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# Effects of Nitrogen Fertilizer Rates on the Growth of Two Cultivars of African Eggplant (*Solanum macrocarpon* L.) in Minna and Abuja, Nigeria

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**Abstract:- The effects of nitrogen rates at 0, 20, 40, 60, 80 and 100 kg ha-1 on vegetative growth of two African eggplant (*Solanum macrocarpon*) were conducted during the 2013 cropping season at the Federal University of Technology, Minna (90 31'N, 60 27'E; 232 m above sea level) and the National Agricultural Seeds Council (NASC), Technical headquarters, Sheda, Abuja (8°53' N, 7°03' E; 213 m above sea level), both in the Southern Guinea Savanna region of Nigeria. Seeds of the two cultivars (FUTMSm1 and FUTMSm2) were sown on nursery beds for five weeks before transplanting. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications, using a 2 × 6 factorial arrangement. Plant height, number of leaves per plant and stem girth were the parameters studied. Nitrogen application rates of 20 to 80 kg ha-1 significantly ($P < 0.05$) increased the values of all the growth parameters (plant height, stem girth and number of leaves/plant) from 6 to 14 weeks after transplanting (WAT) compared to the control. Application of 100 kg N ha-1 significantly reduced the values of all the growth parameters. FUTMSm1 plants were significantly taller, their stem girth was significantly thicker and they also had significantly greater number of leaves than those of FUTMSm2. Nitrogen by cultivar interaction effect on plant height was significant at 10 to 14 WAT ($p<0.05$). It was concluded that N rates of 60 to 80 kg Nha-1 significantly optimum growth for eggplant. FUTMSm1 cultivar of African eggplant was superior to FUTMSm2 because it was significantly ($P < 0.05$) better in respect of plant height, number of leaves and stem girth.**

***Keywords:-*** *Nitogen, African Eggplant, Growth, NASC, FUTMINNA.*

## I. INTRODUCTION

*Solanum macrocarpon* L. (African eggplant) belongs to the Family Solanaceae alongside with other cultivated species such as pepper, tomato and potato (Dupries and Deleener, 1989); and globally there about 1000 species of the genus Solanum. *Solanum macrocarpon* has an African ancestry. This species (*Solanum macrocarpon*) has been given different local names by various authors. It is known to be "Osun' or "Igbagba" (Denton and Olufolaji, 2000) and called 'Gboma' in West Africa (Bonsu et al., 2002). African eggplant, which is one of the constituents of the Nigerian foods and indigenous medicines is highly valued. African eggplant is a very important source of plant protein and minerals. Different accessions of this crop are being cultivated by farmers, and application of fertilizer has been established to be important in their cultivation (Olaniyan and Nwachukwu, 2003). Importance of different macro elements on the growth and yield at different physiological stage has been documented (Ojo and Olufolaji, 1999; Olaniyan and Nwachukwu, 2003), the authors stated that vegetative development requires nitrogen, phosphorous for stimulation of flowering and fruit formation; and potash is essential for seed setting. The extent of *Solanum macrocarpon* growth response to Nitrogen fertilizer application in Nigeria has not been well studied which however gives the reason for limited information on the agronomic recommendation for the crop. However, effects of Nitrogen (N) rates on the growth of African eggplant are well documented elsewhere (Pal et al., 2002; Sat and Saimbhi, 2003). Furthermore, studies have shown that N application rate varied across locations. Therefore, it is very germane to research on the optimum rate of N for African eggplant in the Southern guinea savannah region of the country.

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## II. MATERIALS AND METHOD

➢ *Experimental site and Layout*

Field experiments were conducted during the 2013 growing season. The study was located at Federal University of Technology, Minna (90 31'N, 0060 27'E; 232m above the sea level) and the National Agricultural Seeds Council (NASC), Technical headquarters, Sheda, Abuja (8°53' N, 007°03' E; 213m above the sea level), both in the Southern Guinea Savanna region of Nigeria. Two cultivars of African eggplant (*Solanum macrocarpon*), namely FUTMSm1 and FUTMSm2 were considered in this study. The seeds were sourced from the stock of Crop Production Department of the Federal University of Technology, Minna. Seeds of two cultivars were sown by broadcasting in well prepared nursery beds and were regularly watered. The seedlings from them were nursed for five weeks before transplanting.

The site at each location was cleared of all vegetation and was manually leveled and ridged 75 cm apart. The area was then marked into plots. Plants of the two cultivars (FUTMSm1 and FUTMSm2) were subjected to six nitrogen fertilizer levels: 0 kg N ha-1, 20 kg N ha-1, 40 kg N ha-1, 60 kg N ha-1, 80 kg N ha-1 and 100 kg N ha-1 (with urea as source). This gave a 2 x 6 factorial arrangement which was fitted into randomized complete block design (RCBD) with three replications. Each plot measuring 4 m x 2.25 m (9 m2) contained four ridges spaced 0.75 m apart. Seedlings were transplanted 50 cm apart on the ridges at one per stand (eight seedlings per row). This gave a population of 32 plants per plot which translated to 26,666 plants ha-1. The area of a replicate was 135.625 m2 (17.5 m x 7.75 m) in dimension while a gap of 1.0 m separated the adjacent replicates. The total experimental area was 441.88 m2 (25.25 m x 17.5 m).

Half dose of nitrogen fertilizer was applied at two split doses, at two and five weeks after transplanting (WAT) by banding method 15 cm away from the plant. P2O5 (with Single super phosphate as source) and K2O (with muriate of potash as source) were also applied to each plot at 20 kg and 40 kg ha-1 respectively at 2 WAT as a basal application. Hoe was used for weeding at 5 and 9 weeks after transplanting (twice). Insect pests were controlled by the use of the Best Action insectide (Cypermethrin 30g/L + Dimethoate 250g/L EC) at 1 litre per hectare.

➢ *Data Collection*

Plant height, number of leaves and stem girth were the growth parameters studied. Measurements of growth parameters were obtained as follows:

- *Plant height (cm):*

The height from the base to the growing tip of the shoot of five randomly selected plants was measured using a tape rule and recorded at two weeks interval after transplanting until harvesting time.

- *Number of leaves:*

This was obtained from five randomly tagged plants and recorded at two weeks interval after transplanting until harvesting time.

- *Stem girth (cm):*

This was measured by means of tape rule and recorded at two weeks interval after transplanting until harvesting time.

➢ *Data Analysis*

Data collected on the studied parameters were subjected to analysis of variance (ANOVA) using SAS statistical software package (SAS Institute, 2012. Cary, NC). Main and interaction effects were analysed using the Least Significant Difference (LSD) at 5 % level of probability and Duncan Multiple Range Test at 0.05 level of probability (Duncan, 1955).

## III. RESULTS AND DISCUSSION

The results of physicochemical analysis of the pre-planting and post-harvest soils used as shown in Table 1 indicate that the soil was Sandy-Loam and Sandy Clay-Loam in Abuja and Minna respectively. Total Nitrogen, phosphorus, potassium and organic carbon of the soil were low using the standard developed by Esu (1991). Data on effect of nitrogen rates on plant height in the two African eggplant cultivars at 4 - 14 WAT in 2013 in Abuja are presented in Table 2. Plant heights were significantly ($P < 0.05$; F – test) greater in FUTMSm1 than in the FUTMSm2 from 8 – 14 WAT. Plants to which N fertilizer was applied and those without N fertilizer were generally not significantly different in height for the first four weeks after transplanting. However, from 6 to 14 WAT, the height differences among plants supplied with 20 – 80 kg N ha-1 were mostly insignificant. These values generally resulted in significantly ($P < 0.05$; F – test) taller plants compared to 0 and 100 kg Nha-1.

The effect of the interaction between cultivar and nitrogen rate on plant height of two African eggplant cultivars at 10, 12 and 14 WAT in Abuja is shown in Table 3. Application of 0, 20 and 100 kg N ha-1 did not result in significant plant height difference between the two cultivars at 10 WAT whereas at 40, 60 and 80 kg N ha-1 nitrogen rates, FUTMSm1 produced significantly taller plants compared to FUTMSm2. At both 12 and 14 WAT, FUTMSm1 plants were significantly taller than FUTMSm2 plants at 20, 40, 60 and 80 kg N ha-1 but not at 0 and 100 kg N ha-1. Both cultivars recorded significant increases in plant height when 20 kg N ha-1 was applied compared to 0 kg N ha-1 at Abuja. Further increases in N rate up to 80 kg N ha-1 however did not result in significant increase in the height of FUTMSm2 plants whereas application of 60 kg N ha-1 still significantly increased plant height in FUTMSm1 compared to the value obtained at 20 kg Nha-1. Application of N at 100 kg N ha-1 resulted in significantly reduced plant height in both cultivars. Effect of cultivar and nitrogen rates on stem girth is presented in Table 4. FUTMSm1 and FUTMSm2 plants were similar in girth measurements at 4, 6 and 8 WAT. Significant differences (P < 0.05) were however recorded between the two cultivars from 10 – 14 WAT with the plants of FUTMSm1 cultivar having greater girth values. Stem girth increased with age in both cultivars. The application of nitrogen at 20 – 80 kg ha-1 resulted in the production of plants with significantly greater girth compared to plants of the control and 100 kg N-1 especially from 6 – 14 WAT. Increasing N application up to 100 kg N ha-1 resulted in significant smaller plant girth compared to the measurement recorded for lower N rates. Table 5 shows that the number of leaves produced by plants of the two cultivars grown at Abuja were similar at 4 and 6 WAT whereas plants of the FUTMSm1 cultivars produced significantly more leaves than FUTMSm2 plants at 8 – 14 WAT. Application of nitrogen fertilizer at the rate of 20 – 80 kg N ha-1 consistently and significantly increased the number of leaves per plant from 6 to 14 WAT. Plants that received no N and those to which 100 kg N ha-1 were applied had similar number of leaves all through the period of study. Cultivars by nitrogen interaction effects were non-significant at all growth stages.

Table 6 shows the plant height values as affected by cultivar type and nitrogen rates in 2013 at Minna. There were generally significant (p < 0.05; F - test) differences between the two cultivars at all ages. Table 6 also shows the influence of cultivars and nitrogen rates on Plant height in Minna. At 14 WAT, FUTMSm1 plants were only superior in height to those of FUTMSm2 when 60 and 100 kg N ha-1 were applied. Table 4.10 shows further that nitrogen fertilizer application has no effect significantly on plant height within the first four weeks after transplanting. However, as from 6 WAT plants from plots to which N was applied were significantly taller than those from 0 kg N ha-1. At 10, 12 and 14 WAT, the application of 60, 80 and 100 kg N ha-1 resulted in similar responses which were significantly greater at all other N levels. Mean values of the number of leaves of African eggplant as affected by cultivar and nitrogen rates and their interaction at Minna in are presented in Table 7 and 8, respectively. At 4 WAT, FUTMSm2 cultivar produced significantly more leaves than the FUTMSm1 cultivar whereas at 6 – 14 WAT, the number of leaves per plants of the two cultivars was similar. At 6 WAT plants of FUTMSm2 cultivar produced significantly more leaves than those of FUTMSm1 cultivar when 20 kg N ha-1 was applied. At 14 WAT FUTMSm1 cultivar produced significantly more leaves than FUTMSm2 cultivar when 40 kg N ha-1 was applied. Application of N fertilizer resulted in a general significant increase in leaf production compared to the control and there were no significant differences recorded in the number of leaves produced amongst all the rates of N application.

The variations recorded in the height, number of leaves and stem girth of plants of the two cultivars in the current study suggest the influence of genetic factors which has been documented in garden eggplant and other solanaceous vegetable crops (Sood et al., 2009; Tumbilen et al., 2011). The significant increase in plant growth in response to N fertilizer application in this study is in agreement with the report of the studies on eggplant carried out by Wange and Kale (2004) and Oloniruha (2009). Aminifard et al., (2010) applied N fertilizer rates of 0, 50, 100 and 150 kg to eggplant (*Solanum melongena*) and reported significant increase in plant height and leaf number at 50 kg/ha compared to the control. The differences among the 50, 100 and 150 kg N/ha were however non-significant. Suge et al., (2011) also reported increased plant growth in eggplant (*Solanum macrocarpon*) when NPK fertilizer rates increased from 0 to 150 kg/ha. However, the general non-significant increases in plant height, leaf number and stem girth beyond 20 kg of N ha-1 in the Abuja location and for leaf number and girth at Minna in this study suggests that supplementing the resident soil N status with this amount was adequate for obtaining optimum response of these traits for *Solanum macrocarpon*. Contrary to the above trend, application of N at 60, 80 and 100 kg/ha resulted in significantly taller plants compared to the values recorded at 0, 20 and 40 kg N/ha at 10-14 WAT in Minna. This shows a variation in the response of this trait to N at different locations. The importance of N as the growth supportive element in plant and microbes has been explicitly documented (Vitousek et al., 1997; Olsen et al., 2001; Galloway et al., 2003). Nitrogen is also the main constituent of all amino acids in proteins and lipids acting as structural com-pounds of the chloroplast (Basela and Mahadeen, 2008) and therefore the yield-limiting factor for plant growth (NajafvaandDirekvandi et al., 2008). Tisdale et al. (2003) stated that N deficiency causes stunted growth due to poor photosynthesis resulting in poor formation of chlorophyll and nucleic acid.

The decrease in plant height, number of leaves and stem girth with the application of N fertilizer beyond 80 kg N ha-1 in Abuja may be due to N toxicity which may have adverse effects on the vitality of plants. AVRDC (2004) report showed a reduction in the yield of *Solanum nigrum* when N was applied above 50 kg ha-1. Juma and Van Averbeke (2005) also reported that application of N in excess of 200 kg ha-1 resulted in yield decline (relative to the optimum) in muxe (*Solanum retroflexus*). The presence of excess N in the soil has been reported to be capable of resulting in reduced root growth (Bozorgi, 2012).

The significant interaction effect of cultivars and N rates on plant height as recorded at 10 to 14 WAT and only at 14 WAT at Abuja and Minna respectively and the effect on leaf number at Minna agrees with the findings of Boroujerdnia and Ansari (2007) in lettuce (*Lactuca sativa* L.) whose study also revealed that cultivar had a significant effect on growth characteristics. That interaction effect on plant height became significant in older plants suggests that plant age should be factored into soil fertility management strategies for different varieties of a crop to take care of the growth pattern differences.

The delay in attaining first flower bud opening, days to 50 % flowering and days to first fruit formation when 100 kg N ha-1 was applied agrees with the findings of Law-Ogbomo and Egharevba (2009) which showed that as the NPK fertilizer rates was increased from 0 kg NPK/ha to 400 kg NPK/ha on two tomato cultivars, days to reaching 50%

flowering were increased; the earliest bud break were recorded at 75 kg NPK/ha. Increase in N application up to 160 kg ha-1 has also been reported to cause delay in the maturity of Canola up to 176 days (Gulzar et al., 2006). Akanbi et al., (2010) also reported that such delay is known to cause an extension of crop vegetative growth at the expense of reproductive phase under luxury consumption of the available soil nutrients.

The higher mortality rate of seedlings to which N was applied especially at the Abuja location agrees with the result obtained for *Solanum retroflexus* by Juma (2006).

The significant increase in the number of productive branches and the number of flowers formed/plant due to application of nitrogen fertilizer in this study agrees with the findings of Aminifard et al., (2010) who evaluated the effect of different N rates on growth and yield of eggplant and recorded the greatest flower number at N application of 100 kg ha-1 and number of lateral branches at 50 kg ha-1 while the least numbers were recorded in the control. Omotoso and Shittu (2007) also reported that okra plants that were fertilized produced more fruiting branches with 300 kg ha-1 of NPK 15:15:15 than those that received lower rates of application (0 and 150 kg NPK ha-1) due to higher nitrogen content which induced higher number of fruiting branches.

| Soil Properties | Pre - planting soil test analysis | | Post -planting soil test analysis | |
|---|---|---|---|---|
| | Abuja | Minna | Abuja | Minna |
| **Particle size distribution (gkg$^{-1}$)** | | | | |
| Sand | 820 | 700 | 760 | 740 |
| Silt | 150 | 70 | 80 | 120 |
| Clay | 30 | 230 | 160 | 140 |
| Soil textural class | SL | SCL | SL | SCL |
| Soil pH ($H_2O$ 1:1) | 6.8 | 7 | 6.3 | 6 |
| Soil pH (0.01 M $CaCl_2$) | 5 | 5.2 | 5.4 | 5.3 |
| Organic Carbon (g/kg) | 30 | 38 | 48 | 40 |
| Avail. P (mg/kg) | 5.29 | 5.8 | 8.5 | 7.2 |
| Total Nitrogen (g/kg) | 0.36 | 0.33 | 0.46 | 0.43 |
| **Exchangeable bases (Cmolkg$^{-1}$)** | | | | |
| $Ca^{2+}$ | 1.56 | 1.45 | 1.76 | 2.01 |
| $Mg^{2+}$ | 0.88 | 0.74 | 1.44 | 1.84 |
| $K^+$ | 0.17 | 0.23 | 0.26 | 0.38 |
| $Na^+$ | 0.09 | 0.16 | 0.17 | 0.21 |
| Exchangeable acidity (**Cmol kg$^{-1}$**) $Al^{3+} + H^+$ | 0.07 | 0.06 | 0.02 | 0.03 |

Table 1:- Physicochemical characteristics of soils of experimental sites at a depth of 0 – 15 cm at pre- and post-planting stages at Abuja and Minna in 2013 raining season
SL = Sandy loam, SCL=Sandy clay loam, Avail. P= Available phosphorous

| Treatment | Plant height (cm) | | | | | |
|---|---|---|---|---|---|---|
| | 4 WAT | 6WAT | 8 WAT | 10 WAT | 12 WAT | 14 WAT |
| Cultivar (C) | | | | | | |
| FUTMSm1 | 7.85 | 22.95 | 56.54 | 71.19 | 75.02 | 83.27 |
| FUTMSm2 | 7.26 | 20.41 | 50.92 | 56.94 | 58.95 | 65.22 |
| Lsd (0.05) sig. level | NS | NS | * | * | * | * |
| Nitrogen rates (N) (Kgha$^{-1}$) | | | | | | |
| 0 | 7.30a-c | 17.57b | 35.38b | 41.77c | 43.45c | 53.59c |
| 20 | 8.20ab | 25.92a | 57.93a | 68.47b | 72.72a | 77.88a |
| 40 | 7.09bc | 23.10a | 58.12a | 71.66ab | 76.04a | 80.32a |
| 60 | 7.40a-c | 21.38ab | 64.91a | 76.08ab | 79.12a | 84.33a |
| 80 | 8.47a | 25.43a | 62.82a | 76.68a | 77.70a | 84.54a |
| 100 | 8.20ab | 16.70b | 43.22b | 49.72c | 52.92b | 64.81b |
| SE± | 0.45 | 1.76 | 2.77 | 2.79 | 2.74 | 2.69 |
| Interaction | | | | | | |
| C x N | NS | NS | NS | * | * | ** |

Table 2:- Effect of cultivar and nitrogen rates on plant height of African eggplant (Solanum macrocarpon) in 2013 at Abuja at 4 – 14 WAT

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N means with the same letter(s) within the same column are not significantly different at P<0.05 according to Duncan Multiple Range Test (DMRT).
NS = Not significant.
* = Significant a P<0.05 level of probability.
** = Significant a P<0.01 level of probability.
WAT = Weeks after transplanting.

| Cultivar | Nitrogen rates (kg/ha) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 20 | 40 | 60 | 80 | 100 |
| | 10 WAT | | | | | |
| FUTMSm1 | 44.62ef | 73.57bc | 80.59ab | 87.61a | 89.29a | 51.43de |
| FUTMSm2 | 38.91f | 63.37c | 62.72cd | 64.54c | 64.07c | 48.01ef |
| SE± | 3.93 | | | | | |
| | 12 WAT | | | | | |
| FUTMSm1 | 46.01fg | 78.6b | 87.07ab | 91.37a | 92.53a | 54.57d-f |
| FUTMSm2 | 40.89g | 66.83c | 65.01cd | 66.87c | 62.87c-e | 51.27e-g |
| SE± | 3.87 | | | | | |
| | 14 WAT | | | | | |
| FUTMSm1 | 56.74de | 86.7b | 92.9ab | 98.83a | 98.77a | 65.69cd |
| FUTMSm2 | 50.43e | 69.07c | 67.73cd | 69.83c | 70.31c | 63.93cd |
| SE± | 3.8 | | | | | |

Table 3: -Interaction effect of cultivar and nitrogen rates on plant height of African eggplant at Abuja at 10, 12 and 14 WAT.

WAT = Weeks after transplanting.
Means within column with the same letter(s) with the same age at transplanting are not significantly different at P<0.05 according to Duncan Multiple Range Test (DMRT).

| Treatment | Stem girth (cm) | | | | | |
|---|---|---|---|---|---|---|
| | 4 WAT | 6WAT | 8 WAT | 10 WAT | 12 WAT | 14 WAT |
| Cultivar (C) | | | | | | |
| FUTMSm1 | 2.90 | 3.52 | 5.53 | 6.14 | 6.25 | 6.49 |
| FUTMSm2 | 2.80 | 3.36 | 5.23 | 5.55 | 5.63 | 5.78 |
| Lsd (0.05) sig. level | NS | NS | NS | * | | |
| Nitrogen rates (N) (Kgha$^{-1}$) | | | | | | |
| 0 | 2.79a | 3.17bc | 4.11b | 4.39c | 4.43c | 4.92b |
| 20 | 3.08a | 3.69a | 5.74a | 6.24b | 6.39a | 6.54a |
| 40 | 2.87a | 3.52ab | 5.93a | 6.40ab | 6.54a | 6.62a |
| 60 | 2.80a | 3.53ab | 6.14a | 6.79a | 6.83a | 6.88a |
| 80 | 3.01a | 3.73a | 5.69a | 6.37ab | 6.41a | 6.56a |
| 100 | 2.58a | 3.01c | 4.65b | 4.88c | 5.05b | 5.29b |
| SE± | 0.19 | 0.15 | 0.2 | 0.18 | 2.38 | 0.16 |
| Interaction | | | | | | |
| C x N | NS | NS | NS | NS | NS | NS |

Table 4: - Effect of cultivar and nitrogen rates on stem girth of African eggplant (Solanum macrocarpon) in 2013 at Abuja at 4 – 14 WAT

N means with the same letter(s) within the same column are not significantly different at P<0.05 according to Duncan Multiple Range Test (DMRT).
NS = Not significant.
WAT = Weeks after transplanting.

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| Treatment | Number of leaves per plant (no) | | | | | |
|---|---|---|---|---|---|---|
| | 4 WAT | 6WAT | 8 WAT | 10 WAT | 12 WAT | 14 WAT |
| Cultivar (C) | | | | | | |
| FUTMSm1 | 5.31 | 21.40 | 43.32 | 50.71 | 54.65 | 59.88 |
| FUTMSm2 | 5.51 | 21.61 | 39.10 | 43.42 | 47.73 | 51.74 |
| Lsd (0.05) sig. level | NS | NS | * | * | * | * |
| Nitrogen rates (N) (Kgha$^{-1}$) | | | | | | |
| 0 | 5.13ab | 18.18bc | 29.90b | 37.17b | 40.27b | 47.73b |
| 20 | 5.90a | 24.80a | 45.57a | 52.93a | 55.95a | 59.79a |
| 40 | 5.08ab | 22.30ab | 45.85a | 52.48a | 56.97a | 60.72a |
| 60 | 4.87b | 22.27ab | 46.58a | 52.05a | 57.12a | 61.52a |
| 80 | 5.65ab | 25.07a | 48.88a | 53.73a | 58.73a | 62.23a |
| 100 | 4.77b | 16.40c | 30.50b | 34.03b | 38.53b | 42.87b |
| SE± | 0.33 | 1.54 | 2.38 | 2.53 | 2.35 | 2.34 |
| Interaction | | | | | | |
| C x N | NS | NS | NS | NS | NS | NS |

Table 5:- Effect of cultivar and nitrogen rates on number of leaves of African eggplant (Solanum macrocarpon) in 2013 at Abuja at 4 – 14 WAT

N means with the same letter(s) within the same column are not significantly different at P<0.05 according to Duncan Multiple Range Test (DMRT).
NS = Not significant.
* = Significant a P<0.05 level of probability.
WAT = Weeks after transplanting.

| Treatment | Plant height (cm) | | | | | |
|---|---|---|---|---|---|---|
| | 4 WAT | 6WAT | 8 WAT | 10 WAT | 12 WAT | 14 WAT |
| Cultivar(C) | | | | | | |
| FUTMSm1 | 13.69 | 23.52 | 42.55 | 63.42 | 71.99 | 75.46 |
| FUTMSm2 | 8.57 | 18.79 | 38.13 | 49.80 | 60.03 | 65.12 |
| Lsd (0.05) sig. level | * | * | NS | * | * | * |
| Nitrogen rates (N) (Kgha$^{-1}$) | | | | | | |
| 0 | 10.58a | 15.10d | 34.37b | 45.26c | 52.43c | 55.20c |
| 20 | 10.39a | 20.25c | 41.48b | 54.48b | 63.14b | 66.84b |
| 40 | 11.18a | 24.13a | 38.32ab | 53.53b | 63.76b | 67.54b |
| 60 | 12.65a | 21.35bc | 43.02a | 61.32a | 71.44a | 75.88a |
| 80 | 10.12a | 23.86ab | 45.11a | 62.53a | 75.03a | 80.20a |
| 100 | 11.86a | 22.24a-c | 39.74ab | 62.54a | 70.29a | 76.08a |
| SE± | 1.02 | 0.87 | 2.76 | 2.33 | 2.16 | 2.00 |
| Interaction | | | | | | |
| C x N | NS | NS | NS | NS | NS | * |

Table 6:- Effect of cultivar and nitrogen rates on plant height of African eggplant (Solanum macrocarpon) in 2013 at Minna at 4 – 14 WAT

N means with the same letter(s) within the same column are not significantly different at P<0.05 according to Duncan Multiple Range Test (DMRT).
NS = Not significant.
* = Significant a P<0.05 level of probability.
WAT = Weeks after transplanting.

| Cultivars | Nitrogen rates (kg/ha) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 20 | 40 | 60 | 80 | 100 |
| 6 WAT | | | | | | |
| FUTMSm1 | 14.00d | 16.93cd | 21.27ab | 21.13ab | 22.73ab | 18.87bc |
| FUTMSm2 | 14.00d | 24.20a | 20.33a-c | 21.60ab | 20.53a-c | 20.47a-c |
| SE± | 1.35 | | | | | |
| 14 WAT | | | | | | |
| FUTMSm1 | 45.73c | 67.87ab | 73.87a | 68.73ab | 67.87ab | 63.84ab |
| FUTMSm2 | 57.60bc | 65.93ab | 59.67b | 65.33ab | 72.87a | 76.00a |
| SE± | 4.14 | | | | | |

Table 7:- Interaction between cultivars and nitrogen rates on number of leaves of African eggplant at 6 WAT and14 WAT in Minna

WAT = Weeks after transplanting.
Means with the same letter(s) are not significantly different at P<0.05 according to Duncan Multiple Range Test (DMRT).

## IV. CONCLUSION

It is concluded from this study that N rates of 60 to 80 kg Nha$^{-1}$ significantly optimum growth for eggplant. FUTMSm1 cultivar of African eggplant was superior to FUTMSm2 because it was significantly ($P < 0.05$) better in respect of plant height, number of leaves and stem girth.

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