Effect of fertilizers on the growth and yield of Lady's Finger (*Abelmoschus esculentus L*) crop

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Abstract:

Field experiments were carried out in outdoor nursery of Solapur University, Solapur, Maharashtra, to evaluate the effects of organic and chemical fertilizers on Lady's finger crop in terms of growth and yield. The field experiment involved five treatments together with the control and replicated thrice in randomized block design. Plot size 2m x1m was prepared for field cultivation. Vermicompost (T_1) was applied at rate of 1kg/plot (@ 0.5kg/sq.m). A comman dose of organic fertilizers such as NADEP compost (T_2) and pit compost (T_3) were applied at same rate (@ 1.25kg/plot (@ 0.625 kg/sq.m) in plot size 2m x 1m as per usual practice of agriculturalists. Chemical fertilizers were applied in the proportion 100:50:50 Kg of NPK/ha respectively according to recommended dose of fertilizers as (T_4) and a set without fertilizer treating as control (T_5). The maximum plant height of Lady's finger crop (24.55cm) was obtained in chemical fertilizer treatment (T_4) while the lowest plant height of Lady's finger crop (17.03cm) was recorded when the crop was grown with pit organic fertilizer (T_3) after 60th day. The highest (3.66) and lowest (2.33) numbers of fruits per plant were recorded with chemical fertilizer treatment (T_4) and control treatment (T_5) respectively. The maximum (10.46cm) and the lowest (9.26cm) fruit length of Lady's finger crop were obtained in control field and use of vermicompost fertilizer respectively. The maximum (9.09gm) the lowest (6.48gm) mean weight per fruit per plant the fruit were observed with chemical fertilizer (T_4) and pit compost treatment (T_3) respectively. The maximum mean total weight of fruits per plant (28.17gm/plant) was recorded in chemical fertilizer treatment (T_4) while the lowest mean weight of fruits per plant (12.66gm/plant) was recorded with pit compost treatment (T_3). The maximum fruit yield per plot (1.26kg/plot) was recorded with chemical fertilizer treatment (T_4) followed by vermicompost treatment (T_1) after 60th day. It is concluded that the maximum fruit yield of Lady's finger crop per plot (1.79 kg/plot) was recorded in chemical treatment (T_4) while the lowest fruit yield was observed in pit compost treatment (T_3) after 90th day.

Keywords: *Abelmoschus esculentus L*, chemical, effects, fertilizers, growth, organic, yield

Introduction:

Okra is an important vegetable crop which is source higher nutrition such as carbohydrates, fats, protein, minerals and vitamins in our diet (Satyanarayana, 2002). Compost is made by biological degradation of plant and animal residues under control aerobic condition (Eghball et al., 1997). Vermicomposting is biological

process described as bio oxidation and stabilization of organic material comprising the combined action of earthworms and mesophilic microorganism (Aira et al., 2002). Compost is known to be a degraded product rich in microorganism used to help the plants growth and development (Postma et al., 2003). Compost and vermicompost are used in agriculture and have beneficial effect on soil structure and biota (Carpenter et al., 2000; Subler, 1998). Continuous use of different chemical fertilizers in decreases necessary soil nutrients and minerals that are naturally found in fertile soil (Baloch et al., 2014). The quality of compost derived from various organic wastes vary which depends on composting feed material that make difficult to predict its applicable rates and examine its beneficial rates on soil nutrient content, soil conditioning and bio-control properties (Rashad et al., 2011). Addition of organic and inorganic fertilizers from different sources, balanced carbon and nitrogen ratio, higher organic matter built up, efficient microbial activity, synergistic interaction between organic manures, vermicompost and bio-fertilizers improve the growth and yield of Lady's crop (Chattoo et al., 2011). The objective of present work is to study the effect of organic and chemical fertilizers on growth and yield of Lady's finger (*Abelmoschus esculentus L*) crop in comparison with control.

Materials and Methods:

The test crop is Lady's Finger (*Abelmoschus esculentus L*). The experiment was rested on randomized block design with three replications. The plot size of each treatment was 2m x 1m. All together 15 plots of $2m^2$ each were prepared for the field experiment. Total near about 44 seeds were sown in every plot. Drip irrigation system was used in whole studywork. The requirements of fertilizers are important for the early growth and total production of fruit yield in Lady's Finger. The treatment plan included the application of vermicompost (T_1), NADEP organic fertilizern(T_2), pit compost (T_3) and chemical fertilizers in the proportion 100:50:50 kg of NPK/ha respectively according to recommended dose of fertilizers as T_4 and control (T_5). Vermicompost (T_1) was applied at rate of 1kg/plot (@ 0.5 kg/sq. m) as recommended by Mal et al., (2013). A comman dose of organic fertilizers such as NADEP compost (T_2) and pit compost (T_3) were applied at same rate (@ 1.25 kg/plot (@ 0.625 kg/sq. m) in plot size 2m x 1m as per usual practice of agriculturalists (Aryal and Tamrakar, 2013). Straight chemical fertilizers (Urea-43.4gm + single super phosphate -62.5gm + murate of potash-16.6gm) were combinally used in treatment T_4. (Krushidarshani, 2014). Not any fertilizers were supplemented in control set of treatment (T_5). Experimental details and cultivation practice for Lady's Finger crop were as described bellow,

Botanical name: *Abelmoschus esculentus L*

Varity: Local

Experiment: Field experiment

Design: Randomized block design

Plot size: 2m x1m

Replications: Three

Treatments: Five

Crop population per plot: 44 (30cm x 15cm), (Krushidarshani, 2014).

Treatment details:

T_1 - Vermicompost prepared from agricultural solid waste @ 5t/ha

T_2 - NADEP organic fertilizer prepared from agricultural solid waste @ 6.25t/ha

T_3 – Pit organic fertilizer prepared from municipal solid waste @ 6.25t/ha

T_4 - Chemical fertilizer- 100:50:50-N: P_2O_5: K_2O Kg/ha.

T_5 - Control

Quantity of fertilizers used in plot size 2m X 1m.

T_1 – 1 kg/plot (@ 0.5 Kg/sq.m)

T_2 - @ 1.25 kg/plot (@ 0.625 kg/sq.m)

T_3 - @ 1.25 kg/plot (@ 0.625 kg/sq.m)

T_4 - According to RDF (Urea-43.4gm + single super phosphate-62.5gm + murate of potash-16.6 gm)

T_5 – Control.

Result and discussion:

Results achieved in present investigation are described below. All the values of nutrients found after their analysis in laboratory by known standard methods for prepared organic fertilizers and experimental soil are noted in Table 1.

Table 1. Soil and organic fertilizers characteristics.

Parameters	Soil	T_1	T_2	T_3
pH	8.10	8.06	7.65	7.15
Moisture (%)	8.08	30.20	18.34	05.35
Org. matter (%)	1.00	16.42	11.75	11.30
N (%)	0.34	1.01	0.92	0.77
P (%)	0.25	1.50	1.06	0.17
K (%)	0.15	1.05	1.91	0.88

T_1 indicates vermicompost, T_2 indicates NADEP compost and T_3 indicates Pit compost.

All plants were selected for obtaining fruit yield of Lady's finger crop from each plot after 90th day. The results are presented in Table 2.

Table 2

Effects of fertilizer treatments on growth and yield of Lady's finger crop after 60th days.

Treatments	Plant height (cm/plant)	Number of fruits/plant	Mean length of fruits/plant	Mean weight/ fruit /plant (gm)	Mean of total weight of fruits/plant (gm)	Yield/plot (kg/2m^2)
T_1	20.06 (±4.25)	2.83 (±0.22)	9.26 (±1.04)	8.18 (±3.18)	25.34	1.15
T_2	19.86 (±2.86)	3.16 (±1.69)	9.32 (±2.44)	7.61 (±3.39)	16.49	0.75
T_3	17.03 (±4.01)	2.5 (±0.91)	10.38 (±3.36)	6.48 (±3.95)	12.66	0.57
T_4	24.55 (±3.52)	3.66 (±1.66)	10.23 (±2.51)	9.09 (±3.75)	28.17	1.26
T_5	19.03 (±4.10)	2.33 (±0.68)	10.46 (±0.81)	8.13 (±2.13)	22.60	1.01

T_1 indicates vermicompost, T_2 indicates NADEP compost, T_3 indicates pit compost, T_4 indicates chemical fertilizers and T_5 indicates control. The bracket values represent standard deviation.

A. Plant height after 30th day:

Plant height of Lady's finger crop was observed by tagging 10 plants from each research plot after 30th day. Average plant height (cm) in the treatments T_1, T_2, T_3, T_4 and T_5 were found to be 6.6cm (±1.29), 8.54cm (±1.31), 8.3cm (±0.85), 8.26cm (±1.21) and 6.88cm (±1.47) respectively. The highest plant height (8.54 cm/plant) was observed in treatment T_2 followed by treatment T_3. The minimum plant height was observed with chemical fertilizers (T_4) and lowest value (6.6cm/plant) was observed with application of vermicompost treatment (T_1) after 30th day.

B. Plant height after 60th day:

Plant height of Lady's finger crop was observed by tagging 10 plants from each research plot after 60th day. Average plant height (cm) in the treatments T_1, T_2, T_3, T_4 and T_5 were found to be 20.06cm, 19.86cm, 17.03cm, 24.55cm and 19.03cm respectively. The maximum plant height of Lady's finger crop (24.55cm) was obtained in chemical fertilizer treatment (T_4) followed by vermicompost treatment. The minimum plant height of Lady's finger crop (19.86cm) was recorded when the crop was grown with NADEP compost. The lowest plant height of Lady's finger crop (17.03cm) was recorded when the crop was grown with pit organic fertilizer (T_3) @ 1.25 kg/plot (@ 0.625 kg/sq.m).

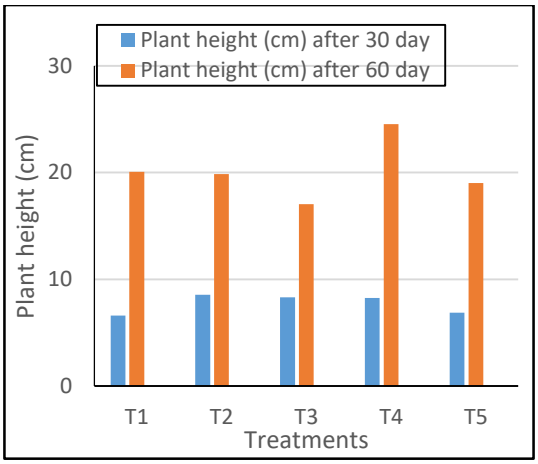

Fig. 1: Effects of fertilizer treatments on plant height (cm/plant) of Lady's finger crop

C. **Number of fruits/plant after 60th days:**

The numbers of fruits per plant is the important factor of fruit yield in Lady's finger. Average number of fruits per plant in the treatments T_1, T_2, T_3, T_4 and T_5 were found to be 2.33, 3.16, 2.5, 3.66 and 2.83 respectively**.** The highest (3.66) and lowest (2.33) numbers of fruits per plant were recorded with chemical fertilizer treatment (T_4) and control treatment (T_5) respectively.

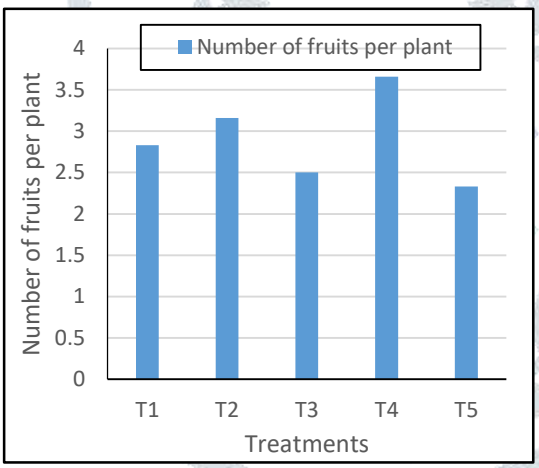

Fig. 2: Effects of fertilizer treatments on number of fruits of Lady's finger crop after 60th days

D. Fruit length (cm/plant) after 60th days:

Average fruit length (cm/plant) in the treatments T_1, T_2, T_3, T_4 and T_5 were found to be 9.26cm, 9.32cm, 10.38cm, 10.23cm and 10.46cm respectively. The maximum (10.46cm) and the lowest (9.26cm) fruit length of Lady's finger crop were obtained in control field and use of vermicompost fertilizer respectively.

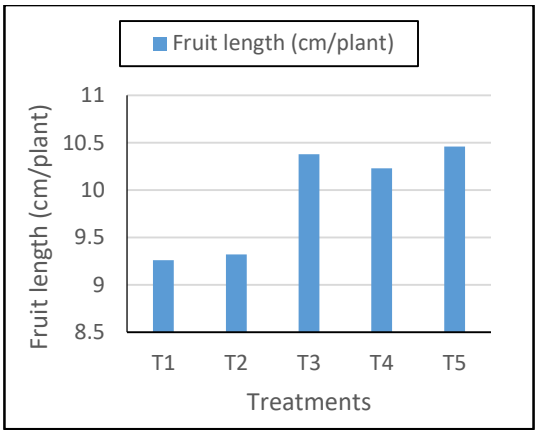

Fig. 3: Effects of fertilizer treatments on fruit length of Lady's finger crop

E. Weights of fruits/plant after 60th days:

Mean average weight of fruits per plant (gm/plant) in the treatments T_1, T_2, T_3, T_4 and T_5 were found to be 8.18gm, 7.61gm, 6.48gm, 9.09gm and 8.13gm respectively**.** The maximum (9.09gm) the lowest (6.48gm) weight of the fruit were observed with chemical fertilizer (T_4) and pit compost treatment (T_3) respectively.

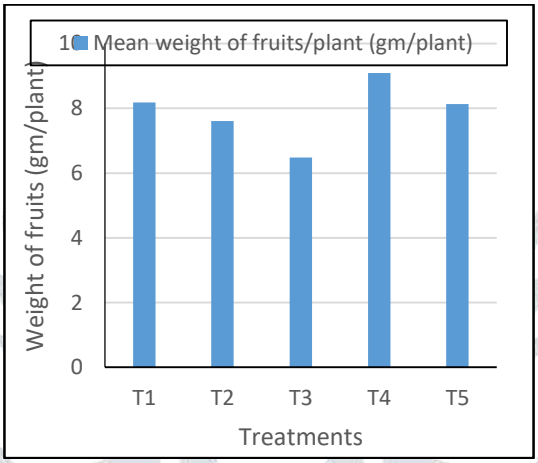

Fig. 4: Effects of fertilizer treatments on mean weight of fruits of Lady's finger crop

F. Fruit yield after 60th days:

Mean weight of fruits/plant (gm/plant) in the treatments T_1, T_2, T_3, T_4 and T_5 were found to be 25.34gm, 16.49gm, 12.66gm, 28.17gm and 22.60gm respectively. The maximum mean total weight of fruits per plant (28.17gm/plant) was recorded in chemical fertilizer treatment (T_4) then followed by vermicompost treatment (T_1). The lowest mean weight of fruits per plant (12.66gm/plant) was recorded with pit compost treatment (T_3).

G. Fruit yield/plot (kg/plot) after 60th days:

Fruit yield of Lady's finger crop per plot (kg/plot) in the treatments T_1, T_2, T_3, T_4 and T_5 were found to be 1.15 kg/plot, 0.75 kg/plot, 0.57 kg/plot, 1.26kg/plot and 1.05kg/plot respectively. The maximum fruit yield per plot (1.26kg/plot) was recorded with chemical fertilizer treatment (T_4) followed by vermicompost treatment (T_1). The lowest fruit yield was observed in pit compost treatment (T_3).

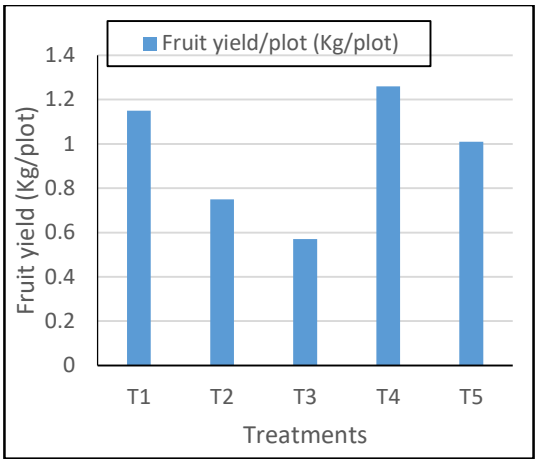

Fig. 5: Effects of fertilizer treatments on fruit yield/plot (kg/plot) of Lady's finger crop

H. Fruit yield/plot (kg/plot) after 90th days:

Fruit yield/plot (kg/plot) in the treatments T_1, T_2, T_3, T_4 and T_5 were found to be 1.77 kg/plot, 1.07 kg/plot, 0.814 kg/plot, 1.79 kg/plot and 1.47 kg/plot respectively**.** The maximum fruit yield/plot (1.79 kg/plot) was recorded in chemical treatment (T_4) followed by control treatment (T_5). The lowest fruit yield was observed in treatment (T_3).

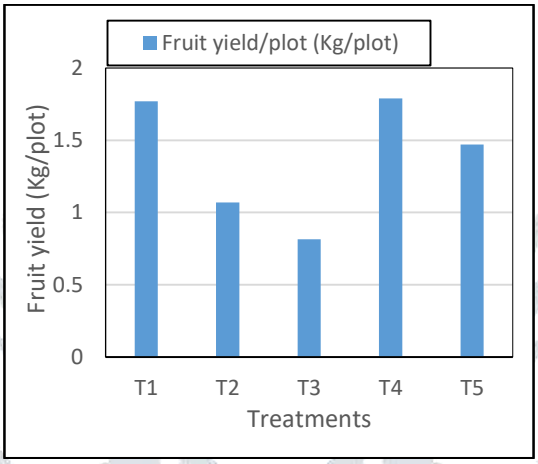

Fig. 6: Effects of fertilizer treatments on fruit yield/plot (kg/plot) of Lady's finger crop

Photo plate 1: Experimental view of plot of Lady's Finger vegetable.

Photo plate 2: Experimental view of plot of Lady's Finger vegetable.

Conclusion:

Among the different fertilizer treatments studied, only application of chemical fertilizer showed better fruit yield of Lady's finger crop and is followed by vermicompost fertilizer treatment. It is concluded that the growth of Lady's finger crop is better with application of chemical fertilizer.

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