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Research Article

PERFORMANCE OF VARIETIES UNDER DIFFERENT ROW SPACING IN SOYBEAN(*Glycine max* L.)

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Abstract: The field experiment was conducted in field at Regional Research Center, Amravati during *kharif* season 2021-22. Six soybean varieties NRC 165, NRC 152, HIMSO 1689, JS 21-72, and check JS 20-34, NRC 86were sown on spacing 30 cm and 45 cm. The experiment was conducted in split plot design of net plot size of 5.0 m x 2.7 m and replicated in three times keeping row spacing in main plot and varieties in sub plot.The observation on dry matter was recorded at 30 DAS, 45 DAS and 60 DAS, CGR and RGR on 30-45 and 45-60 DAS. From each net plot,five plants were randomly selected and labeled for taking biometric observations at different growth stages. Amongst the different row spacing, 45 cm row spacing recorded significantly highest Mean seed yield *i.e.*, 2230 kg/ha. While in different genotypes, JS 21-72, proves significantly superior over rest of others and recorded highest seed yield *i.e.*, 2671 kg/ha under 45 cm row spacing but found at par with HIMSO 1689 and JS 20-34. The lowest seed yield was observed in variety NRC 86 at 30 cm row spacing (1710 kg/ha).

Keywords: *Soybean genotypes, Row spacing*

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Introduction

Soybean has emerged as one of the major oilseed crops and developed rural economy and raised the socio-economic status of soybean farmers. The soybean optimum plant population and plant geometry are the important factors for achieving higher soybean grain yields. The higher plant population creates plant to plant competition for water, light, nutrients, and space resulting reduce the plant growth and poor yield. Optimum spacing and seed rate influences yield and yield contributing characters of soybean [1]. On the other hand, lower plant population is unable to exploit the available resources and these resources go wastes. Higher plant populations have led to increased plant height due to plant to plant competition for light [2]. In Vidarbha region of Maharashtra state, India, from last three years the productivity of soybean is consistently decreasing due to unfavorable climatic condition. The other reason behind that the near about 85% farmers are cultivated same genotype year after year *i.e.*, JS-335. Due to increasing in pest and diseases problem and unfavorable climate, JS-335 genotype could not sustain the higher productivity. Now there is need to change/replace the variety which can perform better than existing in respect of adverse climatic condition and productivity. Therefore, the present investigation was undertaken to study the performance of different genotype under different row spacing.

Materials and Method

The field experiment was conducted in field at Regional Research Center, Amravati during *kharif* season 2021-22. Six soybean varieties NRC 165, NRC 152, HIMSO 1689, JS 21-72, and check JS 20-34, NRC 86 were sown on row spacing 30 cm and 45 cm. The experiment was conducted in split plot design of net plot size of 5.0 m x 2.7 mand replicated in three times keeping row spacing in main plot and varieties in sub plot.

Soil type was medium deep with 4.89 kg/ha organic carbon, bulk density 1.43 g cm^3, organic carbon 4.89 g/kg, porosity 46.03% and initial status of soil was 215, 19, 345 Kg/ha NPK respectively. Sowing Soybean entries was done by dibbling after seed bed preparation.

The observation on dry matter was recorded at 30 DAS, 45 DAS and 60 DAS, CGR and RGR on 30-45 and 45-60 DAS. Yield attributes *viz*., branches per plant, pods per plant, seed index and seed yield kg/ha and straw yield kg/ha were recorded at the time of harvesting. From each net plot, five plants were randomly selected and labeled for taking biometric observations at different growth stages. The same plants were harvested separately for post harvest studies. The threshing and cleaning of seeds were done from plant of each net plot. The cleaned seeds obtained from each net plot were weighted in kg. After separation of seeds from biological yield, remaining material (stem + pod husk) was considered as straw yield and its final weights were recorded in kg per net plot, which were then converted into straw yield (Kg/ha) by multiplying hectare factor.

Result and Discussion

Row spacing had significant effect on morpho-physiological parameters, yield attributes and yield of soybean. Number of branches per plant (2.67), number of pods per plant (48.73) were recorded significantly highest at 45 cm row spacing. Similar results were also reported by De Bruin and Pedersen (2008) [3], Billore *et al*. (2000) [4] and Vyas and Khandwe (2014) [5]. Test weight and Dry weight per plant at 30, 45 and 60 DAS does not affect by row spacing. Similarly, trend was observed in respect to RGR also.

Among different genotypes, significantly highest no. of pods per plant and test weight was recorded in JS 21-72 (65.23) and NRC 152 (11.50 g) respectively. Dry matter accumulation per plant at all growth stages was found significantly higher in JS 21-72 while highest CGR 30-45 DAS was recorded in HIMSO 1689 followed by all genotypes except JS 20-34. CGR at 45-60 DAS, highest CGR was noticed in JS 21-72 (38.04 g/m^2/day). In respect of number of branches per plant, none of the entries proves significantly superior over each other.

Highest RGR at 30-45 DAS was recorded in 30 cm row spacing while RGR at 45-60 DAS was recorded in 45 cm row spacing. Amongst the genotype, NRC 152 and JS 21-72 was recorded maximum RGR at 30-45 DAS and 45-60 DAS respectively.

Table-1 Branches/plant, Pods/plant, Test weight (g), Dry weight/plant (g), CGR (g/m2/day) and RGR (g/g/day) influence by different row spacing

Treatment	Branches/ plant	Pods/plant	SeedIndex (g)	Dry weight/plant (g)			CGR		RGR	
				30 DAS	45 DAS	60 DAS	30-45 DAS	45-60 DAS	30-45 DAS	45-60 DAS
Row spacing (cm)										
30	2.30	43.38	10.06	2.80	8.94	13.98	18.40	14.88	0.098	0.032
45	2.67	48.73	11.22	3.30	10.07	15.67	20.33	16.80	0.091	0.033
SE(m)±	0.13	1.55	0.58	0.11	0.92	0.85	3.10	4.51	0.011	0.011
CD (P=0.05)	0.39	4.57	NS	0.33	NS	NS	NS	NS	NS	NS
Entry										
NRC 165	2.26	28.10	10.83	2.49	8.46	10.11	17.90	7.96	0.099	0.015
NRC 152	2.30	25.23	11.50	1.98	9.29	10.87	21.91	4.74	0.125	0.013
HIMSO 1689	2.60	53.60	10.50	2.36	9.73	15.87	22.14	18.41	0.115	0.040
JS 2172	2.73	65.23	10.83	4.57	11.45	24.13	20.66	38.04	0.073	0.060
NRC 86 (C)	2.43	58.27	9.50	3.56	9.90	13.73	19.03	11.50	0.082	0.025
JS 2034 (C)	2.56	45.90	10.67	3.35	8.20	13.99	14.55	17.38	0.073	0.043
SE(m)±	0.22	2.90	0.44	0.22	0.74	0.94	2.15	3.05	0.007	0.007
CD (P=0.05)	NS	8.55	1.29	0.66	2.18	2.78	6.33	8.99	0.021	0.020
Interaction						C				
SE(m)±	0.11	2.53	0.43	0.29	0.49	0.60	1.88	3.03	0.011	0.007
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table-2 Straw yield (kg/ha), HI (%), Grain production efficiency (kg/ha/day) and RUE(kg/ha-mm) as influence by different row spacing

Treatment	Straw yield (kg/ha)	HI (%)	Grain production efficiency (kg/ha/day)	RUE (kg/ha-mm)
Row spacing (cm)				
30	2443	44.88	20.76	2.97
45	2663	45.55	23.27	3.33
SE(m)±	124.33	--	--	--
CD (P=0.05)	NS	--	--	--
Entry				
NRC 165	2294	44.84	20.29	2.92
NRC 152	2316	44.76	20.50	2.92
HIMSO 1689	2771	44.99	22.81	3.31
JS 2172	3102	45.18	26.10	3.75
NRC 86 (C)	2271	44.60	19.89	2.68
JS 2034 (C)	2564	46.91	22.50	3.33
SE(m)±	103.67	--	--	--
CD (P=0.05)	NS	--	--	--
Interaction				
SE(m)±	81.81	--	--	--
CD (P=0.05)	NS	--	--	--

Straw yield does not influence by different row spacing and by different genotype. Lowest Harvest Index (45.55%), Grain production efficiency (23.27 kg/ha/day) and rain use efficiency (3.33 kg/ha-mm) were recorded under 45 cm row spacing [Table-2]. While among the genotypes, lowest harvest index was observed in variety NRC 86 (44.60). maximum grain production efficiency (kg/ha/day) and rain use efficiency was found in genotype JS 21-72 *i.e.*, 26.10 and 3.75 respectively.

From [Table-3] reveals that, Amongst the different row spacing, 45 cm row spacing recorded significantly highest Mean seed yield *i.e.*, 2230 kg/ha. Shrestha *et al.*, (2021)[6] reported that intra row spacing of 43-60 cm and intra plant spacing of 10-15 cm was found optimum in terms of grain yield of soybean. While in different genotypes, JS 21-72, proves significantly superior over rest of others and recorded highest seed yield *i.e.*, 2671 kg/ha under 45 cm row spacing but found at par with HIMSO 1689 and JS 20-34. The lowest seed yield was observed in variety NRC 86 at 30 cm row spacing (1710 kg/ha)

Table-3 Seed yield (kg/ha) as influence by different row spacing

Treatment	Row spacing (cm)		
Entry	30	45	Mean
NRC 165	1818	1915	1867
NRC 152	1785	1946	1866
HIMSO 1689	2074	2441	2258
JS 2172	2444	2671	2558
NRC 86 (C)	1710	1951	1831
JS 2034 (C)	2088	2457	2273
Mean	1987	2230	
	SE m±	CD (P=0.05)	
Row spacing	87.81	259.01	
Entry	99.27	292.80	
Interaction	51.38	NS	

From one year data, it reveals that, amongst the different row spacing, genotype JS 2172 recorded significantly highest seed yield 2671 kg/ha under 45 cm row spacing but found at par with HIMSO 1689 and JS 20-34. Significantly lowest seed yield was observed in variety NRC-86 at 30 cm row spacing (1710 kg/ha).

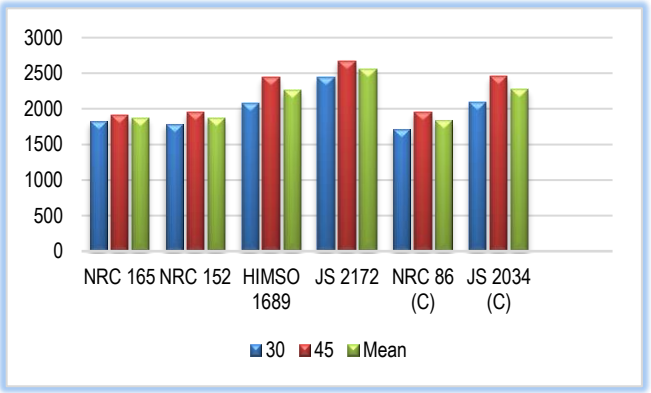

Fig-1 Seed yield (kg/ha) as influence by different row spacing

Conclusion

Seed yield of Soybean under 45 cm row spacing was found more than 30 cm row spacing. However, genotype JS 2172 recorded significantly highest seed yield with both spacing.

Application of research: With optimum plant population we can increase number of pods per plant with less pest and disease incidence

Research Category: Agronomy

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Study area / Sample Collection: Regional Research Center, Amravati, 44603

Cultivar / Variety / Breed name: Soybean (*Glycine max* L.)

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
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