Available online at www.elixirpublishers.com (Elixir International Journal)

Agriculture

Elixir Agriculture 85 (2015) 34528-34530

ISSN: 2229-712X

Effects of Fertilizer Types on Different Varieties of Eggplant (*Solanum Melonga*) in Ogbomoso Agro Ecological Zone

Lawal,B. A.*, Ilupeju, E. A. O., Akanbi, W. B., Onarinde, C. R. and Atanda, T. T.

Department of Crop Production and Soil Science, Ladoke Akintola University of Technology, Ogbomoso, Nigeria.

ARTICLE INFO

Article history:

Received: 18 July 2015;

Received in revised form:

10 August 2015;

Accepted: 20 August 2015;

Keywords

Eggplant,

Fertilizer type,

Variety.

ABSTRACT

Inappropriate fertilizer application usage is among the problems associated with eggplant production in Ogbomoso agro-ecological zone. Field experiment was conducted at the Teaching and Research Farm of Ladoke Akintola University of Technology, Ogbomoso to assess the effects of different fertilizers on the performance of five varieties of eggplant. The treatments consisted of five fertilizer types (No fertilizer, Inorganic fertilizer (NPK 100%), Organic fertilizer (100% compost), 50% compost + 50% NPK and 75% compost + 25% NPK) and five varieties of eggplant (Nacy, Ravenna, Nathelie, Reth and Orma). The fertilizer treatments were supplied at the equivalent rate of 60 kg N/ha. The experiment was a factorial experiment laid out in randomized complete block design. The five fertilizer types and five eggplant varieties translates to 25 treatment combinations, which was replicated three times. The agronomic and yield data collected were analyzed using the analysis of variance procedure while the treatment means were separated using the Duncan Multiple range test at 5% level of probability. It was observed that application of fertilizer improved the growth and yield attributes of eggplant when compared with where no fertilizer was applied. Combined application of 50% compost + 50% NPK and 75% compost and 25% NPK gave the highest fruit yields of 31.8 and 29.9 t/ha, respectively, which were not different significantly from each other. Ravenna variety produced the highest fruit yield (37.1t/ha). Planting of Ravenna variety with application of 50% NPK + 50% compost could be recommended for production of eggplant in the study area.

Introduction

Eggplant (*Solanum melongena)* is a crop grown in Nigeria for its nutritional, medicinal and economic values of the leaves and fruits. Onuoha, (2005) and Maraizu (2007) stated that eggplant contains a lot of minerals, vitamins which are important and highly beneficial for the maintenance of human health. Chadha and Oluocha (2003) and Onunka *et al.,* (2011), reported that consumption of eggplant as a fruit vegetable is capable of tackling malnutrition problem in Africa. Eggplant contains phyto-nutrients such as nasunin and chlorogenic acid (Sabo and Dia, 2009). It is a very good source of dietary fiber, potassium, manganese, copper, and vitamin B6, folate, and niacin. Eggplant is an important vegetable crop in Nigeria. The fruits are consumed fried, stewed, marinated and prepared in other ways through industrial processes like canned paste among others. There are varieties of species that are more popularly grown for their fruits and, in some cases, the leaves and tender shoots.

Fruit yield in eggplant is dependent on a number of factors which include flowering, pests and diseases, soil nutrient status and of course fertilizer application (Huth and Pellmyr, 1977). Eggplant is a heavy feeder of fertilizer and occupies the ground for a long period of time, so one or two dressing of fertilizer may be necessary (Swiader *et al.*, 1992). Its production in the area of this study, southwestern Nigeria is constrained by the low level of soil fertility, coupled with prevailing poor climatic conditions, which result in low yield of the plant. Constraints and the problem of soil nutrients of low to medium level of available nutrients have caused yield below potential levels (Adepetu, 1986). Therefore, fertilizer application has been a component of improved cultural practices for most crops since over 95 percent of most arable land of south west Nigeria are under frequent cultivation.

The need for increasing food production, including vegetables, is of great importance throughout the world. Eggplant is a fruit that its production needs to be increased because of its numerous potentials. There are few cultivars with morphological diversity. Some are usually low yielding and have varying degrees of acceptability and susceptibility to diseases and pests. While many commercial hybrids of the exotic eggplant have been developed and commonly grown in different parts of the world. Fertilizer recommendation is location specific; consequently, the need to determine the fertilizer requirement of available varieties. This research therefore aimed to determine the appropriate fertilizer combination and eggplant variety that is best for this agro-ecological zone.

Materials and Methods

The experiment was conducted at the Teaching and Research Farm of Ladoke Akintola University of Technology, Ogbomoso, Nigeria (Long. 4^{o} 10' E; Lat. 8^{o} 10' N).. The experimental site has been used for cultivation over the years. Prominent weed species noted were *Chromolaena odorata, Imperata cylindrica and Tithonia diversifolia*. The land was ploughed twice. The field was then mapped out into plots. The size of each plot was 4 x 4 m with a distance of 1 m between plots and 2 m between each replicate.

The experiment was a factorial experiment laid out in a randomized complete block design. There were five fertilizer treatments and five eggplant varieties giving 25 treatment

Tele:

E-mail addresses: balawal@lautech.edu.ng

combinations, which was replicated three times. The five fertilizer treatments are No fertilizer; control (F1), Inorganic fertilizer; NPK 100% (F2), Organic fertilizer; 100% compost (F3), 50% compost + 50% NPK (F4) and 75% compost + 25% NPK (F5). Each treatment were formulated to supply 60 kg N/ha. The eggplant varieties are Nacy (V1), Ravenna (V2), Nathelie (V3), Reth (V4) and Orma (V5). Three seeds were planted per hole and later thinned to two plants per stand, at spacing of 0.5 m by 0.5 m. The NPK fertilizer treatments were applied three weeks after planting while compost were applied two weeks before planting by the method of incorporation.

Data collection started two weeks after planting (WAP) and subsequently at two weeks interval. Growth and yield parameters recorded were plant height (cm), number of leaves, leaf area (cm^2), number of flowers, fruit length (cm) and fruit girth (cm), number of fruits per plant, fruit yield (g/plant and kg/ha) and weight of seed (g/plant). The leaf area was determined by the non-destructive length x width method described by Subedi and Ma (2005) using the relation: Leaf area = 0.75 (length x width), where 0.75 is a constant. The data collected were statistically analyzed using the Analysis of Variance procedure while the treatment means were separated using the Duncan Multiple Range Test at 5% range of probability (Gomez and Gomez, 1984).

Results

Fertilizers types had significant effect ($p \leq 0.05$) on the growth parameters of eggplant (Table 1). At 2 WAP, plots where 75% Compost + 25% NPK was applied had the tallest plant of 2.4 cm but not significantly different from height (2.3 cm) obtained from plots where 50% Compost + 50% NPK was applied while the value least (1.8 cm) was obtained in plots treated with 100% compost. There was no significant effect of fertilizer type at 8 WAP on plant height. Significant production of leaf was recorded from eggplant treated with 100% NPK compared with other treatments while plots where no fertilizer was applies (control) had the least production of leaf. Table 2 presents eggplant varietal effect on growth parameters. Nathelie variety had the tallest plant throughout the weeks of the experiment while Ravenna variety had the shortest (8.8 cm) that was significantly lower than others at 8 WAP. Reth variety had the highest mean number of leaves (16.4) which did not translate to the highest leave production. Significant highest leave production in leaf area (212.2 and 272.8 cm^2 at 6 and 8 WAP respectively) was obtained from Orma variety.

The influence of fertilizer types on yield and its components are presented in Table 3. Application of combination of 75% compost + 25% NPK to eggplant produced the highest mean number of flowers per plant (11.9). The highest fruit yield harvested (796.4 g/plant and 31.8 t/ha respectively) was harvested from application of 50% Compost + 50% NPK to eggplant, these harvests were however not significantly different from yield of eggplant treated with 75% Compost + 25% NPK (765.0 g/plant and 29.9 t/ha respectively). The fertilizer types tried had no significant influence on fruit length but has on fruit girth. Seed weight per plant was highly influenced by the fertilizer types, application of 50% Compost + 50% NPK produced the highest (381.3 g) which was significantly higher than production of other fertilizer types, while application of 100% compost had the least influence (250.6 g) on the seed weight. Variety influenced the yield and its attributes significantly (Table 4). Nacy variety has the highest mean number of flowers per plant (12.5) while Orma variety has the least (8.9) that was significantly smaller than flower production of other varieties. The highest mean number of fruit per plant (0.4) which was statistically higher than production of other varieties was recorded from harvest of Ravenna variety. This variety also has the highest fruit yield per plant (927.1 g) and highest fruit yield per hectare (37.1 t). The highest seed weight per plant was obtained from Nacy variety while Reth variety produced the least.

Discussion

Application of fertilizer influenced growth of eggplant, especially plots where there are combinations of organic (compost) and inorganic (NPK) fertilizers. The better performance of the mixture could be explained by the complimentary role of immediate release of inorganic fertilizer and slow release of organic ones as submitted by Leo Espinoza, (2001); who reported that nutrients in inorganic fertilizer are readily available for plant uptake upon application while the organic forms of nutrients are slowly available. Earlier in 1997, Roe *et al*., found out that yields were usually higher when compost was combined with mineral fertilizers. In providing explanation for this, Adrien, (2006) submitted that application of organic manures significantly increased levels of organic C and N and the formation of water-stable aggregates, as compared with application of chemical fertilizers. The results of the effect of compost on the yield and quality of some vegetables compared with chemical fertilizers reported by Vogtmann *et al*., (1993) also agreed with the observation. They also observed that sole compost treatment resulted in lower vegetable yields in the first two years, but there were no difference after the third year. Also, Mahmoud *et al*., (2009) reported that, in Cucumber production, application of compost increased accumulation of organic carbon, nitrogen and phosphorous more than application of mineral fertilizers. They concluded that Compost combined with mineral fertilizers was the best management system for increasing soil fertility, cucumber yield and quality and reduction of the cost of nitrogen mineral fertilizer. Observed varietal differences in response to growth and yield of eggplant were in agreement with the report of Blay *et al.*, (1999). Ravenna variety is better adapted to this agroecological zone than other varieties tried.

Conclusion and Recommendation

Application of 50% NPK + 50% compost seemed to be best for the production of Ravenna eggplant variety in the study area. Combined application of compost and inorganic fertilizer produced the best yield and yield attributes.

References

Adepetu, J. A. (1986). Soil fertility and fertilizer requirements in Oyo, Ogun and Ondo States. *FDALR, Federal Min Agric Water Res, Lagos, Nigeria*.

Adrien, N. D. (2006). Mixed paper mill sludge effects on corn yield, nitrogen efficiency and soil properties. Agron. J., 98: 1471-1478.

Blay, E. T., Danquah, E. Y., and Ababu, A. (1999). Effect of time of harvest, stage of fruit ripening, and post-harvest ripening on seed yield and germinability of local egg (Solanum gilo Radii). *Ghana Journal of Agricultural Science,32* (2), 159-167.

Chadha M. L. and M. O. Oluocha (2003). Home-based Vegetable s and other Strategies to Overcome Micronutrient Malnutrition in Developing Countries. *Food, Nutrition and Agricultural Journal*. 32(1):17-23.

Danquah-Jones, A. (2000). Variation and correlation among agronomic traits in Egg (Solanum gilo Radii). *Department of Crop Science. Accra, University of Ghana, Legon, 30.*

Table 1: Effect of fertilizer type on the growth parameters of eggplant

	Plant height (cm)				Number of leaves				Leaf area (cm^2)			
	Time of sampling in weeks after planting											
Fertilizer	2	4	6	8	2	4	6	8	2	4	6	8
No fertilizer	2.0b	3.8b	6.2b	10.1a	3.3a	6.5c	9.0d	11.0d	23.1e	84.2b	120.6e	158.8e
100% Compost	1.8b	4.3a	6.9a	10.0a	3.4a	6.2cd	13.1b	15.0b	30.8b	74.8c	207.7a	215.2b
100% NPK	1.9b	4.1a	6.8a	10.2a	4.5a	5.8d	12.5c	14.2c	26.8a	83.8b	175.7b	240.9a
75% Compost + 25 NPK	2.4a	4.2a	7.2a	10.1a	4.5a	7.7b	12.9bc	14.8b	25.9d	73.9d	135.9d	207.7c
50% Compost + 50% NPK	2.3a	4.2a	7.2a	10.5a	4.2a	8.4a	14.0a	15.8a	33.1a	91.4a	168.4c	196.8d

Means along the column with the same letter(s) are not significantly different from each other using Duncan Multiple Range Test at 5% probability level

Table 2: Effect of varieties on the growth parameters of eggplant

	Plant height (cm)				Number of leaves				Leaf area (cm^2)			
	Time of sampling in weeks after planting											
Varieties	2	4	6	8	2	4	6	8	2	4	6	8
Nacy	2.1b	3.2c	3.4e	10.3b	4.5a	9.1a	12.0c	14.1c	27.1c	92.9b	186.4b	197.6c
Ravenna	2.2ab	3.4c	6.4d	8.8d	3.8a	7.0c	10.3e	12.8d	30.4b	75.2c	157.6d	195.3d
Nathelie	2.3a	5.7a	9.0a	12.2a	3.6a	6.0d	13.7b	14.7b	31.6a	72.6d	89.4e	195.3e
Reth	1.6c	3.3c	7.1c	9.5c	4.2a	7.6b	14.6a	16.4a	24.5d	105.2a	162.6c	219.1b
Orma	2.2ab	5.1b	8.4b	10.4b	3.8a	4.8e	10.9d	12.9d	26.5d	62.1e	212.2a	272.8a

Means along the column with the same letter(s) are not significantly different from each other using Duncan Multiple Range Test at 5% probability level

Table 3: Effect of fertilizer type on the yield and yield components of eggplant

Fertilizer	Average Number of flowers per plant	Average Number of fruits per plant	Fruit Yield (g/plant)	Fruit yield (kg per plot)	Fruit yield (t/ha)	Fruit length (cm)	Fruit girth (cm)	Seed weight (g/plant)
No fertilizer	11.5b	7.7a	733.6bc	73.4bc	29.4bc	18.1a	16.4b	283.8d
100% Compost	11.4c	6.4c	684.8c	68.5cd	27.4cd	17.9a	16.3b	250.6e
100% NPK	10.8d	5.4d	631.0d	63.1d	25.2d	18.3a	14.0d	290.1c
75% Compost + 25 NPK	11.9a	7.9a	765.0ab	74.8ab	29.9ab	18.2a	17.4a	381.3a
50% Compost + 50% NPK	10.2e	7.2b	796.4a	79.6a	31.8a	18.0a	15.5c	346.1b

Means along the column with the same letter(s) are not significantly different from each other using Duncan Multiple Range Test at 5% probability level

Table 4: Effect of variety on the yield and yield components of eggplant

Variety	Number of flowers per plant	Number of fruits per plant	Fruit Yield (g/plant)	Fruit yield (kg per plot)	Fruit yield (t/ha)	Fruit length (cm)	Fruit girth (cm)	Seed weight (g/plant)
Nacy	12.5a	6.3c	723.0b	72.3b	28.9b	19.7a	17.6a	10.99a
Ravenna	11.8b	10.4a	927.1a	92.7a	37.1a	18.1b	17.8a	318.8c
Nathelie	11.4c	6.1c	728.21b	71.1bc	28.4bc	17.9b	16.3b	371.1b
Reth	11.2d	7.6b	665.7c	66.6c	26.6c	18.1b	15.4c	192.8e
Orma	8.9e	4.2d	566.6d	56.7d	22.7d	16.6c	12.4d	258.3d

Means along the column with the same letter(s) are not significantly different from each other using Duncan Multiple Range Test at 5% probability level

Gomez, K. A., and Gomez, A. A. (1984). *Statistical procedures for agricultural research*. John Wiley & Sons.

Huth, C. J., and Pellmyer, D. (1977). Nutrient requirements of solanaceous vegetable crops. *Indian journal of agricultural sciences*, *58*, 668-672.

Leo Espinoza (2001). Effect of fertilizer on grain yield of soya bean. *Eur. J. Agron 13: 212-221.*

Mahmoud, E., El-Kader, N. A., Robin, P., Akkal-Corfini, N., and El-Rahman, L. A. (2009). Effects of different organic and inorganic fertilizers on cucumber yield and some soil properties. *World Journal of Agricultural Sciences*, *5*(4), 408-414.

Maraizu, J. O. (2007). The Control of Fusarium Wilt of Eggplant Caused by Fusarium oxysporum F-sp melongena in Parts of Isiala-Ngwa Area of Abia *State* (M. Sc. Thesis of Department of Plant Health Management, Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State, Nigeria).

Onunka, B. N., Chinaka, C. C., and Ezeh, C. I. (2011). Socio-Economic Determinants of African Eggplant (Solanum Gilo) Marketers in Abia State, Nigeria. *Journal of Agriculture and Social Research (JASR)*, *11*(2), 147-154.

Onuoha, A. I. (2005). Economics of Resource Use Among Small-Scale Eggplant Farmers in Isiala-Ngwa North Local Government Area of Abia State, Nigeria. *Journal of Agricultural and Rural Development*, *8*(2), 36-43.

Roe, N. E., Stoffella, P. J., and Graetz, D. (1997). Composts from various municipal solid waste feedstocks affect vegetable crops. II. Growth, yields, and fruit quality. *Journal of the American Society for Horticultural Science*, *122*(3), 433-437.

Sabo, E., and Dia, Y. Z., (2009): Awareness and effectiveness of vegetable technology information packages by vegetable farmers in Adamawa State. Nigeria. *African J. Agric. Res. 4(2): 065-070.*

Subedi, K. D., and Ma, B. L. (2005). Nitrogen uptake and partitioning in stay-green and leafy maize hybrids. *Crop science*, *45*(2), 740-747.

Swiader, J. M., Ware, G. W., and McCollum, J. P. (1992). *Producing vegetable crops* (No. Ed. 4). Interstate Printers and Publishers Inc.

Vogtmann, H., Matthies, K., Kehres, B., and Meier-Ploeger, A. (1993). Enhanced food quality: effects of composts on the quality of plant foods. *Compost Science and Utilization*, *1*(1), 82-100.