International Research Journal of Plant Science (ISSN: 2141-5447) Vol. 2(11) pp. 328-331, November 2011
Available online http://www.interesjournals.org/IRJPS

Full length Research Paper

Effects of nitrogen and potassium fertilizers on the growth, seed yield and nutritional values of egusi melon (Citrullus lanatus (thumb) manf.) in Ogbomoso South west Nigeria

Olaniyi J. O* **and B. A. Tella**

Department of Agronomy, Ladoke Akintola University of Technology,
P M B 4000, Ogbomoso, Nigeria.

Accepted 20 September, 2011

Field trials were carried out at the Teaching and Research farm, Ladoke Akintola University of Technology, Ogbomoso ($8^o10'$N and 4^0 10'E) to determine the effects of N and K fertilizers and their combinations on growth, seed yield and quality of Egusi melon (Citrullus lanatus (thumb) manf.). The treatments involved two levels of Nitrogen (O, and 60kg.Nha^{-1}) and five levels of potassium; (0, 10, 20, 30 and 40kg.K_2Oha^{-1}) and their combinations. The ten treatments were assigned randomly into a factorial experiment and fitted into a randomized complete block design with three replicates. Data were collected on growth parameters, yield attributes and quality of melon seeds. Plant height, number of leaves, nutrient uptake, seed yield and quality were significantly increased with increasing rates of nitrogen and potassium. The highest performances were obtained at 60kgNha^{-1} and 30kg K_2Oha^{-1} rates, respectively. Significant interactions were detected between N and K in most of the measured parameters. The best seed yield and quality were recorded at 60kgNha^{-1} by 30kg K_2Oha^{-1} fertilizer combinations.

Keywords: Citrullus lanatus, nitrogen rate, potassium rate, seed yield, seed quality.

INTRODUCTION

Egusi melon belongs to the family Cucurbitaceae, which consists of cucumber, water melon and pumpkin. It is a relative of watermelon. Its seed type, bitter fleshy pulp as well as colour of the pulp differentiate it from water melon (Grubben, 1977; Adeniran, 1994). Egusi melon originated from the tropical and sub-tropical Africa and is a native of West Africa, where it was distributed and grown throughout the Mediterranean (Tindall, 1986; Sekoni, 1984)

Egusi melon is an important component of traditional cropping system in Nigeria .^It can be intercropped with such staple crops as cassava, maize and sorghum (Omidiji, 1977). Also, it can be used as weed control when planted with other crops like okra. It is at times grown as sole crop in large field, market garden near large urban centre or backyard crop in Nigeria (Ikeorgu *et al*., 1989). Egusi melon is popular in Nigeria for its edible seeds , which are used in preparation of local stew and snacks such as fried melon seed ball known as 'robo' in South West Nigeria. The melon seeds contains 38% protein and 30-50% of semi drying oil. The oil content is comparable to those of other oil plants. It has been found out that Egusi melon contains water, vitamins and fair amount of minerals like P K, Mg, Ca, Zn, and Fe (Omidiji, 1977).

Application of fertilizers appears to play an important role in the yield potential of melon. Compound fertilizer (NPK 15-15-15) has been reported to be responsible for the increased seed yield of Egusi melon (Anyim and Ayodele, 1983; Denton and Adeniran, 1990; Olaniyi, 2000). In order to increase its yield potential and improve the seed quality, right quantity of fertilizer need to be applied to the crops. This study was designed to determine the optimum N and K rates required for

*Corresponding Author E-mail: Olaniyikunle2005@yahoo.com

Table 1: Influence of N and K Fertilizers on the Growth Parameters and Dry Matter Yield of Egusi Melon

N and K Level (Kg/ha)	Vine Length (cm)	Number of Leaves	Dry Matters Yield (g)
0	39.1	46.9	15.0
60N	45.0	66.6	21.7
$10k_2O$	35.5	43.8	13.9
$20k_2O$	42.5	59.8	18.0
$30k_2O$	51.1	62.5	21.5
$40k_2O$	46.1	68.7	23.4
60N x $10K_2O$	40.4	50.3	13.0
60N x $20K_2O$	45.6	65.0	19.0
60N x $30K_2O$	46.9	66.0	24.6
60N x $40K_2O$	48.2	85.7	31.7
Cv(%)	9.4	5.1	6.0

maximum growth, seed yield and quality of egusi melon.

MATERIALS AND METHODS

Field trials were conducted during the early seasons of 2006 and 2007, on an Alfisol soil at the Teaching and Research Farm, Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Nigeria. Ogbomoso is located on longitude 4°10' and latitude 8°10'N in the Guinea Savanna Zone of south western Nigeria. Rainfall distribution is bimodal over eight or nine months of the year.

The experimental site was cleared and 10 beds of 1.2 x 1.2 m^2 each in sizes were prepared manually. The physico-chemical properties of the soil of the experimental site was determined (IITA, 1989). The soil contained 6.5 pH (H_2O), 0.09mg/kg organic carbon, 0.17mg/kg total N, 5.81mg/kg available P, 0.13c mol/kg exchangeable K, 0.15c mol/kg exchangeable Na, 7.56c mol/kg exchangeable Ca, 0.75c mol/kg exchangeable Mg, 0.06c mol/kg exchangeable acidity, 8.9c mol/kg ECEC, 82% sand, 7% silt, 11% clay and textural class is sandy loam. Black-edged seed 'bara' was used as test crop. There were two levels of N from urea, i.e., 0 and 60 $kg \cdot ha^{-1}$ combined with the five rate of potassium fertilizer to produce a 2 × 5 factorial experiment arranged in a randomized complete block design with three replications.

Melon seeds were sown at a spacing of 1 m between rows and plants within rows to give a population of 10,000 $plants \cdot ha^{-1}$ Three seeds were sown/hole, and thinned down to one plant/hole two weeks after sowing (WAS). A fertilizer containing P was applied at planting at the rate of 8.8 $kg \cdot ha^{-1}$ of P, and N and K were applied by side banding three weeks after sowing. Weeds were controlled by hoeing at 3 and 6 WAS.

Data were recorded from six plant/plot samples which were randomly chosen at 8 WAS stage. Vine length was determined by measuring the primary vine, counting numbers of leaves, and dry matter yield determined by drying the whole plant at 65°C for 48 hrs and weighed. Number of female flowers, number of fruits, weight of seed/fruit, seed yield per plant and hectare were used to determine yield.

The dried seed samples were ground with a Wiley mill, and passed through a 0.5mm sieve to asses the nutrient elements status in seeds. Total N, P, K, Ca, Mg, Fe and Fat contents were determined by the procedure as described by I.I.T.A (1982).

Data were subjected to ANOVA in SAS (SAS, 1989), and significant means separated using the least significant difference (LSD) at 0.05 probability level.

RESULTS

The mean vine length, number of leaves and dry mater yield were significantly influenced by the applied nitrogen and potassium fertilizers (Table 1). The growth parameters increased from 0kg up to 60 kg ha^{-1} of applied N rate. Likewise, the various growth parameters increased with increasing potassium levels up to $40kgK_2Oha^{-1}$, and a declined thereafter. The N and K interactions significantly improved number of leaves and dry mater yield of melon plants with the highest values obtained at 60kgN by $30kgK_2O$ $ha.^{-1}$

The mean number of female flowers, number of fruits and seed yields were significantly affected by the applied N and K fertilizers (Table 2). These yield and yield components increased from 0kg till $60kgha^{-1}$ of applied N rate. Similarly, the highest yield attributes were recorded at $30kgK_2O$ ha^{-1} and a declined thereafter. There were significant interactions between N and K in all the yield and yield components measured. The best values were obtained at 60kgN by $30kgK_2Oha^{-1}$ fertilizer combinations.

Most of the mineral nutrients and qualities of egusi melon seeds were significantly influenced by the sole application of N and K fertilizers rates (Table 3). Fat,

Table 2: Yield and Yield Components of Egusi Melon As Influenced By N and K Fertilizers Application

N and K Level (Kg/ha)	Number of female flowers	Number of fruits/plant	Weight of seed/fruit	Seed yield (kg/ha)	Total seed yield (ton/ha)
0	2.63	1.58	252	37.6	0.38
60N	3.61	1.85	473	65.8	0.66
$10k_2O$	2.08	1.32	306	46.9	0.47
$20k_2O$	3.17	2.03	332	53.3	0.53
$30k_2O$	6.50	1.82	575	80.5	0.80
$40k_2O$	2.17	1.80	381	51.9	0.52
60N x $10K_2O$	3.33	1.53	448	67.1	0.67
60N x $20K_2O$	3.67	1.87	488	80.0	0.80
60N x $30K_2O$	7.00	2.20	688	100.2	1.00
60N x $40K_2O$	1.67	1.77	395	46.7	0.47
Cv (%)	14.3	13.1	13.1	15.2	15.4

Table 3: Effect of N and K Fertilizers on the Quality and Mineral Nutrients Compositions of Egusi Melon

Level (kg/ha)	%Fat	%Protein	%N	%P	%K	%Ca	%Mg	ppmFe	ppmZn
0	43.75	25.40	4.16	0.08	0.39	0.05	0.34	60.39	54.57
60N	46.74	25.88	4.58	0.10	0.55	0.06	0.41	68.34	55.27
$10k_2O$	45.03	25.11	4.32	0.09	0.45	0.05	0.36	64.33	54.50
$20k_2O$	45.18	25.62	4.36	0.09	0.47	0.06	0.38	64.51	54.75
$30k_2O$	46.03	26.07	4.50	0.11	0.51	0.06	0.40	64.83	55.13
$40k_2O$	45.31	25.22	4.39	0.09	0.48	0.05	0.39	64.62	54.98
60N x $10K_2O$	46.52	25.70	4.56	0.10	0.54	0.05	0.39	68.51	55.00
60N x $20K_2O$	46.65	25.27	0.59	0.10	0.56	0.06	0.41	68.65	55.25
60N x $30K_2O$	48.05	25.82	4.65	0.11	0.58	0.06	0.43	68.80	55.62
60N x $40K_2O$	46.66	26.25	4.59	0.10	0.55	0.05	0.41	68.72	55.51
Cv (%)	1.0	0.9	13	13.3	2.9	7.2	3.7	0.2	0.9

protein, N, P, K, Ca, Mg and Fe contents increased with increasing K up to $30kgK_2Oha^{-1}$ and thereafter declined. Also, the quality attributes increased as the N rates increased with the highest contents recorded at $60kgNha^{-1}$ of fertilizer application. Although, the N and K interactions were not significant for most nutritional values, the best values were obtained at 60kgN by $30kgK_2Oha^{-1}$ fertilizer combinations.

DISCUSSION

The increased in growth parameters as applied N rate increases as been reported by other researchers (Anyim and Ayodele, 1983; Olaniyi *et al*., 2008). Nitrogen is an important plant nutrient which can be absorbed by plants primarily in the form of nitrate and NH_4^+, and an adequate supply is associated with vigorous vegetative growth and a deep colouration (Tisdale and Nelson, 1990). The optimum rate of $30kgK_2Oha^{-1}$ obtained for maximum growth, seed yield and nutritional values was less than 40 - $60kgK_2Oha^{-1}$ recommended by Ayodele and Olaniyan (1982). This might probably due to the differences in the agro ecological zones in which the studies were been carried out. The high contents of Protein, Fat, Iron and other nutrients obtained in melon seeds under this investigation with and without fertilizer applications were in agreement with the findings of Omidiji (1977) and Olaniyi (2006), who reported that Egusi melon contains water, vitamins and fair amount of minerals like P, K, Mg, Ca, Zn and Fe. N fertilizer improves the nutritional quality of sorghum grain by improving crude protein content (De Wit, 1994).The best performance was obtained from 60kgN by $30kgK_2Oha^{-1}$ fertilizer combination rate which confirmed the earlier work of other researchers (Denton and Adeniran, 1989; Olaniyi, 2000; 2006), who reported increased in crop performance with combined fertilizer applications.

CONCLUSION AND RECOMMENDATION

The vegetative growth, fruit production and seed yield appreciably influenced by the sole application of N and K

and their combinations. The growth, yield and nutritional values were more influenced by the increased rates of potassium application up to 30kgK_2Oha^{-1} and declined at 40kgK_2Oha^{-1}.The quality and chemical compositions of melon seeds showed that the melon seeds are very rich in protein, Fat, Iron and other nutrients investigated. The highest growth, seed yield and nutritional values were obtained at sole application of N and K at 60kgha^{-1} and 30kgha^{-1} respectively, whereas the best values were recorded at 60kgN by 30kgK_2Oha^{-1} fertilizer combinations. Therefore, the recommended rates for optimum growth, seed yield and nutritional values of Egusi melon for this ecological zone are at 60kgNha,$^{-1}$ 30kgK_2Oha^{-1} and at 60kgN by 30kgK_2Oha^{-1} combined fertilizer applications.

REFERENCES

Adeniran MO (1994) Preliminary characterization of accession of Egusi melon (*Citrulllus lanatus* (Thunb). Mansf.). M.Sc. Project Report, Department of Agronomy, University of Ibadan. pp.41

Anyim OA, Ayodele OJ (1983). Fertilizer requirement of *Egusi* melon. National Horticultural Research Institute. Annual Report, Pp. 25.

Ayodele JO, Olaniyan FO (1982). Egusi melon agronomy fertilizer studies. National Horticultural Research Institute Vegetable Programmes. Annual Report, Pp. 65 – 69.

Denton LA, Adeniran MO (1990). Geographical distribution and performance of the major seed types of *Egusi* melon (*Citrullus lanatus* Thunb. Mansf.) in Nigeria. J. Horticultural Sci. 1:11-13.

De Wit (1994). Resources use analysis a struggle for interdisciplinary in Freshcolo et al Edition, a future of the land mobilizing and integrating knowledge of land use options. Pp. 41-56.

Grubben GJH (1977). Tropical vegetables and their genetic resources. AGPE: IBPGE, 177/23, Pp. 40-43.

Ikeorgu JEG, Wahua TAT, Ezumah HC (1989). Productivity of Species incassava/maize/okro/egusi melon mixture complex in Nigeria. *Field Crop Res.* 21:1-7.

International Institute of Tropical Agriculture (IITA) (1982). Automated and semi-automated methods of soil and plant analysis manual, series No.7. IITA, Ibadan, Nigeria.

Olaniyi JO, Adelasoye KA, Jegede CO (2008). Influence of Nitrogen Fertilizer on the Growth, Yield and Quality of Grain Amaranth Varieties. World J. Agric. Sciences 4 (4): 506-513

Olaniyi JO (2006). Influence of nitrogen and phosphorus fertilizers on seed yield and quality of *Egusi melon* (*Citrullus lanatus* (Thunb) Mansf.) in Ogbomoso, southwestern Nigeria. Ph.D. Thesis, University of Ibadan, Ibadan. Pp. 57-155.

Olaniyi JO (2000). Growth, seed yield and nutrient composition of egusi melon cultivars as affected by NPK 15-15-15 fertilization. J. Agric. Biotechnol. and Environ. 2(½):12-16.

Omidiji MO (1977). Tropical Cucurbitaceous oil plants of Nigeria. Vegetables for the Hot Humid Tropics 11:37-39.

SAS (Statistic Analysis Systems) Institutions Inc. (1989). SAS User's Guide SAS Institute/STAT User's Guide, Version 6, 4th ed., Vol. 2 Cary, NC, USA.

Sekoni BW (1984). The morphology and cytogenesis of five varieties of *Citrullus lanatus i.e. serewe, bara, sugar baby, early yales and canady red. M.Sc. Project report, Department of Agricultura l Biology, U.I, Ibadan*, Nigeria. pp. 72

Tindall HD (1986). Commercial vegetable growing. Oxford University press, London. Pp. 239-241.

Tisdale SL, Nelson WL (1990). Soil fertility and effect of magnesium sources on the yield and. chemical composition of crops. Michigan . Bull press, Michigan, Ame. pp. 29-31.