMS 100-39	188.50 (13.58)* S	10.00 (3.24)*LR	6.50 (2.64)*MR	10.52 (19.31)*LS	16.00 (3.93)* MR	3.99 (12.04)#LR	SLY
2.	AMS 2014-1	30.00 (4.24) MR	7.50 (2.83)MR	6.00 (2.41)MR	12.50 (21.10)LS	28.00 (5.34) LR	4.75 (13.24)LR	SLY
3.	AMS-MB5-18	125.00 (11.20) LR	8.00 (2.87)MR	7.00 (2.71)MR	15.33 (23.22)LS	31.00 (5.58) LR	4.73 (13.22)LR	SLY
4.	BAUS 102	136.50 (11.67) LR	11.00 (3.36)LR	9.00 (3.08)LR	11.85 (20.57)LS	22.40 (4.78) LR	4.24 (12.54)LR	SLY
5.	CSB 10084	**10.00 (2.62) R**	9.00 (3.08)MR	7.00 (2.73)MR	20.40 (27.19)MS	31.00 (5.61) LR	7.32 (16.23)LR	SLY
6.	CSB 10112	63.00 (7.67) MR	8.50 (2.99)MR	7.50 (2.82)MR	18.73 (25.93)MS	16.00 (4.03) MR	0.81 (6.21)MR	SLY
7.	DS 3106	199.00 (14.10) S	6.50 (2.63)MR	7.50 (2.83)LR	10.32 (18.76)LS	28.20 (5.33) LR	4.68 (12.47)LR	SLY
8.	DS 3108	120.00 (10.98) MR	8.00 (2.92)MR	10.50 (3.24)LR	16.17 (23.29)LS	26.00 (5.14) LR	4.59 (12.90)LR	SLY
9.	DSb 32	25.00 (5.03) MR	**3.00 (1.85) R**	**2.50 (1.73)R**	6.65 (15.25)LS	18.80 (4.39) LR	1.17 (6.88)MR	**SHY (T)**
10.	DSb 34	110.00 (10.08) MR	9.50 (3.16)MR	4.50 (2.23)MR	6.02 (14.47)LS	6.80 (2.70) MR	2.75 (9.11)MR	**SHY (T)**
11.	KDS 921	33.00 (5.46) MR	4.00 (2.07)MR	5.00 (2.30)MR	8.37 (17.30)LS	17.00 (3.82) MR	1.76 (7.81)MR	**SHY (T)**
12.	KDS 992	**12.00 (2.83) R**	10.00 (3.24)LR	9.50 (3.08)LR	21.17 (27.66)MS	7.00 (2.68) MR	4.74 (13.23)LR	SLY
13.	MACS 1493	92.00 (9.50) MR	10.00 (3.24)LR	12.50 (3.60)LR	11.53 (20.16)LS	14.50 (3.65) MR	**0.00 (4.05)R**	SLY
14.	MACS 1520	27.00 (4.04) MR	11.00 (3.38)LR	7.50 (2.82)LR	11.73 (20.47)LS	30.00 (5.37) LR	4.49 (12.82)LR	SLY
15.	MACSNRC 1575	**12.00 (2.83) R**	9.50 (3.15)MR	9.50 (3.15)LR	7.37 (16.28)LS	8.00 (2.86) MR	4.97 (13.35)LR	**SHY (T)**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
16.	NRC 128	90.00 (7.07) MR	11.50 (3.46)LR	6.50 (2.63)MR	13.10 (21.53)LS	25.50 (4.99) LR	5.88 (14.63)LR	SLY
17.	NRC 130	142.00 (11.92) LR	7.50 (2.70)MR	9.00 (3.06)LR	19.98 (26.86)MS	29.60 (5.48) LR	4.92 (13.45)LR	SLY
18.	NRC 131	**15.00 (3.11) R**	9.00 (3.08)MR	12.50 (3.60)LR	13.73 (22.09)LS	12.00 (3.54) MR	6.89 (15.74)LR	SLY
19.	NRC 132	162.00 (12.66) S	11.50 (3.46)LR	6.50 (2.64)MR	11.10 (19.90)LS	26.00 (5.14) LR	6.83 (15.66)LR	SLY
20.	NRC 134	25.00 (3.91) MR	9.00 (3.08)MR	8.50 (2.99)LR	12.43 (20.98)LS	18.00 (4.13) MR	3.99 (10.49)MR	SLY
21.	NRC 136	76.00 (8.34) LR	9.50 (3.14)MR	7.50 (2.83)LR	9.60 (18.53)LS	34.60 (5.91) LR	1.81 (7.88)MR	SLY
22.	NRC 137	**14.00 (3.02) R**	10.00 (3.24)LR	6.00 (2.48)MR	12.53 (20.97)LS	16.00 (3.73) MR	3.10 (9.53)MR	SLY
23.	NRC 147	**14.00 (3.02) R**	17.00 (4.18)S	6.50 (2.64)MR	13.27 (21.75)LS	18.00 (4.29) MR	4.49 (10.99)MR	SLY
24.	NRCSL 1	72.00 (7.96) LR	10.00 (3.24)LR	8.00 (2.87)LR	10.43 (19.20)LS	15.00 (3.93) MR	8. 99 (17.94)LR	SLY
25.	PS 1611	40.00 (4.84) MR	8.00 (2.89)MR	8.00 (2.89)LR	22.07 (27.40)MS	31.00 LR (5.61)	**0.00 (4.05)R**	SLY
26.	PS 1613	19.00 (4.41) MR	8.50 (3.00)MR	9.00 (3.08)LR	12.27 (20.35)LS	27.00 (5.24) LR	5.46 (13.90)LR	SLY
27.	RSC 10-52	**15.00 (3.11) R**	10.50 (3.32)LR	10.00 (3.03)LR	15.17 (23.24)LS	11.40 (3.43) MR	7.99 (16.92)LR	SLY
28.	RSC 10-71	**16.00 (3.20) R**	6.00 (2.52)MR	**2.50 (1.73)R**	10.83 (19.36)LS	**3.00 (1.85) R**	4.29 (12.58)LR	**SHY (T)**
29.	RSC 11-03	29.00 (5.18) MR	12.50 (3.60)LR	9.50 (3.15)LR	15.23 (23.30)LS	21.00 (4.63) LR	8.96 (16.34)LR	SLY
30.	RSC 11-07	55.00 (7.25) MR	10.00 (3.23)LR	10.50 (3.29)LR	12.57 (20.76)LS	10.60 (3.10) MR	3.90 (10.40)MR	SLY
31.	SKF-SPS-11	64.00 (7.91) MR	10.50 (3.31)LR	11.00 (3.39)LR	12.50 (21.06)LS	11.60 (3.47) MR	4.92 (13.25)LR	SLY
32.	SL 1068	62.00 (7.49) LR	13.00 (3.66)LR	7.00 (2.74)MR	15.20 (23.28)LS	15.60 (4.01) MR	**0.00 (4.05)R**	SLY
33.	SL 1104	35.00 (4.55) MR	12.50 (3.59)LR	4.00 (2.07)MR	12.83 (20.94)LS	26.00 (5.05) LR	**0.00 (4.05)R**	SLY

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
34.	SL 1123	50.00 (5.37) MR	9.00 (3.06)MR	7.50 (2.83)LR	18.73 (25.96)MS	20.00 (4.21) MR	1.79 (7.86)MR	SLY
35.	VLS 94	25.00 (5.03) MR	9.50 (3.11)MR	6.50 (2.60)MR	18.80 (24.47)LS	8.00 (2.83) MR	6.55 (14.98)LR	SLY
36.	VLS 95	65.00 (6.07) MR	11.50 (3.45)LR	4.00 (2.12)MR	16.17 (21.61)LS	27.60 (5.29) LR	2.14 (8.34)MR	SLY
37.	DSb 21 (C)	87.00 (9.13) LR	8.50 (3.00)MR	12.50 (3.57)LR	22.90 (28.58)MS	13.80 (3.69) MR	4.64 (13.05)LR	SLY
38.	JS 20-34 (C)	**10.00 (2.62) R**	7.00 (2.71)MR	12.00 (3.49)LR	16.83 (23.98)LS	18.40 (4.35) LR	**0.00 (4.05)R**	SLY
39.	JS 335 (C)	136.00 (11.66) LR	11.00 (3.36)LR	13.00 (3.67)LR	23.17 (28.58)MS	24.00 (4.84) LR	10.30 (19.07)LR	SLY
40.	JS 93-05 (C)	103.00 (10.14) LR	13.50 (3.71)LR	7.50 (2.79)MR	21.00 (27.29)MS	20.00 (4.51) LR	**0.00 (4.05)R**	SLY
41.	JS 97-52 (C)	88.00 (8.52) LR	14.50 (3.87)LR	4.50 (2.16)MR	15.83 (23.67)LS	23.00 (4.79) LR	9.80 (18.17)LR	SLY
42.	NRC 86 (C)	**16.00 (4.03) R**	7.00 (2.73)MR	9.50 (3.15)LR	14.07 (22.27)LS	23.00 (4.85) LR	6.20 (14.99)LR	SLY
43.	PS 1092 (C)	36.00 (6.02) MR	9.50 (3.16)MR	**3.50 (2.00)MR**	8.23 (16.58)LS	7.60 (2.77) MR	8.73 (17.26)LR	**SHY (T)**
44.	PS 1347 (C)	38.00 (6.02) MR	12.50 (3.60)LR	5.00 (2.34)MR	10.17 (19.06)LS	18.60 (4.37) LR	9.30 (18.10)LR	SLY
45.	RKS 18 (C)	98.50 (9.89) LR	12.00 (3.51)LR	13.00 (3.67)LR	19.47 (26.36)MS	25.80 (5.13) LR	8.10 (16.97)LR	SLY
46.	SL 688 (C)	73.00 (8.42) LR	**16.50 (4.12) S**	9.50 (3.14)LR	17.90 (25.18)MS	28.00 (5.33) LR	3.90 (10.40)MR	SLY
47.	VLS 59 (C)	65.50 (8.04) LR	11.00 (3.36)LR	11.00 (3.38)LR	19.10 (25.84)MS	29.00 (5.43) LR	6.17 (14.68)LR	SLY
48.	VLS 63 (C)	28.00 (5.31) MR	9.50 (3.16)LR	7.50 (2.82)LR	19.20 (26.04)MS	13.40 (3.72) MR	8.16 (17.11)LR	SLY
	SE ±	2.97	0.43	0.47	3.87	1.01	4.59	
	CD at 5 %	5.98	0.86	0.94	7.78	2.03	9.24	

Table 3.8 :Ent. 2 e. Field screening of AVT-I entries for resistance to major insect-pests (<u>Raipur</u>)

S. No.	Name of Variety	No. of Defoliators/mrl (*S. litura* and *C. acuta*)	No. of W.fly/3 leaves	Thrips/3 leaves	Overall reaction of varieties
(1)	(2)	(3)	(4)	(5)	(6)
1.	NRC-128	3.6 (2.14) MR	4.2 (2.28) LR	2.8 (1.94) LR	SLY
2.	DSb-34	4.0 (2.23) MR	4.2 (2.28) LR	1.8 (1.66) LR	RHY
3.	SL-1068	3.6 (2.14) MR	4.0 (2.23) LR	2.0 (1.72) LR	SLY
4.	NRC-137	3.8 (2.19) MR	4.1 (2.25) LR	1.6 (1.60) MR	SLY
5.	CSb-10084	4.2 (2.28) LR	4.4 (2.32) LR	2.0 (1.72) LR	SLY
6.	MACS-1493	4.4 (2.32) LR	4.6 (2.36) S	1.4 (1.54) MR	SHY
7.	SL-1123	4.4 (2.32) LR	3.6 (2.14) MR	1.8 (1.67) LR	SLY
8.	BAUS-102	4.4 (2.32) LR	3.0 (2.00) HR	1.6 (1.61) MR	SLY
9.	MACS-NRC-1575	4.2 (2.28) LR	4.4 (2.32) LR	1.4 (1.54) MR	SLY
10.	NRC-132	3.8 (2.19) MR	3.0 (2.00) HR	1.0 (1.40) MR	SLY
11.	AMS-2014-1	4.0 (2.23) MR	3.8 (2.19) MR	1.6 (1.61) MR	SLY
12.	DS-3108	3.4 (2.09) MR	3.2 (2.04) HR	1.6 (1.61) MR	SLY
13.	AMS-10039	4.4 (2.32) LR	4.2 (2.28) LR	1.4 (1.54) MR	SLY
14.	NRC-136	3.8 (2.19) MR	4.2 (2.28) LR	1.0 (1.41) MR	SHY
15.	CSb-10112	3.8 (2.19) MR	4.0 (2.23) LR	2.0 (1.72) LR	SLY
16.	PS-1613	4.2 (2.28) LR	3.8 (2.19) MR	1.6 (1.61) MR	SLY
17.	KDS-992	4.6 (2.36) LR	4.2 (2.28) LR	2.0 (1.72) LR	RHY

(1)	(2)	(3)	(4)	(5)	(6)
18.	RSC-11-07	4.4 (2.32) LR	4.2 (2.28) LR	1.6 (1.61) MR	SLY
19.	NRC-SL-1	4.2 (2.28) LR	4.2 (2.28) LR	2.2 (1.78) LR	SLY
20.	PS-1611	4.2 (2.28) LR	3.6 (2.14) MR	2.0 (1.72) MR	SLY
21.	RSC-11-03	4.2 (2.28) LR	4.0 (2.23) LR	2.0 (1.72) LR	SHY
22.	NRC-134	4.0 (2.23) MR	4.0 (2.23) LR	1.8 (1.66) LR	SLY
23.	SKF-SPS-11	5.0 (2.44) S	4.2 (2.28) LR	1.6 (1.61) MR	SLY
24.	NRC-147	3.8 (2.19) MR	4.0 (2.23) LR	1.6 (1.61) MR	SLY
25.	MACS-NRC-1667	4.0 (2.23) MR	4.0 (2.23) LR	1.6 (1.61) MR	SLY
26.	MACS-450	4.2 (2.28) LR	4.0 (2.23) LR	1.8 (1.66) LR	SLY
27.	RKS-18 (C)	5.0 (2.44) S	4.4 (2.32) LR	2.0 (1.72) LR	SLY
28.	Bragg (C)	4.6 (2.36) LR	4.4 (2.32) LR	1.8 (1.66) LR	SLY
29.	JS-335 (C)	4.8 (2.40) LR	4.0 (2.23) LR	1.8 (1.66) LR	SLY
30.	JS-97-52 (C)	4.4 (2.32) LR	3.8 (2.19) MR	2.2 (1.79) LR	SHY
	CD at 5%	**0.181**	**0.121**	**-**	

Table 3.9 :Ent. 2 e. Field screening of AVT-II entries for resistance to major insect-pests (Raipur)

S. No.	Name of Variety	No. of Defoliators/mrl (*S. litura* and *C. acuta*)	Thrips/ 3 leaves	No. of W.fly/ 3 leaves	Reaction of varieties
1.	SL-1104	3.4 (2.10) MR	4.2 (2.28) LR	1.6 (1.61) MR	RLY
2.	DS-3106	3.4 (2.10) MR	3.4 (2.10) HR	2.0 (1.73) LR	SLY
3.	KDS-921	3.8 (2.18) LR	4.0 (2.23) LR	1.6 (1.61) MR	RHY
4.	RSC-10-71	3.8 (2.18) LR	4.4 (2.32) S	2.2 (1.78) LR	RLY
5.	DSb-32	3.8 (2.18) LR	4.0 (2.23) LR	1.6 (1.61) MR	SLY
6.	RSC-10-52	3.6 (2.14) LR	4.2 (2.28) LR	1.6 (1.61) MR	SHY
7.	MACS-1520	4.8 (2.41) HS	3.8 (2.19) MR	2.0 (1.73) LR	SLY
8.	AMS-MB-5-18	3.4 (2.10) MR	4.0 (2.23) LR	1.6 (1.61) MR	SHY
9.	RKS-18 (C)	3.2 (2.05) MR	3.4 (2.10) HR	1.8 (1.66) MR	SLY
10.	Bragg (C)	3.2 (2.05) MR	4.2 (2.28) LR	2.2 (1.78) LR	RHY
11.	JS-335 (C)	3.0 (2.00) MR	4.0 (2.23) LR	1.8 (1.66) MR	SLY
12.	JS-97-52 (C)	3.4 (2.10) MR	4.2 (2.28) LR	1.6 (1.61) MR	RHY
CD at 5%		**0.14**	**0.07**	**-**	**-**

Table 3.10 ENT 3a: Status of AVT-II entries for antixenosis and antibiosis against *S. litura* at Pantnagar:

	Genotypes	Antibiosis			Antixenosis	
		Approx. digestibility AD	Efficiency of Conversion Index ECI	Efficiency of Conversion of Digested food ECD	C value	Antixenosis response
1	AMS-MBS-18	72.63 (58.46)	58.13 (49.78)	80.19 (66.48)	0.94	Slight antixenosis
2	RSC-10-71	70.57 (57.16)	59.72 (50.74)	82.58 (67.64)	1.12	Preferred host
3	RSC-10-52	67.70 (55.79)	42.81 (40.86)	56.12 (48.52)	1.00	Preferred host
4	KDS-921	67.59 (55.42)	67.57 (57.44)	66.10 (54.87)	1.14	Preferred host
5	MACS-1520	75.99 (60.77)	41.37 (40.01)	55.11 (48.00)	0.97	Slight antixenosis
6	DSb 32	71.52 (57.83)	57.99 (49.86)	69.37 (56.46)	0.80	Slight antixenosis
7	DS-3106	78.21 (62.24)	49.30 (44.59)	63.25 (52.72)	0.87	Slight antixenosis
8	SL 1104	81.43 (64.58)	42.87 (40.88)	52.82 (46.62)	0.50	Strong antixenosis
9	JS 335	74.34 (59.67)	59.82 (50.86)	77.57 (64.21)	check	
	SEM±	2.693	04.755	06.353	-	-
	CD at 5%	8.074	17.440	19.047	-	-

Table 3.11 ENT 3b: Status of AVT-II entries for antixenosis and antibiosis against *S. litura*

Antixenosis reaction of AVT-II entries:

S. No.	Genotypes	Pantnagar		Dharwad	
		C value	Response	C value	Response
1	AMS-MBS 18	0.94	Slight	1.19	Preferred
2	RSC 10-71	1.12	Preferred	1.27	Preferred
3	RSC 10-52	1.00	Preferred	1.24	Preferred
4	KDS 921	1.14	Preferred	0.65	Moderate
5	MACS 1520	0.97	Slight	0.78	Slight
6	DSb 32	0.80	Slight	0.56	Moderate
7	DS 3106	0.87	Slight	1.13	Preferred
8	**SL 1104**	**0.50**	**Strong**	0.84	Slight
9	JS 335 (C)	--	--	--	--

Antibiosis reaction of AVT-II entries

S. No.	Genotypes	Pantnagar			Dharwad		
		AD	ECI	ECD	AD	ECI	ECD
1	AMS-MBS 18	72.63	58.13	80.19	70.60	33.38	23.75
2	RSC 10-71	70.57	59.72	82.58	73.86	43.69	35.61
3	RSC 10-52	67.70	**42.81**	**56.12**	74.35	42.62	32.68
4	KDS 921	67.59	67.57	66.10	69.35	32.63	20.01
5	MACS 1520	75.99	41.37	55.11	72.03	39.84	28.76
6	DSb 32	71.52	57.99	69.37	62.35	**26.09**	**15.39**
7	DS 3106	78.21	49.30	63.25	75.61	31.67	24.82
8	SL 1104	81.43	42.87	52.82	68.23	36.70	30.25
9	JS 335 (C)	74.34	59.82	77.57	80.04	49.29	39.94

Table 3.12: Ent.4 a. Field screening of IVT entries for resistance to major insect-pests (Stem fly- % Stem tunneling)

Code no.	Entry	Dharwad	Pantnagar	Sehore	Parbhani	Amrawati	Imphal
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1.	DS 3109	13.12 (21.23)MR	63.08 (52.61)S	7.45 (15.98) MR	55.42 (48.12) HS	48.5 (44.12) MR	4.24 (12.57)#MR
2.	NRC 146	18.25 (25.28)LR	94.63 (76.76)S	35.55 (36.57) LR	41.77 (40.22) S	48 (43.85) MR	6.08 (14.86)LR
3.	PS 1634	9.45 (17.90)MR	26.24 (30.80)HR	17.55 (24.68) MR	44.36 (41.75) HS	45 (42.12) MR	3.81 (11.75)MR
4.	JS 21-71	11.22 (19.56)MR	67.02 (55.00)S	21.30 (27.30) MR	42.37 (40.58) HS	44.5 (41.72)MR	2.85 (10.43)MR
5.	MACS 1566	8.87 (17.32)MR	13.42 (21.47)HR	36.60 (37.20) LR	24.40 (29.47) **R**	39 (38.53)MR	2.91 (10.57)MR
6.	SL 1191	14.39 (22.28)LR	42.42 (43.09)MR	31.63 (34.19) LR	53.30 (46.91) HS	58.5 (49.89)LR	4.35 (12.71)MR
7.	Himso 1688	10.12 (18.54)MR	92.54 (74.46)S	33.16 (34.89) LR	41.03 (39.82) S	53.5 (47.01)LR	**1.39 (7.24)R**
9.	RSC 11-17	3.57 (2.02)MR	48.00 (43.85)LR	41.66 (40.15) LR	31.03 (33.84) MR	25.5 (30.33)R	4.80 (13.22)LR
10.	MAUS 734	4.23 (2.17)LR	96.71 (81.31)S	3.86 (11.63) R	29.32 (32.72) MR	30.5 (32.95)MR	7.84 (16.77)LR
11.	DSb 33	4.05 (2.13)LR	56.13 (48.54)LR	22.20 (27.95) MR	32.42 (34.69) MR	36 (36.80)MR	8.78 (17.73)LR
12.	NRC 138	4.58 (2.25)S	95.13 (77.75)S	25.78 (32.73) LR	36.43 (37.12) LR	31.5 (33.99)MR	**0.00 (4.05)HR**
13.	JS 21-72	4.49 (2.23)S	85.40 (67.80)S	20.28 (26.56) MR	39.86 (39.14) S	66.5 (54.73)LR	4.91 (13.31)LR
14.	PS 1637	3.94 (2.11)LR	32.88 (34.98)HR	4.02 (11.52) R	35.21 (36.37) LR	41 (39.55)MR	3.45 (9.92)MR
15.	AUKS 176	3.27 (1.94)MR	30.28 (33.39)HR	33.62 (35.55) LR	37.10 (37.51) LR	53.5 (47.01)LR	**2.00 (8.15)R**
17.	GJS 3	3.25 (1.94)MR	26.41 (30.92)HR	24.07 (29.35) MR	30.23 (33.35) MR	72.5 (58.53)S	5.88 (14.61)LR
18.	NRC 139	3.27 (1.94)MR	14.37 (22.27)HR	21.95 (27.55) MR	25.50 (30.32) **R**	34.5 (35.91)MR	8.10 (17.04)LR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
19.	DS 3110	3.79 (2.07)LR	17.65 (24.84)HR	30.25 (34.62) LR	28.00 (31.93) MR	36 (36.68)MR	**11.65 (20.40)S**
20.	SL 1171	3.15 (1.91)MR	32.42 (34.69)HR	48.02 (43.82) S	55.13 (47.94) HS	62 (51.97)LR	4.21 (12.52)MR
21.	MACS 1620	4.85 (2.31)HS	37.82 (37.93)R	17.24 (17.96) MR	22.19 (28.06) **HR**	51 (45.58)LR	4.46 (12.82)MR
22.	MAUS 732	3.68 (2.04)MR	26.32 (30.86)HR	8.77 (12.37) R	25.49 (30.31) **R**	59 (50.19)LR	10.67 (19.44)LR
23.	KS 113	3.77 (2.07)LR	65.30 (53.94)S	10.78 (13.82) R	19.73 (26.36) **HR**	65 (53.83)LR	5.97 (14.73)LR
25.	NRC 148	3.85 (2.09)LR	43.71 (41.38)MR	24.99 (29.92)MR	41.23 (39.90) S	36 (36.75)MR	10.67 (19.44)LR
26.	RSC 11-15	3.84 (2.08)LR	29.59 (32.94)HR	37.31 (37.57) LR	17.22 (24.51) **HR**	45.5 (42.41) MR	5.97 (14.73)LR
27.	RVS 2011-10	4.58 (2.25)S	21.29 (27.47)HR	32.50 (34.62) LR	33.76 (35.50) LR	55.5 (48.16)LR	**1.13 (6.81)R**
28.	Himso 1689	3.39 (1.97)MR	34.04 (35.66)HR	12.93 (15.27) MR	39.24 (38.73) LR	64.5 (53.43) LR	**0.00 (4.05)HR**
29.	CAUMS 1	2.75 (1.80)R	58.33 (49.81)S	25.00 (33.83) LR	42.41 (40.61) S	55 (47.94)LR	7.72 (16.66)LR
30.	RVSM 2011-35	4.35 (2.20)LR	33.05 (35.09)HR	31.31 (33.97) LR	18.68 (25.58) **HR**	61.5 (51.68)LR	**3.70 (10.19)R**
31.	VLS 97	3.00 (1.87)MR	72.57 (58.43)S	38.84 (38.52) LR	40.91 (39.75) S	68.5 (55.86)LR	3.07 (9.49)MR
32.	TS 59	3.57 (2.02)MR	34.70 (36.08)HR	26.69 (30.98) MR	33.71 (35.44) LR	46 (42.69)MR	8.30 (17.24)LR
33.	RVS 2007-4	3.32 (1.95)MR	34.96 (36.24)HR	35.20 (36.22) LR	29.93 (33.14) MR	54.5 (47.65)LR	5.36 (13.99)LR
34.	KDS 1073	4.12 (2.15)LR	50.00 (45.00)LR	28.70 (30.87) MR	28.03 (31.96) MR	31 (33.70) MR	**1.07 (6.70)R**
35.	NRCSL 2	3.69 (2.05)LR	73.28 (58.89)S	39.20 (32.62) LR	38.24 (38.18) LR	51.5 (45.86)LR	6.86 (15.54)LR
36.	KDS 1009	4.49 (2.23)S	64.65 (53.53)S	22.20 (27.95) MR	22.42 (28.24) **HR**	45.5 (42.41)MR	6.93 (15.80)LR
37.	BAUS 100	4.76 (2.29)HS	30.71 (33.65)HR	25.78 (32.73) LR	29.54 (32.89) MR	51 (45.58)LR	7.28 (16.19)LR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
8.	**PS 24 (C)**	-	-	-	-	-	-
8.	**PS 1347(C)**	50.96 (45.55)LR	-	-	-	-	-
16.	**SL 688(C)**	13.84 (21.82)HR	-	-	-	-	-
24.	**PUSA 97-12 (C)**	28.98 (32.57)HR	-	-	-	-	-
38.	**SL 958 (C)**	31.25 (33.99)HR	-	-	-	-	-
8.	DSb 21 (C)	-	3.01 (1.87)MR	-	-	-	-
16.	DSb 23 (C)	-	2.78 (1.81)R	-	-	-	-
24.	KS 103	-	3.06 (1.89)MR	-	-	-	-
38.	JS 335	-	3.13 (1.91)MR	-	-	-	-
8.	Code 9	-	-	20.83 (26.85) MR	-	-	-
16.	Code 18	-	-	38.55 (38.34) LR	-	-	-
24.	Code 27	-	-	9.52 (12.92) R	-	-	-
38.	-	-	-	-	-	-	-
8.	Code 8 (NRC 86) ZC	-	-	-	26.77 (31.14) **R**	-	-
16.	Code 16 (JS 20-34) ZC	-	-	-	19.05 (25.72) **HR**	-	-
24.	Code 24 (JS 20-98) ZC	-	-	-	30.20 (33.32) MR	-	-
38.	Code 38 (JS 335) ZC	-	-	-	34.49 (35.93) LR	-	-
8.	NRC-86	-	-	-	-	44 (41.55)MR	-

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
16.	JS-335	-	-	-	-	71 (57.50)S	-
24.	JS-20-34	-	-	-	-	41 (39.81)MR	-
38.	JS-97-52	-	-	-	-	42.5 (40.67) MR	-
8.	JS 97-52 (Check)	-	-	-	-	-	7.85 (16.78)LR
16.	RKS - 113 (Check)	-	-	-	-	-	8.06 (16.99)LR
24.	JS-335 (Check)	-	-	-	-	-	8.29 (17.20)LR
38.	-	-	-	-	-	-	
	SEm±	**1.96**	**1.81**	(6.76)	**1.40**	4.18	3.16
	CD at 5%	**5.89**	**5.21**	(19.26)	**3.89**	11.98	6.40
	CD at 1 %	**7.84**	**-**	**-**	**5.12**	13.30	**-**
	CV %	**-**	**5.90**	**-**	**5.65**	-	**-**

Table 3.13: Ent. 4 b. Field screening of IVT entries for resistance to major insect-pests (Girdle beetle - % Plant infestation)

Code no.	Entry	Dharwad	Pantnagar	Sehore	Parbhani	Amrawati	Kota
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
1.	DS 3109	13.56 (21.60)LR	3.80 (11.19)MR	4.60 (12.34) MR	12.12 (19.47)	1.88 (1.53)HS	15.00 (21.60) - MR
2.	NRC 146	10.96 (19.33)MR	1.00 (5.55)HR	7.61 (15.21) MR	8.68 (16.74)	0.00 (0.71)HR	8.34 (16.23) - R
3.	PS 1634	5.61 (13.70)R	3.70 (11.09)MR	7.44 (15.53) MR	10.04 (18.39)	0.00 (0.71)HR	18.34 (23.76) - LR
4.	JS 21-71	14.59 (22.45)LR	5.75 (13.86)LR	11.68 (19.80) LR	6.97 (14.29)	0.00 (0.71)HR	15.00 (21.60) - LR
5.	MACS 1566	6.79 (15.10)MR	0.70 (3.44)HR	5.91 (14.00) MR	13.28 (21.07)	2.13 (1.62)HS	13.34 (20.28) - MR
6.	SL 1191	9.64 (18.08)MR	3.75 (11.12)MR	7.11 (14.76) MR	11.40 (19.70)	0.00 (0.71)HR	16.67 (22.62) - LR
7.	Himso 1688	10.40 (18.81)MR	3.15 (10.22)MR	9.81 (18.08) LR	17.11 (24.23)	2.38 (1.70)HS	18.00 (23.54) - LR
9.	RSC 11-17	6.13 (14.33)R	5.30 (13.30)LR	9.83 (17.56) LR	8.91 (17.33)	0.63 (1.01)MR	11.67 (19.14) - MR
10.	MAUS 734	8.56 (17.01)MR	1.65 (7.38)R	6.93 (15.22) MR	10.21 (18.65)	2.38 (1.70)HS	18.34 (23.76) - LR
11.	DSb 33	6.31 (14.54)MR	9.15 (17.59)S	6.86 (14.53) MR	8.15 (16.21)	1.25 (1.32)LR	15.00 (21.60) - MR
12.	NRC 138	13.05 (21.17)LR	7.55 (15.93)LR	15.14 (22.84) S	12.51 (20.66)	0.00 (0.71)HR	18.34 (23.76) - LR
13.	JS 21-72	15.42 (23.11)LR	5.30 (13.30)LR	7.72 (16.11) MR	12.72 (20.89)	0.00 (0.71)HR	16.67 (22.62) - LR
14.	PS 1637	10.22 (18.64)MR	4.80 (12.61)LR	6.15 (14.21) MR	21.22 (27.42)	0.00 (0.71)HR	18.34(23.76) - LR
15.	AUKS 176	16.59 (24.03)LR	4.80 (12.65)LR	7.71 (16.00) LR	11.83 (19.66)	0.00 (0.71)HR	15.00(21.60) - MR
17.	GJS 3	12.01 (20.27)MR	2.15 (8.30)MR	7.72 (16.11) LR	11.59 (19.38)	1.13 (1.27)LR	15.00 (21.60) - MR
18.	NRC 139	14.08 (22.03)LR	5.15 (13.06)LR	4.32 (11.72) MR	23.62 (28.79)	2.00 (1.57)HS	18.34 (23.76) - LR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
19.	DS 3110	15.21 (22.95)LR	7.25 (15.56)LR	13.41 (21.22)S	11.34 (19.53)	0.00 (0.71)HR	8.34 (16.23) – R
20.	SL 1171	8.43 (16.87)MR	5.10 (13.03)LR	6.81 (14.86) MR	11.34 (19.53)	0.00 (0.71)HR	15.00 (21.60) - MR
21.	MACS 1620	12.64 (20.82)LR	3.25 (10.27)MR	10.14 (18.19) LR	12.63 (20.02)	0.00 (0.71)HR	10.00 (17.82) - MR
22.	MAUS 732	7.02 (15.36)MR	1.65 (7.34)R	9.09 (17.46) LR	10.95 (19.01)	1.25 (1.32)LR	15.00 (21.60) - MR
23.	KS 113	11.48 (19.80)MR	3.10 (10.13)MR	2.32 (8.59) R	7.12 (15.42)	0.00 (0.71)HR	15.00 (21.30) - MR
25.	NRC 148	11.25 (19.59)MR	43.71 (41.38)MR	5.40 (13.35) MR	20.12 (26.63)	2.38 (1.70)HS	16.67 (22.75) - LR
26.	RSC 11-15	17.89 (25.01)S	29.59 (32.94)HR	10.84 (19.14) LR	7.93 (16.34)	0.00 (0.71)HR	16.67 (22.62) - LR
27.	RVS 2011-10	18.22 (25.26)S	21.29 (27.47)HR	15.16 (22.84) S	8.98 (17.41)	0.00 (0.71)HR	13.34 (20.28) - MR
28.	Himso 1689	11.23 (19.57)MR	34.04 (35.66)HR	4.54 (12.25) MR	8.79 (16.32)	0.00 (0.71)HR	21.67 (25.69) - LR
29.	CAUMS 1	9.58 (18.02)MR	58.33 (49.81)S	9.30 (17.66) LR	10.49 (18.43)	1.88 (1.53)HS	20.00 (24.68) - LR
30.	RVSM 2011-35	9.43 (17.88)MR	33.05 (35.09)HR	12.47 (19.94) LR	5.96 (14.08)	1.13 (1.27)LR	16.67 (22.62) - LR
31.	VLS 97	16.05 (23.61)LR	72.57 (58.43)S	4.60 (12.16) MR 7	9.59 (16.27)	0.00 (0.71)HR	18.34 (23.76) - LR
32.	TS 59	8.56 (17.01)MR	34.70 (36.08)HR	4.54 (11.47) MR	10.19 (18.59)	0.00 (0.71)HR	15.00 (21.60) - MR
33.	RVS 2007-4	14.25 (22.17)LR	34.96 (36.24)HR	3.14 (10.14) R	9.70 (17.67)	1.13 (1.27)LR	10.00 (17.55) – MR
34.	KDS 1073	18.15 (25.21)S	50.00 (45.00)LR	6.81 (14.86) MR	8.54 (16.99)	0.00 (0.71)HR	11.67 (19.14) - MR
35.	NRCSL 2	13.05 (21.17)LR	73.28 (58.89)S	7.13 (15.44) MR	8.80 (17.25)	2.38 (1.70)HS	11.67 (18.69) - MR
36.	KDS 1009	18.45 (25.43)S	64.65 (53.53)S	7.72 (16.11) LR	16.96 (24.20)	0.75 (1.09)LR	16.67 (22.62) - LR
37.	BAUS 100	17.98 (25.08)S	30.71 (33.65)HR	15.16 (22.84) S	9.80 (17.92)	1.38 (1.37)S	11.67(19.14) - MR

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
8.	DSb 21 (C)	6.21 (14.42)R	-	-	-	-	-
16.	DSb 23 (C)	7.01 (15.35)MR	-	-	-	-	-
24.	KS 103 (C)	6.16 (14.36)R	-	-	-	-	-
38.	JS 335 (C)	9.05 (17.50)MR	-	-	-	-	-
8.	**PS 24 (C)**	-	-	-	-	-	-
8.	**C-8 (PS 1347 C)**	-	5.30 (13.30)LR	-	-	-	-
16.	**C-16 (SL 688 C)**	-	12.65 (20.83)S	-	-	-	-
24.	**C-24 (PUSA 97-12 C)**	-	6.75 (14.98)LR	-	-	-	-
38.	**C-38 (SL 958 C)**	-	6.05 (14.51)LR	-	-	-	-
8.	Code 9	-	-	11.78 (19.88) LR	-	-	-
16.	Code 16	-	-	7.37 (15.73) MR	-	-	-
24.	Code 27	-	-	7.55 (15.95) MR	-	-	-
38.	Code 38	-	-	-	-	-	-
8.	Code 8 (NRC 86) ZC	-	-	-	13.30 (21.07)	-	-
16.	Code 16 (JS 20-34) ZC	-	-	-	1.19 (4.43)	-	-
24.	Code 24 (JS 20-98) ZC	-	-	-	17.71 (24.27)	-	-
38.	Code 38 (JS 335) ZC	-	-	-	11.86 (20.08)	-	-
8.	NRC-86	-	-	-	-	0.00 (0.71)HR	-
16.	JS-335	-	-	-	-	2.25 (1.66)HS	-

(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
24.	JS-20-34	-	-	-	-	2.25 (1.66)HS	-
38.	JS-97-52	-	-	-	-	0.00 (0.71)HR	-
8.	Code 8	-	-	-	-	-	13.34 (20.28)MR
16.	Code 16	-	-	-	-	-	16.67 (22.62)LR
24.	Code 24	-	-	-	-	-	15.00 (21.60)MR
38.	Code 38	-	-	-	-	-	23.34 (26.53)LR
	SEm±	**1.94**	**3.94**	(2.49)	**3.64**	0.09	(1.79)
	CD at 5%	**5.81**	**1.37**	(6.80)	**10.09/NS**	0.25	(5.14)
	CD at 1 %	**7.72**	**-**	**-**	**-**	11.80	**-**
	CV %	**-**	**16.06**	**-**	**13.26**	Sig	**-**

Table 3.14: Ent. 4 c. Field screening of IVT entries for resistance to major insect pests (Defoliators)

Code	Entry	Defoliators (Number of larvae / m)						No. of semilooper/ mrl	No. of *S. litura* larvae/mrl
		Sehore	Amrawati	Pantnagar	Kota	Dharwad	Imphal	Parbhani	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	DS 3109	1.66 (1.47) MR	0.50 (1.00)LR	21.50 (4.63)S	3.17 (1.97) - R	3.29 (1.95)MR	10.50 (3.29)* LR	2.83 (1.82) LR	0.83 (1.15)
2	NRC 146	2.33 (1.67) LR	0.13 (0.79)MR	23.00 (4.79)S	2.84 (1.96) - R	4.01 (2.12)LR	13.50 (3.71) MR	3.50 (1.99) LR	1.67 (1.47)
3	PS 1634	4.66 (2.19) HS	0.13 (0.79)MR	7.00 (2.64)LR	5.67 (2.58) - LR	3.37 (1.97)MR	19.00 (4.38) MR	2.00 (1.57) MR	1.17 (1.27)
4	JS 21-71	2.50 (1.73) LR	0.13 (0.79)MR	11.50 (3.39)S	5.17 (2.48) - LR	3.48 (1.99)MR	12.50 (3.60) LR	2.00 (1.58) MR	0.50 (0.96)
5	MACS 1566	3.86 (2.07) S	0.63 (1.06)LR	6.50 (2.54)LR	5.67 (2.58) - LR	2.63 (1.77)R	13.00 (3.67) LR	3.17 (1.91) LR	1.50 (1.38)
6	SL 1191	0.33 (0.86) HR	0.25 (0.87)LR	16.50 (4.05)S	5.34 (2.51) - LR	3.28 (1.94)MR	13.50 (3.74) LR	2.83 (1.81) LR	1.50 (1.41)
7	Himso 1688	2.00 (1.59) LR	0.63 (1.06)LR	6.50 (2.54)LR	5.67 (2.58) - LR	3.48 (1.99)MR	18.50 (4.36) LR	2.83 (1.82) LR	1.50 (1.41)
9	RSC 11-17	2.50 (1.73) LR	0.25 (0.85)LR	7.00 (2.62)LR	3.00 (2.00) - R	3.57 (2.02)MR	**6.00 (2.55) R**	3.00 (1.86) LR	1.67 (1.46)
10	MAUS 734	2.83 (1.77) LR	0.38 (0.93)LR	2.00 (1.37)HR	4.50 (2.34) - MR	4.23 (2.17)LR	16.50 (4.09) LR	1.67 (1.46) **R**	1.00 (1.22)
11	DSb 33	1.66 (1.46) MR	0.13 (0.79)MR	5.50 (2.34)MR	4.34 (2.31) - MR	4.05 (2.13)LR	12.00 (3.53) MR	2.50 (1.73) MR	1.83 (1.52)
12	NRC 138	0.33 (0.86) HR	0.00 (0.71)MR	6.00 (2.44)MR	5.84 (2.61) - LR	4.58 (2.25)S	12.00 (3.54) MR	1.50 (1.41) **R**	0.17 (0.80)
13	JS 21-72	2.33 (1.68) LR	0.50 (0.99)LR	10.50 (3.24)S	5.17 (2.48) - LR	4.49 (2.23)S	11.50 (3.45) MR	2.50 (1.73) MR	1.83 (1.52)
14	PS 1637	0.33 (0.86) HR	0.13 (0.79)MR	4.50 (2.12)MR	5.17 (2.48) - LR	3.94 (2.11)LR	12.00 (3.52) MR	3.50 (1.99) LR	2.00 (1.58)
15	AUKS 176	1.66 (1.45) MR	0.50 (1.00)LR	5.00 (2.22)MR	5.67 (2.58) - LR	3.27 (1.94)MR	6.50 (2.63) MR	2.67 (1.77) MR	1.67 (1.46)
17	GJS 3	1.66 (1.46) MR	0.25 (0.85)LR	11.00 (3.30)S	5.34 (2.51) - LR	3.25 (1.94)MR	21.50 (4.68) LR	2.67 (1.77) MR	1.83 (1.52)
18	NRC 139	1.99 (1.57) LR	0.25 (0.87)LR	7.00 (2.64)LR	5.50 (2.55) - LR	3.27 (1.94)MR	11.50 (3.45) MR	2.83 (1.82) LR	1.83 (1.50)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
19	DS 3110	2.33 (1.68) LR	0.00 (0.71)MR	6.50 (2.55)LR	3.17 (2.04) -MR	3.79 (2.07)LR	7.50 (2.83) MR	3.00 (1.87) LR	1.33 (1.33)
20	SL 1171	0.49 (0.99) R	0.50 (0.99)LR	8.50 (2.90)LR	5.17 (2.48) - LR	3.15 (1.91)MR	13.00 (3.49) MR	3.83 (2.07) LR	2.33 (1.68)
21	MACS 1620	2.83 (1.82) LR	0.00 (0.71)MR	5.00 (2.22)MR	3.17 (2.04) - MR	4.85 (2.31)HS	17.50 (4.08) LR	2.67 (1.77) MR	1.83 (1.52)
22	MAUS 732	1.77 (1.51) MR	0.25 (0.85)LR	3.00 (1.71)R	6.50 (2.72) - LR	3.68 (2.04)MR	14.50 (3.78) LR	4.00 (2.12) S	1.50 (1.40)
23	KS 113	1.32 (1.33) MR	0.25 (0.85)LR	10.00 (3.16)S	5.67 (2.58) - LR	3.77 (2.07)LR	13.00 (3.58) MR	3.83 (2.08) S	2.83 (1.82)
25	NRC 148	1.00 (1.22) MR	0.38 (0.93)LR	4.50 (2.12)MR	5.17 (2.48) - LR	3.85 (2.09)LR	13.00 (3.65) MR	3.00 (1.87) LR	1.67 (1.46)
26	RSC 11-15	0.49 (0.99) R	0.00 (0.71)MR	2.50 (1.57)HR	5.50 (2.55) - LR	3.84 (2.08)LR	11.00 (3.36) MR	3.00 (1.86) LR	1.83 (1.51)
27	RVS 2011-10	2.83 (1.82) LR	0.13 (0.79)MR	5.50 (2.34)MR	5.00 (2.45) - LR	4.58 (2.25)S	13.50 (3.69) MR	3.00 (1.86) LR	2.00 (1.58)
28	Himso 1689	1.16 (1.29) MR	0.00 (0.71)MR	4.00 (1.98)MR	4.17 (2.27) - MR	3.39 (1.97)MR	17.50 (4.21) LR	1.67 (1.47) **R**	1.33 (1.34)
29	CAUMS 1	2.00 (1.58) LR	0.50 (1.00)LR	1.50 (1.21)HR	4.83 (2.41) - MR	2.75 (1.80)R	17.00 (4.17) LR	2.50 (1.73) MR	1.83 (1.51)
30	RVSM 2011-35	2.66 (1.78) LR	0.00 (0.71)MR	2.50 (1.57)HR	5.50 (2.55) - LR	4.35 (2.20)LR	16.00 (4.03) LR	2.67 (1.76)MR	1.50 (1.34)
31	VLS 97	1.99 (1.56) LR	0.25 (0.85)LR	0.50 (0.50)HR	6.00 (2.65) - LR	3.00 (1.87)MR	12.00 (3.51) MR	1.83 (1.51) MR	1.33 (1.33)
32	TS 59	1.32 (1.33) MR	0.25 (0.85)LR	2.50 (1.57)HR	4.83 (2.41) - MR	3.57 (2.02)MR	15.00 (3.79) LR	3.50 (1.99) LR	1.17 (1.28)
33	RVS 2007-4	1.33 (1.35) MR	0.25 (0.85)LR	3.50 (1.87)MR	2.84 (1.96) - R	3.32 (1.95)MR	14.00 (3.80) LR	2.67 (1.78) MR	1.17 (1.28)
34	KDS 1073	1.82 (1.41) MR	0.00 (0.71)MR	5.50 (2.34)S	5.34 (2.52) - LR	4.12 (2.15)LR	11.00 (3.39) MR	1.83 (1.51) MR	1.83 (1.51)
35	NRCSL 2	1.82 (1.41) MR	0.38 (0.93)LR	6.00 (2.45)MR	5.67 (2.58) - LR	3.69 (2.05)LR	11.00 (3.39) MR	2.67 (1.75) MR	1.33 (1.24)
36	KDS 1009	1.66 (1.42) MR	0.13 (0.79)MR	2.00 (1.37)HR	5.67 (2.58) - LR	4.49 (2.23)S	8.00 (2.92) MR	2.17 (1.61) MR	1.50 (1.40)
37	BAUS 100	1.33 (1.33)MR	0.00 (0.71)MR	5.50 (2.34)MR	4.84 (2.42) - MR	4.76 (2.29)HS	23.00 (4.85) LR	3.67 (2.03) LR	2.17 (1.63)

(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
8.	DSb 21 (C)	-	-	-	-	3.01 (1.87)MR	-	-	-
16.	DSb 23 (C)	-	-	-	-	2.78 (1.81)R	-	-	-
24.	KS 103 (C)	-	-	-	-	3.06 (1.89)MR	-	-	-
38.	JS 335 (C)	-	-	-	-	3.13 (1.91)MR	-	-	-
8.	**C-8** **(PS 1347 C)**	-	-	5.00 (2.22)MR	-	-	-	-	-
16.	**C-16** **(SL 688 C)**	-	-	10.00 (3.15)S	-	-	-	-	-
24.	**C-24** **(PUSA 97-12 C)**	-	-	8.50 (2.90)LR	-	-	-	-	-
38.	**C-38** **(SL 958 C)**	-	-	8.00 (2.82)LR	-	-	-	-	-
8.	JS 97-52 (Check)	-	-	-	-	-	22.50 (4.76) LR	-	-
16.	RKS - 113 (Check)	-	-	-	-	-	17.50 (4.24) LR	-	-
24.	JS-335 (Check)						**25.00** **(5.03) S**		
38.	Code 38	-	-	-	-	-		-	-
8.	Code 8 (NRC 86) ZC	-	-	-	-	-		3.33 (1.95) LR	1.50 (1.41)
16.	Code 16 (JS 20-34) ZC	-	-	-	-	-		1.17 (1.27) **HR**	1.00 (1.19)
24.	Code 24 (JS 20-98) ZC	-	-	-	-	-		2.67 (1.78) MR	2.33 (1.68)
38.	Code 38 (JS 335) ZC	-	-	-	-	-		3.83 (2.07)LR	1.83 (1.52)
8.	NRC-86	-	0.00 (0.71)MR	-	-	-	-	-	-
16.	JS-335	-	0.00 (0.71)MR	-	-	-		-	-
24.	JS-20-34	-	0.00 (0.71)MR	-	-	-		-	-

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
38.	JS-97-52	-	0.50 (1.00)LR	-	-	-		-	-
8.	Code 8	-	-	-	5.67 (2.58) - LR	-	-	-	-
16.	Code 16	-	-	-	5.00 (2.45) - LR	-	-	-	-
24.	Code 24	-	-	-	5.67 (2.58) - LR	-	-	-	-
38.	Code 38	-	-	-	6.50 (2.74) - LR	-	-	-	-
8.	JS 95-60	2.33 (1.67) LR	-	-	-	-	-	-	-
16.	JS 20-34	1.50 (1.40) MR	-	-	-	-	-	-	-
24.	JS 335	1.99 (1.56) LR	-	-	-	-	-	-	-
38.	-	-	-	-	-	-	-	-	-
	SEm±	(0.16)	0.08	**0.22**	(0.13)	**0.25**	0.59	**0.11**	**0.17**
	CD at 5%	(0.49)	0.23	**0.65**	(0.38)	**0.74**	1.19	**0.30**	**0.49/NS**
	CD at 1 %	-	-	**-**	-	**1.06**	-	**0.40**	**0.65**
	CV %	-	13.71	**13.03**	-	**-**	-	**8.73**	**17.93**

Table 3.15: Ent. 4 d. Field screening of IVT entries for resistance to major insect pests (Pod borer, Aphids, White fly, Bean bug and YMV Rating)

Code No.	Entry	Bug/ mrl*	Aphid 3 leaf/plant		No. of jassids/plant	White fly		Pod borer damage (%)	Pod borer larvae/m	YMV Rating
		Pantnagar	Imphal	Pantnagar	Parbhani	Pantnagar	Parbhani	Dharwad	Parbhani	Delhi
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
1	DS 3109	1.50 (1.21)	11.20 (3.33)* MR	4.20 (2.05)MR	0.80 (1.14)	6.30 (2.50)MR	2.00 (1.57) LR	33.23 (35.19)S	0.50 (0.99)	0
2	NRC 146	1.50 (1.21)	25.00 (5.04) LR	11.70 (3.41)S	0.90 (1.18)	2.30 (1.52)HR	1.40 (1.37) MR	29.96 (33.17)LR	0.17 (0.80)	1
3	PS 1634	0.50 (0.50)	15.20 (3.96) MR	3.35 (1.83)HR	1.40 (1.37)	7.70 (2.72)MR	3.10 (1.89)LR	25.26 (30.16)MR	0.17 (0.80)	1
4	JS 21-71	2.00 (1.40)	**4.40 (2.16) R**	1.65 (1.28)HR	1.20 (1.30)	9.20 (3.03)LR	3.40 (1.97) S	32.15 (34.53)S	0.33 (0.91)	3
5	MACS 1566	1.00 (1.00)	30.00 (5.45) LR	4.85 (2.20)MR	1.30 (1.33)	5.65 (2.35)MR	3.80 (2.07) HS	23.82 (29.20)MR	0.00 (0.70)	5
6	SL 1191	1.50 (1.21)	25.20 (5.05) LR	7.15 (2.67)LR	0.80 (1.12)	7.80 (2.76)MR	1.60 (1.44) MR	30.45 (33.48)LR	0.17 (0.80)	3
7	Himso 1688	1.00 (0.71)	23.00 (4.84) LR	13.50 (3.67)S	0.70 (1.09)	13.70 (3.70)S	1.30 (1.32) MR	25.61 (30.39)MR	0.00 (0.70)	7
9	RSC 11-17	0.00 (0.00)	17.80 (4.16) MR	1.80 (1.33)HR	1.10 (1.26)	9.30 (3.05)LR	2.00 (1.57) LR	24.57 (29.70)MR	0.17 (0.80)	3
10	MAUS 734	0.50 (0.50)	10.20 (3.00) MR	6.15 (2.47)MR	1.00 (1.22)	10.30 (3.21)LR	1.90 (1.54) LR	26.54 (31.00)MR	0.17 (0.80)	3, BB
12	DSb 33	0.50 (0.50)	15.90 (4.04) MR	14.35 (.3.79)S	1.10 (1.26)	8.85 (2.97)LR	3.00 (1.86) LR	28.03 (31.95)LR	0.00 (0.70)	1
13	NRC 138	0.00 (0.00)	11.00 (3.21) MR	23.00 (4.79)S	1.30 (1.34)	10.65 (3.26)S	2.80 (1.81) LR	25.91 (30.59)MR	0.17 (0.80)	3
14	JS 21-72	0.50 (0.50)	21.20 (4.64) LR	7.15 (2.67)LR	0.70 (1.08)	10.00 (3.16)LR	1.10 (1.26) MR	31.63 (34.21)S	0.17 (0.80)	1
15	PS 1637	1.00 (1.00)	25.80 (5.08) LR	3.00 (1.73)HR	1.00 (1.22)	9.80 (3.13)LR	1.60 (1.44) MR	26.99 (31.29)MR	0.33 (0.89)	1
17	AUKS 176	0.50 (0.50)	21.80 (4.70) LR	3.35 (1.83)HR	0.70 (1.09)	13.50 (3.67)S	1.50 (1.40) MR	28.16 (32.04)LR	0.17 (0.80)	5
18	NRC 139	1.50 (1.21)	29.00 (5.33) LR	3.50 (1.87)R	1.00 (1.22)	6.35 (2.52)MR	1.50 (1.41) MR	29.65 (32.98)LR	0.17 (0.80)	3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
19	DS 3110	1.00 (1.00)	30.40 (5.56) LR	8.85 (2.98)S	1.00 (1.21)	8.65 (2.94)LR	3.00 (1.86) LR	33.21 (35.18)S	0.33 (0.89)	0
20	SL 1171	0.00 (0.00)	15.00 (3.93) MR	7.30 (2.70)LR	1.20 (1.30)	9.00 (3.00)LR	2.10 (1.58) LR	33.08 (35.10)S	0.00 (0.70)	1
21	MACS 1620	1.00 (1.00)	19.80 (4.50) LR	2.00 (1.37)HR	1.00 (1.22)	5.00 (2.24)R	2.30 (1.63) LR	28.43 (32.21)LR	0.17 (0.80)	1
22	MAUS 732	0.50 (0.50)	12.90 (3.65) MR	5.85 (2.41)MR	1.10 (1.25)	7.35 (2.71)MR	1.00 (1.22) MR	30.47 (33.49)LR	0.17 (0.80)	5
23	KS 113	0.00 (0.00)	18.20 (4.28) LR	6.00 (2.45)MR	1.00 (1.22)	7.30 (2.70)MR	1.40 (1.37) MR	24.52 (29.67)MR	0.17 (0.80)	3, BB
25	NRC 148	0.50 (0.50)	13.00 (3.67) MR	12.65 (3.55)S	1.40 (1.37)	8.00 (2.82)LR	2.10 (1.58) LR	28.09 (31.99)LR	0.33 (0.91)	1, BB
26	RSC 11-15	0.50 (0.50)	16.60 (4.07) MR	2.65 (1.62)HR	1.00 (1.19)	4.40 (2.12)HR	1.30 (1.33) MR	25.61 (30.39)MR	0.00 (0.70)	1
27	RVS 2011-10	0.50 (0.50)	19.60 (4.47) LR	4.35 (2.08)MR	1.00 (1.22)	4.35 (2.08)HR	1.30 (1.33) MR	30.03 (33.22)LR	0.00 (0.70)	1
28	Himso 1689	1.00 (1.00)	27.60 (5.30) LR	6.15 (2.48)MR	1.40 (1.37)	6.50 (2.55)MR	2.20 (1.62) LR	28.45 (32.22)LR	0.00 (0.70)	5
29	CAUMS 1	0.00 (0.00)	24.20 (4.94) LR	9.35 (3.05)S	1.00 (1.22)	9.80 (3.16)LR	1.30 (1.32) MR	27.98 (31.92)LR	0.33 (0.91)	1
30	RVSM 2011-35	0.50 (0.50)	22.80 (4.77) LR	5.15 (2.26)MR	1.20 (1.30)	4.85 (2.20)R	1.10 (1.26) MR	33.21 (35.18)S	0.00 (0.70)	1
31	VLS 97	0.50 (0.50)	25.40 (4.94) LR	5.15 (2.26)MR	0.80 (1.40)	5.35 (2.31)R	0.90 (1.18) MR	32.15 (34.53)S	0.17 (0.80)	3, BB
32	TS 59	1.50 (1.21)	11.80 (3.47) MR	8.35 (2.88)LR	1.50 (1.41)	10.20 (3.19)LR	2.10 (1.60) LR	28.42 (32.20)LR	0.00 (0.70)	3
33	RVS 2007-4	0.00 (0.00)	**36.60 (6.09) S**	4.35 (2.08)MR	1.40 (1.34)	8.50 (2.91)LR	1.80 (1.51) MR	26.59 (31.03)MR	0.17 (0.80)	3
34	KDS 1073	1.50 (1.21)	10.20 (3.20) MR	6.50 (2.55)LR	1.20 (1.29)	5.50 (2.34)MR	1.20 (1.29) MR	26.54 (31.00)MR	0.00 (0.70)	5
35	NRCSL 2	1.00 (1.00)	20.80 (4.53) LR	3.80 (1.95)R	1.50 (1.41)	8.15 (2.85)LR	2.00 (1.57) LR	27.88 (31.86)MR	0.33 (0.89)	0
36	KDS 1009	1.00 (1.00)	**6.00 (2.50) R**	4.70 (2.16)MR	1.40 (1.37)	6.35 (2.52)MR	2.40 (1.67) LR	32.64 (34.83)S	0.33 (0.91)	1, BB
37	BAUS 100	0.00 (0.00)	16.00 (4.04) MR	4.85 (2.19)MR	0.80 (1.13)	9.70 (3.11)LR	1.20 (1.30) MR	33.49 (35.35)HS	0.00 (0.70)	0

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
8	DSb 21 (C)	-	-	-	-	-	-	26.25 (30.81)MR	-	-
16	DSb 23 (C)	-	-	-	-	-	-	27.54 (31.64)MR	-	-
24	KS 103 (C)	-	-	-	-	-	-	25.39 (30.25)MR	-	-
38	JS 335 (C)	-	-	-	-	-	-	27.28 (31.47)MR	-	-
8.	**PS 24 (C)**	-	-	-	-	-	-	-	-	--
8	**C-8 (PS 1347 C)**	-	-	11.65 (3.37)S	-	-	-	-	-	-
16	**C-16 (SL 688 C)**	-	-	3.35 (1.83)HR	-	-	-	-	-	-
24	**C-24 (PUSA 97-12 C)**	-	-	10.15 (3.19)S	-	-	-	-	-	-
38	**C-38 (SL 958 C)**	-	-	4.65 (2.16)MR	-	-	-	-	-	-
8	JS 97-52 (Check)	-	24.80 (5.03) LR	-	-	-	-	-	-	-
16	RKS - 113 (Check)	-	23.80 (4.91) LR	-	-	-	-	-	-	-
24	JS-335 (Check)	-	23.20 (4.86) LR							
38	Code 38	-	-	-	-	-	-	-	-	-
8	Code 8 NRC 86) ZC	-	-	-	0.70 (1.09)	-	1.80 (1.51) MR	-	0.00 (0.70)	-
16	Code 16 (JS 20-34) ZC	-	-	-	0.50 (0.99)	-	0.80 (1.14) **R**	-	0.17 (0.80)	-
24	Code 24 (JS 20-98) ZC	-	-	-	0.90 (1.16)	-	1.90 (1.53) LR	-	0.33 (0.89)	-
38	Code 38 (JS 335) ZC	-	-	-	0.80 (1.14)	-	1.60 (1.42) MR	-	0.00 (0.70)	**-**

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
8	Code 8	-	-	-	-		-	-	-	0
16	Code 16	-	-	-	-	-	-	-	-	0
24	Code 24	-	-	-		-	-	-	-	0
38	Code 38	-	-	-	-	-	-	-	-	0
	SEm±	**(4.25)**	0.73	**0.30**	**0.09**	**0.16**	**0.13**	**1.39**	**0.08**	-
	CD at 5%	**-**	1.49	**0.87**	**0.27/NS**	**0.48**	**0.38**	**4.15**	**0.24/NS**	-
	CD at 1 %	**NS**	-	**-**	**0.36**	**-**	**0.51**	**5.53**	**0.32**	**-**
	CV %	**72.61**	-	**87.00**	**11.21**	**9.50**	**12.96**	**-**	**1.54**	**-**

Table 3.16: Ent5. Evaluation of Bt 127SC strain for efficacy against lepidopteran larvae infesting soybean

Treatments		**Sehore**								**Kota**			
		Gesoniagemma				***Chrysodeixis acuta***				***Chrysodexis acuta***			
		1st spray		**2nd spray**		**1st spray**		**2nd spray**		**1st spray**		**2nd spray**	
		3 DAT	**7 DAT**	**3 DAT**	**7 DAT**	**3 DAT**	**7 DAT**	**3 DAT**	**7DAT**	**3DAT**	**7 DAT**	**3 DAT**	**7 DAT**
1	Bt 127 SC @ 3 ml/l water	1.55 (1.42)	0.99 (0.82)	2.33 (1.68)	1.66 (1.26)	1.33 (1.83)	0.74 (1.07)	1.08 (1.33)	0.41 (0.92)	1.84 (1.68)	1.33 (1.53)	2.00 (1.73)	1.67 (1.63)
2	Bt Commercial Delfin @ 1 g/l water	2.99 (1.86)	1.44 (1.38)	3.33 (1.96)	2.43 (1.71)	2.00 (1.58)	1.33 (1.36)	2.44 (1.70)	1.00 (1.22)	2.58 (1.89)	2.17 (1.77)	2.50 (1.87)	2.17 (1.78)
3	Indoxacarb 15.8 EC @ 333 ml/ha	0.33 (0.87)	0.00 (0.70)	1.89 (1.56)	0.78 (1.11)	0.33 (0.91)	0.33 (1.03)	0.74 (1.10)	0.08 (0.75)	1.67 (1.63)	1.25 (1.50)	1.67 (1.63)	1.33 (1.53)
4	Quinalphos 25 EC @ 1500 ml/ha	0.66 (1.05)	0.22 (0.82)	2.44 (1.70)	1.33 (1.36)	1.00 (1.23)	0.34 (0.94))	0.83 (1.11)	0.16 (0.85)	1.67 (1.63)	1.42 (1.55)	2.17 (1.78)	1.84 (1.68)
5	Chlorantraniliprole 18.5 SC @ 150 ml/ha	0.22 (0.78)	0.00 (0.70)	1.67 (1.46)	0.99 (1.22)	0.33 (0.89)	0.00 (0.70)	0.92 (1.18)	0.55 (1.02)	1.25 (1.49)	1.00 (1.41)	1.25 (1.50)	0.92 (1.38)
6	Untreated check	4.44 (2.29)	2.66 (1.78)	6.00 (2.54)	3.69 (2.04)	6.33 (3.10)	5.66 (3.11)	5.33 (2.41)	3.66 (3.71)	3.33 (2.08)	4.09 (2.25)	4.75 (2.39)	4.92 (2.42)
	SEm±	(0.14)	(0.12)	(0.13)	(0.18)	(0.07)	(0.18)	(0.09)	(0.12)	(0.07)	(0.06)	(0.06)	(0.06)
	CD at 5 %	(0.42)	(0.35)	(0.41)	(0.56)	(0.23)	(0.55)	(0.26)	(0.36)	(0.21)	(0.18)	(0.18)	(0.19)

Table 3.16contd..

	Treatments	Dharwad															
		Spodoptera litura(l/mrl)*				*Thysanoplusia orichalcea* (l/mrl)*				*Hedylepta indicata* (l/mrl)*				*Cydia ptychora* (% damage)**			
		1st spray		2nd spray		1st spray		2nd spray		1st spray		2nd spray		1st spray		2nd spray	
		3 DAT	7 DAT	3 DAT	7 DAT	3 DAT	7 DAT	3 DAT	7 DAT	3 DAT	7 DAT	3 DAT	7 DAT	3 DAT	7 DAT	3 DAT	7 DAT
1	Bt 127 SC @ 3 ml/l water	1.23 (1.31)	0.69 (1.09)	1.18 (1.30)	0.63 (1.06)	1.41 (1.38)	0.95 (1.20)	1.31 (1.35)	0.62 (1.06)	2.39 (1.70)	2.14 (1.62)	2.53 (1.74)	2.08 (1.61)	24.29 (29.52)	20.13 (26.65)	23.12 (28.73)	19.18 (25.96)
2	Bt Commercial Delfin @ 1 g/l water	1.67 (1.47)	1.32 (1.35)	1.80 (1.52)	1.41 (1.38)	1.92 (1.56)	1.63 (1.46)	1.85 (1.53)	1.53 (1.42)	2.80 (1.82)	2.61 (1.76)	2.91 (1.85)	2.57 (1.75)	26.33 (30.86)	25.07 (30.03)	28.14 (32.02)	26.24 (30.80)
3	Indoxacarb 15.8 EC @ 333 ml/ha	0.78 (1.13)	0.39 (0.94)	0.63 (1.06)	0.24 (0.86)	0.95 (1.20)	0.20 (0.84)	0.79 (1.14)	0.17 (0.82)	0.41 (0.95)	0.13 (0.79)	0.36 (0.93)	0.16 (0.81)	16.18 (23.71)	10.02 (18.45)	17.25 (24.53)	11.63 (19.93)
4	Quinalphos 25 EC @ 1500 ml/ha	2.07 (1.60)	1.08 (1.26)	2.13 (1.62)	1.67 (1.47)	1.38 (1.37)	0.81 (1.14)	1.23 (1.32)	0.76 (1.12)	2.63 (1.77)	2.09 (1.61)	2.72 (1.79)	2.17 (1.63)	25.08 (30.04)	19.64 (26.30)	26.61 (31.04)	22.15 (28.06)
5	Chlorantraniliprole 18.5 SC @ 150 ml/ha	0.39 (0.94)	0.14 (0.80)	0.28 (0.88)	0.17 (0.82)	0.43 (0.96)	0.12 (0.79)	0.65 (1.07)	0.15 (0.81)	0.36 (0.93)	0.04 (0.73)	0.41 (0.95)	0.08 (0.76)	13.16 (21.26)	9.86 (18.29)	12.09 (20.34)	8.85 (17.30)
6	Untreated check	4.46 (2.23)	5.65 (2.48)	6.29 (2.61)	7.53 (2.83)	4.23 (2.17)	5.19 (2.39)	6.03 (2.56)	7.21 (2.78)	5.64 (2.48)	6.75 (2.69)	7.95 (2.91)	6.87 (2.71)	34.23 (35.79)	39.09 (38.68)	40.25 (39.36)	42.10 (40.44)
	SEm±	0.12	0.08	0.11	0.09	0.17	0.22	0.20	0.19	0.27	0.24	0.29	0.22	0.97	0.86	0.90	0.85
	CD at 5 %	0.39	0.26	0.32	0.29	0.50	0.68	0.62	0.58	0.84	0.71	0.88	0.67	2.93	2.57	2.72	2.59

* Figures in the parenthesis are transformed $\sqrt{x + 0.5}$ values, ** Transformed angular values

Table 3.16contd..

	Treatments	Imphal												Indore			
		S. litura(larvae/m)				Bean leaf webber/m				Bihar hairy caterpillar/m				*S. litura* (larvae/m)		Semilooper /m	
		1st spray		2nd spray		1st spray		2nd spray		1st spray		2nd spray					
		3DAT	7DAT	3DAT	7DAT	3DAT	7DAT	3DAT	7DAT	3DAT	7DAT	3DAT	7DAT	3DAT	7DAT	3DAT	7DAT
1	Bt 127 SC @ 3 ml/l water	0.75 (1.06)	0.50 (0.97)	4.50 (1.86)	0.00 (0.71)	4.25 (2.17)	2.25 (1.63)	0.75 (1.10)	0.75 (1.10)	91.50 (9.50)	5.00 (1.66)	10.50 (3.03)	2.00 (1.41)	1.75 (1.50)	0.92 (1.19)	11.50 (3.46)	6.42 (2.63)
2	Bt Commercial Delfin @ 1 g/l water	1.00 (1.18)	0.75 (1.06)	2.75 (1.79)	0.75 (1.10)	4.00 (2.09)	0.50 (0.97)	1.00 (1.14)	0.75 (1.10)	61.50 (7.23)	7.50 (1.91)	15.50 (3.97)	2.50 (1.52)	2.17 (1.63)	0.59 (1.04)	15.08 (3.95)	7.17 (2.77)
3	Indoxacarb 15.8 EC @ 333 ml/ha	0.00 (0.71)	0.50 (0.97)	0.50 (0.93)	0.00 (0.71)	2.75 (1.76)	0.75 (1.06)	0.00 (0.71)	0.75 (1.06)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.50 (0.93)	0.67 (1.08)	0.50 (1.00)	0.67 (1.08)	0.25 (0.87)
4	Quinalphos 25 EC @ 1500 ml/ha	0.00 (0.71)	1.25 (1.31)	0.50 (0.93)	0.75 (1.06)	2.25 (1.63)	1.50 (1.36)	0.25 (0.84)	1.00 (1.18)	0.00 (0.71)	7.00 (2.26)	0.00 (0.71)	3.00 (1.61)	3.17 (1.91)	1.42 (1.38)	7.58 (2.84)	4.25 (2.18)
5	Chlorantraniliprole 18.5 SC @ 150 ml/ha	0.25 (0.84)	0.50 (0.93)	0.00 (0.71)	0.25 (0.84)	0.75 (1.06)	0.50 (0.97)	0.25 (0.84)	0.25 (0.84)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.08 (0.76)	0.08 (0.76)	5.09 (2.36)	1.33 (1.35)
6	Untreated check	2.00 (1.50)	3.00 (1.86)	8.00 (2.90)	5.75 (2.49)	9.50 (3.15)	7.50 (2.79)	7.25 (2.78)	7.00 (2.74)	139.50 (11.78)	39.50 (6.28)	31.00 (4.99)	1.50 (1.17)	4.50 (2.24)	3.50 (2.00)	17.42 (4.23)	9.67 (3.19)
	SEm±		-	-	-	-	-	-	-	-	-	-	-	**(0.11)**	**(0.11)**	**(0.28)**	**(0.48)**
	CD at 5 %	0.50	0.51	1.00	0.39	0.52	0.54	0.46	0.48	2.48	1.80	2.21	NS	**(0.32)**	**(0.31)**	**(0.80)**	**(1.39)**

Table 3.17: Ent 5.Effect of Bt 127 SC strain on grain yield of soybean across locations

Treatments		Yield (kg/ha)					
		Kota	Imphal	Dharwad	Sehore	Indore	Mean
1	Bt 127 SC @ 3 ml/l water	1714	1293	1793	1389	1810	**1600**
2	Bt Commercial Delfin @ 1 g/l water	1571	1265	1624	1374	1884	**1544**
3	Indoxacarb 15.8 EC @ 333 ml/ha	1905	1553	1832	1488	1985	**1753**
4	Quinalphos 25 EC @ 1500 ml/ha	1762	1519	1687	1452	1890	**1662**
5	Chlorantraniliprole 18.5 SC @ 150 ml/ha	2000	1617	2066	1471	2015	**1834**
6	Untreated check	1429	957	1054	1177	1831	**1290**
	SEm±	60.65	48.22	65.57	17.64	**74.09**	-
	CD (P=0.05)	182.76	102.77	203.72	47.05	**214.95**	-

Table 3.18: Ent 6. Assessment of polymer coating on the efficacy of seed treating chemicals and inoculants [STEM FLY]

Treatment	% Seedling mortality due to stem fly	% Stem tunnelling due to stem fly							
	Dharwad	Sehore		Dharwad		Indore		Parbhani	
		30 DAG	45 DAG	30 DAG	45 DAG	30 DAG	45 DAG	30 DAG	45 DAG
T-1	3.14	1.54 (6.98)	5.05 (12.77)	8.16	9.48	21.85	40.57	24.669	46.775
T-2	4.20	3.56 (10.93)	6.34 (14.86)	12.27	17.19	26.71	55.58	26.140	47.583
T test	**S**	**S**	**S**	**S**	**S**	**NS**	**S**	**NS**	**NS**

DAG – Days After Germination

Treatment	% Seedling mortality due to stem fly	% Stem tunnelling due to stem fly							
	Dharwad	Sehore		Dharwad		Indore		Parbhani	
		30 DAG	45 DAG	30 DAG	45 DAG	30 DAG	45 DAG	30 DAG	45 DAG
T-2	4.20	3.56 (10.93)	6.34 (14.86)	12.27	17.19	26.71	55.58	26.140	47.583
T-3	2.26	1.88 (7.89)	4.52 (12.25)	7.34	8.07	17.85	39.90	22.448	43.404
T test	**S**	**S**	**S**	**S**	**S**	S	S	**NS**	**NS**

Table 3.19: Ent 6. Assessment of polymer coating on the efficacy of seed treating chemicals and inoculants [DEFOLIATORS]

Treatment	Defoliators (Nos. /m)											
	Dharwad						Sehore		Indore			
	Spodoptera		Semilooper		% Defoliation		30 DAG	45 DAG	Spodoptera		Semilooper	
	30 DAG	45 DAG	30 DAG	45 DAG	30 DAG	45 DAG			30 DAG	45 DAG	30 DAG	45 DAG
T-1	3.28	4.24	2.35	3.61	15.67	23.28	1.53 (1.43)	1.33 (1.37)	1.30	0.17	13.87	0.50
T-2	4.13	5.98	3.12	4.06	19.16	29.31	1.68 (1.47)	1.67 (1.47)	2.57	0.30	12.50	0.27
T test	S	S	S	S	S	S	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Treatment	Defoliators (Nos. /m)											
	Dharwad						Sehore		Indore			
	Spodoptera		Semilooper		% Defoliation		30 DAG	45 DAG	Spodoptera		Semilooper	
	30 DAG	45 DAG	30 DAG	45 DAG	30 DAG	45 DAG			30 DAG	45 DAG	30 DAG	45 DAG
T-2	4.13	5.98	3.12	4.06	19.16	29.31	1.68 (1.47)	1.67 (1.47)	12.50	0.27	2.57	0.30
T-3	2.64	3.75	2.14	3.23	12.23	18.09	1.44 (1.38)	1.56 (1.41)	13.43	0.53	1.67	0.10
T test	S	S	S	S	S	S	**NS**	**NS**	NS	NS	NS	NS

BHC – Bihar Hairy Caterpillar; GSL – Green Semilooper

Table 3.20: Ent 6. Assessment of polymer coating on the efficacy of seed treating chemicals and inoculants [WHITE FLY]

Treatment	White fly (Nos. /leaf)										
	Dharwad			Parbhani			Sehore	Indore			
	10 DAG	20 DAG	30 DAG	10 DAG	20 DAG	30 DAG		10 DAG	20 DAG	30 DAG	Effects on germination
T-1	0.25	0.40	0.55	0.00	0.514	0.773	7.03	0.231	0.788	0.921	70.00
T-2	0.30	0.42	0.60	0.00	0.460	0.786	5.73	0.233	1.212	1.569	65.00
T test	**NS**	**NS**	**NS**	**--**	**NS**	**NS**	NS	**NS**	**NS**	**NS**	**NS**

Treatment	White fly (Nos. /leaf)										
	Dharwad			Parbhani			Sehore	Indore			
	10 DAG	20 DAG	30 DAG	10 DAG	20 DAG	30 DAG		10 DAG	20 DAG	30 DAG	Effects on germination
T-2	0.30	0.42	0.60	0.00	0.460	0.786	5.73	0.233	1.212	1.569	73.33
T-3	0.26	0.39	0.52	0.00	0.453	0.686	6.39	0.110	0.656	1.058	73.33
T test	**NS**	**NS**	**NS**	**--**	**NS**	**Significant**	**NS**	NS	S	NS	NS

Table 3.21: Ent 6. Assessment of polymer coating on the efficacy of seed treating chemicals and inoculants [GIRDLE BEETLE]

Treatment	Girdle beetle (%Infestation)										
	Dharwad			Sehore			Indore		Parbhani		
	30 DAG	45 DAG	60 DAG	30 DAG	45 DAG	60 DAG	30 DAG	45 DAG	30 DAG	45 DAG	60 DAG
T-1	3.07	4.98	5.75	3.61 (10.75)	6.71 (14.91)	8.25 (15.94)	0.99	1.33	2.812	8.004	9.134
T-2	3.65	5.17	5.94	3.91 (11.26)	5.06 (12.71)	8.74 (17.70)	0.80	0.93	2.860	9.350	9.267
T test	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Treatment	Girdle beetle (%Infestation)										
	Dharwad			Sehore			Indore		Parbhani		
	30 DAG	45 DAG	60 DAG	30 DAG	45 DAG	60 DAG	30 DAG	45 DAG	30 DAG	45 DAG	60 DAG
T-2	3.65	5.17	5.94	3.91 (11.26)	5.06 (12.71)	8.74 (17.70)	0.80	0.93	2.860	9.350	9.267
T-3	2.09	3.23	5.67	2.60 (8.27)	5.18 (13.05)	8.48 (16.52)	1.65	2.08	2.479	6.141	8.230
T test	**S**	**S**	**NS**	**NS**	**NS**	**NS**	NS	NS	**NS**	**NS**	**NS**

Table 3.22: Ent 6. Assessment of polymer coating on the efficacy of seed treating chemicals and inoculants [POD BORER AND GRAIN YIELD]

Treatment	**Pod borer damage (%)**	**Grain yield (kg/ha)**				
	Dharwad	**Sehore**	**Parbhani**	**Dharwad**	**Indore**	**Mean**
T-1	38.37	1528	2233	1924	1481.3	**1792**
T-2	39.16	1455	2045	1786	1460.7	**1687**
T test	**NS**	**S**	**NS**	**S**	**NS**	**--**

Treatment	**Pod borer damage (%)**	**Grain yield (kg/ha)**				
	Dharwad	**Sehore**	**Parbhani**	**Dharwad**	**Indore**	**Mean**
T-2	39.16	1577	2045	1786	1461	**1717**
T-3	38.09	1617	2155	2075	1435	**1821**
T test	**NS**	**S**	**NS**	**S**	NS	**--**

Table 3.23: Ent.7: Evaluation of germplasm lines for resistance against major insect-pests (IMPHAL)

Sl. No.	ACC. No.	No. of BHC larvae/m	No. of other defoliating larvae*/m	Percent defoliation at peak incidence/plant	No. of aphids /plant
1	JS 20-30	24.00	7.00	16.67 (LS)	16.80
2	JS 20-86	55.00	22.00	26.00 (MS)	18.00
3	JS 20-50	37.00	16.00	25.00 (MS)	21.00
4	JS 20-59	30.00	10.00	21.33 (LS)	22.40
5	JS 20-27	31.00	17.00	27.33 (MS)	34.00
6	JS 20-79	10.50	4.00	15.31 (LS)	8.40
7	JS 20-41	64.00	18.00	21.18(LS)	24.00
8	JS 20-56	25.00	3.00	20.00 (LS)	8.00
9	JS 20-61	42.00	11.00	28.57 (MS)	40.00
10	JS 20-23	38.00	10.00	30.00 (MS)	17.60
11	JS 20-60	41.00	10.00	23.06 (LS)	18.00
12	JS 20-21	10.00	7.00	10.79 (LS)	32.00
13	JS 20-51	32.50	12.00	28.75 (MS)	28.00
14	JS 20-53	4.00	2.00	14.09 (LS)	7.20
15	JS 20-55	0.00	6.00	11.15 (LS)	17.20
16	JS 20-48	5.00	12.00	17.92 (LS)	10.80
17	AGS-56	6.00	7.00	15.83 (LS)	4.00
18	AGS-76	9.00	9.00	13.57 (LS)	0.00
19	EC 547464	64.00	15.00	26.67 (MS)	14.00
20	G-11	12.00	13.00	17.73 (LS)	0.00
21	JSM 288	87.00	6.00	29.17 (MS)	24.00
22	EC 280148	15.50	6.00	30.77(MS)	10.00
23	AGS 112	17.00	16.00	25.00 (LS)	12.80
24	EC 33940	38.00	12.00	29.17 (LS)	16.00
25	EC 241695	28.00	5.00	28.75 (MS)	20.00
26	EC 113778	6.00	24.00	16.36 (LS)	14.40
27	AMSS 34	8.00	16.00	21.79 (LS)	8.80
28	SQL 32	9.00	14.00	21.00 (LS)	4.00
29	AMS 60-2-3-4	26.00	5.00	26.15 (MS)	0.00
30	SQL 37	10.00	3.00	21.15 (LS)	0.00
31	SQL 36	33.00	7.00	18.53 (LS)	11.20
32	AMS 25-5-2	51.00	13.00	23.08 (LS)	24.00

Sl. No.	ACC. No.	No. of BHC larvae/m	No. of other defoliating larvae*/m	Percent defoliation at peak incidence/plant	No. of aphids /plant
33	SQL 31	14.00	7.00	22.50 (LS)	11.60
34	AMS 48-7-3	130.00	19.00	31.25 (MS)	9.00
35	SQL 86	0.00	11.00	14.62 (LS)	16.80
36	EC 232019	38.50	11.00	23.85 (LS)	11.00
37	MAUS 142	0.00	5.00	11.33 (LS)	12.40
38	AMS MB 51-94	6.00	2.00	9.67 (LS)	8.00
39	PS 1423	23.00	8.00	18.67 (LS)	0.00
40	AMS 148	56.00	12.00	28.13 (MS)	6.40
41	EC 309537	68.00	18.00	24.38 (LS)	5.60
42	JSM 126	71.50	12.00	26.79 (MS)	6.80
43	JS 75-30	8.00	4.00	14.64 (LS)	6.00
44	VLS 75	0.00	6.00	10.67 (LS)	6.00
45	DB 1587	12.00	13.00	14.33 (LS)	0.00
46	EC 241690	37.00	20.00	21.33 (LS)	12.80
47	EC 287754	18.00	9.00	19.00 (LS)	12.00
48	Harder	0.00	10.00	10.67(LS)	0.00
49	AMS 108	0.00	9.00	15.33 (LS)	7.00
50	AGS 102	0.00	22.00	17.33 (LS)	8.00

LS: Least Susceptible; MS: Moderately susceptible

Table 3.24: Ent.7: Evaluation of germplasm lines for resistance against major insect-pests (SEHORE)

Code No.	ACC. No.	Defoliators		Stem fly (% Stem tunneling)	Girdle beetle (%Plant Infestation)
		Larvae/ mrl	Defoliation (%)		
1	JS 20-30	3.3	20.2	37.02	0.00
2	JS 20-86	5.6	36.04	20.36	8.00
3	JS 20-50	2.6	18.60	20.83	6.5
4	JS 20-59	3.00	11.00	10.06	1.50
5	JS 20-27	1.00	27.5	37.40	0.00
6	JS 20-79	3.33	25.00	11.44	1.50
7	JS 20-41	2.33	32.5	20.86	0.00
8	JS 20-56	1.33	33.5	8.22	1.35
9	JS 20-61	1.66	30.45	20.00	7.20
10	JS 20-23	1.33	25.50	22.10	2.70
11	JS 20-60	1.66	36.00	31.88	5.85
12	JS 20-21	1.66	27.50	17.30	3.00
13	JS 20-51	1.00	20.50	30.40	0.00
14	JS 20-53	1.66	25.00	11.44	7.20
15	JS 20-55	2.33	26.50	23.30	0.00
16	JS 20-48	1.66	25.00	15.40	0.00
17	AGS-56	1.66	28.00	21.00	6.50
18	AGS-76	2.33	33.00	26.25	6.18
19	EC 547464	1.00	19.50	36.55	6.55
20	G-11	1.66	30.70	22.15	5.85
21	JSM 288	3.33	21.50	20.00	3.00
22	EC 280148	2.33	15.50	22.60	2.70
23	AGS 112	3.00	20.40	25.15	5.00
24	EC 33940	2.00	19.5	29.58	2.70
25	EC 241695	1.66	21.10	14.35	3.00
26	EC 113778	2.00	28.50	18.16	6.18
27	AMSS 34	1.66	25.00	20.86	2.85
28	SQL 32	1.66	24.50	49.00	15.67
29	AMS 60-2-3-4	1.66	30.00	33.25	5.00
30	SQL 37	1.00	21.50	33.20	0.00

Code No.	ACC. No.	Defoliators		Stem fly (% Stem tunneling)	Girdle beetle (%Plant Infestation)
		Larvae/ mrl	Defoliation (%)		
31	SQL 36	3.00	26.50	50.00	1.45
32	AMS 25-5-2	3.33	18.5	26.00	5.00
33	SQL 31	2.33	18.50	51.69	2.85
34	AMS 48-7-3	1.33	17.50	39.00	0.00
35	SQL 86	1.66	17.0	35.55	8.00
36	EC 232019	3.66	18.5	24.26	1.50
37	MAUS 142	0.66	7.5	19.20	11.50
38	AMS MB 51-94	1.66	12.5	20.00	15.00
39	PS 1423	2.00	29.5	17.90	6.50
40	AMS 148	1.66	28.0	38.65	3.00
41	EC 309537	1.00	21.50	33.00	6.50
42	JSM 126	0.66	13.5	39.67	1.45
43	JS 75-30	3.00	19.0	21.20	3.00
44	VLS 75	1.66	12.0	17.08	11.50
45	DB 1587	0.66	9.00	27.00	1.35
46	EC 241690	2.00	16.0	33.42	3.00
47	EC 287754	1.33	10.00	35.70	0.00
48	Harder	1.00	23.50	34.00	6.50
49	AMS 108	1.00	20.5	4.17	11.50
50	AGS 102	2.00	19.50	10.80	8.00
51	JS 335	3.33	25.50	25.33	12.50

Table 3.25: ENT 7: Evaluation of germplasm lines for resistance against major insect- pests. (KOTA)

Code No.	ACC. No.	Defoliators (mrl)*	Girdle beetle (% infestation) **
1	JS 20-30	3.67(2.16) -MR	18.34(23.76) - LR
2	JS 20-86	3.17(2.04) -R	21.67(25.69) - LR
3	JS 20-50	4.17(2.27) -MR	16.67(22.62) -LR
4	JS 20-59	4.67(2.38) - LR	18.34(23.76) -LR
5	JS 20-27	4.17(2.27) - MR	15.00(21.60) -MR
6	JS 20-79	3.50(2.12) - MR	20.00(24.78) -LR
7	JS 20-41	4.34(2.31) - MR	20.00(24.68) -LR
8	JS 20-56	4.17(2.27) - MR	21.67(25.69) -LR
9	JS 20-61	3.00(2.00) - MR	11.67(19.14) -MR
10	JS 20-23	4.67(2.38) - LR	18.34(23.76) -LR
11	JS 20-60	4.34(2.31) - MR	20.00(24.68) -LR
12	JS 20-21	4.17(2.27) - MR	16.67(22.62) -LR
13	JS 20-51	4.84(2.42) - LR	18.34(23.76) -LR
14	JS 20-53	4.67(2.38) - LR	18.33(23.53) -LR
15	JS 20-55	4.83(2.41) - LR	18.34(23.76) -LR
16	JS 20-48	4.34(2.31) - MR	16.67(22.62) -LR
17	AGS-56	4.17(2.27) - MR	21.50(25.61) -LR
18	AGS-76	4.50(2.34) - LR	15.00(21.60) -MR
19	EC 547464	5.17(2.48) - LR	18.34(23.76) -LR
20	G-11	5.17(2.48) - LR	16.67(22.62) -LR
21	JSM 288	5.34(2.52) - LR	15.00(21.30) -MR
22	EC 280148	4.67(2.38) - LR	16.67(22.62) -MR
23	AGS 112	4.67(2.38) - LR	16.67(22.75) -MR
24	EC 33940	4.84(2.42) -LR	16.67(22.62) -MR
25	EC 241695	4.84(2.41)-LR	20.00(24.68) -LR
26	EC 113778	2.84(1.96) - R	8.34(16.23) -R
27	AMSS 34	4.17(2.27) -LR	16.67(22.75) -LR
28	SQL 32	4.84(2.42) -LR	18.33(23.53) -LR
29	AMS 60-2-3-4	5.50(2.55) -LR	13.34(20.28) -MR
30	SQL 37	5.00(2.45) -LR	16.50(22.50) - LR
31	SQL 36	2.67(1.91) -HR	10.00(17.82) - R
32	AMS 25-5-2	5.00(2.45) -LR	18.34(23.76) -LR
33	SQL 31	4.50(2.34) -LR	25.00(27.45) - S

Code No.	ACC. No.	Defoliators (mrl)*	Girdle beetle (% infestation) **
34	AMS 48-7-3	5.17(2.48) -LR	15.00(21.60) -MR
35	SQL 86	2.84(1.96) -R	11.67(19.14) -MR
36	EC 232019	5.34(2.52) -LR	16.67(22.62) -LR
37	MAUS 142	5.34(2.51) -LR	20.00(24.68) -LR
38	AMS MB 51-94	3.17(2.04) -MR	8.34(16.23) -R
39	PS 1423	4.34(2.31) -MR	16.67(22.62) -LR
40	AMS 148	3.34(2.08) -MR	11.67(19.14) -MR
41	EC 309537	5.34(2.52) -LR	18.34(23.76) -LR
42	JSM 126	4.84(2.42) -LR	20.00(24.68) -LR
43	JS 75-30	2.84(1.96) -R	13.34(20.28) -MR
44	VLS 75	4.84(2.41) -LR	20.00(24.78) -LR
45	DB 1587	4.17(2.27) -MR	20.00(24.68) -LR
46	EC 241690	5.50(2.55) -LR	20.00(24.68) -LR
47	EC 287754	4.17(2.26) -MR	18.34(23.76) -LR
48	Harder	4.50(2.34) -LR	20.00(24.68) -LR
49	AMS 108	5.34(2.51) -LR	16.67(22.62) -LR
50	AGS 102	4.67(2.38) -LR	18.34(23.76) -LR
SEm ±		(0.1)	(1.72)
CD (P=0.05)		(0.27)	(4.90)

* Square root transformed values ** Angular transformed values

Table 3.26: ENT 7 - Evaluation of germplasm lines for resistance against major insect pests (<u>DHARWAD</u>)

Code No.	ACC. No.	Defoliators (larvae/mrl)*	% Defoliation**	Pod borer damage** (%)	Girdle beetle damage** (%)
1.	JS 20-30	3.75 (2.06)LR	35.50 (36.56)MS	27.89 (31.87)MR	9.56 (18.00)MR
2.	JS 20-86	3.29 (1.95)MR	42.20 (40.50)MS	26.45 (30.94)MR	7.42 (15.80)MR
3.	JS 20-50	3.16 (1.91)MR	47.30 (43.43)MS	33.84 (35.56)LR	13.51 (21.56)LR
4.	JS 20-59	3.82 (2.08)LR	51.10 (45.61)S	29.56 (32.92)MR	12.57 (20.76)LR
5.	JS 20-27	4.02 (2.13)LR	32.30 (34.62)MS	34.12 (35.73)LR	15.09 (22.85)LR
6.	JS 20-79	3.51 (2.00)MR	32.55 (34.77)MS	28.51 (32.26)MR	9.25 (17.70)MR
7.	JS 20-41	3.24 (1.93)MR	47.80 (43.72)MS	31.59 (34.18)LR	10.78 (19.16)LR
8.	JS 20-56	3.57 (2.02)MR	53.50 (46.99)S	26.38 (30.89)MR	5.02 (12.94)MR
9.	JS 20-61	4.29 (2.19)LR	62.55 (52.25)S	37.46 (37.72)HS	10.52 (18.92)MR
10.	JS 20-23	4.05 (2.13)LR	44.50 (41.83)MS	38.59 (38.39)HS	17.56 (24.76)S
11.	JS 20-60	4.38 (2.21)LR	52.60 (46.47)S	32.10 (34.50)LR	16.49 (23.95)S
12.	JS 20-21	3.68 (2.04)MR	32.35 (34.65)MS	27.58 (31.67)MR	6.58 (14.86)MR
13.	JS 20-51	3.53 (2.01)MR	44.20 (41.65)MS	25.52 (30.33)R	8.29 (16.73)MR
14.	JS 20-53	3.94 (2.11)LR	32.00 (34.44)MS	35.48 (36.54)S	7.31 (15.68)MR
15.	JS 20-55	3.75 (2.06)LR	38.00 (38.04)MS	39.54 (38.95)HS	10.32 (18.73)MR

Code No.	ACC. No.	Defoliators (larvae/mrl)*	% Defoliation**	Pod borer damage** (%)	Girdle beetle damage** (%)
16.	JS 20-48	3.81 (2.08)LR	46.50 (42.98)MS	28.45 (32.22)MR	8.88 (17.33)MR
17.	AGS-56	3.60 (2.02)MR	35.20 (36.38)MS	27.78 (31.79)MR	11.25 (19.59)LR
18.	AGS-76	3.15 (1.91)MR	28.50 (32.25)MS	24.89 (29.92)R	8.16 (16.59)MR
19.	EC 547464	2.80 (1.82)R	24.00 (29.32)LS	29.36 (32.80)MR	4.25 (11.89)R
20.	G-11	2.65 (1.77)R	20.50 (26.91)LS	36.17 (36.96)S	7.86 (16.27)MR
21.	JSM 288	2.93 (1.85)MR	22.15 (28.06)LS	26.48 (30.96)MR	6.43 (14.68)MR
22.	EC 280148	4.18 (2.16)LR	35.10 (36.32)MS	27.46 (31.59)MR	13.02 (21.14)LR
23.	AGS 112	4.77 (2.30)S	64.50 (53.41)S	34.77 (36.12)LR	12.48 (20.68)LR
24.	EC 33940	4.86 (2.32)S	60.20 (50.87)S	31.50 (34.13)LR	9.16 (17.61)MR
25.	EC 241695	3.13 (1.91)MR	28.50 (32.25)MS	32.15 (34.53)LR	11.25 (19.59)LR
26.	EC 113778	4.01 (2.12)MR	37.75 (37.89)MS	34.97 (36.24)S	18.21 (25.25)S
27.	AMSS 34	3.45 (1.99)MR	45.50 (42.40)MS	30.63 (33.59)LR	14.28 (22.19)LR
28.	SQL 32	3.07 (1.89)MR	38.00 (38.04)MS	28.45 (32.22)MR	12.57 (20.76)LR
29.	AMS 60-2-3-4	4.84 (2.31)S	64.00 (53.11)S	29.93 (33.15)MR	8.29 (16.73)MR
30.	SQL 37	4.26 (2.18)LR	57.80 (49.47)S	33.21 (35.18)LR	8.35 (16.79)MR
31.	SQL 36	3.82 (2.08)LR	44.60 (41.88)MS	32.15 (34.53)LR	4.92 (12.81)R
32.	AMS 25-5-2	3.53 (2.01)MR	37.40 (37.69)MS	28.44 (32.22)MR	7.39 (15.77)MR

Code No.	ACC. No.	Defoliators (larvae/mrl)*	% Defoliation**	Pod borer damage** (%)	Girdle beetle damage** (%)
33.	SQL 31	4.08 (2.14)LR	49.80 (44.87)MS	35.58 (36.60)S	8.09 (16.52)MR
34.	AMS 48-7-3	4.22 (2.17)LR	44.50 (41.83)MS	27.15 (31.39)MR	14.37 (22.27)LR
35.	SQL 86	2.62 (1.77)R	18.50 (25.46)LS	28.89 (32.50)MR	6.05 (14.23)MR
36.	EC 232019	3.77 (2.07)LR	42.00 (40.38)MS	32.64 (34.83)LR	17.98 (25.08)S
37.	MAUS 142	4.00 (2.12)LR	37.50 (37.75)MS	35.67 (36.66)S	18.19 (25.24)S
38.	AMS MB 51-94	3.52 (2.00)MR	30.75 (33.66)MS	27.34 (31.51)MR	9.05 (17.50)MR
39.	PS 1423	3.27 (1.94)MR	32.50 (34.74)MS	34.85 (36.17)S	7.18 (15.54)MR
40.	AMS 148	3.58 (2.02)MR	58.80 (50.05)S	28.59 (32.31)MR	11.35 (19.68)LR
41.	EC 309537	3.46 (1.99)MR	37.50 (37.75)MS	32.23 (34.58)LR	7.34 (15.71)MR
42.	JSM 126	3.39 (1.97)MR	26.50 (30.97)LS	31.19 (33.94)LR	8.69 (17.14)MR
43.	JS 75-30	2.35 (1.69)R	18.50 (25.46)LS	28.48 (32.24)MR	7.63 (16.03)MR
44.	VLS 75	3.06 (1.89)MR	37.50 (37.75)MS	29.45 (32.85)MR	4.46 (12.19)R
45.	DB 1587	3.54 (2.01)MR	52.00 (46.13)S	30.76 (33.67)LR	3.98 (11.50)R
46.	EC 241690	4.22 (2.17)LR	44.50 (41.83)MS	27.51 (31.62)MR	12.35 (20.57)LR
47.	EC 287754	2.69 (1.79)R	29.75 (33.04)MS	33.14 (35.13)LR	5.97 (14.14)MR

Code No.	ACC. No.	Defoliators (larvae/mrl)*	% Defoliation**	Pod borer damage** (%)	Girdle beetle damage** (%)
48.	Harder	3.59 (2.02)MR	33.60 (35.41)MS	29.65 (32.98)MR	13.21 (21.30)LR
49.	AMS 108	4.60 (2.26)S	52.50 (46.41)S	33.24 (35.19)LR	15.20 (22.94)LR
50.	AGS 102	3.57 (2.02)MR	30.00 (33.20)MS	35.12 (36.33)S	10.12 (18.54)MR
JS 335 (C)		2.94 (1.85)MR	32.50 (34.74)MS	29.19 (32.69)MR	8.56 (17.01)MR
S.Em±		0.28	1.42	1.44	1.89
CD @ 5%		0.85	4.22	4.31	5.65
CD @ 1%		1.14	5.65	5.77	7.58
Mean		3.72	40.15	30.52	10.64

* Figures in the parenthesis are transformed $\sqrt{x+0.5}$ values, ** Transformed angular values

Table 3.27: ENT 7. Screening of Germplasm line for resistance against major insect-pests (INDORE)

Code	ACC. No.	DTF	DTM	Girdle beetle (% Infestation)	Girdle beetle (% damage)	Stem fly (% stem tunnelling)	Semilooper (larvae/m)	*S. litura* (larvae/m)	Yield (kg/ha)
1.	JS 20-30	32	91	0.00	0.00	71.58	7	2	1356
2.	JS 20-86	40	97	2.70	2.70	54.26	21	1	1889
3.	JS 20-50	40	98	2.00	0.00	41.07	19	0	2978
4.	JS 20-59	38	90	2.22	0.00	25.00	11	0	1978
5.	JS 20-27	32	81	0.00	0.00	34.23	9	0	1311
6.	JS 20-79	39	97	0.00	0.00	43.07	13	0	1933
7.	JS 20-41	33	83	0.00	0.00	29.27	18	1	2000
8.	JS 20-56	35	87	0.00	0.00	54.26	8	2	1467
9.	JS 20-61	30	96	2.63	0.00	81.20	10	15	2178
10.	JS 20-23	30	81	0.00	0.00	27.17	10	6	1044
11.	JS 20-60	31	90	0.00	0.00	85.34	10	5	1933
12.	JS 20-21	30	82	0.00	0.00	27.10	9	3	1511
13.	JS 20-51	33	95	2.56	0.00	61.34	11	3	2600
14.	JS 20-53	35	84	0.00	0.00	47.32	3	1	1333
15.	JS 20-55	33	86	0.00	0.00	52.07	2	2	1089
16.	JS 20-48	36	90	2.17	2.17	24.07	11	6	2133
17.	AGS-56	36	91	4.44	0.00	52.90	10	5	1311
18.	AGS-76	35	91	5.00	0.00	49.02	7	3	1533
19.	EC 547464	32	79	2.56	0.00	37.30	5	1	2222
20.	G-11	36	93	7.50	2.50	47.48	9	0	1578
21.	JSM 288	35	93	1.92	1.92	42.41	9	1	1178
22.	EC 280148	38	87	0.00	0.00	50.00	19	0	1133
23.	AGS 112	32	89	4.17	0.00	28.13	10	0	1089
24.	EC 33940	38	90	2.27	0.00	32.37	8	0	889
25.	EC 241695	36	88	2.27	2.27	37.20	8	0	1733
26.	EC 113778	36	88	2.86	0.00	33.90	12	0	1111
27.	AMSS 34	43	89	4.76	2.38	21.78	9	1	1444
28.	SQL 32	28	88	0.00	0.00	58.49	14	0	1444
29.	AMS 60-2-3-4	32	87	2.94	2.94	43.20	11	0	1978

Code	ACC. No.	DTF	DTM	Girdle beetle (% Infestation)	Girdle beetle (% damage)	Stem fly (% stem tunnelling)	Semilooper (larvae/m)	*S. litura* (larvae/m)	Yield (kg/ha)
30.	SQL 37	33	91	0.00	0.00	47.83	11	1	1400
31.	SQL 36	29	88	0.00	0.00	31.18	7	0	933
32.	AMS 25-5-2	36	88	0.00	0.00	50.69	17	1	1800
33.	SQL 31	30	87	0.00	0.00	30.27	9	0	1133
34.	AMS 48-7-3	33	85	4.44	4.44	22.79	7	0	1822
35.	SQL 86	27	88	0.00	0.00	41.67	5	0	933
36.	EC 232019	38	91	0.00	0.00	56.39	22	0	1022
37.	MAUS 142	39	103	0.00	0.00	58.78	11	0	2800
38.	AMS MB 51-94	32	93	5.26	2.63	56.86	12	0	1489
39.	PS 1423	36	98	6.12	4.08	38.26	16	0	2289
40.	AMS 148	35	89	2.50	2.50	13.77	8	0	1844
41.	EC 309537	38	91	0.00	0.00	34.68	12	0	1178
42.	JSM 126	38	98	0.00	0.00	28.66	12	0	2111
43.	JS 75-30	41	98	6.06	0.00	26.31	13	0	1289
44.	VLS 75	36	94	0.00	0.00	45.33	8	0	1378
45.	DB 1587	41	96	2.22	0.00	27.23	16	0	978
46.	EC 241690	40	93	2.38	2.38	34.44	13	0	1067
47.	EC 287754	33	95	2.44	2.44	38.00	18	0	1733
48.	Harder	44	100	6.98	6.98	24.04	10	0	2733
49.	AMS 108	35	86	5.13	5.13	28.95	11	0	2578
50.	AGS 102	39	90	0.00	0.00	29.05	7	0	1956
	AVERAGE	**35**	**90**	**2.0**	**0.9**	**41.2**	**11.0**	**1.2**	**1637**

पादप रोग विज्ञान
Plant Pathology

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Abbreviations used for soybean diseases

S. No.	Disease	Abbreviation	Pathogen
1.	Charcoal rot	CR	*Macrophomina phaseolina (Rhizoctonia bataticola)*
2.	Collar rot	Coll. R	*Sclerotium rolfsii*
3.A.	Rhizoctonia Root Rot	RRR	*Rhizoctonia solani*
3.B.	Rhizoctonia Aerial Blight	RAB	*Rhizoctonia solani*
4.	Bacterial Pustule	BP	*Xanthomanas campestris* pv. *glycines*
5.	Bacterial Blight	BLB	*Pseudomonas savastanoi* pv. *glycinea*
6.	Fusarium Rot / Wilt	FR /FW	*Fusarium* species
7.	Soybean Mosaic Virus	SMV	*Soja virus I*
8.	Soybean Yellow Mosaic Virus	YMV	*Mungbean yellow mosaic virus*
9.	Bud Proliferation/ No Podding	BPro./NPod.	*Phytoplasma*
9.	Myrothecium Leaf Spot	MLS	*Myrothecium roridum*
10.	Frogeye Leaf Spot	FLS	*Cercospora sojina*
11.A.	Cercospora Leaf Spot/Blight	CLS	*Cercospora kikuchii*
11.B.	Purple Seed Stain	PSS	*Cercospora kikuchii*
12.	Rust	Rust	*Phakopsora pachyrhizi*
13.	Alternaria Leaf Spot	ALS	*Alternaria* species
14.	Brown Spot	BS	*Septoria glycine*
15.	Target Leaf Spot	TLS	*Corynespora cassicola*
16.	Phoma Leaf Blight	PhB	*Phoma medicaginis*
17.	Cotyledonary Spot	CS	A number of fungi are involved
18.	Indian Bud Blight	IBB	A strain of *Groundnut bud necrosis virus*
29.	Powdery Mildew	PM	*Microsphaera diffusa*
20.	Anthracnose	Anth.	*Colletotrichum truncatum*
21.	Pod And Stem Blight	P&SB	*Diaporthe phaseolorum var. sojae*
22.	Wilt Complex	WC	-
23.	Pod Diseases/ Blight	PB PB(Ct) PB(Mr) PB(Mp) PB(Ph) PB(Fus) PB(Cer)	 a.*Colletotrichum truncatum* b. *Myrothecium roridum* c. *Macrophomina phaseolina* d. *Phomopsis* species e. *Fusarium* species f. *Cercospora* species
24	Choanephora Leaf Blight	ChLB	*Choanephora infundibulifera*
25	Red Crown Rot	RCR	*Colonectria* species
26	Helminthosporium Leaf Spot	HLS	*Helminthosporium* species
27	Sudden Death Syndrome	SDS	*Fusarium* species
28	Seed Rot	SR	*Pythium* spp. *Phytophthora* spp.

Table 4.1: PP1 Survey for soybean diseases (diseases scenario at different centers)

S. No.	Location / Disease	Northern Hill Zone		Northern Plain Zone				North Eastern Hill Zone		Central Zone			Southern Zone			No. of Centres (15)
		Palampur	Almora	Ludhiana	Pantnagar	Dholi	Delhi	Jorhat	Medziphema	Sehore	Jabalpur	Amravati	Ugarkhurd	k- Digraj	Dharwad	
1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18
1	CR				$				$		$	$				4
2	Coll. R							$	$		$	$				4
3	RAB				$			$	$		$					4
4	Rust								$				$	$	$	4
5	BS	$									$					2
6	TLS												$		$	2
7	CLS/PSS							$		$			$		$	4
8	FLS	$	$							$	$		$		$	6
9	ALS							$			$	$	$		$	5
10	PB(Ct)	$	$		$			$	$		$	$	$		$	9
11	BP	$	$		$				$		$	$			$	7
12	BLB				$											1
13	YMV	$		$	$	$	$	$			$	$	$		$	10
14	SMV			$	$						$					3
15	FR /FW				$			$	$							3
16	BND						$									1
17	SR							$								1
18	ChLB												$			1
Centre-wise no. of diseases reported		5	3	2	8	1	2	7	7	2	10	6	7	1	8	71

Table 4.2: PP2 Trap nursery trial for disease monitoring (Infection Index)

S. No.	Varieties	Northern Hill Zone							Northern Plain Zone							
		Almora DOS: 16/06/2018		Palampur DOS: 22/06/2018					Pantnagar DOS : 07/07/2018						Delhi*	
		FLS	BP	PB (ct)	FLS	BS	PB (ct)	BP	BP	BLB	PB(Ct)	RAB	SMV	YMV	YMV	BND
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	**JS 72-44**	55.5	11.1	11.1	24.66	33.33	16.66	11.11	22.22	0.00	31.94	33.33	21.71	33.33	0.00	0
2	**JS 75-46**	44.4	11.1	22.2	44.44	44.44	11.11	11.11	0.00	98.75	44.44	44.44	69.22	31.94	5.56	0
3	**JS 71-05**	44.4	11.1	22.2	55.55	33.33	11.11	0.00	31.94	0.00	22.21	33.17	10.49	9.88	1.96	0
4	**JS 72-280**	55.5	11.1	11.1	33.33	33.33	20.66	8.88	33.33	0.00	33.33	45.67	12.34	16.67	100.00	0
5	**PK 262**	44.4	22.2	11.1	55.55	44.66	11.11	0.00	31.59	0.00	22.22	31.94	11.11	32.83	5.56	0
6	**PK 472**	44.4	11.1	11.1	33.33	24.66	11.11	0.00	22.21	0.00	22.33	34.56	11.10	11.09	17.86	0
7	**MACS 58**	33.3	11.1	22.2	11.11	24.66	11.11	44.44	6.66	0.00	33.33	33.32	27.77	15.28	50.00	0
8	**JS 93-05**	55.5	11.1	33.3	11.11	55.55	44.44	33.33	0.00	88.88	33.33	56.78	33.33	0.00	46.43	0
9	**Punjab 1**	55.5	11.1	22.2	11.11	11.11	11.11	77.77	25.76	0.00	22.21	44.44	11.10	16.67	25.00	0
10	**Bragg**	44.4	22.2	22.2	33.33	33.33	55.55	8.88	9.87	0.00	33.17	32.82	22.22	0.00	75.00	0
11	**Monetta**	33.3	11.1	11.1	16.66	33.33	33.33	20.66	31.94	0.00	9.87	33.33	19.24	14.19	100.00	0
12	**KHSB 2**	11.1	11.1	22.2	24.66	33.33	11.11	11.11	29.62	0.00	9.87	31.94	56.78	30.75	100.00	0
13	**NRC 7**	11.1	11.1	11.1	20.66	33.33	44.44	0.00	33.33	0.00	11.11	22.22	11.11	8.64	100.00	0
14	**VLS 58**	33.3	11.1	22.2	11.11	33.33	33.33	11.11	0.00	0.00	22.21	33.33	23.45	12.34	12.50	0
15	**JS 335**	22.2	33.3	11.1	55.55	33.33	55.55	0.00	32.06	0.00	33.33	56.78	31.94	33.33	Dead	Dead
16	**Shivalik**	66.8	33.3	22.2	77.77	33.33	24.66	0.00	0.00	65.45	75.30	98.13	44.44	9.88	25.00	0

*** CI: Coefficient of infection**

Table 4.2: contd...

S. No.	Varieties	North Eastern Hill Zone					
		Jorhat DOS: 19/09/2018			Medziphema DOS: 10/07/2018		
		Coll-R	RAB	PB (Ct)	FW	RAB	PB (Ct)
1	2	3	4	5	7	8	9
1	JS 72-44	11.48	14.44	30.86	13.47	19.97	20.69
2	JS 75-46	8.39	9.01	24.19	16.67	9.79	20.76
3	JS 71-05	10.49	15.67	29.01	9.23	10.15	29.37
4	JS 72-280	10.74	10.74	44.19	21.92	4.06	26.71
5	PK 262	2.46	2.20	28.88	14.51	31.59	20.69
6	PK 472	7.28	24.44	43.20	17.74	38.77	49.79
7	MACS 58	13.20	00	35.30	12.04	8.14	39.59
8	JS 93-05	8.27	11.97	44.93	20.27	64.44	29.47
9	Punjab 1	14.81	14.19	30.86	15.05	5.65	37.87
10	Bragg	5.92	12.46	45.43	0.00	0.00	0.00
11	Monetta	13.70	13.45	45.18	4.18	28.42	33.24
12	KHSB 2	20.61	22.96	49.13	0.00	0.00	0.00
13	NRC 7	7.28	1.85	39.75	11.26	56.88	27.36
14	VLS 58	-	-	-	17.12	8.76	47.02
15	JS 335	22.96	10.24	39.62	20.66	63.75	71.90
16	Shivalik	6.29	17.16	49.87	18.81	2.07	26.97

Table 4.2: contd...

S. No	Varieties	Central Zone											Southern Zone		
		Sehore* DOS: 04/07/2018	Jabalpur DOS : 27/06/2018					Amravati DOS: 26/06/2018					Dharwad DOS: 12/07/2018		
		TLS	YMV	CR	RAB	PB (Ct)	BP	YM V	CR	PB (Ct)	BP	ALS	Rust	PSS PDI	PB (ct)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	JS 72-44	3.55	18.5	16.5	5.5	0.0	0.0	4.71	23.30	0.00	0.00	27.93	72.56	3.56	22.65
2	JS 75-46	4.0	12.7	12.5	7.4	3.5	0.0	0.00	0.00	0.00	0.00	2.77	65.25	4.52	25.65
3	JS 71-05	4.25	8.5	28.5	15.0	2.8	0.0	0.00	0.00	2.77	0.00	0.00	55.63	5.21	16.35
4	JS 72-280	3.30	16.4	38.2	17.4	0.0	0.0	0.00	10.70	0.00	0.00	0.00	55.23	9.50	25.25
5	PK 262	3	14.5	30.5	4.7	0.0	0.0	0.00	2.70	0.00	0.00	0.00	54.25	4.25	19.63
6	PK 472	2	11.8	4054	5.4	0.0	0.0	1.70	8.20	0.00	0.00	2.70	50.12	6.21	25.63
7	MACS 58	4.55	9.0	55.0	20.5	8.5	4.8	2.94	43.75	0.00	2.78	7.43	78.21	2.21	24.56
8	JS 93-05	4.05	8.4	22.0	7.5	0.0	6.4	2.84	54.75	0.00	0.00	0.00	50.21	10.22	20.12
9	Punjab 1	4.5	12.5	35.5	18.5	0.0	0.0	0.00	39.70	0.00	16.80	0.00	54.28	9.25	30.15
10	Bragg	3.8	14.5	12.5	4.5	4.3	0.0	0.00	60.75	10.77	0.00	6.48	72.35	7.50	23.12
11	Monetta	2.7	11.5	70.5	28.5	0.0	0.0	0.00	14.25	22.22	0.60	13.44	85.25	12.56	54.56
12	KHSB 2	2.2	9.6	35.0	18.0	2.5	18.5	0.00	17.93	0.00	0.00	4.93	72.25	6.50	32.12
13	NRC 7	2.25	20.5	55.0	15.5	3.5	0.0	0.00	0.00	0.00	0.00	0.00	52.32	10.65	20.12
14	VLS 58	1.75	17.8	40.5	13.8	0.0	0.0	0.00	15.75	15.75	1.70	18.70	77.50	6.50	26.53
15	JS 335	7	8.6	34.5	15.4	0.0	4.0	3.77	54.75	3.93	4.75	15.38	79.21	6.36	28.56
16	Shivalik	3.15	23.0	12.0	16.5	6.8	0.0	0.00	2.75	21.20	2.88	10.20	68.45	5.36	25.32

***Disease grades**

Table 4.3: PP3 (a). Reaction of CIVT entries for various diseases.

S. No.	Varieties	FLS		BP				PB (ct)								RAB				YMV						BS	BLB	
		Almora	Palampur	Pantnagar^{nc}	Almora	Amravati	Medziphema	Almora	Pantnagar	Medziphema	Ugarkhurd	Palampur	Jorhat	Indore	Dharwad	Medziphema	Pantnagar	Jorhat	Jabalapur	Delhi	Jabalpur	Pantnagar	Ludhiana	Jorhat	Amravati	Palampur	Pantnagar	Jorhat
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**32**	**33**
1	DS 3109	MS	S	AR	AR	AR	AR	AR	HR	MS	MR	MR	MS	MR	MR	MS	MR	MS	MR	HR	HR	HR	HS	MR	AR	MR	AR	AR
2	NRC 146	AR	AR	AR	HR	AR	AR	AR	MR	S	MR	HS	S	MR	MR	MS	HS	MS	MR	HR	HR	HR	HS	MR	AR	MR	AR	AR
3	PS 1634	MR	MR	MR	AR	AR	AR	HR	HR	HR	MR	HR	HR	S	MR	MR	HR	MR	AR	HR	HR	HR	S	HR	AR	HR	AR	AR
4	JS 21-71	MS	MR	MR	HR	AR	AR	HR	HR	S	MR	HR	S	MR	MR	AR	MR	AR	AR	MR	R	AR	HS	HR	AR	MR	AR	AR
5	MACS 1566	MS	HR	AR	HR	AR	AR	HR	HR	S	MR	MR	S	MS	MR	HR	HR	HR	MR	HS	MR	HR	HS	HR	AR	HR	AR	AR
6	SL 1191	MS	S	AR	HR	AR	AR	HR	HR	S	MS	HR	S	HS	MS	AR	HR	AR	AR	HR	HR	MR	HR	MR	AR	HR	AR	AR
7	Himso 1688	S	MR	MR	HR	AR	AR	HR	MR	HS	MR	MR	HS	HS	MR	MR	MR	MR	MR	MS	R	HR	HS	R	AR	MR	AR	AR
8	PS 24(C)	-	MS	MR	-	AR	AR	-	MS	AR	MS	MR	AR	HS	MS	AR	MR	AR	MR	HS	MR	AR	HS	R	AR	MR	AR	AR
9	RSC 11-17	MR	MS	MR	HR	AR	AR	AR	S	AR	MR	MR	AR	MS	MR	AR	S	AR	MR	S	R	HR	HS	MR	AR	HR	MS	AR
10	MAUS 734	MS	MR	MR	HR	AR	AR	HR	MR	HS	MS	MR	HS	HS	MS	HR	HS	HR	MR	R	HR	AR	HS	MR	AR	MR	AR	AR
11	DSb 33	HR	MR	MR	HR	AR	AR	AR	HS	MS	MR	MR	MS	HS	MR	AR	S	AR	MS	HR	HR	HR	HS	R	AR	MR	AR	AR
12	NRC 138	MS	MS	MR	MR	AR	AR	HR	S	HS	MS	S	HS	MR	MS	AR	MS	AR	MR	S	HR	HR	HS	R	AR	MR	AR	AR
13	JS 21-72	MS	MR	MR	AR	AR	AR	AR	HR	S	MS	MR	S	S	MS	HR	MR	HR	AR	R	HR	HR	MR	MR	AR	MR	AR	AR
14	PS 1637	MS	MR	AR	HR	AR	AR	AR	HR	AR	MR	MR	AR	S	MR	AR	MS	AR	MR	S	HR	HR	S	R	AR	MR	AR	AR
15	AUKS 176	MS	MR	AR	AR	AR	AR	AR	MR	MR	MS	MR	MR	S	MS	AR	MS	AR	MR	MS	HR	MR	HS	MR	AR	MR	AR	AR
16	PS 1347(C)	-	HR	HR	-	AR	AR	-	MR	HR	MR	MR	HR	MR	MR	AR	MS	AR	MS	MR	HR	AR	S	HR	AR	MR	AR	AR
17	GJS 3	MS	MR	MS	AR	AR	AR	AR	MR	AR	MR	MS	AR	MS	MR	AR	MS	AR	MS	HR	R	AR	HS	HR	AR	HR	AR	AR
18	NRC 139	MS	MR	AR	MR	AR	AR	HR	HR	MS	MR	MR	MS	MS	MR	AR	HR	AR	MR	HR	MR	AR	HR	HR	AR	MR	AR	AR
19	DS 3110	S	MS	AR	MS	AR	AR	HR	HR	MS	MR	MS	MS	MR	MR	AR	MR	AR	MR	MS	HR	AR	S	HR	AR	MR	AR	AR
20	SL 1171	MS	MR	HR	HR	AR	AR	HR	HR	MS	MS	MR	MS	MR	MS	AR	MR	AR	MR	MS	R	HR	HS	HR	AR	MR	AR	AR
21	MACS 1620	HR	MR	S	HR	AR	AR	HR	S	HR	MS	MS	HR	MR	MS	AR	S	AR	MR	Dead	HR	HR	HS	HR	AR	MR	AR	AR
22	MAUS 732	HR	MR	MR	HR	AR	AR	HR	MR	MR	MR	MR	MR	S	MR	AR	MR	AR	MR	MS	MS	HR	HS	HR	AR	MR	AR	AR
23	KS 113	HR	MR	AR	HR	AR	MR	HR	MR	MS	MR	MR	MS	MR	MR	AR	MR	AR	MS	HR	MR	HR	HS	HR	AR	MS	AR	MR
24	SL 958(C)	-	AR	HR	-	AR	AR	-	MR	AR	MS	MS	AR	MR	MS	HR	MS	HR	MR	MR	R	AR	HS	R	AR	MR	AR	AR

1	2	3	4	5	6	7	8	9	10	11	12	13	15	16	17	18	19	20	21	24	25	26	27	28	29	30	32	33
25	NRC 148	MS	MR	AR	MR	AR	AR	HR	MR	AR	MR	MS	AR	S	MR	MR	MS	MR	MS	HS	R	HR	HS	HR	AR	MR	AR	AR
26	RSC 11-15	MS	MR	HR	HR	AR	AR	HR	HR	AR	MR	MR	AR	MS	MR	AR	MR	AR	MR	HS	MR	HR	HS	HR	AR	MR	AR	AR
27	RVS 2011-10	MR	MR	AR	HR	AR	AR	HR	HR	MS	MR	MR	MS	MR	MR	AR	MR	AR	MS	HR	MR	AR	HS	HR	AR	MR	AR	AR
28	Himso 1689	MS	MS	MR	HR	AR	AR	HR	S	MS	MS	MR	MS	MR	MS	S	S	S	AR	Dead	HR	HR	HS	HR	AR	MR	S	AR
29	CAUMS 1	S	MR	AR	HR	AR	AR	HR	MR	AR	MR	MS	AR	HS	MR	MS	MR	MS	MS	HS	R	HR	HS	R	AR	MR	AR	AR
30	RVSM 2011-35	MS	HR	AR	HR	AR	AR	HR	HR	MS	MR	MR	MS	MR	MR	AR	HR	AR	MR	R	MR	AR	HS	HR	AR	MR	AR	AR
31	VLS 97	MS	MR	HS	HR	AR	AR	HR	MR	MS	MS	MR	MS	S	MS	MR	MS	MR	MS	MR	MR	MR	HS	HR	AR	MR	AR	AR
32	TS 59	MR	MR	HR	MR	AR	AR	HR	MR	AR	MR	MR	AR	HS	MR	MR	MR	MR	AR	HR	R	AR	HS	HR	AR	MS	AR	AR
33	RVS 2007-4	MS	MR	HR	MR	AR	AR	MR	HR	S	MR	MR	S	HS	MR	MS	HR	MS	MS	S	MR	HR	HS	R	AR	MR	HR	AR
34	KDS 1073	MS	MR	HR	HR	AR	AR	HR	HR	MS	MS	MR	MS	HS	MS	MR	HR	MR	MR	MS	MS	AR	HS	MR	AR	HR	AR	AR
35	NRCSL 2	MR	MR	HR	HR	AR	MR	HR	HR	AR	MR	S	AR	MS	MR	MS	HR	MS	MR	HR	R	HR	HS	R	AR	MR	AR	MR
36	KDS 1009	MS	MR	AR	MR	AR	AR	HR	HR	AR	MR	AR	AR	MS	MR	AR	HR	AR	MR	MR	HR	HR	HS	HR	AR	HR	AR	AR
37	BAUS 100	MS	MR	HR	MS	AR	AR	HR	MR	MR	MS	MR	MR	S	MS	AR	MR	AR	MR	MS	MR	MR	HS	HR	AR	MR	AR	AR
1	**Shivalik (c)**	S	HS		MS			HR			MS	MS			MS											MS		
2	**Bragg (c)**										MS		AR		S			HS						MS				AR
3	**VLS 2 (c)**	S			MS			HR																				
4	**VLS 58 (c)**														MR													
6	**VLS 63 (c)**														MS													
8	**SL 688 (c)**						AR			AR																		
10	**PS 1042 (c)**															MS												
11	**PS 1347(c)**															MS							S					
12	**RKS 18 (c)**						AR			S						MS												
13	**JS 97-52 (c)**					MR	AR									HS									AR			
14	**JS 93-05 (c)**					HR	AR		AR	HR	MS		HR	MR	MS	MS		MS						MS	MS			AR

1	2	3	4	5	6	7	8	9	10	11	12	13	15	16	17	18	19	20	21	24	25	26	27	28	29	30	32	33
15	**JS 335 (c)**		MS	MS		MR	AR			HS	S	S	HS		S	S	MS	MS	MS		MS	MS		MS	MS	MR	MS	AR
18	**JS 95-60 (c)**														MR										AR			
19	**JS 20-29 (c)**																											
20	**JS 20-34 (c)**																											
21	**Punjab 1 (c)**			MR		AR			AR		MS			HS	MS		MS					MR			AR		AR	
22	**DSb 21 (c)**										S				S													
28	**NRC 37 (c)**													HS														
29	**MACS 450**										MS																	

Table 4.3: contd...

S. No	Varieties	TLS	FW	BND	Rust				SMV		ALS	Coll.R.	CR		PSS	
		Sehore	Medziphema	Delhi	Ugarkhurd	Dharwad	Medziphema	K.Digraj	Pantnagar	Indore	Amravati	Jorhat	Amravati	Jabalpur	Ugarkhurd	Dharwad
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
1	DS 3109	MS	S	HR	MS	MS	AR	HS	HR	R	AR	MS	AR	AR	HR	HR
2	NRC 146	-	S	HR	MS	S	AR	MS	HR	R	AR	MS	AR	MR	HR	HR
3	PS 1634	-	MR	HR	HS	HS	AR	HS	HR	MS	AR	MR	HR	MS	HR	HR
4	JS 21-71	MR	AR	HR	MS	MS	S	S	AR	MS	AR	AR	MS	AR	HR	HR
5	MACS 1566	MR	AR	HR	MS	MS	AR	HS	HR	MR	AR	AR	AR	MR	MR	MR
6	SL 1191	AR	MR	HR	MS	MS	AR	HS	AR	MS	AR	MR	AR	AR	HR	HR
7	Himso 1688	MS	HR	HR	S	S	AR	HS	AR	S	AR	HR	AR	HS	HR	HR
8	PS 24(C)	MR	AR	HR	R	HR	AR	HS	HR	MR	AR	AR	AR	HS	HR	HR
9	RSC 11-17	HR	AR	HS	MS	MS	AR	HS	MR	MR	AR	AR	AR	MR	MR	MR
10	MAUS 734	S	MR	HR	HS	S	AR	HS	HR	R	AR	MR	S	MS	HR	HR
11	DSb 33	S	AR	HR	HR	HR	HS	MR	HR	R	AR	AR	S	S	HR	HR
12	NRC 138	MR	MR	HR	MS	MS	AR	S	MR	MR	AR	MR	AR	HS	HR	HR
13	JS 21-72	-	AR	HR	MS	MS	MR	S	HR	MR	AR	AR	HR	AR	HR	HR
14	PS 1637	MS	AR	HR	MS	MS	AR	HS	HR	R	AR	AR	AR	HS	HR	HR
15	AUKS 176	S	AR	HR	MS	MS	AR	HS	HR	MS	AR	AR	HR	S	MR	MR
16	PS 1347(C)	-	HR	HR	R	HR	MR	HS	AR	R	AR	HR	MS	S	HR	HR
17	GJS 3	S	MS	HR	MS	MS	MR	HS	AR	R	AR	MS	AR	S	HR	HR
18	NRC 139	-	MR	HR	HS	HS	MR	HS	AR	R	AR	MR	AR	S	HR	HR
19	DS 3110	MS	AR	HR	S	S	AR	HS	AR	R	AR	AR	AR	MS	MR	MR
20	SL 1171	MR	MR	MS	MS	MS	MR	HS	HR	R	AR	MR	AR	HS	HR	HR
21	MACS 1620	MR	AR	Dead	MS	MS	AR	HS	MR	R	AR	AR	AR	MR	HR	HR
22	MAUS 732	MR	MR	HR	S	S	AR	HS	MR	S	AR	MR	AR	MR	HR	HR
23	KS 113	MR	AR	HR	MS	MS	AR	MS	HR	S	AR	AR	AR	MS	HR	HR
24	SL 958(C)	MS	AR	HR	MR	MR	AR	HS	AR	R	AR	AR	AR	HS	HR	HR
25	NRC 148	MR	MR	HR	S	S	AR	HS	HR	S	AR	MR	AR	HS	MR	MR
26	RSC 11-15	HR	AR	HR	MS	S	HR	HS	HR	S	AR	AR	AR	S	HR	HR
27	RVS 2011-10	MR	AR	HR	S	S	AR	HS	AR	S	AR	AR	MS	HS	MR	MR
28	Himso 1689	MS	AR	Dead	S	S	AR	HS	MS	S	AR	AR	MS	AR	HR	HR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
29	CAUMS 1	MR	AR	HR	S	S	AR	HS	HR	S	AR	AR	S	MS	HR	HR
30	RVSM 2011-35	MR	AR	HR	MS	MS	HR	HS	AR	MS	AR	AR	MS	HS	MR	MR
31	VLS 97	MR	AR	HR	S	S	AR	HS	MR	R	AR	AR	MS	HS	HR	HR
32	TS 59	S	AR	HR	MS	MS	MR	HS	HR	MS	AR	AR	HR	MR	HR	HR
33	RVS 2007-4	MS	AR	HR	MS	S	AR	HS	MS	MR	AR	AR	MS	HS	HR	HR
34	KDS 1073	MR	AR	HR	MR	MR	AR	R	MR	R	AR	AR	MS	AR	HR	HR
35	NRCSL 2	MS	MR	HR	HS	HS	AR	HS	HR	MR	AR	MR	AR	AR	MR	MR
36	KDS 1009	MR	AR	HR	S	S	AR	R	MR	MS	AR	AR	AR	AR	HR	HR
37	BAUS 100	MS	AR	HR	S	S	AR	HS	MR	R	AR	AR	AR	HS	HR	HR
1	Bragg (c)				S	S						HR			MS	MS
2	VLS 58 (c)				S	S									HS	HS
3	VLS 59 (c)					S										
4	VLS 63 (c)					S										
5	PS 1042 (c)															
6	SL 688 (c)		HR													
7	RKS 18 (c)		AR		S	S	S									MS
8	JS 97-52 (c)		HR				MR				HR		S			
9	JS 93-05 (c)	MR	HR		HS	HS		HS		MR	HR	MS	HS		HR	HR
10	JS 335 (c)	S	MS		HS	HS	S	HS	MS		MS	HR	MS	MR	MS	MS
11	JS 72-44 (c)	MS														
12	JS 75-46 (c)															
13	JS 95-60 (c)				S						HR		MS			
14	JS 20-29 (c)															
15	JS 20-34 (c)															
16	Punjab 1 (c)	S			S				HR	S	HR		S		MS	
17	NRC 77 (c)															
18	NRC 86 (c)															
19	DSb 21(c)				HR	HR									HR	HR
20	SL525(c)															
21	RAUS 5(c)															
22	NRC 37 (c)				HS					MR						
23	NRC 7 (c)	S														
24	VLS 2 (c)															
25	Shivalik				S	S									MS	MS
26	MACS 450				MS	MS									HR	HR

Table 4.4: PP3 (b). Reaction of AVT-I entries for various diseases

S. No.	Varieties	Northern Hill Zone						Northern Plain Zone								
		Palampur			Almora			Pantnagar						Delhi*		Dholi
		FLS	PB (ct)	BS	FLS	BP	PB (Ct)	BP	BLB	PB (ct)	RAB	SMV	YMV	YMV	BND	YMV
1	2	3	4	5	6	7	10	11	12	13	14	15	16	17	18	19
1	AMS 100-39	MR	MR	MR	HR	HR	HR	AR	AR	MS	S	MR	AR	-	-	MS
2	AMS 2014-1	MS	MS	MR	HR	HR	HR	AR	AR	MR	MR	MR	AR	MS	HR	MR
3	BAUS 102	MR	HS	MR	MS	HR	HR	AR	AR	HR	MR	MR	MR	HS	HR	
4	CSB 10084	MR	MS	MR	MS	HR	HR	HS	AR	HR	MS	HR	HR	-	-	MS
5	CSB 10112	MS	AR	MR	S	HR	HR	HS	AR	HR	MS	HR	MR	S	HR	S
6	DS 3108	MS	MR	MR	S	HR	HR	AR	AR	HR	HR		AR	HR	HR	S
7	DSb 34	MR	MR	MR	HR	HR	HR	AR	AR	MR	HS	MR	AR	-	-	-
8	KDS 992	MR	MR	MR	HR	HR	HR	MS	S	MR	S	MR	MR	Dead	Dead	-
9	MACS 1493	MR	HR	MR	HR	HR	HR	AR	MS	MR	S	MR	HR	MS	MR	S
10	MACSNRC 1575	MR	S	MR	HR	MR	HR	AR	HS	HS	S	MR	AR	Dead	Dead	MS
11	MACSNRC 1667 (EDV)*	MR	MR	HR	HR	HR	MR	AR	AR	MR	HS	HR	AR	HS	HR	-
12	NRC 128	MR	AR	HR	HR	HR	HR	AR	AR	HR	MR	MR	AR	HR	HR	MS
13	NRC 130	MR	MS	MR	HR	MR	HR	HS	AR	S	HS	MR	MR	-	-	MS
14	NRC 131	MR	MS	MR	HR	HR	HR	HS	AR	S	HS	MS	HR	-	-	MR
15	NRC 132	MR	HR	MR	MS	MR	HR	AR	AR	MR	MS		AR	R	HR	S
16	NRC 134	MR	HR	MS	MS	HR	HR	AR	AR	HR	MR	MR	MR	HS	HR	MR
17	NRC 136	MR	AR	MR	MS	HR	HR	AR	AR	MR	MS	HR	HR	HS	HR	S
18	NRC 137	MR	HR	MR	MS	HR	HR	AR	AR	HR	MR	HR	AR	MS	HR	MS
19	NRC 147	AR	MR	HR	MR	HR	HR	-	-	-	-	-	-	MS	HR	-
20	NRCSL 1	MR	MS	MR	MS	HR	HR	MR	AR	MS	MS	HR	AR	-	-	S
21	PS 1611							AR	AR	AR	HR	HR	AR	MR	HR	S
22	PS 1613	MR	MR	MR	MS	HR	HR	AR	AR	HR	HR	AR	MR	HR	HR	S
23	RSC 11-03	MR	HR	MR	HR	HR	HR	AR	AR	MR	MS	AR	AR	MR	HR	MS

1	2	3	4	5	6	7	10	11	12	13	14	15	16	17	18	19
24	RSC 11-07	HR	MS	MR	MS	HR	HR	AR	AR	MR	MS	AR	AR	-	-	S
25	SKF-SPS-11	MR	MR	MR	MS	HR	HR	AR	AR	MR	S	MR	HR	S	HR	-
26	SL 1068	MS	HR	MR	MR	HR	HR	AR	AR	HR	HR	HR	HR	HR	HR	MS
27	SL 1123	HR	HR	MR	MS	HR	HR	AR	AR	HR	HR	HR	AR	HR	HR	S
28	VLS 94	AR	AR	MR	HR	HR	HR	MR	AR	MR	MS	MR	HR	HR	HR	S
29	VLS 95	MR	MR	MS	MR	HR	HR	HS	HS	S	MS	MR	HR	-	-	MS
1	JS 97-52 ©	-						AR	AR	MR	MR	MR	AR			
2	JS 72-44 ©	-						MR	AR	MR	MS	MR	MR			
3	JS 335 ©	MS	S	MS	HR	HR	HR	HR	AR	MR	S	MS	S			S
4	JS 93-05 ©	-						MR	AR	MR	MS	HR	MR			S
5	JS 20-29©	-														
6	PS 1092 ©	AR	MS	MR												
7	Punjab 1 ©	-						MR	AR	MR	MS	HR	HR			
8	DSb 21 ©	-														
9	SL 958©	-						AR	AR	HR	HR	AR	AR			
10	Shivalik ©	HS	MS	MS	S	HR	HR	AR	HS	HS	HS	MS	HR			
11	VLS 59 ©	HR	MR	MR				MR	AR	MS	MS	MR	HR			
12	VLS 63 ©	HR	MR	MR												
13	VLS 58	-			MS	HR	MR									
14	Bragg				MS	HR	HR	MR	AR	MR	MR	HR	AR			
15	MACS 450				MR	MR	MR	AR	AR	MR	MS	MR	HR			
16	SL 688							HR	AR	HR	HR	AR	AR			
17	JS 7546							MR	S	MR	MS	MS	MR			
18	JS 20-34							MS	AR	MS	S	HR	HR			
19	PS 1042							MR	AR	MS	HR	AR	HR			

-: Reaction for check entries: not reported New Delhi Center: Check entries reaction not reported.

Table 4.4: PP3 (b). Reaction of AVT-I entries for various diseases

S. No.	Varieties	North Eastern Hill Zone						
		Medziphema		Jorhat				
		PB (ct)	RAB	Coll. R	RAB	PB (Ct)	YMV	BLB
1	2	3	4	5	6	7	8	9
1	AMS 100-39	MR	MS	MR	MS	MR	HR	AR
2	AMS 2014-1	HR	MR	MR	MR	HR	HR	AR
3	BAUS 102	MR	AR	MS	AR	MR	R	AR
4	CSB 10084	HR	HR	HS	HR	HR	R	AR
5	CSB 10112	MS	HR	HR	HR	MS	R	AR
6	DS 3108	HR	AR	MS	AR	HR	HR	AR
7	DSb 34	S	MR	MR	MR	S	HR	AR
8	KDS 992	S	HR	HR	HR	S	HR	AR
9	MACS 1493	MR	AR	MS	AR	MR	R	AR
10	MACSNRC 1575	HS	AR	MS	AR	HS	R	AR
11	MACSNRC 1667 (EDV)*	HS	MR	-				
12	NRC 128	HR	HS	MR	HS	HR	R	AR
13	NRC 130	HS	MR					
14	NRC 131	MS	AR	MR	AR	MS	HR	AR
15	NRC 132	HR	S	MS	S	HR	HR	AR
16	NRC 134	MS	MS	MR	MS	MS	HR	AR
17	NRC 136	S	AR	MR	AR	S	HR	AR
18	NRC 137	MS	HR	MS	HR	MS	R	AR
19	NRC 147	MS	S	-				
20	NRCSL 1	MR	MS	MR	MR	MR	HR	AR
21	PS 1611	AR	AR	AR	MR	AR	HR	AR
22	PS 1613	MR	AR	MR	MR	AR	HR	AR
23	RSC 11-03	AR	AR	HR	AR	MS	R	AR

1	2	3	4	5	6	7	8	9
24	RSC 11-07	MS	AR	HS	AR	AR	HR	AR
25	SKF-SPS-11	S	MS	MR	MS	S	HR	AR
26	SL 1068	HR	MR	MS	MR	HR	HR	AR
27	SL 1123	MR	MR	HS	MR	MR	HR	AR
28	VLS 94	MS	AR	HR	AR	MS	HR	AR
29	VLS 95	S	S	HR	MS	MS	HR	AR
1	**Bragg ©**	-	-	MS	MS	MS	MS	MR
2	**JS 97-52 ©**	AR	HS					
3	**JS 335 ©**	S	MS	MS	MS	MS	MS	AR
4	**JS 93-05 ©**	S	MR	MS	MR	MS	MS	MR
5	PS 1042 ©	AR	MR					
6	**VLS 59**	MR	HS					
7	**VLS 63**	AR	AR					
8	**SL 688**	HR	MR					
9	**SL 525**	AR	MR					

*** -:**Not reported

Table 4.4: Contd… PP 3 (b). Reaction of AVT-I entries for various diseases

S. No.	Varieties	Central Zone								Southern Zone						
		Jabalpur			Sehore	Amravati				Dharwad			Ugarkhurd			K.Digraj
		CR	YMV	RAB	TLS	YMV	CR	ALS	BP	Rust	PSS	PB (ct)	Rust	PSS	PB (ct)	Rust
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
1	AMS 100-39	AR	R	AR	MS	AR	HR	HR	AR	MS	MR	MS	MS	MR	MS	MS
2	AMS 2014-1	MR	R	MR	MS	AR	AR	HR	AR	MS	MR	MS	MS	MR	MS	S
3	BAUS 102	MS	HR	AR		AR	HR	HR	AR	MS	MR	MS	MS	MR	MS	MS
4	CSB 10084	-	-	-	MR	AR	MS	HR	AR	MS	MR	MS	MS	MR	MS	-
5	CSB 10112	-	-	-	MR	AR	MS	AR	AR	MS	MR	MS	MS	MR	MS	-
6	DS 3108	MR	HR	MR	MR	AR	HR	HR	AR	MS	MR	MS	MS	MR	MS	-
7	DSb 34	HS	MR	MS	MR	AR	MS	AR	HR	HR	HR	MR	HR	HR	MR	MR
8	KDS 992	AR	HR	MR	MR	HR	MS	HR	HR	MS	HR	MS	MS	HR	MS	HR
9	MACS 1493	MS	MR	MR	MR	HR	AR	HR	AR	S	HR	MS	MS	HR	MS	HR
10	MACSNRC 1575	HS	R	MS	MS	AR	HR	HR	AR	MS	MR	MR	MS	MR	MR	MS
11	MACSNRC 1667 (EDV)*	HS	MR	MS	-	AR	HR	AR	AR	MS	HR	MR	MS	HR	MR	MS
12	NRC 128	-	-	-	-	HR	HR	AR	AR	MS	HR	MS	MS	HR	MS	MS
13	NRC 130	AR	R	MR	MR	AR	MS	AR	AR	MS	HR	MS	MS	HR	MS	-
14	NRC 131	MS	R	MR	MR	AR	HR	AR	AR	MS	MR	MS	MS	MR	MS	-
15	NRC 132	S	HR	MS	-	AR	AR	AR	AR	MS	HR	MR	MS	HR	MR	S
16	NRC 134	MS	HR	AR	MR	AR	AR	AR	AR	MS	MR	MR	MS	MR	MR	-
17	NRC 136	MS	HR	AR	MR	AR	AR	AR	AR	MS	MS	MS	MS	MS	MS	-
18	NRC 137	MS	HR	AR	MR	HR	AR	AR	AR	MS	MS	MS	MS	MS	MS	-
19	NRC 147	HS	HR	MR	MR	AR	AR	AR	AR	MS	HR	MR	MS	HR	MR	MS
20	NRCSL 1	MR	HR	AR	MR	HR	HR	AR	AR	MS	HR	MS	MS	HR	MS	-
21	PS 1611	MS	HR	MS		HR	HR	AR	AR	-	-	-	-	-	-	S
22	PS 1613	AR	HR	MR	MR	HR	HR	AR	AR	MS	HR	MS	MS	HR	MS	-
23	RSC 11-03	MR	MR	MR	MR	HR	HR	AR	AR	MS	MR	MS	MS	MR	MS	-
24	RSC 11-07	MR	MR	AR	MR	HR	AR	AR	AR	MS	HR	MR	MS	HR	MR	MS
25	SKF-SPS-11	HS	MR	MR	MR	HR	AR	AR	AR	S	MR	MR	S	MR	MR	MR

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
26	SL 1068	HS	R	MS	MR	HR	MS	HR	MR	S	MS	MS	S	MS	MS	
27	SL 1123	HS	HR	MR	MR	HR	MS	HR	HR	S	MS	MS	S	MS	MS	-
28	VLS 94	AR	HR	MR	MR	HR	HR	AR	AR	S	MS	MS	S	MS	MS	-
29	VLS 95	HS	HR	MR	MR	HR	S	HR	AR	MS	MS	MS	MS	MS	MS	-
1	Bragg ©									S	MS	S	S	MS	S	
2	NRC 37 ©				HS					HS	MS	MS	HS	MS	MS	
4	JS 97-52 ©	MS	HR	MR		HR	S	HR	AR							
5	JS 72-44 ©				MS											
6	JS 335 ©	MR	MS	MS	HS	MR	MR	S	AR	HS	MS	S	HS	MS	S	HS
7	JS 95-60 ©	HS	HR	MR		HR	S	AR	AR	S	MR	MR	S	MR	MR	
8	JS 93-05 ©	HS	MR	MR		HR	S	HR	AR	HS	HR	MS	HS	HR	MS	HS
9	JS 75-46 ©															
10	Punjab 1 ©	S	MR	MS	MR	HR	MS	AR	MR	S	MR	MS	S	MR	MS	
11	DSb 21 ©	HS	MR	MR	MR					HR	HR	S	HR	HR	MS	
12	SL 688 ©	HS	HR	MR	MR											
13	PS 1347 ©				MR											
14	PS 1092 ©				MR											
15	Shivalik ©									S	MS	MS	S	MS	MS	
16	VLS 63 ©				MS					S	MS	MS	S	MS	MS	
17	VLS59©	HS	HR	MR	MR											
18	VLS58©	S	HR	MR						S	HS	MR	S	HS	MR	
19	RKS 18©									S	MS	MS	S	MS	MS	
20	NRC 86				MS											
21	SL 958				MR					S	MS	MS	S	MS	MS	
22	JS 20-34				MR											
23	DSb 23									HR	HR	MR	HR	HR	MR	
24	MACS 450				MR					MS	HR	MR	MS	HR	MR	

Table 4.5: PP3 (c). Reaction of AVT-II entries for various diseases

S. No.	Varieties	Northern Hill Zone						Northern Plain Zone									
		Palampur			Almora			Pantnagar						Dholi	Ludhiana	Delhi^{DI}	
		FLS	PB (ct)	BS	FLS	BP	PB	BP	BLB	PB	RAB	SMV	YMV	YMV	YMV	YMV	BND
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**16**	**17**	**18**	**19**
1	AMS-MB 5-18	HR	HR	MR	HR	HR	HR	AR	AR	MR	MS	MS	MS	-	HS	HR	HR
2	DS 3106	MR	HR	MR	MS	MS	MR	AR	AR	HR	MR	MR	AR	S	HR	HR	HR
3	DSb 32	HR	HR	MR	MS	HR	HR	AR	AR	MR	S	MR	MR	MS	HS	HR	HR
4	KDS 921	HR	HR	MR	HR	HR	HR	MS	HS	MS	MS	HS	MR	MR	HS	HR	HR
5	MACS 1520	MR	HR	MR	HR	HR	HR	AR	AR	MR	MS	MR	MR	-	HS	HR	HR
6	RSC 10-52	AR	HR	MR	AR	HR	HR	AR	AR	HR	S	MR	MR	MR	HS	HS	HR
7	RSC 10-71	MR	MR	MR	-	-	-	AR	AR	MR	MS	MR	MR	MS	HS	MS	HR
8	SL-1104	S	HR	MR	-	-	-	AR	AR	HR	MR	MR	HR	-	HR	MR	HR
1	JS 335 (C)	MS	S	MS	HR	HR	HR	MR	AR	MR	MR	HR	AR	S			
2	Shivalik (C)				S	HR	HR	AR	HS	HS	HS	MS	HR				
3	VLS 59 (C)							MR	AR	MS	MS	MR	MR				
4	SL 688 ©							HR	AR	HR	HR	AR	AR				
5	RKS 18 ©														HS		
6	Bragg ©				MS	HR	HR	MR	AR	MR	MR	HR	AR				
7	JS 72-44 (C)							MR	AR	MR	MS	MR	MR				
8	JS 75-46 (C)							MR	AR	MR	MS	MS	MR				
9	Pb -1 (C)							MR	AR	MR	MS	HR	HR	S			
10	JS 93-05(C)							MR	AR	MR	S	HR	MR				

1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19
11	JS 97-52 (C)							AR	AR	MR	MR	MR	AR				
12	JS 20-34							MR	AR	MS	S	HR	HR				
13	SL 958							AR	AR	HR	HR	AR	AR				
14	PS 1042/1092	AR	MS	MS	-			MR	AR	MS	HR	AR	HR				
15	MACS 450				MR	MR	MR	AR	AR	MR	MS	MR	HR				
16	VLS 58				MR	HR	HR										

DI: Data Incomplete -:Not reported

Table 4.5: Contd… PP3 (c). Reaction of AVT-II entries for various diseases

S. No.	Varieties	North Eastern Hill Zone						
		Medziphema		Jorhat				
		RAB	PB (ct)	Coll. R	RAB	PB (Ct)	YMV	BLB
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	AMS-MB-5-18	HR	HR	MS	HR	HR	HR	AR
2	DS 3106	AR	HR	MS	AR	HR	HR	AR
3	DSb 32	S	MR	MS	S	MR	HR	AR
4	KDS 921	AR	HR	MS	AR	HR	HR	AR
5	MACS 1520	S	S	MS	S	S	R	AR
6	RSC 1052	AR	AR	MS	AR	AR	HR	AR
7	RSC 1071	HS	MS	MS	HS	MS	HR	AR
8	SL 1104	AR	HR	-	-	-	-	-
1	**Bragg ©**			MS	MR	HR	S	MR
2	**JS 97-52 ©**	HS	AR					
3	**JS 335 ©**	S	HS	MS	S	HS	MS	MR
4	**JS 93-05 ©**	MR	MS	MS	MR	MS	MS	MR
5	**PS 1042 ©**	MR	AR					
6	**PS 1347 ©**	MR	AR					
7	**SL 688**	MR	HR					
8	**SL 525**	MR	AR					

Table 4.5: PP3 (c). Reaction of AVT-II entries for various diseases

S. No	Varieties	Central Zone								Southern Zone						
		Jabalpur			Sehore	Amravati				Dharwad			Ugarkhurd			K.Digraj
		CR	YMV	RAB	TLS	YMV	CR	ALS	BP	Rust	PSS	PB (ct)	Rust	PSS	PB (ct)	Rust
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
1	AMS-MB-5-18	AR	MR	MR	S	HR	AR	HR	AR	MS	HR	MS	MS	HR	MS	-
2	DS 3106	MS	HR	AR	S	AR	HR	HR	AR	MS	HR	MS	MS	HR	MS	-
3	DSb 32	MR	HR	AR	AR	AR	**MS**	HR	AR	HR	HR	MR	HR	HR	MR	HR
4	KDS 921	MR	MR	MR	MS	AR	AR	HR	AR	MS	MR	MS	MS	MR	MS	HR
5	MACS 1520	MR	MR	AR	MS	AR	HR	HR	HR	MS	HR	MR	MS	HR	MR	S
6	RSC 1052	MR	MR	MR	MR	MR	AR	AR	AR	S	HR	MS	S	HR	MS	-
7	RSC 1071	MS	MR	MR	AR	HR	HR	AR	AR	S	MR	MS	S	MR	MS	-
8	SL 1104	HS	MR	MR	AR	AR	AR	HR	AR	MS	HR	MS	MS	HR	MS	-
1	Bragg ©									S	MS	S	S	MS	S	
2	NRC 37 ©				HS					HS	MS	MS	HS	MS	MS	
3	NRC 77 ©															
4	JS 97-52 ©	MS	HR	MR		MR	MR	MS	HR							
5	JS 72-44 ©				MS											
6	JS 335 ©	MS	MS	MS	HS	MS	MR	MR	HR	HS	MS	S	HS	MS	S	HS
7	JS 95-60 ©					AR	MS	MR	AR	S	MR	MR	S	MR	MR	HS
8	JS 93-05 ©	HS	MS	MS		MR	MR	HR	HR	HS	HR	MS	HS	HR	MS	
9	JS 75-46 ©															
10	JS 20-34				MR											
11	Punjab 1 ©	S	MR	MS	MR	HR	MS	AR	MR	S	MR	MS	S	MR	MS	
12	DSb 21 ©				MR					HR	HR	S	HR	HR	MS	
13	SL 525 ©															
14	SL 688 ©	HS	HR	MR	MR											
14	PS 1042 ©															

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
15	PS 1347 ©				MR											
16	PS 1092 ©				MR											
17	Shivalik ©									S	MS	MS	S	MS	MS	
19	VLS 63 ©				MR					S	MS	MS	S	MS	MS	
20	VLS59©	HS	HR	MR	MR											
21	VLS58©															
22	RKS 18©									S	MS	MS	S	MS	MS	
23	RAUS 5															
24	NRC 86															
25	SL 744									S	MS	MS	S	MS	MS	
26	SL 958				MR											
27	DSb 23									HR	HR	MR	HR	HR	MR	
28	MACS 450				MR					MS	HR	MR	MS	HR	MR	

nc: Data not considered/ incomplete

Table 4.6: PP4 Performance of the previous year's resistant entries

S.No.	Northern Plain Zone						Northern Hill Zone				Central Zone					
	Pantnagar DOS: 7/07/2018				Ludhiana		Almora DOS: 16/06/2018				Amravati DOS:29/06/2018					
	Var.	Year of Test	RAB	YMV	Var.	YMV	Var.	FLS	Var.	FLS	Var.	Year of Test	CR	Var.	Year of Test	CR
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	SL 1068	2nd	HR	AR	SL 1028	HR	KSO 245	HR	MACS 706	HR	SL 958	6th		JS 20-96	1st	AR
2	SL 1123	2nd	HR	AR	PS1347	HR	JS 20-34	HR	NRC 99	HR	JS 20-71	5 th	AR	JS 20-103	-	-
3	DS 3108	2nd	HR	AR	DS2705	HR	VLS 76	HR	VLS 89	HR	JS 20-89	5 th	AR	JS 20-108	1st	AR
4	PS 1613	2nd	MR	AR	PS1092	HR	KDS 344	HR	KDS 753	HR	DS 3050	5 th	AR	JS 20-116	1st	AR
5	DS 3105	2nd	MS	AR	DS3104	HR	NRC 88	AR	KDS 869	HR	SL 955	5th	AR	JS 21-03	1st	MS
6	DS 3106	3rd	S	AR	SL1074	HR	VS 2004-9	HR	Shivalik	S	AMS 1002	5 th	HR	JS 21-05	1st	AR
7	SL 688	15th	MR	AR	DS1460	HR	VS 2005-40	AR	MACS 1442	HR	AMS 1003	4th	HR	JS 21-06	1st	AR
8	PS 1572	3rd	AR	AR	SL958	HR	VS 2006-17	AR	VLS 92	MR	* MACS 1370	3 rd		JS 21-09	1st	AR
9	SL 1028	4th	HR	HR	PS1572	HR	VLS 47	HR	NRC 125	HR	* JS 20-96	3 rd		JS 21-13	1st	AR
10	SL 1074	3rd	HR	HR	Pusa 197-12	HR	JS-40	HR	DSb 34	HR	JS 20-87	3 rd	AR	SL-96	1st	AR
11	VLS 89	2nd	MR	MR	DS3106	HR	MACS 1058	HR	MACS 1493	HR	*RVS 2002-4	2 nd		SL-710	1st	AR
12	PS 1589	3rd	MR	AR	PS1589	HR	DSB-11	HR	TS 53	MS	JS 20-53	3 rd	AR	SL-738	1st	AR
13	PS 1550	4th	MS	AR	DS3105	HR	MAUS-282	S	SL 1123	MS	MAUS 706	3 rd	AR	DS 3106	1st	AR
14	MACS 1460	2nd	HR	AR	SL1104	HR	JS-20-14	MS	MACS 1575	HR	AMS-MB 5-18	2nd	AR	DSb 32	1st	S

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
15	PS 1556	3rd	MS	AR	Himso 1687	HR	JS (SH)2002-14	MR	AMS 2014-1	MS	JS 20-98	2nd	AR	KDS 921	1st	HR
16	JS 20-98	3rd	HR	HR	PS1086	HR	NRC 79	HR	PS 1613	HR	MACS 1460	2nd	MR	RSC 10-71	1st	AR
17	DS 3101	3rd	HR	AR	SL113	HR	AMS 1	HR	Shivalik	S	KDS 753	2nd	HR	SL 1104	1st	AR
18	PS 1546	5th	MR	HR	DS3106	HR	RHS-52	HR	NRC 131	HR	RSC 10-46	2nd	AR	JS 335 ©	-	S
19	SL 979	5th	AR	AR	DSB31	R	JS (SH)2003	HR	KDS 992	HR	PS 1556	3rd	AR	JS 9305 ©	-	S
20	SL 982	5th	HR	HR	PS1611	HR	NRC 82	HR	NRC 129	MR	RVS 2008-24	2nd	AR	TAMS 38 ©	-	HS
21	SL 958	6th	HR	AR			JS 20-19	HR	RVS 2011-2	MS	RVS 2007-06	2nd	AR	Pb 1 ©	-	S
22	PS 1518	4th	MR	AR			JS-9	AR	Salimar	AR	MACS 1520	1st	AR			
23	PS 1569	2nd	MS	AR			NRC 84	HR	DSb 21	HR	NRC 125	1st	AR			
24	MACS 1460	2nd	HR	HR			KHS 86	HR	JS 75-46	MS	RSC 10-52	1st	AR			
25	DS 2705	4th	MR	AR			KS 5343	HR	JS 20-116	HR	MACS 1336	-	-			
26	DS 2708	6th	MR	AR			VLS 74	MS	KDS 980	MS	JS 99-89	-	-			
27	PS 1570	2nd	S	HR			VLS 73	HR	KDS 1045	HR	JS 20-18	1st	AR			
28	PS 1042	8th	MR	AR			DSB 20	HR	JS 2094	MS	JS 20-19	1st	AR			
29	PS 1505	6th	MR	HR			AMS-MB-5-18	MS	KS 3	MS	JS 20-20	1st	AR			
30	NRC 127	2nd	HR	HR			AMS-MB-5-19	HR	TS 7	MS	JS 20-29	1st	AR			
31	PS 1552	3rd	HR	HR			Shivalik	MS	NSO 81	MS	JS 20-34	1st	AR			
32	PS 1540	4th	HR	AR			KDS 378	MS	NRC 85	MS	JS 20-69	1st	AR			
33							VLS 86	HR	NRC 42	MS	JS 20-74	1st	AR			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
34							VLS 87	S	JS (SH) 2002-11	MS	JS 20-76	1st	AR			
35							Himso 1685	AR	KDS 8	HR	JS 20-79	1st	AR			
36							MACS 1407	AR	BAUS 96	HR	JS 20-82	1st	MS			
37									VLS 63	MS	JS 20-84	1st	MS			
38											JS 20-86	1st	MS			
39											JS 20-89	1st	AR			
40											JS 20-90	1st	AR			
41											JS 20-94	1st	AR			

Contd.,

S. No	Central Zone								Southern Zone									
	Jabalpur DOS: 27/06/2018						Sehore DOS :04/07/2018		Dharwad DOS:12/07/2018					Ugarkhurd DOS:20/07/2018				
	Var.	**Year of Test**	**CR**	**Var.**	**Year of Test**	**YMV**	**Var.**	**CR**	**Var.**	**Year of Test**	**Rust**	**PSS**	**PB (ct)**	**Var.**	**Year of Test**	**Rust**	**PSS**	**PB (ct)**
1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**15**	**17**	**18**
1	JS 20-69	6^{th}	MR	JS 20-69	6^{th}	HR	AMS 38-24*	AR	DSb 23	7^{th}	HR	HR	MR	DSb 28-3	7^{th}	HR	HR	MR
2	JS 20-34	6^{th}	HR	JS 20-98	5^{th}	HR	AMS 243	AR	DSb 28-3	7^{th}	HR	HR	MR	DSb 30-2	7^{th}	HR	HR	MR
3	JS 20-36	5^{th}	HR	JS 20-116	5^{th}	R	AMS 358	AR	DSb 30-2	5^{th}	MR	HR	MR	EC 391336	5^{th}	HR	HR	MR
4	JS 20-98	5^{th}	MR	JS 20-18	5^{th}	HR	AMS 475	**S**	DSb 21 (C)	9^{th}	HR	HR	MS	EC 242104	5^{th}	HR	HR	MR
5	NRC 86	5^{th}	MR	JS 20-19	5th	HR	AMS MB 5-18	AR	KDS 753	5^{th}	MR	MR	MS	EC 3551	5^{th}	MR	MR	MS
6	PS 1469	4^{th}	HR	JS 20-20	5^{th}	HR	AMS 5-19	AR	EC 391336	5^{th}	HR	HR	MR	EC 241778	11^{th}	HR	HR	MR
7	MAUS 706	4^{th}	MR	SL 900	5^{th}	HR	AMS 77	AR	EC 379152	4^{th}	HR	MR	MS	EC 241780	11^{th}	HR	MR	MS
8	MACS - 1520	3^{rd}	MR	SL 983	5^{th}	MR	JS 99-89	AR	EC 242104	5^{th}	HR	HR	MR	DSb 21 (C)	5^{th}	HR	HR	MR
9	AMS MB 5 - 18	3^{rd}	HR	JS 21-05	4^{th}	HR	JS 20-18	AR	EC 3551	5^{th}	MR	HR	MS	DSb 23	7^{th}	HR	HR	MR
10	NRC 125	3^{rd}	HR	AMS MB 5 - 18	3^{rd}	R	JS 20- 19	AR	EC 241780	11^{th}	HR	HR	MS	DSb 32	11^{th}	HR	HR	MS
11	RSC 10-52	3^{rd}	MR	RSC 10-52	3^{rd}	HR	JS 20-20	AR	EC 241778	11^{th}	HR	HR	MS	SL 1028	11^{th}	MS	HR	MS
12	AMS MB 5 - 19	2^{nd}	HR	NRC 125	3^{rd}	HR	JS20 - 29*	AR	JS 21-08	6^{th}	MS	MR	MR	DSb 31	5^{th}	MR	MR	MR

1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**15**	**17**	**18**
13	AUKS - 174	2^{nd}	HR	SL 1104	3^{rd}	R	JS20 -34	AR	DSb 32	5^{th}	HR	HR	MR	NRC 125	2^{nd}	MS	HR	MR
14	AMS 2014 - 1	2^{nd}	MR	DS 3106	3^{rd}	HR	JS20 -69	AR	DSb 31	5^{th}	MR	HR	MR	NRC 126	2^{nd}	MS	HR	MR
15	BAUS 102	2^{nd}	S	SL 1028	3^{rd}	MS	JS20 - 74*	AR	DS 3106	2^{nd}	MS	MR	MR	JS 335 (C)		HS	S	S
16	JS 21-17	2^{nd}	HR	SKF SPS - 11	2nd	MS	JS20 - 76*	AR	NRC 125	2^{nd}	MS	HR	MS					
17	NRC – 133	2^{nd}	MR	RVS 2011-1	2^{nd}	HR	JS20 -79	AR	NRC 126	2^{nd}	MS	HR	MR					
18	AMS 100-39	2^{nd}	HR	JS 21-17	2^{nd}	HR	JS20 - 82*	AR	RSC 10-52	2^{nd}	MS	MR	MS					
19	RSC 11-03	2nd	MR	RSC 10-46	2^{nd}	MR	JS20 -84	AR	SL 1028	2^{nd}	MS	MR	MS					
20	PS 1611	2^{nd}	MS	RSC 11-03	2^{nd}	MR	JS20 -86	AR	SL 1074	2^{nd}	MS	HR	MS					
21	SKF SPS -11	2nd	HS	PS 1611	2^{nd}	HR	JS20 -89	AR	NRC 128	2^{nd}	MS	HR	MS					
22	PS 1613	2^{nd}	HR	PS 1613	2^{nd}	HR	JS20 -90	AR	DSb 34	2^{nd}	HR	HR	MR					
23	RVS 2011-1	2^{nd}	MR	NRC 128	2^{nd}	R	JS20 -94	AR	BAUS 102	2^{nd}	MS	HR	MS					
24	AMS 243	1^{st}	MR	NRC 129	2^{nd}	HR	JS20 -96	AR	JS 335 (C)		HS	S	S					
25	AMS – 77	1^{st}	HR	NRC 136	2^{nd}	HR	JS20 - 98*	AR										
26	AMS 264	1^{st}	HR	NRC 137	2^{nd}	HR	JS20 - 103	AR										
27				DS 3106	2^{nd}	HR	JS20 - 108	AR										
28				NRC SL 1	2^{nd}	MR	JS20 - 116	AR										
29							JS21 – 03	AR										

1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	15	17	18
30							JS21 – 05	**S**										
31							JS21 - 06*	AR										
32							JS21 -09	AR										
33							JS21 - 13*	AR										
34							SL 96	AR										
35							SL 710	AR										
36							SL 738	AR										
37							SL 955*	AR										
38							SL 958	AR										
39							RVS 2002-4	AR										
40							RVS 2001-4	AR										

Table 4.7: PP5. Evaluation of germplasm lines for identification of multiple disease resistant sources

S.N	Palampur (26/06/2018)				Jabalpur (27/06/2018)			Indore			Dharwad (12/07/2018)			Pantnagar (7-7-2018)		
	Genotype	FLS	PB (ct)	BS	CR	YMV	RAB	PB (Ct)	BP	SMV	Rust	PSS	PB (Ct)	RAB	YMV	PB
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	JS 20-30	MS	HR	MR	S	HR	MR	HS	R	R	MS	HR	MS	HR	HR	HR
2	JS 20-86	MR	HR	MR	HS	HR	MR	MR	R	MS	MS	HR	MR	MS	AR	HR
3	JS 20-50	MR	HR	MR	HS	HR	MS	S	R	MS	MS	HR	MS	MS	HR	HR
4	JS 20- 59	MR	HR	MR	MR	HR	MS	MS	R	R	MS	HR	MS	MR	AR	S
5	JS 20-27 (E)	AR	S	MR	MR	HR	HR	HS	R	R	MS	HR	MR	S	AR	HR
6	JS 20-79	MS	AR	MR	HS	HR	MR	MR	R	R	MS	HR	MR	HR	MR	MR
7	JS 20-41	MR	HR	MR	HS	R	MS	S	R	R	MS	MR	MS	MR	AR	MR
8	JS 20-56	MR	MR	MR	HR	R	MR	MR	R	MS	S	HR	MR	S	AR	HR
9	JS 20-61	HR	MR	MR	S	HR	MR	S	R	R	MS	HR	MR	MR	MR	MR
10	JS 20-23 (E)	AR	MS	MS	AR	HR	AR	MS	R	R	MS	HR	MS	S	MR	HR
11	JS 20-60	HR	AR	MR	S	HR	MS	MS	R	MS	MS	HR	MS	MR	AR	MS
12	JS 20-21 (E)	MR	S	MR	AR	R	AR	S	R	R	MS	MR	MR	MS	HR	MR
13	JS 20-51	MS	HR	MR	HS	HR	MR	S	R	R	MS	HR	MS	MR	AR	HR
14	JS 20-53	HR	MR	HR	HS	R	MS	MR	R	R	MS	HR	MS	HR	HR	MR
15	JS 20-55	HR	MR	MR	HS	R	MS	MR	R	MS	MS	MR	MS	MR	AR	HR
16	JS 20-48	HR	AR	HR	HS	HR	S	MS	R	R	MS	MR	MS	S	AR	HR
17	AGS 56	HR	AR	MS	S	MS	MS	HS	R	R	S	HR	MR	HR	AR	HR
18	AGS 76	AR	AR	MR	MR	MR	AR	HS	R	MS	MS	MR	MR	MR	MR	MR
19	EC 547464	MR	MR	MR	AR	HR	MR	S	R	MS	MS	HR	MR	MS	HR	HR
20	G-11	HR	AR	MR	MR	MR	MR	HS	R	R	MS	HR	MS	MR	MR	HR
21	JSM 288	MR	MR	MR	AR	MS	AR	HS	R	MS	S	HR	MR	HR	HR	HR
22	EC 280148	MR	AR	MR	HS	HR	S	HS	R	R	MS	HR	MR	MS	AR	HR
23	AGS 112	MR	MR	MR	S	HR	MS	S	R	MS	MS	MR	MR	S	HR	HR
24	EC 33940	MS	HR	MR	HS	MR	MR	HS	R	MS	MS	MR	MS	MS	HR	HR

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
25	EC 241695(L)	MS	AR	MR	HS	HR	S	S	R	R	MS	MR	MS	MS	AR	HR
26	EC 113778	MS	AR	MR	HS	HR	MS	MR	R	MS	MR	MR	MS	MR	MR	MS
27	AMSS 34	AR	AR	MR	S	R	AR	MS	R	MS	MS	MR	MS	S	MR	HR
28	SQL 32	MS	MS	MR	MR	R	AR	MS	R	R	MS	HR	MR	MR	HR	MR
29	AMS 60-2-3-4	AR	HR	MR	HS	MR	MS	MR	R	R	MS	HR	MR	HS	AR	AR
30	SQL 37	MR	HR	MR	S	MR	MR	MR	R	R	MS	HR	MS	MR	HR	HR
31	SQL 36	MR	MR	MR	S	MS	MR	S	R	MS	MS	HR	MS	MR	HR	MS
32	AMS 25-5-2	MS	AR	MR	HS	HR	MR	S	R	MS	MS	HR	S	S	AR	MR
33	SQL 31	MR	MR	MR	MR	HR	AR	HS	R	R	MS	MR	S	MR	AR	MR
34	AMS 48-2-3	MR	MR	MR	HS	HR	MS	MS	R	MS	MS	MR	S	MS	AR	MR
35	SQL 86	MS	HR	HR	S	HR	MR	S	R	R	MS	HR	MR	MS	AR	MR
36	EC 232019	MS	AR	MR	HS	HR	MR	HS	R	R	MS	HR	MS	S	S	MR
37	MAUS 142(L)	MS	AR	MR	AR	R	AR	HS	R	MS	MS	MR	MS	HR	AR	AR
38	AMS MB 51-94	AR	AR	HR	AR	MR	AR	MS	R	R	MS	MR	MS	MR	AR	HR
39	PS 1423 (L)	AR	AR	HR	S	MS	AR	S	R	R	MS	HR	MS	HR	MR	HR
40	AMS 148	MS	MR	MR	HS	R	MR	MS	HS	R	S	HR	MS	S	MR	S
41	EC 309537	AR	AR	MS	S	HR	MR	S	R	MS	MS	MR	MS	MR	MR	HR
42	JSM 126	HR	HR	HR	MR	HR	HR	HS	R	R	MR	MR	MS	MS	HR	HR
43	JS 75-30	AR	AR	MR	AR	HR	MR	HS	R	R	MS	HR	MS	HR	MR	AR
44	VLS 75	HR	AR	MR	AR	MR	AR	HS	HS	R	S	HR	MS	-	-	-
45	DB 1587	MR	MS	MR	S	R	MR	HS	HS	R	MS	HR	S	MR	MS	HR
46	EC 241690	MR	AR	MR	MS	R	MS	HS	R	R	MS	HR	MS	MS	AR	MR
47	EC 287754	MR	HR	MR	MR	HR	MS	HS	R	MS	MS	HR	MS	MR	AR	HR
48	Trait Specific Harder (L)	AR	AR	HR	AR	HR	AR	MS	R	R	MS	MR	MS	HR	AR	HR
49	AMS 108	HR	HR	MR	HS	HR	MS	S	S	R	MS	MR	MS	S	HR	S
50	AGS 102 (Mix.)	MR	AR	MR	HS	HR	MR				MS	HR	MS	MR	MR	HR
51	JS 335 (Check)	MS	S	MR	MR	MS	MS				HS	S	S			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
52	Shivalik (Check)	HS	MS	MS												
53	JS 93-05				HS	MR	MR									
54	Punjab 1				MS	MR	MS									
	TAMS 38				HS	HR	MR									

Table 4.8:PP 6. Bioefficacy of Zillon against Yellow Mosaic Virus Disease (2nd Year)-Paid Trial

S. No.	Treatments	Northern Plain Zone							
		Pantnagar DOS :07.07.2018				Ludhiana			
		Percent disease incidence	Infection index	100 seed weight (g)	Yield (kg/ha)	Percent disease incidence	Infection index	100 seed weight (g)	Yield (kg/ha)
1	2	3	4	5	6	7	8	9	10
1.	Spraying with zillon @ 4 ml/l at 15 and 30 DAS	2.06	30.93	8.03	1481				
2.	Spraying with zillon @ 6 ml/l at 15 and 30 DAS	1.61	36.61	8.42	1699				
3.	Spraying with zillon @ 4 ml/l at 15 and 45 DAS	2.34	31.16	8.00	1362				
4.	Spraying with zillon @ 6 ml/l at 15 and 45 DAS	1.71	17.68	8.66	1653				
5.	Spraying with zillon @ 4 ml/l at 15, 30 and 45 DAS	2.36	26.74	8.34	1652	Trial vitiated due to low disease pressure			
6.	Spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS	1.17	33.73	8.56	1744				
7.	Spraying with triazophos @ 1.5 ml/l @ 15 and 45 DAS	2.87	39.91	8.01	1520				
8.	Untreated control	4.12	40.02	7.60	1335				
	CD (5%)	1.17	19.86	0.60	65.00				
	CV (%)	-	-	-	-				

Contd.,

S. No.	Treatments	Central Zone						
		Jabalpur DOS :04.07.2018				Amarvati DOS :27.06.2018		
		Percent disease incidence	Infection index	100 seed weight (g)	Yield (kg/ha)	Infection index	100 seed weight (g)	Yield (kg/ha)
1	2	3	4	5	6	8	9	10
1.	Spraying with zillon @ 4 ml/l at 15 and 30 DAS	35.0	17.5	10.70	1196.7	9.51 (1.78)	8.65	964
2.	Spraying with zillon @ 6 ml/l at 15 and 30 DAS	30.3	15.2	11.27	1228.7	8.84 (1.72)	8.84	1144
3.	Spraying with zillon @ 4 ml/l at 15 and 45 DAS	36.3	18.2	10.55	1185.3	7.85 (1.62)	11.05	1133
4.	Spraying with zillon @ 6 ml/l at 15 and 45 DAS	31.7	15.8	11.08	1212.7	6.86 (1.51)	9.49	1119
5.	Spraying with zillon @ 4 ml/l at 15, 30 and 45 DAS	21.7	10.8	11.80	1281.0	7.03 (1.53)	11.24	1248
6.	Spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS	20.0	10.0	11.90	1289.0	6.48 (1.47)	11.84	1311
7.	Spraying with triazophos @ 1.5 ml/l @ 15 and 45 DAS	25.3	12.7	10.88	1218.3	6.96 (1.52)	10.55	1197
8.	Untreated control	47.3	23.7	9.85	1105.0	10.83 (1.90)	7.90	889
	S. Em ±					0.04	0.21	46.50
	CD (5%)	2.9	-	0.49	100.5	0.13	0.65	141.04
	CV (%)						3.74	7.15

- Square root values

S. No.	Treatments	Southern Zone				Northern Eastern Hill Zone			
		Dharwad(Ugarkhurd) DOS :10.06.2018				**Medziphema** DOS :07.07.2018			
		Percent disease incidence	Infection index	100 seed weight (g)	Yield (q/ha)	Percent disease incidence	Infection index	100 seed weight (g)	Yield (q/ha)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1.	Spraying with zillon @ 4 ml/l at 15 and 30 DAS	1.5 (7.03)	8.95 (17.40)	13.46	13.51	0	0	11.11	16.30
2.	Spraying with zillon @ 6 ml/l at 15 and 30 DAS	2.0 (8.13)	6.50 (14.76)	14.71	13.67	0	0	10.88	14.46
3.	Spraying with zillon @ 4 ml/l at 15 and 45 DAS	1.5 (7.03)	9.56 (18.00)	13.47	13.80	0	0	10.82	13.73
4.	Spraying with zillon @ 6 ml/l at 15 and 45 DAS	2.5 (9.09)	4.32 (11.99)	13.93	14.86	0	0	11.00	16.83
5.	Spraying with zillon @ 4 ml/l at 15, 30 and 45 DAS	1.5 (7.03)	5.36 (13.38)	14.78	15.90	0	0	10.57	12.99
6.	Spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS	2.0 (8.13)	2.36 (8.83)	14.68	17.45	0	0	10.04	13.49
7.	Spraying with triazophos @ 1.5 ml/l @ 15 and 45 DAS	4.0 (11.53)	10.26 (18.67)	13.37	14.53	0	0	10.93	16.18
8.	Untreated control	8.5 (16.94)	12.32 (20.54)	13.06	13.71	0	0	10.90	13.31
	S. Em ±	0.67	0.48	0.23	6.92			0.54	9.70
	CD (5%)	2.04	1.44	0.32	21.03			1.63	29.30
	CV (%)	12.42	5.28	2.81	-	-	-	-	-

Table 4.9:ENT 6/PP 7. Assessment of polymer coating on efficacy of seed treating chemicals and inoculants

Treatments	Pantnagar(03-07-2018)				Indore				
	Percent seedling mortality		Anthracnose		Plant Stand	Seedling mortality(10 & 20 DAG)	PDI/Pod filling stage		
	10 DAG	20 DAG	Percent disease incidence	Percent disease index			Anth.	RAB	SMV
JS 335 seeds treated with Carboxin and Thiamethoxam WITH polymer coating.Seed treatment with Rhizobium and PSB cultures to be done by respective centers at the time of sowing.					1620	0	8.0	3.0	3.0
JS 335 seeds treated with Carboxin and Thiamethoxam WITHOUT polymer coating. Seed treatment with Rhizobium and PSB cultures to be done by respective centers at the time of sowing.	Trial vitiated due to poor germination.				1451	0	9.0	3.0	3.0
.JS 335 seeds treated with Carboxin and Thiamethoxam WITHOUT polymer coating. Seed treatment with Rhizobium and PSB cultures to be done by respective centers at the time of sowing.					1451	0	9.0	3.0	3.0
JS 335 seed treated with (pre-mix Pyroclostrobin and Thiophenate methyl) + (pre-mix Thiram and Carboxin) + Thiamethoxam WITH polymer coating. Seed treatment with Rhizobium and PSB cultures to be done by respective centers at the time of sowing.					1529	0	8.0	3.0	3.0

Table 4.9:ENT 6/PP 7:. Assessment of polymer coating on efficacy of seed treating chemicals and inoculants

Treatments	Dharwad(14-07-2018)			Sehore*	
	Percent seedling mortality		Pod blight	% Seedling mortality	Target leaf spot (0-9 scale)
	10 DAG	20 DAG	Percent disease index		
JS 335 seed treated with carboxin and thiamethoxam with polymer coating. Seed treatment with Rhizobium and PSB culture at the time of sowing	6.2 (14.41)	6.2 (14.41)	12.56 (20.95)	0	31.53 (33.60)
JS 335 seed treated with carboxin and thiamethoxam with polymer coating. Seed treatment without Rhizobium and PSB culture at the time of sowing	8.5 (16.94)	11.2 (19.54)	24.56 (29.70)	0	28.86 (32.24)
JS 335 seed treated with (pre-mix pyroclostrobin and thiaphenate methyl) + (pre-mix thiram and carboxin) + thiamethoxam with polymer coating.	6.5 (14.76)	7.75 (16.16)	14.25 (22.17)	0	20.89 (27.03)
T test (0.05)					NS
T_1 v/s T_2	NS	S	S		**S**
T_2 v/s T_3	NS	S	S		

*Mean of 10 replications

सूक्ष्मजीव विज्ञान
Microbiology

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MB 1/16: Isolation & screening of rhizobacteria capable of producing ACC deamianse activity, antioxidant potential & phytohormones for developing inoculates to mitigate abiotic stress in soybean

Indore Centre

Table-MB1/16A: FAME profile of bacterial isolates:

S. No.	Sim Index	Isolates
P1	0.488	*Pseudomonas-aeruginosa*-GC subgroup A
P2	0.802	*Klebsiella-pneumoniae*-pneumoniae-GC subgroup B
P3	0.727	*Pseudomonas-putida*-biotype A
P4	0.531	*Pseudomonas-putida*-biotype A
P5	0.226	*Pseudomonas-putida*-biotype A
P6	0.531	*Pseudomonas-aeruginosa*-GC subgroup A

Table- MB1/16B: Qualitative and quantitative screening of potential rhizobacterial isolates for PGP traits

PGP traits		P1	P3	P6
IAA(tryptophan µg ml^{-1}) at 6^{th} day		80.0	10.0	90.0
P-solubilization zone PSI (cm)		2.0	1.5	2.5
Siderophore production (clear halo zone (cm)		0.5	-	1.0
ACC deaminase activity	DF + ACC	++	+++	-
	DF + $(NH_4)_2SO_4$	++	++	++
	DF	+	+	+

+++, higher growth; ++, moderate; +, poor growth

Table-MB1/16C: Evaluation of isolates at different levels of PEG 6000 under *Invitro* (growth observed in KB broth at 48 hours at 28°C at Indore Centre

Selected potential isolates	PEG					Mean	LSD one way
	0%	10%	20%	30%	40%		
P1	1.141a	0.637b	0.493c	0.360d	0.422cd	0.595**a**	0.086
P3	0.699a	0.5023b	0.357c	0.258d	0.232d	0.405**b**	0.055
P6	1.368a	0.7346b	0.452c	0.242d	0.170d	0.596**a**	0.153
Mean	1.067**a**	0.625**b**	0.425**c**	0.287**d**	0.256**d**	-	-
Two way ANOVA							
LSD (0.01) PEG	0.044						
LSD (0.01) ISOLATES	0.034						
Interaction effects Isolate × PEG	***						

Delhi Centre

Table MB1/16D: Screening of osmotolerant isolates for PGP traits at Delhi Centre

Isolate	30%PEG	20%PEG	IAA production	Siderophore production
T2-7	1.37		+	+
T3-9	1.3		+	+
T4-15	0.79		+	+
T3-15	0.81		+	+
T2-8		1.3	+	+
T2-11		1.31	+	+

Ludhiana Centre

Table MB1/16E: Screening of selected potential rhizobacterial isolates for multifarious PGP traits at Ludhiana Centre

Multifarious PGP trai		***Bradyrhizobium* sp.**	***P. oryzihabitans***	***P. fluorescence***
IAA(µg ml^{-1}) at 6^{th} day	(-) Tryptophan	13.32	15.71	48.77
	(+) Tryptophan	46.38	14.62	47.33
P-solubilization at 12^{th} day	PSI	1.30	1.75	1.80
	(mg100ml^{-1})	11.46	9.87	11.55
Siderophore	Diameter of clear halo zone (cm)	1.05	2.00	1.65
ACC ($OD_{600\ nm}$)	Bacterial growth	++	+++	+++
	DF + ACC	0.5372	0. 9733	0.8453
	DF + $(NH_4)_2SO_4$	0.9453	1.4316	1.2138
	DF	0.2750	0.3444	0.3283

Table-MB1/16F: Intensity of growth in selected potential *Bradyrhizobium* sp. and rhizobacterial isolates of soybean at Ludhiana Centre.

Stress treatment	**Selected potential isolates**		
PEG6000 (%)	***Bradyrhizobium* sp.**	***P. oryzihabitans***	***P. fluorescence***
0	0.828	1.54	0.716
5	0.487	1.20	0.535
7.5	0.466	0.986	0.495
10	0.417	0.816	0.473
15	0.415	0.654	0.470
20	0.321	0.414	0.328
25	0.286	0.268	0.195
30	0.178	0.102	0.090
NaCl %			
0	0.140	1.743	1.077
2.5	0.203	0.947	0.936
5	0.242	0.841	0.733
7.5	0.238	0.720	0.419
10	0.178	0.194	0.395
Temperature (Degrees Celsius)			
28±2	0.396	1.327	1.142
35±2	0.275	0.926	0.856
40±2	0.150	0.394	0.737

MB 2/17: Development of multi-trait soybean rhizobia and their evaluation under in vitro

Delhi centre

Table-MB 2/17A: Screening of soybean rhizobia for ACC deaminase activity at Delhi Centre

Isolates	ACC deaminase activity (µmol of α- ketobutyrate /mg protein /hr)
PV3.5	0.825 ± 0.055
PV3.16	0.898 ± 0.110
PV3.2	1.012 ± 0.026

Indore Centre

Table-MB 2/17B: Screening of soybean rhizobia for moisture tolerance characteristics in YEM Broth at Indore Centre

Selected potential rhizobacteria	PEG			
	0%	**10%**	**20%**	**30%**
D-2 A Fame *B. japonicum*	3.21	0.54	0.40	0.25
D-1 A Fame *B. japonicum*	1.48	0.90	0.42	0.27
D-4 A 16S r-RNA *B. daquingense*	2.52	2.21	**0.71**	**0.55**
D-1 C 16S r-RNA *B. liaoningense*	2.81	2.32	**0.55**	**0.50**
D-4 B 16S r-RNA *B. liaoningense*	1.66	1.23	0.36	0.13
IND-I 16S r-RNA *B. japonicum*	2.23	0.75	**0.45**	**0.37**
D-13 B Fame *B. japonicum*	1.47	0.78	0.15	0.05
D-13 BN Fame *B. japonicum*	1.84	0.82	0.28	0.14
IND-II 16S r-RNA *B. liaoningense*	0.90	0.62	0.37	0.23
D-11 A 16S r-RNA *B. liaoningense*	0.64	0.49	0.34	0.29
D-11 D Fame *B. japonicum*	0.65	0.48	0.31	0.00
AL-1 MB Fame *B. japonicum*	3.42	2.20	0.32	0.05
AL-3 MB Fame *Rhodovulum sulfidophilum*	1.49	0.67	0.40	0.15
D-13 BAN Fame *Rhodovulum sulfidophilum*	2.42	0.65	0.29	0.12
D-13 BANB Fame *B. Japonicum*	0.86	0.61	**0.40**	0.23
D-17 BN Fame *B. Japonicum*	1.78	0.53	0.36	0.16
D-13 BBN Fame *B. Japonicum*	1.36	0.66	0.26	0.07
PS-1 M Fame *B. Japonicum*	3.23	0.65	0.23	0.10
JS 90-41 BN Fame *B. Japonicum*	1.55	0.48	0.27	0.12
D-2AAN Fame *B. Japonicum*	2.41	0.56	0.28	0.15

MB2a/18: Evaluation of promising soybean rhizobia for conferring drought tolerance in soybean under pot conditions.

Indore Centre

Table-MB2a/18A: Evaluation of promising soybean rhizobia for nodulation parameters assessed under stress conditions in soybean (variety JS 95-60) under pot conditions at Indore centre

Inoculation	**Nodules (no./plant) (at 50% flowering stage)**			**Nodule dry mass (at 50% flowering stage) (g/plant)**			**Leghaemoglobin content (mg/g of nodules)**			**N-content in shoots (%)**		
	ST	**UNST**	**Mean**	**ST**	**UNST**	**Mean**	**ST**	**UNST**	**Mean**	**ST**	**UNST**	**Mean**
Un-inoculated control	68.66f	88.33e	75.50d	0.08h	0.10gh	0.09e	4.26d	6.20e	7.97c	0.51f	0.54ef	0.52d
Commercial *B. japonicum*	92.00e	130.33cd	111.16c	0.23d	0.12g	0.17d	5.80c	5.77c	10.32b	0.56e	0.63d	0.59c
B. daqingense	145.33bc	229.00a	187.16a	0.28ab	0.31a	0.29a	10.4b	11.93a	11.36ab	0.73b	0.72b	0.72a
B. liaoningense	132.00cd	147.00bc	139.50b	0.23cd	0.26bc	0.24c	12.02a	11.96a	11.99a	0.60d	0.68c	0.64b
B. japonicum	148.33bc	226.66a	187.50a	0.27b	0.27b	0.27b	10.91ab	11.78a	11.34ab	0.68c	0.78a	0.73a
AMF	117.66d	157.66b	137.66b	0.15f	0.18e	0.16d	10.42b	10.06b	10.43b	0.56e	0.63d	0.59c
Mean	117.33b	163.16a		0.21a	0.20a		10.49a	10.65a			0.60b	0.66a
One way ANOVA LSD (P=0.05)	**18.04**			**0.02**			**1.18**			**0.037**		
Two way ANOVA LSD (P=0.05)												
Stress	7.36			0.01			0.594			0.015		
Inoculation	12.75			0.01			1.029			0.026		
Interaction effect Stress×inoculation	***			***			***			**		

*Data are average of 3 replications; LSD, least significance difference at 5% level of significance by Duncans multiple range test of ANOVA

Table-MB2a/18B: Evaluation of promising soybean rhizobia for conferring drought tolerance in soybean (variety JS 95-60) under pot conditions at Indore centre

Inoculation	Chlorophyll Content (mg g^{-1} of fresh leaf)			Relative water content (%)			Dry wt. of shoot plant^{-1} (g)			Dry wt. of root plant^{-1} (g)			P-content in shoots (%)		
	ST	**UNST**	**Mean**	**ST**	**UNST**	**Mean**	**ST**	**UNST**	**Mean**	**ST**	**UNST**	**Mean**	**ST**	**UNST**	**Mean**
Un-inoculated control	1.39d	1.65c	1.52b	28.16f	51.03de	39.59b	3.09e	3.41d	3.25d	1.02b	1.12b	1.07b	0.14g	0.10h	0.12d
Commercial *B. japonicum*	1.44cd	1.68c	1.56b	34.59fd	50.28de	42.43b	3.65c	4.06ab	3.86b	1.14b	1.23b	1.18b	0.10h	0.15fg	0.12d
B. daqingense	2.39ab	2.51ab	2.45a	55.66cde	61.13bc	58.39a	3.69c	3.92b	3.81b	1.7a	1.26b	1.48a	0.19b	0.22a	0.20a
B. liaoningense	2.35ab	2.31b	2.33a	40.43ef	71.38ab	55.90a	3.57cd	3.63c	3.60c	1.39ab	1.14b	1.27ab	0.16de	0.16de	0.16c
B. japonicum	2.38ab	2.62a	2.50a	50.38de	78.59a	64.49a	4.12ab	4.23a	4.18a	1.02b	1.22b	1.12b	0.18bc	0.15ef	0.16c
AMF	2.44ab	2.29b	2.36a	50.57de	67.47abc	59.02a	3.53cd	3.99b	3.76b	1.2b	1.16b	1.18b	0.17cd	0.22a	0.19b
Mean	2.06b	2.18a		43.30b	63.31a		3.61b	3.87a		1.24a	1.19a		0.15b	0.17a	
One way ANOVA LSD (P=0.05)	**0.244**			**14.30**			**0.202**			**0.383**			**0.010**		
Two way ANOVA LSD (P=0.05) Stress Inoculation Interaction effect Stress×inoculation	0.09 0.17 ns			5.83 10.11 ns			0.08 0.14 *			0.15 0.27 ns			0.00 0.00 ***		

*Data are average of 3 replications; LSD, least significance difference at 5% level of significance by Duncans multiple range test of ANOVA

Ludhiana Centre

Table-MB2a/18C: Effect of promising soybean rhizobia for conferring drought tolerance on growth, symbiotic, proline content and yield in soybean (Variety SL 958).

Treatments	Dry wt. of shoot plant^{-1} (g)		Dry wt. of root plant^{-1} (g)		Chlorophyll Content (mg g^{-1} of fresh leaf)		Number of nodules/ plant		Dry Weight of nodules/plant (mg)		Leghaemoglobin content (mg/g of nodules)		Catalase Activity (U/min/g fresh weight of root		Grain yield (g/plant)
	BD	AD	BD	AD	BD	AD	BD	AD	BD	AD	BD	AD	BD	AD	
Un-inoculated control	4.33	4.29	0.51	0.39	0.18	0.12	18	12	46.8	21.6	1.34	0.74	4.64	4.98	4.97
Bradyrhizobium sp. (LSBR-3)	8.48	5.93	0.86	0.69	0.41	0.19	37	28	86.4	58.5	2.91	2.25	5.03	5.73	5.68
B. daqingense	7.83	5.69	0.80	0.70	0.31	0.16	31	26	77.5	55.6	2.24	2.14	4.89	5.27	5.59
B. liaoningense	6.00	5.18	0.79	0.61	0.35	0.21	32	22	77.1	47.6	2.56	2.08	4.77	5.13	5.53
CD at 5%	A=0.23; B=0.33; AB=0.46		A=0.061; B=0.087; AB=0.123		A= NS; B=0.047; AB=0.067		A=NS; B=6.44; AB= 7.28		A= 3.13; B=4.42; AB=6.26		A=0.246; B=0.348; AB=0.492		A=NS; B=NS; AB=NS		0.472

BD = Before Drought; AD = After Drought

Pantnagar Centre

MB 2a/18D: Chlorophyll (a& b content) and proline content in soybean leaves (mg g^{-1}) in a pot trial under stress conditions at Pantnagar

Moisture level/ Cultures	Chlorophyll 'a' content in leaves (mg g^{-1})				Chlorophyll 'b' content in leaves (mg g^{-1})				Proline content in leaves (ug g^{-1})			
	No stress	**Stress**	**Total**	**Average**	**No stress**	**Stress**	**Total**	**Average**	**No stress**	**Stress**	**Total**	**Average**
Uninoculated Control	5.12	11.47	16.59	**8.29**	2.66	6.08	8.74	**4.37**	0.080	0.133	0.213	**0.106**
Local rhizobial strain (pant 2)	10.17	14.20	24.38	**12.19**	5.56	7.88	13.44	**6.72**	0.083	0.134	0.217	**0.108**
B. daqingense	10.43	11.49	21.93	**10.96**	5.42	6.62	12.04	**6.02**	0.082	0.522	0.604	**0.302**
B. liaoningense	13.08	12.54	25.62	**12.81**	7.01	6.83	13.83	**6.92**	0.102	0.495	0.596	**0.298**
Total	38.80	49.70	88.51		20.65	27.40	48.05		0.347	1.283	1.630	
Average	**9.70**	**12.43**	**22.13**		**5.16**	**6.85**	**12.01**		0.087	0.321	0.408	
C.D. (≤ 0.05)	**Moisture stress (MS)** NS	**Cultures (C)** 0.97	**MS X C** 1.38		**Moisture stress (MS)** NS	**Cultures (C)** 0.59	**MS X C** 0.83		**Moisture stress (MS)** NS	**Cultures (C)** 0.022	**MS X C** 0.032	

MB 2a/18E: Nodulation and RWC soybean leaves in a pot trial under stress conditions at Pantnagar

Moisture level/ Cultures	Nodule Number/plant				Nodule dry weight g/plant				Relative Water content in leaves (%)			
	No stress	Stress	Total	Average	No stress	Stress	Total	Average	No stress	Stress	Total	Average
Uninoculated Control	144.67	50.33	195.00	97.50	0.89	0.62	1.51	0.75	56.37	34.03	90.40	45.20
Local rhizobial strain (pant 2)	158.66	77.89	236.55	118.28	0.95	0.69	1.64	0.82	56.31	64.27	120.58	60.29
B. daqingense	195.11	101.11	296.22	148.11	1.29	0.74	2.02	1.01	63.35	36.75	100.10	50.05
B. liaoningense	167.78	124.11	291.89	145.94	1.14	0.88	2.02	1.01	62.49	44.69	107.18	53.59
Total	666.22	353.44	1019.66		4.26	2.92	7.18		238.52	179.74	418.26	
Av.	166.56	88.36	254.91		1.07	0.73	1.80		59.63	44.93	104.56	
C.D. (≤ 0.05)	**Moisture stress (MS)** NS	**Cultures (C)** 14.64	**MS X C** 20.71		**Moisture stress (MS)** NS	**Cultures (C)** 0.18	**MS X C** NS		**Moisture stress (MS)** NS	**Cultures (C)** 4.46	**MS X C** 6.31	

MB 2a/18F: Dry weights of shoots and roots and grain yield of soybean in a pot trial under moisture stress conditions at Pantnagar

Moisture level/ Cultures	Dry shoot weight at harvest (g plant^{-1})				Dry root weight at harvest (g plant^{-1})				Grain yield (g plant^{-1})			
	No stress	**Stress**	**Total**	**Average**	**No stress**	**Stress**	**Total**	**Average**	**No stress**	**Stress**	**Total**	**Average**
Uninoculated Control	7.37	6.37	13.75	6.87	8.07	6.74	14.81	7.41	10.37	6.17	16.54	8.27
Local rhizobial strain (pant 2)	8.83	8.16	16.99	8.50	9.82	9.04	18.86	9.43	12.12	7.03	19.15	9.58
B. daqingense	8.87	8.45	17.32	8.66	9.45	8.83	18.28	9.14	10.54	6.76	17.30	8.65
B. liaoningense	10.39	9.75	20.14	10.07	11.01	10.26	21.27	10.63	12.90	9.75	22.65	11.33
Total	35.47	32.74	68.21		38.35	34.87	73.21		45.94	29.71	75.65	
Av.	8.87	8.19	17.05		9.59	8.72	18.30		11.48	7.43	18.91	
C.D. (≤ 0.05)	**Moisture stress (MS)** NS	**Cultures (C)** 0.69	**MS X C** NS		**Moisture stress (MS)** 0.71	**Cultures (C)** 1.01	**MS X C** NS		**Moisture stress (MS)** NS	**Cultures (C)** 1.17	**MS X C** NS	

MB 2a/18G: Nutrient uptake (N and P) in shots and grains of soybean in a pot trial under moisture stress conditions at Pantnagar

Moisture level/ Cultures	N uptake in shoots (mg plant^{-1})				N uptake in grains (mg plant^{-1})				Phosphorus uptake in shoot (mg plant^{-1})				Phosphorus uptake in grains (mg plant^{-1})			
	No stress	**Stress**	**Total**	**Average**	**No stress**	**Stress**	**Total**	**Average**	**No stress**	**Stress**	**Total**	**Average**	**No stress**	**Stress**	**Total**	**Average**
Uninoculated Control	35.66	43.67	79.34	39.67	562.54	342.18	904.72	452.36	7.37	6.37	13.74	6.87	79.69	45.41	125.10	62.55
Local rhizobial strain (pant 2)	50.30	43.89	94.19	47.10	661.87	395.94	1057.81	528.90	8.83	8.16	16.99	8.50	80.39	44.41	124.80	62.40
B. daqingense	47.69	47.34	95.03	47.51	575.44	388.01	963.45	481.72	8.87	8.45	17.32	8.66	74.81	47.89	122.70	61.35
B. liaoningense	70.08	65.36	135.44	67.72	712.39	550.97	1263.37	631.68	10.39	9.75	20.14	10.07	89.71	66.19	155.90	77.95
Total	203.73	200.27			2512.24	1677.10	4189.33		35.46	32.73			324.60	203.90		
Average	50.93	50.07			628.06	419.27	1047.33		8.87	8.18			81.15	50.98		
C.D. (≤ 0.05)	**Moisture stress (MS)** NS	**Cultures (C)** 4.88	**MS X C** 6.91		**Moisture stress (MS)** NS	**Cultures (C)** 71.81	**MS X C** NS		**Moisture stress (MS)** NS	**Cultures (C)** 2.24	**MS X C** 3.17		**Moisture stress (MS)** NS	**Cultures (C)** 10.03	**MS X C** NS	

Dharwad Centre

MB 2a/18H: Relative chlorophyll content in leaves, leghaemoglobin in nodules, proline and RWC in leaves of soybean as influenced by selected rhizobia strains at different moisture levels under pot conditions (Dharwad centre)

Treatments (M1) Rhizobial inoculation	Chlorophyll content (SPAD)			Leghaemoglobin in nodules (mg/g fresh nodules)			Proline content in leaves (µmol g-1 FW)			Relative water content (%)		
	Stress level (M2)			Stress level (M2)			Stress level (M2)			Stress level (M2)		
	FC	SS	Mean of A	FC	SS	Mean of A	FC	SS	Mean of A	FC	SS	Mean of A
T1: Un-inoculated control	31.21	33.13	32.17	0.52	0.16	0.34	4.90	5.62	5.26	56.41	41.66	49.03
T2: Local rhizobial strain	32.94	32.88	32.91	0.53	0.20	0.36	4.72	5.50	5.11	58.57	41.56	50.06
T3: *B. daqingense*	36.95	35.31	36.13	0.56	0.21	0.39	4.20	5.04	4.62	65.07	41.93	53.50
T4: *B. liaoningense*	35.42	34.97	35.19	0.54	0.20	0.37	4.38	5.14	4.76	59.24	41.58	50.41
Mean of B	34.13	34.07		0.54	0.20		4.55	5.32		59.82	41.68	
	S.Em. ±		C.D.@ 1%		S.Em. ±	C.D.@ 1%		S.Em. ±	C.D.@ 1%		S.Em. ±	C.D.@ 1%
C.D. of A	1.35		5.16		0.06	0.22		0.19	0.75		4.03	15.41
C.D. of B	0.95		3.65		0.04	0.15		0.14	0.53		2.85	10.90
C.D. of AXB(Rhizobial inoculation +Stress level	1.91		7.30		0.08	0.08		0.28	1.05		5.70	21.79

MB 2a/18I: Nodule numbers/plant in soybean as influenced by selected rhizobia strains at different moisture levels under pot conditions (Dharwad centre)

Treatments (M1) Rhizobial inoculation	Stress level (M2) Nodules per plant		
	FC	SS	Mean of A
T1: Un-inoculated control	56.41	41.66	49.03
T2: Local rhizobial strain	58.57	41.56	50.06
T3: *B. daqingense*	65.07	41.93	53.50
T4: *B. liaoningense*	59.24	41.58	50.41
Mean of B	59.82	41.68	
	S.Em. ±		C.D.@ 1%
C.D. of A	4.03		15.41
C.D. of B	2.85		10.90
C.D. of AXB(Rhizobial inoculation +Stress level	5.70		21.79

MB 3/14: Field evaluation of AMF and *Paenibacillus polymyxa* microbial combination at farmer's field

Indore Centre

Table MB 3/14A: Field evaluation of AMF and *Paenibacillus polymyxa* in a field trial at Indore centre (Variety JS 95-60)

Treatment	**Nodules (no./plant) (at 50% flowering stage)**	**Nodule dry mass (at 50% flowering stage) (g/plant)**	**N-content in shoots (%)**	**N-content in Seed (%)**	**P-content in shoots (%)**	**P-content in seed (%)**	**N uptake (kg $ha^{-1)}$**	**P uptake (kg $ha^{-1)}$**	**Grain yield (kg/ha)**	**Cost benefit ratio**
Paenibacillus polymyxa (HKA 15)+AMF consortia	211.86a	0.346a	4.76a	4.263a	0.121a	0.56a	186.02a	12.303a	2140a	3.91
Farmers practice (12, 32, 16 Kg NPK/ha)	170.8a	0.251b	4.99a	3.52b	0.113a	0.58a	180.3a	9.715b	1628b	2.97
LSD (P=0.05)	43.69	0.030	1.02	0.560	0.022	0.052	70.459	1.832	208.349	

*Data are average of 6 replications; LSD, least significance difference at 5% level of significance by Duncans multiple range test of ANOVA

Sehore Centre

Table MB 3/14B: Field evaluation of AMF and *Paenibacillus polymyxa* in a field trial at Sehore centre (Variety RVS 2001-4)

Treatments	NN per plant	NDW dry wt.(mg)	N content(%) in		P content (%)in		Total N uptake Kg/ha	Total P uptake Kg/ha	Grain yield kg/ha	B:C Ratio
			shoot	Grain	shoot	Grain				
T1 *Paenibacillus polymixa+75% RDF*	30.22(97)	41.02 (91)	1.02 (7.88)	6.94 (143.4)	0.40 (9.88)	0.48 (71)	142.42 (39.13)	24.05 (23.55)	16.06 (85.90)	2:1
T2 Farmer practice	18.22	34.21	0.91	6.01	0.30	0.3	121.14	14.29	12.32	0.5:1
Result (p=0.05)	Significant	Significant	Significant	Significant	Significant	Significant	Significant	Significant	Significant	
T1 v/s T2										

*t value : 2.26 & fcal values are mentioned in paranthesis.

Delhi Centre

Table-MB 3/14C: Field evaluation of AMF and *P. polymyxa* microbial combination in Delhi centre (Variety DS12- 13)

Treatment	**Nodules (no./plant) (at 50% flowering stage)**	**Nodule dry mass (at 50% flowering stage) (g/plant)**	**N-content in shoots (%)**	**N-content in grains (%)**	**Grain yield (kg/ha)**
Paenibacillus polymyxa (HKA 15)+AMF consortia	30.57a	108.45a	2.27a	6.68a	1141.86a
Farmers practice (20, 40, 60 Kg NPK/ha)	28.13a	96.24a	2.11a	6.54a	995.03a
LSD (P=0.05)	2.44	47.32	0.76	0.24	158.03

Ludhiana Centre

Table-MB 3/14D: Field evaluation of AMF and *P. polymyxa* microbial combination on symbiotic traits, total N & P content and yield in soybean at farmer's field in Ludhiana Centre (variety SL-958)

Treatments	**Number of nodules/plant**	**Dry Weight of nodules/plant (mg)**	**Total N content of shoot (%)**	**Total P content of shoot (%)**	**Grain Yield (kg/ha)**
Farmer's practice	22	62.8	1.18	0.128	1200
***Paenibacillus polymyxa* (HKA 15) + AMF consortium**	35	78.1	1.25	0.136	1300

Table-MB 3/14E Economics of microbial consortium of *Paenibacillus polymyxa* (HKA 15) + AMF application as biofertilizer in soybean at farmer's field at Ludhiana Centre.

Treatments	**Grain yield (kg/ha)**	***Gross returns (Rs/ha)**	****Net returns (Rs/ha)**	**B :C ratio**	**Additional income over control (Rs/ha)**
Farmer's practice	1200	40680	10,977	1.37	-
***Paenibacillus polymyxa* (HKA 15) + AMF consortium**	1300	44070	14,117	1.47	3140

***Market price of soybean = Rs. 3390/- quintal**
**** Cost of microbial consortium @ Rs. 100 per packet (for one hectare)**
Cost of cultivation of farmer's practice = Rs. 29,703
Cost of cultivation of microbial treatments = Rs. 29,953

Pantnagar Centre

Table-MB3/14F: Impact of AM fungi and *Paenibacillus polymyxa* microbial combination on nodulation, nutrient content and yield of soybean at Farmer's field (Variety PS 1347) at Pantnagar Centre

Treatments	No. of Nodules/ plant	Nodule dry weight (g/plant)	N content in stover at harvest (%)	N content in grain (%)	Total N uptake in (kg/ha)	P content in Stover at harvest (%)	P content in grain (%)	Total P uptake (kg/ha)	Grain yield (kg/ha)	B:C Ratio
Paenibacillus polymyxa (HKA 15) + AMF consortia	93	0.276	1.60	6.11	132.52	0.29	0.60	15.96	1587	1.70
Farmer's Practice	71	0.187	1.40	5.95	110.56	0.25	0.52	12.20	1390	1.57

MB 4/13: Nodulation ability of AVT-II entries of respective centers.

Table MB 4/13A: Nodulation ability with the native homologous rhizobia of AVT II soybean entries evaluated at different centres during kharif 2018

Zones **Central Zone**	**AVT II entries**	**Nodule number/plant**	**Nodule dry weight (mg/plant)**	**LgH (mg/g) fresh nodules)**
Sehore	MACS 1520	16.44	25.23	2.93
	AMS-MB5-18	17.27	25.65	2.87
	RSC 10-52	**32.49**	**35.02**	**3.21**
	NRC-86 (Check)	24.77	25.66	2.86
Indore	MACS 1520	129.9	1604.3	8.10
	AMS-MB5-18	150.3	1403.1	12.57
	RSC 10-52	**184.3**	**1870.86**	**14.48**
	NRC-86 (Check)	127.6	1347.40	6.23
North plain zone				
Ludhiana	SL 1104	**85.0**	**104.10**	**2.95**
	DS 3106	27.0	39.0	1.88
	PS 1347 (Check)	60.0	82.80	2.44
Delhi	SL 1104	**14.42**	**57.0**	-
	DS 3106	5.67	11.0	-
	PS 1347 (Check)	4.0	18.0	-
Pantnagar	SL 1104	**97.73**	**534.33**	**0.43**
	DS 3106	91.60	442.60	0.60
	PS 1347 (Check)	78.86	374.33	0.61

*AVT II entries in NEHZ and EZ could not be evaluated for nodulation parameters due to non availability of microbiologists/discipline at those centres

Indore Centre

Table MB 4/13B: Evaluation of AVT-II entries for nodulation parameters at IISR, Indore

Entry	**Nodule number**	**Nodule dry weight (mg/g nodules)**	**Leghaemoglobin content (mg/g nodules)**
MACS 1520	129.9c	1604.33b	8.1c
NRC-86 (check)	127.6c	1343.4c	6.23d
AMS-MB5 18	150.3b	1403.1bc	12.57b
RSC 10-52	184.3a	1870.866a	14.48a
LSD (P=0.05)	8.82	217.23	1.69

*Data are average of 3 replications; LSD, least significance difference at 5% level of significance by Duncans multiple range test of ANOVA

Sehore centre

Table MB 4/13C: Evaluation of AVT-II entries for nodulation parameters at RAK college of Agriculture Sehore (MP)

Treatments	Nodule no./plant				Nodule dry weight (mg/plant)			
	R1	R2	R3	MEAN	R1	R2	R3	MEAN
JS 97-52	23.02	26.98	21.11	**23.70**	28.01	33.1	31.03	**30.71**
NRC- 86	27.68	24.26	22.38	**24.77**	25.49	24.09	27.39	**25.66**
RSC 10-52	34.01	31.23	32.24	**32.49**	32.01	38.01	35.04	**35.02**
JS- 335	20.16	17.01	18.1	**18.42**	24.09	27.11	26.16	**25.79**
MACS 15-20	19.21	15	15.1	**16.44**	22.19	25.49	28.02	**25.23**
AMSMB 5-18	18.23	14.5	19.09	**17.27**	27.62	25.17	24.16	**25.65**
JS 20-34	20.26	18.5	17.01	**18.59**	23.63	24.69	21.11	**23.14**
SEM				1.111				1.243
SED				1.571				1.758
CD 5 %				3.229				3.615
CV %				8.877				7.884
t5%				2.056				2.056

Table MB 4/13D: Evaluation of AVT-II entries for nodulation and yield parameters at RAK college of Agriculture Sehore (MP)

Leghaemoglobin content in nodules (mg/g fresh nodules)						Grain yield (Kg/ha)				
TREATMENTS	R1	R2	R3	TOTAL	MEAN	R1	R2	R3	TOTAL	MEAN
JS 97-52	2.79	2.66	2.7	8.2	**2.72**	1021.12	1026	1031	3078.1	**1026.04**
NRC- 86	2.83	2.8	2.96	8.6	**2.86**	1316.62	1381.81	1317.16	4015.6	**1338.53**
RSC 10-52	3.21	3.24	3.19	9.6	**3.21**	1579	1585	1584	4748.0	**1582.67**
JS- 335	2.98	3.01	3.03	9.0	**3.01**	1210	1310	1413	3933.0	**1311.00**
MACS 15-20	2.92	2.96	2.92	8.8	**2.93**	1356	1358	1360	4074.0	**1358.00**
AMS MB 5-18	2.88	2.88	2.84	8.6	**2.87**	1298	1158	1140	3596.0	**1198.67**
JS 20-34	2.94	2.83	2.9	8.7	**2.89**	1311	1312	1303	3926.0	**1308.67**
TOTAL	**20.6**	**20.4**	**20.5**	**61.5**	**2.9**	**9091.7**	**9130.8**	**9148.2**	**27370.7**	**1303.4**
SEM					0.030					32.603
SED					0.042					46.107
CD 5 %					0.086					94.783
CV %					1.753					4.333
t5%					2.056					2.056

Delhi Centre

Table MB 4/13E: Evaluation of AVT-II entries for nodulation parameters at Delhi Centre

AVT-II	Nodule Number ($plant^{-1}$)	Nodule dry wt. (mg $plant^{-1}$)	Leghaemoglobin (mg g^{-1} of fresh wt. nodules)
PS1347 (Check)	78.86	374.33	0.61
SL1104	97.73	534.33	0.43
DS3106	91.60	442.60	0.60

Ludhiana Centre

Table MB 4/13F: Screening of AVT-II entries of nodulation ability with native homologous rhizobia under field conditions Ludhiana Centre

AVT–II entries (varieties)	Number of nodules/plant	Dry Weight of nodules/plant (mg)	Leghaemoglobin content (mg/g of nodules)
NRC128	26	38.4	1.75
PS1611	58	89.4	2.35
PS1613	43	79.9	2.19
NRC134	ND	ND	ND
NRCSL-1	76	45.2	1.91
NRC147	10	27.5	1.05
SL1104	85	104.1	2.95
DS3106	27	39.0	1.88
PS1347	60	82.8	2.44
SL688	23	32.6	2.12
Pusa 97-12	50	75.3	1.87
SL958	50	86.8	1.92

ND = Not detected

Pantnagar Centre

Table MB 4/13G: Evaluation of AVT-II entries of nodulation ability with native homologous rhizobia under field conditions at Pantnagar Centre

AVT-II entry	Nodule no/plant	NDW/plant (mg)	SDW/plant (g)
SL 1104	**14.42**	**57.0**	**12.49**
DS 3106	5.67	11.0	14.47
PS 1347 (C)	4.0	18.0	14.61
SL688 (C)	6.58	17.0	10.51
Pusa 9712 (C)	2.42	13.0	17.99
SL958 (C)	12.67	27.0	12.05
C.D.	N/A	N/A	N/A

Station trial on PPFM at Dharwad centre

Table 1: Field demonstration of Pink pigmented Facultative Methylotrophs (PPFM) on soybean at farmer's field

Crop	Treatments	Yield q/ha
soybean	T1:RPP+PPFM ($18^{th}+23^{rd}+27^{th}$) consortium sprayed at 15^{th} and 30^{th} days	**19.8**
	T2: RPP	**17.50**

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सारांश प्रतिवेदन
Summary Reports

SUMMARY REPORT OF BREEDING TRIALS KHARIF 2018

This year as per the recommendations of 48th All India Co-ordinated Research Project Workshop a new trial on Vegetable Soybean was started in NHZ, CZ and SZ. As per the decision of last year's workshop entries succumbing to YMV in hot spots Ludhiana & Delhi and to Charcoal Rot at Jabalpur were given 0 yield while calculating their zonal average. NRC 147 was a high oleic acid entry and was directly entered in AVT I of all zones so as to readily release the material in 2 years. MACSNRC 1667 is an EDV of MACS 450 for null KTI and was directly introduced in AVTI of Southern Zone. Results of Plant Breeding for Kharif 2018 are briefly summarized below.

1. Northern Hill Zone

1.1 Initial Varietal Trial

Grain Soybean

Proposed Testing Centres: Almora, Palampur, Majhera
Data received from: All the Centres

The yield data of 34 test entries and three checks is presented in Table 1.1.1 of this compilation. Grain yield varied from 1013 kg/ha to 2148 kg/ha (VLS 59) with an average of 1556 kg/ha and none of the test entries was superior to the best check VLS 59.

Vegetable Soybean

Proposed Testing Centres: Almora, Palampur and Srinagar

Data received from: Almora and Palampur

Trial failed at Srinagar. Green pod yield was available from Almora centre only and out of 4 entries only two MACS 1508 and Himso 1685 could survive up to green pod stage. Harasoya was the best check and none of the surviving entries could out yield it.

1.2 Advanced Varietal Trial-I

Proposed Testing Centres: Almora, Palampur, Majhera
Data received from: All the Centres

Yield of NRC 147 (1222 Kg/ha) was 30% less than that of the best check VLS 59 (1830 Kg/ha) in this zone (Table 1).

Table 1: Mean Performance of AVT-I Entries of Northern Hill Zone

S.No.	Entries	Yield (Kg/ha)	Rank	Maturity
1	NRC 147	1222	IV	110
2	PS 1092(C)	1820	II	120
3	VLS 59(C)	1830	I	114
4	VLS 63(C)	1748	III	118

2. Northern Plain Zone

2.1 Initial Varietal Trial

Proposed Testing Centres: Pantnagar, Delhi, Ludhiana.

Data received from: All the Centres

The yield data of 34 test entries along with three checks has been presented in Table 1.2.1 of this compilation. Twenty two entries could not survive the high YMV disease incidence in Ludhiana as well as in Delhi and as per the recommendations of the previous AICRPS workshop these entries were given zero yields while calculating their zonal mean. Grain yield ranged from 66 kg/ha (VLS 97) to 2247 kg/ha (JS 21-71) with a mean of 977 kg/ha. Only one entry (JS 21-71) out yielded the best check by more than 5%. The maturity duration varied from 99 days (NRC 138) to a maximum of 129 days (SL 958) with a mean value of 117 days (Table 1.2.3).

2.2 Advanced Varietal Trial-I

Proposed Testing Centres: Pantnagar, Delhi, Ludhiana,
Data received from: All the Centres

The grain yield and maturity of six test entries and 4 checks is presented in Table 1.2.6 of this compilation. PS 1347 was the highest yielding check and 2 entries PS 1613 and PS 1611 recorded the yield superiority of 35% & 17%, respectively. Maturity duration ranged from 112 to 129 days with a mean of 123 days.

Based on the mean performance of the IVT and AVTI, three entries PS 1613, PS 1611 and NRC 128 could out yield the best check PS 1347 by a margin of 29, 28 and 18 percent, respectively (Table 2).

NRC 147 performed very poorly in this zone and could produce only 704 Kg/ha as against 1964 Kg/ha of the best check PS 1347 (Table 3). However its maturity duration was only 112 days while all checks took 124-129 days to mature.

Table 2: Mean Performance of AVT-I Entries of Northern Plain Zone

S.No.	Entry	Yield (Kg/ha)		Mean	Rank	Maturity Mean
		IVT-2017	AVT I-2018			
1	NRC 128	3371	1193	2282	III	115
2	PS 1611	2675	2299	2487	II	119
3	PS 1613	2362	2641	2502	I	124
4	NRC 134	2222	837	1530	VIII	113
5	NRCSL 1	2115	1330	1723	VI	120
6	PS 1347 (C)	1918	1964	1941	IV	123
7	Pusa 97-12 (C)	1819	1530	1675	VII	121
8	SL 958 (C)	1983	1788	1886	V	125

Table 3: Mean Performance of High Oleic Acid Entry NRC 147 in AVT-I of Northern Plain Zone

S. No.	Entry	Yield (Kg/ha)	Rank	Maturity
1	NRC 147	704	IV	112
2	PS 1347 (C)	1964	I	126
3	Pusa 97-12 (C)	1530	III	124
4	SL 958 (C)	1788	II	129

2.3 Advanced Varietal Trial-II

Proposed Testing Centres: Pantnagar, Delhi, Ludhiana

Data received from: All the Centres

The grain yield and maturity of two test entries and four checks is presented in Table 1.2.6 and 1.2.8 of this compilation. SL 1104 could out yield the best check PS 1347 (1964 Kg/ha) by 24% and DS 3106 was at par with it. Both of the test entries had the maturity duration of 127 days which was at par with that of PS 1347 (126 days).

Based on the three year data, SL 1104 could out yield the best check PS 1347 (2026 Kg/ha) by more than 14% (Table 4).

Table 4: Mean Performance of AVT-II Entries of Northern Plain Zone

S.No.	Entries	Yield (Kg/ha)			Mean	Rank	Maturity
		IVT-2016	AVT I-2017	AVT II-2018			
1	SL 1104	2173	2302	2427	2301	I	124
2	DS 3106	1481	2203	1983	1889	III	124
3	PS 1347 (C)	2025	2090	1964	2026	II	122
4	SL 688 (C)	1432	1781	1766	1660	IV	121
5	Pusa 97-12 (C)	1654	1736	1530	1640	V	120

3. North Eastern Hill Zone

3.1 Initial Varietal Trial

Proposed Testing Centres: Jorhat, Imphal, Umiam
Data received from: All the Centres

The yield data of 34 test entries along with three checks has been presented in Table 1.3.1 of this compilation. Data of Umiam was rejected due to high CV (91%) and that of Jorhat due to low mean yield (687 Kg/ha), respectively. The mean yield varied from 1284 Kg/ha (NRC 148) to 3506 Kg/ha (MACS 1620). Two test entries *viz* MACS 1620 and MAUS 732 out yielded the best check RKS 113 (2914 kg/ha) by 20 and 16%, respectively. Maturity duration of the trial ranged from 99 to 112 days with a mean of 107 days.

3.2 Advanced Varietal Trial-I

Proposed Testing Centres: Jorhat, Imphal, Umiam

Data received from: All the Centres

The data of only Imphal centre was considered and the data of Jorhat centre was rejected due to low trial yield (489 Kg/ha) and that of Umiam due to low yield (515 Kg/ha) and high CV (78%). The yield and maturity data of twelve test entries along with three checks is presented in Table 1.3.6 and 1.3.8, respectively of this compilation. The yield ranged from 972 Kg/ha(CSB 10084) to 1967 Kg/ha (PS 1613) with a trial mean of 1415 Kg/ha. Two checks JS 335 and RKS 18 were the best checks with an average yield of 1867 Kg/ha and only PS 1613 could out yield them by 5%.

Mean yield and maturity of two years is presented in Table 5. Based on two years performances two entries PS 1613 (1749 Kg/ha) and DS 3108 (1678 Kg/ha) out yielded the best check JS 335 (1582 Kg/ha) by 11 and 6%, respectively. The entries showed the maturity range of 94 to 107 days.

Yield of high oleic acid entry NRC 147 (1222 Kg/ha) was 35% less than that of the best checks JS 335 and RKS 18.

Table 5: Mean Performance of AVT-I Entries of North Eastern Hill Zone

S.No.	Entry	Yield (Kg/ha)		Mean	Rank	Maturity
		IVT-2017	AVT I-2018			
1	NRC 128	1667	1300	1484	VII	100
2	PS 1613	1531	1967	1749	I	102
3	NRCSL 1	1494	1661	1578	V	97
4	CSB 10084	1679	972	1326	X	104
5	SL 1068	1556	1061	1309	XI	104
6	SL 1123	1556	1633	1595	III	105
7	NRC 137	1531	1200	1366	IX	102
8	CSB 10112	1507	1044	1276	XII	107
9	DS 3108	1506	1850	1678	II	99
10	VLS 95	1469	1389	1429	VIII	99
11	NRC 132	1445	1050	1248	XIII	98
12	JS 335(c)	1297	1867	1582	IV	96
13	JS 97-52(c)	1247	1144	1196	XIV	94
14	RKS 18(c)	1235	1867	1551	VI	98

Table 6: Mean Performance of High Oleic Acid Entry NRC 147 in AVT-I of Northern Eastern Hill Zone

S. No.	Entry	Yield (Kg/ha)	Rank	Maturity
1.	NRC 147	1222.00	II	92.50
2.	JS 335 (c)	1867.00	I	92.33
3.	JS 97-52 (c)	1144.00	III	90.00
4.	RKS 18 (c)	1867.00	I	96.33

3.3 Advanced Varietal Trial-II

Proposed Testing Centres: Jorhat, Imphal, Umiam

Data received from: Jorhat and Imphal

Out of two centres from where data was received the data of Jorhat was rejected due to low mean yield of only 80 Kg/ha and data of only Imphal centre was accepted. DSb 32 was the highest yielding entry with a yield of 2648 Kg/ha followed by RSC 10-71 (1915 Kg/ha), respectively (Table 1.3.11). Mean maturity duration of the zone varied from 98 to 110 days.

Based on the mean performance of three years three entries KDS 921, RSC 10-71 and DSb 32 out yielded the best check RKS 18 by 9, 12 and 25% (Table 7). Zonal maturity duration over 3 years ranged from 102 to 112 days with KDS 921 being the latest maturing entry.

Table 7: Mean Performance of AVT-II Entries of North Eastern Hill Zone

S. No.	Entries	Yield (Kg/ha)			Mean	Rank	Maturity
		IVT-2016	AVT I-2017	AVT II-2018			
1	KDS 921	1950	1760	1500	1737	III	112
2	RSC 10-71	2230	1222	1915	1789	II	106
3	DSb 32	2198	1131	2648	1992	I	102
4	JS 335(C)	1309	1378	1667	1451	VI	103
5	RKS 18(C)	1506	1658	1637	1600	IV	103
6	JS 97-52(C)	1704	1482	1333	1506	V	108

4 Eastern Zone

4.3 Initial Varietal Trial

Proposed Testing Centres: Bhawanipatna, Raipur, Ranchi,
Data received from: All the Centres

The yield data of 34 test entries along with four checks has been presented in Table 1.4.1 of this compilation. Mean maximum yield (2305 kg/ha) was recorded in PS 1637 whereas the mean minimum yield was recorded by AUKS 176 (1103 kg/ha). Seven test entries (PS 1637, MACS 1566, Himso 1689, RSC 11-17, MACS 1620, DSb 33, RSC 11-15) could out yield the best check RSC 10-46 (1992 kg/ha). The average yield for this zone was 1832 kg/ha. Maturity duration ranged from 96 days (NRC 146) to 108 days (RSC 10-46) with average duration of 103 days.

Advanced Varietal Trial-I

Proposed Testing Centres: Bhawanipatna, Raipur, Ranchi,
Data received from: All the Centres

Table 1.4.6 and 1.4.8 of this compilation shows yield and maturity data of 10 test entries and three checks. NRC 128, AMS 2014-1, RSC 11-07, MACS 1493 and RSC 11-03 could out yield the best check by more than 5%. Maturity duration in AVTI ranged from 99 days (NRC 147) to 109 days (JS 97-52).

Based on the mean yield data of two years nine entries *viz.* RSC 11-07, NRC 128, AMS 2014-1, NRC 136, MACS 1493, RSC 11-03, NRCSL 1, NRC 132 and NRC 137 could out yield the best check RKS 18 (Table 8). NRC 136 and NRC 137 were drought tolerant lines.

NRC 147 which was a direct submission to AVT I recorded 4% less yield than the best check JS 97-52 (Table 9).

Table 8: Mean Performance of AVT-I Entries of Eastern Zone

S.No.	Entry	Yield (Kg/ha)		Mean	Rank	Maturity
		IVT-2017	AVT I-2018			
1	NRC 128	1982	2004	**1993**	II	107
2	NRCSL 1	1938	1593	**1766**	VII	107
3	NRC 137	1766	1655	**1710**	IX	108
4	RSC 11-07	2130	1959	**2045**	I	102
5	AMS 2014-1	1883	1981	**1932**	III	107
6	NRC 132	1802	1668	**1735**	VIII	104
7	RSC 11-03	1784	1810	**1797**	VI	108
8	MACS 1493	1765	1934	**1849**	V	105
9	NRC 136	1741	1964	**1852**	IV	107
10	VLS 94	1741	1364	1552	XI	104
11	JS 335(C)	1580	1494	1537	XIII	105
12	RKS 18(C)	1506	1642	1574	X	107
13	JS 97-52(C)	1376	1709	1542	XII	110

Table 9: Mean Performance of High Oleic Acid Entry NRC 147 in AVT-I of Eastern Zone

S. No.	Entry	Yield (Kg/ha)	Rank	Maturity
1	NRC 147	1648	II	99
2	JS 335(C)	1494	IV	103
3	RKS 18(C)	1642	III	106
4	JS 97-52(C)	1709	I	109

4.4 Advanced Varietal Trial-II

Proposed Testing Centres: Bhawanipatna, Raipur, Ranchi, Dholi
Data received from: All the Centres

The data for yield and maturity of two entries with three checks has been presented in Table 1.4.11 and 1.4.13 of this compilation. RSC 10-71 and RSC 10-52 recorded 22 and 11% yield superiority over the best check JS 97-52 (1685 Kg/ha). The maturity duration of the trial ranged from 102 to 107 days.

Average grain yield and maturity data over three years has been shown in Table 10. Based on three years average data, RSC 10-71 and RSC 10-52 have shown an yield advantage of 15 and 13%, respectively over the best check JS 97-52 (1645 Kg/ha). Mean maturity duration of the trial ranged from 105 to 109 days.

Table 10: Mean Performance of AVT-II Entries of Eastern Zone

S. No.	Entries	Yield (Kg/ha)			Mean	Rank	Maturity
		IVT 2016	AVTI 2017	AVTII 2018			
1	RSC 10-71	2049	1590	2059	1899	I	107
2	RSC 10-52	2185	1521	1867	1858	II	107
3	JS 335(C)	1531	1275	1472	1426	V	105
4	RKS 18(C)	1778	1430	1626	1611	IV	105
5	JS 97-52(C)	1918	1331	1685	1645	III	109

5 Central Zone

5.3 Initial Varietal Trial

Grain Soybean Trial

Proposed Testing Centres: Amravati, Anand, Indore, Jabalpur, Kota, Morena, Nagpur, Parbhani, Sehore, Amreli, Lok Bharti

Data received from: All the Centres1

The data from Anand and Morena was rejected as per the recommendations of monitoring teams. Data of Jabalpur was rejected due to low mean yield and that of Lok Bharti because of high CV. The yield data of 34 test entries along with four checks has been presented in Table 1.5.1. The mean value for yield varied from 1089 kg/ha (VLS 97) to 2034 kg/ha (RVSM 2011-35). Only two test entries RVSM 2011-35 and Himso 1689 could out yield the best check variety JS 335 (1817 Kg/ha) by more than 11%. NRCSL 2 is an EDV of JS 335 for YMV resistance and has recorded yield and maturity duration those of equivalent to JS 335.

The maturity duration has been found to be as low as 86 days (JS 20-34) to 100 days (SL 1191 and KDS 1009) with an average of 95 days. Two test entries (NRC 146 and NRC 138) had equivalent maturity duration to that of earliest maturity check JS 20-34 and their performance is summarized in Table 11.

Table 11: Performance of early maturing entries in AVTI of Central Zone

S. No.	Entry	Maturity	Yield (Kg/ha)	Plant Height
1.	NRC 146	88.0	1568	38.2
2.	NRC 138	89.6	1594	40.0
3.	JS 20-34 (c)	86.2	1635	36.6

Vegetable Soybean Trial

Proposed Testing Centres: Amravati, Indore, Kota, Parbhani

Data received from: Indore, Kota, Parbhani

Maximum green pod yield (5651 Kg/ha) was recorded by JS 95-60 which is grain soybean checks kept in Central Zone to start Vegetable soybean trials in the absence of a vegetable soybean check. Karune (5502 Kg/ha) which is a known vegetable soybean line yielded almost at par to best check. 100 green seed weight of Karune followed by NRC 105 (50g) was maximum (60 g) and it was 28-34g in checks.

5.4 Advanced Varietal Trial-I

Proposed Testing Centres: Amravati, Amreli, Anand, Indore, Jabalpur, Kota, Lok Bharti, Morena, Nagpur, Parbhani, Sehore

Data received from: All the Centres except Nagpur

The data from Anand and Morena was rejected as per the recommendations of monitoring teams. Data from Lok Bharti was rejected due to high CV. Trial failed at Nagpur. The yield and maturity data of six entries along with four checks have been presented in Table 1.5.6 and 1.5.8 of this compilation. Only one test entry AMS 100-39 could out yield the best check (JS 20-34) by 17%. Maturity duration of the trial ranged from 84 days to 100 days.

Based on the two years data AMS 100-39 with a maturity duration of 96 days and mean of 2066 Kg/ha was the highest yielding entry and it out yielded the best check by 15% (Table 12). Mean maturity duration over three years ranged from 86 days (JS 20-34) to 102 days (JS 97-52).

Based on two years data early maturing entry NRC 130 had a yield advantage of 7% and NRC 131 was at par with the early check JS 20-34 (Table 13). Average plant height of JS 20-34 over two years was 32.3 cm and that of NRC 130 and NRC 131 was 47.4 and 55.2 cm.

High oleic acid entry NRC 147 yielded 1314 Kg/ha with a maturity duration of 92 days against the best yielding check JS 20-34 (1686 Kg/ha) and maturity duration of 84 days (Table 14).

Table 12: Mean Performance of AVT-I Entries of Central Zone

S.No.	Entry	Yield (Kg/ha)		Mean	Rank	Maturity
		IVT-2017	AVT I-2018			
1	AMS 100-39	2164	1968	2066	I	96
2	NRC 132	1686	1280	1483	VII	99
3	MACSNRC 1575	1223	1254	1239	IX	91
4	NRC 130	1712	1481	1597	IV	89
5	NRC 131	1555	1446	1501	V	91
6	JS 335(C)	1622	1583	1603	III	97
7	JS 97-52(C)	1352	1433	1393	VIII	102
8	NRC 86(C)	2023	1584	1804	II	97
9	JS 20-34(C)	1305	1686	1496	VI	86

Table 13: Mean Performance of Early Maturing AVT I Entries of Central Zone

S.No.	Entry	Yield (Kg/ha)		Mean	Rank	Maturity	Plant Height (cm)
		IVT-2017	AVT I-2018				
1	NRC 130	1712	1481	1597	I	89	47.4
2	NRC 131	1555	1446	1501	II	91	55.2
3	JS 20-34(C)	1305	1686	1496	VI	86	32.3

Table 14: Mean Performance of High Oleic Acid Entry NRC 147 in AVT-I of Central Zone

S. No.	Entry	Yield (Kg/ha)	Rank	Maturity
1.	NRC 147	1314	V	92
2.	JS 335(C)	1583	III	96.5
3.	JS 97-52(C)	1433	IV	100.13
4.	NRC 86(C)	1584	II	95.75
5.	JS 20-34(C)	1686	I	83.63

5.5 Advanced Varietal Trial-II

Proposed Testing Centres: Amravati, Anand, Indore, Jabalpur, Kota, Morena, Nagpur, Parbhani, Sehore
Data received from: All the Centres

The data from Anand and Morena was rejected as per the recommendations of monitoring teams. Data from Nagpur was rejected due to low trial mean yield (806 Kg/ha). Yield and maturity data of three entries with four checks has been presented in Table 1.5.11 and 1.5.13 of this compilation. NRC 86 was the best yielding check with a yield of 1598 Kg/ha and only MACS 1520 could out yield it by more than 5%.

Based on the pooled data of three years, all of the three entries *viz* MACS 1520, RSC 10-52 and AMS-MB5-18 and could out yield the best check NRC 86 by 16, 8 and 8 percent, respectively (Table 15). The maturity duration of these entries was 100 days.

Table 15: Mean Performance of AVT-II Entries of Central Zone

S.No.	Entries	Yield (Kg/ha)			Mean	Rank	Maturity
		IVT-2016	AVT I-2017	AVT II-2018			
1	RSC10-52	2633	1732	1657	2007	II	101
2	MACS 1520	2929	1814	1704	2149	I	100
3	AMS-MB5-18	2485	1921	1601	2002	III	100
4	JS 335(C)	2076	1345	1545	1655	V	100
4	JS 97-52(C)	2103	1362	1442	1636	VI	103
5	NRC 86(C)	2335	1617	1598	1850	IV	100
6	JS 20-34(C)	1631	1535	1549	1572	VII	89

6 Southern Zone

6.3 Initial Varietal Trial

Grain Soybean

Proposed Testing Centres: Adilabad, Bidar, Bengaluru, Dharwad, K.Digraj, Pune,
Data received from: All the Centres

The yield data of 34 test entries along with three checks has been presented in Table 1.6.1. Mean yield ranged from 1888 kg/ha (NRC 139) to 2776 kg/ha (DSb 33) with the average yield of 2247 kg/ha. DSb 23 was the highest yielding check with 2665 Kg/ha and only DSb 33 could out yield it by more than 5%. The maturity duration for this zone varied from 88 days (NRC 146) to 99 days (KS 113 and PS 1634) with a mean value of 95 days (Table 1.6.3).

Vegetable Soybean

Proposed Testing Centres: Adilabad, Bengaluru, Pune,
Data received from: All the Centres

Mean green pod yield of the zone varied from 4674 (NRC 105) to 10571 (Karune) with a mean of 7854 Kg/ha. Only one entry could Karune could out yield the best check KDS 726 (9472 Kg/ha). 100 green seed weight varied from 30 g (MACS 1508) to 73 g (Karune).

6.4 Advanced Varietal Trial I

JS 335 was the best check with a mean of 2358 Kg/ha. Six entries *viz* DBb 34, KDS 992, MACS 1493, NRC 147, RSC 1107 and NRCSL 1 could out yield the best check by more than 5% (Table 1.6.6).

Based on the two year data all of the test entries except NRC 132 yielded more than 5% to the best check DSb 21 (Table 16). NRC 132 is a lox 2 free entry and out yielded the best check by 3%. Maturity duration of the trial ranged from 91 to 101 days with an average of 96 days.

MACSNRCS 1667 is an EDV of MACS 450 and is null for anti-nutritional factor Kunitz Trypsin Inhibitor (null-KTI). Its yield was marginally lower (49 Kg) than MACS 450 and maturity duration was similar. High oleic acid entry NRC 147 out yielded the best check (JS 335) by 9% (Table 17). Maturity duration of the trial ranged from 91-97 days with NRC 147 maturing in 94 days.

Table 16: Mean Performance of AVT-I Entries of Southern Zone

S. No.	Entry	Yield (Kg/ha)		Mean	Rank	Maturity
		IVT-2017	AVTI-2018			
1	NRCSL 1	2472	2503	2487	VI	97
2	RSC 11-07	2649	2556	2602	IV	95
3	AMS 2014-1	2549	2365	2457	VIII	96
4	NRC 132	2479	2273	2376	X	98
5	MACS 1493	2703	2655	2679	II	95
6	AMS 100-39	2580	2409	2494	V	97
7	KDS 992	2617	2710	2663	III	101
8	DSb 34	2546	2841	2693	I	93
9	BAUS 102	2467	2460	2463	VII	100
10	SKF-SP-11	2456	2431	2443	IX	97
11	DSb 21(c)	2270	2346	2308	XI	98
12	RKS 18 (c)	2291	2260	2275.5	XIII	95
13	JS 335 (c)	2241	2358	2299.5	XII	95
14	JS 93-05 (c)	1956	2250	2103	XIV	91

Table 17: Mean Performance of EDV and High Oleic Acid AVT-I Entries of Southern Zone

S. No.	Entry	Yield (Kg/ha)	Rank	Maturity
1	MACSNRC 1667 (EDV)	2325	V	97
2	NRC 147	2563	I	94
3	DSb 21(c)	2346	IV	96
4	MACS 450*	2374	II	97
5	RKS 18 (c)	2260	VI	95
6	JS 335 (c)	2358	III	94
7	JS 93-05 (c)	2250	VII	91

*For MACSNRC 1667

3.2. SUMMARY REPORT OF AGRONOMIC EXPERIMENTS – *KHARIF* - 2018

By and large, all the trials were conducted during *kharif* 2018 at all the Centres representing 6 zones of the country as per technical programme. Raipur centre did not submit the data in time hence it was not included in zonal mean.The experiment-wise salient findings (Table 2.1.1 to 2.5.6) are given as under.

1. ASP 1 /16. Evaluation of AVT II entries under different sowing dates

` The new entries with two sowing dates were tested in split plot with three replications to study the response of soybean new entries to different sowing dates (Table 2.1.1-2.1.18).

1.1. Northern plain zone (Pantnagar and Ludhiana)

1.1.1. Entries

The effect of soybean new entries and sowing date was found to be non-significat at Pantnagar (Table 2.1.1). Significantly higher yield was recorded with SL 1104 as compared to check variety PS 1347. On zonal mean basis, the highest yield was noted with SL 1104 (30.43%) followed by DS 31 06 (7.79%) as compared to check PS 1347.

Similar trend was also recorded in most of the growth and development and yield attributes, straw yield, grain production index and rainfall use efficiency (Table 2.1.2).

1.1.2. Sowing date

Normal planting of soybean produced significantly higher yield to the tune of 36.95% at Ludhiana and 8.35% at Pantnagar than 20 days later planting. On the zonal mean basis, the normal planting yielded more (23.82%) than late planting (Table 2.1.1).

A similar trend was also noted in all the parameters (Table 2.1.2).

1.1.3. Interaction effect

The interaction between entries and sowing dates was found to be significant at Ludhiana centre and entry SL 1104 planted under normal time produced maximum yield at Ludhiana (Table 2.1.1).

1.2. Northern eastern (Ranchi, Raipur and Bhawanipatna)

1.2.1. Entries

New entry RSC 10 52 yielded higher than check at Ranchi and Bhawanipatna. On the basis of zonal mean, new entry RSC 10 52 yielded higher (22.28%) than check variety JS 97 52. (Table 2.1.3).

Similar trend was also recorded in most of the growth and development and yield attributes, straw yield, grain production index and rainfall use efficiency (Table 2.1.4).

1.2.2. Sowing dates

Timely planting of all the new entries of soybean gave significantly higher yield (30.50 to 31.09%) at both the centers than late planting. The zonal mean revealed that the normal planting produced higher yield (30.83%) than late planting (Table 2.1.3).

A similar trend was also observed in all the studied parameters except RGR at both the stages and rainfall use efficiency (Table 2.1.4).

1.2.3. Interaction effect

The interaction between entries and sowing dates was found to be non- significant at both the centre (Table 2.1.3).

1.3. North eastern hill zone (Imphal and Medziphema)

1.3.1. Entries

The new entries DSb 32 and RSC 10 71 yielded higher than check variety JS 97 52 at Imphal while at Medziphema, new entries differed non-significantly among themselves (Table 2.1.5). On the zonal mean basis, new entry DSb 32 and RSC 10 71 1 produced negligibly higher yield (19.38 and 3.18%) as compared to check- JS 97 52.

On zonal mean basis, more or less a similar trend was also observed in all the parameters under study (Table 2.1.6).

1.3.2. Sowing dates

Timely planting of soybean yielded significantly higher (30.71 to 137.38 %) than late planting at Imphal and Medziphema (Table 2.1.5). On zonal mean basis, the highest yield (63.33%) was recorded under normal planting as compared to late planting.

On zonal mean basis, maximum values of all the growth and yield attributes were associated with normal planting (Table 2.1.6).

1.3.3. Interaction effect

The interaction between entries and sowing date was found significant at Imphal centre (Table 2.1.5). New entry DSb 32 planting under normal condition gave maximum yield than rest of the combinations.

1.4. Cenral zone (Sehore, Kota and Amravati)

1.4.1. Entries

New entry RSC 10 51 yielded higher than check variety NRC 86 at Sehore, while at Amravati and Kota, new entries differed non-significantly among themselves. On the basis of zonal mean, the new entry i.e. RSC 10 51 yielded higher (2.09%) than check variety NRC 86 (Table 2.1.7).

On zonal mean basis, more or less a similar trend was also observed in all the parameters under study (Table 2.1.8).

1.4.2. Sowing dates

Timely planting of soybean yielded significantly higher (20.80 to 141.36%) than late planting at all the centres (Table 2.1.7). On zonal mean basis, the highest yield (59.49%) was recorded under normal planting as compared to late planting.

On zonal mean basis, maximum values of all the growth and yield attributes were associated with normal planting (Table 2.1.8).

1.4.3. Interaction effect

The interaction between entries and sowing date was found non-significant at Amrawati and Kota centres (Table 2.1.7). New entry RSC 10 52 under normal planting yield higher than rest of the combinations.

2. ASP2/15. Sustainable soybean production through crop rotation and tillage systems

Two tillage systems (minimum and conventional) and four crop rotations were tested in strip plot design with four replications to study the response of soybean to tillage systems and crop rotations (Table 2.2.1-2.2.23).

2.1. North plain zone (Pantnagar and Ludhiana)

2.1.1. Crop rotations

Soybean yield significantly influenced by the crop rotation at Pantnagar and Ludhiana however, rabi and soybean equivalent yield remained unaffected due to different crop rotation at both the centres (Table 2.2.1, 2.2.2 and 2.2.3). Soybean-soybean-maize-soybean rotation yielded maximum at both the centres.

The net returns and B:C ratio was higher with soybean-soybean-soybean-maize at Pantnagar while at Ludhiana, they remained unaffected due to crop rotation (Table 2.2.4 and 2.2.5).

2.1.2. Tillage systems

Soybean, *rabi* and soybean equivalent yield differed non-significantly between two tillage systems at Ludhiana and Pantnagar (Table 2.2.1, 2.2.2 and 2.2.3.). The net returns and B:C ratio was higher with minimum tillage at Pantnagar, while at Ludhiana, net returns and B:C ratio differed non-significantly between two tillage systems (Table 2.2.4 and 2.2.5).

2.1.3. Interaction effect

Interaction between tillage systems and crop rotations for soybean, *rabi* yield and SEY were found to be non-significant at both the centres.

2.2. Eastern zone (Raipur and Ranchi)

2.2.1. Crop rotations

The highest soybean yield was associated with Soy-Maize-Soy-Maize (Table 2.2.5.). *Rabi* crop yield and SEY was maximum with soybean-soybean-maize-soybean.

Soybean-soybean-maize-soybean showed highest net returns and B:C ratio (Table 2.2.8.). Soybean-soybean-maize-soybean rotation was found to be nutrient exhaustive at Ranchi (Table 2.2.8.). The initial values of soil OC, N. P, and K and nutrient uptake were given in Table 2. 2.8.

2.2.2. Tillage systems

The highest soybean (12.25%), *rabi* (2.53%) and soybean equivalent yield (12.76%) was with minimum tillage at Ranchi (Table 2.2.6.).

The economical parameters remained unaffected due to tillage systems (Table 2.2.7).The initial values of soil OC, N. P, and K and nutrient uptake were given in Table 2. 2.8. Minimum tillage was found to be nutrient exhaustive than conventional tillage.

2.2.3. Interaction effect

Interaction between tillage systems and crop rotations was found to be non-significant for soybean, *rabi* and soybean equivalent yield.

2.3. Central zone (Kota and Amravati)

2.3.1. Crop rotation

Crop rotation failed to cause appreciable improvement in soybean, rabi and soybean equivalent yield at both the centres (Table 2.2.12 to 2.2.14).

The maximum net returns and B:C ratio was with continuous soybean (Table 2.2.15.). The initial values of soil parameters and nutrient uptake at of Kota and Amravati are given in Table 2.2.16 and 2.2.17.

2.3.2. Tillage systems

Tillage systems failed to bring any appreciable difference in soybean, *rabi* crop yield and SEY at Kota, while at Amravati, conventional tillage produced higher yield (soybean, *rabi* and SEY) than minimum tillage (Table 2.2.12 to 2.2.14). On zonal mean basis, conventional tillage gave higher yield to the tune of 2.39, 2.70 and 7.96% of soybean, *rabi* and SEY over minimum tillage, respectively (Table 2.2.12 to 2.2.13).

Conventional tillage was found to be economical than minimum tillage (Table 2.2.15.).The initial values of soil parameters and nutrient uptake at of Kota and Amravati are given in Table 2.2.16 and 2.2.17. The maximum nutrient uptake was associated with conventional tillage at Amravati, while it was just reverse at Kota.

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2.3.3. Interaction effect

Interaction between tillage systems and crop rotations was found to be non-significant at both the centres (Table 2.2.12 to 2.2.13).

2.2. Southern zone (Dharwad, Adilabad and Pune)

2.4.1. Crop rotation

Kharif crop yield was highest with soybean- soybean- maize-soybean (Table 2.2.18). The maximum *rabi* crop yield was with soybean-soybean soybean-maize (Table 2.2.19). Soybean-Soybean-maiz**e**-soybean rotation produced maximum SEY as evidenced from zonal mean (Table 2.2.20).

A similar trend was also observed in economics of different treatments were given in Table 2.2.21. The soil analysis and nutrient uptake data are given in table 2.2.22 and 2.2.23. Growing of continuous soybean showed maximum nutrient uptake at Adilabad and Pune centre.

2.4.2. Tillage systems

Tillage systems significantly influenced soybean yield at Adilabad and Dharwad while, *rabi* yield and SEY significantly influenced by tillage systems at all the three centres (Table 2.2.18 to 2.2.20). Conventional tillage yielded higher than minimum tillage at all the three centres. On zonal mean basis, conventional tillage gave higher soybean (9.55%), *rabi* yield (7.28%) and SEY (7.57%) over minimum tillage.

A similar trend was also observed in economics of different treatments were given in Table 2.2.21. The soil analysis and nutrient uptake data are given in table 2.2.22 and 2.2.23.

2.4.3. Interaction effect

Interaction between tillage systems and crop rotations was found to be significant at Dharwad.

3. ASP7/17. Bridging yield gap of soybean through site specific nutrient management (SSNM)

Seven treatments of nutrient under RBD to evaluate the yield gap of soybean due to omission of nutrients (Table 2.3.1. to 2.3.13).

3.1. North plain zone (Delhi, Pantnagar and Ludhiana)

The application of nutrients through expert system (SSNM) produced maximum yield at Pantnagar, while at Delhi and Ludhiana, recommended dose of fertilizers produced maximum yield (Table 2.3.1). On zonal mean basis, the application through SSNM was found to be superior to rest of the treatments. The highest net returns and B:C ratio was associated with SSNM.

The highest yield gap was with absolute control at all the centres. The yield gap analysis revealed that the omission of N, P and K from nutritional schedule through SSNM reduced the yield to the tune of 283, 343 and 81 kg/ha at Delhi. The corresponding values were 25, -21 and 317 kg/ha at Ludhiana and 395, 346 and 420 kg/ha at Pantnagar, respectively. The yield gap due to N. P and K omission from nutritional schedule through RDF was higher than SSNM at Delhi, and Ludhiana (Table 2.3.2.). The soil properties after harvest and nutrient content in seed and straw and nutrient uptake was depicted in table 2.3.3 to 2.3.5.

3.2. North eastern zone (Raipur. Ranchi and Bhawanipatna)

The maximum yield was recorded with SSNM at Ranchi while it was maximum with RDF at Bhawanipatna (Table 2.3.6). On zonal mean basis, The SSNM gave higher yield to the tune of 2.0% as compared to RDF. On zonal mean basis, the highest net returns and B:C ratio was associated with SSNM.

The highest yield gap was with absolute control at Ranchi and Bhawanipatna. The highest yield gap was due to omission of P from SSNM as well as from RDF followed by omission of N and K at Ranchi. While at Bhawanipatna, the maximum yield gap was with omission of N followed by P and K (Table 2.3.7).

3.3. North eastern hill zone (Imphal and Medziphema)

The maximum yield was recorded with SSNM and RDF at Imphal and Medziphem, respectively (Table 2.3.8). On zonal mean basis, RDF produced maximum yield (14.23%) than SSNM. The omission of P and K from nutritional schedule through SSNM produced higher yield than SSNM at Medziphema.

The highest yield gap was with absolute control and followed by farmers practice at Imphal. While at Medziphema, the highest gap was with absolute control. The yield gap due to omission of N, P and K from nutritional schedule through SSNM was in line N, P and K at Imphal. The highest yield gap trend was K,N and P due omission from RDF was recorded at Medziphema (Table 2.3.9.).

3.4. Central zone (Sehore, Kota, Indore and Amravati)

The maximum yield was noted with SSNM at Sehore and Indore (Table 2.3.10) while at Amravati and Kota, it was highest with RDF. The N and K omission produced higher yield than SSNM at Amravati. On zonal mean basis, the highest yield was with RDF and closely followed by SSNM.

The highest yield gap was with absolute control at all the centres. Yield gap analysis indicated that the highest gap was noted when P omission from nutritional schedule through SSNM followed by K and N at Indore, Sehore (Table 2.3.11). The maximum yield gap was recorded with N omission followed by K and P at Kota. The highest yield gap was due to P omission followed by N and K at Amravati. More or less similar trend of yield gap was recorded under RDF. The highest net returns and B:C ratio was with RDF as evidenced from zonal mean.

3.5. Southern zone (Pune, Dharwad and Adilabad)

Application of nutrients through SSNM produced maximum yield at Dharwad (Table 2.3.12). At Adilabad and Dharwad, application of RDF recorded highest yield and remained at par with SSNM. The maximum net reurns and B:C ratio was associated with RDF.

The highest yield gap was with absolute control at Pune and Adilabad. The yield gap due to omission of nutrients like N and P increased the yield over SSNM at Dharwad. The yield gap trend was K, N and P at Pune, while the trend was N, P and K at Adilabad (Table 2.3. 13).

4. ASP4/15. System intensification for soybean productivity augmentation under Ridge Furrow planting

Two variety and four planting geometry were assessed in split plot design with three replication to optimize the planting geometry for achieving higher yield of soybean varieties (Table 2.4.1 to 2.4.15).

4.1. North plain zone (Pantnagar and Ludhiana):

4.1.1. Planting geometry:

The different planting geometry did not influence soybean yield at Ludhiana (Table 2.4.1). Plant of soybean at 45 x 5 cm spacing produced maximum yield and closely followed by 45 x 10 cm at Pantnagar. Zonal mean data revealed that as the plant to plant spacing increases yield decreases and maximum being with 45 x 5 cm.

Growth and development and yield attributes and economics follows the same trend as was observed in yield (Table 2.4.2 and 2.4.3).

4.1.2. Variety:

Difference between varieties was found to be non-significant at both the centres. However, variety PS 10 92 yielded higher (6.03%) than SL 958 at Pantnagar and SL 958 produced higher (11.36%) yield as compared to PS 10 92 at Ludhiana. On zonal mean basis, SL 958 gave higher (1.65%) yield than PS 10 92.

Growth and development and yield attributes and economics follows the same trend as was observed in yield (Table 2.4.2 and 2.4.3).

4.1.3. Interaction effect:

The interaction between variety and planting geometry was found to be non-significant at both the centres.

4.2. North eastern (Ranchi):

4.2.1. Planting geometry:

The maximum yield was recorded with 45 x 10 cm plant geometry and closely followed by 45 x 5 cm and both the treatments showed superiority over reaming treatments (Table 2.4.4).

Plant growth and development and yield attributes and economics was in line as observed in yield (Table 2.4.5 and 2.4.6).

4.2.2. Variety:

Variety RSC 10 46 produced higher yield(46.77%) as compared to JS 95 60 (Table 2.4.4). Variety RSC 10 46 was found to be superior in respect of growth and development, yield attributes and economical parameters (Table 2.4.5 and 2.4.6).

4.2.3. Interaction effect:

The interaction between variety and planting geometry was found to be non-significant.

4.2. North eastern hill (Imphal and Medziphema):

4.3.1. Planting geometry:

Planting geometry did not show any appreciable effect on soybean yield at Imphal (Table 2.4.7). The increase in plant to plant space with in row has negative impact on soybean yield and highest yield being with 45 x 5 cm. at Medziphema. On the basis of zonal mean, the highest yield was associated with 45 x 10 cm and closely followed by 45 x 5 cm.

Growth and development and yield attributes and economical parameters follows the similar pattern as observed in yield (Table 2.4.8 and 2.8.9).

4.3.2. Variety:

Both the varieties remained at par with respect to yield at both the centre (Table 2.4.7). On the basis of zonal mean, variety JS 97 52 yielded higher (84.81%) as compared to JS 93 05. Growth and development and yield attributes and economical parameters follows the similar pattern as observed in yield (Table 2.4.8 and 2.8.9).

4.3.3. Interaction effect:

The interaction between variety and planting geometry was found to be non-significant at both the centres.

4.4. Central (Sehore, Kota and Amravati):

4.4.1. Planting geometry:

Soybean yield remained unaffected due planting geometry at Kota (Table 2.4.10). The maximum yield was recorded with 45 x 10 cm and closely followed by 45 x 5 c. at Amravati. While at Sehore, the highest yield was noted with 45 x 5 cm and closely followed by 45 x 10 cm. On zonal mean basis, the planting of soybean either 45 x 10 cm or 45 x 5 cm produced identical yield and gave significantly higher yield than rest of the treatments.

Growth and development and yield attributes and economical parameters follows the similar pattern as observed in yield (Table 2.4.11 and 2.8.12).

4.4.2. Variety:

Soybean yield did not differ significantly due to varieties at Kota centre (Table 2.4.10), Soybean variety JS 20 34 and RVS 24 yielded higher at Amravati and Sehore. On the basis of zonal mean, both the varieties were identical in productivity ability.

Growth and development and yield attributes and economical parameters follows the similar pattern as observed in yield (Table 2.4.11 and 2.8.12).

4.4.3. Interaction effect:

Interaction of variety and planting geometry was found to be non-significant at Amravati and Kota. Variety RVS 24 and 45 x 10 cm produced maximum yield as compared to other combinations at Sehore.

4.5. Southern (Pune, Adilabad and Dharwad):

4.5.1. Planting geometry:

Soybean yield remained unaffected due to planting geometry at Dharwad and pune (Table 2.4.13). At Adilabad, soybean yield decreased as the plant to plant spacing within rows increases and maximum being with 45 x 5 cm. On the basis of zonal mean, the planting of soybean either at 45 x 5 or 45 x 10 cm behaved identically and found to be superior than wider plant to plant spacing.

Growth and development and yield attributes and economical parameters follows the similar pattern as observed in yield (Table 2.4.14 and 2.8.15).

4.5.2. Variety:

Both the varieties behaved identically at Dharwad and Pune (Table 2.4.13). Variety MACS 1188 yielded higher (11.63%) than JS 93 05 at Adilabad as well as in zonal mean (10.62%).

Growth and development and yield attributes and economical parameters follows the similar pattern as observed in yield (Table 2.4.14 and 2.8.15).

4.5.3. Interaction effect:

Interaction of variety and planting geometry was found to be non-significant at all the three centres.

5.5. AGRON. 5/18: Evaluation of bio-efficacy of MACARENA (Bio-stimulant) on soybean

Two treatments were assessed with ten replications to evaluate the bio-efficacy of MACARENA on soybean crop (Table 2.5.1 to 2.5.6).

5.5.1. Central (Sehore, Kota and Amravati):

Soybean yield remained unaffected due to treatments at Kota and Sehore (Table 2.5.1). However, at Amravati, the two spray of MACARENA at pre flowering and pod initiation increased the soybean yield to the tune of 8.89% as compared to recommended dose of fertilizer (RDF).

The marginal higher values of dry matter, branches and pods/plant and seed index was recorded with application of MACARENA as compared to RDF at Kota (Table 2.5.2). While at Sehore, all the parameters showed non-significant differences between the treatments (Table 2.5.3). The maximum straw yield and pods plant was associated with applied MACARENA than RDF (Table 2.5.4).

5.5.2. Southern (Adilabad):

The application of MACARENA @ 625 ml/ha each at pre flowering and pod initiation significantly improved the soybean yield to the tune of 19.98% as compared to RDF (Table 2.5. 5).The maximum straw yield, branches/plant, pods/plant, seed index and harvest index was recorded with applied MACARENA as compared to RDF.

5.5.3. North eastern (Raipur): Centre did not submit the report in time.

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Soybean Frontline Demonstrations

During the year, 25 centers have conducted a total of 1129 FLDs on farmer's fields against the target of 900 FLDs in plot of 0.4 ha each (Table 6.1). The physical and financial targets and achievements were presented in Table 6.1. The centres namely Raipur did not submitted the data in time. Of the 1136 FLDs, 74.89 and 25.11% were represented by man and farm women. While the representation of categories wise beneficiaries were 15.93% by SC, 8.63% by ST, 43.66% by OBC and 31.78% by general (Table 6.2).

Data accrued from successful 1147 FLDs on full package (all the recommended inputs and cultural practices and improved soybean varieties) revealed that the adoption of research emanated improved soybean production technology led to an increase in yield and net returns to the tune of 26.19 and 40.17% over farmers practice which was achieved by the additional expenditure of only Rs. 3718/ha (Table 6.3). The difference in gross returns due to improved technology and farmer's practice was 32.38%. Soybean yield as high as 3043 and 2404 kg/ha could be obtained in some farmer's field under the improved production technology and farmer's practice at Sangli. The lowest yield under improved technology and Farmer's practice was recorded at Srijan, Rajasthan (993 and 664 kg/ha). The estimated yield gap II was 378 kg/ha.

In all 1147 frontline demonstrations, a total of 42 improved varieties have been demonstrated in farmer's fields (Table 6.4). The maximum demonstrations was conducted on variety JS 95 60 followed by VL Bhatt 201, VLS 77 and MAUS 158. Among the varieties, soybean variety MACS 1281 gave highest yield (3245 kg/ha) followed by KDS 726 (3107 kg/ha) and KDS 344 (3013 kg/ha). The lowest yield was recorded with VL Bhatt 201 (1275 kg/ha). None of the variety yielded below 1 t/ha.

The details of cost of soybean cultivation have been worked out. The information have not been provided by the different centres like Almora, SOPA, Indore, Sehore, KVK, Karda. The details of cost of cultivation under improved technology and farmers practice (Table 6.5) indicated that the soybean cultivation cost under improved technology was higher to the tune of 18.59% as compared to farmers practice cultivation cost. Under the improved production technology, the trend of expenditure was in line- Seed and sowing, followed by fertilizer application, land preparation, threshing, interculture operations/ hand weeding, harvesting, herbicide application, insecticide application and others. However, in case of farmers practice the trend was seed and sowing, land preparation, fertilizer, interculture operations, harvesting, threshing, insecticide, herbicide application and others.

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SUMMARY REPORT OF ENTOMOLOGY EXPERIMENTS CONDUCTED DURING *KHARIF* - 2018

Seven entomological field trials were conducted during *kharif* 2018 at 12 Coordinated centres viz. Delhi, Pantnagar, Ludhiana (Northern Plain Zone), Palampur (Northern Hill Zone), Sehore, Parbhani, Kota, Amrawati, Indore (Central Zone), Dharwad (Southern Zone), Raipur (Eastern zone) and Imphal (North Eastern Hill Zone). Trial wise salient findings are presented below:

Ent. 1. Seasonal incidence of insect pests and their bio-control agents

A. Incidence of insect-pests: The information on incidence of major insect-pests at different coordinating centres is compiled in **Table 3.1**. Total **21** insect spp. infested soybean crop in different zones during *kharif* 2018 at different coordinating centres:

Zone	Insects
North Plain Zone (Delhi, Pantnagar)	*Bemisia tabaci, Obereopsis brevis, S. obliqua, S. litura, D. orichalcea, H. indicata, M. maculosus,* ***Melanagromyza sojae,*** **Aphids**, Green Stink Bug, Leaf miner, Pod borer.
North Eastern Hill Zone (Imphal)	*Helicoverpa armigera,* ***Spilarctia obliqua***, *A. modicella*, **Aphids**, *M. sojae, Bemisia tabaci, S. litura, C. acuta, Obereopsis brevis,* Bean bug, Thrips
Central Zone (Sehore, Kota, Parbhani, Amravati)	*Cneorane* spp, ***Melanagromyza sojae***, ***Gesonia gemma***, *Chrysodeixis acuta, Spodoptera litura,* ***Obereopsis brevis***, *Helicoverpa armigera, Diachrysia orichalcea, Spilarctia obliqua, Hedylepta indicata, Bemisia tabaci, Myllo*cerus spp., Grass hopper, Field Crickets
Southern Zone (Dharwad)	*Melanagromyza sojae, Obereopsis brevis, S. litura, , D. orichalcea, Spilarctia obliqua, N. viridula,* ***Cydia ptychora***, Thrips, Aphids, Jassids, *Bemisia tabaci*, Myllocerus spp., *A. modicella,* ***H. indicata***, *Helicoverpa armigera,*

The extent of infestation/damage by major insect-pests at different coordinating centres is given below :

Location	Major insects (infestation / damage)
Palampur	Bean bug - 4.4/m; Jassids 16.5 /3 leaves; White fly 15.0 /3 leaves
Delhi	No major insect observed
Pantnagar	Stem fly – 100 % infestation and 37.50 % Stem tunnelling; Aphids – 14.4/ 3 leaves; Defoliation 9.9 % at flowering.
Sehore	*Gessonia gemma* -6.5 larvae /mrl ; *Chrysodeixis acuta* -4.6 larvae /mrl ; Defoliation-5.5 to 19.5 %; Stem fly -80% infestation and 43.97 % stem tunnelling ; Girdle beetle -14.8 %infestation
Parbhani	Girdle beetle – 14.6 % infestation; Stem fly – 35.4 % stem tunnelling; Semilooper – 4.6 larvae/m
Amravati	No major insect except Stem fly with 70 % infestation.
Kota	Girdle beetle – 26.7 % infestation ; Semiloopers – 5.33 larvae/m; Defoliation – 10.0 % at flowering and 30.0 % at peak
Dharwad	*C. ptychora* – 45.1 % pod damage; *H. indicata* – 22.4 % infestation;
Imphal	*S. obliqua* – 107 larvae / m; Leaf Weber – 14.7 larvae /m; *S. litura* – 10.0 larvae/m; Defoliation – 16.3 to 22.1 % Aphids – 24.8 /plant

B. Incidence of Bio-control agents (BCAs) : Periodic incidence of natural bio-control agents were recorded in soybean ecosystem. The important ones were ; entomopathogenic fungi – *Beauveria bassiana Nomurea rileyi*, Parasitoids – *Bracon* sp., *Sturmia* sp., *Apanteles* sp., *Cotesia flavipus*; *Carcellia illota;* Predators – Spiders, Coccinelids, *Chrysoperla carnea, Cantheconidia furcellata* **(Table 3.2**). The extent of larval mortality due to bio-control agents (BCAs) is given hereunder:

Location	**BCAs**	**Period**	**Extent**
Sehore	*B. bassiana*	3rd week of August	50 % larval mortality
Kota	*Cotesia*	34th SMW	10 % parasitoidation
Dharwad	*N. rileyi*, *Apanteles*	September 4th week	10.85 % mortality 7.50 % parasitoidation
Imphal	*N. Rileyi* and *B. bassiana*	--	10 to 20 % larval mortality
Pantnagar	Bacterial infection *Cotesia* spp.	-- --	55 % mortality 2.5 % parasitoidation
Parbhani	*Coccinella* Spiders	34th SMW 39th SMW	1.33 /m 4.33 /m

Ent. 2. Screening for resistance against major insect-pests (AVT entries)

AVT-I and -II entries of different zones, along with those found resistant in previous years were screened for insect resistance / tolerance. Further, they were categorized into different resistance categories against individual insect spp. by employing **AICRPS method** and against location specific insect-pest complex by **Maximin - Minimax method (Tables 3.3 to 3.9).** Information on reaction of different entries against major insect-pests during last three years (2016, 2017 and 2018) was compiled and promising genotypes were identified by using following criteria:

1. Resistance against one insect spp. at 3 or more locations in any of the 3 years,
2. Multiple resistance at any location in any of the 3 years, or
3. Resistance against one insect spp. in 2 or more years at any location.

Based on above criteria, lines identified as potential donors for insect resistance / tolerance against specific insect pests are mentioned below:

Insect(s)	**Genotype(s)**
Stem fly	MACS 1543, NRC 126, PS 1611, RSC 11-03, VLS 92 = **05**
Girdle beetle	AMS 100-39, BAUS 102, KDS 980, NRC 131, NRC 132, NRC 137, NRC SL 1, SKS-SPS 11, VLS 94 = **09**
Defoliators	KDS 921, NRC 130, RSC 10-71, SL 1028, SL 1123 = **05**
Leaf miner	KDS 869 = **01**
Aphids	PS 1556 = **01**
Multiple Insects	2 Insects: AMS 2014-1, DSb 34, RSC 10-70, SL 1072 = **04** 3 Insects: MACS 1493, PS 1572 = **02**
Multiple Insects and yield	AMS-MB 5-18, DSb 32, NRC 127, DSb 28-03, RVS 2007-6 = **05**

ENT 3: Status of AVT-II entries for antixenosis and antibiosis against *S. litura*

At Pantnagar, among 8 genotypes tested, only one entry, SL 1104 exhibited **strong antixenosis** against *S. litura*. However, at Dharwad SL 1104 showed slight antixenosis reaction. The genotypic differences in antixenosis reaction across locations need to be studied in detail.

Antixenosis reaction of AVT-II entries:

S. No.	Genotypes	Pantnagar		Dharwad	
		C value	Response	C value	Response
1	AMS-MBS 18	0.94	Slight	1.19	Preferred
2	RSC 10-71	1.12	Preferred	1.27	Preferred
3	RSC 10-52	1.00	Preferred	1.24	Preferred
4	KDS 921	1.14	Preferred	0.65	Moderate
5	MACS 1520	0.97	Slight	0.78	Slight
6	DSb 32	0.80	Slight	0.56	Moderate
7	DS 3106	0.87	Slight	1.13	Preferred
8	**SL 1104**	**0.50**	**Strong**	0.84	Slight
9	JS 335 (C)	--	--	--	--

Antibiosis reaction of AVT-II entries

The lower values of ECI and ECD for RSC 10-52 and DSb 32 indicate good antibiosis reaction against *S. litura* larvae. It was interesting to note that SL 1104, which showed strong antixenosis reaction at Pantnagar was having very high AD value. It implies that given a choice, the larvae do not prefer SL 1104, but under no-choice condition they consume lot of foliage. However, relatively low ECI and ECD indicate adverse effect on larval growth and development.

S. No.	Genotypes	Pantnagar			Dharwad		
		AD	ECI	ECD	AD	ECI	ECD
1	AMS-MBS 18	72.63	58.13	80.19	70.60	33.38	23.75
2	RSC 10-71	70.57	59.72	82.58	73.86	43.69	35.61
3	RSC 10-52	67.70	**42.81**	**56.12**	74.35	42.62	32.68
4	KDS 921	67.59	67.57	66.10	69.35	32.63	20.01
5	MACS 1520	75.99	41.37	55.11	72.03	39.84	28.76
6	DSb 32	71.52	57.99	69.37	62.35	**26.09**	**15.39**
7	DS 3106	78.21	49.30	63.25	75.61	31.67	24.82
8	SL 1104	81.43	42.87	52.82	68.23	36.70	30.25
9	JS 335 (C)	74.34	59.82	77.57	80.04	49.29	39.94

Ent. 4. Screening of IVT entries for resistance to major insect-pests

Thirty four coded entries were screened against major insect-pests at coordinating centres (**Tables 3.12 to 3.15**). Promising entries showing desirable reaction against one major insect-pest at more than one location and/or against more than one insect spp. at one or more locations are listed below, which will be tested further in next season:

Insect	Promising entries
Stem fly	AUKS 176, DS 3110, MAUS 732, RSC 11-15, RVS 2011-10, Himso 1689, RVSM 2011-35 = **07**
Defoliators	CAUMS 1, RSC 11-17, NRC 146, DS 3109, RVS 2007-4, MAUS 734, MAUS 732, PS 1637, KDS 1009 = **09**
Girdle beetle	NRC 146, RSC 11-17 = **02**
Aphids	JS 21-71 = **01**
White fly	NRC 146 = **01**
Multiple Insects	**RSC 11-17 (GB, LD), KDS 1009 (LD, SF), JS 21-71 (WF, Jas, Thr), NRC 146 (GB, LD, WF), RVS 2011-10 (SF, LD) = 05**

ENT 5. Evaluation of Bt 127 SC strain for efficacy against lepidopteran larvae infesting soybean (3rd year)

The trial was allotted to Sehore, Kota, Dharwad, Imphal and Indore centers. Efficacy of Bt 127 SC was assessed against various defoliating larvae viz. *Gessonia gemma*, *Chrysodeixis acuta*, *Spodoptera litura*, *Helicoverpa armigera*, *Spilarctia obliqua*, leaf webber and pod borer (*C. ptychora*).

At all the centers, Bt 127 SC proved to be significantly superior over untreated control, thus establishing its efficacy (**Tables 3.16 to 3.17**). The effect on lepidopteran defoliators, including *S. litura*, was numerically better than but statistically on par with commercial Bt formulation, Delfin. On the basis of yields at 5 centers, all the treatments recorded significantly higher yield than the untreated control. Chemical insecticide treated plots yielded more than Bt formulations treated ones. However there was no significant difference in yields obtained with Bt 127 and Delfin.

It is important to mention here that Bt 127 SC is formulated by an ICAR Institute (IIOR, Hyderabad) from indigenous strain and would be very cost effective. The commercial formulation, on the other hand, consists of exotic strains and is very costly. Promotion of such bio-control products developed by public R&D set up should be encouraged.

ENT 6. Assessment of polymer coating on the efficacy of seed treating chemicals and inoculants (2nd year)

Main objective of this trial was to see the effect of polymer coating on retention of efficacy of seed treating chemicals. The trial was conducted at Pantnagar, Sehore, Parbhani, Dharwad and Indore centers (**Tables 3.18 to 3.22**). With two years' study, it was evident that the effect of seed treatment with pesticides with polymer coating is effective in retaining their efficacy up to 30 to 45 days. With polymer coating it was also possible to load number of chemicals on seed without losing their efficacy. It is therefore recommended that seed treatment with pesticides with polymer coating can be done much before the actual sowing to suitably adjust within the narrow planting window. Seed treatment is effective to control early stage insects and diseases and maintaining desired plant population and ensuring good yields.

ENT 7. Evaluation of germplasm lines for resistance against major insect-pests

Fifty germplasm lines were evaluated for their insect reaction at respective hot spots (Sehore, Indore, Kota, Dharwad and Imphal (**Table 3.23 to 3.27)**. On the basis of insect reaction and yield potential following promising lines were identified for further evaluation during next season: AMS 108, AMSS 34, EC 347464, EC 113778, EC 232019, Harder, JS 20-41, JS 20-48, JS 20-50, JS 20-51, JS 20-53, JS 20-55, JS 20-59, JS 20-61, JS 20-86, MAUS 142, PS 1423, SQL 31, SQL 32, and SQL 37.

Compiled and Summarized by

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SUMMARY REPORT OF COORDINATED PLANT PATHOLOGY EXPERIMENTS CONDUCTED DURING *KHARIF*-2018

Nine Pathology field trials were conducted during *kharif* 2018 at 15 co-ordinated centres spread over five zones to generate the information on prevalence of diseases, their severity, sources of resistance to either a single disease or multiple diseases, screening of germplasm lines for identification of sources of multiple disease resistance, bioefficacy of zillon against YMV disease and assessment of polymer coating on efficacy of seed treating chemicals and inoculants. Trial wise salient findings are presented below: (Table 4.1 to 4.9).

As reported by various centres, although a total 18 diseases appeared across the country on soybean but only eight of them were wide spread occurring in 3 or more zones and four were zone specific. Except FLS at Almora and Palampur,Sehore,Jabalpur,Ugarkhurd and Dharwad YMV at Pantnagar, Ludhiana, Dholi and Delhi, Coll R and PB (Ct) at Pantnagar,Jabalpur and Amravati, SR at Jorhat, Coll R, CR and PB(Ct) at Jabalpur and Amaravati, rust and PB (Ct) at Ugar khurd, Dharwad, K. Digraj.Seed rot at Jorhat,BND at Delhi and ChLB at Ugarkhurd which appeared in moderate to severe form, severity of other diseases was mild to moderate at most of the locations. Two disease viz., PB (Ct) and YMV were found in all the five zones which are the key diseases across the locations. FLS and ALS appeared in four zones except northern Plain zone BND appeared only at Delhi and Seed rotting at Jorhat and ChLB at Ugarkhurd in moderate to severe form. The other hemibiotrphic diseases at different locations appeared in mild to moderate form. In general, the disease pressure differed at different locations across a zone which is mainly due to variation in congenial weather that prevailed across the different locations during the cropping period.

The major results of the trials are presented here as under:

PP 1: Survey for soybean diseases

Disease scenario across the locations has been reported by synthesis and analysis of the available information from survey and surveillance and also based on severity of diseases recorded in other trials of soybean pathology (Table 4.1 to 4.5). In NHZ, at Almora, FLS was moderate to severe and BP & PB (Ct) were in mild form. Whereas at Palampur, FLS,BS,BP and PB(Ct) were in moderate to severe form. In NPZ, at Pantnagar, RAB, BLB ,SMV and PB(Ct) were moderate to severe where in YMV and BP were recorded with mild to moderate severity. At Ludhiana, YMV and SMV were mild form, while at Delhi, YMV was severe and BND was mild. At Dholi, YMV was in severe form. At Jorhat, Seed rot,damping off,CLS,BLB were notice in mild to moderate form while RAB and PB (Ct) were moderate, YMV,FW and ALS were mild. At Medziphema, PB (Ct) and RAB were severe, other diseases like FW and CR moderate form and CollR,CR and rust were mild. In CZ, at Sehore, FLS was moderate to severe form. At Amravati, Charcoal Rot (CR) was found moderate to severe from. Disease pressure of ALS,YMV,BP,PB(Ct) were found in very mild form. At Jabalpur, CR, YMV and RAB,PB(Ct) and BP were moderate to severe form, BLS, ALS and SMV were in mild form.

PP 2: Trap nursery trial

Appearance of various major diseases was monitored at 10 centres across the zones (Table 4.2) on 16 susceptible varieties. In NHZ, at Almora, the situation was different from previous year where in only FLS appeared in moderate to severe form, PB (Ct) and BP appeared in mild to moderate form. At Palampur, FLS and BS appeared in moderate to severe form, while, PB (Ct) and BP in mild form. In NPZ, at Pantnagar, PB(Ct) and RAB in were severe form and YMV , SMV BP and BLB were in mild form. At Delhi, YMV was in severe form and BND was in mild form. In NEHZ, at Jorhat, PB(Ct) appeared in moderate to severe form where as CollR and RAB appeared in mild to moderate form. At Medziphema, RAB, PB (Ct) in moderate to severe form. and FW in mild to moderate form. In CZ, at Sehore, TLS appeared in moderate to severe form. At Jabalpur, this year, CR appeared in moderate to severe form and YMV,RAB, BP and PB(Ct) were in mild to moderate form. At Amravati, CR were in moderate form and other diseases such as YMV, PB(Ct) ,ALS and BP appeared in mild form. In SZ, rust appeared in severe form at all the three centres viz., Ugar Khurd, Dharwad and Kasbe Digraj and PB (Ct) and PSS appeared in moderate form at Ugar Khurd and Dharwad.

PP 3(a): Incidence of various diseases in IVT

Thirty seven entries along with checks were screened at 12 locations across the zones against major diseases (Table 4.3). Evaluation of entries were considered reliable only for FLS, PB (Ct), RAB, YMV, Rust, TLS,SCV,IBB,CollR, CR and FW appeared in moderate to severe form in susceptible checks or in any test entry at one or more centres. Disease pressure of rest of the diseases i.e. BP, BS, BLB except Pantnagar, BND, PSS/CLS, SMV and PB (Ct) at Almora was low to moderate in susceptible check as well as in test entries. Therefore, the resistant status of the entries to diseases of latter group was not reliable and needs further confirmation. The data of those centres where susceptible check/test entries showed susceptible or highly susceptible reaction considered for classifying varieties in to different resistance categories. The entries observed Absolute Resistant (AR) and Highly Resistant (HR) at such centre (s) and did not express susceptible reaction to same disease at other centres where infection in susceptible check (s) and in entries was even less than 77.7 were also considered as resistant.

Appearance of FLS was moderate at Almora and severe at Palampur. Entry NRC 146 showed AR reaction at Almora, while MACS 1620,MAUS 732 and KS 113 showed HR reaction at Almora. Entries MACS 1566,RVSM 2011-35 showed HR reaction to FLS at Palampur.

Appearance of PB(Ct) was moderate to severe at Pantnagar,Medziphema, Jorhat,Indore,Ugarkhurd and Dharwad. At Pantnagar,none of entries showed AR reaction, while nine entries(RSC 11-17,PS 1637,GJS 3,NRC 148,RSC 11-15,CAUMS-1,TS 59,NRCSL 2 and KDS 1009) showed AR reaction, two entries(PS 1634 and MACS 1620) showed HR reaction at Medziphema. At Palampur, KDS 1009 recorded AR reaction where in, three entries (PS 1634,JS 21-71 and SL 1191) showed HR reaction. At Jorhat the entries (PS 1637,GJS 3,NRC 148,RSC 11-15,CAUMS-1,TS 59,NRCSL 2 and KDS 1009 showed AR reaction while entries (PS 1634,MACS 1620) showed HR reaction. At Indore none of entries were AR/HR to PB (Ct) where as 13 entries showed MR reaction under very high disease pressure. At Ugarkhurd,none of the entries showed AR/HR reaction while 23 entries showed MR reaction to PB(Ct).None of entries showed either AR or HR reaction at Dharwad. Entries PS 1637, GJS 3 and NRC 148 showed AR reaction over two locations.

RAB appeared in severe form at Medziphema, Pantnagar and Jorhat with moderate to severe form. Entries JS 20-71,RSC 11-17,DSb 33,NRC 138,PS 1637,AUKS 176, GJS 3,NRC 139,DS 3110, SL 1171, MACS 1620,MAUS 732,KS 113,RVS 2011-10,RVSM-2011-35,KDS 1009 and BAUS 100 recorded AR reaction at Medziphema. None of entries recorded AR reaction and The entries PS 1634,MACS 1556, SL 1191,RVSM 2011-35,RVS 2007-11,KDS 1073,NRCSL 2 and KDS 1009 showed HR reaction at Pantnagar. The entries JS 21-71,RSC 11-17,DSb 33,NRC 138,SL 1191, PS 1637,AUKS 176,GJS 3,NRC 139 showed HR reaction at Jorhat. The data of Jabalpur for RAB ,Pantnagar for BS,Ugarkhurd for PSS, Amravati for ALS,Jabalapur and BLB for BLB and CollR,Delhi for BND was not considered reliable due to less than 77.7 infection index. At Sehore, none of the entries showed AR reaction and RSC 11-17 showed HR reaction for TLS. Rust was severe at Ugarkhurd,Dharwad and K.Digraj. DSb 33 showed HR reaction at Ugarkhurd, Dharwad and MR reaction at K.Digraj. KDS 1073 and KDS1009 showed HR reaction at K.Digraj only. The data of Medziphema was not reliable due to lower infection index.CR was severe in test entries and checks both at Amravati and Jabalpur. Twenty one entries at Amravati and seven entries at Jabalpur showed AR reaction. The entries DS 3109,SL 1191,NRCSL 2,KDS 1009 showed AR reaction at both locations.

PP 3(b): Incidence of various diseases in AVT-I

A total of twenty nine entries which were promoted to AVT-1 from IVT in all the zones, have been evaluated against major diseases at 13centres (Table 4.4) along with checks. Susceptible check varieties or test entries contracted severe disease (I. I. equal or more than 77.7).For FLS at Palampur and Almora,RAB,BLB,BP and PB(Ct) at Pantnagar, YMV at Delhi & Dholi, CollR and PB (Ct) at Jorhat and Medziphema, RAB at Jorhat, CR at Jabalapur and Amravati, TLS at Sehore, rust at Dharwad, Ugarhurd, and K.Digraj,PB(Ct) at Dharwad and Ugarkhurd are reliable. Therefore, resistant status of entries against these diseases at above locations was considered as reliable. The entries observed AR and highly resistant (HR) at such centre (s) and did not express susceptible reaction to same disease at other centre (s) of the same zone were considered as real resistant. Resistant status of BS at Palampur, BP and PB(Ct) at Alomra, BS, YMV and SMV at Pantnagar,BND at Delhi,BLB at Jorhat,YMV at Jabalpur and YMV, ALS and BP at Amravati and PSS at Dharwad were considered as not reliable.

In NHZ, at Palampur two entries (NRC 147 and VLS 94) showed AR reaction to FLS while entries (RSC 11-07 and SL 1123) showed HR reaction. The entry VLS 94 showed AR at Palampur and HR at Almora for FLS.

In NPZ at Pantnagar,the entry PS 1611 showed AR reaction to PB(Ct),BP nad BLB while nine entries for BP,25 for BLB and one entry PS 1611 showed AR recation for PB(Ct).At Delhi, none of entries showed AR/HR reaction for YMV ,entries DS 3108,PS 1613,SL 1123,VLS 94 and VLS 95 showed MR reaction. The entries SL 1123, VLS 94 showed AR reaction for BP,BLB,HR for RAB and YMV across the locations. At Dholi, none of the entries showed AR/HR reaction. The entries AMS 2014-2,NRC 131,NRC 134 showed MR reaction.

In NEHZ, at Medziphema two entries(PS 1611 and RSC 11-03) showed AR reaction to PB(Ct) while five entries(AMS-2014-1, DS 3108, NRC 128,NRC 132,SL 1068) showed HR reaction to PB(Ct).At Jorhat,CSB 10112,RSC 11-03,VLS 94 and VLS 95 showed HR reaction to CollR. In case of RAB at Jorhat nine entries showed AR reaction. In case of PB(Ct) three entries (PS 1611,PS 1613RSC 11-07) showed AR reaction. The entries AMS MB 2014-1,CSB 10112,NRC128,NRC 132 and PS 1611 showed AR/HR reaction at both Medziphema and Jorhat locations.

In CZ at Jabalpur, the entries AMS 100-39.KDS 992,NRC 130,PS 1613 and VLS 94 showed AR reaction to CR.At Sehore,none of entries showed AR/HR reaction to TLS..In SZ at Dharwad,DSb 34 showed HR reaction to Dharwad, Ugarkhurd and MR at K.Digraj. Rest of the entries showed S/HS reaction to rust.

PP 3(c): Incidence of various diseases in AVT-II

Eight entries at 14 locations across the country were evaluated for their reaction to diseases along with checks as per procedure described in Table 4.5. Susceptible check variety (s) or test entry (s) with severe disease rating (1.1 equal or more than 77.7) for FLS & PB(ct) at Palampur and FLS at Almora, BLB,PB(ct),RAB,SMV and YMV at Pantnagar,YMV at Dholi,Ludhiana and Delhi, RAB & PB(ct) at Meziphema,RAB,PB(Ct) at Jorhat,CR at Jabalpur,TLS at Sehore ,rust at Dharwad,Ugarkhurd and K.Digraj, PB(Ct) at Ugarkhurd and Dharwad. Therefore the resistant of entries against those disease at above locations were considered on reliable. The data with respect to BS at Palampur, BP at Pantnagar, BND at Delhi,CollR and BLB,YMV at Jorhat,YMV & RAB at Jabalpur,YMV,ALS BP and CR at Amravati, PSS at Ugarkhurd and Dharwad were not reliable since infection index in susceptible checks/entries was less than 77.7 and hence did not consider for analysis of results. In NHZ, at Palampur RSC 10-52 recorded AR reaction and MS MB 5-18,DSb 32,KDS 921 showed HR reaction for FLS. In case of PB(ct) all the entries showed HR reaction except RSC 10-71 recorded MR reaction.RSC 10-52 showed AR for FLS and HR for PB(ct). Entry RSC 10-52 showed AR reaction for FLS at Almora. The entry RSC 10-52 showed AR for FLS at Palampur and Almora centers.

In NPZ, At Pantnagar, all the entries showed AR reaction for BLB except KDS 921,RSc 10-52,DS 3106 showed HR reaction to BLB which indicated multiple disease resistance. For reaction to SMV & YMV ,none of entries showed AR/HR reaction.Five entries showed MR reaction for YMV and SMV.For the reaction to YMV, the entries KDS 921,RSC 10-52 showed MR reaction at Dholi. DS 3106 and SL 1104 showed HR reaction at Ludhiana and AMS MB 5-18,,DS 3106,DSb 32,KDS 921,MACS 1520 and SL 1104 showed HR reaction at Delhi center.
The entries DS 3106 and SL 1104 showed AR/HR reaction at two or more centers.

In NEHZ, at Medziphema, DS 3106,KDS 921,RSC 10-52 and SL 1104 showed AR reaction and AMS MB 5-18 recorded HR reaction to RAB. In case of PB (Ct),the entry RSC 10-52 showed AR reaction and AMS MB 5-18,DS 3106,KDS 921 and SL 1104 showed HR reaction at Medziphema. At Jorhat center, entries DS 3106,KDS 921 and RSC 10-52 showed AR recation for RAB, RSC 10-52 showed AR for PB (Ct). The entries DS 3106,RSC 10-52 showed AR/HR reaction to RAB & PB(ct) at Medziphema and Jorhat centers. In CZ, entry AMS MB 5-18 showed AR reaction to CR at Jabalpur & rest of entries showed MR/MS reaction. DSb 32,RSC 10-71 and SL 1104 showed AR reaction to TLS at Sehore center.

In SZ, DSb 32 showed HR reaction to rust at Dharwad,Ugarkhurd and K.Digraj where as KDS 921 showed HR reaction at K.Digraj only. For PB (Ct), none of entries showed AR/HR reaction at Ugarkhurd and Dharwad. The entries DSb 32 and MACS 1520 recorded MR reaction both at Ugarkhurd and Dharwad.

PP 4: Performance of previous year resistant entries

Disease specific resistant entries/varieties of past years were further evaluated to select those which are showing durable resistance status at various identified locations (Table 4.6). In NPZ, at Pantnagar out of 32 previous entries, PS 1572,SL 979 maintained AR status and 10 maintained HR status to RAB. In case of YMV the data was not reliable due to less disease severity and could not satisfy minimum infection index of 77.7 at Pantnagar and Ludhiana.

In NHZ, at Almora, out of 73 entries tested the entries NRC 88,VS 2005-40,VS 2006-17,Himso 1685,MACS 1407 and Salimar maintained AR status to FLS. In CZ at Amravati, out of 82 entries, 42 maintained AR status to CR. At Jabalpur, out of 25 entries tested, 11 maintained HR reaction for CR. At Sehore, out of 40 entries tested 37 entries recorded AR reaction to CR. In case of YMV, the data was not reliable due to less disease severity and could not satisfy minimum infection index of 77.7.

At Dharwad out of 24 entries tested, DSb 34, DSb 23, DSb 28-3 and DSb 21 maintained HR reaction to rust, EC 391336, EC 379152, EC 242104 the new sources of resistance identified four years back maintained HR recation to rust at Dharwad and Ugarkhurd. At Ugarkhurd, out of 14 entries, 9 entries maintained HR reaction to rust and 10 entries MR reaction to PB (Ct). The variety DSb 21 maintained HR reaction to rust for the last nine years both at Ugarkhurd and Dharwad.

PP.5. Evaluation of germplasm lines for identification of multiple disease resistant sources

Fifty germplasm each were evaluated at Palampur, Jabalpur, Indore, Dharwad and Pantnagar centres for identification of sources of multiple disease resistance. Evaluation of FLS and PB(Ct) at Palampur, CR & RAB at Jabalpur and rust & PB(Ct) at Dharwad,RAB,YMV & PB (Ct) at Pantnagar were considered reliable looking to the target disease pressure at the location. At Palampur, JS 20-27(E),JS 20-23(E),AMS 56,AMS 34,AMS 60-2-3-4,AMS MB 5194 showed AR reaction to FLS. Nineteen entries showed AR and 12 HR reaction to PB(Ct).At Jabalpur,JS 20-23(E),JS 20-21(E),JMS 288,EC 547464,MAUS 142,AMS MB 51-94,JS 75-30,VLS 75,Trait Specific Harder(L) showed AR to CR.For RAB 11 entries maintained AR reaction. The disease reaction of YMV was not found reliable due to less disease severity and could not satisfy minimum infection index of 77.7. At Dharwad, no germplasm line was observed as resistant for rust. EC 113778 showed MR to rust and 15 lines MR to PB(Ct). The data of PSS was not reliable due to low disease pressure.At Indore center,eight entries showed MR reaction for PB(Ct),47 entries resistant to BP.The data of SMV was not reliable.At Pantnagar,nine entries showed HR reaction to RAB and 27 entries HR to PB(Ct).The data of YMV was to reliable due to low disease pressure.

The entries that showed AR/HR reaction at three or more locations are Trait Specific Harder(L),EC 287754,AGS 102,JS 75-30,EC 309537 for PB(Ct) which can be used sources in resistance breeding programme (Table 4.8).

PP. 6. Bioefficacy of Zillon against Yellow Mosaic Virus Disease (2st Year)-<u>Paid Trial</u>

Eight treatments including various dosages of Zillon were evaluated at NPZ (Pantnagar and Ludhiana), CZ (Jabalpur and Amarvati),SZ(Ugarkhurd) and NZ(Medziphema) centers during *Kharif* 2018.The severity of YMV was low to moderate across all the locations except NPZ zone. In NPZ at Ludhiana center where infection index was very low and could not derive any conclusion with respect to Zillon. At Pantnagar, spraying with zillon @ 6 ml/l at 15 and 45 DAS recorded minimum infection index (17.68) followed by spraying with zillon @ 4 ml/l at 15 30 and 45 DAS(26.74).The maximum infection index was recorded in untreated control(40.02).The maximum yield of 17.44 q/ha was recorded in spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS which was stastically on par with spraying with zillon @ 6 ml/l at 15 and 30 DAS(15.86 q/ha) and spraying with zillon @ 6 ml/l at 15 and 45 DAS(16.53q/ha).The minimum seed yield of 13.35q/ha was recorded in untreated control. In CZ at Jabalpur, though infection index was low to moderate, the minimum infection index was recorded in spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS(12.70) and maximum in untreated control(23.7 I.I.). The maximum yield of 12.89 q/ha was recorded in spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS which significant superior over untreated control(11.05q/ha) and on par with spraying of traizophos @1.5ml at 15 and 45 DAS(12.18q/ha). At Amravati, severity was low with minimum the minimum infection index was recorded in spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS(6.48) while maximum in untreated control(10.93 I.I). The maximum yield of 13.11 q/ha was recorded in spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS which significant superior over untreated control(8.89q/ha) and on par with spraying of traizophos @1.5ml at 15 and 45 DAS(11.97q/ha). In SZ,the YMV infection was low at Ugarkhurd with minimum infection index in case of spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS (2.36) followed by spraying with zillon @ 6 ml/l at 15 and 45 DAS(4.32).The maximum infection index was recorded in untreated control(12.32).The seed yield was maximum (17.45 q/ha) in treatment of spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS followed by 15.90q/ha in case of spraying with zillon @ 4 ml/l at 15, 30 and 45 DAS which are stastically on par with each other. The minimum seed yield was recorded in untreated control(13.71q/ha).No conclusions could be drawn from NEZ Medziphema center due to absence of YMV in that area. However, spraying with Zillion in the absence indicated enhancement of yield with maximum yield of 16.83 q/ha by spraying with zillon @ 6 ml/l at 15 and 45 DAS when compared with untreated control(9.70q/ha).

Among the different treatments across the zones, spraying with zillon @ 6 ml/l at 15, 30 and 45 DAS was found better in reducing the infection index of YMV followed by spraying with zillon @ 4 ml/l at 15, 30 and 45 DAS which is numerically superior over chemical control. Hence, spraying with Zillon at 4 to 6 ml/L at 15,30 and 45 DAS be advocated for management of Yellow Mosaic Virus disease and enhancement of yield in soybean(Table 4.10).

PP 7: Assessment of polymer coating on efficacy of seed treating chemicals and inoculants

Three different treatments involving polymer seed coating were evaluated against location specific seed borne and seedling diseases at NPZ(Pantnagar),CZ(Indore and Sehore) and SZ(Dharwad).At Pantnagar, trial vitiated due to poor germination. At Sehore, TLS severity was minimum (20.89) in case of JS 335 seed treated with (pre-mix pyroclostrobin and thiophenate methyl) + (pre-mix thiram and carboxin) + thiamethoxam with polymer coating.In Sehore,there was no seedling mortality and also no significant difference wrt to severity of TLS and CV. At Dharwad, the seedling mortality was minimum (6.20%) after 20DAG with anthracnose infection index of 12.56 in JS 335 seed treated with carboxin and thiamethoxam with polymer coating. Seed treatment with Rhizobium and PSB culture at the time of sowing. At Indore, infection index of PB(Ct),RAB and SMV was on par both at JS 335 seed treated with carboxin and thiamethoxam with polymer coating. Seed treatment with Rhizobium and PSB culture at the time of sowing and JS 335 seed treated with (pre-mix pyroclostrobin and thiophenate methyl) + (pre-mix Thiram and Carboxin) + thiamethoxam with polymer coating. Thus, the studies clearly indicated effectiveness of polymer coating in reducing the seed borne infections.

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AICRP-Soybean Microbiology Trials
Kharif 2018-2019

MB 1/16: Isolation and screening of rhizobacteria capable of producing ACC deaminase activity, antioxidant potential and phytohormones for developing inoculants to mitigate abiotic stress in soybean.

Centres: ***Pantnagar, Delhi, Indore, Sehore and Ludhiana***

This experiment was initiated at various centres to explore fluorescent pseudomonads from the soybean rhizosphere soil finally to use as potential plant growth promoting rhizobacteria in soybean. The colonies exhibiting fluorescence under UV light in Kings B media were selected for isolation and further investigations.

Table: MB 1/16A to MB1/16F lists the isolations and parameters carried out at different centres. A total of 14 isolates from Delhi center; 03 from Indore centre; 26 from Pantnagar centre and 8 from Ludhiana center have been isolated and purified.

At Indore centre, a total of 12 putative rhizobacteria were obtained from the soybean rhizosphere soil. Out of these, 06 isolates were appears to be as pseudomonads on the basis of colonies exhibited fluorescence under UV light on King's medium. Based on fatty acid methyl ester analysis (FAME), 03 isolates were found to mainly belong to *Pseudomonas* and were evaluated for moisture stress tolerance traits at varying PEG concentration (0 to 40% PEG 6000 gradient in KB broth). During first stage, a total of 3 isolates of Pseudomonas strains were selected based on unique profile of fatty acids and similarity index. These strains were evaluated for moisture tolerant characteristics in a gradient of PEG6000 (0 to 40%) in KB broth under invitro. Out three, one strain *Pseudomonas aeruginosa* (P1) was found to have higher growth at 20% PEG as compared to other two. Moreover, this strain also found to possesses PGP traits *viz.* Indole acetic acid (IAA), phosphate (P) solubilization, siderophore production and ACC deaminase activity assays. Among all three, isolate P3 found to be negative for ACC deaminase production. Overall P1 strain found to be best and is being characterized through 16SrRNA gene sequences **(Tables MB1/16A to MB1/16C).**

At Delhi centre, 07 isolates out of 14 fluorescent pseudomonads, who grew well in 30% and 20% PEG 6000 (polyethylene glycol) were screened for plant growth promoting traits under in vitro conditions. All 07 isolates were found to be positive for IAA and siderophore production based on plate assay. An orange halo around the colony in CAS medium was taken as positive siderophore producer **(Table MB1/16D).**

At Pantnagar centre, a total of 26 probable fluorescent *Pseudomonas* isolates have been isolated from the rhizosphere soil and roots' of various soybean varieties grown under field conditions and raised under glass house conditions. The probable isolates of fluorescent *Pseudomonas* are being screened for their capability to resist the stress conditions under laboratory conditions. The stress resistant isolates are being screened for the production of ACC deaminase activity, antioxidant potential and phytohormones.

At Ludhiana, of the 08 rhizobacterial isolates were identified as pseudomonads on the basis of colonies exhibited fluorescence under UV light on King's medium. All the pseudomonads screened for multifarious PGP traits *viz.* IAA, P-solubilization, siderophore, ACC deaminase and salt tolerance. All the pseudomonads were positive for catalase and superoxide dismutase (SOD). On the basis of PGP traits, out of 8 pseudomonads, only 2 bacterial isolates were selected as potential PGPR under abiotic stress conditions (Table.1). Pseudomonads *viz.* LSE-2 & LSE-3 showed excellent growth on DF medium containing ACC as nitrogen source. Further, 2 pseudomonads LSE-2 & LSE-3 were identified as *P. oryzihabitans* and *P. fluorescence* by 16 S rRNA sequencing. PEG (6000) was used for the study abiotic stress in isolates **(Tables MB1/16E and F).**

All the isolates were tested with PEG (6000) at varying concentrations from 0 to 30%, reduced growth with increasing concentrations of PEG. *P. oryzihabitans* revealed less decreased in growth in terms of optical density (5%= 1.201 and 7.5%= 0.986) as compared to P. *fluorescence* (5%= 0.535 and 7.5%= 0.495). Similar trend was seen with different concentrations of NaCl (@0, 2.5, 5, 7.5 and 10%) except *Bradyrhizobium* sp. LSBR-3. However, maximum optical density was recorded with P. *oryzihabitans* as compared to P. *fluorescence.* Further, all the isolates were screened at different temperatures (28°C, 35°C and 40°C). Highest optical density was observed with P. *fluorescence* at 28±2°C and sharply decreased at 40±2°C temperature **(Table MB1/16F).**

MB 2/17: Development of multi trait soybean rhizobia and their evaluation under *in vitro*

Centers: Delhi, Indore, Pantnagar and Ludhiana

This trial was initiated to to develop and select potential rhizobia having multiple PGP traits (IAA production, Nitrate reduction, P solubilization, Siderophore production and ACC deaminase production using standard methods) for utilization in soybean.

At Delhi centre, three rhizobia recovered from field grown soybean were purified and screened for ability to grow using ACC as sole source of N. Their ability to grow under defined medium with ACC as sole source of nitrogen was evaluated under broth conditions **(Table MB 2/17A).** At Indore centre, 20 soybean rhizobia (characterized based on FAME) were screened for moisture tolerance trait in YEM broth in a gradient of PEG6000 (0 to 30%; 0 to -0.73 mPa osmotic stress). Out of all isolates, 04 strains were found to be relatively tolerant at 0.73 mPa stress simulated through PEG. The potential strains are being further evaluated for various PGP traits under invitro **(Table MB2/17B).**

Based on 16S r-RNA gene sequences from the potential strains, one novel rhizobial i.e., strain identified as *Bradyrhizobium daqingense* (isolated from drought-tolerant line PK-472) has been reported from Indian rhizosphere for the first time.

At Ludhiana centre, one potential soybean rhizobial isolate was evaluated along with two *Pseudomonas* strains in MB1/16 trial at elevated levels of PEG, NaCl and temperature for tolerant characteristics. Overall soybean rhizobia found to be equally tolerant against all three stresses when compared to other two PGPR strains **(Tables MB1/16E to F).**

MB2a/18: Evaluation of promising soybean rhizobia for conferring drought tolerance in soybean under pot conditions

Centres: (Indore, Sehore, Ludhiana, Delhi, Pantnagar and Dharwad)

This trial was conducted in unsterilized soil in pots. 02 potential root nodulating soybean rhizobia (*B. daqingense* and *B.liaoningense*) recovered from soybean varieties which are currently in seed chain by the Indore centre were tested under moisture stress conditions. With these strains, a commercial/local soybean *Rhizobium* culture was also included in the trial. The treatments comprising of no. of rhizobial strains+ one uninoculated control with and without stress conditions (2 factors) replicated 6 times in a factorial (2 factors) completely randomized design. The stress treatment (stopping irrigation) was imposed at R5 stage for 10 days or until plants started showing wilting symptoms whichever is earlier. Root nodulation, growth, nutrient and physiological parameters were observed, analysed and recorded.
At Indore centre, nodulation parameters -nodule number, nodule biomass and leghaemoglobin content in nodules enhanced significantly in the treatment of *B. daqingense* and *B. japonicum* in stressed as

well unstressed pots. The chlorophyll content, dry biomass of shoot and root and relative water content was also found to enhance significantly in B. *daqingense* and *B. japonicum* and found to be superior for all the parameters when compared with commercial local rhizobial culture. Similarly, the RWC, dry weights of root, shoots and P content in shots was enhanced significantly even under stress conditions over the control and local commercial inoculum **(Tables MB2a18Ato B).**

At Ludhiana centre, data recorded at R5 stage for growth, symbiotic traits and after moisture stress revealed significantly enhancement in all the inoculated treatments over un-inoculated control. Among all the *Rhizobium* treatment *Bradyrhizobium* sp. & *Bradyrhizobium daqingense* differed significantly for dry weight of shoot and nodule dry weight in before and after drought stress treatments as compared to *B. liaoningense.* However, the difference was non-significant for shoot dry weight, chlorophyll content, nodule number leghaemoglobin content and catalase activity. Improvement in yield due to inoculation with different *Bradyrhizobium* treatment varied from 11.27% to 14.29% over un-inoculated control **(Table MB2a/18C).**

At Pantnagar, both the strains *B.daqingense and B. liaoningense* performed better in terms of having higher chlorophyll, proline content, RWC and all other parameters over the control. However local strain (pant-2) also did well as compared to control but when compared to other two strains the response for all the parameters was statistically at par when compared to *B. liaoningense* and *B. daqingense*. Overall, inoculation of both the strains improved plant nodulation, vigour and N and P nutrient uptake under both the conditions although comparatively inoculation of *B. liaoningense* performed better and improved grain yield than the rest of strains **(Tables MB2a/18D to MB2a/18G).**
At Dharwad centre, both the strains *B.daqingense and B. liaoningense* performed better in terms of having higher chlorophyll, proline content, RWC, leghaemoglobin and all other parameters over the control and local strain. However, comparatively the response of *B. daqingense* for all the parameters was higher over the others **(Tables MB2a/18H to MB2a/18I).**

In conclusion, treatment of *B. daqingense* performed better under both the conditions than the all other strains which signifies the role of inoculants in stress tolerance of soybean plants.

MB 3/14: Field evaluation of AMF and *Paenibacillus polymyxa* microbial combination at farmer's field

Centres: Indore, Sehore, Delhi, Ludhiana* and *Pantnagar

This trial was conducted with latest released soybean variety of the concern centre and response of *Paenibacillus polymyxa* (HKA 15)+AMF consortia (*Rhizophagus intraradices+Funneliformi geosporus+Funneliformis mosseae+Septoglomus constrictum*) with reduced dose of NPK fertilizers (75% RDF) was compared with 100% NPK fertilizers as farmers practice. Different parameters viz., Nodule number, nodule dry weight (at 50 % flowering stage), N and P content in shoots and grains at harvest, total N and P -uptake (Kg/ha), grain yield and B:C ratio was observed, analysed and recorded.
At Indore centre, nodulation parameters viz., nodule number, nodule dry weight of plants grown in plots of *Paenibacillus polymyxa* (HKA 15) and AMF with 75% RDF was higher than the 100% NPK/farmers practice. The nutrients (N, P content in shoots and seeds) were also higher than farmers practice. The co-inoculation of *Paenibacillus polymyxa* (HKA 15) + AMF has significantly enhanced P-uptake in shoots, grain yield and cost benefit ratio over the farmers practice **(Table MB3/14A).** At Sehore, co-inoculation of *Paenibacillus polymyxa* (HKA 15) + AMF at 75% RDF has significantly enhanced all the growth, nodulation and nutrient parameters over the farmers practice **(Table MB3/14B).**.

Similarly, at Delhi Centre, the combined inoculation of *Paenibacillus polymyxa* (HKA 15) and AMF increased the nodule number, nodule dry mass as well as yield over farmer's practices. However the values were statistically at par **(Table MB3/14C).**

At Ludhiana, application of *Paenibacillus polymyxa* (HKA 15)+AMF improved nodulation, N & P content over Farmer's practice treatment. Enhancement in yield due to microbial combination was 8.33% over Farmer's practice treatment. Additional income of Rs. 3140 was recorded with application of microbial consortium over Farmer's practice treatment. Benefit cost ratio with microbial consortium was 1.47 whereas, with Farmer's practice treatment it was 1.37 **(Table MB 3/14E).** The higher responses on nodulation, nutrient uptake, grain yield and cost economic due to combined application of *Paenibacillus polymyxa* (HKA 15)+AMF over the farmers practice was also obtained at farmers field in Pantnagar centre **(Table MB3/14F).**

<u>**After following four years it is concluded that co-inoculation of *Paenibacillus polymyxa* (HKA 15)+AM fungi at 75% RDF not only have comparable response with 100% RDF/farmers (20, 40,60 Kg NPK/ha) practice but also enhanced yield and cost: benefit ratio which becomes soybean production more economic. Hence, application of biofertilizers improves the crop stand and increases the yield in soybean and signifies reduction in fertilizer inputs by microbial intervention.**</u>

MB 4/13: Nodulation ability of AVT-II entries at respective centres
Centres: Indore, Sehore, Delhi, Pantnagar & Ludhiana

In the central zone, across two centres (Sehore and Indore) all the three entries (MACS 1520, AMS-MB 5-18 and RSC 10-52) performed better in terms of producing higher nodules per plant, nodule dry weight and leghaemoglobin content in the fresh nodules than the check (NRC 86). However amongst the all the entries, RSC 10-52 was found to be the best entry (recorded nodules 184/plant and analysed 14.48g leghaemoglobin/g nodules) for having higher compatibity with native homologous rhizobia **(Tables MB4/13A to D).**

In the north plain zone, across three centres (Delhi, Ludhiana and Pantnagar), Two AVT-II lines, SL 1104 and DS 3106 along with PS 1347 as check were screened for nodulation in the breeder's field trial. At Delhi centre, among the two entries, SL 1104 performed better in terms of nodulation parameters. It showed better nodule number (14.42/plant) and nodule dry weight (57mg/plant) than DS 1306 and all other checks. However, shoot dry weights of the other entry, DS 1306 was higher than SL1104. When compared to check (PS 1347), both the entries (SL 1104 and DS3106) performed better in terms of having higher nodulation parameters. However when compared to check entry DS 3104 did not have higher nodulation at Ludhiana centre. Overall, entry, SL1104 was found to be the best entry for having higher compatibity with native homologous rhizobia and produced higher nodulation, nodule dry weight and leghaemoglobin content in nodules

(Tables MB4/13A to MB4/13G).

Field demonstration of Pink pigmented Facultative Methylotrophs (PPFM) at farmer's field on soybean at Dharwad centre

The results of the farm trials have revealed that the highest soybean yield was recorded with the treatment received RPP+PPFM (18^{th}+23^{rd}+27^{th}) consortium sprayed at 15^{th} and 30^{th} days (19.8 q/ha) compared to the treatment received RPP alone (17.5 q/ha) respectively **(Table 1).**

Compiled by

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Soybean processing and value addition

Introduction

Soybean is considered highly nutritious and recommended in many vegetarian diets. Apart from proteins, soybean contains basic nutritive constituents such as lipids, vitamins, minerals, free sugar, isoflavones, flavanoids, saponins and peptides that are of therapeutic value. But unfortunately it also has many anti-nutritional factors like trypsin inhibitor, phytic acids, some oligosaccharides and oxalate which are harmful to the human health. Even it acts as allergen to some people. The main objection to soybean products by some consumers are the associated intrinsic flavour which has been described as beany/grassy or astringent and phenomenon of flatulence. Various processing activity reduces or removes this harmful elements. Fermentation is the most effective and cheapest mode of processing. Indeed, the first benefit of soybean fermentation is the reduction of its beany flavour and chalkiness. Fermentation can reduce anti-nutritional factors and objectionable flavour. This can be achieved by using microbial cultures in the form of mono and multi cultures. Southeast Asian countries were known to consume different types of fermented soybean. In India, people of North Eastern states traditionally prepare and consume fermented soybean. In the present study, fermentation is applied to improve bioactive components responsible for health benefits and reduction of anti-nutritional factors.

Objective/Technical Programme

1. To develop nutraceutical/functional food from fermented soybean
2. Extraction of Poly-Glutamate (PGA) from fermented soybean
3. Formulation and development of soy okara cookies by blending with different levels of black scented rice flour

Programme 1: To develop nutraceutical/ functional food from fermented soybean-*hawaijar*

According to American Dietetic Association, functional food are defined as foods that provide specific health benefits beyond basic nutrition when consumed as part of a varied diet. Whereas nutraceutical could be either food, nutrient or any supplement which have health promoting, disease prevention or medicinal properties. The regular consumption of synthetic drugs may cause organ failure and so many side effects. Now the medical science is realizing the importance of food in treatment and prevention of diseases. And through systematic studies it is more or less accepted that diet related chronic diseases such as heart disease, cancer, stroke and diabetes can be decreased significantly through the proper use of functional foods and nutraceuticals. Some of the reported health promoting effects of fermented soybean includes fibrinolytic and thrombolytic activity, antidiabetic activity, Angiotensin I-converting enzyme (ACE) inhibitor activity etc.(Fig.1).

Fermentation not only reduces the toxins but also it is an excellent processing method for improving nutritional and functional properties of soybean due to the increased content of small bioactive compounds. Generally, the occurrence of ACE inhibitory effect in soybean fermented foods tended to be attributed to bioactive peptides produced by the hydrolysis of soybean protein during fermentation.

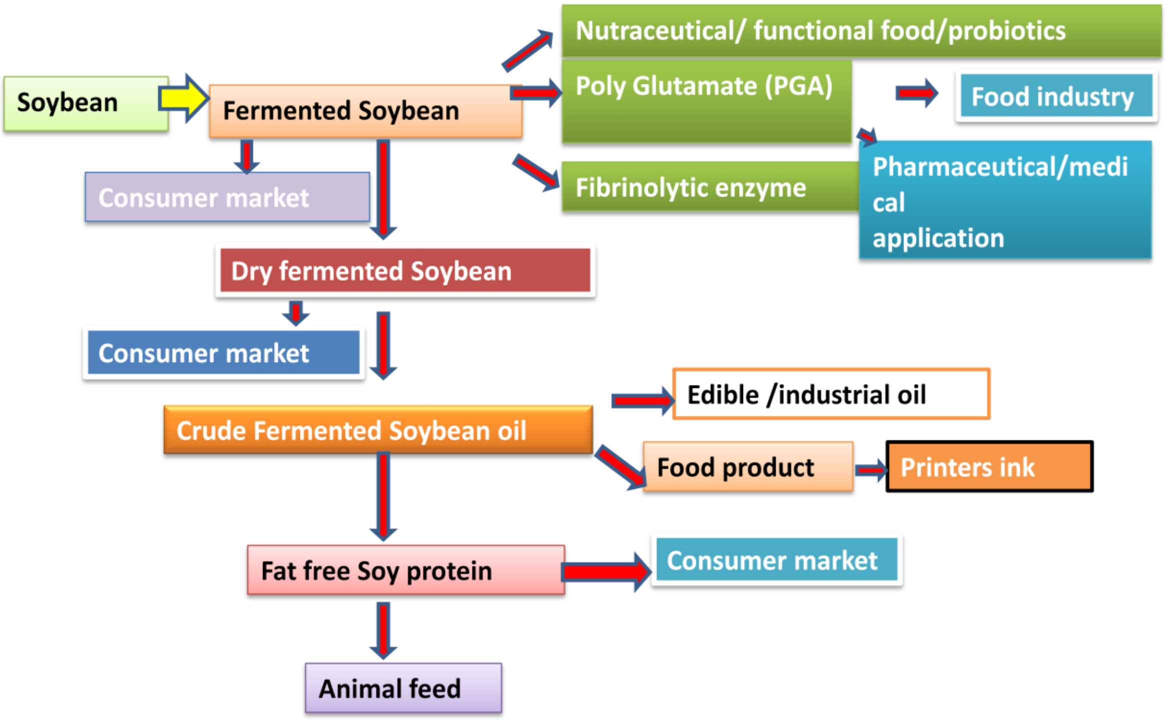

Fig 1: Value chain of fermented soybean

The seeds of JS-335 soybean variety were procured from Andro Research Farm, CAU, Imphal and local small variety were purchased from local farmers of Manipur. The seeds were cleaned manually, dried in sun and stored in plastic containers for further use. Soybean seeds were soaked in water. It is difficult to maintain consistent quality control when making traditional fermented soybean- *hawaijar*. So a scientific method for production of quality fermented soybean- *hawaijar* is established by inoculation with different starter culture strain S and H (Diagram 1).

Diagram1: Flow Chart for fermented soybean- *Hawaijar* preparation using starter culture

Raw soybean

Soak 100g soybean seeds overnight

Cooking standardised in pressure cooker. After 5 whistle keep in sim for 45min

Wash the cooked seeds two times with boiled water and drain it

Transfer 20g each cooked seeds to stainless steel tray with lid

Inoculate activated starter 20g/kg of boiled soybean of different strain and mix it thoroughly

Incubate the inoculated seeds at 40-42^0 for 20-22 hrs

Quality fermented soybean-hawaijar is ready to serve

Biochemical analysis:

1. Identification of starter culture used

a) Phenotypic characterization

Cell morphology of the two starter culture used were determined by using a microscope. Isolates were Gram-stained and tested for catalase production.

b) Genotypic characterization

The genomic DNA was extracted by using the lysozyme method (Jeyaram *et al*., 2008). The DNA was subjected to PCR using universal primers for 16S ribosomalRNA genes following the method of Singh *et al*., 2014.

2. Fatty acid composition analysis using gas chromatography

The fatty acid profilling of the sample was done at Department of Biochemistry, ICAR-Indian Institute of Soybean Research (IISR), Indore. Oil was extracted from the dried fermented soybean powder. A fraction of the oil was taken for preparation of fatty acid methyl esters (FAMEs) using 1N sodium methoxide. FAMEs were injected into Shimadzu gas chromatograph (GC17A) for estimation of fatty acid composition.

3. ACE inhibition assay

The ACE inhibitory activity was assayed by using the modified method of Lieberman. For each assay, 65 µl of a sample solution and 50 µl of 12.5mm Hip-His-Leu as a substrate in a borate buffer (pH 8.3) containing 1M NaCl were incubated with 10µl of ACE (2mU) for 1 hr at 37^0C. The reaction was stopped by adding 125µl of 0.5M HCl. The liberated hippuric acid was extracted with 750 µl of ethyl acetate, and 200 µl of the resulting extract was then evaporated to dryness with a centrifugal concentrator. The precipitate was dissolved in 1.2 ml of 1M NaCl, and the absorbance at 228 nm was then measured. The sample concentration required to inhibit 50% of the ACE activity under the assay conditions is taken as IC_{50} value.

Results

1. Identification of starter culture used

Phenotypic characterization of starter culture

The bacterial strains isolated in this study were subjected to various morphologic, biochemical and physiologic tests. Isolates were Gram-stained and tested for catalase production. The results showed that all strains were gram positive, catalase positive and preliminary identified as *Bacillus* sp. The results of the morphologic, biochemical and physiologic study of micro-organism such are shown in table 1. (Fig. 2, 3, 4).

Table 1: Phenotypic characteristics of the two starter culture from fermented soybean

Strain	Colony morphology	Cell morphology	Cell motility	Endospore	Gram reaction	Catalase reaction	Inferences
Strain H	Large, creamy white, irregular margin	Rods in chain	Present	Terminal ellipsoidal spore	(+)ve	(+)ve	*Bacillus* sp.
Strain S	Small, whitish and slimy with regular margin	Rods in cell and chain	Present	Terminal ellipsoidal spore	(+)ve	(+)ve	*Bacillus* sp.

Fig 2: Starter culture strain H

Fig. 3: Starter culture strain S

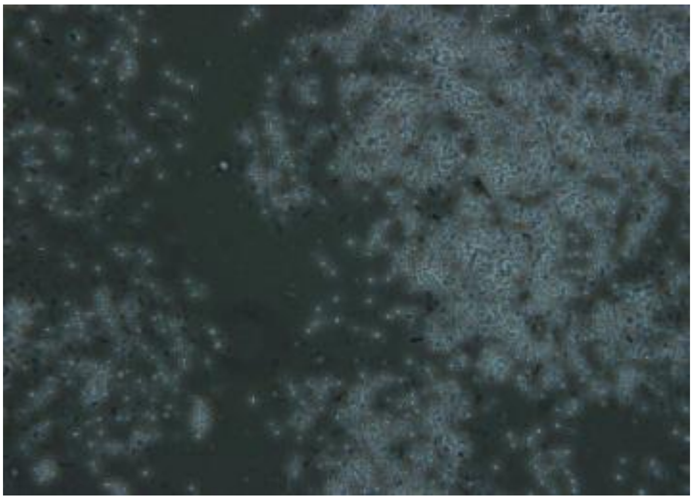

Fig. 4: Cell morphology of *Bacillus* species strain (H)

b) Genotypic characterization

The genomic DNA was extracted by using the lysozyme method (Jeyaram *et al*., 2008). The DNA was subjected to PCR using universal primers for 16S ribosomalRNA genes following the method of Singh *et al*., 2014. The amplified product is carefully purified and outsource for sequencing. The gene sequence (Fig. 5) thus obtained was BLAST in NCBI website to find similar sequence. The reference is 100% similar with *Bacillus subtilis*. Therefore, the strain can be safely identified as *Bacillus subtilis*.

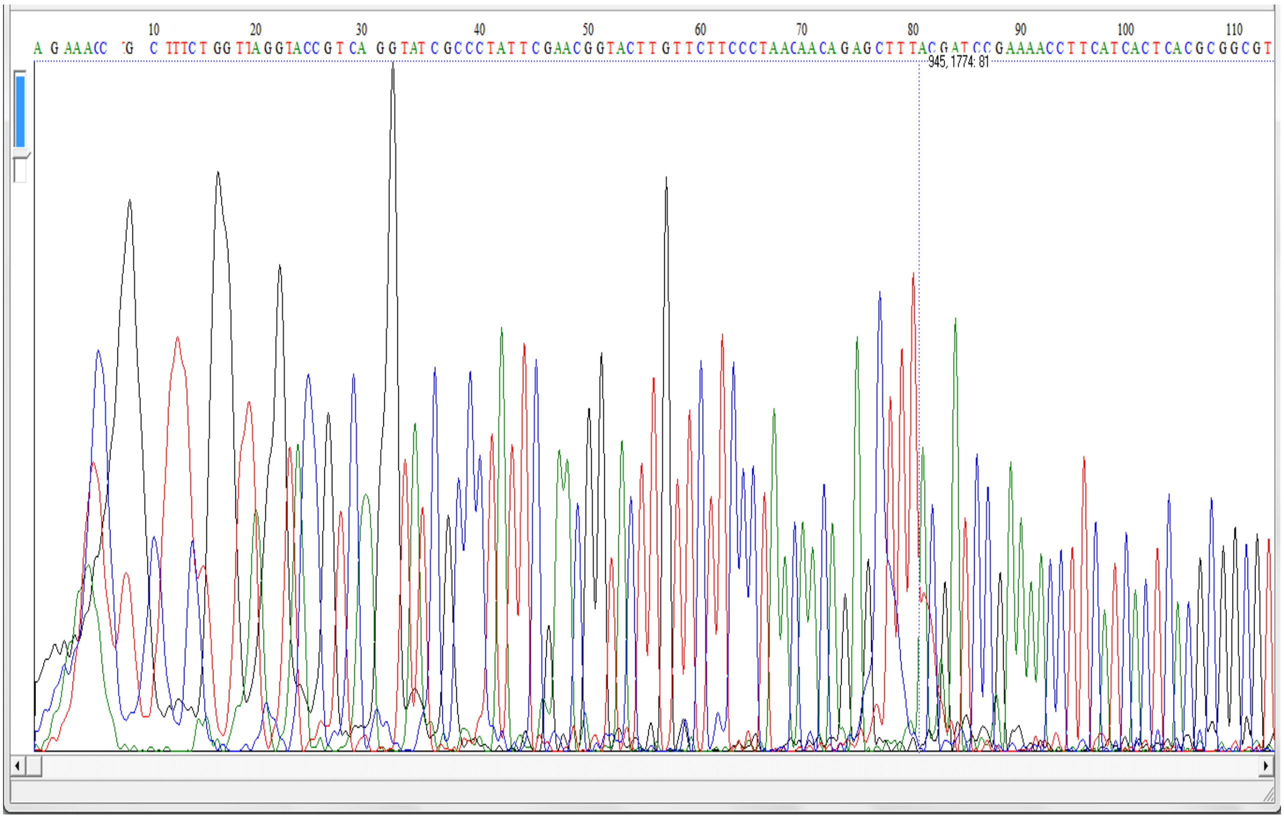

Fig. 5: DNA sequence-chromatogram

2. Fatty acid profiling

The soybean samples were then fermented with different starter culture strain S and strain H. As part of a programme to improve the fermentation process of different soybean using starter culture of different strain, this study was focused on fatty acid profiles, which would be useful as food compositional data. As shown in table 2, the fermentation by different starter cultures seemed to affect the fatty acid contents. Five fatty acids were identified in the fermented samples (palmitic, stearic, oleic, linoleic and α-linolenic acid). Interestingly, our data showed that starter culture strain H inoculation in soybean fermentation contributed to an increase in concentration of unsaturated fatty acids (oleic, linoleic and α-linolenic) in both the soybean variety.

Table 2: Fatty acid profiles of fermented soybean – *Hawaijar* using different starter culture strain

Fatty acid	Sample No. 1 (S)	Sample No. 2 (H)	Sample No. 3 (S)	Sample No. 4 (H)
Palmitic acid	11.24	9.90	13.82	12.20
Stearic acid	2.24	1.81	1.50	1.91
Oleic acid	14.06	13.31	20.61	20.77
Linoleic acid	67.33	69.21	58.20	58.32
α Linolenic acid	5.10	5.75	5.80	6.78

*The data shown are mean.

Where,
Sample 1= Local small variety fermented with starter culture (S)
Sample 2= Local small variety fermented with starter culture (H)
Sample 3= JS-335 variety fermented with starter culture (S)
Sample 4= JS-335 variety fermented with starter culture (H)

3. ACE inhibition assay

Angiotensin Converting Enzyme (ACE) converts angiotensin I to angiotensin II and inactivates bradykinin a potent vasodilator, thereby increasing the blood pressure and risk of cardiovascular disease. ACE inhibitory peptides derived from protein rich foods can be used for treating high blood pressure and hypertension. During soybean fermentation, the ACE inhibitory peptides are generated by proteolytic degradation of soybean protein fractions (glycinin and β-conglycinin). Fermentation of soybean with different micro-organisms improves the bio-functional properties due to the increase in free isoflavones and peptides (Fig. 6)

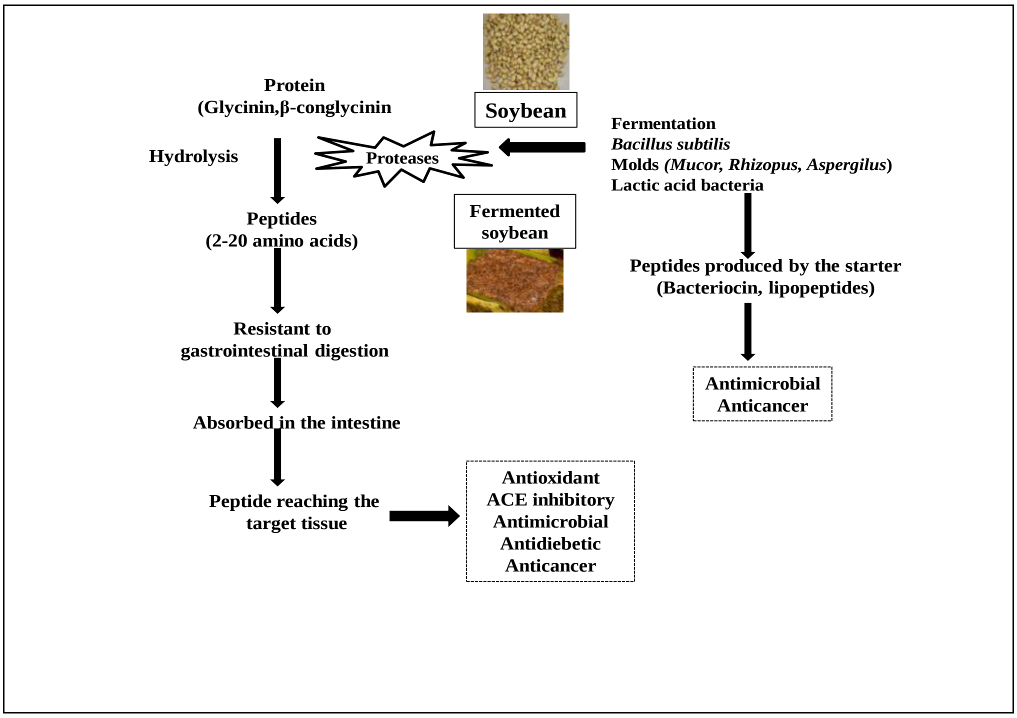

Fig. 6: Formation and biological activity of bioactive peptides in fermented soybean

ACE inhibitory activity was found to increase during fermentation and exhibited higher ACE inhibition percent in starter culture strain (H) than starter culture strain (S) of both the soybean used (local small variety and JS-335) as shown in the fig. 7.

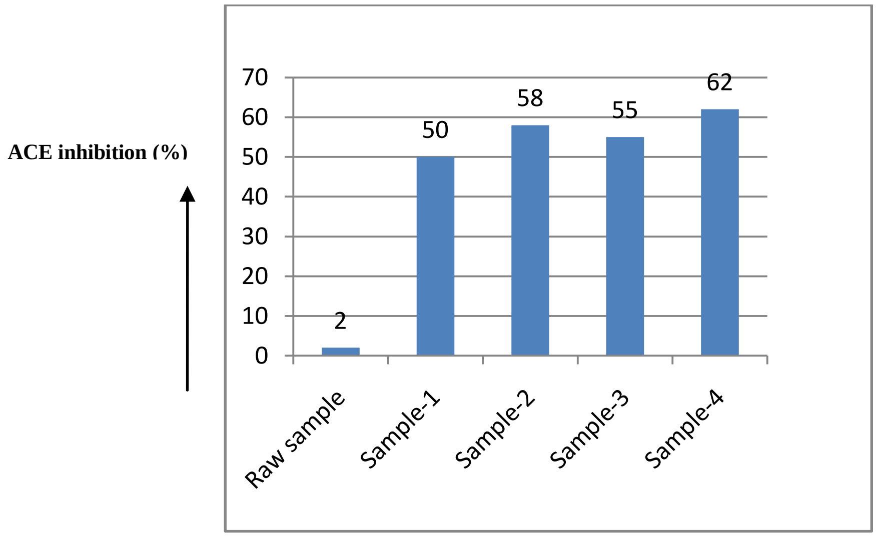

Fig. 7: ACE inhibitory effect of fermented soybean

Where,
Sample 1= Local small variety fermented with starter culture (S)
Sample 2= Local small variety fermented with starter culture (H)
Sample 3= JS-335 variety fermented with starter culture (S)
Sample 4= JS-335 variety fermented with starter culture (H)

Programme 2: Extraction of Poly-Glutamate (PGA) from fermented soybean

PGA is one of the functional properties of micro-organisms present in fermented soybean food. Poly-Glutamate **(**PGA) is produced by *Bacillus* spp. in many Asian fermented soybean products giving the characteristic of a sticky texture to the product. The stickiness is one of the best qualities of good fermented soybean-*hawaijar* preferred by the consumers, which is due to the production of poly-glutamic acid (PGA). PGA has several applications as foods as well as non-foods. Functional foods supplemented by a proper quantity of PGA may therefore serve as a therapeutic tool for osteoporosis treatment.

Biochemical analysis

Extraction of PGA by organic/ solvent

Weighed 100g of previously fermented soybean and then add 200ml of water and stirred gently to extract water soluble PGA. The solid part/seeds of fermented soybean is removed by sedimentation and decantation. To the remaining solution, double the amount of pre-cooled ethanol is added and kept in refrigeration for 3 hours. Centrifuge the solution at 6000 rpm for 6 min. and then supernatant is discarded. The pellet thus obtain is dried in hot air oven at 45^0C until its weight became constant in subsequent weighing.

Thin Layer Chromatography (TLC) assay

The extracted crude PGA (0.3g) was digested using 5ml of 6N HCl and keeping in water bath at 110^0C for 24 hours. The solution was spotted in the TLC plate (Merck). 1.0µl of glutamate solution was also spotted in the TLC plate as control. The mobile phase, solvent mixture of ethanol, acetic acid and water (3:1:1) was used during the experiment. The TLC was continued for 2hr 15min.

RESULT

Extraction of Poly-Glutamate (PGA) from fermented soybean using ethanol has been standardised keeping different temperature at constant pH. From the Table 3, the crude PGA production from fermented soybean increased with increase in temperature upto 45^0C and then decline steadily. In this study, it is evident that the maximum PGA yield of 2.3g/100g wet fermented soybean was recorded by treatment C_1V_1 at 45^0C followed by C_2V_1 with 2.2g/100g wet fermented soybean at constant pH 7.4 (Table 3 & Fig. 8).

Table 3: Production of crude PGA (g/100g) by solvent extraction at different temperature

Temperature	Crude PGA (g/100g)			
	C_1V_1	C_1V_2	C_2V_1	C_2V_2
30^0C	0.3	0.2	0.4	0.2
35^0C	0.5	0.4	0.5	0.5
40^0C	1.2	0.7	1.0	0.8
45^0C	2.3	1.3	2.2	1.5
50^0C	1.6	1.1	1.5	1.0

Where,
$C_1V_{1=}$ Local small variety with starter culture strain S
$C_1V_{2=}$ JS-335 variety with starter culture strain S
$C_2V_{1=}$ Local small variety with starter culture strain H
$C_2V_{2=}$ JS-335 variety with starter culture strain H

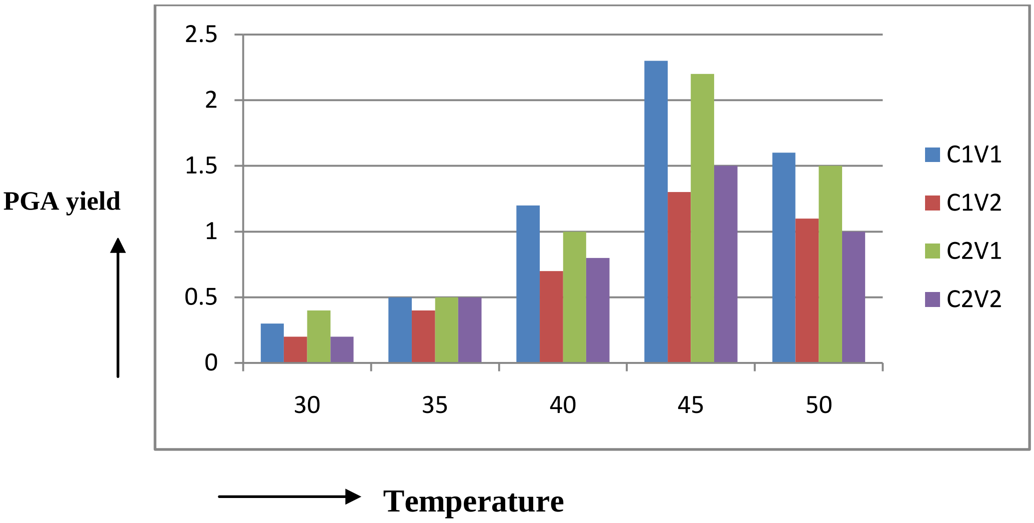

Fig 8: Production of crude PGA from fermented soybean at different temperature

Extraction of Poly-Glutamate (PGA) from fermented soybean using ethanol has been standardised keeping different pH at constant temperature. From the Table 4, the crude PGA production from fermented soybean increased with increase in pH upto 8 and then decline steadily. In this study, it is evident that the maximum PGA yield of 2.5g/100g was recorded by treatment C_1V_1 (Local small variety with strain S) at pH 8 followed by C_2V_1 (Local Small variety with strain H) with 2.3g/100g at constant temperature 42^0C (Table 4 and Fig. 9)

Table 4: Production of crude PGA (g/100g) from fermented soybean using different culture at different pH

pH	Crude PGA (g/100g)			
	C_1V_1	C_1V_2	C_2V_1	C_2V_2
5	0.4	0.3	0.3	0.2
6	0.8	0.7	0.8	0.7
7	1.7	1.3	1.5	1.1
8	2.5	2.2	2.3	2.2
9	2.0	1.9	2.0	1.9

Where,

$C_1V_{1=}$ Local small variety with starter culture strain S

$C_1V_{2=}$ JS-335 variety with starter culture strain S

$C_2V_{1=}$ Local small variety with starter culture strain H

$C_2V_{2=}$ JS-335 variety with starter culture strain H

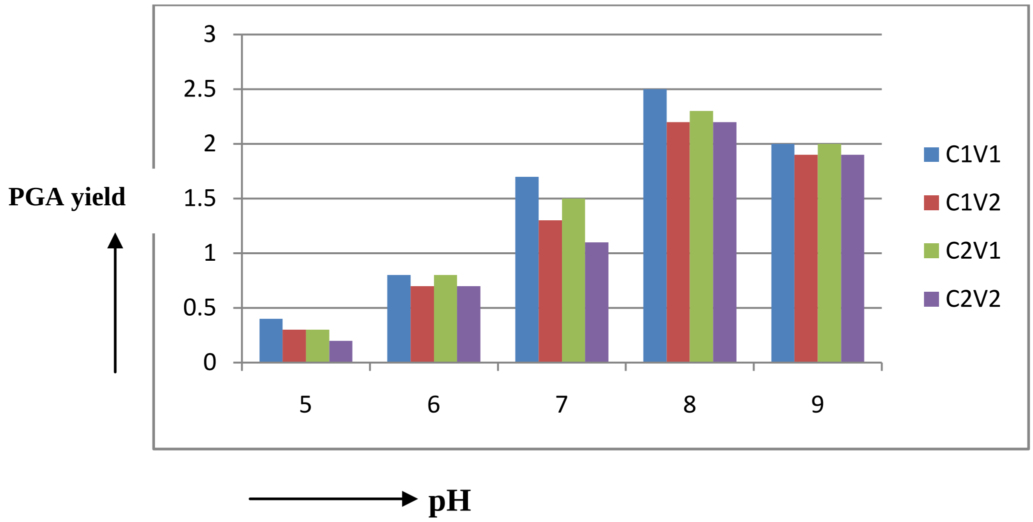

Fig 9: Production of crude PGA from fermented soybean at different pH

The production of PGA was confirmed qualitatively by hydrolysis of polymer and detection of the monomers by Thin Layer Chromatography (TLC), and thus can be concluded that the mucilaginous mass/ slimy texture in the fermented soybean-*hawaijar* was polymer of glutamate (Plate 3) and hence it is Poly-Glutamate (PGA). It is evident from this TLC plate that the extracted sample containing crude PGA has been broken down to glutamate (Plate 1). PGA has several applications as foods as well as non-foods.

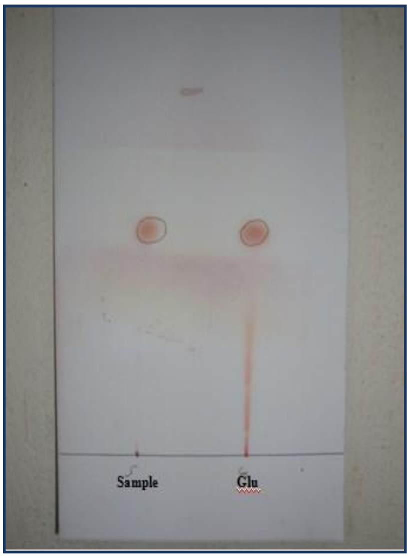

Plate 1: TLC plate showing the breakdown of PGA to glutamate

Programme 3: Formulation and development of soy okara cookies by blending with different levels of black scented rice flour

Cookies are widely consumed and generally, they are rich in carbohydrates, fats and calories, but low in fibre, vitamins and minerals. Okara, the pulpy by-product generated during the manufacturing process of soymilk and tofu, is a potentially nutritious product that is high in fiber, protein, carbohydrates, vitamins, minerals, and fat. In general, it is considered as a waste product and is either disposed off, thereby posing problem for the environment, or used as animal feed. After soymilk extraction, much of that fat, fibre and protein remains in okara. An important characteristics of okara flour is that it does not contain gluten. Okara proteins are of high quality, since all the essential amino acids are present, having the capacity to reduce triglycerides and cholesterol. A possible use for okara is in baked goods as it has a large amount of fiber and protein.

Currently, fortification of cookies has evolved to improve its nutritional and functional quality. This may be achieved through incorporation of protein-rich ingredients from soybean and wheat flour as a fortification of cookies. Black scented rice/ purple rice (*Oryza sativa* L.) contains much higher levels of antioxidants, vitamins and minerals such as iron and zinc compared to wheat. Black rice is an economically important rice species, so it is preferred for the preparation of snacks and desserts. In addition, it has many nutritional benefits as it contains more protein, vitamins and minerals than white rice. Considering the potential health benefits of black rice and okara powder/flour and the increasing consumption of healthy food, the objective of the present study was to prepare nutritious cookies to deliver a nutritious and healthy product and to study the effect of different combination of okara powder on the nutritional and sensory quality of the developed cookies.

The seed of JS-335 soybean variety were procured from Andro Research Farm, Central Agricultural University (CAU), Imphal. The seeds were cleaned manually, dried in sun and stored in plastic containers for further use. Wheat flour was procured from the local market. The flours were screened through a 0.25 mm sieve and stored at 4^0C in a refrigerator to prevent spoilage particularly rancidity until usage.

Preparation of Composite Flour

Composite flour is prepared by substituting the wheat flour with okara and black rice flour in the ratio of 10:10:80, 15:10:75, 20:10:70, 25:10:65 and 0:0:100 (control) of okara: black rice flour: wheat flour (Table 5). The method adopted in the preparation of okara fortified cookies is shown in Figure 10.

Table 5: Treatments of composite flour

Treatments		Okara powder (%)	Black rice flour (%)	Wheat Flour (%)
T1	**JS-335**	**10**	**10**	**80**
T2		**15**	**10**	**75**
T3		**20**	**10**	**70**
T4		**25**	**10**	**65**
T5	**Control**	**-**	**-**	**100**

Chemical analysis: The proximate composition (i.e., moisture, fat, protein) of okara fortified cookies samples/products were determined according to the standard analytical methods (AOAC 2000).

Determination of moisture

Moisture content was determined by drying a sample in an oven at 70^0C for 12 hr, the weight loss incurred was calculated as:

Moisture (%) =weight loss on drying/weight of the sample x 100

Determination of fat

Fat content was determined using the Soxhlet extraction method. In this method, fat was determined by extracting the dried materials (food samples) with a light petroleum fraction in a continuous extraction apparatus. The solvent was distilled off and the extract was dried and weighed.

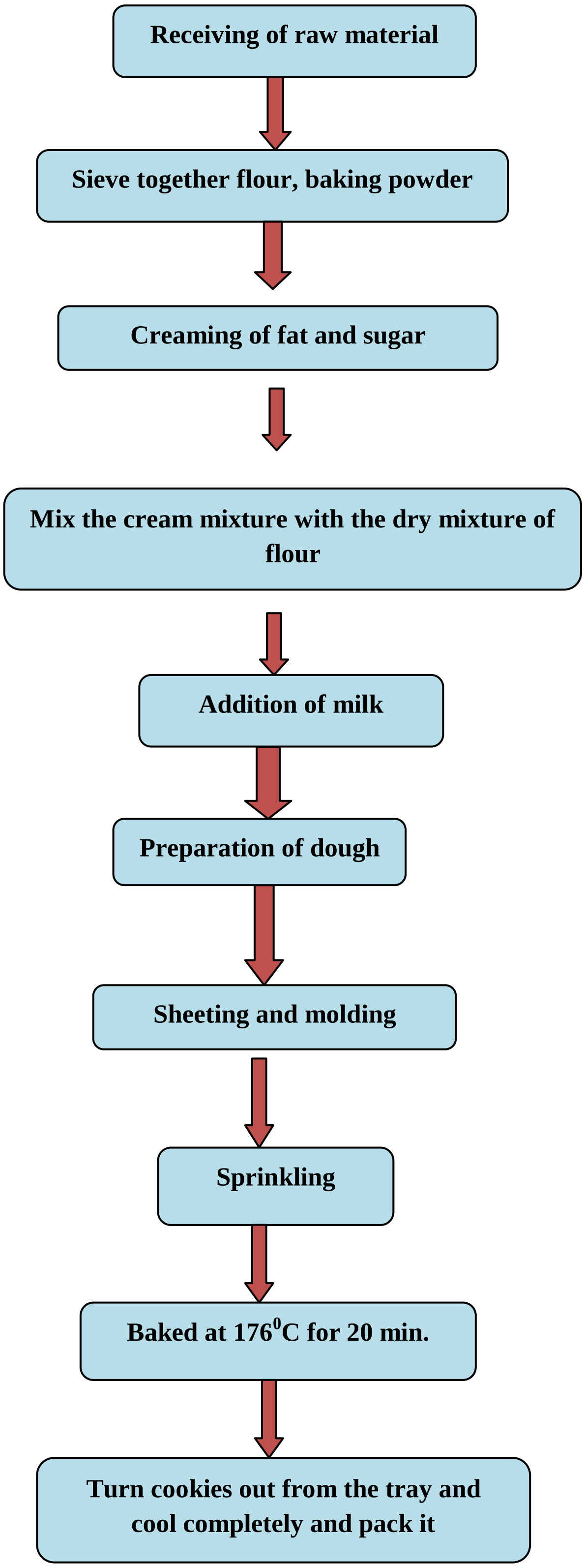

Figure 10: Flowchart for the preparation of okara fortified cookies

Determination of protein

Protein content of the samples was determined using the Kjeldahl method. The method consists of three basic steps: 1. Digestion of the sample in sulphuric acid with a catalyst, which results in conversion of nitrogen to ammonia; 2. Distillation of the ammonia into a trapping solution; and 3. Quantification of the ammonia by titration with a standard solution. According to this method, percentage of crude protein content of the samples = % nitrogen x 6.25

Sensory evaluation

The sensory evaluation of the products was done on the basis of 9-point hedonic scale scorecard. Each attribute was scored based on its intensity scaled on a 9-point hedonic scale (1= disliked extremely, 2=disliked very much, 3=disliked moderately, 4=disliked slightly, 5= neither liked or disliked, 6= liked slightly, 7= liked moderately, 8= liked very much, 9= liked extremely) for colour, taste, texture, flavour and overall acceptability.

Stability of cookies during storage

Cookies made with different levels of okara powder were stored for three month. These were evaluated every 30 days during storage of 3 months considering colour, taste, texture, flavour and overall acceptability.

Statistical analysis

Data on nutritional and sensory evaluation of biscuits were analysed statistically by Completely Randomized Design (CRD).

Results

The results for moisture, protein and fat are given in table 6. The moisture content was not significantly affected by the partial replacement of wheat flour with okara powder and black rice flour. The results revealed that the moisture content decreased from 5.70 to 3.97 % with the increase in okara powder. This may be due to the greater amount of total dry solids in okara powder with high emulsifying properties compared to wheat flour..

As expected, the protein content increased with the level of substitution of okara powder. The results of protein contents were shown in table 6, which revealed that there were high significant differences between the samples. Results showed that the protein content gradually increased from 5.15 % to 7.85 % with increased addition of okara powder. In general, treatment T_4 gave the highest protein content (7.85%) followed by treatment T_3 (6.80%) as compared with the control sample T_5 (3.26%). Appraisal of data in table 6 revealed that the replacement of wheat flour with okara powder and black rice flour caused an increase in fat content from 21.40% to 21.59%. There was no significant difference in the fat content of okara fortified cookies.

Table 6: Proximate composition of cookies prepared from different levels of okara powder, black rice and wheat flour.

Treatments	Parameters		
	Moisture (%)	Protein (%)	Fat (%)
T1	5.41	5.15	21.40
T2	5.02	5.67	21.42
T3	4.50	6.80	21.53
T4	3.97	7.85	21.59
T5	5.70	3.26	12.51
S.Ed (±)	0.80	0.26	0.56
C.D	1.79	0.59	1.25

Where,

T1= Okara powder: Black rice flour: Wheat flour (10:10:80)

T2= Okara powder: Black rice flour: Wheat flour (15:10:75)

T3= Okara powder: Black rice flour: Wheat flour (20:10:70)
T4= Okara powder: Black rice flour: Wheat flour (25:10:65)
T5= Control (0:0:100)

Plate 2: Cookies prepared with different levels of okara powder, black rice and wheat flour

Sensory evaluation

According to the total sensory scores, the samples exhibited great acceptable sensory characteristics among consumer panel members as shown in table 7 and fig. 11. The overall acceptability scores for treatment T_1, T_2, T_3 and T_4 remains the same. So fortification of cookies can be done by replacing wheat flour with okara powder upto 10-25%.

Table 7: Average score for sensory evaluation of cookies from different levels of okara powder, black scented rice and wheat flour

Treatments	Parameters				
	Colour	Taste	Texture	Flavour	Overall acceptability
T1	6.75	7.00	6.60	7.75	7.40
T2	7.25	6.50	6.90	7.50	7.40
T3	6.88	7.80	7.30	7.75	7.40
T4	7.50	7.10	7.40	7.88	7.40
T5	7.11	7.11	7.00	7.82	7.07
S.Ed(±)	0.29	0.51	0.34	2.35	0.43
CD	0.65	1.14	0.77	5.24	0.97

Where,
T1= Okara powder: Black rice flour: Wheat flour (10:10:80)
T2= Okara powder: Black rice flour: Wheat flour (15:10:75)
T3= Okara powder: Black rice flour: Wheat flour (20:10:70)
T4= Okara powder: Black rice flour: Wheat flour (25:10:65)

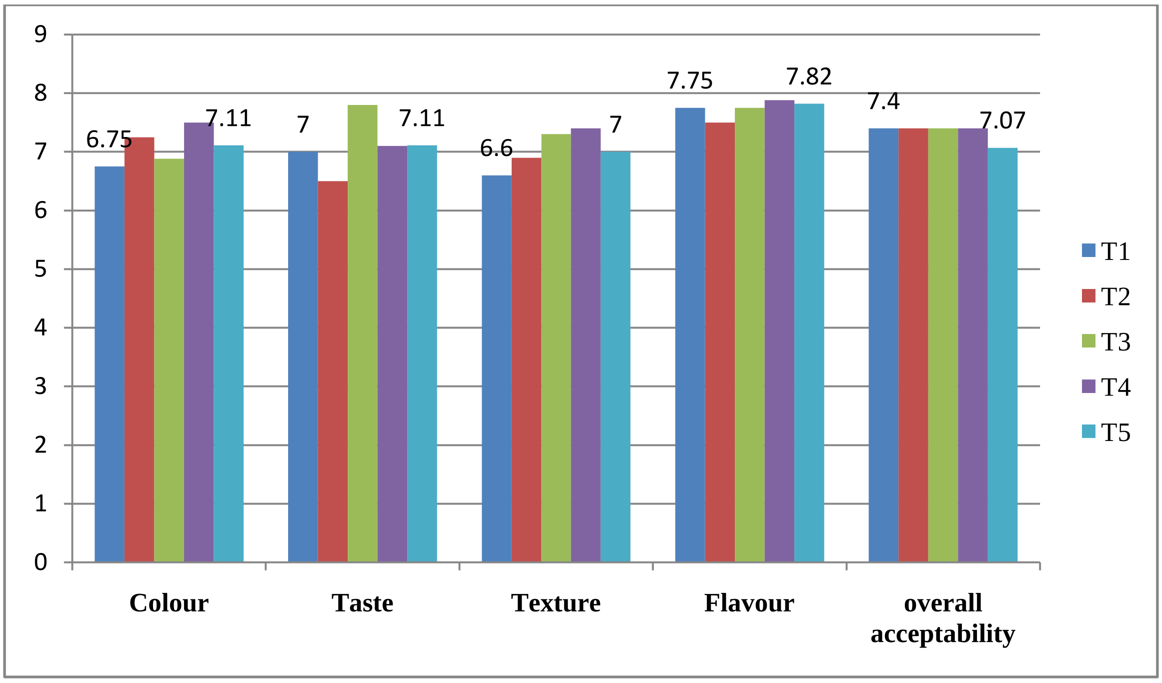

Fig 11: Diagrammatic representation of sensory analysis of different cookies formulations

Stability of cookies during storage

The direct method to access the acceptability of cookies is through sensory evaluation. The evaluation of sensory storage stability of cookies showed that there were no differences in the results. As shown in fig. 12 , the overall score for all attributes falls within a range of average between 5.8 to 6.8 which means that cookies throughout the storage time were graded with the level of "like slightly". The results obtained show that it is possible to develop cookies with improved functional characteristics using soybean okara powder and black scented rice flour with good storage stability depending on the type of packaging used (Plate 3).

Plate 3: Cookies packed in plastic container during storage period of three months

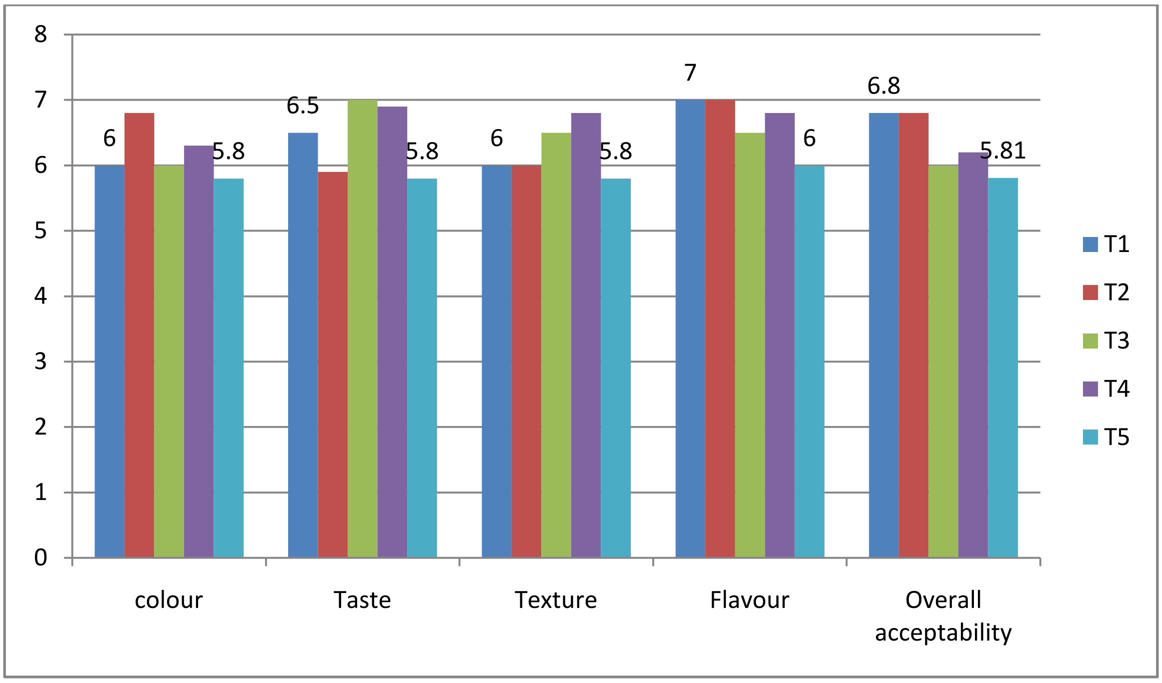

Fig. 12: Diagrammatic representation of sensory evaluation after three month storage period

CONCLUSION

The fermented soybean have been presented with galore of health promoting factors and other industrial applications other than a traditional food. Thus soybean has a great potential as a source of important nutrients and nutraceutical of implication to human health. Fermentation not only reduces the toxins but also it is an excellent processing method for improving nutritional and functional properties of soybeans due to the increased content of small bioactive compounds. The NEH region of India also has similar traditional fermented soy products. With further research and development and management efforts fermented soybean of NEH region could be exploited for the ever expanding nutraceutical and functional food industries. Furthermore, it is possible to develop cookies with improved functional characteristics by replacing wheat flour with soy okara powder (10-25%) and black scented rice flour with good storage stability depending on the type of packaging used . Finally the nutritional value of the cookies increases without affecting the sensory attributes.

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Appendices

Appendix-I

RECOMMENDATIONS OF 48TH ANNUAL GROUP MEETING (March 15-17, 2018) AND ACTION TAKEN REPORT

S. No.	Recommendations	Action Taken
1.	A separate trial on evaluation of vegetable soybean should be initiated in all the zones.	A separate trial was conducted for evaluation of vegetable soybean in NHZ, CZ and SZ. Number of centres in other zones were less than 3 so trial was not constituted for other zones.
2.	New Zonal notified variety should be included as check in Plant Breeding trials.	In NPZ PS24 and SL 958; In EZ RSC 10-46; in CZ JS 20-98 and in SZ DSb 23 were added as newly notified checks.
3.	MAGIC population should be developed in National Hybridization Programme.	F1s have been generated at Indore, Pantnagar, Ludhiana, Jabalpur, Pune, Dharwad and further crossing programme would be taken up.
4.	Entries with special traits should be given advantage of 5% (in grain yield) from the best check for promotion.	Noted for compliance.
5.	Essentially derived varieties should be included in AVT-I directly.	MACSNRC 1667 an EDV of MACS 450 for null KTI has been entered in AVTI of SZ. Developer of NRCSL2, an EDV of JS 335 for YMV resistance, has preferred to enter the material in IVT.
6.	Shuttle breeding should be initiated in NHP.	Noted and efforts initiated.
7.	Off-season nursery at GKVK Bangaluru should be strictly used for generation advancement.	IISR is coordinating in generation advancement and extra contingency of Rs. 2.00 lakhs has been provided to the center.
8.	Checks should also be coded and field layout to be provided by IISR.	All the zonal checks were coded and field layout was provided by IISR for maintaining uniformity.
9.	Pune and Palampur centers should multiply germplasm accessions (500 lines each) in addition to Multilocation Germplasm trial.	Pune and Palampur centres have multiplied 1100 germplasm lines and seed from Pune Centre has been received at IISR, Indore.
10.	Almora center should be included in Multilocation Germplasm trial for FLS screening.	Almora centre could not take up multilocation germplasm trial for FLS.
11.	Yield of entries dying in NPZ and CZ from YMV and charcoal rot should be treated as zero in zonal average calculation.	Out of 34 entries in IVT 14 entries succumbed to YMV disease in Ludhiana and Delhi and 7 entries died due to Charcoal rot in Jabalpur. Zero mean at these centres was taken for zonal mean calculation of these entries.
12.	Seed for IVT entry should reach IISR, Indore by 10th May 2018.	Most of the centres did not comply with this recommendation.

Appendix–II

Multi-location Germplasm Evaluation

With the purpose of identification of superior germplasm lines for yield and associated traits and their subsequent integration in breeding programmes across AICRP on Soybean centres to broaden the genetic base of coming soybean varieties, a multi-location evaluation trial of 125 germplasm lines was conducted across 8 locations representing all the zones of AICRP *viz* Palampur (NHZ), Pantnagar (NPZ), Imphal (North Eastern Hill Zone), Raipur (EZ), Indore, Jabalpur and Parbhani (CZ) and Pune (SZ) for 9 morphological traits (Days to flower (DF), Days to maturity (DM), Plant Height (PH in cm), Branches / plant, Pods / plant, 100 seed weight (100 SW in g), Plot yield (gm) and seed yield / plant (gm) as per the programme given below.

DESIGN	:	Augmented Design
PLOT SIZE	:	Single row, 3m long
REPLICATION	:	Nil
LOCATIONS (7)	:	Palampur, Pantnagar, Imphal, Jabalpur, Raipur, Indore, Parbhani and Pune
ENTRIES	:	125
Zonal Checks		
• Palampur	:	VLS 59, VLS 63, PS 1556, Harasoya, Himso 1685
• Pantnagar	:	SL958, PS 24, PS 1347
• Imphal	:	RKS 113, RSC 10-46, KDS 753, MACS 1460, RVS 2010-1
• Raipur	:	-
• Jabalpur	:	NRC 86, JS 20-29, JS 20-69, JS 20-98, JS 20-34
• Indore		NRC 86, JS 20-29, JS 20-69, JS 20-98, JS 20-34
• Parbhani	:	NRC 86, JS 20-29, JS 20-69, JS 20-98, JS 20-34
• Pune	:	MACS 1460, DSb 21, DSb 23, KDS 753, MACS 1188

Mean performance and descriptive statistics of 125 germplasm lines over 8 locations along with the performance of checks is given in Tables 1-16. Box plots for 9 morphological traits (Days to flower (DF), Days to maturity (DM), Plant Height (PH in cm), Branches / plant, Pods / plant, 100 seed weight (100 SW in g), Plot yield (gm) and seed yield / plant (gm) showing distribution of entries in different centres are depicted in Fig 1-3.

Table 1: Evaluation of Germplasm at Multi-location- Pune

S.No	Genotype	Days to 50% Flowering	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
1	VI 1199	42.00	106.00	61.20	12.40	20.20	47.40	-	6.58	11.90
2	VI 1206-9	49.00	102.00	87.80	11.60	18.20	50.40	-	7.18	15.20
3	EC 389153	54.00	89.00	90.60	15.60	34.80	100.00	-	9.64	9.50
4	EC 389154B	42.00	106.00	86.80	13.60	29.60	85.00	-	18.80	12.10
5	EC 389154C	42.00	106.00	36.60	10.60	21.80	67.20	-	14.82	14.60
6	EC 389164	49.00	106.00	77.40	10.80	28.20	52.00	-	9.00	12.20
7	EC 389170	49.00	108.00	59.00	10.40	15.00	33.40	-	4.64	9.30
8	EC 389179B	44.00	108.00	53.60	11.40	18.00	54.00	-	11.84	14.00
9	EC 390981A	44.00	108.00	73.80	14.20	32.80	87.40	-	22.43	10.40
10	EC 390981 B	50.00	108.00	69.20	12.40	20.80	59.40	-	16.08	14.20
11	EC 391164	47.00	94.00	38.60	9.20	19.40	59.00	-	11.86	15.70
12	EC 391181	49.00	108.00	74.60	15.80	42.20	124.60	-	24.68	13.30
13	EC 393222	56.00	102.00	96.00	19.00	29.60	72.80	-	16.00	13.30
14	EC 391316	44.00	108.00	61.80	11.00	21.20	57.40	-	9.86	13.90
15	EC 391332	44.00	102.00	64.80	12.00	17.80	56.40	-	12.48	14.30
16	EC 391346	44.00	104.00	55.20	11.60	18.60	56.60	-	15.34	15.20
17	EC 396055	49.00	104.00	78.60	12.40	25.00	65.20	-	11.50	11.60
18	EC 396057	44.00	102.00	74.40	12.80	20.20	57.20	-	10.22	12.80
19	EC 396059	42.00	108.00	71.40	10.80	18.80	57.40	-	12.34	13.90
20	EC 396065	42.00	102.00	62.60	12.00	29.00	87.00	-	16.46	13.80
21	EC389173	49.00	102.00	59.60	12.60	27.60	72.20	-	15.10	15.60
22	EC 389166	44.00	102.00	60.20	13.00	30.80	95.20	-	21.66	13.90
23	EC 393224	52.00	102.00	65.20	11.00	30.40	72.40	-	15.60	13.10
24	EC 393228	50.00	89.00	76.40	13.20	26.80	65.00	-	13.86	12.70
25	EC 393231	49.00	102.00	65.80	10.60	15.80	45.40	-	8.40	12.80
26	G 2258	42.00	99.00	57.00	12.40	16.80	44.40	-	7.92	13.30

27	G 2263	49.00	104.00	88.80	14.60	28.60	77.80	-	17.30	15.90
28	DCB 137	42.00	102.00	49.80	10.60	16.40	54.60	-	9.70	14.50
29	EC 457214	41.00	102.00	28.80	10.40	24.80	82.60	-	17.36	14.00
30	DE 201	42.00	108.00	53.60	11.60	22.60	57.80	-	12.36	14.30
31	DN 290	44.00	102.00	51.60	11.80	25.20	71.00	-	18.12	15.20
32	AGS 12	41.00	108.00	33.80	8.80	13.60	36.80	-	11.08	14.70
33	DS 201	41.00	104.00	37.60	10.40	18.80	51.80	-	12.60	13.50
34	EC 100778	49.00	102.00	53.00	12.20	23.40	54.00	-	16.98	11.50
35	EC 103336	42.00	85.00	61.20	12.40	21.80	69.60	-	16.06	14.80
36	EC 106998	49.00	108.00	61.80	11.60	20.00	52.20	-	12.16	16.00
37	EC 107407	49.00	89.00	53.00	12.00	21.40	62.60	-	13.74	14.70
38	EC 709540	52.00	108.00	60.80	12.80	27.20	89.60	-	18.00	14.60
39	EC 109543	44.00	104.00	48.60	12.20	24.80	76.60	-	14.74	14.10
40	EC 113778	44.00	89.00	45.60	10.20	24.20	73.80	-	17.36	15.40
41	EC 114572	44.00	102.00	62.40	12.40	17.60	59.40	-	13.30	15.00
42	EC 16213	42.00	108.00	31.00	6.40	13.20	39.20	-	9.48	14.10
43	EC 172613	44.00	108.00	58.60	12.20	24.20	60.40	-	15.46	14.20
44	EC 172663	44.00	108.00	56.20	11.40	21.40	65.00	-	13.54	14.60
45	EC 173325	36.00	108.00	27.40	7.80	17.00	40.20	-	12.10	17.80
46	EC 241708	44.00	102.00	47.20	10.00	20.40	62.20	-	16.24	14.30
47	EC 241709	44.00	102.00	70.80	12.00	19.80	64.20	-	12.82	14.10
48	EC 393237	49.00	94.00	39.60	9.00	21.40	68.80	-	16.90	17.30
49	EC 242072	42.00	104.00	40.60	10.80	23.80	67.40	-	13.06	13.80
50	EC 242105	49.00	104.00	75.20	16.40	34.20	74.80	-	15.36	12.20
51	EC 242111	42.00	102.00	61.00	12.60	27.00	70.00	-	14.72	15.00
52	EC 250586	44.00	108.00	51.40	12.40	26.80	67.40	-	15.92	13.90
53	AGS 163	36.00	102.00	26.40	8.00	16.00	45.40	-	10.86	13.10
54	AGS 164	44.00	102.00	44.20	8.00	12.40	40.60	-	10.68	13.80
55	EC 251501	44.00	102.00	54.40	11.40	20.20	57.20	-	10.86	14.00
56	AGS 174	44.00	102.00	67.60	12.20	18.80	55.40	-	13.96	13.90
57	EC 251876	44.00	94.00	57.80	12.20	23.20	75.40	-	17.30	14.70

58	EC 280149	49.00	94.00	52.20	9.80	18.60	48.00	-	13.90	14.20
59	EC 248769	58.00	92.00	64.40	10.60	24.20	62.60	-	18.92	15.60
60	EC 289099	49.00	92.00	64.80	13.20	30.40	84.80	-	20.00	14.20
61	AGS 186A	49.00	104.00	60.80	12.00	20.20	65.20	-	14.90	13.20
62	EC 291397	36.00	102.00	61.60	13.20	19.60	59.40	-	15.48	16.00
63	EC 291398	44.00	94.00	66.00	11.00	23.40	69.00	-	15.74	14.60
64	EC 291403	42.00	102.00	35.60	7.60	11.80	32.60	-	7.28	13.00
65	EC 291451	44.00	96.00	67.40	12.20	17.60	61.00	-	15.38	15.90
66	EC 291453	49.00	95.00	75.00	13.00	21.60	58.00	-	10.32	11.50
67	EC 309537	49.00	95.00	67.60	10.80	13.60	32.40	-	6.74	14.20
68	EC 30967A	44.00	102.00	63.00	11.40	19.40	54.60	-	10.34	14.20
69	EC 313974	49.00	95.00	66.60	12.60	22.20	48.80	-	8.30	11.70
70	EC 325103	42.00	87.00	47.00	9.40	9.60	31.00	-	8.42	16.00
71	EC 325113	49.00	97.00	80.00	13.20	23.80	77.00	-	15.92	11.90
72	EC 338721B	44.00	104.00	58.60	11.20	15.60	44.20	-	9.80	15.10
73	EC 333929	42.00	102.00	68.00	12.00	16.00	51.00	-	12.54	13.50
74	EC 39044	49.00	102.00	60.80	10.00	18.60	52.60	-	12.68	15.90
75	EC 39107	42.00	102.00	45.00	8.20	12.00	31.80	-	9.04	15.10
76	EC 39177	41.00	106.00	35.00	8.00	11.00	31.20	-	5.52	12.80
77	EC 39513	44.00	102.00	44.80	9.20	16.20	55.60	-	14.98	14.50
78	EC 39743	49.00	104.00	87.00	12.80	19.60	49.80	-	5.52	13.50
79	EC 76759	49.00	104.00	69.00	9.80	14.20	27.60	-	4.86	11.90
80	EPS1B	38.00	106.00	40.60	10.60	20.20	48.40	-	10.58	11.60
81	FASSY COOK	41.00	102.00	28.80	9.40	15.00	37.80	-	9.44	15.10
82	G 47	49.00	89.00	38.80	10.40	23.20	68.40	-	15.86	14.90
83	G2	36.00	102.00	26.00	7.40	14.80	38.20	-	9.32	17.20
84	GP 4	58.00	102.00	65.20	11.60	19.00	45.80	-	9.02	14.80
85	GP 7	49.00	106.00	79.60	11.00	14.20	29.60	-	5.86	11.60
86	GPC 34 A	49.00	87.00	81.20	11.40	19.00	46.80	-	7.92	14.90
87	EC 33940	42.00	94.00	52.40	10.80	15.60	43.40	-	8.38	15.80
88	GO 3465	52.00	108.00	72.60	12.00	18.40	45.80	-	7.78	11.70

89	G 10525	58.00	108.00	91.20	14.20	32.00	98.60	-	10.96	9.90
90	G 2225	52.00	102.00	102.00	16.00	21.80	53.60	-	9.66	12.20
91	G 288	49.00	108.00	65.80	10.80	13.80	39.60	-	8.90	16.10
92	G4 P15	42.00	94.00	44.20	9.80	10.20	34.00	-	9.22	13.40
93	GP 465	42.00	99.00	59.80	11.20	12.80	46.00	-	10.26	15.10
94	H2P2	42.00	102.00	41.00	9.20	12.60	32.60	-	10.32	15.10
95	JSM 227	44.00	97.00	50.60	10.60	13.20	41.40	-	9.94	14.30
96	K 53	44.00	87.00	31.60	8.00	17.80	43.00	-	12.16	16.80
97	KB 17	44.00	87.00	47.40	11.80	24.00	71.20	-	15.04	14.70
98	KDS 256	42.00	108.00	31.20	8.80	16.20	53.80	-	10.44	11.30
99	LEE 54	44.00	106.00	45.80	10.80	20.20	58.60	-	12.40	15.60
100	SL (E) 1	44.00	106.00	39.20	8.80	16.60	56.20	-	13.80	17.10
101	SQL 37	42.00	106.00	36.00	8.20	12.60	38.20	-	11.02	15.10
102	WT 88	42.00	91.00	34.00	7.80	12.40	34.80	-	7.76	15.90
103	EC 528675	52.00	108.00	44.80	12.00	22.40	60.20	-	7.44	9.90
104	EC 528640	44.00	99.00	48.60	10.00	12.60	33.00	-	6.38	14.40
105	EC 538830	44.00	106.00	58.40	11.60	19.40	46.20	-	8.14	14.50
106	EC 468597	50.00	108.00	51.80	11.60	25.60	72.80	-	12.00	14.30
107	EC 572160	44.00	84.00	55.40	12.20	24.60	76.60	-	14.74	15.00
108	EC 590225	49.00	84.00	70.20	15.00	28.40	100.00	-	20.90	12.20
109	PI 204336	49.00	94.00	24.80	8.80	17.00	47.60	-	8.42	12.80
110	PI 210178	49.00	106.00	49.00	9.00	20.00	37.00	-	3.56	7.50
111	TG X 1488-9-ID	52.00	102.00	83.00	15.00	32.60	99.60	-	20.36	14.10
112	TG X 293-71E	51.00	91.00	54.00	10.20	13.80	43.60	-	10.66	13.80
113	TG X 702-4-8	49.00	94.00	78.20	14.20	37.00	89.80	-	22.78	11.20
114	TG X 849-813	49.00	89.00	46.00	11.20	14.40	37.80	-	9.38	15.60
115	TG X 849-813	52.00	104.00	70.60	13.20	19.80	65.80	-	9.38	13.80
116	TG X 849-13-4	58.00	108.00	81.80	13.40	19.80	125.20	-	11.88	9.90
117	VLS 11	45.00	108.00	76.80	11.80	21.60	53.60	-	8.86	10.80
118	EC 23001 B	42.00	102.00	60.20	14.60	21.40	70.60	-	15.98	14.50
119	EC 350664	42.00	97.00	33.60	9.40	18.80	52.80	-	13.14	13.50

120	377883 B	42.00	102.00	56.00	12.60	24.00	77.60	-	20.68	17.80
121	GC 84051-32-1	52.00	102.00	59.80	12.60	26.00	75.60	-	15.88	15.50
122	VP 1147 A	52.00	104.00	71.60	12.80	35.60	119.60	-	27.94	16.90
123	JS 20-37	45.00	106.00	59.00	9.40	13.20	52.00	-	11.94	13.90
124	JS 20-86	44.00	106.00	56.00	8.40	13.40	47.80	-	10.30	13.60
125	JS 20-50	42.00	106.00	60.00	9.60	15.80	54.40	-	14.82	14.70

Table 2: Descriptive Statistics for Multi-location Germplasm Evaluation at Pune

	Days to 50% Flowering	***Days to Maturity***	***Plant Height (cm)***	***No. of Nodes per Plant***	***No. of Pod Clusters per Plant***	***No. of Pods per Plant***	***Row yield***	***Seed Yield per Plant (gm)***	***100 Seed weight (gm)***
Mean	45.86	100.99	58.02	11.36	20.73	59.37	-	12.66	13.92
Minimum	36.00	84.00	24.80	6.40	9.60	27.60	-	3.56	7.50
Maximum	58.00	108.00	102.00	19.00	42.20	125.20	-	27.94	17.80
CV (%)	9.95	6.40	28.60	18.17	29.98	32.99	-	34.73	13.02
MACS 1460 (CK)	41.80	100.20	53.04	8.88	13.44	45.68	-	12.41	14.16
KDS 753 (CK)	42.80	100.00	52.72	10.56	17.80	48.40	-	15.26	17.12
Dsb 23 (CK)	42.40	93.20	46.20	10.52	21.56	56.04	-	14.16	14.56
Dsb 21 (CK)	44.60	97.00	63.40	11.68	22.52	68.40	-	16.66	13.86
MACS 1188 (CK)	48.20	101.00	48.44	10.56	19.56	54.60	-	15.92	16.60

Table 3: Evaluation of Germplasm at Multi-location- Imphal

S.No	Genotype	Days to 50% Flower-ing	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
1	VP 1199	51.00	99.00	54.80	10.20	24.60	40.40	62.70	3.73	6.34
2	VP 1206-9	58.00	102.00	81.40	12.60	14.10	30.60	93.07	3.28	8.58
3	EC 389153	59.00	105.00	73.20	14.00	21.40	38.40	84.50	2.53	6.11
4	EC 389154 B	55.00	107.00	55.20	12.40	26.20	44.40	53.00	11.22	9.41
5	EC 389154 C	47.00	103.00	50.20	14.60	21.00	42.40	11.21	1.86	6.60
6	EC 389164	58.00	103.00	51.80	11.80	15.20	55.00	90.86	2.90	6.30
7	EC 389170	56.00	97.00	44.20	15.60	27.20	52.20	8.03	1.70	4.25
8	EC 389179 B	58.00	101.00	43.00	12.40	19.80	42.20	20.73	2.32	6.86
9	EC 390981 A	59.00	110.00	65.60	12.00	27.40	58.80	108.26	7.57	6.36
10	EC 390981 B	56.00	101.00	55.00	15.00	13.20	24.00	6.56	1.43	4.65
11	EC 391164	57.00	102.00	46.80	10.60	10.60	25.80	13.44	5.00	8.38
12	EC 391181	55.00	105.00	44.40	10.40	13.60	43.60	12.60	2.52	6.30
13	EC 393222	63.00	111.00	52.20	14.00	20.40	54.60	121.16	3.52	5.16
14	EC 391316	56.00	99.00	54.40	16.00	23.40	60.60	63.25	3.24	8.14
15	EC 391332	52.00	99.00	53.00	15.40	25.60	77.60	75.21	4.01	8.15
16	EC 391346	51.00	96.00	59.20	14.20	20.80	54.00	111.86	2.00	7.60
17	EC 396055	58.00	111.00	69.00	14.80	22.00	64.80	99.76	3.12	6.26
18	EC 396057	56.00	97.00	61.00	13.00	22.00	61.20	63.96	2.90	7.78
19	EC 396059	52.00	98.00	59.00	13.80	19.80	66.80	91.35	4.80	8.25
20	EC 396065	50.00	99.00	54.80	11.40	24.60	36.80	44.30	2.03	6.91
21	EC 389173	57.00	103.00	43.80	12.00	21.60	59.00	82.50	3.05	6.70
22	EC 389166	51.00	104.00	43.60	15.00	24.60	59.80	24.74	3.05	6.36
23	EC 393224	58.00	105.00	24.20	11.00	33.30	80.30	88.00	5.54	6.40
24	EC 393228	54.00	107.00	52.40	12.80	27.80	50.80	67.99	6.48	7.76
25	EC 393231	58.00	95.00	50.40	13.40	28.40	67.40	45.53	3.48	6.87

26	G 2258	57.00	96.00	52.00	13.40	27.20	56.00	34.27	2.61	7.82
27	G 2263	58.00	104.00	75.00	12.80	16.40	30.00	81.12	2.33	8.44
28	DCB 137	55.00	96.00	55.40	13.40	17.00	44.80	48.09	2.80	6.47
29	EC 457214	52.00	93.00	61.00	15.40	20.00	66.60	87.82	5.45	6.90
30	DE 201	55.00	98.00	56.80	10.20	21.80	42.80	81.51	3.76	6.72
31	DN 290	57.00	94.00	52.20	13.80	17.00	40.20	62.55	2.10	7.56
32	AGS 12	49.00	93.00	58.40	12.00	13.60	34.60	135.32	3.04	8.44
33	DS 201	49.00	102.00	55.60	12.00	24.80	55.00	108.60	3.50	6.98
34	EC 100778	55.00	100.00	53.40	14.40	13.80	32.00	47.30	1.72	5.27
35	EC 103336	55.00	96.00	56.00	14.00	15.60	52.00	98.79	3.37	9.28
36	EC 106998	57.00	96.00	52.40	16.00	35.80	102.40	26.19	6.84	7.86
37	EC 107407	54.00	99.00	62.60	14.00	27.60	72.80	83.63	4.33	8.85
38	EC 109540	56.00	95.00	59.40	15.80	21.20	54.20	71.83	2.60	8.39
39	EC 109543	58.00	96.00	56.00	13.80	26.00	67.40	115.13	4.89	7.84
40	EC 113778	51.00	97.00	57.80	15.00	30.40	75.80	82.35	6.97	7.37
41	EC 114572	45.00	99.00	66.60	14.40	24.40	57.00	55.60	3.23	8.18
42	EC 16213	56.00	100.00	28.60	9.00	18.80	59.80	39.94	3.23	8.10
43	EC 172613	55.00	100.00	53.00	12.80	34.20	81.20	68.51	5.60	8.70
44	EC 172663	57.00	99.00	50.00	12.40	24.80	62.00	71.41	3.86	9.14
45	EC 173325	53.00	79.00	45.40	9.60	22.20	47.20	182.68	7.55	11.62
46	EC 241708	54.00	104.00	64.40	16.60	26.20	64.80	46.19	6.02	9.50
47	EC 241709	58.00	104.00	54.80	13.60	23.00	62.40	86.81	4.80	9.93
48	EC 393237	55.00	107.00	39.60	10.80	18.80	60.40	58.74	4.39	11.64
49	EC 242072	52.00	105.00	66.00	15.80	28.60	81.80	131.07	7.91	10.02
50	EC 242105	57.00	103.00	74.80	14.00	38.40	71.20	105.94	6.72	7.88
51	EC 242111	57.00	106.00	63.20	15.60	33.00	85.40	131.27	7.70	9.87
52	EC 250586	59.00	104.00	62.80	14.00	31.00	94.80	113.69	11.33	11.05
53	AGS 163	46.00	97.00	41.40	8.40	16.00	41.40	61.51	4.53	7.97
54	AGS 164	59.00	105.00	74.40	16.20	23.80	73.00	172.16	9.88	11.07
55	EC 251501	59.00	107.00	71.20	13.00	24.80	69.60	33.36	5.51	8.62
56	AGS 174	51.00	102.00	72.40	13.00	23.20	87.00	174.20	11.01	11.52

57	EC 251876	50.00	100.00	71.60	17.20	26.00	70.60	216.00	9.60	11.71
58	EC 280149	56.00	102.00	76.20	13.40	22.20	59.80	148.52	7.01	10.01
59	EC 2487469	62.00	104.00	82.80	12.60	14.40	34.20	27.80	5.92	13.31
60	EC 289099	58.00	106.00	65.20	12.60	27.00	93.20	60.64	8.07	10.24
61	AGS 186 A	58.00	96.00	60.60	16.00	27.20	63.60	112.58	6.07	9.82
62	EC 291397	58.00	96.00	51.80	11.40	19.60	52.80	93.73	6.24	10.39
63	EC 291398	56.00	100.00	60.40	15.20	29.80	70.20	67.40	6.01	10.33
64	EC 291403	56.00	100.00	56.80	9.00	18.80	52.60	73.01	3.88	9.46
65	EC 291451	58.00	107.00	56.00	12.60	23.80	47.80	70.41	2.41	8.03
66	EC 291453	61.00	106.00	59.40	13.40	15.00	23.40	96.44	2.51	5.41
67	EC 309537	56.00	98.00	57.60	12.80	59.00	44.20	68.02	2.05	8.52
68	EC 30967 A	57.00	97.00	56.40	13.20	25.80	60.20	36.22	3.42	8.25
69	EC 313974	61.00	104.00	64.20	11.20	23.00	45.60	55.90	3.27	6.89
70	EC 325103	53.00	97.00	46.00	10.60	15.40	44.80	44.86	4.74	9.90
71	EC 325113	60.00	104.00	77.40	14.80	22.40	52.80	103.13	5.17	5.94
72	EC 33872 B	56.00	101.00	63.80	13.80	23.60	52.80	32.83	2.68	9.55
73	EC 333929	56.00	100.00	53.80	13.40	18.20	46.80	44.81	2.38	8.54
74	EC 39044	62.00	105.00	70.40	12.20	16.00	30.00	63.16	3.04	8.60
75	EC 39107	56.00	97.00	52.00	8.00	13.80	37.60	100.29	2.48	6.79
76	EC 39177	57.00	104.00	68.60	13.20	20.00	62.80	86.13	3.06	8.37
77	EC 39513	59.00	106.00	61.20	14.60	7.20	15.80	71.49	1.59	7.70
78	EC 39743	60.00	107.00	86.00	11.80	10.80	25.00	25.85	1.77	7.46
79	EC 76759	61.00	105.00	72.40	12.00	18.60	32.80	61.41	2.35	6.70
80	EPS 1B	55.00	97.00	46.80	11.00	18.80	55.80	60.14	4.58	7.33
81	FASSY COOK	58.00	103.00	45.40	10.80	19.00	42.40	62.33	3.16	7.88
82	G 47	58.00	101.00	52.40	12.40	23.40	50.40	60.37	2.96	8.71
83	G 2	55.00	102.00	44.60	11.40	18.80	54.40	79.17	5.49	8.47
84	GP 4	60.00	105.00	77.40	11.60	17.60	41.80	47.33	4.79	9.23
85	GP 7	62.00	106.00	70.20	11.80	17.60	30.20	89.44	2.49	7.62
86	GPC 34 A	60.00	104.00	61.80	14.40	21.80	58.40	82.19	3.46	6.20
87	EC 33940	55.00	100.00	60.60	13.00	20.40	46.00	29.11	1.72	8.03

88	G 03465	64.00	110.00	50.00	11.00	19.80	45.00	68.16	2.33	5.06
89	G 10525	60.00	111.00	72.00	11.20	19.80	54.60	46.01	3.75	6.97
90	G 2225	-	-	-	-	-	-	-	-	-
91	G 288	57.00	107.00	62.20	11.80	12.10	46.60	27.42	2.88	8.73
92	G4P15	54.00	99.00	40.80	9.20	13.80	33.20	120.66	2.55	7.99
93	GP 465	58.00	102.00	50.00	13.20	13.60	31.60	48.11	3.29	7.19
94	H2P2	50.00	98.00	42.80	10.40	14.00	42.40	76.66	4.29	7.61
95	JSM 227	59.00	100.00	51.20	13.40	15.80	35.00	35.06	2.83	6.37
96	K 53	57.00	103.00	38.80	9.00	10.00	19.60	43.49	1.42	5.80
97	KB 17	58.00	100.00	48.80	13.60	18.60	39.80	41.42	2.18	8.40
98	KDS 256	59.00	101.00	47.40	8.40	14.40	53.00	59.79	3.37	6.08
99	LEE 54	61.00	102.00	53.00	11.60	19.20	42.20	37.02	2.56	8.94
100	SL E 1	62.00	113.00	53.40	12.00	13.60	47.60	80.68	2.26	8.94
101	SQL 37	53.00	98.00	43.20	11.80	16.80	50.60	168.66	4.99	8.06
102	WT 88	53.00	96.00	43.00	10.40	14.40	45.80	150.17	5.08	10.26
103	EC 528675	66.00	114.00	53.40	12.20	18.80	51.20	160.18	3.54	8.30
104	EC 528640	57.00	101.00	61.20	14.20	19.00	66.40	73.32	4.20	8.81
105	EC 538830	58.00	100.00	55.40	13.20	23.20	49.60	83.82	3.23	8.39
106	EC 468597	59.00	105.00	56.80	13.40	19.60	50.80	99.81	3.20	8.66
107	EC 572160	64.00	99.00	48.80	13.80	18.40	47.00	33.19	2.94	8.57
108	EC 590225	63.00	109.00	52.00	12.40	17.00	50.80	86.29	2.50	7.18
109	PI 204336	57.00	96.00	26.40	9.80	15.20	39.00	27.50	3.54	6.94
110	PI 210178	63.00	105.00	71.20	13.80	28.00	64.60	82.18	2.50	5.10
111	SPI 4	61.00	109.00	54.00	13.40	17.00	49.00	120.10	3.50	8.16
112	TGX1488-9-1D	64.00	112.00	44.60	11.20	18.00	46.80	82.19	2.50	5.10
113	TGX293-71E	61.00	113.00	55.60	12.60	14.80	53.80	72.66	2.76	6.12
114	TGX702-4-8	62.00	109.00	55.00	11.80	19.40	52.80	126.13	3.58	7.18
115	TGX849-813	62.00	113.00	55.40	12.80	19.60	54.60	70.69	2.77	6.60
116	TGX849-D-13-4	68.00	115.00	44.20	11.40	17.80	51.80	86.74	3.40	8.13
117	VLS 11	63.00	109.00	41.40	12.40	21.20	38.40	55.15	3.19	5.12
118	EC 23001 B	59.00	108.00	44.20	14.40	20.00	42.60	101.77	4.09	7.31

119	EC 350664	55.00	100.00	39.40	8.00	13.20	35.40	52.76	7.01	6.68
120	EC 377883 b	59.00	109.00	50.40	12.00	18.20	53.80	97.43	7.17	9.95
121	GC 84051-32-1	58.00	102.00	55.40	14.60	25.80	51.00	62.67	4.20	8.09
122	VP 1147 A	57.00	102.00	63.20	11.60	21.40	54.80	165.23	4.93	9.91
123	JS 20-37	59.00	103.00	52.40	13.00	16.60	52.00	128.48	5.55	7.44
124	JS 20-86	58.00	101.00	56.00	12.00	15.00	53.20	47.70	5.77	8.31
125	JS 20-50	56.00	104.00	51.00	9.80	19.40	50.80	108.06	5.69	7.46

Table 4: Descriptive statistics for Multi-location Germplasm Evaluation at Imphal

	Days to 50% Flowering	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
Mean	**56.94**	**102.20**	**56.04**	**12.71**	**20.93**	**52.12**	**76.94**	**4.14**	**7.96**
Minimum	45.00	79.00	24.20	8.00	7.20	15.80	6.56	1.42	4.25
Maximum	68.00	115.00	86.00	17.20	59.00	102.40	216.00	11.33	13.31
CV (%)	6.96	5.18	19.92	15.13	31.57	30.02	51.62	50.45	20.52
KDS753 (CK)	55.20	101.40	55.04	13.96	16.00	34.08	143.88	6.17	11.65
MACS 1460 (CK)	52.20	100.60	49.62	10.46	15.88	46.00	133.90	3.91	8.06
RKS 113 (CK)	55.20	98.20	45.04	11.00	13.52	38.00	86.06	3.13	6.61
RSC 10-46 (CK)	54.20	103.20	56.68	12.96	16.92	45.80	113.17	4.97	7.91
RVS 2010-1 (CK)	55.40	99.20	55.92	11.56	13.36	40.52	73.15	3.72	8.05

Table 5: Evaluation of Germplasm at Multi-location- Indore

S.No	Genotype	Days to 50% Flower-ing	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
1	VP 1199	46.00	91.00	114.20	15.80	15.75	46.25	383.80	8.70	7.20
2	VP 1206-9	51.00	94.00	140.40	13.60	14.20	51.60	76.10	4.90	7.40
3	EC 389153	51.00	92.00	93.00	15.80	18.50	77.50	200.80	6.12	6.40
4	EC 389154 B									
5	EC 389154 C	47.00	93.00	82.60	14.40	17.00	64.50	254.10	13.18	11.60
6	EC 389164	53.00	94.00	113.20	14.00	16.67	37.00	70.30	3.20	6.80
7	EC 389170	50.00	93.00	89.40	11.00	30.33	93.33	89.30	10.66	12.10
8	EC 389179 B	48.00	93.00	78.50	11.50	14.40	57.00	296.70	12.74	10.00
9	EC 390981 A	50.00	94.00	115.60	16.00	32.50	100.00	96.00	5.44	8.60
10	EC 390981 B	48.00	93.00	82.80	12.40	19.25	71.25	84.10	9.36	7.10
11	EC 391164	48.00	96.00	89.40	10.40	9.00	42.80	87.80	5.76	10.70
12	EC 391181	46.00	93.00	99.80	17.80	20.60	65.40	208.00	16.62	9.40
13	EC 393222	-	-	-	-	-	-	-	-	-
14	EC 391316	48.00	94.00	89.00	10.60	20.67	69.67	167.20	8.12	9.70
15	EC 391332	47.00	92.00	82.00	8.80	14.00	50.75	155.90	6.72	7.30
16	EC 391346	47.00	93.00	85.20	10.20	14.40	60.00	212.20	12.60	7.50
17	EC 396055	50.00	94.00	87.40	9.60	17.50	58.00	78.00	2.92	8.10
18	EC 396057	46.00	90.00	77.00	12.80	20.50	67.50	114.30	5.12	6.90
19	EC 396059	45.00	92.00	84.80	9.80	11.50	55.50	109.20	11.64	11.30
20	EC 396065	45.00	93.00	88.40	12.60	20.25	63.75	265.70	22.88	8.40
21	EC 389173	48.00	92.00	80.80	12.20	14.50	65.75	149.40	8.76	8.70
22	EC 389166	48.00	94.00	86.25	12.00	17.60	77.60	180.40	12.84	9.00
23	EC 393224	48.00	97.00	97.00	12.80	20.20	71.00	256.10	9.70	9.30
24	EC 393228	48.00	98.00	78.00	10.40	20.00	70.00	155.40	4.06	8.40
25	EC 393231	47.00	94.00	76.20	11.40	14.20	37.00	59.76	6.92	9.60
26	G 2258	47.00	92.00	74.60	12.20	16.20	57.00	223.70	7.98	7.60

27	G 2263	52.00	96.00	99.60	11.60	18.33	60.33	71.50	3.12	9.90
28	DCB 137	43.00	92.00	93.00	12.60	15.50	66.25	256.90	6.30	8.60
29	EC 457214	43.00	93.00	91.40	11.80	15.00	62.50	192.60	8.14	8.10
30	DE 201	44.00	92.00	107.00	10.80	16.67	52.67	243.60	8.10	8.70
31	DN 290	47.00	93.00	71.40	10.00	14.50	48.00	82.50	4.54	8.90
32	AGS 12	45.00	92.00	95.60	7.00	11.60	50.00	361.80	10.18	10.50
33	DS 201	44.00	94.00	97.20	10.20	12.40	47.00	157.90	5.74	9.00
34	EC 100778	50.00	93.00	96.00	8.60	11.00	55.00	145.60	3.76	6.20
35	EC 103336	47.00	95.00	105.00	11.20	20.00	76.25	254.50	12.70	11.60
36	EC 106998	48.00	93.00	100.80	11.00	29.60	101.00	208.30	13.62	9.60
37	EC 107407	48.00	92.00	93.60	10.00	16.50	68.75	149.90	10.04	8.10
38	EC 109540	48.00	94.00	95.00	11.80	19.50	70.00	214.30	9.34	7.90
39	EC 109543	48.00	95.00	94.20	11.60	14.20	76.00	133.70	14.28	7.70
40	EC 113778	47.00	93.00	95.80	10.40	12.50	57.50	207.30	7.74	7.20
41	EC 114572	46.00	92.00	98.40	11.40	18.00	62.00	165.10	12.48	8.10
42	EC 16213	44.00	93.00	92.00	13.40	15.33	55.00	236.30	6.84	9.40
43	EC 172613	48.00	93.00	84.67	12.67	12.33	51.67	112.10	4.60	7.20
44	EC 172663	47.00	94.00	90.75	11.75	22.67	79.67	104.60	7.94	10.90
45	EC 173325	45.00	96.00	91.00	10.60	13.00	62.25	203.30	7.32	8.00
46	EC 241708	46.00	92.00	93.80	12.20	19.67	56.00	148.00	2.80	7.00
47	EC 241709	47.00	93.00	96.80	13.00	20.00	73.20	143.30	10.68	7.30
48	EC 393237	47.00	97.00	91.00	11.20	15.75	63.75	176.50	9.20	14.70
49	EC 242072	46.00	93.00	92.60	13.60	15.00	62.75	178.00	8.06	8.60
50	EC 242105	48.00	95.00	86.75	11.00	14.00	50.00	58.80	3.82	6.10
51	EC 242111	48.00	94.00	87.20	11.60	12.00	41.25	202.00	6.40	9.10
52	EC 250586	48.00	93.00	78.40	11.00	15.33	65.00	107.50	4.98	6.60
53	AGS 163	43.00	92.00	61.20	10.80	17.20	61.20	128.30	6.64	9.20
54	AGS 164	47.00	96.00	86.20	9.20	13.20	44.40	253.80	6.02	7.60
55	EC 251501	47.00	94.00	66.00	10.60	13.75	68.50	209.60	11.72	14.60
56	AGS 174	47.00	96.00	98.00	10.80	15.33	55.00	209.10	8.16	7.40
57	EC 251876	47.00	96.00	85.00	12.40	18.20	71.00	268.10	11.30	11.80

58	EC 280149	50.00	99.00	96.80	9.80	25.00	100.00	132.45	10.72	8.90
59	EC 2487469	52.00	98.00	86.60	12.20	26.00	110.00	48.40	4.74	8.70
60	EC 289099	48.00	94.00	83.80	9.20	12.25	71.25	266.30	9.28	8.20
61	AGS 186 A	47.00	93.00	74.80	13.20	33.00	148.00	56.50	6.40	6.20
62	EC 291397	48.00	95.00	80.60	13.00	18.60	51.80	120.20	12.02	9.20
63	EC 291398	48.00	99.00	71.80	8.80	13.25	56.75	149.10	9.96	9.30
64	EC 291403	-	-	-	-	-	-	-	-	-
65	EC 291451	50.00	94.00	81.20	12.00	33.00	101.67	201.00	10.86	10.80
66	EC 291453	52.00	96.00	96.60	12.40	11.00	34.00	195.90	3.54	6.40
67	EC 309537	46.00	95.00	69.20	11.20	18.00	52.50	176.90	9.00	11.00
68	EC 30967 A	47.00	93.00	69.20	11.00	19.50	51.25	226.50	8.46	7.50
69	EC 313974	46.00	98.00	93.20	13.40	15.75	60.25	104.60	8.60	6.20
70	EC 325103	46.00	96.00	85.60	12.00	18.00	59.40	220.90	12.32	11.30
71	EC 325113	-	-	-	-	-	-	-	-	-
72	EC 33872 B	46.00	96.00	90.40	12.00	16.75	49.25	321.40	5.32	10.10
73	EC 333929	-	-	-	-	-	-	-	-	-
74	EC 39044	-	-	-	-	-	-	-	-	-
75	EC 39107	47.00	96.00	92.00	9.00	17.00	40.50	128.00	6.42	7.10
76	EC 39177	47.00	93.00	68.80	9.80	6.40	35.20	144.40	8.84	13.70
77	EC 39513	49.00	99.00	78.00	9.60	11.00	40.50	287.00	4.54	11.60
78	EC 39743	-	-	-	-	-	-	-	-	-
79	EC 76759	53.00	100.00	87.00	11.60	14.33	41.67	134.60	3.60	6.70
80	EPS 1B	44.00	94.00	78.40	9.60	16.40	57.20	306.50	9.24	13.30
81	FASSY COOK	43.00	99.00	85.00	10.60	11.00	40.75	118.30	6.80	12.00
82	G 47	48.00	99.00	88.20	11.40	14.00	53.33	215.70	4.54	8.20
83	G 2	43.00	96.00	69.20	10.00	16.60	60.80	145.00	9.50	10.60
84	GP 4	50.00	96.00	95.20	9.20	17.75	47.75	191.10	9.42	6.70
85	GP 7	54.00	95.00	160.20	13.00	19.67	73.67	73.80	7.38	7.20
86	GPC 34 A	50.00	94.00	160.60	12.40	26.25	65.50	82.60	8.26	7.80
87	EC 33940	47.00	94.00	80.00	11.80	21.20	65.80	291.30	6.58	12.30
88	G 03465	-	-	-	-	-	-	-	-	-

89	G 10525	61.00	94.00	113.00	12.20	19.75	64.25	70.40	5.62	6.20
90	G 2225	-	-	-	-	-	-	-	-	-
91	G 288	48.00	98.00	105.80	11.80	17.40	45.00	110.80	6.84	6.00
92	G4P15	43.00	98.00	74.80	9.40	15.00	45.00	307.60	7.44	11.30
93	GP 465	47.00	100.00	75.00	10.40	7.50	39.75	187.40	4.90	9.70
94	H2P2	43.00	99.00	70.60	9.20	12.80	33.60	228.30	7.02	13.20
95	JSM 227	46.00	99.00	82.60	11.00	10.50	39.25	325.50	4.84	8.60
96	K 53	46.00	98.00	83.40	9.00	15.60	56.00	204.60	10.02	8.60
97	KB 17	46.00	96.00	87.80	12.40	18.40	57.00	234.20	8.64	8.40
98	KDS 256	47.00	97.00	86.00	10.20	9.33	30.00	182.10	6.84	7.80
99	LEE 54	48.00	95.00	91.60	11.80	19.20	62.40	166.50	7.58	10.80
100	SL E 1	48.00	98.00	85.80	11.60	16.50	60.00	413.90	17.00	15.10
101	SQL 37	47.00	99.00	75.00	9.20	11.00	38.40	260.60	8.06	9.70
102	WT 88	48.00	98.00	78.00	10.00	12.00	42.00	298.00	7.40	13.20
103	EC 528675	61.00	100.00	112.40	15.20	8.50	23.50	91.00	3.70	8.40
104	EC 528640	48.00	96.00	89.40	11.40	14.67	60.00	235.40	9.36	8.20
105	EC 538830	48.00	96.00	91.00	12.60	16.20	60.75	207.40	8.52	8.80
106	EC 468597	47.00	94.00	90.20	11.40	15.40	52.00	278.60	10.02	8.20
107	EC 572160	48.00	95.00	89.40	11.20	13.00	47.50	187.80	6.80	7.10
108	EC 590225	52.00	98.00	108.40	12.00	10.33	41.67	129.40	4.90	6.20
109	PI 204336	43.00	99.00	69.60	9.80	11.40	43.80	506.40	10.48	10.20
110	PI 210178	-	-	-	-	-	-	-	-	-
111	SPI 4	47.00	99.00	120.75	13.50	11.80	47.60	57.90	5.16	7.60
112	TGX1488-9-1D	48.00	100.00	85.00	10.20	12.00	39.80	220.30	6.22	10.60
113	TGX293-71E	54.00	98.00	122.40	13.60	15.50	45.00	78.60	2.70	5.70
114	TGX702-4-8	46.00	96.00	90.00	10.80	12.00	56.25	199.50	7.58	7.90
115	TGX849-813	46.00	95.00	108.60	12.80	13.25	51.75	217.30	8.60	8.20
116	TGX849-D-13-4	54.00	96.00	143.80	14.00	30.50	81.00	238.70	3.54	5.70
117	VLS 11	48.00	94.00	94.80	13.00	18.25	63.75	320.40	11.38	6.20
118	EC 23001 B	-	-	-	-	-	-	-	-	-
119	EC 350664	46.00	99.00	71.20	10.00	14.00	56.67	412.20	5.26	9.70

120	EC 377883 b	45.00	99.00	79.80	12.40	14.60	62.60	323.00	19.24	12.30
121	GC 84051-32-1	46.00	94.00	93.00	12.60	18.00	63.60	395.90	9.70	10.00
122	VP 1147 A	50.00	99.00	100.40	11.40	18.00	53.80	78.20	8.72	8.10
123	JS 20-37	-	-	-	-	-	-	-	-	-
124	JS 20-86	47.00	93.00	93.40	10.80	12.00	45.00	300.50	11.44	7.30
125	JS 20-50	-	-	-	-	-	-	-	-	-

Table 6: Descriptive statistics for Multi-location Germplasm Evaluation at Indore

	Days to 50% Flowering	***Days to Maturity***	***Plant Height (cm)***	***No. of Nodes per Plant***	***No. of Pod Clusters per Plant***	***No. of Pods per Plant***	***Row yield***	***Seed Yield per Plant (gm)***	***100 Seed weight (gm)***
Mean	47.68	95.15	90.95	11.51	16.46	58.94	190.77	8.17	8.93
Minimum	43.00	90.00	61.20	7.00	6.40	23.50	48.40	2.70	5.70
Maximum	61.00	100.00	160.60	17.80	33.00	148.00	506.40	22.88	15.10
CV (%)	6.32	2.60	18.36	14.93	31.07	30.06	47.28	42.49	23.49
NRC 86 (CK)	46.00	94.00	67.00	9.60	14.60	51.60	319.20	10.56	11.00
JS 20-29 (CK)	49.00	89.00	75.60	10.20	20.60	65.40	477.90	13.14	11.30
JS 20-69 (CK)	46.00	100.00	91.20	12.00	19.40	57.80	677.00	18.36	13.00
JS 20-98 (CK)	44.00	93.00	64.00	8.80	12.00	77.25	299.10	12.18	9.90
JS 20-34 (CK)	43.00	91.00	68.40	9.60	6.60	22.20	272.20	50.86	12.40

Table 7: Evaluation of Germplasm at Multi-location- Pantnagar

S.No	Genotype	Days to 50% Flower-ing	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
1	VI 1199	50.00	108.00	65.00	18.00	-	43.00	170.00	24.00	8.99
2	VI 1206-9	60.00	112.00	89.00	20.00	-	124.00	90.00	18.00	8.52
3	EC 389153	63.00	112.00	83.00	20.00	-	74.00	160.00	32.00	6.03
4	EC 389154 B	52.00	114.00	74.00	21.00	-	77.00	110.00	22.00	8.77
5	EC 389154 C	52.00	111.00	84.00	20.00	-	53.00	110.00	22.00	7.53
6	EC 389164	61.00	114.00	92.00	21.00	-	50.00	170.00	34.00	8.15
7	EC 389170	53.00				-				
8	EC 389179 B	56.00	111.00	71.00	18.00	-	98.00	150.00	30.00	8.47
9	EC 390981 A	54.00	114.00	105.00	23.00	-	96.00	395.00	35.00	7.41
10	EC 390981 B	57.00	109.00	58.00	18.00	-	57.00	150.00	12.50	6.15
11	EC 391164	57.00	112.00	62.00	18.00	-	32.00	50.00	12.50	
12	EC 391181	50.00	111.00	66.00	21.00	-	82.00	100.00	27.50	8.35
13	EC 393222	64.00	120.00	98.00	23.00	-	111.00	440.00	27.50	8.70
14	EC 391316	52.00	109.00	55.00	18.00	-	80.00	195.00	17.50	7.91
15	EC 391332	52.00	111.00	64.00	17.00	-	87.00	100.00	25.00	7.92
16	EC 391346	53.00	109.00	63.00	18.00	-	57.00	155.00	15.00	8.22
17	EC 396055	60.00	112.00	74.00	16.00	-	168.00	365.00	27.50	7.97
18	EC 396057	54.00	110.00	53.00	17.00	-	79.00	135.00	17.50	7.70
19	EC 396059	54.00	108.00	57.00	15.00	-	58.00	105.00	15.00	8.04
20	EC 396065	54.00	107.00	65.00	17.00	-	77.00	150.00	17.50	7.85
21	EC 389173	53.00	105.00	63.00	19.00	-	119.00	220.00	20.00	7.46
22	EC 389166	54.00	108.00	56.00	18.00	-	73.00	95.00	10.00	7.97

23	EC 393224	54.00	100.00	65.00	20.00	-	55.00	120.00	22.50	7.69
24	EC 393228	55.00	111.00	68.00	17.00	-	84.00	345.00	27.50	7.94
25	EC 393231	52.00	109.00	81.00	18.00	-	70.00	195.00	15.00	8.32
26	G 2258	53.00	107.00	53.00	13.00	-	50.00	135.00	10.00	7.69
27	G 2263	55.00	112.00	113.00	25.00	-	94.00	350.00	25.00	8.79
28	DCB 137	47.00	109.00	64.00	16.00	-	79.00	305.00	17.50	8.98
29	EC 457214	46.00	108.00	50.00	16.00	-	102.00	295.00	27.50	9.36
30	DE 201	47.00	107.00	96.00	18.00	-	44.00	175.00	7.50	8.15
31	DN 290	48.00	107.00	70.00	18.00	-	32.00	160.00	10.00	9.10
32	AGS 12	46.00	110.00	69.00	17.00	-	54.00	135.00	12.50	10.21
33	DS 201	49.00	111.00	69.00	16.00	-	53.00	120.00	12.50	7.69
34	EC 100778	56.00	111.00	58.00	13.00	-	26.00	185.00	7.50	5.83
35	EC 103336	50.00	112.00	70.00	19.00	-	37.00	140.00	10.00	7.77
36	EC 106998	52.00	113.00	77.00	20.00	-	51.00	275.00	12.50	9.18
37	EC 107407	52.00	109.00	81.00	19.00	-	42.00	215.00	7.50	8.33
38	EC 109540	48.00	107.00	83.00	19.00	-	56.00	325.00	12.50	7.76
39	EC 109543	51.00	108.00	95.00	19.00	-	67.00	340.00	17.50	7.66
40	EC 113778	52.00	108.00	94.00	18.00	-	34.00	195.00	7.50	7.18
41	EC 114572	54.00	101.00	93.00	19.00	-	99.00	275.00	20.00	8.44
42	EC 16213	46.00	110.00	77.00	17.00	-	17.00	95.00	5.00	9.72
43	EC 172613	50.00	108.00	69.00	15.00	-	86.00	205.00	20.00	8.65
44	EC 172663	54.00	108.00	67.00	15.00	-	87.00	135.00	15.00	8.91
45	EC 173325	47.00	111.00	56.00	14.00	-	38.00	90.00	10.00	11.21
46	EC 241708	51.00	108.00	74.00	20.00	-	82.00	380.00	20.00	7.99
47	EC 241709	51.00	108.00	73.00	21.00	-	85.00	285.00	20.00	8.28
48	EC 393237	50.00	111.00	40.00	14.00	-	84.00	85.00	17.50	10.70
49	EC 242072	50.00	108.00	73.00	22.00	-	87.00	315.00	20.00	9.16
50	EC 242105	56.00	109.00	86.00	20.00	-	35.00	140.00	10.00	7.20
51	EC 242111					-				
52	EC 250586	52.00	108.00	58.00	18.00	-	68.00	340.00	15.00	6.78
53	AGS 163	48.00	107.00	59.00	13.00	-	81.00	70.00	12.50	10.21

54	AGS 164	55.00	108.00	55.00	17.00	-	45.00	245.00	12.50	7.22
55	EC 251501	51.00	109.00	73.00	16.00	-	48.00	330.00	15.00	6.40
56	AGS 174	57.00	110.00	65.00	16.00	-	63.00	160.00	15.00	7.14
57	EC 251876	50.00	110.00	66.00	20.00	-	85.00	255.00	17.50	8.43
58	EC 280149	54.00	110.00	75.00	15.00	-	79.00	70.00	17.50	8.01
59	EC 2487469	52.00	108.00	101.00	18.00	-	78.00	215.00	20.00	8.48
60	EC 289099	53.00	110.00	69.00	15.00	-	51.00	140.00	7.50	6.89
61	AGS 186A	52.00	111.00	76.00	18.00	-	65.00	275.00	17.50	6.88
62	EC 291397	50.00	109.00	69.00	19.00	-	43.00	180.00	10.00	7.83
63	EC 291398	52.00	112.00	60.00	19.00	-	59.00	365.00	12.50	8.74
64	EC 291403	56.00	110.00	70.00	16.00	-	64.00	300.00	12.50	8.04
65	EC 291451	55.00	116.00	70.00	19.00	-	58.00	90.00	10.00	7.41
66	EC 291453	59.00	113.00	84.00	22.00	-	74.00	245.00	12.50	6.12
67	EC 309537	57.00	107.00	67.00	18.00	-	68.00	105.00	15.00	6.30
68	EC 30967 A	52.00	106.00	63.00	21.00	-	75.00	175.00	15.00	9.07
69	EC 313974	52.00	105.00	100.00	25.00	-	109.00	130.00	27.50	7.60
70	EC 325103	56.00	109.00	57.00	14.00	-	65.00	55.00	15.00	5.07
71	EC 325113	62.00	119.00	103.00	23.00	-	76.00	295.00	25.00	7.73
72	EC 338721B	57.00	107.00	68.00	17.00	-	59.00	185.00	12.50	7.57
73	EC 333929	57.00	106.00	65.00	16.00	-	59.00	90.00	10.00	7.79
74	EC 39044	57.00	106.00	92.00	19.00	-	67.00	220.00	17.50	8.52
75	EC 39107	57.00	105.00	78.00	16.00	-	38.00	80.00	10.00	7.53
76	EC 39177	57.00	110.00	82.00	18.00	-	59.00	290.00	12.50	8.84
77	EC 39513	59.00	108.00	73.00	13.00	-	42.00	200.00	10.00	8.69
78	EC 39743	59.00	112.00	165.00	22.00	-	60.00	50.00	12.50	9.03
79	EC 76759	62.00	120.00	92.00	21.00	-	54.00	265.00	12.50	8.20
80	EPS 1B	47.00	109.00	56.00	14.00	-	51.00	80.00	10.00	7.95
81	FASSY COOK	52.00	117.00	53.00	15.00	-	55.00	150.00	12.50	8.84
82	G 47	51.00	109.00	62.00	18.00	-	62.00	180.00	15.00	7.57
83	G2	50.00	114.00	58.00	15.00	-	74.00	230.00	12.50	8.77

84	GP 4	58.00	114.00	61.00	15.00	-	78.00	100.00	15.00	6.63
85	GP 7					-				
86	GPC 34 A	58.00	112.00	125.00	20.00	-	86.00	435.00	12.50	8.53
87	EC 33940	52.00	112.00	83.00	19.00	-	84.00	140.00	15.00	7.81
88	GO 3465	64.00	113.00	138.00	20.00	-	64.00	345.00	17.50	7.00
89	G 10525	62.00	115.00	107.00	23.00	-	69.00	90.00	25.00	6.87
90	G 2225	61.00	114.00	105.00	25.00	-	97.00	245.00	37.50	8.44
91	G 288	51.00	110.00	61.00	15.00	-	57.00	100.00	12.50	10.63
92	G 4 P 15	48.00	107.00	58.00	15.00	-	65.00	255.00	22.50	8.36
93	GP 465	57.00	107.00	55.00	14.00	-	84.00	215.00	22.50	8.17
94	H2P2	50.00	109.00	64.00	17.00	-	56.00	205.00	15.00	8.98
95	JSM 227	50.00	102.00	60.00	17.00	-	90.00	140.00	35.00	7.92
96	K 53	52.00	116.00	42.00	13.00	-	49.00	250.00	15.00	8.74
97	KB 17	52.00	106.00	71.00	19.00	-	84.00	385.00	17.50	7.51
98	KDS 256	56.00	117.00	50.00	13.00	-	58.00	195.00	20.00	9.97
99	LEE 54	52.00	117.00	66.00	18.00	-	36.00	280.00	12.50	7.97
100	SL (E) 1	53.00	116.00	55.00	15.00	-	56.00	195.00	15.00	10.91
101	SQL 37	48.00	114.00	55.00	16.00	-	39.00	350.00	15.00	8.62
102	WT 88	48.00	111.00	60.00	15.00	-	45.00	345.00	17.50	10.22
103	EC 528675	64.00	121.00	79.00	22.00	-	58.00	450.00	12.50	5.71
104	EC 528640	52.00	106.00	71.00	20.00	-	62.00	285.00	17.50	8.19
105	EC 538830	57.00	107.00	69.00	21.00	-	39.00	260.00	20.00	7.13
106	EC 468597	57.00	107.00	58.00	21.00	-	136.00	295.00	22.50	7.15
107	EC 572160	58.00	107.00	58.00	21.00	-	65.00	210.00	20.00	7.86
108	EC 590225	62.00	112.00	74.00	24.00	-	93.00	295.00	30.00	6.00
109	PI 204336	48.00	108.00	37.00	14.00	-	56.00	95.00	25.00	10.42
110	PI 210178	57.00	108.00	117.00	21.00	-	143.00	310.00	17.50	4.26
111	SPI 4	58.00	111.00	80.00	23.00	-	194.00	180.00	30.00	8.82
112	TGX 1488-9 ID	57.00	117.00	61.00	15.00	-	76.00	150.00	15.00	8.69
113	TGX 293-71E	61.00	118.00	98.00	24.00	-	53.00	190.00	15.00	6.73

114	TGX 702-4-8	57.00	108.00	64.00	20.00	-	106.00	205.00	25.00	6.83
115	TGX 849-813	62.00				-				
116	TGX 849-13-4	62.00	120.00	67.00	22.00	-	98.00	255.00	30.00	6.88
117	VLS 11	57.00	101.00	66.00	17.00	-	72.00	165.00	17.50	5.93
118	EC 23001 B	52.00	107.00	62.00	17.00	-	75.00	120.00	25.00	7.72
119	EC 350664	56.00	107.00	38.00	13.00	-	86.00	290.00	20.00	8.72
120	377883 B	49.00	107.00	53.00	16.00	-	45.00	200.00	17.50	8.80
121	GC 840551-32-1	56.00	109.00	60.00	16.00	-	53.00	100.00	12.50	8.18
122	VP 1147 A	57.00	111.00	81.00	18.00	-	46.00	125.00	12.50	7.58
123	JS 20-37	56.00	110.00	53.00	15.00	-	61.00	80.00	20.00	7.20
124	JS 20-86	47.00	102.00	62.00	13.00	-	65.00	390.00	25.00	9.31
125	JS 20-50	56.00	103.00	60.00	17.00	-	81.00	345.00	25.00	9.87

Table 8: Descriptive statistics for Multi-location Germplasm Evaluation at Pantnagar

	Days to 50% Flowering	*Days to Maturity*	*Plant Height (cm)*	*No. of Nodes per Plant*	*No. of Pod Clusters per Plant*	*No. of Pods per Plant*	*Row yield*	*Seed Yield per Plant (gm)*	*100 Seed weight (gm)*
Mean	53.98	109.98	72.14	18.01	-	69.58	206.24	17.62	8.06
Minimum	46.00	100.00	37.00	13.00	-	17.00	50.00	5.00	4.26
Maximum	64.00	121.00	165.00	25.00	-	194.00	450.00	37.50	11.21
CV (%)	8.13	3.63	27.03	16.48	-	38.37	47.57	38.45	14.64
SL 958 (CK)	47.00	120.00	80.00	15.00	-	60.00	210.00	21.00	7.89
PS 24 (CK)	46.00	119.00	65.00	17.00	-	65.00	290.00	24.00	12.36
PS 1347 (CK)	48.00	122.00	60.00	19.00	-	70.00	275.00	22.00	10.14

Table 9: Evaluation of Germplasm at Multi-location- Raipur

S.No	Genotype	Days to 50% Flower-ing	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
1	VI 1119	45.00	97.00	75.60	-	-	21.20	155.00	-	-
2	VI 1206-9	55.00	103.00	107.60	-	-	22.80	189.00	-	-
3	EC 389153	55.00	103.00	90.40	-	-	42.20	155.00	-	-
4	EC 389154 B	48.00	106.00	66.20	-	-	24.60	113.00	-	-
5	EC 389154 C	47.00	106.00	73.40	-	-	29.00	160.00	-	-
6	EC 389164	56.00	103.00	85.20	-	-	51.40	118.00	-	-
7	EC 389170	43.00	101.00	59.20	-	-	50.80	180.00	-	-
8	EC 389179 B	45.00	97.00	62.00	-	-	40.00	145.00	-	-
9	EC 390981 A	57.00	104.00	81.00	-	-	56.60	166.00	-	-
10	EC 390981 B	52.00	101.00	61.60	-	-	38.00	182.00	-	-
11	EC 391164	48.00	103.00	54.60	-	-	47.00	286.00	-	-
12	EC 391181	47.00	101.00	68.40	-	-	35.40	82.00	-	-
13	EC 393222	55.00	116.00	49.60	-	-	38.20	291.00	-	-
14	EC 391316	47.00	101.00	53.40	-	-	42.80	134.00	-	-
15	EC 391332	47.00	101.00	59.60	-	-	39.20	135.00	-	-
16	EC 391346	45.00	103.00	52.80	-	-	32.40	167.00	-	-
17	EC 396055	55.00	101.00	68.80	-	-	22.80	186.00	-	-
18	EC 396057	45.00	99.00	52.80	-	-	43.20	150.00	-	-
19	EC 396059	45.00	99.00	52.60	-	-	26.80	221.00	-	-
20	EC 396065	45.00	99.00	47.00	-	-	46.80	184.00	-	-
21	EC 389173	45.00	101.00	48.60	-	-	38.20	265.00	-	-
22	EC389166	45.00	101.00	44.60	-	-	27.00	183.00	-	-
23	EC 393224	47.00	101.00	41.80	-	-	22.20	149.00	-	-
24	EC 393228	48.00	102.00	57.80	-	-	36.20	225.00	-	-
25	EC 393231	48.00	103.00	64.40	-	-	31.80	192.00	-	-

26	G 2258	48.00	101.00	49.20	-	-	35.20	156.00	-	-
27	G 2263	48.00	104.00	74.60	-	-	39.80	319.00	-	-
28	DCB 137	47.00	102.00	43.20	-	-	31.20	136.00	-	-
29	EC 457214	45.00	101.00	38.40	-	-	53.40	263.00	-	-
30	DE 201	47.00	103.00	60.60	-	-	36.80	71.00	-	-
31	DN 290	47.00	102.00	61.20	-	-	51.60	221.00	-	-
32	AGS 12	42.00	102.00	46.60	-	-	50.00	222.00	-	-
33	DS 201	43.00	99.00	35.80	-	-	28.60	127.00	-	-
34	EC 100778	54.00	97.00	55.00	-	-	33.60	143.00	-	-
35	EC 103336	47.00	102.00	52.60	-	-	32.40	227.00	-	-
36	EC 106998	47.00	102.00	55.20	-	-	27.60	129.00	-	-
37	EC 107407	47.00	101.00	65.40	-	-	23.60	209.00	-	-
38	EC 109540	45.00	101.00	68.60	-	-	39.80	204.00	-	-
39	EC 109543	45.00	101.00	68.20	-	-	38.20	243.00	-	-
40	EC 113778	47.00	101.00	75.80	-	-	31.20	160.00	-	-
41	EC 114572	48.00	102.00	61.80	-	-	39.40	221.00	-	-
42	EC 16213	42.00	102.00	42.40	-	-	19.40	70.00	-	-
43	EC 172613	43.00	99.00	59.60	-	-	31.00	166.00	-	-
44	EC172663	45.00	99.00	60.30	-	-	70.00	160.00	-	-
45	EC173325	43.00	101.00	44.80	-	-	30.40	112.00	-	-
46	EC241708	45.00	101.00	62.20	-	-	52.40	155.00	-	-
47	EC241709	45.00	101.00	60.20	-	-	45.80	109.00	-	-
48	EC393237	45.00	102.00	41.00	-	-	51.00	130.00	-	-
49	EC242072	45.00	101.00	63.60	-	-	44.20	157.00	-	-
50	EC242105	47.00	101.00	69.00	-	-	23.40	137.00	-	-
51	EC242111	47.00	101.00	50.40	-	-	39.20	115.00	-	-
52	EC250586	45.00	101.00	60.80	-	-	47.60	236.00	-	-
53	AGS163	43.00	101.00	36.20	-	-	33.20	127.00	-	-
54	AGS164	47.00	101.00	54.20	-	-	51.40	135.00	-	-
55	EC251501	45.00	101.00	47.30	-	-	28.00	118.00	-	-
56	AGS174	45.00	99.00	72.60	-	-	29.40	212.00	-	-

57	EC251876	45.00	99.00	62.40	-	-	39.20	171.00	-	-
58	EC280149	54.00	102.00	69.40	-	-	47.80	169.00	-	-
59	EC2487469	54.00	102.00	64.40	-	-	42.40	326.00	-	-
60	EC289099	45.00	102.00	65.40	-	-	40.00	234.00	-	-
61	AGS186A	47.00	102.00	58.60	-	-	38.80	171.00	-	-
62	EC291397	47.00	104.00	57.60	-	-	46.20	257.00	-	-
63	EC 291398	47.00	102.00	64.40	-	-	47.40	228.00	-	-
64	EC 291403	45.00	101.00	50.60	-	-	49.40	158.00	-	-
65	EC291451	45.00	101.00	65.00	-	-	59.20	149.00	-	-
66	EC291453	55.00	104.00	83.20	-	-	55.20	163.00	-	-
67	EC309537	47.00	101.00	59.60	-	-	37.60	200.00	-	-
68	EC30967A	45.00	101.00	60.60	-	-	24.80	163.00	-	-
69	EC313974	47.00	99.00	84.80	-	-	68.20	80.00	-	-
70	EC325103	45.00	101.00	45.20	-	-	29.00	112.00	-	-
71	EC325113	55.00	101.00	98.60	-	-	75.00	100.00	-	-
72	EC33871B	44.00	100.00	52.80	-	-	37.80	191.00	-	-
73	EC333929	44.00	101.00	58.60	-	-	45.00	151.00	-	-
74	EC39044	47.00	101.00	71.00	-	-	55.40	172.00	-	-
75	EC39107	47.00	102.00	63.00	-	-	39.20	167.00	-	-
76	EC39177	45.00	101.00	53.60	-	-	54.20	135.00	-	-
77	EC39513	45.00	101.00	64.20	-	-	44.80	226.00	-	-
78	EC39743	56.00	105.00	105.60	-	-	64.20	126.00	-	-
79	EC76759	56.00	105.00	84.40	-	-	49.20	90.00	-	-
80	EPS1B	43.00	100.00	96.00	-	-	81.80	80.00	-	-
81	FASSY COOK	44.00	100.00	106.60	-	-	47.60	214.00	-	-
82	G47	44.00	100.00	38.60	-	-	64.20	190.00	-	-
83	G2	44.00	104.00	46.20	-	-	27.40	112.00	-	-
84	GP4	57.00	103.00	71.60	-	-	31.20	319.00	-	-
85	GP7	56.00	106.00	90.00	-	-	38.40	72.00	-	-
86	GPC34A	56.00	106.00	96.60	-	-	47.40	168.00	-	-
87	EC33940	47.00	101.00	58.60	-	-	31.60	215.00	-	-

88	GO 3465	54.00	102.00	96.00	-	-	81.80	154.00	-	-
89	G 10525	56.00	103.00	73.00	-	-	36.80	149.00	-	-
90	G 2225	59.00	105.00	98.40	-	-	71.80	239.00	-	-
91	G 288	45.00	104.00	54.20	-	-	53.80	117.00	-	-
92	G4P15	43.00	103.00	39.00	-	-	32.60	152.00	-	-
93	GP465	44.00	104.00	53.80	-	-	54.60	324.00	-	-
94	H2P2	42.00	102.00	37.20	-	-	40.20	145.00	-	-
95	JSM 227	45.00	113.00	55.00	-	-	47.40	337.00	-	-
96	K 53	45.00	101.00	46.40	-	-	23.00	136.00	-	-
97	KB 17	47.00	101.00	44.60	-	-	26.20	143.00	-	-
98	KDS 256	45.00	106.00	55.60	-	-	47.80	375.00	-	-
99	LEE 54	45.00	115.00	57.40	-	-	51.60	149.00	-	-
100	SL(E)1	45.00	95.00	61.40	-	-	46.60	218.00	-	-
101	SQL37	42.00	106.00	44.00	-	-	45.40	184.00	-	-
102	WT 88	43.00	114.00	40.40	-	-	38.20	209.00	-	-
103	EC 528675	56.00	95.00	68.20	-	-	90.80	189.00	-	-
104	EC 528640	43.00	101.00	56.80	-	-	43.80	299.00	-	-
105	EC 538830	43.00	99.00	56.40	-	-	44.60	178.00	-	-
106	EC 468597	45.00	99.00	60.60	-	-	46.60	280.00	-	-
107	EC 572160	43.00	103.00	60.40	-	-	47.40	173.00	-	-
108	EC 590225	56.00	108.00	77.20	-	-	62.40	272.00	-	-
109	PI 204336	43.00	106.00	55.60	-	-	34.40	240.00	-	-
110	PI 210178	56.00	105.00	76.00	-	-	19.80	118.00	-	-
111	SPI 4	55.00	105.00	73.40	-	-	45.20	220.00	-	-
112	TGX 1488-9-ID	47.00	106.00	50.80	-	-	37.20	210.00	-	-
113	TGX 293-71E	56.00	103.00	90.50	-	-	31.00	58.00	-	-
114	TGX 702-4-8	47.00	102.00	59.00	-	-	46.40	125.00	-	-
115	TGX 849-813	47.00	99.00	70.20	-	-	29.00	162.00	-	-
116	TGX 849-13-4	56.00	106.00	86.20	-	-	115.60	174.00	-	-
117	VLS 11	47.00	101.00	77.20	-	-	54.20	137.00	-	-
118	EC 23001B	45.00	102.00	68.40	-	-	73.60	379.00	-	-

119	EC 350664	45.00	102.00	47.20	-	-	51.00	302.00	-	-
120	377883B	45.00	103.00	58.20	-	-	50.80	178.00	-	-
121	GC 84051-32-1	47.00	102.00	60.20	-	-	45.20	145.00	-	-
122	VP 1147A	48.00	102.00	88.00	-	-	50.40	201.00	-	-
123	JS 20-37	45.00	103.00	62.60	-	-	56.20	269.00	-	-
124	JS 20-86	45.00	103.00	64.00	-	-	40.00	287.00	-	-
125	JS 20-50	43.00	104.00	57.00	-	-	48.20	221.00	-	-

Table 10: Descriptive statistics for Multi-location Germplasm Evaluation at Raipur

	Days to 50% Flowering	**Days to Maturity**	**Plant Height (cm)**	**No. of Nodes per Plant**	**No. of Pod Clusters per Plant**	**No. of Pods per Plant**	**Row yield**	**Seed Yield per Plant (gm)**	**100 Seed weight (gm)**
Mean	47.48	102.20	62.75	-	-	43.33	182.08	-	-
Min	42.00	95.00	35.80	-	-	19.40	58.00	-	-
Max	59.00	116.00	107.60	-	-	115.60	379.00	-	-
CV(%)	9.27	3.09	25.28	-	-	34.74	35.86	-	-
NO CHECKS				-	-			-	-

Table 11: Evaluation of Germplasm at Multi-location- Jabalpur

S.No	Genotype	Days to 50% Flower-ing	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
1	VI 1199	41.00	-	-	11.30	-	-	-	-	-
2	VI 1206-9	49.00	-	-	9.40	-	-	-	-	-
3	EC 389153	59.00	90.00	75.30	20.00	13.70	61.00	440.00	4.3	6.60
4	EC 389154 B	43.00	-	-	-	-	-	-	-	-
5	EC 389154 C	43.00	-	-	-	-	-	-	-	-
6	EC 389164	51.00	-	-	-	-	-	-	-	-
7	EC 389170	47.00	92.00	39.00	11.50	16.00	37.00	250.00	2.8	7.18
8	EC 389179 B	44.00	93.00	48.00	7.50	10.20	26.00	100.00	1.4	9.65
9	EC 390981 A	49.00	91.00	76.60	20.40	21.50	56.30	150.00	2.4	8.27
10	EC 390981 B	43.00	-	-	-	-	-	-	-	-
11	EC 391164	41.00	-	-	-	-	-	-	-	-
12	EC 391181	41.00	90.00	49.50	12.50	9.00	29.20	150.00	1.9	8.69
13	EC 393222	59.00	104.00	62.00	15.30	23.00	64.00	350.00	8.3	8.32
14	EC 391316	43.00	-	-	-	-	-	-	-	-
15	EC 391332	41.00	-	-	-	-	-	-	-	-
16	EC 391346	43.00	-	-	-	-	-	-	-	-
17	EC 396055	45.00	90.00	55.00	13.50	16.50	42.30	250.00	3.7	8.14
18	EC 396057	42.00	-	-	-	-	-	-	-	-
19	EC 396059	43.00	-	-	-	-	-	-	-	-
20	EC 396065	41.00	-	-	-	-	-	-	-	-
21	EC 389173	41.00	-	-	-	-	-	-	-	-
22	EC 389166	42.00	-	-	-	-	-	-	-	-
23	EC 393224	43.00	91.00	62.00	16.00	7.10	46.60	100.00	1.4	9.15
24	EC 393228	44.00	92.00	61.33	16.40	10.00	35.00	150.00	2.5	9.20
25	EC 393231	44.00	-	-	-	-	-	-	-	-

26	G 2258	44.00	-	-	-	-	-	-	-	-
27	G 2263	47.00	-	-	-	-	-	-	-	-
28	DCB 137	41.00	95.00	42.20	12.50	13.00	42.00	300.00	10.7	9.24
29	EC 457214	41.00	94.00	42.50	14.20	10.40	34.00	100.00	2.6	9.26
30	DE 201	40.00	95.00	52.00	11.40	13.50	28.00	50.00	1.0	7.16
31	DN 290	42.00	-	-	-	-	-	-	-	-
32	AGS 12	39.00	95.00	40.50	11.20	9.40	30.40	200.00	3.1	8.64
33	DS 201	39.00	-	-	-	-	-	-	-	-
34	EC 100778	45.00	93.00	37.00	9.50	3.00	22.00	100.00	1.5	8.10
35	EC 103336	43.00	-	-	-	-	-	-	-	-
36	EC 106998	43.00	90.00	52.00	7.40	7.00	25.00	50.00	0.6	9.35
37	EC 107407	47.00	92.00	45.00	9.40	3.00	22.60	100.00	1.5	7.30
38	EC 109540	46.00	92.00	40.50	8.20	3.40	12.20	50.00	1.0	11.15
39	EC 109543	47.00	92.00	38.00	8.00	3.50	14.00	50.00	0.7	9.97
40	EC 113778	45.00	93.00	40.00	9.00	2.10	18.50	100.00	2.2	9.93
41	EC 114572	48.00	93.00	44.50	10.40	2.40	20.40	50.00	0.7	10.30
42	EC 16213	41.00	89.00	35.40	6.00	6.20	20.40	50.00	1.3	9.37
43	EC 172613	46.00	93.00	34.00	8.00	4.20	18.20	50.00	0.9	9.05
44	EC 172663	47.00	94.00	40.50	9.00	7.00	22.50	50.00	0.8	10.05
45	EC 173325	41.00	-	-	-	-	-	-	-	-
46	EC 241708	47.00	95.00	44.00	10.00	5.40	24.50	150.00	1.6	9.96
47	EC 241709	49.00	93.00	38.40	12.40	5.00	24.50	50.00	0.9	7.82
48	EC 393237	47.00	-	-	-	-	-	-	-	-
49	EC 242072	49.00	-	-	-	-	-	-	-	-
50	EC 242105	46.00	-	-	-	-	-	-	-	-
51	EC 242111	46.00	-	-	-	-	-	-	-	-
52	EC 250586	49.00	-	-	-	-	-	-	-	-
53	AGS 163	49.00	-	-	-	-	-	-	-	-
54	AGS 164	48.00	-	-	-	-	-	-	-	-
55	EC 251501	47.00	-	-	-	-	-	-	-	-
56	AGS 174	47.00	-	-	-	-	-	-	-	-

57	EC 251876	46.00	-	-	-	-	-	-	-	-
58	EC 280149	49.00	-	-	-	-	-	-	-	-
59	EC 2487469	49.00	-	-	-	-	-	-	-	-
60	EC 289099	46.00	-	-	-	-	-	-	-	-
61	AGS 186 A	48.00	-	-	-	-	-	-	-	-
62	EC 291397	49.00	-	-	-	-	-	-	-	-
63	EC 291398	48.00	-	-	-	-	-	-	-	-
64	EC 291403	45.00	-	-	-	-	-	-	-	-
65	EC 291451	43.00	-	-	-	-	-	-	-	-
66	EC 291453	51.00	-	-	-	-	-	-	-	-
67	EC 309537	46.00	-	-	-	-	-	-	-	-
68	EC 30967 A	47.00	-	-	-	-	-	-	-	-
69	EC 313974	47.00	-	-	-	-	-	-	-	-
70	EC 325103	41.00	-	-	-	-	-	-	-	-
71	EC 325113	51.00	-	-	-	-	-	-	-	-
72	EC 338721 B	46.00	94.00	47.30	11.20	7.40	31.50	100.00	1.6	8.03
73	EC 333929	41.00	93.00	44.60	10.40	7.20	26.50	50.00	1.1	8.33
74	EC 39044	49.00	-	-	-	-	-	-	-	-
75	EC 39107	46.00	-	-	-	-	-	-	-	-
76	EC 39177	45.00	-	-	-	-	-	-	-	-
77	EC 39513	48.00	-	-	-	-	-	-	-	-
78	EC 39743	49.00	-	-	-	-	-	-	-	-
79	EC 76759	56.00	-	-	-	-	-	-	-	-
80	EPS1B	41.00	-	-	-	-	-	-	-	-
81	FASSY Cook	41.00	-	-	-	-	-	-	-	-
82	G 47	46.00	-	-	-	-	-	-	-	-
83	G 2	41.00	-	-	-	-	-	-	-	-
84	GP 4	50.00	-	-	-	-	-	-	-	-
85	GP 7	51.00	-	-	-	-	-	-	-	-
86	GPC 34 A	52.00	-	-	-	-	-	-	-	-
87	EC 33940	46.00	92.00	68.40	12.40	13.50	35.60	50.00	0.5	9.85

88	GO 3465	57.00	-	-	-	-	-	-	-	-
89	G 10525	58.00	94.00	68.50	17.50	13.50	62.40	300.00	3.1	7.23
90	G 2225	58.00	96.00	66.00	13.20	14.60	55.00	150.00	2.0	8.84
91	G 288	43.00	-	-	-	-	-	-	-	-
92	G 4 P 15	41.00	90.00	40.00	13.00	12.60	28.50	150.00	2.3	8.94
93	GP 465	43.00	92.00	46.30	13.00	12.70	42.50	200.00	5.0	8.33
94	H2P2	41.00	92.00	38.40	12.40	15.00	28.00	100.00	1.5	7.84
95	JSM 227	41.00	94.00	48.60	13.20	11.40	42.50	150.00	2.1	8.33
96	K 53	41.00	93.00	36.50	9.00	3.40	16.00	20.00	0.4	8.02
97	KB 17	46.00	-	-	-	-	-	-	-	-
98	KDS 256	46.00	-	-	-	-	-	-	-	-
99	LEE 54	46.00	93.00	45.00	10.50	7.50	28.40	50.00	0.7	7.20
100	SL (E) 1	47.00	95.00	60.50	13.20	8.00	36.50	200.00	4.1	12.18
101	SQL 37	40.00	89.00	43.00	10.20	7.00	27.50	100.00	1.8	9.03
102	WT 88	43.00	94.00	43.50	9.40	8.20	30.50	100.00	2.0	8.50
103	EC 528675	58.00	96.00	65.00	17.50	22.00	82.50	400.00	6.6	6.58
104	EC 528640	43.00	-	-	-	-	-	-	-	-
105	EC 538830	43.00	92.00	47.50	8.00	7.00	28.40	50.00	0.9	8.92
106	EC 468597	44.00	94.00	44.00	9.00	6.00	22.50	100.00	1.6	9.52
107	EC 572160	44.00	94.00	44.00	9.00	5.00	18.00	50.00	0.8	7.09
108	EC 590225	49.00	95.00	58.40	14.50	9.00	46.80	20.00	0.3	7.19
109	PI 204336	41.00	96.00	32.50	9.20	7.00	22.40	50.00	1.2	9.26
110	PI 210178	57.00								
111	SPI 4	50.00	92.00	38.50	9.00	3.00	32.00	50.00	0.9	9.64
112	TGX 1488-9-ID	46.00	93.00	48.00	12.00	6.00	20.40	50.00	0.7	8.93
113	TG X 293-71 E	57.00	-	-	-	-	-	-	-	-
114	TG X 702- 4-8	46.00	-	-	-	-	-	-	-	-
115	TG X 849-813	49.00	93.00	49.00	12.40	10.00	42.60	50.00	0.8	9.85
116	TG X 849-13-4	57.00	89.00	62.50	20.40	22.50	90.00	250.00	4.0	6.73
117	VLS 11	46.00	90.00	50.60	10.60	4.30	23.50	250.00	2.6	7.09
118	EC 23001 B	43.00	90.00	51.00	10.00	2.60	22.00	250.00	2.8	8.56

119	EC 350664	43.00	91.00	36.50	7.00	8.30	26.50	250.00	5.0	8.54
120	377883 B	43.00	88.00	46.30	10.00	5.40	28.70	200.00	4.7	10.37
121	GC 84051-32-1	44.00	89.00	48.40	10.60	7.80	32.50	100.00	1.7	8.30
122	VP 1147-1	46.00	89.00	64.50	10.20	8.30	33.30	100.00	1.7	8.12
123	JS 20-37	46.00	92.00	51.00	10.00	8.20	30.50	50.00	0.7	9.97
124	JS 20-86	42.00	91.00	50.40	8.40	7.60	38.50	100.00	1.3	10.62
125	JS 20-50	37.00	90.00	54.20	11.00	8.00	24.60	50.00	0.7	9.26

Table 12: Descriptive statistics for Multi-location Germplasm Evaluation at Jabalpur

	Days to 50% Flowering	**Days to Maturity**	**Plant Height (cm)**	**No. of Nodes per Plant**	**No. of Pod Clusters per Plant**	**No. of Pods per Plant**	**Row yield**	**Seed Yield per Plant (gm)**	**100 Seed weight (gm)**
Mean	45.62	92.52	48.86	11.50	9.06	33.34	130.69	-	8.74
Min.	37.00	88.00	32.50	6.00	2.10	12.20	20.00	-	6.58
Max.	59.00	104.00	76.60	20.40	23.00	90.00	440.00	-	12.18
CV(%)	11.27	2.76	21.65	28.54	56.88	46.69	75.08	-	13.47
JS 95-60 (CK)	35.00	82.00	35.00	6.50	6.30	15.50	50.00	-	11.26
JS 335(CK)	46.00	92.00	42.50	9.30	10.50	30.60	150.00	-	10.20
JS 20-98(CK)	47.00	96.00	48.50	10.00	14.80	66.50	250.00	-	10.65
NRC 37(CK)	45.00	96.00	55.50	12.40	10.60	32.60	100.00	-	9.84
NRC 86(CK)	47.00	98.00	40.60	10.40	11.40	36.50	150.00	-	8.94

Table 13: Evaluation of Germplasm at Multi-location- Parbhani

S.No	Genotype	Days to 50% Flower -ing	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
1	VI 1199	36.00	99.00	64.60	22.00	18.00	57.80	250.10	6.10	8.70
2	VI 1206-9	47.00	112.00	119.00	18.60	16.00	50.40	468.00	8.35	10.00
3	EC 389153	57.00	122.00	93.20	30.00	24.00	75.60	257.00	5.35	8.40
4	EC389154 B	43.00	105.00	91.20	26.00	22.00	70.20	373.00	8.28	11.04
5	EC 389154 C	42.00	105.00	58.60	16.60	14.00	45.40	262.00	6.24	9.90
6	EC 389164	46.00	108.00	61.60	18.00	16.00	60.00	385.00	6.53	8.20
7	EC 389170	43.00	103.00	41.00	15.40	13.00	37.60	186.00	3.10	5.05
8	EC 389179 B	42.00	102.00	41.60	20.60	17.00	60.40	411.00	6.96	9.70
9	EC 390981 A	45.00	108.00	71.20	25.00	22.00	76.40	384.00	6.40	7.90
10	EC 390981 B	42.00	102.00	58.80	18.00	15.00	57.20	514.00	8.86	11.40
11	EC 391164	44.00	104.00	41.60	14.20	12.00	45.60	452.00	8.37	13.70
12	EC 391181	42.00	102.00	61.20	19.40	17.00	58.00	432.00	9.19	13.20
13	EC 393222	56.00	120.00	76.20	13.00	10.00	23.60	253.00	4.44	9.40
14	EC 391316	41.00	101.00	56.40	20.00	18.00	70.80	440.00	7.59	10.10
15	EC 391332	37.00	98.00	53.20	10.00	8.00	27.80	360.00	6.55	10.40
16	EC 391346	41.00	102.00	50.80	11.00	9.00	30.40	334.00	5.76	10.10
17	EC 396055	47.00	110.00	60.80	15.80	12.00	49.20	400.00	7.14	10.40
18	EC 396057	41.00	100.00	41.60	15.60	13.00	61.00	415.00	7.55	10.30
19	EC 396059	41.00	100.00	52.80	17.20	14.00	67.60	447.00	8.28	10.70
20	EC 396065	42.00	103.00	45.20	18.00	15.00	62.00	432.00	7.71	10.10
21	EC 389173	40.00	100.00	51.00	18.00	15.00	66.20	426.00	7.75	11.90
22	EC 389166	40.00	100.00	42.60	18.00	14.00	62.20	438.00	8.11	12.20
23	EC 393224	41.00	101.00	59.00	17.20	14.40	32.80	293.00	5.43	11.12
24	EC 393228	41.00	101.00	53.20	20.00	17.00	53.00	314.00	5.41	9.08
25	EC 393231	41.00	101.00	52.40	18.00	15.00	42.20	368.00	7.51	11.50

26	G 2258	40.00	101.00	53.80	15.00	12.00	31.60	450.00	8.18	10.90
27	G 2263	46.00	110.00	92.40	20.80	17.00	62.00	398.00	7.11	11.70
28	DCB 137	37.00	97.00	44.60	18.00	16.00	59.60	362.00	6.70	9.70
29	EC 457214	39.00	100.00	54.80	18.00	16.00	60.60	447.00	7.71	10.60
30	DE 201	36.00	96.00	83.20	24.00	20.00	70.40	552.00	9.52	11.20
31	DN 290	37.00	97.00	50.00	13.00	11.00	37.60	341.00	5.88	10.70
32	AGS 12	38.00	99.00	44.80	19.00	17.00	57.40	469.00	7.95	12.60
33	DS 201	37.00	97.00	89.00	21.00	18.00	61.80	454.00	7.69	10.60
34	EC 100778	44.00	105.00	61.00	22.00	18.00	57.80	237.00	4.02	6.40
35	EC 103336	40.00	102.00	51.40	12.00	10.00	33.00	362.00	6.35	11.30
36	EC 106998	41.00	102.00	60.60	18.00	15.60	37.00	330.00	5.59	10.80
37	EC 107407	41.00	102.00	60.00	17.00	14.60	39.40	382.00	6.95	10.60
38	EC 109540	41.00	102.00	59.20	20.00	17.00	51.60	443.00	7.91	11.90
39	EC 109543	42.00	103.00	59.80	16.40	13.00	38.80	366.00	6.31	10.60
40	EC 113778	43.00	104.00	58.20	16.00	14.20	32.60	359.00	6.30	11.60
41	EC 114572	41.00	102.00	53.40	19.00	15.00	42.80	462.00	7.97	12.30
42	EC 16213	37.00	97.00	29.40	20.00	17.00	52.80	408.00	8.33	12.00
43	EC 172613	41.00	102.00	50.00	21.00	18.00	62.40	418.00	7.09	10.80
44	EC 172663	40.00	100.00	61.80	23.00	20.00	69.40	440.00	8.30	11.50
45	EC 173325	34.00	94.00	29.20	10.00	8.00	33.20	393.00	7.21	13.80
46	EC 241708	40.00	100.00	51.20	28.00	25.00	72.00	407.00	7.14	10.80
47	EC241709	42.00	102.00	55.00	25.00	22.80	61.80	498.00	8.44	11.03
48	EC 393237	42.00	102.00	33.00	27.00	23.00	67.60	296.00	6.04	10.90
49	EC 242072	42.00	102.00	66.60	28.00	26.00	76.40	418.00	7.21	10.40
50	EC 242105	44.00	105.00	79.80	30.00	26.00	79.00	412.00	7.11	9.10
51	EC 242111	41.00	102.00	43.80	18.60	15.00	68.60	454.00	7.96	11.20
52	EC 250586	41.00	102.00	57.80	20.00	17.80	56.20	448.00	7.72	11.60
53	AGS 163	32.00	92.00	24.00	22.00	19.00	67.80	382.00	6.95	10.40
54	AGS 164	36.00	96.00	42.20	20.00	17.00	47.80	366.00	6.31	9.70
55	EC 251501	43.00	103.00	47.20	24.00	19.00	54.60	360.00	6.32	9.90
56	AGS 174	41.00	101.00	59.60	22.00	20.40	60.60	401.00	6.80	10.90

57	EC 251876	40.00	100.00	53.80	24.00	20.60	62.80	412.00	7.10	11.40
58	EC 280149	44.00	105.00	49.00	15.00	13.00	41.80	343.00	6.02	9.50
59	EC 2487469	48.00	108.00	41.40	18.00	15.00	50.00	350.00	6.03	9.70
60	EC 289099	42.00	102.00	57.60	22.00	18.00	54.00	418.00	7.21	9.90
61	AGS 186 A	42.00	102.00	44.60	18.00	14.00	41.60	336.00	5.90	9.80
62	EC 291397	42.00	102.00	49.80	17.40	14.00	38.80	365.00	6.64	11.00
63	EC 291398	41.00	101.00	48.80	14.00	11.00	32.00	383.00	7.03	10.20
64	EC 291403	41.00	101.00	29.80	15.00	12.00	32.80	284.00	4.90	9.90
65	EC 291451	42.00	102.00	59.80	22.00	19.20	52.20	475.00	8.05	11.50
66	EC 291453	47.00	107.00	79.80	22.00	19.00	65.20	371.00	6.29	8.60
67	EC 309537	40.00	100.00	73.20	18.00	14.00	39.40	368.00	6.34	10.60
68	EC 30967 A	41.00	101.00	57.60	15.20	11.00	32.40	440.00	7.46	11.90
69	EC 313974	42.00	102.00	62.60	22.00	18.00	68.00	366.00	6.31	8.40
70	EC 325103	40.00	100.00	52.40	16.00	13.00	41.80	530.00	8.83	14.50
71	EC 325113	45.00	105.00	97.20	15.00	12.00	49.80	278.00	5.67	7.70
72	EC 338721 B	41.00	100.00	49.40	14.00	11.00	33.60	360.00	6.10	11.00
73	EC 333929	41.00	100.00	46.60	17.00	13.00	46.80	480.00	8.00	11.30
74	EC 39044	45.00	104.00	62.20	18.00	15.00	40.40	390.00	6.72	10.60
75	EC 39107	41.00	100.00	61.20	14.00	11.00	45.40	439.00	7.44	14.00
76	EC 39177	41.00	102.00	25.80	18.00	14.00	44.20	339.00	5.95	10.16
77	EC 39513	41.00	102.00	52.60	13.60	10.00	26.60	345.00	5.95	10.10
78	EC 39743	46.00	106.00	111.00	18.00	14.00	48.60	320.00	5.42	9.50
79	EC 76759	46.00	106.00	89.80	24.00	21.00	61.00	326.00	5.53	8.50
80	EPS1B	34.00	95.00	27.20	13.20	9.00	24.60	318.00	5.48	10.80
81	FASSY COOK	34.00	95.00	51.80	17.00	13.00	39.40	328.00	5.75	8.50
82	G 47	41.00	101.00	58.00	17.00	13.00	37.60	352.00	6.07	9.90
83	G 2	35.00	95.00	59.40	13.00	10.00	26.60	257.00	5.04	10.70
84	GP 4	49.00	110.00	87.80	14.00	11.00	35.00	294.00	5.16	8.60
85	G P7	47.00	108.00	114.00	14.00	10.00	29.00	211.00	3.91	7.90
86	GPC 34 A	47.00	109.00	134.80	20.00	17.00	52.00	382.00	6.95	10.10
87	EC 33940	41.00	102.00	60.40	18.00	14.00	49.00	405.00	7.10	10.30

88	GO 3465	53.00	117.00	124.00	24.00	20.00	66.40	334.00	5.76	8.30
89	G 10525	52.00	117.00	116.00	25.00	20.00	60.20	261.00	5.94	8.90
90	G 2225	49.00	115.00	110.40	25.00	22.00	68.00	362.00	6.71	9.70
91	G 288	39.00	100.00	59.20	20.00	17.00	59.80	428.00	7.38	12.50
92	G 4 P15	36.00	96.00	29.60	21.80	16.60	42.00	490.00	8.17	14.60
93	GP 465	36.00	96.00	38.80	24.00	18.00	55.40	388.00	6.58	9.09
94	H2 P2	35.00	95.00	29.20	17.80	15.80	36.60	406.00	7.00	13.20
95	JSM 227	40.00	100.00	36.20	22.20	19.60	42.20	342.00	6.00	10.30
96	K 53	40.00	100.00	50.60	24.00	20.00	59.40	290.00	5.80	8.70
97	KB17	42.00	102.00	56.00	18.00	14.00	39.20	306.00	5.28	8.80
98	KDS 256	41.00	101.00	57.60	17.20	14.00	45.00	348.00	5.90	10.50
99	LEE 54	42.00	102.00	70.40	18.00	14.00	59.80	363.00	6.25	9.20
100	SL (E)1	42.00	102.00	86.60	20.00	17.00	51.20	360.00	6.43	11.70
101	SQL 37	37.00	97.00	30.00	20.00	17.00	64.60	398.00	6.86	12.40
102	WT 88	38.00	98.00	29.60	18.00	14.00	45.80	385.00	6.75	13.30
103	EC 528675	53.00	115.00	56.80	20.00	18.00	72.00	211.00	6.20	7.50
104	EC 528640	41.00	100.00	53.20	18.00	14.00	63.60	371.00	6.29	10.50
105	EC 538830	39.00	99.00	60.80	20.00	17.00	61.00	420.00	7.12	9.50
106	EC 468597	42.00	102.00	59.00	22.00	19.00	66.80	428.00	7.38	10.00
107	EC 572160	40.00	100.00	56.00	24.00	21.00	70.60	368.00	6.46	9.40
108	EC 590225	47.00	110.00	84.00	18.00	14.00	50.80	318.00	5.48	8.60
109	PI 204336	38.00	100.00	28.20	19.00	16.00	54.80	401.00	6.91	11.08
110	PI 210178	44.00	105.00	87.80	19.60	16.00	60.20	208.00	3.92	4.40
111	SPI 4	44.00	105.00	87.40	18.40	14.00	40.40	329.00	5.77	8.80
112	TGX 1488-9-ID	44.00	105.00	60.40	17.40	14.00	54.40	290.00	5.80	9.10
113	TGX 293-71 E	47.00	108.00	113.40	20.00	17.00	56.00	284.00	5.56	8.60
114	TGX 702-4-8	42.00	102.00	41.80	20.00	17.00	52.00	378.00	6.63	11.80
115	TGX 849-813	45.00	110.00	45.20	22.00	18.00	64.00	354.00	6.74	10.10
116	TGX 849-13-4	59.00	120.00	85.60	15.00	11.00	31.40	206.00	4.53	10.38
117	VLS 11	44.00	108.00	64.60	13.00	10.00	32.20	228.00	4.00	6.90
118	EC 23001 B	39.00	101.00	47.00	20.00	17.00	58.60	436.00	7.52	10.30

119	EC 350664	40.00	100.00	49.00	20.00	16.60	40.00	267.00	4.61	8.80
120	377883 B	39.00	99.00	52.80	20.00	17.60	52.00	440.00	7.46	12.30
121	GC 84051-32- 1	41.00	101.00	82.20	21.20	17.00	54.00	282.00	5.42	10.50
122	VP 1147A	43.00	102.00	114.60	25.00	21.00	70.20	394.00	6.91	10.20
123	JS 20-37	42.00	101.00	65.00	25.00	22.00	75.40	362.00	6.24	8.10
124	JS 20-86	39.00	99.00	80.00	20.00	17.00	60.60	430.00	7.54	11.70
125	JS 20-50	40.00	100.00	58.60	20.00	16.00	58.40	402.00	7.73	10.90

Table 14: Descriptive statistics for Multi-location Germplasm Evaluation at Parbhani

	Days to 50% Flowering	**Days to Maturity**	**Plant Height (cm)**	**No. of Nodes per Plant**	**No. of Pod Clusters per Plant**	**No. of Pods per Plant**	**Row yield (gm)**	**Seed Yield per Plant (gm)**	**100 Seed weight (gm)**
Mean	41.9	102.6	60.9	19.1	15.9	51.9	370.7	6.6	10.3
CV (%)	10.5	37.0	5.1	20.7	23.7	26.3	19.8	17.7	16.2
Minimum	32	92	24	10	8	23.6	186	3.1	4.4
Maximum	59	122	134.8	30	26	79	552	9.5	14.6
NRC 86 (CK)	37	98	48	18	15	43	298	6	11
JS 20-34 (CK)	28	88	30	11	8	20	252	5	12
JS 20-29 (CK)	38	99	48	14	11	30	350	6	12
JS 20-69 (CK)	36	97	46	17	13	45	342	6	10
JS 20-98 (CK)	37	97	41	16	12	37	279	6	11

Table 15: Evaluation of Germplasm at Multi-location- Palampur

S.No	Genotype	Days to 50% Flower-ing	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
1	VP 1199	57.00	126.00	75.00	-	-	32.00	-	6.50	10.70
2	VP 1206-9	68.00	136.00	105.00	-	-	42.00	-	6.80	12.90
3	EC 389153	68.00	137.00	95.00	-	-	18.00	-	5.80	8.10
4	EC 389154 B	68.00	135.00	61.00	-	-	29.00	-	5.70	8.80
5	EC 389154 C	68.00	127.00	60.00	-	-	53.00	-	4.90	9.80
6	EC 389164	69.00	134.00	83.00	-	-	29.00	-	4.80	8.60
7	EC 389170	63.00	133.00	51.00	-	-	27.00	-	6.00	7.70
8	EC 389179 B	61.00	136.00	50.00	-	-	26.00	-	7.10	9.50
9	EC 390981 A	63.00	137.00	86.00	-	-	20.00	-	4.50	8.50
10	EC 390981 B	63.00	124.00	61.00	-	-	24.00	-	6.00	10.00
11	EC 391164	57.00	127.00	49.00	-	-	26.00	-	6.20	10.50
12	EC 391181	63.00	137.00	54.00	-	-	27.00	-	5.50	9.10
13	EC 393222	59.00	137.00	75.00	-	-	22.00	-	4.50	7.80
14	EC 391316	64.00	128.00	58.00	-	-	27.00	-	4.00	9.80
15	EC 391332	68.00	128.00	60.00	-	-	20.00	-	9.50	9.20
16	EC 391346	70.00	122.00	60.00	-	-	29.00	-	6.00	11.40
17	EC 396055	69.00	137.00	83.00	-	-	15.00	-	4.50	7.50
18	EC 396057	64.00	123.00	61.00	-	-	26.00	-	7.00	8.60
19	EC 396059	69.00	123.00	63.00	-	-	17.00	-	4.50	9.00
20	EC 396065	68.00	124.00	56.00	-	-	32.00	-	4.00	10.10
21	EC 389173	57.00	123.00	46.00	-	-	27.00	-	4.20	9.20
22	EC 389166	60.00	135.00	43.00	-	-	16.00	-	4.40	9.30
23	EC 393224	61.00	127.00	71.00	-	-	20.00	-	5.00	9.20
24	EC 393228	64.00	137.00	77.00	-	-	19.00	-	5.50	9.20
25	EC 393231	64.00	126.00	50.00	-	-	20.00	-	5.20	9.60

26	G 2258	68.00	123.00	39.00	-	-	16.00	-	3.50	8.60
27	G 2263	68.00	129.00	63.00	-	-	17.00	-	6.00	9.70
28	DCB 137	60.00	132.00	35.00	-	-	16.00	-	3.60	10.80
29	EC 457214	60.00	124.00	40.00	-	-	20.00	-	5.90	10.60
30	DE 201	60.00	124.00	54.00	-	-	17.00	-	5.30	11.20
31	DN 290	58.00	122.00	47.00	-	-	23.00	-	5.00	12.00
32	AGS 12	59.00	122.00	49.00	-	-	20.00	-	5.40	13.80
33	DS 201	68.00	129.00	66.00	-	-	29.00	-	6.00	11.20
34	EC 100778	69.00	127.00	51.00	-	-	20.00	-	5.20	7.90
35	EC 103336	59.00	123.00	50.00	-	-	30.00	-	9.00	16.00
36	EC 106998	69.00	122.00	53.00	-	-	19.00	-	4.50	9.60
37	EC 107407	70.00	123.00	50.00	-	-	24.00	-	4.50	9.20
38	EC 109540	70.00	123.00	55.00	-	-	30.00	-	6.20	11.70
39	EC 109543	70.00	127.00	56.00	-	-	37.00	-	6.50	10.60
40	EC 113778	69.00	122.00	46.00	-	-	18.00	-	4.50	9.30
41	EC 114572	69.00	129.00	47.00	-	-	21.00	-	4.80	10.50
42	EC 16213	58.00	129.00	52.00	-	-	32.00	-	5.50	12.40
43	EC 172613	70.00	128.00	43.00	-	-	38.00	-	5.00	11.70
44	EC 172663	70.00	133.00	43.00	-	-	30.00	-	6.20	10.80
45	EC 173325	58.00	124.00	45.00	-	-	19.00	-	4.60	15.20
46	EC 241708	61.00	136.00	55.00	-	-	33.00	-	5.00	9.60
47	EC 241709	70.00	137.00	64.00	-	-	28.00	-	5.40	15.20
48	EC 393237	69.00	129.00	34.00	-	-	46.00	-	3.00	12.60
49	EC 242072	62.00	123.00	63.00	-	-	53.00	-	6.00	11.60
50	EC 242105	63.00	137.00	69.00	-	-	41.00	-	9.50	9.00
51	EC 242111	70.00	123.00	51.00	-	-	35.00	-	5.60	9.80
52	EC 250586	70.00	123.00	67.00	-	-	48.00	-	3.50	6.80
53	AGS 163	57.00	137.00	42.00	-	-	22.00	-	4.20	12.50
54	AGS 164	68.00	129.00	42.00	-	-	30.00	-	4.00	9.90
55	EC 251501	68.00	129.00	40.00	-	-	22.00	-	4.30	9.40
56	AGS 174	70.00	127.00	52.00	-	-	31.00	-	4.50	10.70

57	EC 251876	70.00	127.00	49.00	-	-	20.00	-	4.80	10.60
58	EC 280149	70.00	124.00	40.00	-	-	25.00	-	5.00	13.10
59	EC 2487469	62.00	124.00	71.00	-	-	33.00	-	5.40	12.00
60	EC 289099	70.00	137.00	60.00	-	-	30.00	-	5.00	11.00
61	AGS 186 A	63.00	123.00	61.00	-	-	29.00	-	5.20	10.60
62	EC 291397	70.00	127.00	69.00	-	-	27.00	-	5.10	12.20
63	EC 291398	70.00	126.00	57.00	-	-	31.00	-	5.00	11.80
64	EC 291403	70.00	122.00	55.00	-	-	20.00	-	6.00	8.30
65	EC 291451	70.00	122.00	53.00	-	-	19.00	-	4.00	8.80
66	EC 291453	70.00	124.00	58.00	-	-	23.00	-	4.60	7.30
67	EC 309537	70.00	124.00	44.00	-	-	31.00	-	6.10	15.30
68	EC 30967 A	70.00	124.00	45.00	-	-	36.00	-	4.50	9.70
69	EC 313974	70.00	137.00	52.00	-	-	27.00	-	5.00	10.80
70	EC 325103	70.00	124.00	39.00	-	-	22.00	-	6.00	11.60
71	EC 325113	72.00	137.00	73.00	-	-	23.00	-	7.80	12.60
72	EC 33872 B	72.00	127.00	55.00	-	-	21.00	-	3.60	10.10
73	EC 333929	62.00	124.00	45.00	-	-	20.00	-	3.20	10.30
74	EC 39044	68.00	135.00	62.00	-	-	29.00	-	7.00	8.20
75	EC 39107	68.00	122.00	57.00	-	-	14.00	-	5.20	11.80
76	EC 39177	70.00	122.00	68.00	-	-	21.00	-	7.80	10.20
77	EC 39513	70.00	122.00	56.00	-	-	22.00	-	8.20	10.40
78	EC 39743	72.00	136.00	75.00	-	-	23.00	-	5.00	10.60
79	EC 76759	72.00	133.00	71.00	-	-	20.00	-	5.00	7.80
80	EPS 1B	60.00	133.00	43.00	-	-	19.00	-	3.00	10.00
81	FASSY COOK	61.00	123.00	52.00	-	-	24.00	-	4.50	11.40
82	G 47	62.00	123.00	56.00	-	-	18.00	-	10.20	9.70
83	G 2	60.00	123.00	54.00	-	-	16.00	-	2.50	11.80
84	GP 4	68.00	127.00	69.00	-	-	29.00	-	9.00	14.00
85	GP 7	70.00	137.00	78.00	-	-	18.00	-	11.50	8.60
86	GPC 34 A	72.00	137.00	93.00	-	-	20.00	-	6.50	11.60
87	EC 33940	72.00	137.00	51.00	-	-	22.00	-	4.20	7.60

88	G 03465	68.00	137.00	106.00	-	-	31.00	-	6.00	8.20
89	G 10525	68.00	137.00	93.00	-	-	26.00	-	4.20	6.70
90	G 2225	78.00	137.00	95.00	-	-	28.00	-	3.50	11.60
91	G 288	62.00	122.00	75.00	-	-	29.00	-	8.50	10.20
92	G4P15	60.00	122.00	49.00	-	-	16.00	-	4.60	12.60
93	GP 465	63.00	136.00	66.00	-	-	29.00	-	7.20	13.80
94	H2P2	60.00	127.00	43.00	-	-	16.00	-	4.30	12.10
95	JSM 227	68.00	127.00	34.00	-	-	18.00	-	4.00	9.80
96	K 53	60.00	123.00	31.00	-	-	16.00	-	4.20	10.50
97	KB 17	68.00	123.00	45.00	-	-	20.00	-	3.50	8.60
98	KDS 256	58.00	123.00	63.00	-	-	25.00	-	7.50	12.70
99	LEE 54	70.00	122.00	52.00	-	-	29.00	-	4.50	10.40
100	SL E 1	70.00	122.00	58.00	-	-	30.00	-	4.20	9.90
101	SQL 37	63.00	127.00	44.00	-	-	17.00	-	4.50	11.20
102	WT 88	63.00	127.00	52.00	-	-	26.00	-	6.00	12.20
103	EC 528675	82.00	137.00	72.00	-	-	27.00	-	5.20	6.80
104	EC 528640	72.00	127.00	68.00	-	-	22.00	-	9.20	9.40
105	EC 538830	72.00	127.00	64.00	-	-	19.00	-	5.90	8.70
106	EC 468597	72.00	122.00	69.00	-	-	22.00	-	4.20	10.20
107	EC 572160	72.00	129.00	67.00	-	-	27.00	-	4.80	9.10
108	EC 590225	72.00	129.00	96.00	-	-	28.00	-	8.80	8.70
109	PI 204336	63.00	129.00	51.00	-	-	23.00	-	4.00	8.90
110	PI 210178	72.00	135.00	103.00	-	-	22.00	-	6.20	6.50
111	SPI 4	72.00	123.00	69.00	-	-	23.00	-	5.00	9.60
112	TGX1488-9-1D	72.00	137.00	61.00	-	-	18.00	-	4.60	8.20
113	TGX293-71E	72.00	122.00	99.00	-	-	27.00	-	4.20	12.20
114	TGX702-4-8	72.00	122.00	61.00	-	-	21.00	-	7.00	14.50
115	TGX849-813	72.00	135.00	75.00	-	-	27.00	-	4.20	10.60
116	TGX849-D-13-4	99.00	133.00	88.00	-	-	37.00	-	3.50	10.60
117	VLS 11	72.00	122.00	61.00	-	-	18.00	-	5.00	7.40
118	EC 23001 B	70.00	122.00	55.00	-	-	23.00	-	6.50	11.80

119	EC 350664	72.00	123.00	51.00	-	-	21.00	-	7.20	10.20
120	EC 377883 b	70.00	123.00	56.00	-	-	18.00	-	4.90	10.80
121	GC 84051-32-1	70.00	127.00	59.00	-	-	30.00	-	4.00	8.70
122	VP 1147 A	72.00	127.00	64.00	-	-	23.00	-	8.50	7.40
123	JS 20-37	68.00	123.00	57.00	-	-	17.00	-	5.00	9.40
124	JS 20-86	63.00	135.00	47.00	-	-	32.00	-	4.10	8.00
125	JS 20-50	70.00	135.00	67.00	-	-	20.00	-	6.20	10.80

Table 16: Descriptive statistics for Multi-location Germplasm Evaluation at Palampur

	Days to 50% Flowering	Days to Maturity	Plant Height (cm)	No. of Nodes per Plant	No. of Pod Clusters per Plant	No. of Pods per Plant	Row yield	Seed Yield per Plant (gm)	100 Seed weight (gm)
Mean	67.1	128.2	59.8	-	-	25.1	112.0	5.4	10.3
CV (%)	8.5	4.4	26.3	-	-	29.7	40.7	29.4	18.6
Minimum	57.0	122.0	31.0	-	-	14.0	35.0	2.5	6.5
Maximum	99.0	137.0	106.0	-	-	53.0	255.0	11.5	16.0
VLS-59 (CK)	58.4	121.2	46.6	-	-	20.6	113	5.8	14.2
PS-1556 (CK)	60.6	126.8	49.6	-	-	19.4	104	6.04	11.86
VLS-63 (CK)	58.6	121.4	45.4	-	-	23	141	6.44	14.04
Hara Soya (CK)	56.2	120.8	56.2	-	-	22.2	130	6.28	15.76
Himso 1685 (CK)	60.8	124.4	65.8	-	-	24.6	160.0	8.1	17.9

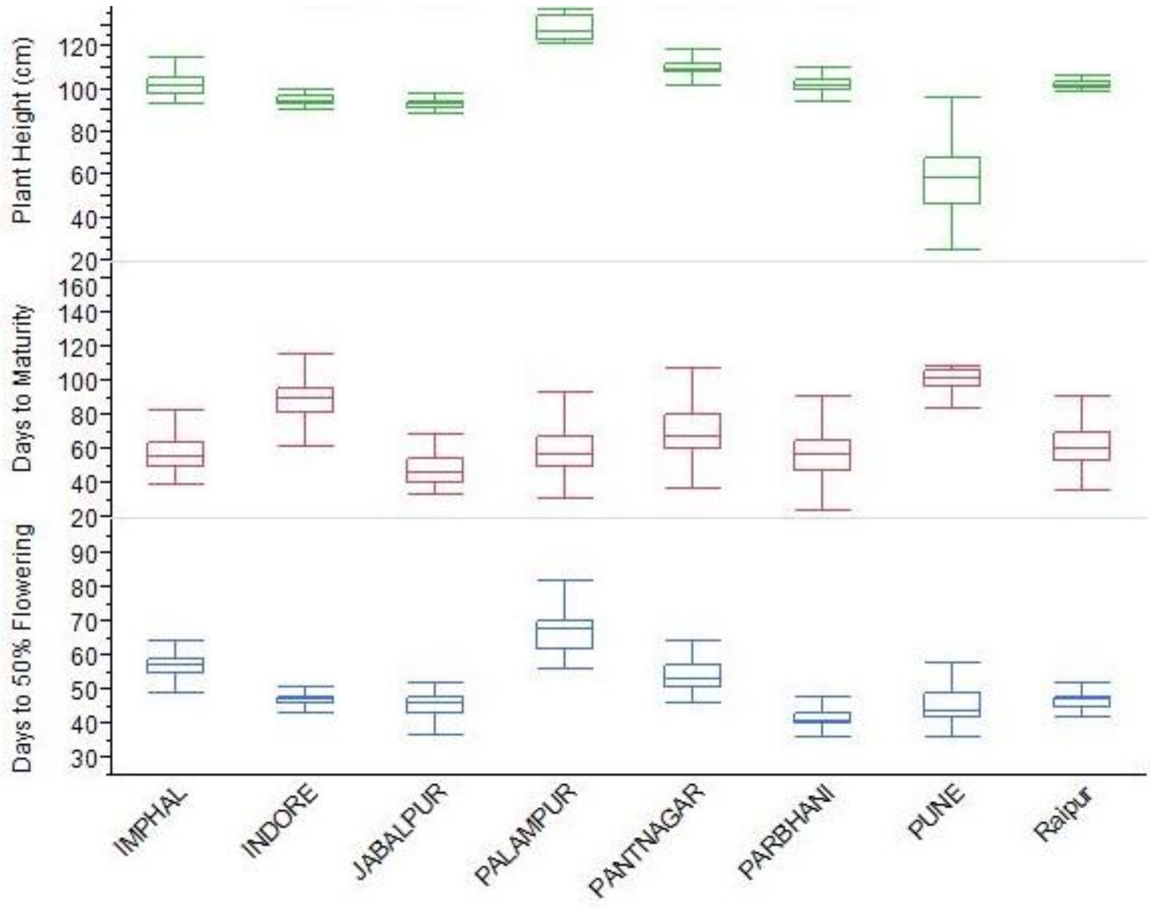

Fig 1: Box Plots for Days to Flower, Days to Maturity and Plant Height (cm) in 8 AICRP Centres

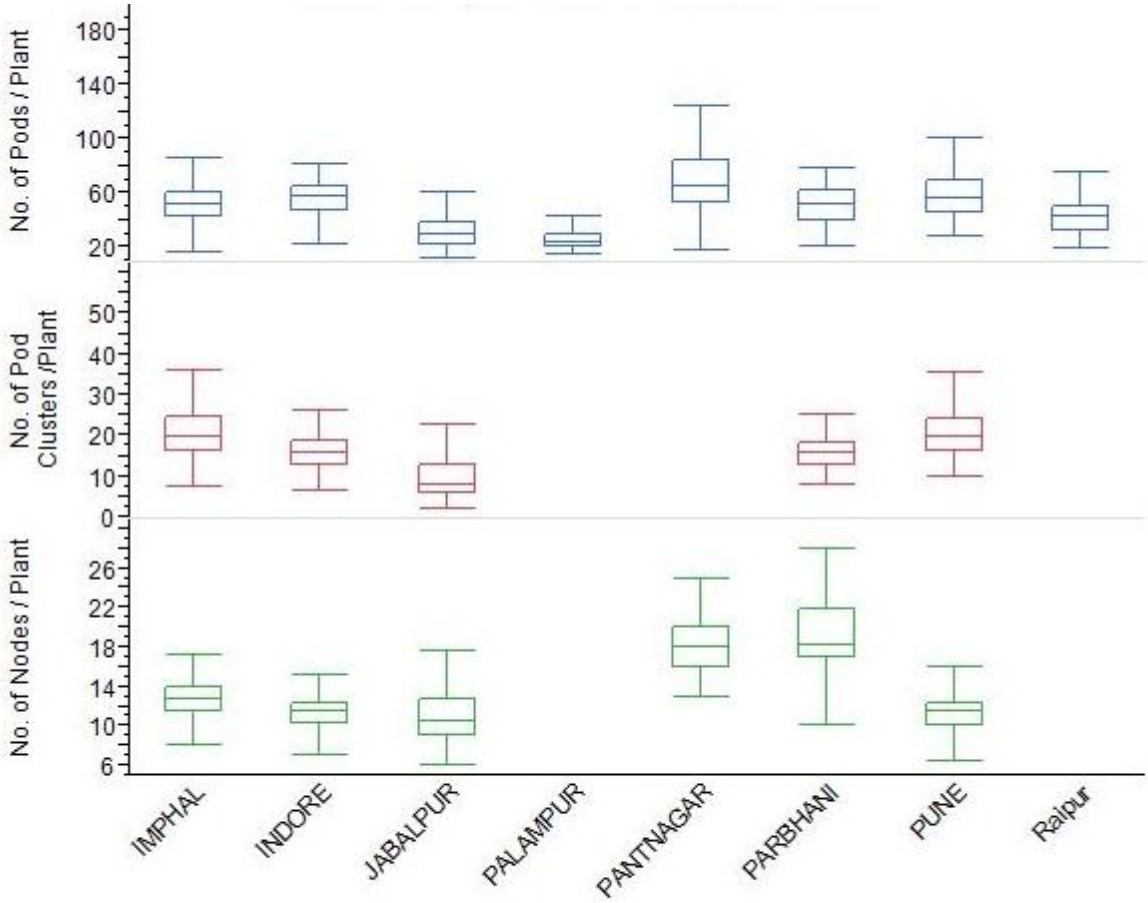

Fig 2: Box Plots for Number of Nodes / plant, Number of pods / plant and Number of pod cluster / plant in 8 AICRP Centres

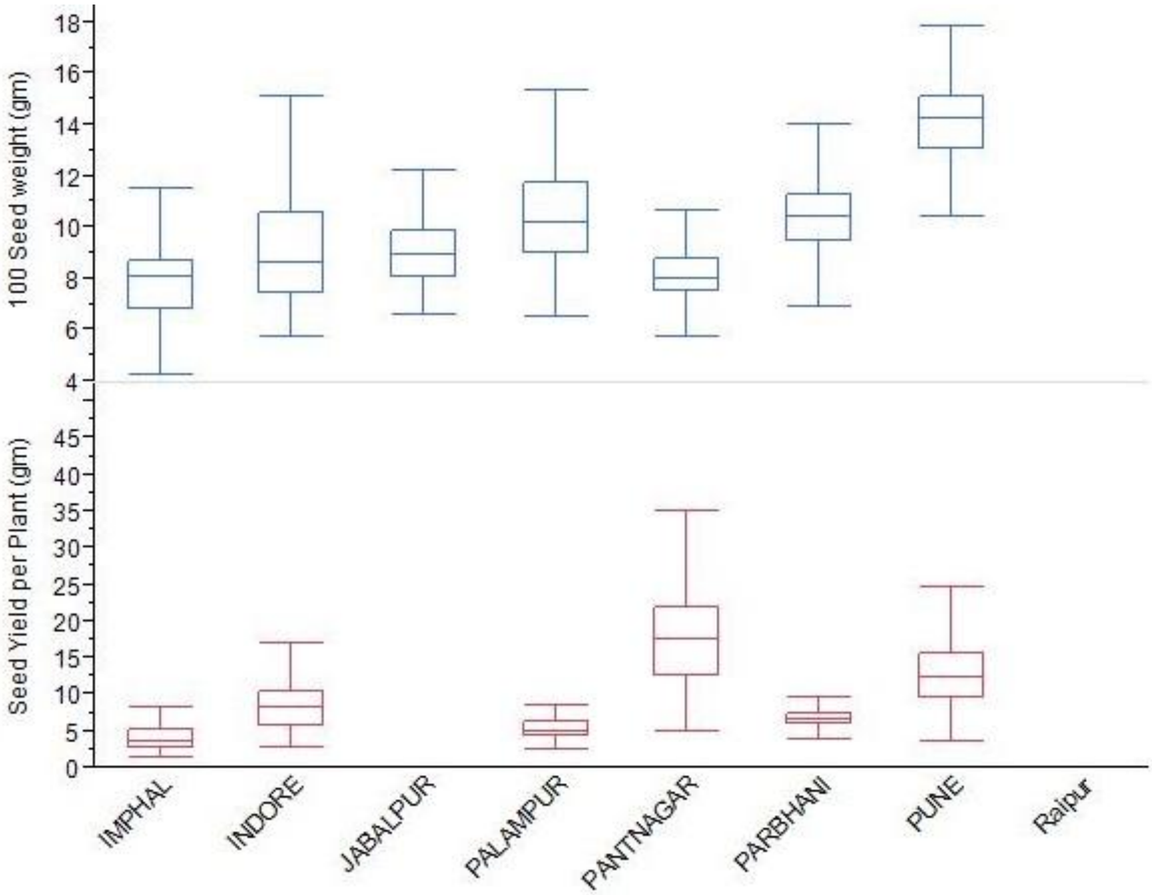

Fig 3: Box Plots for Seed Yield / Plant and 100 Seed Weight in 8 AICRP Centres

Appendix-III

National Hybridization Programme

Table 1: F1s nworg gnieb sertnec PRCIA morfin offseason nursery at UAS Bangalore during rabi-summer 2018-19

S. No.	Cross Combination	Number of seeds
Indore		
1.	C38 X RVS 2001-18	11
2.	C42 X RVS 2001-18	16
3.	C40 X RVS 2001-18	18
4.	C26 [JS 335 x (JS 335 x PI 416937)] X JS 335	10
5.	Cat 3293 X Young	20
6.	C41 x RVS 2001-18	09
7.	DS 3105 x JS 20-38	09
8.	JS 20-34 x JS 20-38	08
9.	JS 20-38 x JS 95-60	21
10.	10- JS 9560 x JS 20-38	15
Parbhani		
11.	NRC130 X SALIMER	12
12.	SKF 10-50 X EC 538828	10
13.	SKF 10-50XAMS100-39	15
14.	MAUS162 X AMS 100-39	10
15.	JS2029 X AMS 100-39	9
Almora		
16.	Salimer x VLS 63	34
17.	PS1556 x VLS89	27
Amreli		
18.	VLS-94XNRC-130	25
19.	VLS95XNRC137	20
Dharwad		
20.	DSB23 X DT-21	47
21.	MACS1575 X DSB23	28
22.	DSB23 X MACS1575	75
Palampur		
23.	CAT411AXNRC127	5
24.	NRC-136 X CAT 411	4
25.	HIMSOYAXNRC-52-1	3

Table 2: F2s nworg gnieb sertnec PRCIA morfin offseason nursery at UAS Bangalore during rabi-summer 2018-19

S. No.	Cross Combination
Dharwad	
1.	DSB23XEC242104
Bangalore	
2.	JS-97-52 X Bragg
3.	JS 9752 X PS1029
4.	PS 2041 X Tams 98-2
5.	MAUS 2 X Tams 98-2
6.	JS 2098 X PS 1029
7.	SL 958 X KDS 753
8.	PS 1556 x G 27
9.	CAT 3406 X KDS 753
10.	PS 1556 X SL 688
11.	JS 9041 X PK 472
12.	SL 958 X SL 688
13.	JS 9752 X 11-5B
14.	RVS 2001-118 X EC572086
15.	JS 9752 X NRC 37
16.	JS 2041 X SL 688
17.	JS 9752 X IVT (2)
18.	A3293 X JS 9041
19.	RVs 2001-18 X EC572086

Table 3: F3s nworg gnieb sertnec PRCIA morfin offseason nursery at UAS Bangalore during rabi-summer 2018-19

S. No.	Cross Combination
Dharwad	
1.	MACS1460XEC242104
Bangalore	
2.	PS 1029 X G-29
3.	EC546882 X MACS 450
4.	CAT 3406 x MACS 450
5.	JS 9752 X IVT 2016 (10)
6.	MAUS 612 X AGS 25
7.	SL 96 X 107-4

Table 4: F4s nworg gnieb sertnec PRCIA morfin offseason nursery at UAS Bangalore during rabi-summer 2018-19

S. No.	Cross Combination
Adilabad	
1.	PS1029XG-29
2.	JS97-52XLee
3.	JS97-52XIVT-2016
4.	JS97-52XSL688
5.	JS97-52XBragg
Imphal	
6.	PP6 X 2911-40
7.	KPS726XBNS-5
8.	DSB-23-02X52958
9.	CAT3406XMACS450
10.	MAUS71XAGS25
11.	EC546882 X JS 9752
12.	CAT3293 X NRC-2
13.	PS1556XDSB-21
14.	JS9752 X A9525
15.	JS9752XTAMS 98-21
Bangalore	
16.	Bragg X EC602288
17.	NRC 37 X JS 9560
18.	JS 9752 X JS 335
19.	CAT 44 X EC 1726017
20.	SL 955 X MAC 450
21.	MACS 460 X MACS 1410
22.	NRC 37 X EC 602288
23.	Bragg X JS 335
24.	MACS 1460 X EC 1760217
25.	JS 335 X LS 2038
26.	JS 9752 X Tams 51
27.	PS 1024 X G 29

Table5. Details of the segregating population of the crosses from AICRP centres advanced to F_3 generations at ICAR- IISR Indore during Kharif 2018

S. No.	Cross Combination	Number of 3 meter rows
Indore		
1.	JS 97-52 X EC 572086	10
2.	JS 97-52 X EC 572086	5
3.	SL 958 X (SL 958 X MACS 450)	4
4.	JS 20-98 X AK 887	10
5.	[(JS 20-34 X (JS 97-52 x EC 390977)] X PI 416937	10
6.	JS 90-41 X EC 538828	10
7.	JS 97-52 X (JS 97-52 x EC 390977)	11
8.	RVS 2001-18 X EC 572086	10

9.	RVS 2001-18 X EC 572154	12
10.	AGS 25 X NRC 130	10
11.	(JS 97-52 x EC 390977) X (JS 335 X YOUNG)	10
12.	SL 958 X AGS 25	10
13.	AGS 328 X RVS 2001-18	5
14.	JS 97-52 X AGS 25	10
15.	EC 572086 (SL 955 X JS 20-34)	5
16.	[(JS 97-52 x EC 325097 (55-8-3)] X JS 97-52)] X JS 90-41	8
17.	(JS 97-52 X (JS 97-52 x EC 390977)) X EC 572086	7
18.	(NRC 37 X JS 97-52) X EC 538828	9
19.	EC 77147 X RVS 2001-18	8
20.	[(F5-JS 97-52 x MACS 330) X SL 958)] X EC 572086	5
21.	JS 20-98 X PS 1029	6
22.	EC 572154 X (SL 958 X MACS 450)	7
23.	AGS 25 X EC 538828	10
24.	EC 572086 X RVS 2001-18	7
25.	F4(JS 97-52 x EC 333897) X (EC 602288 X JS 90-41)	4
26.	EC 55878 X RVS 2001-18	5
27.	JS 335 X (JS 335 X PI 416937)	2
28.	(JS 97-52 x AGS 25) X ADT-1) X PK 427	5
29.	[(JS 71-05 x Cat 2797) X JS 71-05)] X JS 71-05	2
30.	JS 20-34 X AK 887	7
31.	SL 96 X AGS 25	6
32.	EC 572086 X (SL 958 X MACS 450)	2
33.	EC 34087 X EC 538828	4
34.	(SL 958 X (JS 97-52 x EC 390977)) X JS 90-41	5
35.	SL 958 X JS 335	3
36.	EC 39028 X RVS 2001-18	1
37.	ADT 1 X AGS 25	1
38.	(JS 97-52 X (JS 97-52 x EC 390977)) X EC 572086	2
39.	EC 34087 X JS 20-29	11
40.	JS 20-34 X EC 771186	8
41.	PI 416937 X (F5 AGS 25 x JS 93-05)	1
42.	AGS 25 X EC 538828	3
43.	[(F5-JS 97-52 x MACS 330) X SL 958)] X EC 572086	2
44.	EC 572154 X DS 3106	1
45.	[(JS 71-05 x Cat 2797) X JS 71-05)] X JS 71-05	3
46.	RVS 2001-18 X PK 427	2
47.	(EC 602288 X JS 90-41)X F5-54	3
48.	AGS 25 X EC 390977	3
49.	(NRC 37 X JS 335) X NRC 121	2
50.	(F5-54 X SL 958) X JS 20-98	2
51.	(F5-54 X SL 958) X EC 572086	2
52.	F5-54 X PI 416937 (PI 416937)	2
53.	[(JS 71-05 x Cat 2797) X JS 71-05)] X JS 71-05	7
54.	EC 572154 X EC 572086	3
55.	(JS 97-52 x EC 390977) X EC 771112	1
56.	MACS13 X AGS 2	1
57.	(JS 97-52 x EC 390977) X DS 3106	1
58.	(JS 97-52 x EC 325097 (55-8-3) X JS 90-41	20
59.	JS 21-08 X NRC 121	6
60.	EC 572154 X RVS 2001-18	10
61.	CM60 X JS JS 335	1
62.	(55-8-3 (JS97-52 x EC 325097) X JS 97-52) X 90-41	10
63.	AGS 25 X G 27	15
64.	11-5B X (JS 335 X PI 416937)	20
65.	20-34 X JS 97-52	8
66.	SL 958 X JS 97-52	9
67.	MAUS 81 X EC 538828	1
68.	SL 958 X JS 20-29	1
69.	(EC 602288 X JS 90-41)X PI 416937	10

70.	JS 20-34 X RVS 2001-18	5
71.	(SL 955 X JS 20-34) EC 572086	3
72.	(JS 97-52 x EC 333897) X (EC 602288 X JS 90-41)	7
73.	(SL 958 X EC 390977) X EC 572154	2
74.	SL 958 X MACS 450	2
75.	(55-8-3 (JS97-52 x EC 325097) X [EC 390977] X JS 90-41)]	2
76.	(NRC 37 X JS 97-52) X EC 572086	2
77.	JS 97-52 X EC 538828	15
78.	(JS 97-52 x EC 390977) X MACS 450) X EC 572086	13
79.	RVS 2001-18 x AKS 887	10
80.	[(SL 958 X F5(JS 97-52 x MACS 330)] X EC 572154	10
81.	YOUNG X KAERI 651-6	1
82.	JS 21-08 X EC 538828	14
83.	SL 958 X AGS 25	5
84.	EC 55878 X EC 538828	4
85.	JS 97-52 x EC 390977 X [(JS 97-52 x AGS 25) X EC 390977 x EC 538828))	6
86.	(JS 97-52 x EC 390977) X (JS 335 X PI 416937)	3
	Parbhani	
87.	MAUS 158 X EC 538828	3
88.	JS 20-29 X MAUS 612	7
	Sehore	
89.	RVS 2001-2 X CODE 13	23
90.	RVS 2011-2 X JS 95-60	9
91.	RVS 2011-2 X JS 95-60	12
92.	JS 97-52 X KARUNE	10
93.	RVS 2007-6 X JS 20-116	4
94.	RVS 2007-6 X JS 20-34	4
	Almora	
95.	VLS 47 X EC 34057	2
	Dharwad	
96.	DSb 21 x DT 21	30
97.	DSb 21 X AGS 25	1
	Imphal	
98.	EC 383165 X DSB 19	10
99.	EC 383165 X JS 335	10
100.	EC 383165 X CAU SLC	10
	Ludhiana	
101.	SL 979 X EC 100027	17
102.	SL 979 X EC 538828	6
	Pantnagar	
103.	JS 335 X AGS 25	10
104.	CM60 X JS 335	1
	Pune	
105.	MACS 1188 X EC 103332	4
	Bangalore	
106.	MAUS 2 X SL 688	2
107.	MAUS 2 X TAMS 98-2	1
108.	CAT 3406 X RKS 18	20

Off-season nursery conducted by
Dr. T. Onkarappa
Principal Scientist (Plant Breeding) and Head
AICRP on Soybean
UAS, Bangaluru

Compilation of Monitoring Reports (*kharif* 2018)

Team 1	**: Dr. A.N. Sharma and Dr. S. D. Billore**
Centres:	**: Delhi, Ludhiana, Palampur and Srinagar**

Weather conditions at different centres during the season (date of monitoring):				
Parameters	**Delhi** (9-9-2018)	**Srinagar** (10.9.2018)	**Ludhiana** (11& 12.9.2018)	**Palampur** **(**13-14.9.2018 **)**
Onset of monsoon	--	--	June end	27.6.2018
Date of sowing	7.7.2018	--	July 6 onwards	16.6.2018
Rainfall distribution	--	--	Erratic	Above normal
Rainfall (mm)	864.9	--	626.4	2479.7
# Rainy days	--	--	20	94

Conduct of Trials: (Allotted / Conducted)				
Discipline	**Delhi**	**Srinagar**	**Ludhiana**	**Palampur**
Plant Breeding	3 / 3	2 / 2	2 / 2	2 / 2
Agronomy	2 / 2	--	4 / 4	1 / 1
Entomology	3 / 3	--	3 / 3	2 / 2
Pathology	4 / 4	--	4 / 4	7 / 7
Microbiology	5 / 5*	--	4 / 4	--

* MB 3/14 conducted at IARI field instead of Farmer's field

Germplasm:				
	Delhi	**Srinagar**	**Ludhiana**	**Palampur**
Total collection	1089	--	800	250
# Acquired - From	--	--	50 from IISR and 200 from USDA	125+600 lines from IISR, Indore
For Traits	--	--	YMV resistance	--
How used	--	--	YMV screening and PEQ	Being evaluated for different traits

Crosses made: (Parents / Pollinations)				
	Delhi	**Srinagar**	**Ludhiana**	**Palampur**
# Crosses	11 / 550	--	12/50 each	20 / In progress
Traits	Not mentioned	--	YMV resistance, yield, high protein, Vegetable type	Not mentioned

Generation Advancement:				
	Delhi	**Srinagar**	**Ludhiana**	**Palampur**
Generations advanced	F1 to F5; 38crosses	--	F1 to F6; 226 crosses; 797 progenies	F2 to F7; 71 crosses
Advanced generations received	--	--	--	--

Seed Production Programme: (Variety / Target / Expected in q)			
Delhi	**Srinagar**	**Ludhiana**	**Palampur**
<u>Breeder Seed</u>:			
Pusa 9712 / 2 / 2 Pusa 9814 / 1 / 1 Pusa 12 / 1 / 1 Pusa 05 / 1 / 1 Pusa 14 / 1 / 1	--	SL 958 / 1 / 5	Hara Soya / 3.0 / 17.0 Palam Soya/ 2.0 /18.0 Him Soya /00 /10.0 Shivalik / 00 / 18.0
<u>Nucleus Seed</u>: Stage I + Stage II (Variety / Target / Expected in kg)			
--	--	SL 688 / 30 / 30 SL 525 / 30 / 30 SL 744 / 30 / 30 SL 958 / 60 / 60	Hara Soya / -- / 250 Palam Soya/ -- /250 Him Soya /-- /120 Shivalik / --/ 250

Front Line Demonstrations: (Allotted / Conducted / Visited by Team)			
Delhi	**Srinagar**	**Ludhiana**	**Palampur**
NA	NA	10 / 10 / 3	10 / 35 / 5

Budget Utilization: AUC submitted			
Delhi	**Srinagar**	**Ludhiana**	**Palampur**
NA	NA	Yes	Yes

Comments of Monitoring Team:			
Delhi	**Srinagar**	**Ludhiana**	**Palampur**
Good	Satisfactory	Very Good	Good

Team 2	**: Dr. M.P. Sharma and Dr. Amar Singh**
Centres	**: Pantnagar, Almora and Majhera**

Weather conditions at different centres during the season (date of monitoring):			
Parameters	**Pantnagar** (17-18.09.2018)	**Majhera** (19.9.2018)	**Almora** (19-20.9.2018)
Onset of monsoon	28.6.2018	27.6.2018	--
Date of sowing	29.6.2018	29.6.2018	14.6.2018
Rainfall distribution	Normal	Normal	--
Rainfall (mm)	1359.5	--	476.6
# Rainy days	42	--	51

Conduct of Trials: (Allotted / Conducted)				
Discipline	**Pantnagar**	**Majhera**	**Almora**	**Remarks**
Plant Breeding	2 / 2	2 / 2	3 / 3	All the trials have been conducted nicely and as per the Technical Programme
Agronomy	4 / 4	Nil	--	
Entomology	5 / 5	Nil	--	
Pathology	9 / 9	Nil	4/4	
Microbiology	5 / 5	Nil	--	

Germplasm:			
	Pantnagar	**Majhera**	**Almora**
Total collection	2921	NA	Nil
# Received - From	125 germplasm, 135 RILs and 36 breeding lines from IISR, Indore	NA	Nil
For Traits	Earliness, BP, RAB and YMV resistant and high yield etc.	--	4-
How used	10 lines used for high yield, resistant to biotic\ abiotic stress, plant ideotype, free from lodging shattering etc.	--	--

Crosses made: (Parents / Pollinations)			
	Pantnagar	**Majhera**	**Almora**
# Crosses	25 /150 to 200 each	NA	22 / 60-80 per cross
Traits	High yield, earliness, photo insensitivity BP, RAB and YMV resistant, yield etc.	--	High yield, frog eye leaf spot resistance, earliness, low linolenic acid in soybean and *Bhat* types (small, flat and black seeded)

Generation Advancement:			
	Pantnagar	**Majhera**	**Almora**
Generations advanced	F1 to F8; 132 crosses; 2596 IPP's	NA	F1 to F6; 185 crosses; 379 populations
Advanced generations received	NIL	NA	Nil

Seed Production Programme: (Variety / Target / Expected in q)			
	Pantnagar	**Majhera**	**Almora**
<u>Breeder Seed</u>:			
	PS 1347/ 15 / 60 PK 262 / 2 /2 PS 1225/ 25 / 70	NA	VLS 65 / 4.50 / 4.50 VLS 63 / 3.50 / 3.50
<u>Nucleus Seed</u>: Stage I + Stage II			
	PS 1225, PS 1092 PS 1042, PS 1347,PS 1029,PS 19,PS 21,PS 22, PS 23, PS 24, PS 1556	NA	VLS 65 / 0.80 / 0.80 VLS 63 / 0.50 / 0.50

Front Line Demonstrations: (Allotted / Conducted / Visited by Team)				
	Pantnagar	**Majhera**	**Almora**	**Remarks**
	11/11 / 6	NA	10 / 10 / 6	At Almora center, incidence of FLS was there however the crop condition was good

Budget Utilization: AUC submitted			
	Pantnagar	**Majhera**	**Almora**
	Yes	Yes	NA

Overall comment of Monitoring Team			
	Pantnagar	**Majhera**	**Almora**
	Excellent	Excellent	Very Good

Team 3	Dr. Philips Verghese and Dr. Sanjeev Kumar
Centres:	Kota, Jabalpur, Sehore and Morena

Weather conditions at different centres during the season (date of monitoring):				
Parameters	**Jabalpur** (15.09.2018)	**Sehore** (15.09.18)	**Morena** (14.09.2018)	**Kota** (17.09.2018)
Onset of monsoon	15.06.2018	29.06.18	11.07.2018	25.06.2018
Date of sowing	26-06-2018	03.07.18	03-07-2018	02-07-2018
Rainfall distribution	even	Uneven	Uneven	even
Rainfall (mm)	1074 mm	1600mm	560	720
# Rainy days	43	42	30	29

Conduct of Trials:				
Discipline	**Jabalpur**	**Sehore**	**Morena**	**Kota**
Plant breeding	4 / 4	3 / 3	3 /3	4/4
Agronomy	--	4 / 4	--	5/5
Entomology	--	6 / 6	--	5/5
Plant Pathology	6 / 6	4 / 4	--	--
Microbiology	--	3 / 3	--	--

Germplasm:

	Jabalpur	Sehore	Morena	Kota
Total Collection	560	400	33	128
Received from	125 lines from IISR, Indore		-	-
For traits	Yield, earliness and diseases reaction	Disease resistance &high yield	-	-
How used	--	--	-	-

Information on Crosses Made :(Parents/pollinations)

	Jabalpur	Sehore	Morena	Kota
#Crosses	30/1150 each	20/ 30 to 40 each		10/300
Traits	Earliness, Yield and disease resistance	Earliness, high Yield and disease resistance.		Earliness, high Yield

Information on Generation Advancement:

	Jabalpur	Sehore	Morena	Kota
Generation Advanced	F_2-$F_{11,}$ 82 crosses of different generations. 788 IPP's & 48 Bulk	F2-F8; 90 crosses of different generation and 1435 No. of lines	-	F4-F9; 68 crosses of different generation

Seed Production Programme: (Variety/ Target / Expected (q)

	Jabalpur	Sehore	Morena	Kota
Breeder seed:	JS 20-69/1200/3570 JS 20-29/1500/1215 JS 97-52/50/30 JS 90-98/500/750	RVS 2001-4/120/90 JS 95-60/150/140 JS 93-05/50/60 JS 335/25/22 JS 20-29 /25/28	JS 95-60/25/25 RVS2001-04/30/30	JS 20-34/700/700 JS 20-29/300/150 JS 93-05 /200/150 JS 95-60 /200/100 RVS 45/20/20 RVS 24/20/10 RVS 113/20/10
Nucleus seed	**NIL**	RVS 2001-4/1500/90 JS 95-60/1500/140 JS 93-05/1500/10 JS 355/500/10 JS 20-116/500/5 JS 20-34/500/10 JS 20-29/500/10 JS 20-98/500/10 RVS 18/200/10 RVS 24/200/5 RVS 76/200/3	NIL	JS 20-34/--/10 JS 20-29/--/10 JS 93-05 /--/5 JS 95-60 /--/5 RVS 45/--/5 RVS 24/--/5 RVS 113/--/5

Front Line Demonstrations: Allotted/conducted/visited by team

Jabalpur	Sehore	Morena	Kota
NA	10/10/6	NA	20/20/5

Budget utilization: AUC Submitted

Jabalpur	Sehore	Morena	Kota
Submitted	Submitted	Submitted	Submitted

Manpower : (Technical/Non technical)

Manpower	Jabalpur	Sehore	Morena	Kota
Sanctioned	2-Scientists 2-TA	5-Scientists 4-TA	1- Scientist 1 - TA	3-Scientists 2-TA
In position	2-Scientists	5-Scientists 4-TA	1- Scientist	3-Scientists 2-TA

Overall specific comments of the monitoring team about the performance of the centre:

Jabalpur	Sehore	Morena	Kota
Very Good	Good	Satisfactory	Very Good

Team 4	**: Dr. Shamarao Jahagirdar and Dr. B.S. Gill**
Centres:	**: Amravati, Nagpur, Raipur and Ranchi**

Weather conditions at different centres during the season: (Date of Monitoring)				
Parameters	**Nagpur (1-2.10.2018)**	**Amrawati (30.09.2018)**	**Raipur (29.09.2018)**	**Ranchi (28.09.2018)**
Onset of monsoon on	23rd SMW	22.6.2018	10.6.2018	26.6.2018
Sowing commenced on	20-24.7.2018	23.6 onwards	25.6.2018	27.6.2018
Rainfall Distribution	Erratic	Even	Normal	Abnormal
Rainfall (mm)	953.2	713.2	1116.1	846.2
Rainy days (no.)	36	41	50	44

Conduct of Trials:					**Remarks**
Discipline	**Nagpur**	**Amrawati**	**Raipur**	**Ranchi**	Raipur: Microbiology trials were not conducted.
Plant Breeding	3 / 3	4 / 4	3 / 3	3 / 3	
Agronomy	--	5 / 5	5 / 5	4 /4	
Entomology	--	3 / 3	1 / 1	--	
Pathology	--	6 / 6	1 / 1	--	
Microbiology	--	--	3 / 0	--	

Germplasm:				
	Nagpur	**Amrawati**	**Raipur**	**Ranchi**
Total collection	03	1034	375	501
# Received - From	3 from IISR Indore	--	36 Advance breeding lines and 125 germplasm lines from IISR, Indore	Nil
For Traits	Early, High yield, Bold seed, Wider adaptability	--	--	--
How used	Crossing programme	--	Not mentioned	--

Crosses made: (Parents / Pollinations)				
	Nagpur	**Amrawati**	**Raipur**	**Ranchi**
# Crosses	--	7 /802	51 / 40 to 50 pollinations per cross combination	04 / 150 each
Traits	--	Early, Null-KTI, CR & resistance, long juvenility	High yield and Multiple disease resistance	Yield improvement, wider adaptability

Generation Advancement:				
	Nagpur	**Amrawati**	**Raipur**	**Ranchi**
Generations advanced	F3; 32 crosses	F1 to F7: 61 crosses and 277 progenies	F1 to F7 : 1086 crosses; 243 Bulks and 710 SPS	F3 to F6; 10crosses
Advanced generations received	--	--	36 from IISR, Indore	36 from IISR under NHP

Seed Production Programme: (Variety / Target / Expected in q)			
Nagpur	**Amrawati**	**Raipur**	**Ranchi**
Breeder Seed:			
NA	JS 335/500/830 JS 93-05/400/350 NRC 37 / 20 / 150 JS 20-34 / 50 / ??	CG Soya-1 /50/130 JS 97-52/500/550 JS 93-05/200/200	JS 97-52/20/20 BS -1 / 1.0 / 1.0
Nucleus Seed: Stage I + Stage II			
NA	JS 335/--/1.0 JS 93-05/--/1.0	JS 97-52/40/15 JS 93-05/25/30 CG SOYA-1 /12/1 JS 20-29 / 2 / ?? JS 20-69 / 2 / ??	BS 1 / 0.20 / 0.30 BSS-2 / 0.20 / 0.50

Front Line Demonstrations: Allotted / Conducted / Visited by Team			
Nagpur	**Amrawati**	**Raipur**	**Ranchi**
NA	20/20/5	10 /10 / 5	10 /20 / 3

Budget Utilization: AUC submitted			
Nagpur	**Amrawati**	**Raipur**	**Ranchi**
Yes	Yes	Yes	Yes

Manpower : (Technical/Non technical)

Manpower	**Nagpur**	**Amrawati**	**Raipur**	**Ranchi**
Sanctioned	Need based testing centre	3 Scientists 2 TAs	2 Scientists 2 TA	2 Scientists 2 Technical
In position		3 Scientists 2 TAs	2 Scientists 1 Contractual TA	1 Scientist Nil

Overall specific comments of the monitoring team about the performance of the centre:

Nagpur	**Amrawati**	**Raipur**	**Ranchi**
Very Good	Excellent	Good	**Very Good**

Team 5	: **Dr. Sanjay Gupta and Dr. Lokesh Kumar Meena**
Centres:	**:Parbhani. Amreli, Anand and Bhavnagar**

Weather conditions at different centres during the season:				
Parameters	**Lok Bharti (25.9.2018)**	**Amrreli (26/09/2018)**	**Devgadh Baria (26/09/2018)**	**Parbhani (30.9.2018)**
Onset of monsoon	22.6.2018	13.7.2018	24.6.2018	11.6.2018
Date of sowing	4.7.2018	18.7.2018	20.7.2018	14.6.2018
Rainfall distribution	Erratic	Erratic	Regular	Erratic
Rainfall (mm)	292.1	422.6	1036	802
# Rainy days	11	22	20	28

Conduct of Trials:				
Discipline	**Lok Bharti**	**Amrreli**	**Devgadh Baria**	**Parbhani**
Plant Breeding	2 / 2	2 / 2	3 / 3	5 / 5
Agronomy	--	--	2 / 2	--
Entomology	--	--	--	4 / 4
Pathology	--	--	--	--
Microbiology	--	--	--	--

Germplasm:				
	Lok Bharti	**Amrreli**	**Devgadh Baria**	**Parbhani**
Total collection	--	570	NA	539
# Received - From	--	--	NA	125 from IISR
For Traits	--	--	NA	High yield, earliness, non shattering, biotic and abiotic stress resistance.
How used	--	--	NA	--

Crosses made: (Parents / Pollinations)				
	Lok Bharti	**Amrreli**	**Devgadh Baria**	**Parbhani**
# Crosses	--	8 / 250	NA	60 / 2112
Traits	--	High seed yield and early maturity	NA	High seed yield, early to medium maturity, pest, disease and drought tolerance, non shattering

Generation Advancement:				
	Lok Bharti	**Amrreli**	**Devgadh Baria**	**Parbhani**
Generations advanced:	Under NHP: 5 fresh crosses and 33 F3 for high yield, early maturity to escape drought	33 F_{3s} of NHP received from IISR, Indore	NA	F1 to F7; 212 crosses for Non Shattering, high seed yielding, tolerant to pests, diseases and drought, suitable for mechanical harvesting.
Advanced generations received			--	--

Seed Production Programme: (Variety / Target / Expected in q)			
Lok Bharti	**Amrreli**	**Devgadh Baria**	**Parbhani**
<u>Breeder Seed</u>:			
JS 20-29 / 60 / 70	NA	NA	MAUS 71 / 600 / 650 MAUS 158 / 540 / 650 MAUS 162 / 150 / 550 JS 20-34 / 30 / 30 JS 20-29 / 80 / 75 JS 93-05 / 300 / 150
<u>Nucleus Seed</u>: Stage I + Stage II			
--	NA	NA	MAUS 1 / 25 / 30 MAUS 2 /25 / 30 MAUS 32 / 20 / 25 MAUS 61 / 20 / 25 MAUS 61-2 / 20 / 25 MAUS 71 / 50 / 60 MAUS 81 / 40 / 50 MAUS 158 /40 / 50 MAUS 162 / 50 / 60 MAUS 162 / 50 / 60

Front Line Demonstrations: Allotted / Conducted / Visited by Team			
Lok Bharti	**Amrreli**	**Devgadh Baria**	**Parbhani**
NA	NA	NA	25 / 25 / 5

Budget Utilization: AUC submitted			
Lok Bharti	**Amrreli**	**Devgadh Baria**	**Parbhani**
NA	NA	NA	Yes

Manpower : (Technical/Non technical)

Manpower	Lok Bharti	Amrreli	Devgadh Baria	Parbhani
Sanctioned	Voluntary Center	Voluntary Center	Need based testing centre	Scientists – 2 Technicals - 2
In position	--	--		Scientists – 2 SRA - 2

Overall specific comments of the monitoring team about the performance of the centre:

Lok Bharti	Amrreli	Devgadh Baria	Parbhani
Good	Good	Good	Excellent

Team 6	**: Dr. Jayrame Gowda and Dr. Milind Ratnaparkhe**
Centres:	**: Sangli, Ugar Khurd and Adilabad**

Weather conditions at different centres during the season:

Parameters	**Sangli**	**Ugarkhurd**	**Adilabad (21-22.09.2018)**
Onset of monsoon	??	??	05.06.2018
Date of sowing	??	??	23.06.2018
Rainfall distribution	??	??	Uneven
Rainfall (mm)	??	??	1238.1
# Rainy days	??	??	39

Conduct of Trials:

Discipline	**Sangli**	**Ugarkhurd**	**Adilabad**
Plant Breeding	??	??	4 / 4
Agronomy	??	??	4 / 4
Entomology	??	??	--
Pathology	??	??	--
Microbiology	??	??	--

Germplasm:

	Sangli	**Ugarkhurd**	**Adilabad**
Total collection	??	??	219
# Received - From	??	??	125 from IISR, Indore
For Traits	??	??	--
How used	??	??	--

Crosses made: (Parents / Pollinations)

	Sangli	**Ugarkhurd**	**Adilabad**
# Crosses	??	??	2 / 75
Traits	??	??	High Yielding

Generation Advancement:

	Sangli	**Ugarkhurd**	**Adilabad**
Generations advanced:	??	??	F2,F3 to F6; 22 crosses; 400 populations

Seed Production Programme: (Variety / Target / Expected in q)

Sangli	**Ugarkhurd**	**Adilabad**
Breeder Seed:		
??	??	JS 335 / 400 / 500 Basara/ 25 / 72
Nucleus Seed: Stage I + Stage II		
??	??	**Basara/ 10 / 18**

Front Line Demonstrations: Allotted / Conducted / Visited by Team		
Sangli	**Ugarkhurd**	**Adilabad**
??	??	10 / 10 / 05

Budget Utilization: AUC submitted		
Sangli	Ugarkhurd	**Adilabad**
??	??	Yes

Manpower : (Technical/Non technical)

	Sangli	Ugarkhurd	Adilabad
Sanctioned	??	??	2 Scientists, 2 TAs
In position	??	??	2 Scientists, 2 TAs

Overall specific comments of the monitoring team about the performance of the centre:

Sangli	Ugarkhurd	Adilabad
??	??	Very Good

Note: Report submitted by the Team contains no information about Sangli and Ugarkhurd Centers.

Team 7	**: Dr. Mrinal Kuchlan and Dr. Shiva Kumar**
Centres:	**: Pune, Dharwad and Bangalore**

Weather conditions at different centres during the season:			
Parameters	**Pune (10.09.2018)**	**Bangalore (13.09.2018)**	**Dharwad (11-12.09.2018)**
Onset of monsoon	07.06.2018	--	10.06.2018
Date of sowing	08.07.2018	19.07.2018	06.07.2018
Rainfall distribution	Uneven	Mostly	Mostly Normal
Rainfall (mm)	229.6	--	210
# Rainy days	15	--	32

Conduct of Trials:			
Discipline	**Pune**	**Bangalore**	**Dharwad**
Plant Breeding	4 / 4	3 / 3	2 / 2
Agronomy	3 / 3	--	3 / 3
Entomology	--	--	7 / 7
Pathology	--	--	6 / 6
Microbiology	--	--	1 / 1

Germplasm:			
	Pune	**Bangalore**	**Dharwad**
Total collection	607	--	518
# Received - From	125	--	
For Traits	Earliness Yield	--	High yield, Earliness, Better seed longevity, Four seeded pods, Vegetable types.
How used		--	

Crosses made: (Parents / Pollinations)			
	Pune	**Bangalore**	**Dharwad**
# Crosses	**20 / 700**	**--**	7 /1070
Traits	Earliness, High oil , High Yield, Null Lipoxygenase, Rust resistance, YMV resistance	--	YMV resistance Earliness, and Rust resistance.

Generation Advancement:			
	Pune	**Bangalore**	**Dharwad**
Generations advanced:	F1-F6; 215 crosses; 2094 IPPs	F2-F3-F4, 101 crosses	F2 to F6; 49 crosses; 1372 IPPs

Seed Production Programme: (Variety / Target / Expected in q)		
Pune	**Bangalore**	**Dharwad**
Breeder Seed:		
JS 335 / 200 / 200 MACS 1188 / 150 / 650 MACS 1281 / 15 / 80	JS 335 / 400 / 200	JS 335 /600/1125 JS 93-05 /500/775 DSb 21 /150 /275
Nucleus Seed: Stage I + Stage II		
JS 335 / 220 lines / 100 kg MACS 1188 / 310 lines / 2 kg MACS 1281 / 157 lines / 80 kg **Stage II** JS 335 / 46 x 25 rows / 4Q MACS 1188 / 80 x 25 rows / 15Q MACS 1281 / 48 x 25 rows lines / 8Q		DSb 21 /-/100 kg JS 335 /-/25 kg DSb 21 /- /30 kg

Front Line Demonstrations: Allotted / Conducted / Visited by Team		
Pune	**Bangalore**	**Dharwad**
20 / 20 / 05	NA	10 / 10 / 8

Budget Utilization: AUC submitted		
Coimbatore	**Bangalore**	**Dharwad**
Yes	Yes	Yes

Manpower : (Technical/Non technical)

	Pune	Bangalore	Dharwad
Sanctioned	1 Scientists 1 TAs	1 Scientists 1 TA	4 Scientists 3 TAs
In position	1 Scientists 1 TAs	1 Scientists 1 TA	4 Scientists 3 TAs

Overall specific comments of the monitoring team about the performance of the centre:

Pune	Bangalore	Dharwad
Good	Very Good	Very Good

Team 8	: Dr. Pushpendra and Dr. Rakesh Kumar Verma
Centres:	**: Jorhat, Imphal, Medziphema and Umiam (Barapani)**

Weather conditions at different centres during the season:				
Parameters	**Imphal (23-25.9.2018)**	**Umiam (26.9.2018)**	**Jorhat (27.9.2018)**	**Medziphema (29.9.2018)**
Onset of monsoon	--	--	--	29.5.2018
Date of sowing	20th June onwards	26.6 to 9.7.2018	--	2.7.2018
Rainfall distribution	Normal	--	--	Normal
Rainfall (mm)	987.4	--	--	904.2
# Rainy days	90	--	--	46

Conduct of Trials:				
Discipline	**Imphal**	**Umiam**	**Jorhat**	**Medziphema**
Plant Breeding	4 / 4	3 / 2	3 / 3	--
Agronomy	3 / 3	--	--	3 / 3
Entomology	5 / 5	--	--	--
Pathology	--	--	3 / 3	4 / 4
Microbiology	--	--	--	--
Food Tech	3 / 3	--	--	--

Remarks

Imphal: All trials were conducted as per Technical programme and maintained nicely.
Umiam: AVT-II failed even after re-sowing twice.
Jorhat: All the Trials were badly affected due to heavy and continuous rains and subsequent water logging.
Medziphema: Due to land constraint, plot size in Agronomy trials was reduced.

Germplasm:				
	Imphal	**Umiam**	**Jorhat**	**Medziphema**
Total collection	411	Nil	Nil	NA
# Received - From	399 from Indore, 1 from Bangaluru, and 11 local collections.	Nil	--	NA
For Traits	Vegetable type, Bold seedednes6	Nil	--	NA
How used	7 lines being used in Crossing programme	Nil	--	NA

Crosses made: (Parents / Pollinations)				
	Imphal	**Umiam**	**Jorhat**	**Medziphema**
# Crosses	4/ 225	Nil	Nil	NA
Traits	Yield and Vegetable type	Nil	--	NA
Generation Advancement:				
	Imphal	**Umiam**	**Jorhat**	**Medziphema**
Generations advanced:	F1 to F2; 7 crosses; 9 Populations; 36 under NHP and 33 from other centers	Nil	Nil	NA

Seed Production Programme: (Variety / Target / Expected in q)				
	Imphal	**Umiam**	**Jorhat**	**Medziphema**
Breeder Seed:				
	NA	NA	NA	NA
Nucleus Seed: Stage I + Stage II				
	NA	NA	NA	NA

Front Line Demonstrations: Allotted / Conducted / Visited by Team			
Imphal	**Umiam**	**Jorhat**	**Medziphema**
15 / 15 /3	NA	NA	10 / 10 / 5

Budget Utilization: AUC submitted			
Imphal	**Umiam**	**Jorhat**	**Medziphema**
Yes	Yes	Yes	Yes

Manpower : (Technical/Non technical)

	Imphal	Umiam	Jorhat	Medziphema
Sanctioned	4 Scientists, 4 TA	NA	2 Scientists, 2 TA	2 Scientists, 2 TA
In position	4 Scientists, 4 TA	--	2 Scientists, 2 TA	2 Scientists, 2 TA

Overall specific comments of the monitoring team about the performance of the centre:

Imphal	Umiam	Jorhat	Medziphema
Excellent	Good	Satisfactory	Very Good

Pedigree of Entries included in Coordinated Breeding Trials

S. No.	NameoEntryEntry	PedigreePedigree
1.	BAUS 100	JS 20-37 X JS 335
2.	CAUMS 1	Selection from NRC 2012 3-6-3-1-4-3
3.	DS 3109	Pusa 12 x F4C7-32
4.	DS 3110	Pusa 12 X F4C7-32
5.	DSb 33	DSb21 x JS 95-60
6.	GJS 3	Germplasm line KB-85
7.	Himso 1688	NRC 2007 x B1-19
8.	Himso 1689	NRC-2008 x G-1-12
9.	JS 21-71	JS 20-63 x JS 95-60
10.	JS 21-72	SL 738 x JS 95-60
11.	KDS 1009	AMS 99 33 x EC 241780
12.	KDS 1073	JS 20 05 x EC 241780
13.	KS 113	Selection from KS 103
14.	MACS 1566	RKS 24 x NRC 55
15.	MACS 1620	RKS 25 x NRC 55
16.	NRC 138	JS 97-52 × NRC 107
17.	NRC 139	JS 97-52 × NRC 101
18.	NRC 146	6A-34
19.	NRC 147	Indigenous collection (IC 210)
20.	NRC 148	NRC 7 × AGS 191
21.	NRCSL 2	JS 335 × SL 525 EDV of JS 335
22.	PS 1634	JS 9752 x PS 1225
23.	PS 1637	JS 9752 x PK 472
24.	RSC 11-15	JS 335 x PS 1024
25.	RSC 11-17	JS 97-52 x JS 93-05
26.	RVS 2007-4	RVS 2000 -10 x JS 95-60
27.	RVS 2011-10	JS 335 X PK1042
28.	RVSM 2011-35	JS 335 x PK 1042
29.	SL 1171	SL 755 x PS 1437
30.	SL 1191	SL 783 x SL 871
31.	TS 59	TSG-105(mutant of Bragg) X PK 564
32.	VLS 97	EC 361363 x VLS 47
33.	MACSNRC 1667	PI 542044 x MACS 4503
34.	MACSNRC 1575	PI 542044 x JS 93-05
35.	MACS 1508	Himso 1563 x NRC 67

STATEMENT SHOWING CONTACT PERSONS AT COORDINATING UNIT, IISR INDORE AND STAFF POSITION OF AICRP ON SOYBEAN

A. Coordinating Unit

ICAR-Indian Institute of Soybean Research, Indore-452 001

S.No.	Name	Designation	Contact No.& E-mail
1.	Dr. V.S. Bhatia	Director	09303224211 (M) 0731-2760987 (R) dsrdirector@gmail.com
2.	Dr. A.N. Sharma	Principal Scientist (Entomology)	09425958694 (M) 0731-2471807 (R) amarnathsharma2@gmail.com
3.	Dr. S.D. Billore	Principal Scientist (Agronomy)	09977763727 (M) 0731-2700059 (R) billsd@rediffmail.com
4.	Dr. Sanjay Gupta	Principal Scientist (Plant Breeding)	07415105890 (M) sanitaishu@gmail.com
5.	Dr. M.P. Sharma	Principal Scientist (Microbiology)	09926012261 (M) 0731-6562647 (R) mahaveer620@gmail.com
6.	Dr. G.K. Satpute	Senior Scientist (Genetics & Plant Breeding)	09425079866 gksatpute@yahoo.co.in
7.	Dr. Mrinal.K.Kuchlan	Scientist (Seed Technology)	09009562694 (M) mrinal.kk@gmail.com
8.	Shri. Ravindra Kumar	Finance & Account Officer	0731-2437946 raviazad1971@gmail.com

B. STAFF POSITION AICRP ON SOYBEAN

1. GBPUA&T, PANTNAGAR-263 145 (UTTARAKHAND) -MAIN CENTRE								
1	**2**	**3**	**4**	**5**	**6**	**7**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on January, 2019**	**Name (appointed / adjusted) AICRP soybean**	**Discipline/ subject**	**Date of joining the present post / project**	**Contact no. (Residence, office & Mobile, FAX & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and Email**
Scientist								
Plant Breeder (S-2) (12000-18300)	Professor (37400-67000)+10000	1	157827.00	Dr. Dhirendra Singh	Vegetable Science / Soybean Breeder	August 2018	9897865329 dheer_singh72@yahoo.co.in	Dr. Kamendra Singh Professor, G&PB and Soybean Breeder 05944-234441(O), 233246 (R), 9997706784 (M), singh.kamendra@rediffmail.com Dr. P. S. Shukla Professor, G&PB/ Jt. Director, BSPC 9412141008 (M), 05944-234441(O) ps.shukla@rediffmail.com Dr. M. K. Karnwal, SRO 9639778002 Karan.mk30@gmail.com
Agronomist (S-2) (12000-18300)	JRO (15600-39100) + 7000	1	81122.00	Dr. D. K. Shukla	Agronomy	August 2018	9410755714 Shukladk1974@rediffmail.com	Dr. Ajay Kumar Srivastava, Assistant Professor, Agronomy 9412925737 drajaysrivastava@gmail.com
Microbiologist (S-2) (12000-18300)	Professor (37400-67000)+10000	1	157827.00	Dr. Naveneet Pareek	Soil Science /Microbiology	August 2018	941132050 pareeknav@gmail.com	Dr. K.P. Raverkar, Professor, Soil Science 9412364837 (M), kraverkar@gmail.com
Jr. Entomologist (S-1) (8000-13500)	Senior research office (37400-67000) + 9000	1	118544.00	Dr. Neeta Gaur **(Appointed)**	Entomology	17.5.2006	9457407231 (O) 05944-233737 (R) Neetagaur_ento@rediffmail.com	-
Jr. Plant Pathologist (S-1) (8000-13500)	Senior research office (37400-67000) + 9000	1	118544.00	Dr. S. K. Mishra	Plant Pathology	June, 2013		Dr. K. P. Singh, Professor 9412142537 (M), kpsingh.gbpuat@gmail.com

1	2	3	4	5	6	7	9	10
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on January, 2019**	**Name (appointed / adjusted) AICRP soybean**	**Discipline/ subject**	**Date of joining the present post / project**	**Contact no. (Residence, office & Mobile, FAX & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and Email**
Technical Staff (T-4)		4						
	(9300-		77200.00	Shri R. B. Sachan		August	9897428345	
	(9300-		84285.00	Dr. H. R. Jaiswal		July 2017	9897165967	
	(9300-		62481.00	Dr. M.K.Gupta		04.12.1992	9412120628	
	(9300-		84285.00	Dr. Dalchand		June 2011	9410238211	
2. INDIAN AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI – 110 012 (ICAR INSTITUTE BASED CENTER) –MAIN CENTRE								
-	Principal Scientist 37000-67000			Dr. S. K. Lal (Center I/c)	Genetics & Plant Breeding	NA	9968063221 sklal@iari.res.in sklal68@gmail.com	
	Principal Scientist 37000-67000			Dr. A. Talukdar	Genetics & Plant Breeding	NA	akshayassam@hotmail.com 09810879176 (M)	
-	Head of the Division 37000-67000			Dr. K. Annapurna	Microbiology	NA	09868422180 (M) annapurna96@yahoo.co.in	
	Principal Scientist			Dr. Anirban Roy	Plant Pathology	NA	011-25848418 (O) 9560083999 anirbanroy75@yahoo.com	
-	Senior Scientist			Dr. Anchal Dass	Agronomy	NA	011-25841488 (O); 08527759564 (M) anchal_iari@rediffmail.com	
-	Senior Scientist 37000-67000			Dr. Sachin Suresh Suroshe	Entomology	NA	08527759200 (M) 011-25781482 (O) sachinsuroshe@gmail.com	

3. RAJMATA VIJAYARAJE SCINDIA KRISHI VISHWA VIDYALAYA, RAK COLLEGE OF AGRICULTURE, SEHORE-446 001 (M.P.) -MAIN CENTRE

1	2	3	4	5	6	7	8	9	10
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on July 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col. 5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist									
Senior Scientist (Breeding) [37,400-67,000 + 9,000 AGP]	Principal Scientist	1	189355	Dr. S.R. Ramgiry (Center I/c)	Breeding	3.1.2006	--	08982305368 sr.ramgiry57@gmail.com	
Senior Scientist (Pathology) [37,400-67,000 + 9,000 AGP]	Principal Scientist	1	187244	Dr. M. Saxena	Pathology	4.9.2015	--	09425079059 molysaxena@yahoo.com	
Senior Scientist (Agronomy) [37,400-67,000 + 9,000 AGP]	Principal Scientist	1	191814	Dr. M.D. Vyas	Agronomy	22.7.2009	--	09425080108 vyasmd@rediffmail.com	
Senior Scientist (Entomology) [37,400-67,000 + 9,000 AGP]	Principal Scientist	1	188086	Dr. N. Khandwe	Entomology	5.8.2006	--	09826685106 nandakhandwe@rediffmail.com	
Senior Scientist (Microbiology) [37,400-67,000 + 9,000 AGP]	Senior Scientist	1	182657	Dr. R.C. Jain	Microbiology	21.8.2012	--	09826449874 rcj2011@gmail.com	
Technical Staff	**5**								
Tech. Asstt.	Tech. Asstt.	1	73000	Mr. P.K. Sharma		25.9.2014		--	
Tech. Asstt.	Tech. Asstt.	1	67281	Mr. Trilochal Singh		10.4.2001		--	
Tech. Asstt.	Tech. Asstt.	1	45268	Mr. M.P. Naiyak		10.4.2001		9893712579	
F.E.O.	F.E.O.	1	39243	Mr. Laxman Malviya		6.5.2012		--	
F.E.O.	F.E.O.	1	38533	Mr. P.S. Maravi		8.9.2008	`	--	

4. **AGRICULTURE UNIVERSITY, KOTA, BORKHERA FARM, BARAN ROAD KOTA-324001 Rajasthan**									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**No. of posts**	**Existing post with pay scale and grade pay**	**Gross salary as on July, 2017 (Rs.)**	**Name**	**Discipline/ subject**	**Date of joining the present project and Post**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist									
Senior Scientist (Entomology) [37,400-67,000 + 9,000 AGP]	**1**	Professor [37,400-67,000 + 10,000 AGP]	1,86,526/	Dr. H. R. Chaudhary (Center I/c)	Entomology	16.05.2011	-	0744-2844369 (Telfax) 0744-2326673 (R) 09460677775 (M) arskota@hotmail.com	-
Senior Scientist (Agronomy) [37,400-67,000 + 9,000 AGP]	**1**	Assistant Professor [15600-39100 + 7,000 AGP]	92,536/-	Dr. D. S. Meena (I/c AICRPS)	Agronomy	22.08.2005	-	09414893694 (M) dsmeena1967@gmail.com maenads 1967@yahoo.co.in	-
Assistant Professor [15600-39100 + 6,000 AGP]	**1**	Assistant Professor [15600-39100 + 6,000 AGP]	76,978/-	Dr. Bharat Lal Meena	Plant Breeding	10.08.2017	-		-
Technical Staff									
Tech. Asstt. .(T4) (9300-34800) 4200	**1**	Tech. Asstt. .(T4) (9300-34800) 4800	54,511/-	Smt. Chaman Kumari Jadon	Agronomy	30.06.2007	-	09829260404 (M)	-
Tech. Asstt./ (A.A.O.) (9300-34800) 4200	**1**	Tech. Asstt. (A.A.O.) (9300-34800) 5400	85,053	Shri A. K. Sharma	-	18.01.2010	-	09414331137 (M)	-
Tech. Asstt. .(T4)	**1**	-	-	-	-	**-**	01..03.2017	**-**	-

5. AICRP ON SOYBEAN DR.PDKV, REGIONAL RESEARCH CENTRE, MORSHI ROAD, AMRAVATI-444 603 (MAHARASHTRA) – MAIN CENTRE									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross Salary as on January 2019**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. & Email ID**	➢ Dr.S.S.Nichal is working as Associate professor /Soybean Breeder, Regional Research Centre, Amravati. Mo. 09588414144 e-mail ID- nichal_satish@rediffmail.com ➢ G.D.Chandankar is additionally working as seed production officer, Regional Research Centre, Amravati. Mo. 08275553087 e-mail- gchandankar@rediffmail.com ➢ Dr. S.S. Munje , Jr.Entomologist,looking additionally the Entomological Research Trials Mo.No.09423682629 , E –mail ID- shyammunje@yahoo.com
Scientists									
Jr. Plant Breeder (15600-39100) GP 6000	(1) Jr. Plant Breeder (29070-39100) G.P.-6000	01	83559/-	**G.D. Chandankar (I/c AICRPS)**	Plant Breeding	07.07.12	Nil	Mo. 08275553087 e-mail- gchandankar@rediffmail.com gchandankar2007@hotmail.com	
Jr. Agronomist (15600-39100) GP 6000	(1) Jr.Agronomist (30230-39100) G.P.-6000	01	80816/-	**M.S. Dandge**	Agronomy	10.07.12	Nil	Mo. 09657725820 e-mail- msdandge@rediffmail.com	
Jr. Plant Pathologist (15600-39100) GP 6000	(3) Jr. Plant Pathologist (29180-39100) G.P.-6000	01	76896/-	**R.S.Ghawde**	Plant Pathology	08.08.18	Nil	Mo. 09420841421 e-mail-rajiv_ghawde @rediffamil.com	
Technical Staff									
Technical Asst. (9300-34800) GP -4200	1) Agril.Asstt (10840-20,000)	01	31187/-	U.S.Tarale	-	10.06.15	Nil	- -	
Technical Asst. (9300-34800) GP -4200	2) Agril.Asstt (9910-20,000)	01	28556/-	U.N.Shinde	-	01.07.18	Nil		

6. AGHARKAR RESEARCH INSTITUTE, G.G. AGARKAR ROAD, PUNE- 411 004 (M.S.)									
1	2	3	4	5	6	7	8	9	10
Approved post by the council with pay scale	**No. of posts**	**Existing post with pay scale and grade pay**	**Gross salary as on July 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5,**
Scientist									
Scientist (Plant Breeding) (15600-39100 + 6000 AGP)	1	Scientist D & Soybean Breeder (15600 -39100) Basic 27990 + GP=7600	1,02,321	Dr. Philips Varghese (Center I/c)	Plant Breeding	27.06.2017/ 03/09/1997	-	020-25325061 (O), 020-25870065 (R), 020-25651542 (Fax), 09423014578 (M) philipsv@gmail.com philipsv@aripune.org	
Scientist (Agronomy) (15600-39100 + 6000 AGP)	1	Scientist C & Soybean Agronomist (15600 -39100) Basic 20440 + GP=6600	79,578	Mr. S.A. Jaybhay	Agronomy	27.06.2017/ 17.11.2011	-	020-25325053 (O) 07588559910 (M) 020-25651542 (Fax) santoshagricos@gmail.com sajaybhay@aripune.org	
Technical Staff									
Technical Assistant (T4) (9300-34800 + AGP 4200)	1	Technical Officer A (9300 -34800) Basic 12940 + GP=4600	45,036	Mr. B.D. Idhol	-	25.11.2016/ 25.11.2010	-	02112-282164 (O), 09767573184(M), bdidhol@aripune.org	
Fieldman (T1) (5200-20200) (GP=2000)	1	Technical Assistant B (9300 -34800) Basic 13475 + GP=4200	45,618	Mr. B.N. Waghmare	-	01.07.2014/ 25.04.1997	-	02112-282164 (O) 09762502294 (M) balasahebpulje@gmail.com	
Fieldman (T1) (5200-20200) (GP=2000)	1	Lab. Asst. C (5200 -20200) Basic 10345 + GP=2800	34,224	Mr. D.H. Salunkhe	-	19.05.2015/ 19.05.2005	-	02112-282164 (O) 09970840176 (M) dsalunkhe8878@gmail.com	

7. UNIVERSITY OF AGRICULTURAL SCIENCES, MAIN AGRICULTURAL RESEARCH STATION, KRISHI NAGAR DHARWAD-580 005 (KARNATAKA)									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**No. of posts**	**Existing post with pay scale and grade pay**	**Gross salary as on July, 2017**	**Name**	**Discipline/subject**	**Date of joining the present post and project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col., with phone (Office, Residence, Mobile) Fax and e-mail**
Scientist (4 Post)									
Senior Scientist (Plant Breeding) (37,400-67,000+9,000 AGP)	1	Principal Scientist (Plant Breeding) (Rs.37400-67000+ AGP 10000)	Rs.1,92,2 58	Dr. G. T. Basavaraja (Center I/c)	Breeding	08.06.1998	-	0836-2446556. Extn.2214280(O) 09141388524 (M) Fax: 0836-2748377 basavarajagt@uasd.in	Dr. G.K. Naidu I/C Breeder (Soybean Seed Proeuction) Seed Unit, UAS, Dharwad 09448829556 (M)
Scientist (Agronomy) (15,600-39,000+6,000 AGP)	1	Jr. Agronomist (Agronomy) (Rs.15600-39100+ AGP 6000)	Rs.65,807	Dr. Sangshetty	Agronomy	20.09.2017	-	0836-2446556. Extn.2214280(O) 09741058053 (M) Fax: 0836-2748377 sangu_agr@yahoo.com	
Scientist (Entomology) (15,600-39,000+6,000 AGP)	1	Jr. Entomologist (Entomology) (Rs.15600-39100+ AGP 6000)	Rs.65,807	Dr. R. Channakeshava	Entomology	02.03.2017	-	0836-2446556. Extn.2214280(O) 09900934831 (M) Fax: 0836-2748377 channakeshavar@gmail.com	-
Scientist (Plant Pathology) (15,600-39,000+6,000 AGP)	1	Jr. Pathologist (Plant Pathology) (Rs.15600-39100+ AGP 8000)	Rs.88,784	Dr. Shalini Huilgol	Pathology	23.06.2017	-	0836-2446556. Extn.2214280(O) 09740264000 (M) Fax: 0836-2748377 sagarshalini@uasd.in	Dr. Shamarao Jahagirdar PI Plant Pathology 09740641068 (M) shamaraoj@gmail.com
Technical Staff (4 Post)									

Technical Assistant (T4) (Rs.9300-34800+ AGP 4200)	1	Technical Assistant (Rs.9300-34800+ AGP 4200)	Rs. 37,415	Mrs. Sheela Duddagi	Plant Breeding	01-07-2015	-	0836-2446556. Extn.2214280(O) 07204392351 (M) Fax: 0836-2748377 sheelavd.sheela@gmail.com	-
Technical Assistant (T4) (Rs.9300-34800+ AGP 4200)	1	Technical Assistant (Rs.9300-34800+ AGP 4200)	Rs. 42,103	Mr. C.J. Kumar	-	-		-	-
Fieldman (T1) (5200-20200) (GP=2000)	1	Lab. Asst. (Rs.16000-29600)	Rs.46,785	Mr. T.M. Nadaf	-	23-7-2016	-	0836-2446556. Extn.2214280(O) 9900335264 (M)	-
Fieldman (T1) (5200-20200) (GP=2000)	1	Field Asst. (Rs.16000-29600)	Rs. 40,950	Mr. B.S. Shyagoti	-	01-04-2013	Working arrangement in U.A.S. Dairy, Dharwad	-	-

8. University of Agricultural sciences, GKVK, Bengaluru-560 065 (Karntaka)									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**No. of Posts**	**Existing post with pay scale and grade pay**	**Gross salary as on July 2017**	**Name**	**Discipline/ Subject**	**Date of joining the present Project/t pos**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, Fax) & Email ID**	**Name of the scientists with designation and discipline working on soybean other than mentioned in col.4 with phone(Office, residence, mobile) Fax and E-mail**
Scientists									
Plant Breeder (Sr. Scientist / Assoc. Prof.) Rs. 37400-67000and AGP of Rs. 8000/ 9000	Professor (Plant Breeding) Rs. 37400-67000 and AGP of Rs. 10000	1	189579.00	Dr. Onkarappa,T.	**Genetics & Plant Breeding**	02-11-2018	-	Mob: 9590739123 **Email ID: onkarappa.t@gmail.com**	nil
Technical staff									

Tech. Asstt. (T4) 9300-38400+ GP 4200	Tech. Asstt. (T4) 9300-38400+ GP 4200	1	31000=00	Sowmya, H.H	**Genetics & Plant Breeding**	20-7-2018		8792456063 Sowmyahh.cta@gmail.com	

9. CSKHPKIV, Palampur, District Kangra (H.P.)									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on January, 2019**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientists									
Assistant Soybean Breeder (15600-39100 + 6000 AGP)	Principal Scientist 37400-67000 + 10000 AGP	One	171257.00	Dr. Vedna Kumari	Plant Breeding & Genetics	8.1.2014	---	drvedna@gmail.com (M) 94181-12681 (O) 01894-230391	1. Dr. Janardan Singh Principal Scientist (Agronomy) Department of Agronomy, Forages & Grassland Management CSK HPKV, Palampur -176 062 (HP) singhjdr@rediffmail.com (M) 94189-27836 (O)1894-230392 2. Dr. Surjeet Kumar Principal Scientist (Entomology) Department of Entomology CSK HPKV, Palampur-176 062 (HP) skumarhpau@gmail.com (M) 94181-53087 (O) 01894-230385
Assistant Pathologist (15600-39100 + 6000 AGP)	Senior Scientist 37400-67000 + 9000 AGP	One	141745.00	Dr. Amar Singh	Plant Pathology	27.01.2011	---	singhamar008@gmail.com (M) 94181-49782 (O) 01894-230391	
Technical Staff									
Technical Assistant-I (10300-34800 + 5000 AGP)	Farm Manager 10300-34800	Two	66951.00	Shri Dharam Singh	-	25.03.2017	---	(M) 98054-06680 (O) 01894-230391	---

	+ 5000 AGP								
Technical Assistant-I (10300-34800 + 5000 AGP)	Farm Manager 15600-39100 + 6600 AGP		78240.00	Shri Mehar Chand	-	14.09.2017	---	(M) - (O) 01894-230391	--

10. VIVEKANANDA PARATIYA KRISHI ANUSANDHAN SANSTHAN, ALMORA-263601 UTTARAKHAND (ICAR INSTITUTE BASED CENTER) –SUB CENTRE									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on July, 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist									
-	Scientist (15,600-39,100 + 6,000)	-	-	Dr. Anuradha Bhartiya (Center I/c)	Plant Breeding	21.04.2009	-	05962-241005, Extn.219 (O) 05962-241250, 231539 (Fax) 09410560611(M) anuradhagpb@gmail.com	
-	Sr. Scientist (15,600-39,100 + 8,000)	-	-	Dr. K.K. Mishra	Plant Pathology	01.02.2011	-	9411195453 (M) 05962-231539 (Fax) mishrakkpatho@gmail.com	
-	Sr. Scientist (15,600-39,100 + 8,000)	-	-	Dr. Sher Singh	Agronomy	23.03.2012	-	05962-241005 Extn.306 (O) 05962-241250, 231539 (Fax) 09456158263 (M) shersingh76@gmail.com	

11. PUNJAB AGRICULTURAL UNIVERSITY LUDHIANA – 141004 (PUNJAB) – SUB CENTRE									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on July 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist									
Asstt. Plant Breeder (15,600-39,100) + GP 6,000	Sr. Breeder (37,400-67,000) + GP 10,000	1	1,44,440	Dr. B.S. Gill (Center I/c)	Plant Breeding	Joined as Asstt. Plant Breeder on	-	09872163567 (M) gbalwinder@hotmail.com	Dr. (Mrs) Jagmeet Kaur (Sr.Physiologist) 09888034979 (M) jagskaur@gmail.com Dr. (Mrs) Poonam Sharma

						22.1.1997, promoted to Sr. Breeder on 23.1.2012			(Microbiologist) 09915004976 (M) poonam1963in@yahoo.co.in Dr. Guriqbal Singh (Agronomist) 0161-2251362 (R) singhguriqbal@rediffmail.com Dr (Mrs) Asmita Sirari Asstt. Plant Pathologist 0161-2401960-413(O) asmitasirari@gmail.com Dr Ravinder Singh Sr. Entomologist 097800-29107 (M) ravindergurvara@pau.edu Dr GK Taggar, Asstt. Entomologist 098144-22183 (M) gauravtaggar@pau.edu Dr (Mrs) Sunita Sharma (Biochem) 09876130110 (M)
Asstt. Agronomist (15,600-39,100) + GP 6000	Asstt. Agronomist (15,600-39,100) + GP 6000	1	84,700	Ms. Harpreet Kaur	Agronomy	28.01.2010	-	08146080300 (M) hkmand@rediffmail.com	
Technical Staff									
Tech. Asstt. (10,300-34,800) + GP 3800	Beldar (4900-10,680) + GP 1900	1	39,919	Shri. Sita Ram	-	01.03.2013	-		
Field man (10,300-34,800) + GP 3200	Field man (10,300-34,800) + GP 3750	1	52,213	Shri Balwant Singh	-	01.11.2014	-		

12. CENTRAL AGRICULTURAL UNIVERSITY, IROISEMBA IMPHAL-795004 (MANIPUR)									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on January, 2019**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist									
Jr. Plant Breeder (15600-39100 + 6000 GP)	Jr. Plant Breeder (20590 + 6000 GP)	1	93550	Dr. H. Nanita Devi	Plant Breeding	30th August 2011	-	+918974057246 heisnamnanita@rediffmail.com	-

Jr. Agronomist (15600-39100 + 6000 GP)	Jr. Agronomist (22990 + 6000 GP)	1	101678	Dr. T. Sunanda Devi	Agronomy	30th August 2011	-	+919856117141 sunandabckv@gmail.com	-
Jr. Entomologist (15600-39100 + 6000 GP)	Jr. Entomologist (22990 + 6000 GP)	1	101678	Dr. Nilima Karam	Entomology	30th August 2011	-	+918974715757 nilikaram@gmail.com	-
Jr. Food Scientist (15600-39100 + 6000 GP)	Jr. Food Scientist (24600 + 6000 GP)	1	107520	Dr. L. Sophia Devi	Food Technology	30th August 2011	-	09856939623, 08837223476 rush2sophia@gmail.com	-
Technical Staff									
Fieldman (T1) (5200 - 20200)	Fieldman (T1) (6820 + 1900 GP)	4	34877	H. Sarat Singh	-	19th December 2012	-	+917085411341	-
Fieldman (T1) (5200 - 20200)	Fieldman (T1) (6820 + 1900 GP)		34877	N. Daya Singh	-	20th December 2012	-	+919774941381 ningthoujamdayaSingh@gmail.com	-
Fieldman (T1) (5200 - 20200)	Fieldman (T1) (6560 + 1900 GP)		32118	K. Lalit Singh	-	3rd January 2014	-	+919436683166	-
Fieldman (T1) (5200 - 20200)	Fieldman (T1) (6560 + 1900 GP)		32118	H. Subhaschandra Singh	-	12th March 2014	-	+918787596910	-

13. ASSAM AGRICULTURAL UNIVERSITY, JORHAT -785013 (ASSAM)									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on January, 2019**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) &Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist (2 posts)									
Plant Breeder (15600-39100 +6000 to 8000)	Pr. Scientist 37400-67000 + GP10000	1	196229	Dr. P.K. Goswami	Plant Breeding	04/06/2018	-	9435387290 prasantagawm@yahoo.com	Nil
Plant Pathologist (15600-39100 +6000 to 8000)	Jr. Scientist 15600-39100 +GP6000	1	61326	Dr. Munmi. Borah	Plant Pathology	01/04/2018	-	912764720 Mborah56@gmail.com	Nil
Technical Staff (2 posts)									
Technical Asstt.(T1) 5200-20200 +2000	Field Asstt.III 14000-49000+8700	1	27966	MrDiganta.Hazarika		11/12/2017	-	9365543837	Nil
Technical Asstt.(T1) 5200-20200 +2000	Field Asstt.III 14000-49000+8700	1	27966	Mr. Bimal Deori		12/12/2017	-	9613665059	Nil

14. ICAR RESEARCH COMPLEX FOR NEH REGION, UMIAM – 793 103, MEGHALAYA (ICAR INSTITUTE BASED CENTER) –SUB CENTRE									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on July, 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist									
-	-	-	-	Dr. Amit Kumar (Center I/c)	Plant Breeding	-	-	amit4118@gmail.com 8974630789	-

-	-	-	-	Dr. P. Baiswar	Plant Pathologist	-	-	pbaiswar@yahoo.com 9436107733	-

15. SCHOOL OF AGRICULTURAL SCIENCES AND RURAL DEVELOPMENT, NAGALAND UNIVERSITY, MEDZIPHEMA – 797 106 (NAGALAND)									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on July, 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist - 2									
				Dr. Amarendra Kumar Singh (Center I/c)		26-04-2010		09436075153 (M) 08974055853 (O) aksingh_1967@yahoo.com	
Jr. Scientist (Plant Pathology)	Jr. Scientist (15600-39100)	1	**????**	Dr. Pezangulie Chakruno	Plant Pathology	26.06.2018		09402682097 (M) sksunilphd@gmail.com	
Jr. Scientist (Agronomy)	Jr. Scientist (15600-39100)	1	Rs. 83326/-	Dr. Engrala Ao	Agronomy	20-03-2013		09436824141 (M) engraao@yahoo.in	
Technical Staff (T-4) – 2									
Technical Assistant	Techncal Assisant 5200-20200)	1	Rs. 26905/-	Mr. Talososang Amri		24-07-2012		08731821798 (M)	
Technical Assistant	Technical Assistant 5200-20200)	1	Rs. 26905/-	Mr. Imliakum Ao		25-07-2012		09612304897 (M)	

16. Birsa Agricultural University, Kanke, RANCHI-6									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of post**	**Gross salary as on July, 2017**	**Name**	**Discipline / subject**	**Date of joining the present post/project**	**If post is vacant, date from which it is lying vacant**	**Contact No.**	**Name of scientist with designation & discipline working on soybean other than mentioned in col. 5 with phone**
Scientists									
Jr. Scientist	Jr. Scientist-cum-	1	-	Vacant	Plant	-	-	-	Dr. (Mrs.) Nutan Verma

	Asstt. Prof. (15,600-39,100) GP-7000/-				Breeding				09279324334 (M) nvbau2006@yahoo.co.in
Jr. Scientist	Jr. Scientist-cum-Asstt. Prof. (15,600-39,100) GP-6000/-	1	79667/-	Dr. Arvind Kumar Singh	Agronomy	24.07.2004	-	09431315705 (M) aksbau@gmail.com	
Technical Staff									
Technical Asstt.	Field overseer (9300-34800) GP-2400/-	1	51548/-	Sri S.K Jamahir		01.08.2007	-	09798534619 (M)	
STA	Vacant	-		-		-	1		

17. INDIRA GANDHI AGRICULTURAL UNIVERSITY, RAIPUR-492 012 (C.G.)

1	2	3	4	5	6	7	8	9	10
Approved post by the council with pay scale	**No. of posts**	**Existing post with pay scale and grade pay**	**Gross salary as on July, 2017**	**Name**	**Discipline/ subject**	**Date of joining the present project and Post**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist(2Post)									
Scientist (Plant breeding) [15,600-39,100 + 6,000 AGP]	01	Scientist 15600-39000 +AGP 7000	71,394/=	Dr. Sunil Kumar Nag (Center I/c)	Plant Breeding	2.11.2010	-	Phone- 0771-2442352 (O), Mobile- 9926159853, 9691021610 E-Mail- nagsk_igkv@yahoo.com	1. Dr. S. B Gupta Professor & Head Deptt of Agricultural Microbiology Mobile- 78030-13547 Phone (O)- 0771-2442581 E-mail- sbgupta_igau2002@yahoo.co.in 2. Dr R K Dantre Principal Scientist (Plant Pathology) Department of Plant Pathology Mobile- 94242-14723 Phone (O)- 0771-2444204 ravikantdantre@yahoo.com 3. Dr Y.K.Yadu Principal Scientist
Scientist (Agronomy) [15,600-39,100 + 6,000 AGP]	01	Principal Scientist 37400-67000+ AGP 10000 (Promoted in the scheme)		Dr. Rama Mohan Savu	Agronomy	10.10.2018	-		

									(Entomology) Mo. 94255-10737
Technical Staff (2Post)									
Field Assistant (T1) (5,200-20,200) GP 2000	02						Vacant (Since inception of project)		

18. JNKVV, KRISHINAGAR, ADHARTAL, JABALPUR-482 004 (M.P.)									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**No. of posts**	**Existing post with pay scale and grade pay**	**Gross salary as on July, 2017**	**Name**	**Discipline/ subject**	**Date of joining the present project and Post**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist (2 Post)									
Senior Scientist (Plant Breeding) [37,400-67,000 + 9,000 AGP]	1	Senior Scientist		Dr. M..K.Shrivastava (Center I/c)	Plant Breeding	From 10-08-2017	Filled	M. 09827256494 07987299126 shrivastava.manoj03@gmail.com	
Scientist (Plant Pathology) [15,600-39,100 + 6,000 AGP]	1	Scientist 15600-39100+ AGP 6000		Mr. P. K Amrate	Plant Pathology	19-05-2017	Filled	08224821863 pawanamrate@gmail.com	
Technical Staff (2 Post)									
Technical Assistant (T4) (Rs.9300-34800+ AGP 4200)	1	Vacant	-	-	-		Since 4.8.2017	-	
Technical Assistant (T4) (Rs.9300-34800+ AGP 4200)	1	9300-34800+ AGP 4200	46084	Mr. Dinesh Kumar Pancheshwar	Technical Assistant	01-03-2013	Filled	09981099167 dinesh11pancheshwar@gmail.com	

19. MARATHWADA AGRICULTURAL UNIVERSITY, PARBHANI-431 402 (MS.) -SUB CENTRE									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on July, 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.4, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist									
Soybean Breeder (37,400-67,000)	Soybean Breeder & Officer Incharge (37400-67000 + AGP 9000)	1	Rs.1,06,137/-	Dr. S.P. Mehtre (Center I/c)	Agril. Genetics & Plant Breeding	12/09/2014	--	09421462282, 07588156210 shivaji_pmehtre@rediffmail.com Fax.- (02452)220121	NA
Jr. Entomologist (15,600-39,100)	Jr. Entomologist (15600-39100+ AGP 6000)	1	Rs.59,596/-	Dr. R.S. Jadhav	Agril. Entomology	01.03.2018	--		
Technical Staff (T-4)									
Senior Research Assistant (9,300-34,800)	Senior Research Assistant (9300-34800+ AGP 4400)	1	Rs. 50,009/-	Shri D.T. Pawar	Plant Breeding	21.06.2010	1	09422176738(M) rameshpwr267@gmail.com	NA
Senior Research Assistant (9,300-34,800)	Senior Research Assistant (9300-34800+ AGP 4400)	1	-	Smt.A.A. Joshi	Food Science	14/07/2015	21/10/2014	09637240406 joshianuprita.2009@gmail.com	NA

20. PJTSAU - Agricultural Research Station, Adilabad, Telangana State									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on July 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col. 5, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientists									
Scientist (Agronomy) ₹ 15,600 – 39100 + 6000 AGP	Senior Scientist (Agronomy) ₹ 15,600 - 39100 + 8000 AGP Pay: ₹ 31890 + 8000 (Stage-III)	1	₹ 97,514.00	Dr. Sreedhar Chauhan (Center I/c)	Agronomy	23.07.2013	-	08732-226863 (O) 094411 67821 (M) chauhan.sreedhar@gmail.com	-
Scientist (Plant Breeding) ₹ 15,600 – 39100 + 6000 AGP	Scientist (Plant Breeding) ₹ 15,600 - 39100 + 6000 AGP Pay: Rs. 21300 + 6000 (Stage-I)	1	₹ 66,716.00	Dr. M. Rajendar Reddy	Plant Breeding	24.07.2017	-	08732-226863 (O) 09704134304 (M) rajendar0536@gmail.com	
Total:		**2**							
Technical Staff									
AEO ₹ 17890-53950/-	AEO 17890-53950/25140 + 300/- (TI) Pay: ₹ 25,140.00	1	₹ 34,618.00	Sri Sk. Eesa	Intermediate	21.09.2016	-	08732-226863 (O) 99499 40584 (M)	-
AEO ₹ 17890-53950/-	AEO ₹ 15,000.00	1	₹ 20,117.00	Sri R. Naveen	Diploma in Agriculture	06.04.2017	**	08732-226863 (O) 078938 96654 (M) ramellynaveen@gmail.com	
Total:		**2**							

21. RVSKV Zonal Agricultural Research Station Morena – 476001 (M.P.)									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Approved post by the council with pay scale	**Existing post with pay scale and grade pay**	**No. of posts**	**Gross salary as on July, 2017**	**Name**	**Discipline/ subject**	**Date of joining the present post / project**	**If the post is vacant, date from which it is lying vacant**	**Contact no. (Residence, Office & Mobile, FAX) & Email ID**	**Name of the scientists with designation & discipline working on soybean other than mentioned in col.4, with phone (Office, Residence, Mobile) Fax and E-mail**
Scientist									
-	Prin. Scientist	-	-	Dr. V.K. Tiwari (Center I/c)	Plant Breeding			9425407723 07532234426 vkt786@rediffmail.com	

Statement of the Scientists working for AICRP on Soybean at need based testing Centre

1. GBPUA&T, Regional Research Station, Majhera, P.O. Garampani Dist- Nainital, Uttarakhand – 263135			
1	**2**	**3**	**4**
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1	Dr. Anjuli Agrawal	Officer Incharge (Biochemistry)	(O) 05942-245538 (M) +917500241431 E-mail : oicmajhera@gmail.com
2	Dr. J.P. Purwar	J.R.O. (Entomology)	(O) 05942-245538 (M) +919411324356 E-mail : jp_purwar@rediffmail.com

2. CSKHPKV, Hill Agricultural Research and Extension Centre, Bajaura-175125, Distt. Kullu, Himachal Pradesh			
1	**2**	**3**	**4**
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Dr. Naval Kishore	Scientist (Plant Breeding)	09418067729 (M) E-mail – naval13@gmail.com Fax- 01905 287236

3. Rajendra Agricultural University, Tirhut College of Agriculture, Dholi-843 121, (Muzaffarpur) , Bihar			
1	**2**	**3**	**4**
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Dr. Anil Pandey	Univ. Prof.(Plant Breeding & Genetics) -cum-Chief Scientist & Team Leader (Oilseeds)	E-mail- aniltcadholi@gmail.com Mobile No. 09934019564 Fax: 06274-240266/24025
2.	Dr. Vikram Bharati	Jr. Agronomist (S.F.)	E-mail- vbharatiagro@gmail.com Mobile No.09471645321
3.	Dr. Ashim Kumar Mishra	Jr. Pathologist (Spices)	E-mail- ashim_sigatoka@yahoo.com Mobile No. 09973218436

4. OUA&T, Reginal Research and Technology Transfer Station , Bhawanipatna, Arkabahalipada Farm, Bhawanipatna – 766001, Kalahandi, Odisha			
1	**2**	**3**	**4**
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No.**
1.	Dr. C.M. Khanda	Associate Director of Research Agronomy	(O) : 06670-230274 (M) : 09437130700 E-mail : adrbhawanipatna.ouat@gmail.com
2	Dr. Gouranga Charan Mishara	Sr. Scientist Agronomy	(O) 06670-230274 (M) 09337749182 E-mail : gcmishra8@gmail.com
3	Susanta Kumar Mohanty	Junior Breeder (Plant Breeding and Genetics)	(O) 06670-230274 (M) 09437124090 E-mail : susantamohanty.2008@rediffmail.com

5. PDKV, Department of Agricultural Botany, College of Agriculture, Nagpur-440001			
1	**2**	**3**	**4**
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No.**
1.	Shri S.K.Dhapke	Assistant Professor	0721-2522255 (O) 09011020342(M) s.dhapke@rediff.com

6. R & D Unit, The Ugar Sugar Woks Ltd., Ugar-khurd, Karnataka-591316			
1	**2**	**3**	**4**
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Mr.Jagadish S.Patwardhan	Deputy Manager R & D.	08339-272230 (Ext-214) **(O)**, 9900559159 **(M)** Fax-08339-272232 jagadish.kulkarni@ugarsugar.com jagdishpatwardhan@yahoo.com helpdesk@ugarsugar.com
2.	Mr. R.D.Patil	Agronomist	7259186041 **(M)** helpdesk@ugarsugar.com
3.	Mr.B.B.Patil	Circle Superintendent	7259020396 **(M)** helpdesk@ugarsugar.com

7. MPKV, Agricultural Research Station, Mahatma Phule Krishi Vidyapeeth, K. Digraj-416305 Distt. Sangli (M.S.)			
1	2	3	4
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Dr. D.K. Kathamale	Officer Incharge	0233-2437288 (O), 0233-2437275 (Fax), 0233-2326661 (R), 09405267061 (M) kathmaledk@rediffmail.com kathmaledk@gmail.com
2.	Dr. M.P. Deshmukh	Associate Prof. (Plant Breeding)	0233-2437288 (O), 0233-2437275 (Fax), 0233-2332886 (R), 09423185603 (M) 09422210476 (M) drmpdeshmukh@gmail.com

8. UAS, Raichur, ARS, Bidar-585401 Karnataka			
1	2	3	4
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Dr. Sidramappa	Assistant professor (Plant Breeding)	09900875348 (M) E-mail- siddugpb@yahoo.co.in
2.	Dr.Shobharani M	Agril. Entomology	srani_ent@yahoo.co.in

9. TRIBAL RESEARCH CUM TRAINING CENTRE, ANAND AGRICULTURAL UNIVERSITY, DEVGADH BARIA – 389 380, DIST : DAHOD (GUJARAT)			
1	2	3	4
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Dr. G. J. Patel	Asso. Res. Scientist (Agron)	9825930039 girish_agri2005@yahoo.co.in
2.	Prof. D. B. Parmar	Assi. Res. Scientist (Plant Breeding)	9725017818 dhirajsinh@aau.in
Technical Staff (T-4)			
1.	Mr. S. M. Asari		9909592408 shivrambhai@aau.in
2.	Mrs. R. S. Thakor		7567720400 rekha@aau.in
3.	Mr. Kinjal Suthar		9408932895 kinjalsuthar55@yahoo.com
4.	Mr. D. B. Ramjiyani		9428774964 dweep90@hotmail.com
5.	Ms. Dipti Patel		9825475520 dipti@aau.in

10. Agricultural Research Station Junagarh Agricultural University Keria Road 365601 Amreli- Gujarat.			
1	2	3	4
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Dr. Viren Akbari	Assistant Research Scientist, Plant Breeding	09558458537 virenakabari@jau.in

11. Wheat Research Center Lokbharti, village - Sanosara, Taluqa - Sihor, Dist- Bhavnagar, Gujarat -364230			
1	2	3	4
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Dr. C. P. Singh	Plant Breeding	09727765645 singh.cp70@gmail.com

12. Dry Land Agriculture Research Station, SKUAST-Kashmir, Old Airfield Complex, Rangreth Post Box No. 905, GPO Kashmir 190001, J & K			
1	2	3	4
Sr. No.	**Name of the scientist**	**Designation with discipline**	**Telephone No. (Office, Residence, Mobile, Fax, E-mail)**
1.	Dr. M.N. Khan	Professor, Genetics and Plant Breeding	0959013998 mnk900@gmail.com

Appendix-*VII*

STATEMENT SHOWING REVISED ESTIMATE OF BUDGET FOR AICRP ON SOYBEAN CENTRES FOR THE FY 2018-19

S.No.	Name of the centre	2018-19				
		Pay	TA.	R. cont.	TSP	Total
1	2	4	5	6	7	8
(A) Other than NEH						
1	CoA, (RVSKVV) Sehore	15100000	240000	1188000	0	16528000
2	UAS, Dharwad	5900000	180000	1000000		7080000
3	ARI, (MACS) Pune	6795000	80000	500000		7375000
4	GBPUA&T, PANTNAGAR	8000000	220000	1188000		9408000
5	UAS, BANGALORE	2300000	60000	200000		2560000
6	MAU, PARBHANI	3350000	120000	475000		3945000
7	ARS, KOTA	5900000	150000	818000		6868000
8	PAU, LUDHIANA	3800000	100000	475000		4375000
9	ANGRAU,ARS, ADILABAD	3000000	80000	475000		3555000
10	CSKHPKV, PALAMPUR	4530000	80000	525000		5135000
11	BAU, RANCHI	800000	80000	300000		1180000
12	JNKVV, JABALPUR	2750000	80000	525000		3355000
13	IGKV, RAIPUR	2550000	80000	525000		3155000
14	PDKV, AMRAVATI	2300000	100000	763000		3163000
15	ZARS, MORENA	1500000	50000	288000		1838000
16	IARI, NEW DELHI	0	0	0		0
17	ICAR RE NEH, Barapani	0	60000	150000		210000
18	Need Based requirement	0	0	845000		845000
19	AAU, JORHAT	995000				995000
20	CAU, IMPHAL	1430000				1430000
	Total (A)	**71000000**	**1760000**	**10240000**	**0**	**83000000**
(B) NEH						
21	COA, MEDZIPHAMA	2140000	130000	200000		2470000
22	AAU, JORHAT	1560000	90000	200000		1850000
23	CAU, IMPHAL	5800000	205000	400000		6405000
	Total (B)	**9500000**	**425000**	**800000**	**0**	**10725000**
(C) Tribal Sub Plan		**0**	**0**		**800000**	**800000**
	Grand Total (A+B+C)	**80500000**	**2185000**	**11040000**	**800000**	**94525000**

Appendix-*VIII*

CENTRAL ZONE

S. N.	Name of Varieties	Jabalpur	Indore	Amravati	Parbhani	Morena	Kota	Sehore	Nagpur
1	NRC 86	18.86	20.31	19.88	20.03	19.85	17.86	18.69	19.53
2	JS 335	18.40	19.00	16.90	20.26	19.97	18.57	20.45	19.90
3	RSC 10-52	17.23	18.18	17.55	20.34	16.26	16.53	19.55	19.54
4	MACS 15-20	18.88	18.87	17.96	20.44	19.77	17.95	17.72	20.90
5	JS 97-52	19.55	19.68	19.73	19.78	19.07	16.46	18.62	20.85
6	AMS-MB 5-18	17.62	19.38	18.35	20.05	17.63	19.42	18.86	21.33
7	JS 20-34	17.22	17.92	18.50	20.43	18.70	18.20	17.25	20.52

NORTHERN ZONE

S. No.	Varieties	New delhi	Pantnagar	Ludhiana
1	PUSA97-12	19.94	19.77	20.4
2	SL958	20.18	19.40	20.19
3	DS3106	21.00	20.6	20.6
4	PS1347	19.66	20.8	20.29
5	PS1611	20.80	NOT RECEIVED	20.13
6	SL688	20.59	20.6	19.9
7	NRC134	21.40	NOT RECEIVED	NOT RECEIVED
8	NRC128	19.70	NOT RECEIVED	19.4
9	NRCSL1	19.96	NOT RECEIVED	19.44
10	SL1104	20.4	20.85	20.1
11	PS1613	21.6	NOT RECEIVED	21.3
12	NRC147	19.7	19.0	16.84

NORTH EASTERN ZONE

IMPHAL		
S.No.	**Varieties**	**Oil Content**
1	KDS921	20.70
2	RKS18	20.23
3	JS335	21.0
4	DSB32	20.90
5	JS97-52	18.34
6	RSC1071	19.44

EASTERN ZONE

S. No.		Ranchi	Bhawani patna	Raipur (Only one variety seeds without any replicate were received.)	Dholi
1	JS335	20.4	18.535	NOT RECIEVED	**Readings were not taken as seed hilum was bleeding**
2	JS97-52	20.4	17.751	NOT RECIEVED	
3	RSC10-52	19.38	17.697	17.319	
4	RKS-18	20.42	19.224	NOT RECIEVED	
5	RSC 10-71	Packet found ruptured and seeds mixed, while opened	Seeds received were found mixed	NOT RECIEVED	