Global Scientific JOURNALS

GSJ: Volume 7, Issue 9, September 2019, Online: ISSN 2320-9186
www.globalscientificjournal.com

COMPARATIVE EFFECT OF ORGANIC MANURE AND INORGANIC FERTILIZER ON THE GROWTH AND YIELD OF OKRA (*ABELMOSCHUS ESCULENTUS*) L. MOENCH

Adesida O.A, Smart M.O, Yusuf A.A, Ojeaga K.O

Abstract

The study examined the comparative effect of organic manure and inorganic fertilizer on the growth and yield of Okra (*Abelmoschus esculentus*) L. Moench. The research was carried out at the experimental plot of Federal College of Forestry, Ibadan. Seeds of *Abelmoschus esculentus* were sown directly on the field at a spacing of 50cm by 40cm.The experiment was laid out in a Randomized Complete Block Design (RCBD)with seven treatments replicated three times which comprises of poultry manure and *Gliricidia sepium* at two different levels (10tons/ha,20tons/ha) and NPK 15:15:15 at two levels (150kg/ha,200kg/ha) and control. The following parameters were assessed two weeks after planting; plant height (cm), number of leaves, stem diameter (mm), number of pods and pod weight. Data collected was subjected to Analysis of variance (ANOVA) and separated using Duncan Multiple Range Test (DMRT) at 5% level of probability. The result obtained from this experiment showed that T4 (20tons/ha of poultry manure) performed best in terms of plant height with value of 45.67, while T2 (*Gliricida sepium* at 10tons/ha) recorded least having 29.53. T4 (20tons/ha of poultry manure) also performed best in stem diameter with the value of 2.92 while T2(10tons/ha of *Gliricida sepium)* performed least with 1.83. In addition,T4 (20tons/ha of poultry manure) performed best in the number of leaves recording 7.67 while T2(*Gliricidia sepium* at 10tons/ha) had the least. Moreover, poultry manure at 20tons/ha performed best in the number of pods and pod weight. From the result obtained, it was therefore concluded that the application of poultry manure at 20tons/ha should be adopted by farmers for maximum growth and yield of Okra (*Abelmoschus esculentus*) having performed well in terms of plant height, stem girth, number of leaves and number of pods.

Keywords: Okra, poultry manure, Gliricidia sepium, N:P:K 15:15:15, growth, yield

Introduction

Okra *(Abelmoschus esculentus)* is a popular vegetable which is cultivated in the tropical and sub-tropical region of the world (Baloch, 1994). Okra belongs to the Malvaceae family (Ahmed, 1995). Okra plays an important role to the demand of vegetables in the country where they are scanty in the market (Ahmed, 1995). It is grown for its young leaves and green pods.

The nutritional constituents of okra include calcium, protein, oil and carbohydrates; others are iron, magnesium and phosphorus. Most okra is eaten in cooked or processed form. Young fruits may be eaten raw, the oil could be as high as in poultry eggs and soyabean (Akinfasoye and Nwanguma, 2005). Okra requires nutrients such as Nitrogen (N), Phosphorus (P), Potassium (k), Calcium (Ca), Sodium (Na) and sulphur (S) for fertility maintenance and crop production. These nutrients are specific in function and must be supplied to plants at the right quantity. Lack of sufficient amounts of these nutrients result in poor performance of the crop with growth been affected resulting in low yield (Shukla and Naik, 2003).

Use of organic manures as a means of maintaining and increasing soil fertility has been advocated (Rodale, 1984; Alasiri and Ogunkeye, 1999; Smil, 2000). Animal manures, when efficiently and effectively used, ensure sustainable crop productivity by immobilizing nutrients that are susceptible to leaching. 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 high rates, they give residual effects on the growth and yield of succeeding crops (Makinde and Ayoola, 2008).

Use of inorganic fertilizers can improve crop yields and soil pH, total nutrient content, and nutrient availability (Akanbi *et al*., 2010).

Gliricidia sepium is a common tropical legume tree usually planted as a wind break and it is also an extremely versatile nitrogen fixing agro-forestry tree that can be incorporated in diverse ways into many different small holder farming system (Chinwa *et al*., 2007). Gliricidia leaves improves organic matter contents in the soil, improves soil properties, allowing water to infiltrate into the soil more quickly rather than run off the surface. It restores, improves the soil quality, and increase crop yield.

Materials and Methods

The experiment was carried out within the College Premises of Federal College of Forestry, Ibadan. The College is situated at Jericho Hill, Ibadan North West, Local Government Area of Oyo State. The area lies between Latitude $7^{0}26^{1}$N and Longitude $3^{0}54^{1}$E. The annual rainfall ranges from 1,400mm – 1,500mm and average relative humidity of about 65%, the average minimum temperature is about 24.5^{0}C and average maximum temperature is 31.8^{0}C.

The area is dominated by two seasons: the dry and rainy seasons. The dry season usually commence from November – March while the rainy season starts from April – October. (FRIN, 2017)

Experimental Design : The experimental design was laid out in a Randomized Complete Block Design (RCBD), with 7 treatments replicated 3times making a total of 21plots used for the experiment. The size of the experimental plot was 20m by 8m. The sub-unit plot size was 2m x 1m and furrow path measuring 0.5m.Treatments used include: $T_{1=}$10tons/ha of poultry manure,T_2=10tons/ha of *Gliricidia sepium* leaves,T_3=150tons/ha of NPK 15:15:15,T_4=20tons/ha

of poultry manure,T_5 = 20tons/ha of *Gliricidia sepium* leaves,T_6 =200tons/ha of NPK 15:15:15 T_7 =Control (no treatment).

Parameters Assessed

The following parameters were assessed two weeks after planting: **Number of Leaves**, **Plant height (cm)**,**Stem Diameter (mm)**,**Number of pods and weight of pods.**

Data Analysis

Data collected was subjected to Analysis of variance (ANOVA) using General Statistical Package Software (GENSTAT) and significant means separated using Duncan Multiple Range Test (DMRT) at 5% level of probability.

Result and Discussion

Table 4: Effect of Organic Manures and Inorganic Fertilizer on the Plant Height (cm) of Okra (*Abelmoschus esculentus*)

Table 4 shows that T4 (20tons/ha of poultry manure) performed best in plant height with an average value of 45.67cm while the least performance was observed in T7 (control) with the value of 20.77cm. This work is in accordance with Ajari *et al.,* (2003) who reported that organic manure especially poultry manure could increase plant height when compared with other sources of manure.

Table 5: Effect of Organic Manures and Inorganic Fertilizer on the number of leaves of Okra (*Abelmoschus esculentus*)

Table 5 shows that T4 (20tons/ha of poultry manure) had the highest number of leaves with an average value of 7.67 while the least performance was observed in T7(control) having 5.17. This agrees with the findings of Tindall, (1992) who stated that the increase in number of leaves per plant with organic manures application is important during the vegetative phase of crop plants.

Table 6: **Effect of Organic Manures and Inorganic Fertilizer on the Stem Diameter of Okra (*Abelmoschus esculentus*)**

Table 6 shows that T4 (20tons/ha of poultry manure) performed best in stem girth with an average values of 2.92 followed by seedlings treated with 10tons/ha of poultry manure (T1). T7(control) had the least performance having 1.48.

Table 7: Effect of Organic Manure and Inorganic Fertilizer on the number of pods

The result for pods production reveals that seedling grown with the application of poultry manure at 20tons/ha (T4) produced the highest number of pods with an average value of 9.04 while T1(10tons/ha of poultry manure) performed second best with an average mean of 7.61, while the least number of pods was observed in T7 (control) with the mean value of 3.48.

This result obtained is in agreement with the findings of Sanwal *et al*., (2007) and Premekhar and Rajashree (2009) who reported that higher yield response of crops due to organic manure application could be attributed to improved physical and biological properties of the soil resulting in better supply of nutrients to the plants.

Table 8: Effect of Organic Manure and Inorganic fertilizer on the weight of pods

Table 8 shows the effect of organic manure and inorganic fertilizer on weight of pods produced. It was observed that seedlings treated with 20tons/ha of poultry manure (T4) gave the highest weight with an average mean of 15.62g, followed by seedlings treated with 200kg/ha of NPK 15: 15:15 with an average weight of 11.18g while the least weight was observed in T7 (control). This work however, supported the findings of Adeli *et al.*, (2009), who stated that addition of poultry manure has been shown to improve the fertility of the cultivated soil by increasing the organic matter contents, water holding capacity, oxygen diffusion rate and the aggregate stability of the soils.

Conclusion

The experiment evaluates the comparative effect of poultry manure, *Gliricidia sepium* and NPK 15:15:15 on the growth and yield of *Abelmoschus esculentus*. The application of poultry manure, *Gliricidia sepium*, and NPK 15:15:15 had significant effect on the vegetative growth and yield of *Abelmoschus esculentus*. However, the results obtained revealed that Okra responded well to the application of poultry manure at 20tons/ha in plant height, stem girth, number of leaves,number of pods and weight of pods respectively.

Farmers should therefore be encouraged to adopt the use of organic manure most especially poultry manure in order to enhance the growth and yield of Okra(*Abelmoschus esculentus*).

References

Abou El-Magd, M. M. Hoda, A. Mohammed and Fawzy, Z.F.(2006): Relationship, growth and yield of broccoli with increasing N, P or K ratio in a mixture of NPK fertilizers. Annals Agriculture Science Moshtohor, 43 (2):791-805.

Adeli, A. Sistani, K.R; Tewolde, H. and Rowe De (2009): Broiler litter application effects on selected trace elements under conventional and no till systems. Soil science Pp. 172, 349 – 365.

Ahmed,K.U (1995),Vegetables crop business in Bangladesh. A consultancy report under AVRDC–BARC/BARI-USAID Bangladesh project, BARI, GAZIPUR, Bangladesh,Pp. 400.

Ajari, O.; Tsade, L.E.K.; Oladiran, J.A. and Salako, E.A (2003): Plant height and fruit yield of okra as affected by field application of fertilizer and organic matter in Bida, Nigeria. *The Nigerian Agricultural Journal*, 34:74 - 80

Akanbi, W.B; Togun, A.O; Adediran, J.A; Ilupeju, E.A.O (2010): Growth, dry matter and fruit yields components of okra under organic and inorganic sources of nutrients. *American-Euraskin Journal of sustainable Agriculture 4(1): 1 -3*

Alasiri, K.O. and O.O. Ogunkeye. 1999. Effect of different levels of poultry manure on seed yield of Okra. Proceedings 25th Annual conference of Soil Science Society of Nigeria, 21st – 25th November, 1999. Benin, Nigeria.

Baloch, A.F (1994). Vegetable crops Horticulture, National book foundation, ed, Elena Bahir and Robyn Bantel, Islamabad. Pp 529-531.

Chinwa, P.W, Ong, C.K, Maghembe, J. Black, C.R (2007): Soil water dynamics in cropping system containing Gliricida sepium, pigeon pea and maize in Southern Malawi: Agroforestry Centre, Report, No.7

Makinde, E.A and A. A. Ayoola, (2008).Residual influence of early season crop fertilization and cropping system on growth and yield of cassava. *American J. of Agric. and Biological Science. 3(4): 712-715.*

Premsekhar, M. and Rajashree, V. (2009): Influence of organic manure on growth yield and quality of okra. *American Journal of Sustainable Agriculture, 3(1): 6 - 8*

Rodale, R 1984. Alternative Agriculture. J. Soil Water Conservation. 39:294-296. http://www.jswconline.org/content/349/5/294.extract.

Sanwal, S.K. Lakminarayana, K. Yadav, R.K, Rai, N.; Yaldav, D.S and Mousumi, B. (2007): Effects of organic manures on soil fertility, growth, physiology, yield and quality of turmeric. *Indian Journal of Horticulture 64(4): 444 – 449.*

Sharma, A.R. and B. N. Mittra, (1991): Effect of different rates of application of organic and c. *Journal of Agricultural Science (Cambridge)* 117: 313-318. DOI:10.1017/S0021859600067046Smil, V. 2000. Phosphorus in the Environment: Natural Flows and Human Interferences. Annual Review of Energy and Environment. 25:53-88 (DOI:146/annurev.energy.25.1.53)

Shukla, V; Naik, L.B (2003): Agro techniques for malvaceae vegetables, In: Ifovance in horticulture vol 5. Malhotra publishing house New Delhi, India pp 399 -425

Tindall, H.D. (1992): Vegetables in the tropics macmillan press Ltd, London, Pp. 533

TABLES

Table 1: PRE CROPPING PHYSICAL AND CHEMICAL PROPERTIES OF THE SOIL USED

Soil properties	Content in soil
pH in H_2O	6.33
Organic carbon (%)	1.08
Organic matter (%)	1.86
Total nitrogen (%)	0.09
Available phosphorus (mg/kg)	0.09
Exchangeable Bases (Cmol/kg)	
Ca	7.6
Mg	0.4
K	0.01
Na	0.5
Extractable micro nutrients (mg/kg)	
Fe	425
Cu	2.7
Zn	52.5
Mn	58.6
Particle size distribution (%)	
Sand (%)	82.5
Clay (%)	11
Silt (%)	6.5
Textural class	Sandy loam

Source: FRIN Ibadan, 2019

Table 2: PRE CROPPING PHYSICAL AND CHEMICAL PROPERTIES OF THE POULTRY MANURE USED

Properties	Status
Organic carbon (%)	14.11
Organic matter (%)	24.33

Total nitrogen	1.84
Available phosphorus	0.55
Exchangeable bases (Cmol/kg)	
Ca	4.30
Mg	0.24
K	0.50

Source: FRIN, Ibadan, 2018

Table 3:*Gliricidia sepium*

% M.C	% D.M	% C.F	% C.P	% E.E	% Ash	Kcal / kg
93.00	7.00	5.12	28.5	7.99	6.00	2.450

Source: FRIN, Ibadan, 2018

Table 4: EFFECT OF ORGANIC MANURE AND INORGANIC FERTILIZER ON THE PLANT HEIGHT (cm) OF OKRA (*Abelmoschus esculentus*)

Weeks after Germination

Treatments	wk2	wk4	wk6	wk8
T1	8.35a	18.80ab	28.17ab	37.60ab
T2	7.90ab	14.75bc	23.67b	29.53b
T3	8.42a	16.80b	25.50b	35.77ab
T4	8.30a	24.77a	35.17a	45.67a
T5	8.13a	16.33b	24.82b	33.17ab
T6	8.62a	19.20ab	28.37b	38.00ab

T7	7.12b	13.05c	17.25c	20.77bc
LSD	0.78	4.50	5.54	6.85
%CV	5.5	14.5	12.1	11.4
S.E	0.44	2.57	3.16	3.91

Keys:

T_1 = 10t/ha of Poultry manure

T_2 = 10t/ha of *Gliricidia sepium* leaves

T_3 = 150kg/ha of NPK 15:15:15

T_4 = 20t/ha of Poultry manure

T_5 = 20t/ha of *Gliricidia sepium*leaves

T_6 = 200kg/ha of NPK 15:15:15

T_7 = Control (no treatment).

TABLE 5: EFFECT OF ORGANIC MANURE AND INORGANIC FERTILIZER ON THE NUMBER OF LEAVES OF OKRA (*Abelmoschus esculentus*)

Treatments	wk2	wk4	wk6	wk8
T1	3.67	5.33ab	5.83ab	6.83b
T2	3.17	4.67b	5.17ab	6.00bc
T3	3.67	5.33ab	5.67ab	6.83b
T4	3.83	6.17a	6.50a	7.67a
T5	3.33	5.17a	5.50ab	6.50b
T6	3.67	5.00ab	5.67ab	7.00ab

T7	3.00	4.33b	4.67b	5.17c
LSD	0.66	0.88	1.03	0.51
%CV	10.9	9.7	10.5	4.4
S.E	0	0.50	0.59	0.29

TABLE 6: EFFECT OF ORGANIC MANURE AND INORGANIC FERTILIZER ON THE STEM DIAMETER OF OKRA (*Abelmoschus esculentus*)

Treatments	wk2	wk4	wk6	wk8
T1	0.88b	2.10ab	2.25ab	2.53ab
T2	0.70bc	1.41b	1.58ab	1.83b
T3	1.10a	1.95b	2.10ab	2.31ab
T4	0.83b	2.52a	2.65a	2.92a
T5	0.78bc	1.80b	1.92b	2.22ab
T6	1.09a	2.00ab	2.03ab	2.37ab
T7	0.32c	2.35a	1.20c	1.48bc
LSD	0.49	1.57	0.51	0.44
%CV	34.1	44.3	14.7	11.1
S.E	0.28	0.90	0.29	0.25

TABLE 7: EFFECT OF ORGANIC MANURE AND INORGANIC FERTILIZER ON THE AVERAGE NUMBER AND WEIGHT OF PODS

Treatments	**No of pods**	**Fresh Pod Weight (g)**

T1	7.61	10.20
T2	4.20	6.03
T3	6.13	10.06
T4	9.04	15.62
T5	6.32	9.73
T6	7.44	11.18
T7	3.48	5.87
LSD	2.19	5.87
%CV	8.4	11.41