

Original Research Article

Effect of Sowing Dates and Varieties on Growth, Yield and N-Uptake of Soybean in Coastal AP, India

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ABSTRACT

A field experiment was conducted during early *rabi* season of 2014-15 on clay loam soil at Agricultural College farm, Bapatla, Andhra Pradesh, to study the “Effect of sowing dates and varieties on growth, yield and N-uptake of soybean in Coastal AP. Early sowing of soybean on 15th September with variety JS-335 recorded significantly higher seed yield compared to the other combinations. The highest nitrogen uptake at harvest was recorded with early sowing on 15th September which was significantly superior to rest of the dates of sowing and the highest nitrogen uptake was recorded with JS-93-05 variety which was on a par with JS-335. Early sowing of soybean on 15th September recorded the highest protein content of 34.9 per cent which was on a par with 15th October sowing of soybean but significantly superior over 15th November and 15th December sowing and protein content of soybean was highest with the variety JS-93-05 which was significantly superior over other two varieties JS-335 and Local. Soybean sown on 15th September was found to be the optimum sowing time for getting higher yield and ‘JS-335’ variety was promising in Coastal AP.

Keywords

Sowing, varieties, growth, yield, N-Uptake, Soybean

Introduction

Soybean [*Glycine max* (L.) Merrill] is an important oilseed crop, which plays an important role in the Indian economy. Soybean has now established as number one crop among oilseeds. Its main use for oil extraction, it can be used as *dal* after some heat treatment, soya milk, *tofu* etc. Soybean continues to rank first among various oilseed crops globally, contributing approximately 52 percent to the total oil and fat production. In India, it ranks as number one oilseed crop with an area of 10.84 M. ha and production of 14.68 M t. It is cultivated in an area of about 0.16 M. ha with a production of 0.29 M t in AP. Madhya Pradesh has a major share in area (69%) and production (71%) of

soybean in India. (Directorate of Economics and Statistics, 2012-13).

Non-monetary input, time of sowing has a tremendous influence on the performance of any crop.

Delayed sowing may shrink the vegetative phase, which in turn reduces drymatter accumulation leading to poor partitioning to reproductive parts and ultimately poor realization of the potential yield. The varieties in a crop are equally important for realizing the genetic potential of the crop. Soybean has good potential in coastal AP, hence the present trial was conducted.

Materials and Methods

A field experiment was conducted during early *rabi* season of 2014-15 at Agricultural College Farm, Bapatla, Andhra Pradesh, India. The experimental field was clay loam, slightly alkaline in soil reaction (pH 7.2), low in organic carbon (0.48%) and available nitrogen (190 kg ha⁻¹), medium in available phosphorus (22.0 kg ha⁻¹) and high in available potassium (290.5 kg ha⁻¹). Design adopted was split-plot where four dates of sowing (15th September, 15th October, 15th November and 15th December) were taken as main plots and 3 varieties (JS-335, JS-93-05, Local) in sub plots 30:60:40 kg ha⁻¹ NPK was applied as basal and crop was sown at 45x5 cm. A rainfall of 387.3 mm in 15 rainy was received days during the crop growth period.

Results and Discussion

Effect of sowing dates

There was significant influence of sowing time on growth, yield, harvest index, N-uptake. The plant height at 30 DAS and at maturity and harvest index was not influenced by sowing dates.

At 60 DAS, significantly highest (50.4 cm) plant height of soybean was obtained when sown on 15th September which was on par with soybean sown on 15th October and 15th December (Table-1). Similar result were found by Pramila Rani (1997). At 30 DAS, the highest drymatter accumulation was recorded with 15th September sowing of soybean which was on a par with 15th December sowing and significantly superior over October 15th and November 15th sowing. At 60 DAS, the maximum drymatter accumulation of 2587 kg ha⁻¹ was recorded with 15th September sowing of soybean which was significantly superior to

other sowing dates. At harvest, the highest drymatter accumulation of 3093 kg ha⁻¹ was recorded with 15th September sowing of soybean which was significantly superior to other dates of sowing (Table-2). These results are in conformity with the results of Hanumantharao *et al.*, (1990).

Early sowing of soybean on September 15th recorded higher seed yield of 1269 kg ha⁻¹ which was significantly superior to other dates of sowing. However, the seed yield of soybean recorded was on a par with October 15th and December 15th sowing dates (Table-3). The present results are also in accordance with those of Babalad *et al.*, (1996). Early sowing of soybean on September 15th recorded maximum haulm yield of 1978 kg ha⁻¹ which was on a par with December 15th sowing and significantly superior to other two dates of sowing. Haulm yield obtained when sown on October 15th and December 15th was on a par between them (Table-3). Similar findings of variation in haulm yield due to dates of sowing was reported by Amarajyothi and Pulla Rao (2002).

The highest nitrogen uptake at harvest (110.3 kg ha⁻¹) was recorded with early sowing on 15th September which was significantly superior to rest of the dates of sowing (Table-4). Similar results were reported by Hari Ram Singh and Agrawal (2010).

Effect of Varieties

There was significant influence of varieties on growth, yield, harvest index, N-uptake. The plant height at 30 DAS and harvest index was not influenced by varieties.

The maximum plant height was recorded with JS-335 (52.1cm) which was significantly superior to the other two varieties.

Table.1 Effect of sowing dates and varieties on plant height of soybean at 30, 60 DAS and at maturity

Plant height(cm)												
Sowing dates	Varieties											
	30 DAS				60 DAS				At maturity			
	JS-93-05	JS-335	Local	Mean	JS-93-05	JS-335	Local	Mean	JS-93-05	JS-335	Local	Mean
15 th September	35	36.1	34.2	35.1	51	55.2	45.2	50.4	53.3	57.4	48	52.9
15 th October	34.1	32.9	33.2	33.4	47.6	52.7	43.9	48.1	49	53.6	45.3	49.3
15 th November	32.5	32.6	34	33	42.6	45.8	42.6	43.7	45.8	47.1	44.6	45.8
15 th December	34.1	35.3	33	34.1	47	54.7	44.9	48.9	50	56.2	46.1	50.8
Mean	33.9	34.2	33.6		47	52.1	44.1		49.5	53.6	46	
	SEm ±		CD(P=0.05)		SEm ±		CD(P=0.05)		SEm ±		CD(P=0.05)	
Sowing dates	0.62		NS		0.98		3.4		1.44		NS	
Varieties	0.76		NS		1.29		3.9		0.75		2.3	
Varieties at same date of sowing	1.52		NS		2.58		NS		1.51		NS	
Dates at the same or different varieties	0.44		NS		0.74		NS		0.53		NS	

Table.2 Effect of sowing dates and varieties on drymatter accumulation (kg ha⁻¹) of soybean at 30, 60 DAS and at maturity

Sowing dates	Varieties											
	30 DAS				60 DAS				At maturity			
	JS-93-05	JS-335	Local	Mean	JS-93-05	JS-335	Local	Mean	JS-93-05	JS-335	Local	Mean
15 th September	541	671	527	580	2661	2859	2238	2587	3097	3219	2963	3093
15 th October	372	530	458	454	1907	1887	1815	1870	2615	2851	1807	2424
15 th November	468	605	485	519	1934	2095	1615	1881	2762	2942	1967	2557
15 th December	521	632	441	532	2154	2311	1924	2130	2547	2992	2346	2628
Mean	476	610	478		2164	2288	1898		2755	3001	2271	
	SEm ±		CD(P=0.05)		SEm ±		CD(P=0.05)		SEm ±		CD(P=0.05)	
Sowing dates	16.4		57		76		263		113.9		394	
Varieties	15.7		47		67.9		203		83.3		250	
Varieties at same date of sowing	31.4		NS		135.9		NS		166.7		NS	
Dates at the same or different varieties	9.3		NS		41.1		NS		52.7		NS	

Table.3 Effect of sowing dates and varieties on yield and harvest index of soybean

Sowing dates	Varieties											
	Seed yield (kg ha ⁻¹)				Haulm yield (kg ha ⁻¹)				Harvest index (%)			
	JS-93-05	JS-335	Local	Mean	JS-93-05	JS-335	Local	Mean	JS-93-05	JS-335	Local	Mean
15 th September	1284	1523	1001	1269	1973	2009	1951	1978	39.3	43.2	34	38.8
15 th October	824	1074	889	932	1767	1925	1660	1784	32.1	35.8	34.7	34.2
15 th November	935	881	848	888	1617	1733	1389	1580	36.8	33.5	37.9	36.1
15 th December	1011	959	911	960	1937	1854	1684	1825	34.3	34.1	34.9	34.4
Mean	1016	1109	912		1824	1880	1671		35.6	36.6	35.4	
	SEm ±		CD(P=0.05)		SEm ±		CD(P=0.05)		SEm ±		CD(P=0.05)	
Sowing dates	42		145		40.8		141		1.26		NS	
Varieties	35		101		40.4		121		1.03		NS	
Varieties at same date of sowing	70.1		204		80.8		NS		2.05		NS	
Dates at the same or different varieties	21.5		66		24		NS		0.63		NS	

Table.4 Effect of sowing dates and varieties on nitrogen uptake (kg ha^{-1}) of soybean

Nitrogen uptake (kg ha^{-1})				
Sowing dates	Varieties			
	<i>JS-93-05</i>	<i>JS-335</i>	Local	Mean
15 th September	116.9	113.0	100.9	110.3
15 th October	106.4	98.8	83.7	96.3
15 th November	82.4	82.4	66.8	77.2
15 th December	105.4	103.7	75.4	95.0
Mean	102.9	99.5	81.7	
	SEm \pm		CD (P=0.05)	
Sowing dates	2.42		8.4	
Varieties	2.57		7.7	
Varieties at same	5.14		NS	
Dates at the same or different varieties	1.51		NS	

At harvest, plant height was significantly superior with soybean variety JS-335 (53.6 cm) compared to JS-93-05 (49.5 cm) and local (46.0 cm) varieties (Table-1). Difference in plant height due to cultivars was also reported earlier by Pramila Rani and Kodandaramiah (1999). At 30 DAS, the highest drymatter accumulation (610 kg ha^{-1}) was recorded with variety JS-335 which was significantly superior to the other two varieties tested. At 60 DAS, the highest drymatter accumulation (2288 kg ha^{-1}) was recorded with variety JS-335, which was on a par with variety JS-93-05 (2164 kg ha^{-1}) and significantly superior to local soybean variety. The highest drymatter accumulation (3001 kg ha^{-1}) was recorded with variety JS-335, which was significantly superior to other two varieties JS-93-05 (2755 kg ha^{-1}) and local (2271 kg ha^{-1}) (Table-2). Similar results were reported by Balyan and Mohta (1985).

Highest seed yield of soybean 1109 kg ha^{-1} was recorded with JS-335 which was on a par with variety JS-93-05 (1016 kg ha^{-1}) (Table-3). These results are in conformity with the findings of Babalad *et al.*, (1996). The maximum haulm yield was recorded with JS-335 which was on a par with JS-93-05. Lowest haulm yield was recorded with the local soybean (Table-3). These results are in conformity with the findings of Barik and Sahoo (1989). Among the varieties tested, the highest nitrogen uptake (102.9 kg ha^{-1}) was recorded with JS-93-05 which was on a par with JS-335 (99.5 kg ha^{-1}) (Table-4). Similar results were reported by Hari Ram Singh and Agrawal (2010).

Interaction effect

Interaction between sowing dates and varieties was significant for seed yield. Early sowing of soybean on 15th September with variety JS-335 recorded significantly

higher seed yield compared to JS-93-05 and Local varieties of soybean at different dates of sowing (Table-3).

From the present investigation it can be concluded that Soybean crop sown during early rabi on 15th September was found to be the optimum sowing time for getting higher yield and uptake of N in Coastal AP. Among the varieties, overall performance of variety JS-335 was superior compared to JS-93-05 and Local in terms of seed yield.

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