



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SP4: 151-153

Jitendra Singh Rajput

a) Department of Horticulture,
AKS University Satna, Madhya
Pradesh, India
b) Department of Agriculture
Science and Technology, AKS
University Satna, Madhya
Pradesh, India

DK Sahu

a) Department of Horticulture,
AKS University Satna, Madhya
Pradesh, India
b) Indira Gandhi Krishi
Vishwavidyalaya Krishak
Nagar, Raipur, Chhattisgarh,
India

Khiromani Nag

a) Department of Horticulture,
AKS University Satna, Madhya
Pradesh, India
b) Indira Gandhi Krishi
Vishwavidyalaya Krishak
Nagar, Raipur, Chhattisgarh,
India

LP Bhardwaj

a) Department of Horticulture,
AKS University Satna, Madhya
Pradesh, India
b) Indira Gandhi Krishi
Vishwavidyalaya Krishak
Nagar, Raipur, Chhattisgarh,
India

Correspondence**Jitendra Singh Rajput**

a) Department of Horticulture,
AKS University Satna, Madhya
Pradesh, India
b) Department of Agriculture
Science and Technology, AKS
University Satna, Madhya
Pradesh, India

(Special Issue- 4)

**International Conference on Food Security and
Sustainable Agriculture
(Thailand on 21-24 December, 2018)**

**To find out the effect of plant density on growth and
yield of okra (*Abelmoschus esculentus* L.)**

Jitendra Singh Rajput, DK Sahu, Khiromani Nag and LP Bhardwaj

Abstract

In order to explore the possibility of improving growth and yield of okra an experiment entitled "To find out the effect of plant density on growth and yield of okra (*Abelmoschus esculentus* L.) have been conducted at the research farm of AKS University Satna, M.P. During kharif season of 2015-16. Experiment was laid out in RBD (with factorial concept) with three replications. Experiment comprised of three spacing's viz., 60x30cm, 60x45 and 60x60cm. The spacing's 60x45cm had significant influence on most of the parameters such as plant height (cm), number of leaves per plant, number of branches per plant and yield parameters such as days to first fruit set, days to 50% fruit set, fruit yield per plant (g.), fruit yield per plot (kg) and fruit yield per hectare (q).

Keywords: Okra (*Abelmoschus esculentus* L.) plant density, growth and yield

Introduction

Okra (*Abelmoschus esculentus* L.) is one of the fast growing annual herb; and the tender fruits called capsules are used as a common vegetable. It is one of the important fruit vegetable of tropical and subtropical regions of the world. Its cultivation is also adopted in rainy season in most part of the world. (Thakur & Arora 1999) [1]. The fruits and leaves contain, in 100 g respectively: proteins (2.1 g and 4.4 g); fats (0.2 g and 0.6 g); carbohydrates (7.0 g and 9.0 g); beta-carotene (190 µg and 730 µg); vitamins B1, B2 and B6 (0.04 µg and 0.25 µg; 0.08 µg and 2.80 µg; 0.22 µg and 0.0 µg), besides niacin, B5 (0.6 g and 0.2 g) and vitamin C (47 mg and 59 mg), as well as calcium (84 mg and 530 mg) and iron (1.2 and 0.7 mg). According to FAO (2003) [3]. Okra plants are grown commercially in many countries such as India, Japan, Turkey, Iran, Western Africa, Yugoslavia, Bangladesh, Afghanistan, Pakistan, Malaysia, Thailand, Brazil and in the Southern United States (Benjawan *et al.*, 2007) [1]. Okra grow in India Karnataka, it is grown in an area of 0.14 lakh ha. with an annual production of 1.2 lakh tons and productivity of 8.75 tons of green fruits per ha. Uttar Pradesh, Bihar and Orissa are major okra-growing states in India (Chadha 2002) [2]. In Madhya Pradesh, it is grown successfully in Jabalpur, Sagar, Hosangabad, Vidisha, Sehore, Jhabua, Indore, Barwani and Bhopal in 26.51 thousand hectare area & production of 305.91 thousand mt with 11.5 tonnes / ha productivity during the year of 2014. The plant density plays an important role on yield of okra fruit and seed. Okra production in India is mainly limited from rainy season. The production of okra in off-season may meet up the market demand during the lean period of vegetable supply and can improve the nutritional status. Spacing is also considered on an important cultural operations governing yield of okra. Narrow spacing result in higher plant population lower's, higher competition for all the resource factor but in wider spacing this competition is less which result into healthier plants. Suitable plant spacing can lead to optimum yield but incorrect plant spacing could result in relatively low yield and poor quality fruits. A significant decrease of pod yield per plant with increasing plant density was observed by plant populations may result in rigorous growth, poor quality fruits and low yield due to intra specific competition. The effect of plant spacing on the growth and yield of okra have also been reported by many authors. (Maurya *et al.* 2013) [4].

Materials and Methods

The details of materials used, experimental procedures followed and techniques adopted during the course of present investigation entitled "To find out the effect of plant density on growth and yield of okra. (*Abelmoschus esculentus* L.)" The experiment have been conducted at the farm of AKS University, Satna M.P. (80°21' to 81°23' east longitude and 23°58' to 25°12' north latitude). The experimental plot was located about 2000 meters East of AKS University, Campus. The experimental details are as follow;

Crop	- Okra (<i>Abelmoschus esculentus</i> (L.))
Design	- Factorial Randomized Block Design
Replications	- 03
Treatment	- 09
Net area	- 87.48 sq.m.
Replication distance	- 75 cm
Plot distance	- 50 cm.
Row to Plant distance-	60 x 30, 45, and 60cm
Variety	- Parbhani kranti

Observations assessments

(A). Growth Parameters; (i) Plant Height (cm); Plant height (cm) was measured on randomly selected five plants from inner nine observation plants. It was measured at 30 days interval starting from 30 days after seed sowing to till final harvesting.

(ii) Number of leaves per plants; Among inner nine observation plants five plants were selected randomly for observation. The number of leaves was measured starting from 30 days after seed sowing to final harvesting.

(iii) Number of branches per plants; Primary branches were counted on randomly selected five plants from observation plants. It was measured at 30 days interval starting from 30 days after seed sowing to final harvesting.

(B) Yield Parameters

(i) Days to first fruit set; Days to first fruit set of individual inner plant were observed after randomly selecting the plant. The average of five plant was considered as days to first fruit set.

(ii) Days to 50% fruit set; The day when first five flowers of each individual plant set fruits was considered as days to 50% fruit set of each plant. The average of five observation plants was calculated for this parameter.

(iii) Fruit yield per plant (kg); Picking of fresh marketable fruit was done from the observational plants separately throughout the harvesting period at an interval of 3days it was totaled and then average yield per plant was worked out for each plant.

(iv) Fruit yield per plot (kg); Yield per plot was calculated from yield of inner observational plants. The average yield per plant calculated as above was multiplied gave the yield per plot.

(v) Fruit yield per hectare (q); The yield of fruit per hectare was computed from the per plot yield and was recorded in quintals.

$$\text{Yield per ha (q/ha)} = \frac{\text{Yield per net plot (kg)}}{\text{Net area of the plot (m}^2\text{)}} \times 100$$

Result and Discussion

Experiment have been conducted "To find out the effect of plant density on growth and yield of okra. (*Abelmoschus esculentus* L.)" Cv. Parbhani kranti. The parameters studied were plant height (cm), Number of leaves per plant, Number of branch per plant, Days to first fruit set, Days to 50% fruit set, Fruit yield per plant, Number of seeds per pod, Fruit yield per plot and fruit yield per hectare.

(A) Growth parameters

(i) Plant height (cm); Data collected on account of plant height (cm) of okra as affected by different plant spacing's (cm).

(a) Plant height at 30 days after sowing (DAS); Effect of plant spacing's (cm); Use of spacing's caused beneficial response on plant height of okra and maximum plant height i.e. 29.21cm was obtained at 30 days after sowing when S₂ (60 x 45cm) plant spacing's (cm) was kept.

(b) Plant height at 60 days after sowing (DAS); Effect of plant spacing's (cm); Use of plant spacing's did not cause any response on height of the plant and plant height was remained unaffected.

(c) Plant height at harvest; (a) Effect of plant spacing's (cm); Use of spacing also caused beneficial effect on plant height of okra and maximum plant height i.e. (119.71 cm) at harvest. Was obtained when plant spacing's used 60 x 45 cm.

(iii) Number of leaves per plant; (a) Number of leaves per plant at 30 days after sowing; Effect of plant spacing's (cm); Use of spacing's caused beneficial response on number of leaves per plant in okra and large number of leaves i.e. (15.82) were recorded when plant spacing was kept 60 x 45cm.

(b) Number of leaves per plant at 60 days after sowing (DAS); Effect of plant spacing's (cm); Use of spacing's caused beneficial response on number of leaves per plant in okra and large number of leaves (41.40) were recorded when plant spacing's (cm) was kept 60 x 45cm.

(c) Number of leaves per plant at harvest; Effect of plant spacing's (cm); The effect of plant spacing of 60 x 45 cm resulted in large number of leaves per plant. This result was significantly different from the number of leaves (96.18) at harvest.

(iii) Number of branch per plant; (a) Number of branch per plant at 30 days after sowing; Effect of plant spacing's (cm); Use of plant spacing's (cm) did not cause any effective effect on branch of the plant and number of branch was remained unaffected.

(b) Number of branch per plant at 60 days after sowing; (a) Effect of plant spacing's (cm); The effect of plant spacing of 60 x 45 cm resulted in large number of branch per plant. This result was significantly different from the number of branch (2.56) at 60 days after sowing.

(iv) Number of branch per plant at harvest; (a) Effect of plant spacing's (cm); Use of spacing's also caused beneficial effect on number of branches per plant of okra. The maximum number of branches (4.73) at harvest obtained respectively plant spacing used 60 x 45 cm.

(v) Days taken to 50% flowering; (a) Effect of plant spacing's (cm); Use of spacing's caused beneficial response on days taken to 50% flowering of okra and minimum days taken to 50% flowering i.e. 42.69 days was obtained when S₂ (60 x 45cm) plant spacing's was kept.

(vi) Days to first fruit set; (a) Plant spacing's (cm); Use of spacing's caused beneficial response on days to first fruit set of okra and minimum days to first fruit set i.e. 44.80 days was obtained when S₂(60 x 45cm) plant spacing was kept and maximum days to first fruit set i.e. 46.40 days was involved when plant spacing was kept 60x30cm.

(vii) Days to 50% fruit set; (a) Effect of plant spacing's (cm); Use of spacing's caused beneficial response on days to 50% fruit set in okra minimum days were taken to 50% fruit set (48.80) were recorded when plant spacing's (cm) was kept 60 x 45cm.

(viii) Fruit yield per plant (g); (a) Effect of plant spacing's (cm); Use of spacing's caused effective response on fruit yield per plant (g) of okra and maximum fruit yield per plant i.e. (320.51g) were obtained when S₂ (60 x 45 cm) plant spacing was kept.

(ix) Fruit yield per plot (kg); (a) Effect of plant spacing's (cm); Result indicated that the effect of plant spacing's (cm) significantly affected fruit yield per plot (3.71kg). The maximum fresh weight of pod was recorded when using 60x45 cm plant spacing's.

(x) Fruit yield per hectare (q); (a) Effect of plant spacing's (cm); Result indicated that the effect of plant spacing's (cm) significantly affected fruit yield per hectare (114.39q). The maximum fresh weight of pod was recorded when using 60x45 cm plant spacing's.

Effect of plant spacing; Use of spacing also cause beneficial response on growth parameters such as plant height (cm), number of leaves per plant, number of branches per plant. Yield parameters such as days to first fruit set, day to 50% fruit set, fruit yield per plant (g) and fruit yield per plot (kg) of okra. The beneficial effect due to different plant spacing was significant with plant height, number of leaves per plant, number of branches per plant, days to first fruit set, days to 50% fruit set, fruit yield per plant, fruit yield per plot and fruit yield per hectare. There is no significant effect was found on Spacing's S₂ (60 x 45 cm) significantly superior over all other spacing's with the minimum result is found in S₃ (60 x 60 cm) in okra crop. Similar results were obtained by Yadav *et al.* (1999) ^[6] in okra crop.

Effect of plant spacing's: The study revealed that plant spacing's (60x45cm) significantly resulted in increase in all parameter like. plant height(cm), number of leaves per plant, number of branch per plant, days to first fruit set, days to 50% fruit set, fruit diameter (cm), fruit yield per plant, fruit yield per plot and fruit yield per hectare.

Reference

1. Benjawan C, Chutichudet P, Kaewsit S. Effect of green manures on growth yield and quality of green okra (*Abelmoschus esculentus* L). Pak. Jour. of Biol. Sci. 2007; 10:1028-1035
2. Chadha KL. Hand book of horticulture, Indian Council of Agricultural Research, 2002, 427.
3. FAO. FAO Stat Database, 2003. Available from: <<http://faostat.fao.org>>.
4. Maurya RP, Jamar AB, Jeff AC. Impact of plant spacing and picking interval on the growth, fruit quality and yield of okra (*Abelmoschus esculentus* (L.) Moench). Amer. Jour. of Agri. and Forest. 2013; 1(4):48-54
5. Thakur MR, Arora SK. Okra. In: T.K. Bose, M.G. Som, and J. Kabir (eds) Vegetable crops in India (reprinted edition). Naya Prokash, Calcutta, 1999, 610-618.
6. Yadav, Dhankar. Effect of spacing on growth and yield parameter of okra. Int. Jour. of Farm Science. 1999; 6(1):163-168