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Effect of Organic Media on Growth Parameters of Okra

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ABSTRACT

Before planting any crop, it is crucial to have a solid understanding of the qualities of soil. The characteristics of various soil types will vary. A crop's quality and yield will depend on its soil characteristics. When okra is produced with poor quality due to poor soil qualities then, consumer demand will be reduced. Finding soil-friendly conditions is essential to produce the highest quality okra and satisfying consumer demand. The experiment was conducted in greenhouse of Horticulture Research Institute (HRI), National Agricultural Research Centre (NARC) Islamabad, Pakistan. In this study, Okra seeds were planted in pots in Completely randomized design (CRD) with five treatments i.e., garden soil (T_0) as the control, soil+sand+FYM (T_1), sand+peat moss (T_2), ash+sand+FYM (T_3), and sand+soil+ash (T_4) with five replications each. After 05 months of planting, different parameters of okra plant i.e., height of plant (cm), width of leaf (cm), length of leaf (cm), number of okra fruit, weight of okra fruit (g) and length of okra fruit (cm). In T_0, Maximum number of plants, maximum leaf width (cm) were noted. In T_1, the maximum leaf length, highest number of okra fruit, maximum fruit weight (g) and the longest fruit length were measured. In T_4, the highest plant height was noted. The results are significant in terms of plant height, fruit weight and number obtained by T_1 and T_4.

Keywords: Okra, *Abelmoschus esculentus*, Organic medium, Ash and FYM.

INTRODUCTION

Vegetables are recognized globally because they provide balanced diet, documented as healthy food and play a vital role in controlling micro-nutrients shortage (Adeniji and Peter, 2005). Okra *(Abelmoschus esculentus)* is the most important vegetable crop all over the tropics of the sphere belongs to the family *Malvaceae*. Okra has been originated from South Asia, after that it is cultivated in areas of Ethiopia and West Africa. Around the world it is cultivated in tropical, subtropical and temperate regions. Owing to having numerous uses of fresh leaves, flowers, Seeds and pods; it is a versatile crop (Yonas *et al.*, 2014). It is cherished for its edible green pod. Its green seed pods are consumed as vegetable in soups and boiled or fried form (Ndunguru and Rajabu, 2004). Besides having vitamins, minerals, amino acids and calories in its seed, it is an important crop that is immensely consumed in daily food (Olaniyi *et al.*, 2010).

Okra decreases the chance of heart diseases by reducing serum cholesterol (Habtamu *et al*., 2015). It contains Vitamin A and beta carotene due to which it is also used to improve eye sight along with fresh skin (Lengsfeld *et al.*, 2004). It is propagated through seeds. After one to two month of sowing the plant bear first flower and its fruiting starts just after flowering. Its pods are harvested at immature stage having high mucilage (Fufa, 2019). Okra give high yield in well drained fertile soil with adequate organic matter contents although it can be grown on wide range of soil (Akinyele and Temikotan, 2007).

By using indiscriminate agro-chemicals agricultural yield declined as well as the conventional agricultural sustainability is under threat due to continuous degradation of land. After green revolution use of synthetic fertilizers and pesticides tremendously increased in agricultural production (Gautam *et al.*, 2021). Chemical fertilizers contain excessive nitrogen which causes unforeseen environmental impacts and sensitivity of crops to diseases and pests (Chen, 2002). By the use of excessive amount of chemical fertilizers the negative environmental impacts could be overcome by organic farming practices (Saarsalmi *et al.*, 2001). In order to enhance sustainable agriculture, growing media is used to meet the nutritional requirement. It improves chemical, physical and biological properties of soil which help in maintaining crop quality and improve crop productivity (Maheswarappa (Maheswarappa *et al.*, 1999).

In order to increase yield of the crops the use of fertilizers is found to be very effective. Vegetable growing media includes compost, peat moss, coconut husk, tree bark, poultry feathers, perlite, clay, vermiculite and mineral wool or combinations of media i.e., peat and compost, clay and coir and peat and perlite can also be used for vegetables production (Vaughn *et al.*, 2011) (Nair *et al.*, 2011). By the addition of FYM in soil resulted in increase in soil organic carbon (Dunjana *et al.*, 2012). It also increases enzyme activities and soil microorganisms activity (Watts *et al.*, 2010).

Wood ash is produced after the burning of wood. It's been proved that it is a good source of calcium, magnesium, phosphorus and potassium (Saarsalmi *et al.*, 2001). Ash is used as fertilizer and supplies nutrients to meet requirements of nitrogen-fixing crops. It can be used to increase soil pH of an acidic soil due to which nutrients already present become readily available and generate a favorable environment for the crops (Wiklund, 2017).

In order to produce good quality crops, growers and producers should use growing media which gives positive and satisfactory characteristics otherwise crops will fail to grow satisfactorily. For several decades peat moss has been one of the most important components of growing media because it has important function for plants. It keeps nutrients and water because of good water and air holding capacity. It is very clean medium because it is free from pathogens and weeds. The peat is very economical to buy (Kitir *et al.*, 2018). As a result, the current study focused on physiological growth of okra as cultivated on different growing media. The goal of this study was to evaluate the best growing media for okra growth, their physiological quality of harvested hybrid okra grown on various growing media and investigating the effect of various growing media in increasing the Okra growth, yield and net returns of hybrid okra in greenhouse.

MATERIALS AND METHODS

Experimental area

The experiment was conducted inside a greenhouse of Horticultural Research Institute (HRI), National Agricultural Research Centre (NARC) Islamabad, Pakistan during 2018 summer season. Hybrid variety of okra seeds were subjected to five (05) different potting media. The following five media were used. T0(aerated garden soil), T1(sand+soil+FYM [Cow manure]), T2(soil+sand+FYM+peat-moss), T3(sand+peat-moss) and T4(sand+soil+ash [wood ash]) were used as treatment.

Experimental design

Completely Randomized Design (CRD) Experimental design with ANOVA having 5 replications and 5 treatments was selected. Pots were used for seed growth. The seed rate was 1 seed per pot and the sowing depth was about 3cm. Hybrid variety of okra was used for research, which was obtained from the NARC, Islamabad, Pakistan. These parameters were recorded i.e., Leaf length(cm), Plant height(cm), Numbers of Fruits, Leaf width(cm), Fruit weight(cm) and Fruit length(cm) of okra hybrid variety was checked using a standard scale (ruler) and weighing machine.

Statistical analysis

The obtained data were subject to statistically analyzed by using ANOVA Through statistics-8.1 Computer Software (Statistix, 2006). The LSD test was applied to compare treatments superiority, where necessary.

RESULTS

Plant height (cm)

The visual aspect of various growing media on okra plant height was examined. T_0 (garden soil) was used as a control, T_1 (soil + sand + FYM) (soil, sand, and farmyard manure), T_2 (soil + sand + FYM + peat moss), T_3 (sand + peat moss), and T_4 (sand + soil + ash).The highest plant height was measured in T_4 (59.2 cm), followed by T_1 (57.4cm), T_0 (54.6cm), T_3 (33cm) and finally T_2 (20.6cm) as shown in Figure 1.

Leaf length (cm)

The effect of various growing media on leaf length of okra was examined. Figure 2 shows T_0 (garden soil) was used as a control, T_1 (soil + sand + FYM) (soil, sand, and farmyard manure), T_2 (soil + sand + FYM + peat moss), T_3 (sand + peat moss), and T_4 (sand + soil + ash) among other growing media. Maximum leaf length was noted in T_1 (18cm) further in T_3 (17cm), T_0 and T_4 (13cm).

Leaf width (cm)

The impact of various growing media on the okra leaf's breadth was examined. T_0 (garden soil) was used as a control, T_1 (soil + sand + FYM) (soil, sand, and farmyard manure), T_2 (soil + sand + FYM + peat moss), T_3 (sand + peat moss), and T_4 (sand + soil + ash), among other growing medium. Figure 3 describes the maximum leaf width was measured in T_0 (11cm), followed by T_1 (10cm), T_3(7cm) ,T_2 (5.5cm)and T_4 (5cm).

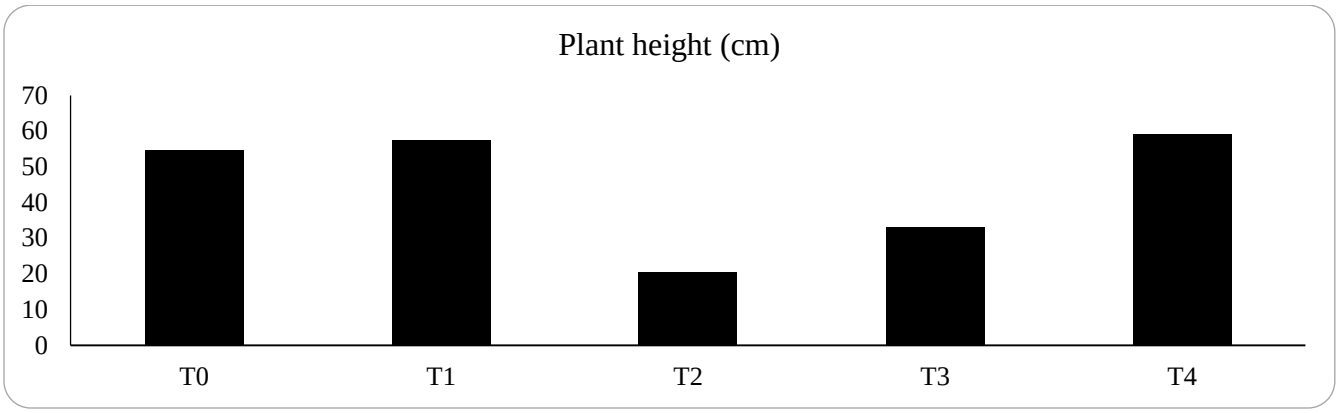

Figure 1: Effect of different organic media on plant height of okra.

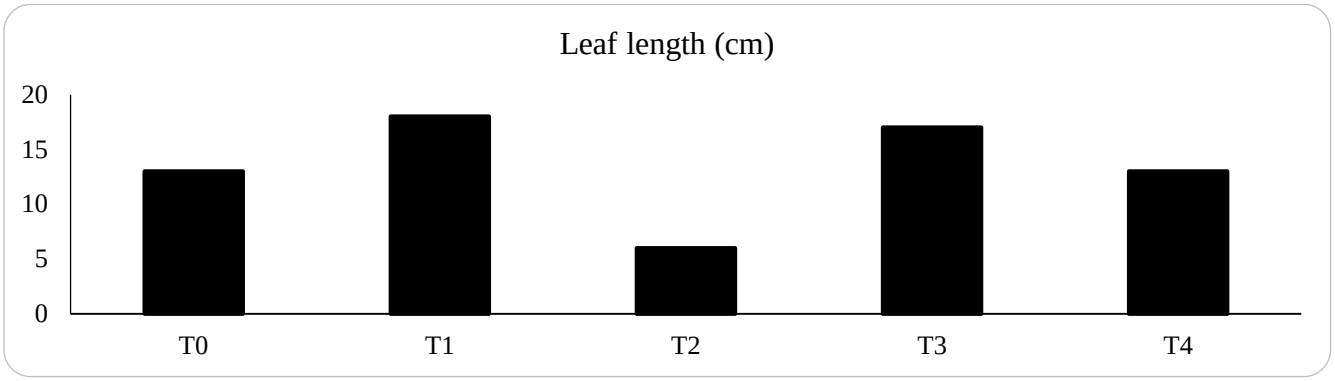

Figure 2: Effect of different organic media on leaf length of okra.

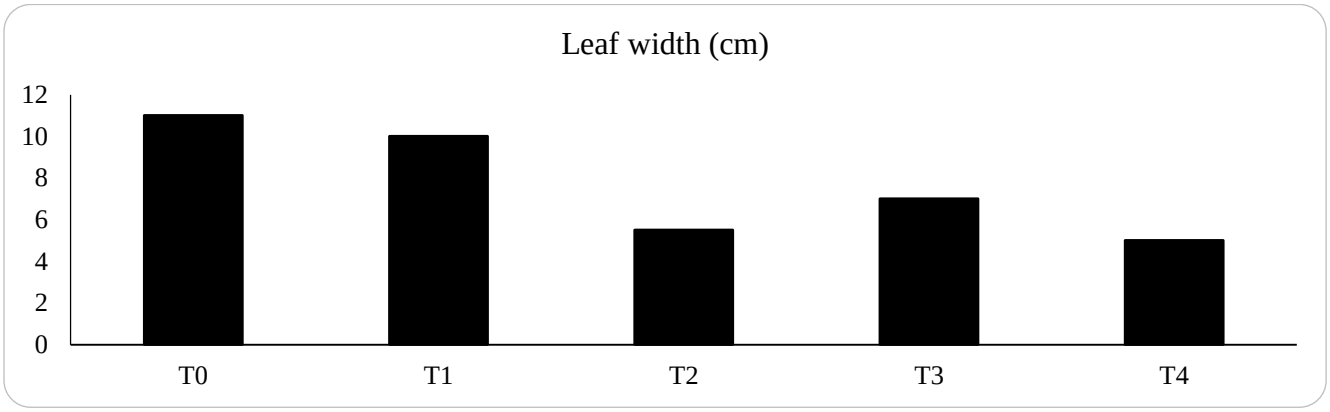

Figure 3: Effect of different organic media on leaf width of okra.

Number of fruits

The impact of various growing media on the number of okra fruits was examined. In T_1 (11) the maximal fruit's number was recorded then the sequence followed as T_0 (10),T_4 (5),T_3(4), and T_2 (3). The various growing medium were T_0 (garden soil) as the control, T_1 (soil+ sand +FYM) T_2 (soil+sand+FYM+peat moss), T_3 (sand+peat moss), and T_4 (sand+soil+ash) as presented in Figure 4.

Fruit length (cm)

The impact of various growing media on the length of the okra fruit was examined. T_0 (garden soil) was used as a control, T_1 (soil + sand + FYM) (soil, sand, and farmyard manure), T_2 (soil + sand + FYM + peat moss), T_3 (sand + peat moss), and T_4 (sand + soil + ash), among other growing medium. Figure 1 elaborates the longest fruit length was measured in T_1 (18cm) followed by T_3 (17cm), the same outcome was found in both T_0 ,T_4, (13cm) and T_2 (6cm) (Figure 5).

Fruit weight (g)

The impact of various growing media on the weight of the okra fruit was examined. As per Figure 6 maximum fruit weight was recorded in T_1 (6.23cm) followed by T_0 (5.27cm) T_3 (3.38cm), T_4 (2.53cm) and T_2 (0.68cm). Among the various growing medium, T_0 (garden soil) served as a control, T_1 (soil+ sand +FYM), T_2 (soil+sand+FYM+peat moss), T_3 (sand+peat moss), and T_4 (sand+soil+ash).

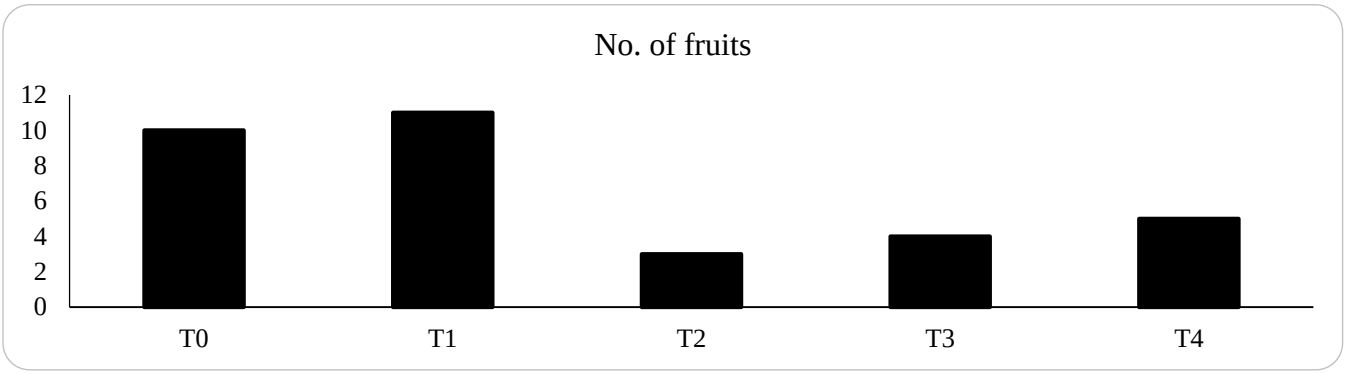

Figure 4: Effect of different organic media on number of fruits of okra.

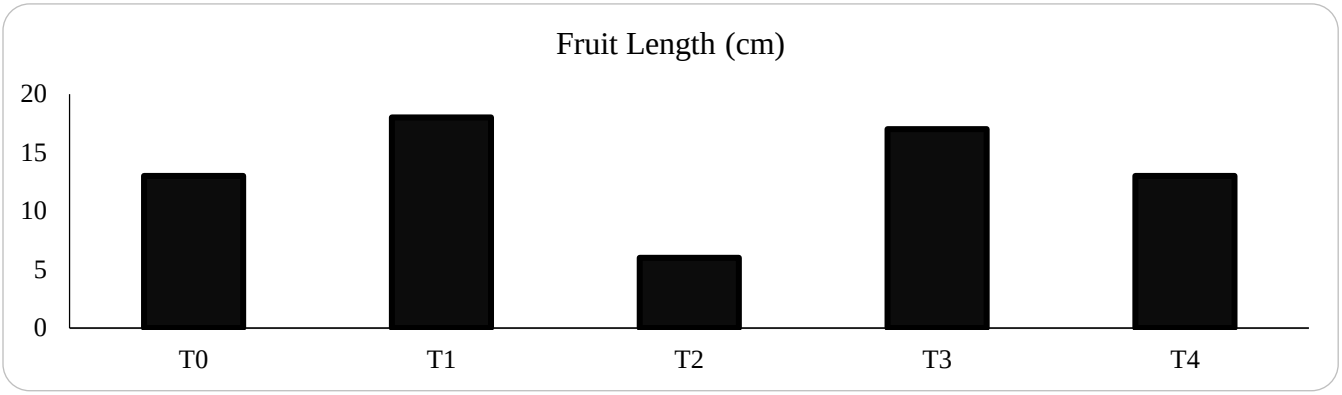

Figure 5: Effect of different organic media on fruit length of okra.

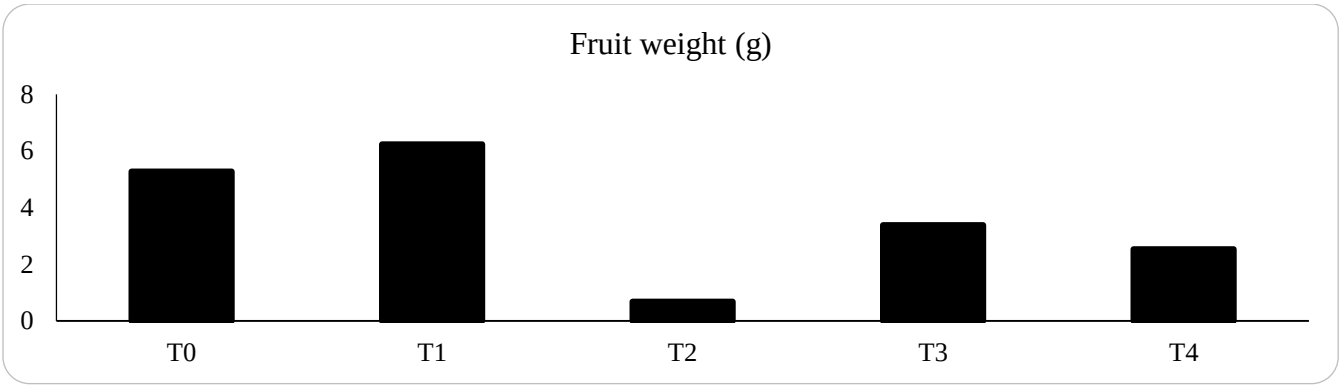

Figure 6: Effect of different organic media on fruit weight of okra.

DISCUSSION

The application of FYM may have improved the nutritional status of the soil, water-holding capacity, physical, chemical, and biological characteristics, all of which contributed to improved nutrient absorption and improved expression of biometrical identifications .One of the main methods of restoring soil losses has traditionally been the FYM. It provides soil organic

matter (SOM), a measure of soil health, life, and even potential for production. Along with the buildup of extra humus content, FYM also allowed for improved inoculation of microorganisms.

Applying FYM and bio fertilizers simultaneously may have had complimentary and supplementary effects, resulting in a sufficient and gradual yet constant distribution of nutrients and improved parameters (Bamboriya *et al*., 2022). Growing okra on poultry manure produced higher-yielding plants. This demonstrates that there was an increase in the morphological growth of the plant because poultry manure was easily accessible and in the ideal shape for simple assimilation by the roots of the plant. The outcome supported the conclusions of (OI *et al.*, 2003) about the production of okra, wherein they said that, in comparison to other manure sources, organic manures, particularly poultry manure, might raise crop plant height.

The usage of organic manures, such as FYM, chicken manure, and goat manure, has grown in popularity in recent years. The soil texture and ability to hold water are improved by organic manuring (Kale *et al.*, 1991). Additionally, it gives soil bacteria nourishment. This boosts microbial activity, which aids in transforming inaccessible plant nutrients into accessible forms. Because it stimulates the activity of soil microbes, which aid in the release of plant nutrients and the healthy growth of plants. Organic manure generally improves all of the physical, chemical, and biological qualities of the soil. Moreover, it has been discovered that organic manure can increase a damaged soil's fertility and maintain output during continuous cropping (Eghareyba & Ogbe, 2002).

Applying peat moss is therefore crucial to the growth of organic crops and radish. Nevertheless, it is advised that scientists and farms utilize a higher amount than the one employed in this study (Ahmed *et al.*, 2023).

The byproduct of power plants is fly ash or Charcoal which has demonstrated a strong ability to increase crop productivity and soil fertility, when applied as soil amendments. These substances can function as general soil conditioners i.e., partial replacement for bell peppers, inorganic fertilizer and tomatoes. Numerous crops such as squash, tomato, okra, watermelon, bell pepper, snap beans, broccoli, cucumber, sweet corn and eggplant have had their production responses to these amendments assessed (Aslam *et al.*, 2018; Wang *et al.*, 2007).

CONCLUSION

The success of okra production is directly linked to the characteristics of the soil. The soil provides crucial support and nutrients for the plants, impacting the quality and quantity of the harvest. Understanding the ideal, soil conditions for crop growth is essential for optimizing productivity. The results show that a combination of soil, sand with FYM and ash were best treatment combinations for okra yield and quality. This study indicates that okra cultivation on mixture of organic media i.e., FYM (cow manure) and Ash (wood ash) results in high yields and superior quality, meeting market demand. It is imperative to enhance soil properties, both physically and chemically, to achieve the desired growth and characteristics of okra.

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AUTHOR CONTRIBUTIONS

All authors contributed equally to this research.

COMPETING OF INTEREST

The authors declare no competing interests.