GROWTH AND YIELD RESPONSE OF "EGUSI" MELON (*CITRULUS LANATUS L)* TO DIFFERENT NUTRIENT SOURCES IN ULTISOL OF SOUTH-EASTERN NIGERIA

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ABSTRACT

Field experiments were conducted during 2011 and 2012 cropping seasons at the teaching and research farm of the Agricultural Department, Nwafor Orizu College of Education Nsugbe, to evaluate the effect of different nutrient sources on the growth and yield of "Egusi Melon (*Citrullus lanatus* L) in ultisol of Anambra, South-east agro ecological Zone of Nigeria. The study involved the use of Organic and inorganic fertilizers applied at different rates viz; Poultry manure at 4t ha^{-1}, Cow dung at 4t ha^{-1}, NPK 15-15-15 at 200kg $ha^{-1,}$ poultry manure (2t ha^{-1}) combined with NPK (100kg ha^{-1}) and Cow dung (2t ha^{-1}) combined with NPK (100kg ha^{-1}) and was laid out in Randomized Complete Block Design (RCBD). The statistical analysis indicated significant differences in the vine length, leaf area index, days to flowering, fruit number and fruit weight at 5% level of probability. Results showed that among the different nutrient sources applied, "Egusi" Melon responded best to the application of poultry manure (2t ha^{-1}) in combination with N.P.K 15-15-15 fertilizer (100kg ha^{-1}) This study has demonstrated that poultry manure in combination with NPK fertilizer is the most suitable for "Egusi" melon in Anambra, South east Nigeria.

Key words: "Egusi" melon, Poultry manure, Cow dung, NPK 15 -15-15, Growth, yield, ultisol.

INTRODUCTION

Melon "melon" (*Citrullus lanatus* L) is a vegetable crop which belongs to the family Cucurbitaceae (Maynard, 2001). The Curcurbitaceae family is made up of other members such as cucumber, pumpkin, eggplant, muskmelon, watermelon and winter squash (Peet, 1995). It is grown for its seed which is rich in oil and protein (Achu etal., 2005)."Egusi" melon (*Citrullus lanatus*) is a monoecious, annual trailing, climing or creeping crop that requires temperature of 17^0c at night and 32^0c at daytime and also at a constant temperature of 22^0c (Adetula and Denton, 2003). When cultivated, it requires high level of water in-take during the first phase of its development (Charles, 2005).

Excessive rainfall and high humidity gives excessive vegetative growth and promote disease infection, mainly leaf and fruit rot disease, with consequent low yield (Charles, 2005) "Egusi" melon is commonly grown in mixture with yam, cassava, maize and okra, such is the tropical multi-cropping system practiced in many parts of Nigeria (Kolo, 1995). In this cropping system little consideration is given to "Egusi" melon (*Citrulus lanatus*). It is a very important crop in Nigeria and many other Africa Countries where the peeled seeds are used in preparing assorted dishes, the ground seeds are used in seasoning food (Anuebunwa, 2000). In the far Northern parts of Sudan, seeds of some types are eaten whole including the seed coat after being roasted (Achu *et al*., 2005). A highly prized vegetable oil is extracted from the seeds which are used for cooking, and cosmetic purposes. Residue from oil extraction is made into balls that are fried to produce a local snack called "robo" in Nigeria or even used as cattle feed. The oil is of interest to the Pharmaceutical industries (Achu *et al*.,

2005). The oil is used in making soap, seeds can also be roasted to make a substitute for coffee (Schipper, 2002). 'Egusi" melon seeds are good source of oil, protein, minerals, vitamins and carbohydrate. The seed contain 4.6g CHO, 0.6g protein, 0.6g crude fiber, 33mg vitamin C, 17g Ca, 16mg P and 230mg K per 100g edible seeds (Gorski, 1985). It can be planted as a weed control measure or in control of soil erosion (Akobundu, 1987).

Reports on the relevance of Organic manure and mineral fertilizers in tropical agriculture have been presented by various researchers. Achebe (2009) found out that N P K fertilizer significantly increased growth parameters, yield and yield components with optimum yield of "egusi" melon obtained at 150kg NPK ha^{-1}. Ojeniyi (2000) observed that continuous use of inorganic fertilizer has not been helpful under intensive agriculture because it is often associated with reduced crop yield, soil acidity and nutrient in balance. Soil degradation which is brought about by decreased organic matter accompanying continuous cropping becomes aggravated repeatedly. Agboola and Omueti (1982) reported that crop response to applied fertilizer depends on soil organic matter.The quantity of soil organic matter in the soil has been found to depend on the quantity of the organic material which can be introduced into the soil either by material returns through root stubble, root exudates or by artificial application in the form of organic manure. The use of poultry manure to improve crop production was necessitated by the declining soil fertility, as a result of increased frequency of cultivation of the land as demand for food production. The nutrient requirement of crops depend upon soil texture, types of previous vegetation cover, soil moisture and cropping intensity (Denton and Swarup, 1990). Poultry manure contains 3.6% N, 13% H_2 O, 1.3% K_2 O and 3.5% P_2 O_5 (Stafan, 2003).

Dileep (2005) reported a significant increase in plant height and number of fruit per plant of chill on application of different organic manures. It seems more economical to apply a combination of organic and inorganic fertilizers for egusi" melon fertilization especially with the present high cost of inorganic fertilizer. Literature available showed that more studies are still required on the effect of different fertilizers on "egusi" melon.

The present study was aimed at evaluating the effect of different nutrient sources on the growth and yield of "egusi" melon in ultisol of Anambra, South east agro ecological Zone of Nigeria.

MATERIALS AND METHODS

Field experiments were conducted during the 2011 and 2012 cropping seasons at the teaching and research farm of the Agricultural Department, Nwafor Orizu College of Education Nsugbe, Anambra South east agro ecological Zone of Nigeria. The experimental site is located at latitude 06^0.52N and longitude 07^0.15E). The average annual rainfall varies from 1200 to 1500mm and has a bimodal distribution. The rainfall lasts between April and October with peak in July and September. The dominant soil of the experiment area is ultisol. A piece of land measuring 30m x 30m was measured out by using a measuring tape and cleared manually using a matchet. Soil samples were taken from the plots before the treatment was applied for laboratory analysis. The soil samples were air dried and passed through a 2mm sieve for laboratory studies and pot experiment. PH was determined by the glass electrode in a 1: 2 soil, water ratio.

Particle size analysis was determined by the hydrometer method of Bouyoucos, (1951), Organic matter by the chromic acid oxidation procedure of Walkley and Black (1934). Exchangeable bases by the neutral ammonium acetate saturation, Na and K in the extracts

were determined by the flame photometer while Ca and Mg were determined by the Atomic Absorption Spectrophotometer (AAS). Exchange acidity by the IMKCl extraction and 0.01M NaOH titration. Nitrogen in the samples was determined by the regular macro – Kjeldahl method as reported by page et al., (1982). Available P was extracted by 0.03 M NH_4F + 0.025m HCl, (Bray and Kutz, (1945). Phosphorus in the extracts was determined calorimetrically by the Ascorbic method of Murphy and Riley, (1962) as modified by Watanabe and Olsen, (1965) and reported by page et al., (1982).

The experimental plot was demarcated with a dimension of 8m x 17.5m which covered a total land area of $140m^2$ with 1.0m inter plot boundary. The plot was then tilled manually using a hoe. The plot was measured out into beds. A total of fifteen (15) beds were constructed with a dimension of 4m x 2m. A 0.5m border separated the beds that served as blocks and the experiment was laid out in a randomized Complete Block Design with five treatment applications replicated four times.The treatments include poultry manure at 4t ha^{-1}, Cow dung at 4t ha^{-1}, NPK 15 - 15 – 15 fertilizer at 200kg ha^{-1}, poultry manure at 2t ha^{-1} + NPK 15 - 15 – 15 fertilizer at 100kg ha^{-1}, and Cow dung at 2t ha^{-1} +NPK 15 – 15 – 15 at 100kg ha^{-1}. Nsukka Local variety was used. For the 2011 cropping season, planting was done on the 20th of July while planting was done on the 18th July for 2012 cropping season. Two seeds of the "egusi" melon plant were sown per hole at a spacing of 0.5m x 0.5m resulting into six (6) stands per row per plot at a seed rate of 72 seeds per plot and this was equivalent to 80, 000 stands per hectare.

Thinning and gap filling for the 2011 cropping season was done on the 19th August 2011 while for the 2012 cropping season, this practice was carried out on the 15th of August, 2012 bringing the population to 36 plants per plot. Adequate field maintenance was carried out to ensure that crops perform well. Weeding was done mechanically by hand pulling and manually by means of a small hoe. This exercise was carried out simultaneously with thinning and gap filling. The melon was sprayed with Attack (Lambdacy halothrin 2.5 EC) on the 18th of August 2011 and on the 14th of August 2012 for 2011 and 2012 respectively to control insect pests. Data were collected on Vine length, leaf area index, number of days to flowering, number of fruits and fresh fruits weight per hectare. The data collected were subjected to statistical analysis according to the procedure outlined by Steel and (1980) for a Randomized Complete Block Design, while mean separation was done using F – LSD at 5% level of probability as described by Obi (2002).

RESULTS AND DISCUSSION

Different nutrient sources significantly affected all the characters investigated. Complementary application of poultry manure at the rate of 2t ha^{-1} and NPK 15 -15-15 fertilizer (100kg ha^{-1}) significantly (p=0.05) increased the "egusi" melon fruit number plant $^{-1}$ (42.43) fresh fruit weight (9. 45t ha^{-1}) and other parameters investigated (Table 2). The complementary application of poultry manure and NPK fertilizer gave the highest values compared to the application of poultry manure, cow dung or N P K fertilizer alone, and the performance trend was poultry manure (2t ha^{-1}) and NPK 15 – 15- 15 fertilizer (100kg ha^{-1}) highest, followed by cow-dung (2t ha^{-1}) combined with NPK 15-15-15 (100kg ha^{-1}), Poultry manure (4t ha^{-1}) ,Cow dung (4t $ha^{-}1$). In respect of the fresh fruit weight, fruit number and days to flowering, poultry manure in combination with NPK fertilizer, and Cow-dung plus NPK fertilizer gave similar values statistically. In respect of the leaf area index, poultry manure in combination with NPK fertilizer and NPK 15-15-15 at 200kg $ha^{-}1$ gave similar values statistically. The results on Table 2 showed significant (p= 0.05) response of Vine length to different fertilizer applications, "egusi" melon plants were longer in those plants

that received poultry manure plus NPK fertilizer, and poultry manure alone. The height of plant is an important growth character directly linked with the productive potential of plant in terms of fodder, grains and fruit yield (Omotoso, 2007).

The results observed could be attributed to the fact that poultry manure in terms of mineralization is relatively fast when compared with cow-dung. Costa et al. (1991) also observed that addition of manure increases soil water holding capacity and this means that nutrient would be made available to crops where manure has been added to the soil. Fuchs et al. (1970) also reported that nutrients from mineral fertilizers enhance the establishment of crops while those from mineralization of organic manure promoted yield when both fertilizers were combined. The application of organic manure such as poultry manure which contains appreciable quantities of magnesium might have helped in chlorophyll synthesis which in turn increased the rate of photosynthesis. Increased fruit number and yield could also be attributed to improvement in physical and biological properties of soil. The results were in line with that of Titiloye (1982) who reported that organic waste or inorganic fertilizer alone could hardly be depended upon as the sole source of nutrient for short duration crops; Anburani and Manivannen (2002), Kang and Balasubramanian (1990) who reported that combination of organic and inorganic fertilizer influenced the leaf area index, flowering and crop yield of okra respectively.

CONCLUSION

The results of the study revealed that among the different nutrient sources evaluated, "egusi" melon responded best to the application of poultry manure at 2t ha^{-1} in combination with NPK 15-15-15 fertilizer (100kg ha^{-1}). The growth characters as well as the yield of "egusi" melon were significantly enhanced. Based on the results obtained from this study, farmers could be advised to use the above combination and rate for optimum growth and yield of "egusi" melon in ultisol of Anambra, South east agro ecological Zone of Nigeria.

Table 1: Some physico chemical properties of the soil at the experimental site

	2011	**2012**
PH	6.10	5.84
Organic matter (%)	1.21	1.34
N (%)	0.70	0.66
Soil Texture	Sandy Loam	Sandy Loam
Bray -1 P(mglkg)	6.40	6.50
K (Cmol /kg)	0.19	0.88
Ca (Cmol /kg)	0.93	0.86
Mg (Cmol /kg)	0.83	1.10
Na (Cmol /kg)	0.56	0.48
CEC (Cmol /kg)	2.62	3.06
Exchangeable acidity	4.51	5.25

Table 2: Effect of different nutrient sources on vine length, leaf area index number of days to flowering, number of fruit and fresh fruits weight (pooled data for two years)

Sources of Nutrient	Vine length (cm)	lead area Index	No of days flowering	No. of fruits per plants	Fresh fruit weight (t / ha)
Poultry manure at 4t ha^{-1}	32.06	6.54	51.12	29.37	5.40
Cow dung at 4t ha^{-1}	24.40	2.70	47.08	10.62	0.60
NPK 15-15-15 at 200kg ha^{-1}	31.59	8.52	49.82	15.62	2.92
Poultry manure at 2t ha^{-1} and NPK 15-15-15 at 100kg ha^{-1}	36.90	10.63	52.88	42.43	9.45
Cow dung at 2t ha-1 and NPK 15-15-15 at 100kg ha $^{-1}$	28.37	4.09	50.72	22.34	7.00
F . L S D (P-0.05)	3.55	2.22	4.69	20.22	4.86

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