



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; SPI: 195-197

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(Special Issue- 1)
2nd International Conference
**“Food Security, Nutrition and Sustainable Agriculture -
Emerging Technologies”**
(February 14-16, 2019)

**Effect of varieties, organic manure and inorganic
fertilizer on growth and yield of okra (*Abelmoschus
esculentus* L.)**

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Abstract

Field experiment was conducted at the farm of Shree Hansraj Moyal at village Ramsara, Teh. Abohar, District Fazilka in Punjab state during March - June 2018 to study the effect of varieties, organic manure and inorganic fertilizer on growth and yield of okra. The two varieties of okra Punjab-8 and F₁ hybrid shabiha and poultry manure and NPK were used for experimentation. The effect of two varieties, poultry manure and NPK on plant height (cm), days to first flowering, number of fruits per plant, fruit length (cm) and fruit weight per plant (g) were observed. Results showed that plant height, number of fruits per plant and fruit weight per plant were maximum in variety V₁ (Punjab-8) with the application of poultry manure. While days to first flowering was minimum in V₁ (Punjab-8) with the application of NPK and fruit length was maximum in V₂ (F₁ hybrid shabiha) with the application of NPK. On the basis of experiment, it may be concluded that variety V₁ (Punjab-8) with poultry manure recorded superior performance for growth and yield attributes of okra.

Keywords: Okra, *Abelmoschus esculentus* L, organic manure, inorganic fertilizer, varieties

Introduction

Okra or lady finger, locally known as bhindi, is an annual vegetable grown in tropical and subtropical regions of the world. It is related to cotton and Hibiscus and is a tall growing, annual summer vegetable. The edible part of okra is pod. The plant may have single or branched stem. Flowers are borne singly at every node or at an alternate node. Okra is a good source of vitamins, calcium, potassium and other minerals. Due to its high iodine content, consumption of okra is good for the control of goiter. Okra is an important source of both soluble and insoluble fibre (Dhaliwal) ^[1]. The tender and nutritious green okra fruits are fried and used as delicious vegetable in summer months, especially when only few vegetables are available in the season. It is also served as salad and soup ingredient. In addition to fruits, leaves are also consumed as vegetable in some African countries. Crude fibers obtained from mature fruit and stems are extensively being used in paper industry (Rana) ^[2]. Soil fertility is usually maintained by the application of organic and inorganic fertilizers and there is also an improvement in physical and biological properties of the soils (Okwuagwa *et al.*) ^[3]. Poultry manure relative resistance to microbial degradation is essential for establishing and maintaining optimum soil physical condition and is important for plant growth. It is also very cheap and effective as a good source of nitrogen for sustainable crop production (Dauda *et al.*) ^[4].

Material and Methods

The experiment was conducted at the farm of Shree Hansraj Moyal at village Ramsara, Teh. Abohar, District Fazilka in Punjab state during March to June 2018. The experiment was conducted in six plots with each plot having dimensions of 272.25 square feet or 25.29 square meters. A pre sowing irrigation was applied before one week of sowing to make sufficient moisture content in the field.

The field was properly prepared with disc harrow followed by two ploughings with cultivator and one planking to make fine tilth. 10 kg seed per acre was sown. The seeds were sown at row to row 45 cm and plant to plant 15cm spacing. The treatments were poultry manure 8t/ha and 100 kg/ha nitrogen in the form of urea, 60 kg/ha phosphorus in the form of SSP and 60kg/ha potash in the form of MOP and the control (without fertilizer). Organic manure was applied to respective plot prior to sowing. Full dose of phosphorus and potassium was applied at the time of sowing. Nitrogen was applied in three splits at three stages- at sowing time, at the time of flowering and at the time of fruit setting. Weed control was done manually i.e 3 hand hoeing. First irrigation was applied after 7-8 days of sowing and after that irrigation was applied as per requirement. To control the attack of aphid and okra fruit borer, alternate 4 sprays of Coragen 20 SC @ 30 ml and Imidacloprid 70 per cent @ of 20g in 100 litre of water per acre was used. For measuring plant height, five plants were selected randomly per treatment and then height of selected plants were measured with the help of measuring tape from ground level up to the top of plant at 15 days interval. The plants were observed daily under each treatment and the number of days to first flowering was recorded. Fruits produced from each plant were counted and the average was worked out to estimate the number of fruits per plant. The length of fruit was measured with measuring scale. The measurement was done from the top to end tip of fruit. The fruit length was measured in cm. The weight of fruits was measured with the help of weighing machine and average was calculated for all treatments and expressed in grams.

Treatments

Varieties

- V₁- Punjab-8 (PAU)
- V₂- F₁ hybrid (Shabiha)

Nutrient Supplements

- NPK @ (100:60:60 kg/ha)
- Poultry manure @ 8t/ha
- No extra nutrition

Results and discussions

Plant height

From the experiment, it has been observed that maximum plant height was found in variety V₁ (Punjab-8) with application of poultry manure followed by NPK and Minimum plant height was found in case of variety V₂ (F₁ hybrid shabiha) and control (without fertilizer). Similarly, Uka *et al.* [5] had also indicated that maximum plant height was recorded with application of poultry droppings. Muhammad *et al.* [6] evaluated four exotic cultivars of okra and maximum yield per plant was found in Sabz-Pari.

Days to first flowering (from date of sowing)

From the experiment, it has been observed that minimum days taken for first flowering was found in variety V₁ (Punjab-8) with application of NPK followed by poultry manure and Maximum days taken for first flowering was found in case of variety V₂ (F₁ hybrid shabiha) and control (without fertilizer). Similarly, Khan *et al.* [7] had assessed five different cultivar of okra for their performance. Minimum number of days to first flowering was obtained from Pusa Green. Jonah *et al.* [8] was conducted an experiment on the growth and yield trait of okra as influenced by NPK 15:15:15 fertilizer and poultry manure.

Result showed that days to first flowering was minimum with sole application of NPK @ 120kg/ha.

Number of fruits per plant

From the experiment, it has been observed that maximum number of fruits per plant was found in variety V₁ (Punjab-8) with application of poultry manure followed by NPK and Minimum number of fruits per plant was found in case of variety V₂ (F₁ hybrid shabiha) and control (without fertilizer). Kibria *et al.* [9] had found that maximum number of fruits per plant was recorded in the 50% NPK + 50% PM i.e. 34.33 followed by 30.83 with the application of full poultry manure.

Fruit length (cm)

From the experiment, it has been observed that maximum fruit length was found in variety V₂ (F₁ hybrid shabiha) with application of NPK followed by poultry manure and Minimum fruit length was found in case of variety V₁ (Punjab-8) and control (without fertilizer). Similarly, Ibrahim *et al.* [10] studied the effect of organic manure and inorganic fertilizer on growth and yield of okra. The maximum fruit length was obtained with the application of NPK.

Fruit weight per plant (g)

From the experiment, it has been observed that maximum fruit weight per plant was found in variety V₁ (Punjab-8) with application of poultry manure followed by NPK and Minimum fruit weight per plant was found in case of variety V₂ (F₁ hybrid shabiha) and control (without fertilizer). Similarly, Kibria *et al.* had also found that maximum fruit weight per plant was recorded in poultry manure.

Observations and tables

Table 1: Effect of organic manure and inorganic fertilizer on plant height of V₁ (Punjab-8) variety of okra.

Treatment	Plant height (cm)					
	15 DAS	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS
T ₁	5.5	11.8	28.0	52.6	74.2	80.6
T ₂	6.2	14.4	31.6	55.6	71.0	78.6
T ₃	5.8	12.4	25.8	42.6	58.6	65.4

Table 2: Effect of organic manure and inorganic fertilizer on plant height of V₂ (F₁ hybrid shabiha) variety of okra.

Treatment	Plant height (cm)					
	15 DAS	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS
T ₁	6.6	12.2	23.8	36.2	53.6	69.2
T ₂	5.1	12.2	26.6	46.0	63.6	76.6
T ₃	5.8	12	22.2	35.6	53.8	70.6

Table 3: Effect of varieties, organic manure and inorganic fertilizer on days to first flowering.

Treatment	T ₁	T ₂	T ₃	Average
V ₁	43.2	40.8	44.6	42.86
V ₂	43.0	46.4	46.8	45.40
Average	43.10	43.60	45.70	

Table 4: Effect of varieties, organic manure and inorganic fertilizer on number of fruits per plant in okra.

Treatment	T ₁	T ₂	T ₃	Average
V ₁	34.9	35.4	23.2	31.16
V ₂	25.5	30.3	20.9	25.56
Average	30.20	32.85	22.05	

Table 5: Effect of varieties, organic manure and inorganic fertilizer on fruit length (cm) of okra.

Treatment	T ₁	T ₂	T ₃	Average
V ₁	7.31	7.38	6.55	7.08
V ₂	7.69	7.29	6.78	7.25
Average	7.50	7.33	6.66	

Table 6: Effect of varieties, organic manure and inorganic fertilizer on fruit weight per plant (g) of okra.

Treatment	T ₁	T ₂	T ₃	Average
V ₁	15.5	16.6	9.0	13.7
V ₂	12.5	14.1	8.2	11.6
Average	14.0	15.3	8.6	

Conclusion

On the basis of experiment, it may be concluded that variety V₁ (Punjab-8) recorded superior performance for growth and yield attributes of okra. Among the treatments poultry manure (T₂) resulted higher yield and have positive effect on growth and yield parameters of okra. NPK (T₁) was also increase growth of okra but having lesser yield as compared to poultry manure. Therefore, it is recommended to use variety V₁ (Punjab-8) with poultry manure for better growth and yield of okra.

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