

Original Research Article

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Effect of Organic, Inorganic and Bio-Fertilizers on Growth, Yield and Quality Traits of Okra [*Abelmoschus esculentus* (L.) Moench]

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ABSTRACT

The present experiment was carried out at the Horticulture Research Farm of the Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India during the year 2016-1017. The plant to plant and row to row spacing were maintained at 30x60 cm respectively. The experiment was carried under Randomized Block Design (RBD) with three replications. A single standard variety (kashipragati) released from IIVR Varanasi is sown with the different treatment combinations. The treatment combinations were T1 control, T2 (FYM), T3 (Vermicompost), T4 Neemcake, T5 (50% RDF+FYM), T6 (50%RDF+ Vermicompost) T7 (50%RDF+Neemcake), T8 (75% RDF+FYM), T9 (75%RDF+Vermicompost), T10 (75%RDF+Neemcake), T11 (50%RDF+Azotobacter), T12 (50%RDF+PSB), T13 (50%RDF+VAM), T14 (75%RDF+Azotobacter), T15 (75%RDF+PSB), T16 (5%RDF+VAM). On the basis of overall performance under the present investigation, it may be concluded that the application of 50%RDF+Vermicompost in kasha pragati increased the growth, yield and nutritional quality of okra under Lucknow condition.

Keywords

Okra, Yield and Quality.

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Introduction

Okra [*Abelmoschus esculentus* L. (Moench)], is an economically important vegetable crop grown in tropical and sub-tropical parts of the world. It is generally an annual plant. Okra belongs to genus *Abelmoschus* and species *esculentus* of family Malvaceae. It is also known as lady's finger or *bhindi*, originated in tropical Africa. Because of its richness in nutrition, taste, medicinal and industrial value okra is one of the most popular vegetables in all section of people. Okra is cultivated for its fibrous fruits or pods containing round, white

seeds. The fruits are harvested when immature and eaten as a vegetable. Okra is mainly propagated by seeds and has duration of 90-100 days. Okra can be grown in both the seasons *i.e.*, *Rabi* and *Kharif*. Okra requires a long, warm and humid growing period. Okra is a good source of vitamins, minerals, calories, and amino acid found in seeds and compares favourably with those in poultry, eggs and soyabean, (Thompson, 1949; Schipper, 2000). All parts of okra (Ladies' fingers) likes fresh leaves, buds, flowers, pods, stems and seeds can be used for different purpose and hence it is a multipurpose crop in

term of its use (Gemedé *et al.*, 2015). The mucilage found in okra may be used for plasma replacement or blood expander (Madison, 2008 and Maramag, 2013). Moreover, long term sustainability of productivity could be achieved only through the interaction of inorganic and organic sources of nutrients (Hedge *et al.*, 1992 and Singh and Yadav, 1992). In India, Uttar Pradesh covering an area of 11.10 thousand hectares with a production of 128.80 thousand million tonnes and productivity of 11.31 metric tonnes per hectare (Anonymous, 2011). Indiscriminate use of inorganic fertilizers has resulted in decreased nutrient uptake, poor quality of vegetables and deterioration of soil health (Ganesh *et al.*, 2000; Agrawal, 2003). Okra produces fruit for a long time and needs balanced and sufficient supply of nutrients for higher yield and better quality.

Materials and Methods

An experiment was conducted at Horticulture Research Farm, Department of Horticulture, at Babasaheb Bhimrao Ambedkar University, Lucknow during September to December of 2016. The experiment was laid out in randomized block design with 16 treatments replicated thrice. Total numbers of plots were 48 and the net plot size was (3.6 m²). The row to row and plant to plant distance of the experiment was maintained respectively 60cm and 30cm. The treatments involved were T1 (Control), T2 (FYM/Compost), T3 (Vermicompost), T4 (Neemcake), T5 (50% RDF+FYM/Compost), T6 (50% RDF+Vermicompost), T7 (50% RDF+Neemcake), T8 (75% RDF+FYM/Compost), T9 (75% RDF+Vermicompost), T10 (75% RDF+Neemcake), T11 (50%RDF+Azotobacter), T12 (50% RDF+PSB), T13 (50% RDF+VAM), T14 (75%RDF+Azotobacter), T15 (75% RDF+ PSB) and T16 (75%RDF+VAM). The land was brought to a fine tilth through ploughing and tillage. Irrigation

channels and bunds were maintained properly. The seeds were sown directly to the field. Light irrigation was given after sowing. The organic manures were applied as basal dose before sowing, for proper decomposition, full dose of phosphorus and potassium and half dose of nitrogen as per treatment were applied just before the sowing. The remaining half dose of nitrogen was applied 30 days after sowing. All cultural practices were followed regularly during crop growth and observations were recorded on vegetative characters i.e. days to germination (50%), days to germination (100%), plant height, stem diameter, number of branches per plant, number of leaves, number of nodes per plant, internodal length. flowering, fruiting and yield characters i.e. days to first flowering, days to 50% flowering, number of fruits per plant, fruit weight, fruit length, fruit diameter, days to first picking, fruit yield per plant, fruit yield per hectare, number of seeds per fruits and bio-chemical parameters *i.e.* total soluble solids (⁰Brix), ascorbic acid, reducing sugar, non-reducing sugar and total sugars. The data on these parameters were subjected to statistical analysis to draw logical conclusions.

Results and Discussion

The perusal data (Table 1) of result indicated that okra plants fertilized with integrated nutrient management T11 (50% RDF+Azotobacter) and T9 (75% RDF+Vermicompost) gave maximum plant heights respectively *i.e.*, (75.08cm) and (88.41). Maximum number of leaves 9.83 and 17.33 found in T8 (75% RDF+ FYM) followed by T5 (50% RDF+ FYM) respectively. T9 (75% RDF+ Vermicompost), T9 (75% RDF+Vermicompost), and T6 (50% RDF+Vermicompost) gave maximum results in maximum number of nodes respectively 8.91, 14.00, 23.91 and maximum number of branches have been observed in the treatments respectively (3.75) T6 (50% RDF+ Vermi

compost), (6.5) T14 (75%RDF+Azotobacter), (12.41) T14 (75%RDF+Azotobacter). Highest Internodal length 9.29 (cm) was found in T11 (50% RDF +Azotobacter). Treatment T16 (75%RDF +VAM) results in minimum days to 50% germination and T16 (75%RDF+ VAM) required minimum days to 100% germination (18.66 days) and also results in maximum stem diameter (11.11....). Organic manures helps in improving soil health and it ensures proper aeration in soil and improves water

holding capacity of soil. All over the study of vegetative characters it was observed that half dose of organic and inorganic fertilizers perform better instead of sole application of chemical fertilizer. Similarly, Minimum days to first flowering under the Treatment T16 (75% RDF+VAM) was observed 91.33. and days to 50% flowering 46.83 under the treatment T16 (75%RDF+VAM) was recorded (Table 1).

Table.1 Effect of organic, inorganic, and biofertilizers on growth, yield and Quality traits of okra cultivar

Treatments	Days to germination 50%	Days to germination 100%	Plant height	Stem diameter	No of Branches per plant	No of Leaves	No of nodes per plant	Internodal length
T1	7.33	14.00	47.15	9.71	9.67	15.33	15.95	6.80
T2	8.11	15.33	48.87	10.04	13.22	15.93	16.50	7.03
T3	7.90	14.33	50.80	10.51	10.83	16.67	17.26	7.36
T4	8.50	15.00	57.82	12.05	10.20	19.18	19.79	8.44
T5	8.00	15.66	58.25	12.13	10.65	19.25	19.93	8.49
T6	7.67	15.00	87.15	13.55	15.93	25.20	22.25	9.50
T7	7.69	14.00	60.72	11.11	9.88	19.82	18.25	7.78
T8	8.10	15.00	61.86	11.63	10.51	20.46	19.11	8.14
T9	8.00	14.66	62.53	11.77	10.86	20.67	19.33	8.25
T10	7.10	15.00	63.50	11.96	12.45	20.95	19.65	8.38
T11	7.90	15.66	63.79	12.07	12.80	21.05	19.83	8.45
T12	7.88	16.66	72.29	12.61	8.23	23.05	20.72	8.83
T13	8.12	14.33	74.34	12.86	14.10	23.29	21.12	9.01
T14	8.00	16.66	76.90	12.97	8.58	23.58	21.31	9.08
T15	8.25	16.33	82.14	13.08	9.92	23.80	21.65	9.15
T16	7.90	18.66	57.68	11.91	7.91	18.78	19.56	8.34
S.E (d)	0.71	1.69	1.99	0.63	0.61	1.06	1.14	0.35
C.D	N.S.	N.S.	4.07	1.31	1.25	2.17	2.33	0.71

Table.2 Effect of organic, inorganic, and biofertilizers on growth, yield and Quality traits of okra cultivar

Treatments	Days to first flowering	Days to 50% flowering	NO Of fruits per plant	Fruit weight	Fruit length	Fruit diameter	Days to first picking	Fruit yield per plot	Fruit yield q/ha	No. of seeds per fruits
T1	34.50	39.40	15.33	28.90	13.20	16.69	47.10	0.05	158.98	50.33
T2	35.67	40.70	15.91	29.99	13.70	17.32	48.88	0.05	165.37	52.23
T3	37.35	42.60	16.59	31.27	14.28	18.06	50.97	0.06	172.68	57.79
T4	42.80	46.80	19.04	35.89	16.39	19.72	58.50	0.07	199.16	59.47
T5	43.05	47.10	19.16	36.10	16.49	19.85	58.87	0.07	199.35	59.86
T6	45.40	49.80	25.78	45.60	20.83	24.35	60.21	0.11	320.74	70.43
T7	37.50	42.80	19.77	37.27	17.02	21.52	58.74	0.07	205.55	63.89
T8	39.30	43.80	20.42	38.50	17.58	22.22	59.73	0.07	212.12	65.01
T9	39.80	44.10	20.62	38.85	17.74	22.43	57.88	0.07	214.45	65.64
T10	40.50	45.25	20.95	39.50	18.04	22.80	57.95	0.07	217.79	66.75
T11	40.85	45.90	21.05	39.70	18.13	22.92	57.15	0.07	218.61	67.12
T12	42.70	46.75	23.80	43.85	20.03	23.33	57.80	0.08	250.83	68.35
T13	43.70	47.40	24.46	44.10	20.14	23.46	58.20	0.08	257.68	68.75
T14	44.10	48.10	24.70	44.55	20.35	23.73	58.44	0.08	266.29	69.56
T15	44.40	48.40	24.90	44.90	20.51	23.93	58.65	0.09	283.98	69.65
T16	40.30	44.10	18.79	35.40	16.17	20.45	56.73	0.06	194.723	61.67
S.E (d)	0.89	0.97	0.92	1.45	0.86	0.81	1.32	0.00	24.13	2.65
C.D	1.82	1.98	1.89	2.97	1.76	1.65	2.70	0.01	49.31	5.41

Minimum days to first picking (48.91) under the treatment T13 (50%RDF+VAM) and, maximum number of fruits per plant was recorded (18.16) under T6 (50%RDF+Vermicompost), highest yield per plot in T6 (50%RDF +Vermicompost) as well as yield per hectare was recorded respectively 11.42, 31740.73, best fruit weight is 44.08 in T13 (50%RDF+VAM), likewise highest fruit length is 13.27 under the treatment T2 (FYM) and fruit diameter gave maximum no of data i.e. 16.68 in T1, and the last data no of seeds per fruit gave the maximum no of seeds is 64.08 under the treatments T5 (50%RDF+FYM) and T10 (75%RDF+Neemcake). Study analyses the best result of T6 in the whole experiment. The plant height and number of leaves, which were significantly higher when compared to glyricidia, FYM, poultry manure and vermicompost application alone

(Channabasangowda *et al.*, 2008; Mojeremane *et al.*, 2015).

This response may be due to better nutrient availability and its uptake by the plants (Roy and Singh, 2006; Achsah and Lakshmi Prabha, 2013). The variation in number of leaves and leaf area by the application of chemical fertilizer were also observed by Arora 1991, and Somkuwar (1997). Rajkhowa *et al.*, (2003) also found significant increase in nutrient uptake by combine use of fertilizer along with vermicompost. Manna *et al.*, (2005) [6] reported that integrated nutrient management, including NPK improved soil organic carbon as well as crop productivity in different agro-ecosystems. Farmyard manure has been used as a soil conditioner since ancient times and its benefit have not been fully harnessed due to large quantities required in order to satisfy the

nutritional needs to crops (Makinde *et al.*, 2007; Pennington *et al.*, 2015) The primary goal of organic farming is to optimize the health and productivity of interdependent communities of soil life, plants, animals and people (Yuda *et al.*, 2016).

Thus on the basis of present investigation, it could be concluded that the okra var. KashiPragati responded well in terms of growth, yield and net profit by the application of (50%RDF+Vermicompost) for highest yield per plot as well as yield per/ha.

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