

Effect of spacing on growth and yield parameters of two varieties of okra, *Abelmoschus esculantus* (L) Moench

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ABSTRACT

The experiment was conducted during 2013-14 at the research farm of Department of Vegetable Science, CCS HAU, Hisar to study the effect of spacing on growth and yield of okra in summer season. Three spacing and two varieties in split-split plot design with three replications were included in the experiment. Growth parameters of okra crop were significantly affected by spacing in two varieties. Highest plant height was observed in wider spacing with variety HBT-49-1. However number of branches was highest in variety Hisar Unnat. Yield attributes like first fruiting node, intermodal length, fruit length, diameter etc were highest in variety HBT-49-1 leading to highest fruit yield (q/ha) in spacing 30 x 10 cm. The spacing 30 x 10 cm resulted in higher growth parameters, yield attributes and yield in variety HBT-49-1.

Keywords: Spacing; varieties; growth; yield attributes; yield; okra

INTRODUCTION

Okra, *Abelmoschus esculantus* (L) Moench is one of the most important summer vegetable crops grown for its immature fruits which are commonly used in culinary preparation. Its tender green fruits are also canned, dehydrated or frozen for off season consumption. The crop is grown in both spring-summer (February-May) and rainy seasons in tropical and subtropical regions of the country. In north India, spring-summer crop remains free from the infections of yellow vein mosaic virus disease and fetches better price in the market. India is

second largest producer of okra after China where it occupies an area of 4.98 lakh hectares with an average production and productivity of 57.48 lakh tonnes and 11.75 tonnes/ha respectively which is 3.9 per cent of the total vegetable production (Vanitha et al 2013).

In Haryana it occupies an area of 18200 hectares with an average production and productivity of 1.45 lakh tonnes and 7.96 tonnes/ha respectively (Anon 2011). The main okra growing areas of Haryana are Sonapat, Karnal, Panipat

and Hansi where the farmers grow the crop on both sides of the ridges by dibbling 4 to 5 seeds per hill at very close spacing using 50-60 kg seed compared to recommended rate of 20-25 kg/ha and 3-4 times higher quantity of nitrogen against recommended dose of 100 kg/ha. It has been recommended to grow spring-summer crop of okra at 30 x 20 cm spacing. Thakur and Arora (1986) have advocated 30 x 15 cm and 30 x 13 cm spacing respectively for growing okra during summer season. A new promising line HBT-49-1 of okra has been found superior to check Hisar Unnat for yield in station trials of three years in spring-summer on recommended spacing and doses of fertilizers. It has been observed that each genotype has its own requirement of spacing and fertilizers for proper growth and development in a particular season as okra is a photosensitive crop. HBT-49-1 has more tall and stout plant canopy than earlier released varieties Hisar Unnat and Varsha Uphar. The present study was conducted to find out the effect of spacing on growth and yield of two varieties of okra.

MATERIAL and METHODS

The present study was carried out at the Research Farm of the Department of Vegetable Science, CCS HAU, Hisar during spring-summer season of 2013-14. Hisar is situated between 29° 10' N latitude and 15° 46' E longitude at mean elevation of 215.2 meters amsl and has a semi-arid, subtropical climate, hot and dry winds during

summer and dry severe cold in the winter. The mean maximum and minimum temperature of 42° to 46°C is quite common during summer months (May-June). The rainfall is restricted mainly to the monsoon months from July to September but sometimes pre-monsoon showers occur in June also. The soil of this area is derived from Indo-Gangentic alluvium which is very deep and sandy loam in texture. The pH of the soil varies from 7.8 to 8.9 since these soils are poor in organic carbon and available nitrogen, medium in phosphorus and rich in potash content.

The experimental material for the present investigation comprised two varieties (Hisar Unnat and HBT-49-1) and three spacing (30 x 5 cm, 30 x 10 cm and 30 x 15 cm). In each replication there were 18 plots, each plot of 3.6 × 3 m size accommodating three rows. Per hill 2-3 seeds were sown which were later thinned to one plant per hill. Recommended package of practices for other operations was followed to raise a healthy crop. The parameters viz plant height at 45, 60, 75 DAS and final harvest (cm), number of branches, first fruiting node, intermodal length (cm), fruit length (cm), fruit diameter (cm), fruit weight (g), number of fruits per plant, fruit yield (q/ha) were recorded in the study. The meteorological data of the crop season were obtained from Department of Agro-meteorology, CCS Haryana Agricultural University, Hisar. Composite soil samples were taken from

four different places of experimental field from a depth of 0-15 cm during season. The samples were analyzed to determine the physical and chemical composition of the soil. The soil was sandy loam with sand (55%), silt (34%) and clay (11%). The electrical conductivity was 0.30 dS/m at 25°C with pH 8 (alkaline) and organic carbon 0.6 per cent. The available nitrogen was 320 (low), phosphorus 17 (medium) and potassium 307 kg/ha (rich).

RESULTS and DISCUSSION

Effect on plant growth (Table 1)

The spacing 30 x 5 cm and 30 x 10 cm significantly produced taller plants at 45, 60 and 75 days after sowing and at harvest the two being at par as compared to spacing 30 x 15 cm. Spacing 30 x 15 cm resulted into significantly higher number of branches (2.31) as compared to 2.20 and 1.84 in 30 x 10 and 30 x 5 cm spacing respectively. It might be due to more competition for light and space among the plants. Similar results were also reported by Maurya (2013). Ekwu and Nwoku (2012) also reported that plant height increased with the plant spacing from 50 x 25 cm to 50 x 50 cm beyond which there was decrease in plant height. In case of 30 x 15 cm spacing reduced competition for light and other resources as well as reduced overlapping from adjacent okra plants within the population could have enabled the plants to utilize their energy for maximum branching. Similar results were also reported

by Ijoyah et al (2010) and Maurya (2013). In nature the competition effect may be completely absent until population density reaches some threshold at which resources become limited (Talukder et al 2003, Makinde and Macarthy 2006).

It was observed that plant height at different intervals (45, 60, 75 DAS and at harvest) was significantly higher in variety HBT-49-1 but number of branches per plant was significantly higher in Hisar Unnat (2.16) as compared to 2.07 in HBT-49-1. The reason for higher plant height in HBT-49-1 could be its genetic constitution. The number of branches per plant was also higher in case of Hisar Unnat. The results are in conformity with the findings of Harishchand et al (2010) and Adiger et al (2011).

Effect on yield attributes and yield (Table 2)

The data were collected on seven yield attributes viz first fruiting node, intermodal length, fruit length, diameter and weight, number of fruits per plant and fruit yield. Spacing 30 x 10 cm significantly affected the yield attributes like first fruiting node and number of fruits per plant. First fruiting node was significantly earlier in 30 x 10 cm spacing but significant reduction in intermodal length was observed in spacing 30 x 15 cm. There was no effect of spacing on fruit length. Fruit diameter (1.45 cm) and fruit weight (7.96 g) were significantly higher in spacing 30 x 15 cm over 30 x 5 cm but

Table 1. Effect of spacing on plant height and number of branches of okra

Treatment	Plant height (cm)				# branches
	45 DAS	60 DAS	75 DAS	At final harvest	
Spacing					
S ₁ : 30 x 5 cm	37.45	69.60	110.94	134.50	1.84
S ₂ : 30 x 10 cm	36.50	68.51	109.50	133.63	2.20
S ₃ : 30 x 15 cm	30.70	63.73	105.38	129.30	2.31
SEm±	0.51	0.29	0.51	0.38	0.02
CD _{0.05}	2.00	1.11	2.00	1.50	0.07
Variety					
V ₁ : Hisar Unnat	33.13	65.31	105.41	128.81	2.16
V ₂ : HBT-49-1	36.64	69.25	111.79	136.52	2.07
SEm±	0.93	0.33	0.76	0.43	0.03
CD _{0.05}	2.77	0.99	2.27	1.28	0.08

Table 2. Effect of spacing on yield attributes and yield of okra

Treatment	First fruiting node	Internodal length (cm)	Fruit length (cm)	Fruit diameter (cm)	Fruit weight (g)	# fruits /plant	Fruit yield (q/ha)
Spacing							
S ₁ : 30 x 5 cm	6.15	5.15	8.61	1.40	7.31	29.69	124.20
S ₂ : 30 x 10 cm	5.42	4.81	8.72	1.44	7.73	35.27	126.51
S ₃ : 30 x 15 cm	5.61	4.65	8.64	1.45	7.96	31.20	114.79
SEm±	0.09	0.10	0.13	0.01	0.06	1.01	0.113
CD _{0.05}	0.36	0.37	NS	0.04	0.22	3.94	0.441
Variety							
V ₁ : Hisar Unnat	5.36	5.05	8.43	1.41	7.33	30.50	118.63
V ₂ : HBT-49-1	6.11	4.70	8.89	1.45	8.00	33.61	125.03
SEm±	0.05	0.05	0.07	0.01	0.06	0.36	0.236
CD _{0.05}	0.14	0.15	0.21	0.02	0.19	1.08	0.702

on par with 30 x 10 cm. Significantly higher number of fruits and fruit yield (126.51 q/ha) were observed in spacing 30 x 10 cm. Narrow spacing results in higher plant population, higher competition for all the resource factors but in wider spacing this competition is less which results into healthier plants. The results are in accordance with those of Saha et al (2005).

The yield is a factor of plant population and higher the plant population per unit area higher will be the yield that explains the higher yield in spacing 30 x 10 cm as compared to 30 x 15 cm. The result is in conformity with the finding of Gorachand et al (1990).

The first fruit node, fruit length, fruit diameter, fruit weight, number of fruits per plant and fruit yield were 6.11 days, 8.89 cm, 1.45 cm, 8.00 g, 33.61 and 125.03 q/ha in HBT-49-1 which were higher to Hisar Unnat being 5.36 days, 8.43 cm, 1.41 cm, 7.33 g, 30.50 and 118.63 q/ha respectively. The intermodal length was higher in Hisar Unnat (5.05 cm) as compared to 4.70 cm in HBT-49-1. Similar results were reported by Abeykoon et al (2010).

CONCLUSION

The present investigations showed that in general the spacing of 30 x 10 cm resulted in higher growth parameters and yield attributes in variety HBT-49-1 of okra.

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