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Growth and yield of soybean varieties at different sowing windows

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ABSTRACT

The field experiment entitled "Growth and yield of soybean varieties at different sowing windows" was conducted during *kharif* 2024 at Agricultural College Farm, Bapatla. The experiment was laid out in randomized block design with factorial concept with three replications. Total twelve treatment combinations consisting of four varieties (V_1: Asb-22, V_2: AIsb-50, V_3: KDS-726 and V_4: JS-335), and three dates of sowing (D_1: I FN of July, D_2: II FN of July and D_3: I FN of August). The experimental results revealed that plant height and drymatter accumulation at harvest, seed yield and haulm yield were significantly higher with Asb-22 variety. I FN of July sowing recorded higher values for the growth and yield which was on par to II FN of July sowing.

Keywords: *Asb-22, FN, Soybean and Varieties and dates of sowing*

Soybean, a significant global crop, is grown in India under diverse agro-climatic conditions. It is a leguminous oilseed crop with high nutritional content, geographical adaptation, and functional health advantages. Soybean contains 40% high biological value protein and 20% oil, with 5% lysine, 4-5% minerals, anti-oxidants, beta-carotene, and 0.3% isoflavones. It contributes 42% to total oilseed production and 22% to total oil production in India. India ranks fifth in world soybean production, with 118.3 lakh hectares and 125.8 lakh tonnes of production in 2022 (SOPA, 2024). Factors affecting soybean production include improper sowing time, climatic variability, low germination percentage, and poor quality seed. Choosing the right genotype and shifting sowing dates can address these challenges. Newly developed varieties with good yield potential and disease resistance are better suited for climate change scenarios. Therefore, it is imperative to find out the optimum sowing time for soybean along with suitable new varieties released recently.

MATERIAL AND METHODS

A field experiment was conducted during *kharif* 2024 at Agricultural College Farm, Bapatla. The soil was neutral in reaction (pH 7.05) and electrical conductivity (0.35 dS was m^{-1}). The experiment was laid out in Randomized block design with factorial concept with three replications. Total twelve treatment combinations consisting of four varieties (V_1: Asb-22, V_2: AIsb-50, V_3: KDS-726 and V_4: JS-335), and three dates of sowing (D_1: I FN of July, D_2: II FN of July and D_3: I FN of August). The total rainfall received during the crop season was 764.6 mm in 32 rainy days. The soil of the experimental field was clay loam in texture, low in available nitrogen (194 kg/ha), medium in available phosphorus (43.5 kg/ha) and high in available potassium (341 kg/ha). Soybean seeds were sown at a spacing of 45 cm X 5 cm in the experimental field following recommended package of practices. In the net plot area five plants were randomly selected. Plant height was recorded at harvest. For destructive sampling, from gross plot five plants were randomly selected. They were oven dried at 60^0C till constant weight is obtained. The dry weight was recorded and expressed as kg ha^{-1}. Finally seed and haulm yields were recorded treatment wise.

RESULTS AND DISCUSSION

Plant height (cm) at harvest

Data pertaining to plant height at harvest presented in Table.1 indicated that among the varieties tested, at harvest, Asb-22 (V_1) recorded significantly highest plant height (54.9 cm) over AIsb-50 (V_2)

(49.4 cm) and was found to be on par with KDS-726 (V_3) with a plant height of 53.9 cm and JS-335 (V_4) with 52.1 cm. Variation in plant height can be attributed to their inherent genetic character with better growth and extending capacity of shoot due to cell division and cell elongation. Similar results were reported by Rekha and Dhurua 2010. Maximum plant height at harvest Table.1 of soybean was recorded when sown during I FN of July (54.9 cm), which was on par with crop sown during II FN of July (52.0) and significantly superior than the plant height recorded when sown during I FN August (50.8 cm). Increased plant height due to early sowing may be due to enhanced vegetative development of crop growing under favourable weather conditions. Similar results were obtained by Nath *et al*., 2017. However, the interaction effect was non-significant.

Days to 50 % flowering

The data in Table. 1 indicated that among four varieties tested, KDS-726 (V_3) took maximum number of days to attain 50% flowering (44) which was on par with variety Asb- 22 (V_1) (42). Variety JS-335 (V_4) took minimum days (40) to attain 50% flowering which was on par with AIsb-50 (V_2), 41 days. Longer duration to 50% flowering with variety KDS-726 (V_3) might be due to its longer vegetative phase. Among the dates of sowing, I FN of July (D_1) took significantly a more number of days (44) for attaining 50% flowering in soybean compared to II FN of July (D_2) sowing (42) and I FN of August sowing (D_3) (40). However, D_1 and D_2 were on par with each other. These results are in conformity with the findings of Deshmukh *et al*., 2019. However, the interaction effect was non-significant on days to 50 % flowering.

Table 1: Plant height at harvest, days to 50% flowering and drymatter accumulation at harvest as influenced by soybean varieties at different sowing time

Treatments	Plant height at harvest (cm)	Days to 50% flowering	Drymatter accumulation at harvest (kg ha^{-1})
Varieties (V)			
(V_1) Asb-22	54.90	42.00	4013.00
(V_2) AIsb-50	49.40	41.00	2981.00
(V_3) KDS-726	53.90	44.00	3266.00
(V_4) JS-335	52.10	40.00	3614.00
SEm±	1.30	0.80	139.40
CD (P=0.05)	3.81	2.40	408.80
Dates of sowing (D)			
(D_1) I FN of July	55	44	3754
(D_2) II FN of July	52	42	3536
(D_3) I FN of August	50.80	40	3116
SEm±	1.12	0.70	120.70
CD (P=0.05)	3.25	2.00	348.60
Interaction (V x D)			
SEm±	2.25	1.40	241.40
CD (P=0.05)	NS	NS	NS
CV%	7.40	5.80	12.10

Drymatter accumulation at harvest

The effect of varieties and dates of sowing on drymatter at harvest was presented in Table. 1. Drymatter accumulation at harvest was significantly highest with soybean variety Asb-22 (V_1) (3917 kg ha^{-1}) which was significantly superior over the AIsb-50 (V_2) and KDS-726 (V_3). However it, was on par to JS-335 (V_4) producing drymatter of 3614 kg ha^{-1}. Difference in drymatter production between soybean varieties could be mainly attributed to increase in plant height and LAI due to their genetic makeup. Naidu *et al*., 2017 recorded similar variation in drymatter production due to varietal difference in soybean. Among sowing dates, crop sown during I FN of July (D_1) recorded significantly higher drymatter at harvest 3754 kg ha^{-1}, which was on par with II FN of July (D_2) sowing, whereas, sowing of soybean crop during I FN of August (D_3) recorded lowest drymatter production of 3116 kg ha^{-1}. Delay in sowing resulted in vegetative phase coinciding with short day periods resulting in lower biomass accumulation and in turn lower yield. These results are in confirmity with the findings of Neenu *et al*., 2017. However, the interaction effect was non-significant.

Seed yield

Among the varieties of soybean tried, Asb-22 (V_1) recorded maximum seed yield and 1517 kg ha^{-1} which was statistically significant over the other three varieties tested Table. 2 AIsb-50 (V_2) variety resulted in recording the lowest seed yield of 1019 kg ha^{-1} It can be attributed to drymatter accumulated at harvest, coupled with better translocation of photosynthates from source to sink which culminated in realizing maximum yield of soybean variety Asb-22 (V_1). These results are in conformity with the findings of Lomte *et al*., 2006. Among the dates of sowing,

Table 2: Seed yield, haulm yield of soybean varieties as influenced by varying sowing time

Treatments	Seed yield (kg ha^{-1})	Haulm yield (kg ha^{-1})
Varieties (V)		
(V_1) Asb-22	1517	2131
(V_2) AIsb-50	1019	1873
(V_3) KDS-726	1097	1953
(V_4) JS-335	1244	2041
SEm±	49	63
CD (P=0.05)	143.8	184.9
Dates of sowing (D)		
(D_1) I FN of July	1338	2173
(D_2) II FN of July	1232	2028
(D_3) I FN of August	1088	1798
SEm±	42.4	54.6
CD (P=0.05)	122.6	157.7
Interaction (V x D)		
SEm±	84.9	109.2
CD (P=0.05)	NS	NS
CV%	12.1	9.5

July I FN crop resulted in maximum seed yield of 1338 kg ha^{-1} which was statistically significant over I FN of August sown crop recording 1088 kg ha^{-1} Table. 2. It can be attributed to favourable photo-thermal effect, coupled with good moisture and favourable temperature during vegetative and reproductive phases contributing to photosynthates accumulation and higher biomass Karunakar *et al*., 2018. Conversely, delay in sowing might have reduced nodes with less pods per plant and seeds per plant recording reduced yields in soybean. The results are in accordance with Kaushik *et al.,* 2014. Interaction effect of varieties and sowing dates on seed yield was non-significant.

Haulm yield

The data presented in Table. 2 showed the influence of varieties and sowing windows on haulm yield. Asb-22 (V_1) recorded maximum haulm yield (2131 kg ha^{-1}) which was significantly superior to AIsb-50 (V_2) and was on par with JS-335 (V_4) and KDS-726 (V_3). However, lowest haulm yield (1873 kg ha^{-1}) was recorded by AIsb-50 (V_2). These results are in conformity with those reported by Mukesh *et al.,* 2017 Similarly maximum haulm yield of 2173 kg ha^{-1} was recorded when crop was sown early during I FN of July (D_1) and it was significantly superior to I FN of August (D_3) and was on par with II FN of July (D_2) (2028 kg ha^{-1}). The decrease in haulm yield due to delay in sowings observed might be due to the unfavourable weather conditions during the crop growth. Asewar *et al.,* 2015 reported the reduction in haulm yield with delay in sowing.

CONCLUSION

Among the three dates of sowing, soybean performed well in terms of growth and yield when sown during I FN July (D_1), which was on par to II FN of July. The soybean variety, Asb-22 (V_1) recorded higher values of growth and yield and its performance was superior to that of JS-335 (V_4), AIsb-50 (V_2) and KDS 726 (V_3) in coastal Andhra Pradesh.

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