

# Impacts of Organic Manure and Mulching Materials on Growth and Yield of Okra (*Abelmoschus esculentus* L. Moench)

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## Abstract

The investigation was conducted to identify the impacts of organic manure (cow dung+ compost) and mulching (black polythene sheet) on okra plants. Different treatments, considering  $T_0$ -Control,  $T_1$ -Mulching,  $T_2$ -Organic+ Mulching and  $T_3$ -Organic manure were carried out in a Randomized Complete Block Design with three replications during 2019 to 2020 in Noakhali, Bangladesh. The maximum plant height (86.53 cm) was recorded in  $T_2$  while the minimum, 70.33cm was found in  $T_0$ . The high leaf number per plant (61) was observed in  $T_2$  whereas in control  $T_0$  gave less number (30.67). The utmost length of leaf (19.07cm) was noticed in  $T_2$  treatment and least length of leaf (16.33cm) was found in control treatment. The topmost number of fruits per plant (52.67) was rendered in  $T_2$  treatment while the lowest number of fruits per plant (35.33) was in control treatment. The superiority in fruit length (17.43cm) was found in  $T_2$  treatment and the inferiority in fruit length (14.4cm) was accomplished in control treatment. The maximum fruit weight (16.18gm) was obtained from  $T_2$  but the minimum (16.18gm) was recorded in control treatment. Based on the findings of the experiment it seems that combined treatments (organic + mulching) was promoted higher growth and yield of okra production.

**Keywords:** Okra, Organic Manure, Mulching, Growth, Yield.

## I. INTRODUCTION

In Bangladesh, vegetable production is not uniform round the year, plenty in winter but less in summer. In summer around 30% of total vegetables are produced and 70% in winter [8]. Present consumption of vegetables in Bangladesh is 112 g/day/capita which is far below the minimum average requirement of 400 g/day/capita [5]. In addition, okra plant successfully grown within a temperature range of 22-35°C with humid condition and in Bangladesh the average temperature during September – January is 25°C. It is grown during spring, summer and kharif seasons. Previously okra

plant was in the *Hibiscus* genus. Afterwards, it was named to *Abelmoschus*, which is distinct from the *Hibiscus* genus [1]. Okra has been called “a perfect villager’s vegetable” because of its lusty nature, dietary fiber and distinct seed protein balance of both lysine and tryptophan amino acids [7]. Okra plays a vital role in the human diet and good source of protein, carbohydrates, vitamins, calcium, potassium, enzymes and total minerals which are often lacking in the diet of developing country. Okra has many local names such as lady’s finger, guino-gombo, gumbo and bhendi [13]. It is a short duration vegetable crop so its growth, yield and quality are largely influenced by the application of manures and mulching. Integrated use of organic manure (cow dung+ compost) and mulch (black polythene sheet) can improve the okra productivity. On the other hand, mulching has a beneficiary effect on the growth and yield of okra plants. It is found that Black plastic mulch gives higher yield as compared to organic mulches and control condition due to the better weed control [3]. It also helps to inhibit the growth of weeds, promote the plant growth, increased the yield and quality of crops [2,11]. The main purpose of this experiment was to detect the effects of organic manure as well as black polythene mulch on the different growth parameters and yield performance of okra production.

## II. MATERIALS AND METHODS

### Experimental Site

The experiment was conducted at Navogram Agro Farm in Mannan Nagar Union, Noakhali, Bangladesh during the period of 1<sup>st</sup> September 2019 to 30<sup>th</sup> January, 2020. Noakhali is located in the South-Eastern part of Bangladesh which is allocated in the Young Meghna Estuarine Flood plain Agro Ecological Zone. According to the Soil Research and Development Institute, Noakhali, the soil of research site was sandy loam in texture which is slightly saline with pH 7.3-8.3. In general, fertility of the testing site is medium but low in organic matter content. The average annual temperature is in the site was recorded 25.6°C and the average annual rainfall is about 2980 mm.

### Experimental Materials

The research materials i.e. seed of okra Krishibid (Zadu) variety along with organic fertilizers and black polythene sheet were collected from DAE approved seed shop of Dotter Hat Bazar in Noakhali District.

### Experimental Design and Treatments

Randomize Complete Block Design (RCBD) was applied for the investigation with four (4) treatments and three (3) replications. The four treatments are listed below-

T<sub>0</sub> - Control (no fertilizer and mulch)

T<sub>1</sub> - Mulching (black polythene sheet)

T<sub>2</sub> - Organic+ Mulching

T<sub>3</sub> - Organic manure (cow dung+ compost)

### Preparation of Land and Seed Sowing

The land of the experiment was ploughed and opened to sun for 3 days. After 3 days the land was again ploughed followed by laddering. After that, the basal dose of fertilizers were applied and mixed thoroughly with the soil before final land preparation. The unit plots were prepared by keeping 1 m spacing between two plots and 50 cm drain was dug around the land. The size of each plot was 4m x 1m with 6 pits, the length and breadth of each pit was 30cm x 30cm respectively. There was 20cm depth in pit and 45cm distance from the border of the plots. The seeds were pushed directly in the pits on 10<sup>th</sup> September 2019. Two (2) okra seeds placed in each pit at 2-3 cm depth.

### Intercultural Operation

The seedlings which were less in vigor, thinned up after 15 days of germination. During the whole growth period three (3) hand weeding and light overhead irrigation was provided with a watering cane to the seedlings were done after germination. However, the un-mulched plot had to be watered more than mulched plots. Later irrigations were given to maintain uniform moisture throughout the crop growth period of okra plant. Finally, prescribed chemicals were used to manage insects and pests to the plants.

### Data Collection

From the experimental site, the data of plant height (cm), number of leaves per plant, length of leaves (cm), number of fruits per plant and length of fruits (cm) parameters were recorded by measuring tape and the weight of individual fruit (g) was weighted by electrical balance.

### Statistical Analysis

Analysis of Variance (ANOVA) was used for the statistical analysis to determine if the treatments have any significant impact on selected parameters or not. All data were analyzed by f-test using Micro-soft

Excel Software version 2013. (Gomez and Gomez, 1984).

## III. RESULTS

### Height of Plant (cm)

Fig.1 was illustrated the average plant height of okra plant under different treatments. It showed that different treatments application influenced directly on the height of plant body. Application of organic and mulching together increase the height was about 86.53cm while control gave the lowest plant height was 70.33cm. At the same time, when mulching and organic treatments were applied individually, they recorded 75.33cm and 82.17cm respectively.

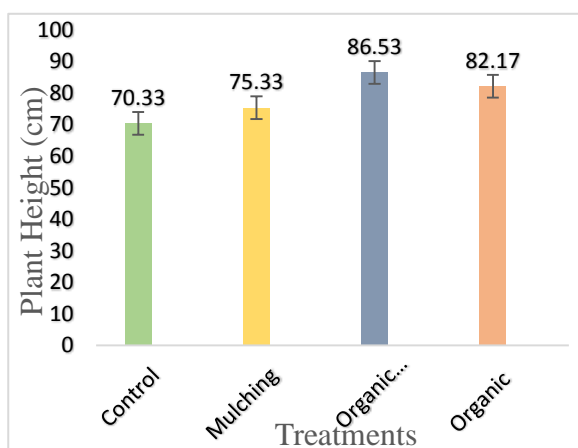


Fig.1. Impact of Treatments on Plant Height (cm)

### Number of Leaves per Plant

In case of leaves number per plant, variation was significantly ( $P < 0.05$ ) observed within the practiced treatments. From fig. 2 it was showed that, organic+ mulching treatment was significantly different from others as it gave maximum (61.00) leaves in each plant as compared to the control treatment which was provided minimum leaves number (30.67).

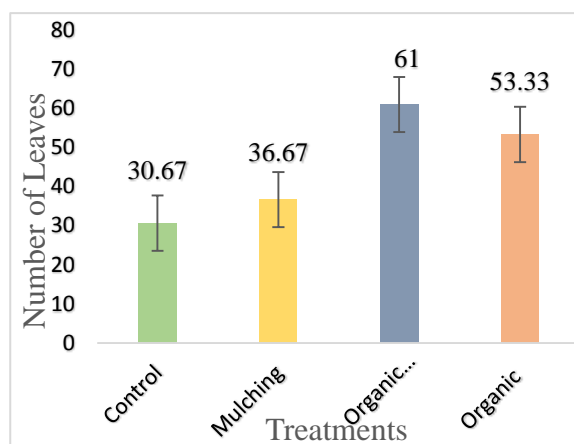


Fig.2. Impact of Treatments on Number of Leaves

### Length of Leaves (cm)

Considering the length of leaves, average leaf length was encountered 16.33cm, 17.50cm, 19.07cm and 18cm respectively for the treatment of control, mulching, organic+ mulching and organic treatments. However, it was observed that organic and mulching in together had the maximum length i.e. 19.07cm while minimal length was 16.33cm noticed in control treatment. (Fig. 3)

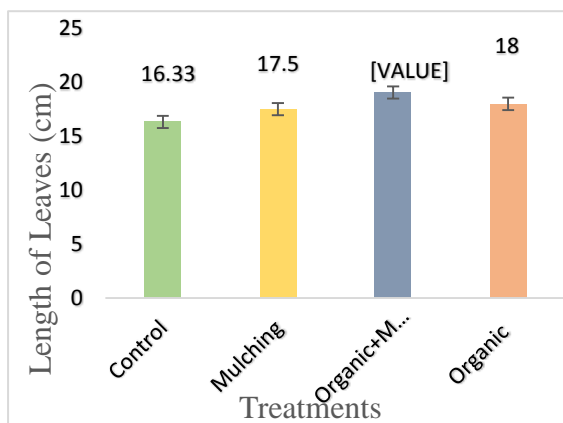


Fig.3. Impact of Treatments on the Length of Leaves

### Number of Fruits per Plant

In the fig.4, the average maximal number of fruits was recorded in the combined treatment of organic and mulching (52.67) whereas control treatment gave the minimal fruit number (35.33). On the other hand, another two treatments  $T_1$  and  $T_3$  were observed almost similar number of fruit in each plant i.e. 39.33 and 42.67 respectively.

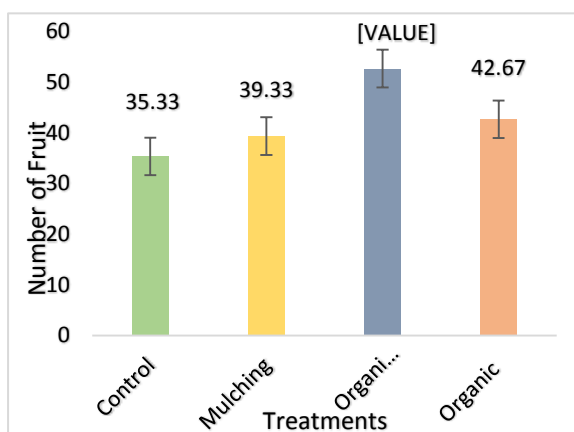


Fig.4. Impact of Treatments on the Number of Fruits/Plant

### Fruits Length (cm)

The average fruits length were obtained 14.40cm, 16.50cm, 17.43cm and 16.30cm respectively for control, mulching, organic+ mulching and organic treatments. The outstretched fruit length (17.43cm) was observed in organic+ mulching ( $T_2$ ) treatments but shorter fruit length (14.40cm) was found in control ( $T_0$ ). (Fig.5).

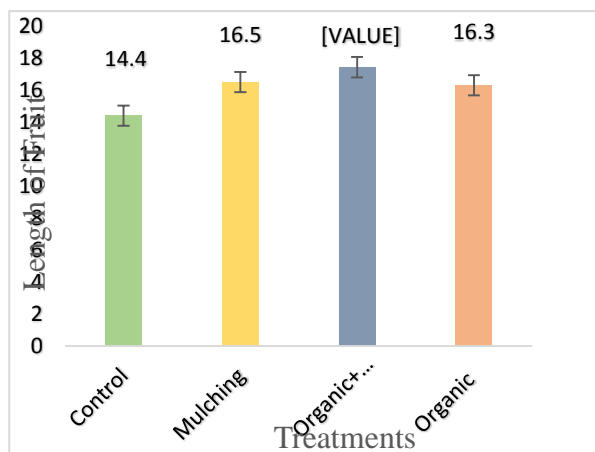


Fig.5. Impact of Treatments on the Length of Fruits

### Individual Fruit Weight (g)

In case of individual fruit weight, there were several significant variation as the utmost fruit weight was accessed 28.73g in the combined treatment of organic and mulching and lowest fruit weight was gained in the use of control treatment (Fig.6). Therefore no significant difference between the other two treatments i.e.  $T_1$  and  $T_3$  as they both gave 24.24g and 24.77g fruit weight individually.

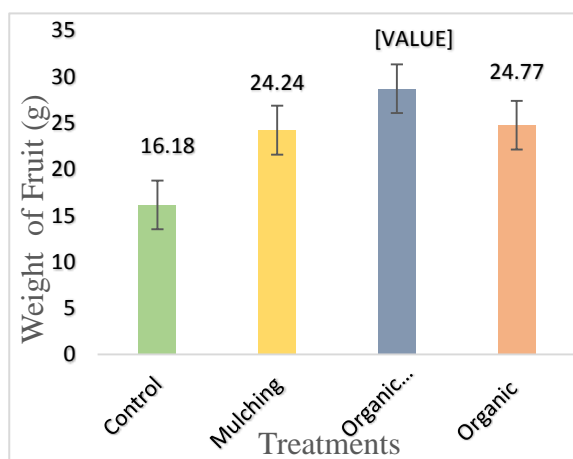


Fig.5. Impact of Treatments on the Weight of Fruits

## IV. DISCUSSION

Okra (*Abelmoschus esculentus* L.) is one of the most important vegetable grown in all over Bangladesh which is cultivated commercially in everywhere the country. Organic manure have gained attention from public as they are available abundantly, free from any chemicals, as well as can increase the soil fertility. It furnishes large portion of macro and micronutrients, protects soil against erosion, supplies the cementing substance for desirable soil aggregate formation and loosen soil [12]. Different vegetative parameters improvement might be explained in view that plastic mulches improve moisture conservation which leads to the overall plant growth [10]. Ultimate satisfactory

development and yield performance of okra was obtained from T<sub>2</sub> treatment where organic manure and mulching used. The result recorded in case of organic manure was supported by Khandakar *et al.*, [9] that it could increase plant height of crops and the results also agreed with the findings Olabode *et al.*, [14] and Mahadeen [10] as they indicated that plants under black plastic mulch produce larger number of fruits due to favorable soil and weed free environment. When it was come for the leaf number then maximal leaf number per plant (61) was observed in T<sub>2</sub> treatment pursued by other two treatments where plastic mulch was used with organic manure. The leaves number were significantly increased by the influence of organic manure [4] and under black plastic mulch plant gave maximum number of leaves [14] which were used in our work. Therefore, the result showed that organic manure treatment provided utmost length of leaf of okra plant followed by other treatments The finding was in agreement with the results of Ufera *et al.*, [16] who reported that the largest leaf length was produced by the application of organic manure .On the other hand, the maximum fruit length (17.43cm) was found in T<sub>2</sub> treatment recurrently by T<sub>1</sub> and T<sub>3</sub> treatments (16.5cm and 16.3cm stepwise) which was confirmed by the findings of Olabode *et al.*, [14] and Aladele, S. E., [1] showed that the highest fruit length was established under plastic mulch than in all other treatments. Furthermore, the maximum fruit weight was obtained as a result of organic manure application which attributed to better supply of nutrients [15] and got the highest fruit weight under application of black plastic mulching [10,14]. Combined application of organic manure and mulching had an overpass effect on fruit weight of okra plant.

## V. CONCLUSION AND RECOMMENDATION

From the experiment the results obtained from all the parameters, it is indicated that all the treatments were not able to perform their full yield potentiality due to different environmental condition. The overall performance in this study, T<sub>2</sub> treatment (organic+ mulching) gave better performance in regarding of growth and yield in comparison with other treatments. Based on the findings, it might be recommended that the use black plastic mulch as well organic manure should be continued to enhance growth and yield of okra production which would increases okra yield as well as farmer's income.

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