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# EFFECTS OF ANIMAL MANURE ON THE GROWTH AND DEVELOPMENT OF OKRA (*Abelmoschus esculentus* L.)

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## ABSTRACT

The response of manure towards the growth and development of crops was plaid in this investigation. Manure and compost not only supply many nutrients for crop production, including micronutrients, but they are also valuable sources of organic matter. Increasing soil organic matter improves soil structure or tilth. Most vegetable crops return small amounts of crop residue to the soil, so manure, compost, and other organic amendments help maintain soil organic matter levels. The pots experiment was comprised 60 pots with two cultivars i.e., "*Sabz Pari*" *and* "*Super Green*" of Okra species having 5 replicates 3 treatments for each species and 6 harvests. The experiments were conducted at the net house of Botany Department, Government Postgraduate College Dera Ghazi Khan in a completely randomized block design. The growth parameters number of leaves 68.01±37.43 and leaf area 70.74±31.87 of cultivar "*Super green*" was showed maximum response in manure than cultivar "*Sabz pari*" 8.11±1.34 and 8.19±5.60, respectively. The vegetative growth of Okra cultivars were showed significant response in different concentration of animals manure. Significant variations were found in between the treatments and the different levels of growth harvest (P≥000***). Moreover the germination response of weeds was also significantly increased with the concentration of animal manure.

**Keywords:** Okra (*Abelmoschus esculentus* L.), compost, manure, fertilizer, vegetables crop, cultivars.

## INTRODUCTION

Soil productivity maintenance is a major constraint of tropical agriculture system. Crop cultivation is usually moved between fields to utilize only fertile soils for some years without use of fertilizers. However, this cannot be sustained to meet increased demand of an increasing population. Tropical soils are adversely affected by sub-optimal soil fertility and erosion, causing deterioration of the nutrient status and changes in soil organism populations (Akande *et al*., 2010).

Animal manure had been used as a source of local fertilizer in the many developing countries across the globe for many centuries. Proper use of manure and compost is essential for both a production and environmental standpoint. Applying rates that are too low can lead to nutrient deficiency and low yields. On the other hand, too high a rate can lead to nitrate leaching, phosphorus runoff, accelerated eutrophication of lakes, and excessive vegetative growth of some crops. Thus, understanding how to manage manure is important for any farming operation with livestock that relies on manure as a major source of nutrients, as well as for vegetable producers who have access to an economical supply of manure, compost, or other organic nutrient sources. The use of inorganic fertilizers has drastically declined due to the energy crisis, which has immensely affected most of the developing countries (Hauck, 1982). Nutrients contained in manures are released more slowly and are stored for a longer time in the soil ensuring longer residual effects, improved root development and higher crop yields (Sharma and Mittra, 1991; Abou El Magd *et al*., 2005).

Manures are usually applied at higher rates, relative to inorganic fertilizers. When applied at higher rates, they give residual effects on the growth and yield of succeeding crops (Maknde and Ayoola, 2008) Improvements of environmental conditions as well as the need to reduce cost of fertizing crops are reasons for advocating use of organic materials (Bayu *et al*., 2006). Organic manures improve soil fertility by activating soil microbial biomass (Ayuso *et al*., 1996). Application of manures sustains cropping system through better nutrient recycling (ElShakweer *et al*., 1998). Manures provide a source of all necessary macro- and micro nutrients in available forms, thereby improving the physical and biological properties of the soil (Abou El Magd *et al*., 2006).

Okra or bhendi [*Abelmoschus esculentus* (L) Moench] is an important protein source in most developing countries. The fruit borers Earias vitella (Fabr.) causing damage to tender fruits are considered as a major constraint to commercial cultivation of this crop. The inorganic chemical fertilizers cause environmental risks including heavy incidence of pests and diseases. Therefore, it is felt imperative to reduce the use of inorganic fertilizers by adopting suitable integrated nutrient management system (INMS) comprising farm yard manure (FYM), composts, vermicompost, oilcakes etc. It is noteworthy that application of organic manures not only produced the highest and sustainable crop yield, but also improved the soil fertility and productivity (Sanwal *et al*., 2007). Although the organic manures contain plant nutrients in small quantities as compared to

the fertilizers, its growth promoting constituents like enzymes and hormones, besides plant nutrients make them useful for improvement of soil fertility and productivity. Hence, the present investigation was undertaken to study the effect of INMS on the quality fruit production in open pollinated varieties of okra along with their reactions to the fruit borer, E. vitella.

Many workers have tried to assess the importance of organic manures in crop production. Senjobi *et al.* (2010) reported that the use of poultry, plant and sheep/goat manures improved all the growth parameters of the leafy vegetable they worked with. Other workers have reported beneficial effects of organic manure on soil properties such as bulk density (Fawole *et al.*, 2010), soil moisture content (Adeleye *et al.*, 2010), water-holding capacity and other soil physical properties (Fawole *et al.*, 2010). Many materials which are waste products of agricultural enterprises and the saw-mill industry can be used beneficially to produce crops and amend the soil for sustainable crop production.

The main objective of this work was very interesting because with the application of animal manure to check the growth and development of vegetables in one side but germination and development of weeds growth response in this trail on other side.

## MATERIALS AND METHODS

### Experimental site

Experiment was carried out in the net house of Botany Department Government Postgraduate College, Dera Ghazi Khan from 25-04-2011 to 16-07-2011. 60 earthen pots were used to test the vegetative growth parameters of *Abelmoschus esculantus* (lady finger) vegetable. The size of each pot was 10 inches deep and 8 inches width and filled with 7kg loam texture soil checked by Soil and Water Testing Laboratory (SWTL) Dera Ghazi Khan having characteristics pH 8.4, EC 4.2mmhos, Organic matter 0.52, available P 10ppm, soil saturation 44% and K 205 ppm which was used for growth trail. The seeds of species were collected from Punjab Seed department Corporation Zonal office Dera Ghazi Khan and two cultivars were selected to analyze the effect of animal manure.

### Rising of seedlings

At the time of sowing 5 seeds were proliferated in each pot. After germination only 2 healthy seedlings were selected for further examination, while remaining plants were thinned out.

### Applications of treatment

The experiment comprised 60 earthern pots with two cultivars i.e., *Sabz Pari* and *Super Green* of Okra species having 5 replicates and 3 treatments for each cultivar:

T1: Control (No add animal manure)
T2: (125:7) 125 gm animal manure with 7 kg soil
T3: (250:7) 250 gm animal manure with 7 kg soil

The first harvest was taken after 15 days of germination, the duration of each harvest is 15 days, and total 6 harvests were taken within 3 month, the plants were carefully dig out with roots from the pots kept into paper envelope, labeled into treatment wise separately then taken into laboratory for different growth parameters, the soil used in the pots was loam in texture.

### Measurements of growth parameters

At each harvest following parameters were recorded; Shoot length (cm), Root length (cm), Number of leaves, Leaf area ($mm^2$), Shoot Fresh weight (gm), Root Fresh weight (gm), Shoot Dry weight (gm) and Root Dry weight (gm).

### Statistical analysis

One-way ANOVA was carried out to determine the differences among treatment groups and growth and development variables of Okra by using a statistical software MINITAB version 14.

## RESULTS

### Effects of animal manure on the growth of Okra

The vegetative growth of Okra cultivars were showed significant response in different concentration of animals manure. With the increase of concentration of animal manure, the growth parameters of okra were significantly increased. But the cultivar *Super Green* of okra was showed maximum response at different vegetative growth levels with the increase of concentration of animal manure than the cultivar *Sabz Pari* (Table-1).

**Table-1.** Mean values plus standard deviation of growth parameters of two cultivars of an Okra.

| Growth variables | Measurements Mean ± Standard deviation | |
|---|---|---|
| | **Cultivars-1** (Super Green) | **Cultivars-2** (Sabz Pari) |
| Root length | 38.30±12.08 | 18.31±10.04 |
| Shoot length | 24.83±8.48 | 5.42±2.43 |
| Root fresh weight | 16.13±9.68 | 3.58±3.29 |
| Shoot fresh weight | 16.56±8.58 | 2.04±1.04 |
| Root dry weight | 3.55±2.06 | 0.94±0.92 |
| Shoot dry weight | 7.71±3.07 | 3.3±1.89 |
| Number of leaves | 68.01±37.43 | 8.11±1.34 |
| Leaf area | 70.74±31.87 | 8.19±5.60 |

**Analysis of variance**

Highly significant variations were found in the growth parameters between the cultivars of okra harvests and treatments of this investigation (Table-2 P≥000*** Figures 2, 3).

**Table-2.** One-way ANOVA: between treatments and the various growth variables of two cultivars of Okra.

| Source | DF | Mean square | F-Value | P-Value |
|---|---|---|---|---|
| Factor | 9 | 1549 | 4.19 | 0.000*** |
| Error | 50 | 370 | | |
| Total | 49 | | | |

**Effects of animal manure at different growth levels of Okra**

**Effects at root/shoot length level**

Root and shoot length of Okra in this study was significantly enhanced due to increase the concentration of animal's manure in the pots experiment (Figure-1). Similar results were reported by Wright *et al*. (1995), who observed that maximum root growth and rooting depth of barley crop were higher in treatments, which received animal manures relative to where manure was not applied.

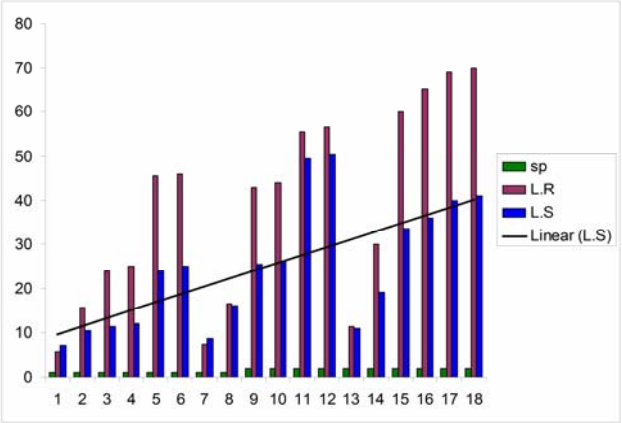


**Figure-1.** Graph among the cultivars, root length and shoot length

**Effects at root/shoot fresh weight and dry weight level**

The results therefore suggest that the observed response was largely due to increased availability of N and P and consequently enhanced root growth. This is further supported by the correlation coefficients whereby shoot dry matter yield was highly and positively correlated to soil available levels of N and P tap root length and root weight. The results are in agreement with those reported by Massomo and Rweyemamu (1989) who observed significant effects on yield of common beans following application of poultry manure.

Among the organic manure treatments, application of FYM performed better than the other treatments through improved plant characters, plant height, number of fruits/plant and yield though the organic manure treatment showed positive effect through growth and yield characters. The chlorophyll content in the leaves might have been significantly improved with the application of organic source of nutrients. The increased application of FYM, which contain appreciable quantities of magnesium, might have helped in chlorophyll synthesis which in turn increased the rate of photosynthesis. The results are in agreement with the findings of Nehra *et al.*

(2001) and Sanwal *et al*. (2007). Higher yield response due to organics is ascribed to improvement in physical and biological properties of soil resulted in better supply of nutrients led to good crop growth and yield. The reason for increased fruit weight and fruit yield could be attributed to solubilization effect of plant nutrients by the addition of FYM leading to increased uptake of NPK (Sendurkumaran *et al*., 1998). Further FYM would have helped the soil to improve the nutrient status and water holding capacity. The significance of organic manuring in sustainable agriculture is well established. (Subbarao *et al.,* 2001). Recovery of P from organic manure is slightly better than from fertilizers as $CO_2$ released by decomposition improves availability from soil. (Gopalakrishnan, 2007). The better efficiency of organic manures might be due to the fact that organic manures especially FYM would have provided the micronutrients such as Zn, Cu, Fe, Mn and Mg in an optimum level. Zinc is involved in the biochemical synthesis of most important phytohormone, Indole Acetic Acid through the pathway of conversion of IAA. Iron is involved in chlorophyll synthesis pathway. Copper and Manganese are the important coenzymes for certain respiratory reaction. Magnesium is involved in chlorophyll synthesis which in turn increases the rate of photosynthesis. Application of organic manure thus would have helped in the plant metabolic activity through the supply of such important micronutrients in the early vigorous growth (Anburani and Manivannan, 2002).

**Effects at number of leaves/ plant and leaf area/plant level**

Numbers of leaves per plant were significantly increased due to increase of manure concentration per pots and the size of the leaves was also significantly enhanced. Thus the leaf area/plant was significantly greater in the increase of concentration of treatments.

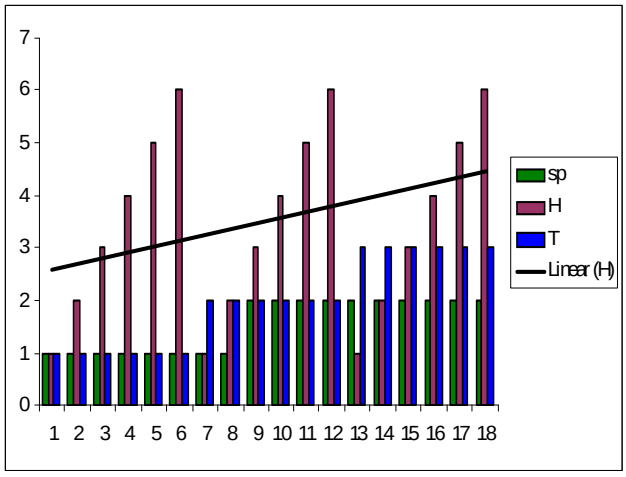


**Figure-2.** Graph among the cultivars, harvest and treatment.

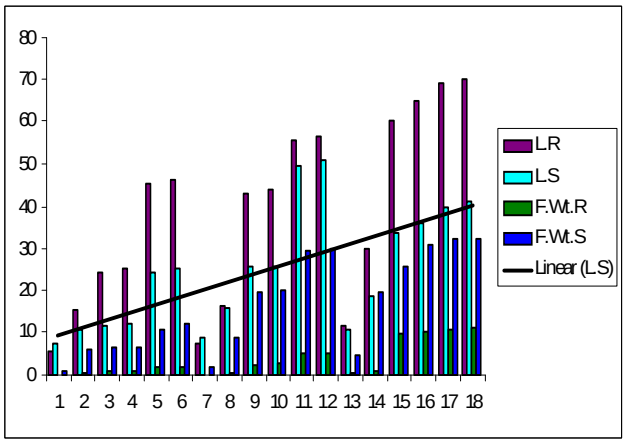


**Figure-3.** Graph among the different growth variables.

**DISCUSSIONS**

Results of the pot experiment indicated that applications of the animal manures significantly increased the chemical soil properties evaluated. Irrespective of the manure type, soil available levels of N and P increased with increasing rates of application. The results also revealed variations among the animal's manures treatment and the cultivars. Similar trends were observed for other attributes observed namely, shoot dry matter yield, taproot length and root dry weight. These responses could largely be due to the initial differences in total N, total P and organic carbon of the manures. Okra dry matter yield was highly and positively correlated to available levels of N and P, tap root length and root weight, indicating that these responses were largely due to availability and uptake of N and P. Generally, results of the field experiment confirmed those of the pot experiment. Soil available levels of N and P after the third crop harvest were higher than those of the first crop cycle indicating that mineralization of N and P increased with time after the initial application of the organic amendments. As it was for the pot experiment, highest responses of the evaluated parameters were obtained from animal manure. Applications of the animal manures could therefore immensely improve fertility of this soil and others with similar properties. Given its superior responses, animal manure could be a very attractive fertilizer alternative particularly for annual crops with short growth cycle such as Okra. Results of this study was confirmed the other research done under different field conditions and for longer experimental duration by Maerere *et al*., (2001). Animal manure was frequently used by the farmers in most of the developing countries such as Pakistan, Nigeria etc for obtaining good quality and quantity yields of the crops, vegetables and fruits. The results of Okra in animal manure in this paper were also supporting documents of the research area across the globe.

**CONCLUSIONS AND RECOMMENDATION**

The study showed that the yield and yield components of Okra were enhanced by the application of manure. Application of organic fertilizers improved the

chemical properties of the soil when compared to the control. The objective of this study was to comparatively evaluate the effects of animal manures on selected soil chemical properties, Okra at different vegetative growth levels. Thus it was recommended that the farmers of developing countries must be used animal manure in their fields to full fill the deficiency of mineral nutrition in the soil. Thus due to application of these local manure farmers were obtained good quality and quantity of yields of theirs crops, vegetables and fruits. Because due to economic and energy stresses across the global population the synthetic fertilizers beyond the bought capacity of the farmers of Third world countries. So most of the farmers were used primarily the different types of animal's manure in their fields. Thus due to application of these local manure farmers were obtained good quality and quantity of yields of theirs crops, vegetables and fruits. Because due to economic and energy stresses across the global population the synthetic fertilizers beyond the bought capacity of the farmers of Third world countries. So most of the farmers were used primarily the different types of animal's manure in their fields.

**Problems countenance during the used of animal manure**

One of the problems was observed during this investigation. The animal excreta were contained number of weed seeds which were not digested by the animals. So with the application of animal manure in the fields the seeds were propagated and competed with the crops for the available nutrients (Figures 4-6). To avoid this problem it was strongly suggested that before using the animal manure in the fields the manure was mulch for one year then used for cultivation.


**Figure-4.** Treatment 1 control with no addition of animal manure.

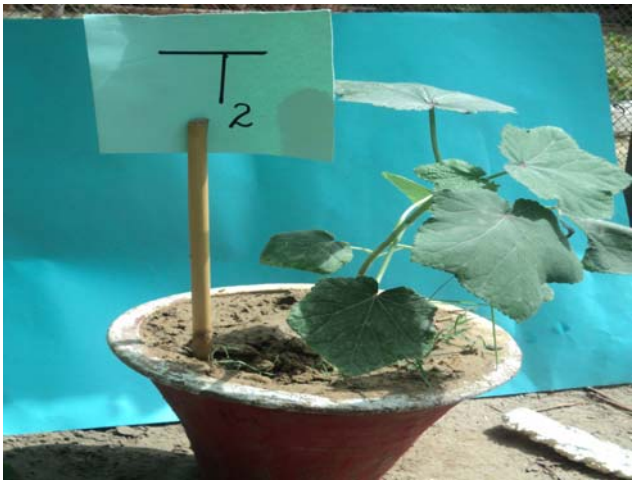


**Figure-5.** Treatment 2 containing 250gm animal manure.


**Figure-6.** Treatment 3 containing 500gm animal manure.

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