

Effect of Planting Dates and Varieties on Seed Quality Parameters of Off-Season Soybean (*Glycine max* L.)

Kagita Navya^{1*}, K. Parimala², M. Rajendar Reddy³ and A. Padmasri⁴

¹Department of Seed Science and Technology, College of Agriculture, PJTSAU, Hyderabad (Telangana), India.

²Senior Scientist (Plant Breeding), Seed Research & Technology Centre, PJTSAU, Rajendranagar, Hyderabad (Telangana), India.

³Scientist (Plant Breeding), AICRP on Soybean, Agricultural Research Station, PJTSAU, Adilabad (Telangana), India.

⁴Senior Scientist (Entomology), Seed Research & Technology Centre, PJTSAU, Rajendranagar, Hyderabad (Telangana), India.

(Corresponding author: Kagita Navya*)

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ABSTRACT: The present study was carried out to assess the effect of dates of sowing and varieties on seed quality parameters of soybean seed produced during off-season. The seed harvested from 15th December and 15th January sown crop of soybean varieties viz., AISb-50, Basara and JS-335 were used for estimation of seed quality parameters. The results revealed that seed quality parameters differed significantly due to sowing dates and varieties. Effect of dates of sowing was found to be non significant for the traits germination (%), speed of germination and electrical conductivity. The crop sown on 15th December exhibited significantly higher seedling length (30.50cm), seedling vigour index-I (2605), dry weight (838.40 mg), seedling vigour index-II (71541) and field emergence (81.22%). Among the varieties studied, AISb-50 exhibited significant superiority for germination (88.67%) and seedling vigour index-I (2443), while the variety JS-335 showed higher field emergence and speed of germination. Seedling length and seedling vigour index-II were found to be on par among the varieties. High amount of leakage of leachates was recorded in Basara whereas the varieties, JS-335 and AISb-50 showed least electrical conductivity. Influence of dates of sowing and varieties revealed that the variety AISb-50 of 15th December sown exhibited higher germination (89.00%), seedling vigour index I (2605) and seedling vigour index II (71541) over other treatments. The traits such as seedling length, seedling vigour index-I, speed of germination and field emergence were found to be significantly superior in JS-335 and AISb-50 of 15th December sown crop. The variety Basara with both the dates of sowing showed higher EC over other interactions studied. Among the different dates of sowing and varieties evaluated, crop sown on 15th December with JS-335 and AISb-50 found to be superior for most of seed quality parameters studied.

Keywords: Soybean, seed quality, varieties, dates of sowing, germination.

INTRODUCTION

Soybean (*Glycine max* L. Merrill) is one of the most important economic oilseed crop. It contributes 25% of vegetable oil production and major source of protein (40%) and oil (20%) for both human and animal consumption. It contains a good amount of minerals, salts and vitamins (thiamine and riboflavin). Soybean isoflavones have beneficial effects on human health due to their antioxidative, antitumoral and antiantherosclerotic activities (Davis *et al.*, 1999). India is the fifth major soybean growing country in the world and it occupies an area of 3.95 lakh ha with a production of 12.50 million tons and productivity of 12.45 q ha⁻¹ (INDIASTAT, 2020-21).

Soybean seed quality deteriorate very quickly due to various constraints. The different varieties of soybean are sensitive to changes in environmental conditions where the crop is being grown (Calvino, 2003). Seed deterioration during storage is one of the reason for low productivity in soybean, as well as ageing conditions adversely affect the seed vigour (Tatic *et al.*, 2012). Mainly soybean seed production is being taken up during *kharif* season. Since for the last few years, incessant rains coincide with pod maturity stage of the crop which results in in-situ germination and rejection of seed lots causes shortage of quality seed. Soybean seed is typically a poorer storer which losses its quality faster rate and leads to poor plant stand in the field. In

such situation contingency seed production especially in the off season is very much essential. Hence, there is a need to identify the best sowing time and ideal genotypes for enhanced quality seed production during off-season in Telangana State. Keeping in view of the above, the present study was taken up to assess the seed quality parameters of soybean seed produced during off-season.

MATERIAL AND METHODS

The field experiment was conducted with two dates of sowing (15th December and 15th January) by using three varieties viz., AISb-50, Basara and JS-335 during *Rabi* 2021-22 at Agricultural Research Station, Adilabad. At physiological maturity the crop was harvested and seed was collected separately for the treatments studied. The seed obtained from field experiment was used to assess the seed quality parameters. The laboratory experiment was conducted Seed Research and Technology Center, Rajendranagar in FCRD with three replications to know the effect of sowing dates and genotypes on seed quality. The observations were recorded for germination (%), seedling length (cm), seedling vigour index-I, seedling dry weight (mg), seedling vigour index-II,

speed of germination, field emergence (%) and electrical conductivity ($\mu\text{Scm}^{-1} \text{g}^{-1}$). Germination test was conducted as per ISTA using between paper method, the number of normal seedlings were counted on 8th day by following formula.

$$\text{Germination \%} = \frac{\text{Number of normal seedlings}}{\text{Total number of seeds placed}} \times 100$$

Seedling vigour index-I and seedling vigour index-II was calculated as per the formula given by Abdul-Baki and Anderson (1973) and expressed in whole number.

$$\text{SVI-I} = \text{Germination (\%)} \times \text{Seedling length (cm)}$$

$$\text{SVI-II} = \text{Germination (\%)} \times \text{Seedling dry weight (mg)}$$

The data recorded on various seed quality parameters were subjected to statistical analysis as per the method given by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Analysis of variance for varieties showed significant difference for germination (%), seedling dry weight, speed of germination, field emergence and electrical conductivity. Whereas the dates of sowing and interaction effects showed significant differences for the traits viz., seedling length, seedling dry weight, seedling vigour index-II and field emergence (Table 1).

Table 1: Analysis of variance for seed quality parameters of off season soybean.

Source of variation	df	Germination (%)	Seedling length (cm)	Seedling vigour index I	Seedling dry weight (mg)	Seedling vigour index II	Speed of germination	Field emergence (%)	Electrical conductivity ($\mu\text{Scm}^{-1}\text{g}^{-1}$)
Dates of sowing (A)	1	0.89	145.64**	1010094.00**	163039.50**	1168265000.00**	0.65	1027.56**	4.38
Varieties (B)	2	60.23*	0.45	56650.50	14414.33*	21607160.00	60.03**	751.17**	1203.85**
A × B	2	9.56	19.25**	217622.10*	20355.34*	228408900.00**	0.16	234.73**	7.13
Error (B)	12	15.50	2.74	36428.39	2971.73	27921510.00	5.15	24.06	10.47
Total	17	19.21	12.82	117398.80	15778.80	117844400.00	10.75	193.42	150.12

*,** Significance at 5% level

Table 2: Effect of sowing dates and varieties on seed quality parameters of off season soybean.

Treatment	Germination (%)	Seedling length(cm)	Seedling vigour index I	Seedling dry weight (mg)	Seedling vigour index II	Speed of germination	Field emergence (%)	Electrical conductivity ($\mu\text{Scm}^{-1} \text{g}^{-1}$)
D ₁	85.33	30.50	2605	838.40	71541	23.44	81.22	45.49
D ₂	85.78	27.63	2131	648.03	55429	23.06	66.11	46.47
V ₁	88.67	28.47	2447	694.70	61507	24.38	76.50	38.62
V ₂	82.34	28.27	2260	792.70	65291	19.68	61.34	62.31
V ₃	85.67	30.47	2397	742.40	63657	25.7	83.17	37.02
D ₁ V ₁	89.00	30.57	2721	838.70	74571	24.43	84.33	39.30
D ₁ V ₂	80.67	28.43	2290	823.40	66454	19.83	75.00	61.61
D ₁ V ₃	86.33	32.5	2803	853.10	73597	26.07	84.33	35.55
D ₂ V ₁	88.33	26.37	2172	550.60	48443	24.33	68.67	37.93
D ₂ V ₂	84.00	28.10	2229	761.90	64127	19.53	47.67	63.01
D ₂ V ₃	85.00	28.43	1991	631.60	53716	25.33	82.00	38.48
GM	85.56	27.66	2368	743.22	63485	23.25	73.67	45.98
CD @5%								
D	4.04	1.70	196.03	55.99	5427	2.33	5.04	3.32
V	4.95	2.08	240.09	68.57	6647	2.85	6.17	4.07
DxV	7.00	2.94	339.54	96.98	9400	4.04	8.73	5.76
C.V. (%)	4.6	5.98	8.06	7.34	8.32	9.75	6.66	7.04
S. Em.(±)	2.27	0.95	110.19	31.47	3051	1.31	2.83	1.87
SE.d.	3.21	1.35	155.84	44.51	4314	1.85	4.00	2.64

The variety AISb-50 exhibited significant superiority for germination (88.67%) over Basara (82.34%) while it showed on par performance with JS-335 (Table 2). The interaction between dates of sowing and varieties revealed that the crop sown on 15th December with AISb-50 (89.00%) registered significantly higher germination percentage over Basara (80.67%) whereas non-significant difference was noticed in 15th January sowing (Table 2). Uem and Unioeste (2003) reported that seeds from optimum sowing dates had higher percentage of germination than delayed planting due to favourable climatic conditions during seed development. Significantly higher seedling length was found in 15th December sown crop (30.50cm) whereas the varieties showed non-significant differences. In the interaction of dates of sowing and varieties, the variety JS-335 exhibited significantly higher seedling length (32.50cm) followed by AISb-50 (30.57cm) of 15th December. Kumar *et al.* (2011); Edje and Burris (1970) in soybean found that germination percentage and seedling length were observed to be low in delayed planting of niger. Similar reduction pattern in germination percentage was also reported by Rao and Wagle (1983) in soybean, Kalpana and Madhava Rao (1991) in pigeon pea and Tirakannavar *et al.* (2006) in chickpea.

Significantly superior seedling length might be due to high seed index, which might have supplied adequate food reserves to resume embryo growth.

Assessment of seedling vigour index-I revealed the wide range of variation for dates of sowing which varied from 2131 to 2605. In case of varieties AISb-50 recorded high mean value (2447) and it was found to be on par with other two varieties. The interaction effect showed significantly higher vigour index-I in JS-335 (2803) and AISb-50 (2721) of 15th December crop over other interaction effects, whereas least vigour index-I was observed in JS-335 of 15th January. Significantly superior vigour index-I was found in 15th December sown crop irrespective of varieties studied. This could be due to congenial weather conditions during the crop growth period facilitated quality seed production. These results are in accordance with the findings of Rahman *et al.* (2013) who reported that optimum time of sowing had high vigour index.

Significant differences were observed in varieties and dates of sowing which ranged from 694.70 to 792.70 mg and from 648.03 to 838.40 mg respectively for seedling dry weight. Seed of 15th December showed significantly higher seedling dry weight (838.40 mg). With respect to varieties Basara (792.70 mg) exhibited superiority over AISb-50 (694.70 mg), while it was found to be on par with JS-335 (742.4 mg). Interaction effects revealed that all the three varieties with 15th December sowing recorded exhibited significant superiority over 15th January except with Basara. Reduction of seedling dry weight in seeds harvested from off season soybean was reported by Khan (2001).

The dates of sowing exhibited wide range of variation from 55429 to 71541 for seedling vigour index-II. The 15th December sowing had significantly higher seedling vigour index-II over 15th January whereas varieties showed non-significant differences. Among the interactions AISb-50 of 15th December exhibited significantly higher seedling vigour index-II (74571) while it showed least in 15th January sowing (48443). Among the varieties, JS-335 (25.70) and AISb-50 (24.38) registered significant superiority over Basara (19.68), whereas dates of sowing showed non-significant differences for the trait speed of germination. Among the six interaction effects, JS-335 of 15th December (26.07) exhibited superiority while lower speed of germination was observed in Basara of 15th January (19.53).

Among the varieties, JS-335 (83.17 %) and AISb-50 (76.50 %) and for dates of sowing 15th December (81.22%) exhibited significant field emergence. Among the different interactions studied, JS-335 (84.33%) and AISb-50 (84.33%) of 15th December sowing followed by JS-335 (82.0%) with 15th January sowing were found to be superior for this. The electrical conductivity was found to be significantly lower in JS-335 (37.02 $\mu\text{Scm}^{-1}\text{g}^{-1}$) and AISb-50 (38.62 $\mu\text{Scm}^{-1}\text{g}^{-1}$) indicating more storability of these varieties. Whereas the variety Basara recorded very higher EC of 62.31 $\mu\text{Scm}^{-1}\text{g}^{-1}$, these are similar with reports of Basra *et al.* (2003); Panobianco and Vieira (2007) in soybean.

This may be due to poor seed coat integrity which leads to increased leakage of electrolytes. The dates of sowing showed non-significant differences for this trait.

CONCLUSION

From the study it can be understood that seed quality parameters was significantly affected by sowing date and varieties. The seed harvested from 15th December sown crop had good seed quality compared to 15th January sown. Among the varieties studied, JS-335 and AISb-50 were found to superior for most of the traits studied. In case of interactions the crop sown on 15th December with JS-335 and AISb-50 exhibited superiority for seed quality parameters.

FUTURE SCOPE

This is one season work and this should be studied in two more seasons and also multilocations to study the impact of dates of sowing and varieties of off-season soybean.

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Conflict of Interest. None.

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