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Research Article

EFFECT OF DIFFERENT ORGANIC FERTILIZERS ON THE GROWTH PARAMETERS OF *ABELMOSCHUSESCULENTUS* (L.) MOENCH

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ABSTRACT

Organic fertilizers are helpful in increasing the availability and uptake of nutrients from the soil and ultimately boost the yield of the vegetable crops. The present study is to evaluate the growth and yield pattern of lady's finger by the application of different organic fertilizers. Significant results were observed in the growth parameters on the 30th day, 45th day and 60th day. The growth and yield parameters were found to be significantly higher in the combination of organic fertilizers such as Azospirillum, VAM fungi and Phosphobacteria.

INTRODUCTION

Vegetables are certain parts of plants that are consumed by humans as food as part of a savoury meal. The modern-day culinary usage of the term vegetable may exclude food derived from plants such as fruits, nuts, and cereal grains, but include seeds such as pulses; the term vegetable is somewhat arbitrary, and can be largely defined through culinary and cultural tradition. Vegetables can be eaten either raw or cooked and play an important role in human nutrition, being mostly low in fat and carbohydrates, but high in vitamins, minerals and dietary fiber. Particularly important are the antioxidant vitamins A, C, and E. Many nutritionists encourage people to consume plenty of fruit and vegetables.

Vegetables play an important role in human nutrition. Most are low in fat and calories but are bulky and filling (Fruits & Vegetables, 2015). When vegetables are included in the diet, there is found to be a reduction in the incidence of cancer, stroke, cardiovascular disease, and other chronic ailments (Vegetables, 2015; Terry & Leon, 2011). Research has shown that, compared with individuals who eat less than three servings of fruits and vegetables each day, those that eat more than five servings have an approximately twenty percent lower risk of developing coronary heart disease or stroke (Vegetables & Fruits, 2015). Biofertilizers are one of the best modern tools for agriculture. They contain microorganisms which promote the adequate supply of nutrients to the host plants to ensure their proper development (Uma Maheswari and Elakkiya, 2014) Okra, also termed as lady's finger, is a flowering plant in the mallow family. This plant is known for its edible green fruits, or long green pods. It's scientific name is "*Abelmoschusesculentus*" and also "*Hibiscus esculentus*". For centuries, this green vegetable has been widely grown across the entire African region. It is cultivated in the entire warm temperate and tropical regions of the world for its fibrous fruits or pods containing round, white seeds. The fruits are harvested when immature and eaten as a vegetable. The plant prefers warm climate and tolerates poor soils with heavy clay and intermittent moisture. It is in the same plant family as hibiscus and cotton.

Okra/lady's finger is one of the most common vegetables of the South-Asian countries. It is used in preparing many yummy and delicious dishes. When cut, it releases a sticky material with thickening properties, often used in soups and stews. The use of organic fertilizers could increase the yield of the vegetable crop as well as improve the fertility of the soil. The present study on the vegetable crop *Abelmoschusesculentus* (L.) Moench is an initiative to grow the plant under different

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organic fertilizers and study the growth parameters such as root length, shoot length, fresh weight and dry weight in different stages of growth.

MATERIALS AND METHODS

Collection of seeds

Seeds of *Abelmoschusesculentus* (L.) Moench was obtained from Tamil Nadu Agricultural University, Coimbatore.

Collection of Fertilizers

The bio-fertilizers such as *Azospirillum*, VAM and Phosphobacteria were collected from TNAU, Coimbatore. The dosage used were as per the TNAU Agriportal.

Organic Fertilizers

Azospirillum

They are called as associative endosymbiont on roots of grasses and similar types of plants. They are known to fix atmospheric nitrogen and benefit host plants by supplying growth hormones and vitamins. *Azospirillum* is considered to be more efficient and it has been reported that *Azospirillum* inoculation increases the growth, nitrogen uptake and yield in number of crops (Mallikarjuna Rao *et al.,* 2014).

Vesicular Arbuscular Mycorrhiza (VAM)

Mycorrhiza is a mutualistic association between plant roots and fungal mycelia. Many graminaceous plants, legumes and horticultural crops are highly susceptible to VAM colonization. The transfer of nutrients mainly phosphorus from the soil to the cells of the root cortex is mediated by intracellular obligate fungal endosymbiont of the genera *Glomus, Gigaspora, Endosone*, etc. which possess vesicles for storage of nutrients and arbuscules for funnelling these nutrients into the root system.

The mycorrhizal fungi mobilize phosphates and other micronutrients like zinc, boron and molybdenum from adjacent soil to the root system through hyphal network (Mallikarjuna Rao *et al.*, 2014)

Phosphobacteria

Microorganisms are also involved in the availability of phosphorus, the second most important nutrient required by crop plants. The phosphate solubilizing bacteria (PSB) solubilize the insoluble phosphates and make them available for crop plants in the rhizosphere region (Mallikarjuna Rao *et al*., 2014).

METHODS

Pot culture experiment

Pot culture experiment was conducted with the test plant. The experiment was carried out in the period from December 2017 to February 2018. The size of the experimental pot was 30 cm × 24 cm × 30 cm. Triplicates were maintained for each treatment.

The soil was cleaned by removing stones and other unwanted materials. The red soil and sand soil were mixed in the ratio of 1:1 and filled in pots of 7 kg capacity. A study was undertaken to assess the effect of different bio-fertilizers on the growth and yield parameters of the plant.

The seeds were soaked in different bio-fertilizers for 12 hours. The bio-fertilizers used for the study were *Azospirillum,* Phosphobacteria and Vesicular ArbuscularMycorrhizal (VAM) fungi. In the growing stages of the plants, the bio-fertilizers were sprayed on the plants and growth study was carried out on 30^{th}, 45^{th} and 60^{th} day of the plant.

The infection to the plant by various insects were controlled by spraying thulasi extract on the leaves.

Treatments

T_0 – Control
T_1 – *Azospirillum*
T_2 – VAM
T_3 - Phosphobacteria
T_4 – *Azospirillum*+ VAM + Phosphobacteria

Growth Parameters

Plant samples were uprooted carefully on 30^{th}, 45^{th} and 60^{th} day. The following growth parameters were measured and recorded for all the treatments.

1. Root length (cm)
2. Shoot length (cm)
3. Number of leaves
4. Fresh weight (g)
5. Dry weight (g)

Root Length

The plants were taken from control pot and other treatment pots and washed to get rid off adhering soil particles. Then, the length of the roots was measured with the help of a scale from root collar point to root tip and expressed in centimeter. Ten seedlings were randomly selected from each treatment and their root length was measured using cm scale and recorded as cm/seedling.

Shoot Length

The shoot length of the plants was measured with the help of scale from the root collar point to shoot apex and expressed in centimeter. Ten seedlings were randomly selected from each treatment and their shoot length was measured using cm scale and recorded as cm/seedling. Three readings were taken for statistical analysis.

Number of leaves

The number of leaves present in the uprooted plants was also calculated.

Fresh Weight

Fresh weight of the plants was measured with the help of an electronic digital balance and expressed in grams.

Dry Weight

The collected plant materials were kept in hot air oven at 55º C for 24 hours. Then, the dry weight of the plants was measured using an electronic digital balance and expressed in grams.

Yield Parameters

Number of fruits

The number of fruits obtained on 45^{th} day and 60^{th} day was calculated for *Abelmoschusesculentus*(L.) Moench.

Statistical Analysis

The data obtained from various biometric and biochemical observations were subjected to statistical analysis as per the procedure of Panse and Sukhatme (1978). The significance and critical differences of various treatments were analysed.

RESULTS AND DISCUSSION

The experiments conducted in *Abelmoschusesculentus* (L.) Moench using different organic fertilizers treatments showed the following results.

Morphology of the Plant

Abelmoschusesculentus (L.) Moench

Systematic Position

Kingdom - Plantae
Order - Malvales
Family - Malvaceae
Genus - *Abelmoschus*
Species - *A. esculentus* (L.) Moench

Description

- They are specially found in tropical region of the world.
- Okra, *Abelmoschusesculentus*, is an herbaceous annual plant in the family Malvaceae.
- It is grown for edible seed pods.
- Okra stem is erect, mucilage sacs occur abundantly in the tissues.
- The leaves are simple, alternate and hairless with heart – shaped leaves, mucilage sacs are also found.
- The plant produces flower with five white to yellow petals which are 4-8 cm (1.6-3.1 in) in diameter.

Plate 1 Habit of *Abelmoschusesculentus* (L.) Moench

- The leaves are 10-20 cm (4-8 inch) long with 5-7 lobes.78
- The seed pod is a capsule upto 25cm (10 inch) long, containing numerous seeds.
- Okra can grow to a height of 1.2-1.8m (4-6 ft) tall and as an annual plant, survives only in growing season.

Medicinal values

- Okra is known to aid in the prevention of diabetes`
- The folates present in okra reduce the neural defects in a newborn baby.
- Controls Obesity
- High fiber content
- Prevents kidney diseases
- Helps in digestion
- Good source of antioxidants

Growth Parameters

Abelmoschusesculentus (L.) Moench

The growth parameters such as root length, shoot length, fresh weight, dry weight and number of leaves were analysed on 30th, 45th and 60thday and tabulated (Plate 2, 3 and 4)

The shoot length and root length was observed to be maximum in T_4 and the values were found to be 25.37 ± 1.19 cm and 15.20 ± 0.36 cm respectively (Table 1).

The number of leaves was also higher in plants treated with *Azospirillum,* VAM and Phosphobacteria (12.67 ± 1.15).

Similarly, the fresh weight and dry weight of the plants were also found to be higher in T_4 in combination of *Azospirillum,* VAM and Phosphobacteria. The readings were found to be 8.80 ± 0.76 g and 2.59 ± 0.36 g respectively. The values were found to be significant at 5 % level (Table 1).

The shoot length and root length of lady's finger was found to be higher in T_4 on the 45th day (Table 2). The values were found to be 35.20 ± 3.67 cm and 20.00 ± 1.42 cm respectively on the 45th day, the number of leaves was found to be more in plants treated with phosphobacteria (21.00 ± 3.00).

Similar to the shoot length and root length of the plants, the fresh weight and dry weight of lady's finger on the 45th day was higher in T_4 and the values were found to be 18.50 ± 1.32 g and 4.16 ± 0.34 g respectively (Table 2).

On the 60th day again the shoot length and root length of lady's finger was observed to be more in T_4 (i.e.,) 48.53 ± 1.20 cm and 25.30 ± 2.97 cm (Table 3). The number of leaves was higher in T_3 on the 60th day (27.67 ± 1.53). But, the fresh weight and dry weight of the plants were higher in T_2 i.e., VAM treated. The values were 28.90 ± 0.928 and 6.81 ± 0.238 respectively. This might be due to the accumulation of nutrients in the plants that has resulted because of VAM treatment.

Bio-fertilizers are used to hasten the biological activity of the plants to improve the availability of plant nutrient (Kumari *et al*., 2015). The work on the growth and establishment of cashew grafts under greenhouse condition by Shankarappa *et al.* (2017) have shown that the bio- fertilizers used increased the growth and nutrient uptake of the cultivar.

The results on the application of microbial inoculants to onion produced maximum plant height, number of leaves per plant and fresh weight of plant. This result is on par with the current study, where the use of organic fertilizers such as *Azospirillum,* VAM fungi and Phosphobacteria has resulted in increased growth parameters of lady's finger.

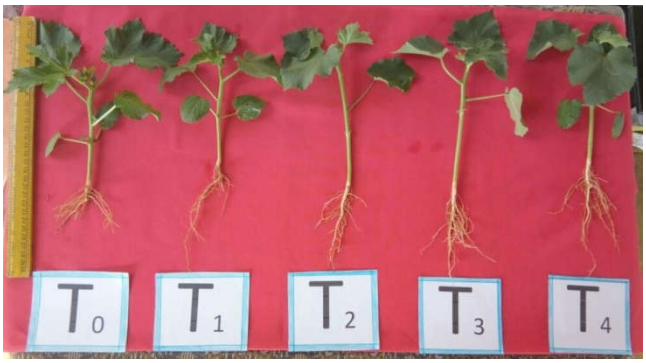

Plate 2 Growth of *Abelmoschusesculentus* (L) Moench on 30th day

Yield parameters

The flowers started coming after 35 days of growth. On the 45thday, fruits were formed and it was more in plants treated with the combination of organic fertilizers (T_4). The value was found to be 4.00 ± 1.00. Similarly, on the 60th day, the number of fruits was found to be higher in T_4 (10.33 ± 1.53). The values were found to be significant at 5 % level (Table 4).

The effect of bacterial bio-fertilizer on the yield of sunflower had shown a positive effect on the growth and yield (Dhanasekar and Dhandapani, 2012). These results are in correlation with the current result on *Abelmoschus*.

Table 1 Growth parameters of *Abelmoschusesculentus* (L.) Moench using different organic fertilizers on the 30th day

Treatments	Shoot length (cm)	Root length (cm)	No. of leaves	Fresh weight (gm)	Dry weight (gm)
T_0	22.57 ± 1.00	7.17 ± 1.11	7.00 ± 1.00	6.68 ± 0.65	0.75 ± 0.61
T_1	27.9 ± 0.82	14.47 ± 0.55	9.33 ± 0.58	7.41 ± 0.50	2.24 ± 0.44
T_2	25.30 ± 1.05	13.23 ± 1.85	10.67 ± 1.53	7.97 ± 0.86	1.73 ± 0.46
T_3	24.87 ± 0.38	12.23 ± 1.85	10.33 ± 2.52	8.54 ± 1.05	1.70 ± 0.30
T_4	**25.37** ± 1.19	**15.20 ± 0.36**	**12.67 ± 1.15**	**8.80 ± 0.76**	**2.59 ± 0.36**
SEd	0.7616	0.8345	1.2293	0.6426	0.3656
Cd (p<0.05)	1.6969	1.8595	2.7390	1.4319	0.8146

Values are mean ± SD of three samples in each group

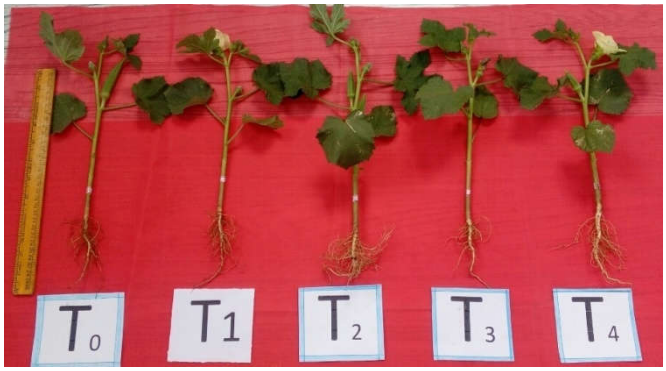

Plate 3 Growth of *Abelmoschusesculentus* (L) Moench on 45th day

Use of bio-fertilizer is needed as an alternative source to bring forth the eco-friendly methods of farming. The extent of benefit from the microorganisms depends on their number and their efficiency, which however, is governed by soil and environmental factors.

Azosprillum might have fixed higher amount of nitrogen in soil and made available to the plants resulting in better uptake of N by plants. VAM or PSB would have caused more mobilization and solubilisation of insoluble P in the soil and improve the availability of phosphorus to plants. Earlier studies by Srivastava (2017) have shown that integration of bio-fertilizers significantly improved the yield of Kalmegh.

Table 2 Growth parameters of *Abelmoschusesculentus* (L.) Moench using different organic fertilizers on the 45th day

Treatments	Shoot length (cm)	Root length (cm)	No. of leaves	Fresh weight (gm)	Dry weight (gm)
T_0	28.83 ± 0.32	12.47 ± 1.12	14.00 ± 1.00	12.09 ± 0.65	2.52 ± 0.39
T_1	35.03 ± 4.02	15.90 ± 0.80	17.33 ± 1.15	13.31 ± 0.52	4.24 ± 0.68
T_2	33.17 ± 2.04	16.80 ± 0.70	18.00 ± 1.00	15.70 ± 1.15	4.16 ± 0.34
T_3	34.40 ± 4.35	16.00 ± 1.06	**21.00 ± 3.00**	17.30 ± 1.87	3.80 ± 0.99
T_4	**35.20 ± 3.67**	**20.00 ± 1.42**	20.67 ± 3.79	**18.50 ± 1.32**	**4.45 ± 0.25**
SEd	59.7399	0.8566	1.8856	0.9838	0.4878
Cd (p<0.05)	133.1094	1.9087	4.2014	2.1921	1.0869

Values are mean ± SD of three samples in each group

Plate 4 Growth of *Abelmoschusesculentus* (L) Moench on 60th day

The use of organic sources enhances the absorption and release of macro as well as well as micronutrients and thus ensure their availability to the plant throughout its growing season. Through bio-fertilizers, fertilizer application can be reduced by 50%.

Table 3 Growth parameters of Abelmoschusesculentus (L.) Moench using different organic fertilizers on the 60th day

Treatments	Shoot length (cm)	Root length (cm)	No. of leaves	Fresh weight (gm)	Dry weight (gm)
T_0	37.17 ± 1.22	17.57 ± 0.78	20.33 ± 0.58	21.89 ± 0.50	4.72 ± 0.78
T_1	43.30 ± 4.81	19.13 ± 0.35	23.00 ± 1.00	27.93 ± 0.61	6.48 ± 0.40
T_2	42.17 ± 3.65	22.57 ± 1.66	25.67 ± 0.58	**28.90 ± 0.92**	**6.81 ± 0.23**
T_3	44.67 ± 2.15	24.23 ± 0.45	**27.67 ± 1.53**	28.70 ± 0.54	6.19 ± 0.60
T_4	**48.53 ± 1.20**	**25.30 ± 2.97**	27.67 ± 3.21	27.31 ± 0.70	6.16 ± 0.77
SEd	2.912	1.2912	1.3824	595.3327	0.4859
Cd (p<0.05)	6.4532	2.8769	3.0803	1326.4903	1.0826

Table 4 Number of Fruits of Abelmoschusesculentus (L.) Moench on the 45th day and 60th day

Treatments	Number of fruits 45th day	Number of fruits 60th day
T0	1.33 ± 0.58	3.33 ± 0.58
T1	1.67 ± 0.58	6.00 ± 1.73
T2	2.33 ± 0.58	7.67 ± 1.53
T3	3.00 ± 1.00	8.67 ± 1.53
T4	**4.00 ± 1.00**	**10.33 ± 1.53**
SEd	0.6992	1.1738
Cd (p<0.05)	1.5579	2.6154

Values are mean ± SD of three samples in each group

References

Dhanasekar, R., and Dhandapani, R. (2012). Effect of Biofertilizers On The Growth Of *Helianthus annuus*. *International Journal Of Plant, Animal and Environmental Sciences*.2(4): 143-147.

Fruits and vegetables. Nutrition for everyone. *Centres for Disease Control and Prevention. 2015-03-30.*

Kumari, C., Manker, A., Karuna, K., Solankey, S. S. and Singh, V. K. (2015).Effect of different levels of nitrogen and microbial inoculants on yield and quality of cabbage *(Brassica oleracea var. capitata)* cv. Pride of India.*India J. Agricultural Sciences*.85(4): 515-8.

Mallikarjuna Rao, K., Singh, P.K., Ryingkhun, H.B.K. and Maying, B. (2014). Use of Bio-Fertilizer in Vegetable. *Production Indian Horticulture Journal*. 4(1): 73-76.

Panse, V.G. and Sukhatme, P.V. (1978). Statistical methods for agricultural workers, 3rdEdn., ICAR, New Delhi, 347.

Shankarappa, T.K., Mushrif, S.K., Subramanyam, B., Sreenatha, A., MaruthiPrasad, B.N., Aswathanarayana Reddy, N. (2017). Effect of Biofertilizers on Growth and Establishment of Cashew Grafts under Nursery Condition. *International Journal of Current Microbiology and Applied Sciences.* 6(8):1959-1965.

Srivastava, A. (2017). Role of biofertilizers in combination with organic and inorganic nutrient sources in enhancement of growth in Kalmegh (*Andrographispaniculata*). *International Journal of Advanced Research in Biological Sciences*. 4(10): 147-150.

Terry, Leon (2011). Health-Promoting Properties of Fruits and Vegetables. *CABI*. 2–4. ISBN 978-1-84593-529-0.

Vegetables. *Infotech Portal*. Kerala Agricultural University. 2015-03-24.

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