

**GROWTH AND YIELD POTENTIALS OF THREE OKRA (*ABELMOSCHUS*
ESSCULENTUS(L.) MEONCH) VARIETIES AT MAKURDI, NIGERIA**

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ABSTRACT

A field experiment was conducted from August to October in year 2015 cropping season at the Research farm, University of Agriculture Makurdi, Nigeria to evaluate the yield performance of three Okra varieties. The treatment consisted of three varieties (NH₄₇₋₄), Clemson spineless and the commonly grown local "Atuur a Nyiom"), replicated three times in a randomized complete block design. Result of study showed that variety 'NH₄₇₋₄' gave the highest pod yield of 5.4 /hasignificantly ($P \leq 0.05$) higher by 14.8% and 40.7% respectively, as compared to that obtained from 'Clemson Spineless' and 'Atuur a nyiom' the implication of study showed that variety NH₄₇₋₄ is a potential replacement to the popularly grown variety 'Atuur a nyiom' at Makurdi Nigeria.

Keywords: Growth, Yield potentials, Okra, vegetable

INTRODUCTION

Okra (*Abelmoschus esculentus*(L) Meonch) is a member of the Malveceae family and one of the most important vegetable grown in Nigeria (Ali, 1999). It is an annual crop grown mainly as fruits and leafy vegetable in both green and dried state in the tropics (Gibbon and Pain, 1984). Okra was domesticated in West and Central Africa, but is now widely cultivated throughout the tropics, primarily for local consumption (Usman, 2001). It is a semi woody fibrous herbaceous annual plant, with an indeterminate growth habit (Usman, 2001).

Okra is an important vegetable in terms of consumption and production area (Iremiren and Okiy, 1986). It ranks third in production area following tomato and onion (Grubben, 1999). In Nigeria, it is produced predominantly by peasant farmers, usually in home gardens or in mixture with other cereal crops (Lombin *et al.*, 1988). It is popularly grown by farmers both for consumption and income purpose.

Okra is also grown for its young leaves and pods. The immature pods are consumed as boiled vegetables and the dried pods are also used as soup thickeners or in stew (Yadev and Dhanker, 2002). It is also of great economic importance because of its nutritional value. The green fruits or pods contain some essential vitamins (Vitamin C) and mineral salt such as calcium, magnesium, potassium and iron including water at varying proportion (Ali, 1999). More importantly, okra is also valuable with regards to anti-carcinogenicity, human immunity promotion, ageing prevention and health care and traditionally the fresh fruits and leaves are boiled and eaten to cure cough and throat infection (Ibeawuchi, 2007). The stem is useful as fibre, while the leaves are considered

good cattle feed (Adetula and Denton, 2003). The seeds however, can be roasted and used as substitute for coffee (Farinde and Owalarefe, 2007). The mature fruit and stems contain crude fibre, which is used in the paper industry. Okra variety “Atuur a Nyiom” is commonly grown among Makurdi farmers with an average yield of 3.1tha^{-1} (Iremiren and Okiy, 1986). This yield is considered low when compared to that of other varieties grown elsewhere (Ali, 1999).

This study was therefore carried out to evaluate the growth and yield performance of two okra varieties against the commonly grown local variety (Atuur a nyiom), with the objective of identifying a variety with a higher yield that could replace the low yielding local variety.

MATERIALS AND METHODS

The experiment was conducted from August to October in year 2015 planting season, at the Research Farm of the University of Agriculture Makurdi, Nigeria to evaluate the growth and yield performance of okra varieties “Clemson Spineless” and NH47 – 4” alongside the popular local variety “Atuur a nyiom”. The seeds of varieties (Clemson Spineless and NH47 – 4) were obtained from the National Institute of Horticultural Research, Ibadan. The two varieties show good adaptation to the agro ecological environment (Usman, 2001). The seed of the local variety (Atuur a Nyiom) was obtained from the farmers in Makurdi. The experimented areas were 100 m^2 and consist of sandy loam soil. The land was cleared, ploughed, harrowed, ridged and divided into 9 plots. Each plot had an area of 9m^2 . Each plot consisted of four ridges, while seeds were sown at the spacing of $1\text{m} \times 30\text{cm}$. The treatments were the three okra varieties (Clemson Spineless, NH47 – 7 and Atuur a Nyiom). The treatments were arranged in a randomized complete block design (RCBD) and replicated three times.

Okra seeds were sowed in a hole to a depth of 2cm, on top of the ridges. Two seeds were sowed per hole and later thinned to one plant at 2 weeks after planting (WAP). The plots were manually weeded as the need arose. Mixed fertilizer (15:15:15) at the rate of 100kg/ha was applied as described by Ekpete (2000), using the side placement method of fertilizer application. The fertilizer was applied as a split application to the trial at 3 and 6 WAP. Harvesting was done in late October when the tip of pod was observed to break easily when pressed with the fingertip (Usman; 2001). Data taken include days to attain 50 % flowering, plant height (cm) at 50% flowering, number of branches per plant, number of leaves per plant, leaf area (cm^2) at 50% flowering, pod length (cm), pod diameter (cm), number of pods per plant, pod weight(g) and yield (tha^{-1}). The data were subjected to Analysis of variance (ANOVA), while the Least Significant Difference (LSD) was used to separate treatment means, following the procedure of Steel and Torrie (1980).

RESULTS

Meteorological Information for Makurdi (August – October) in Year 2015

The meteorological information for Makurdi during the months of August to October in year 2015 is shown in Table 1. Rainfall occurred from the month of August to

October in year 2015. The month of September recorded the highest amount of rainfall (235.6cm) and highest number of rain days. The average monthly temperature ranged from 22.3⁰C to 31.6⁰C, while the average relative humidity ranged from 80.3% to 85.2%. The average solar radiation was about 6.0 hours.

Physio-Chemical Properties of Soil of the Experimental Site in Year 2015.

The physio-chemical properties of soil of the experimental site in year 2015 are presented in Table 2. Total Nitrogen value in the soil (0.09%) was low. The soil had a low level of phosphorus (4.4ppm) with a low level of potassium (0.26%). The percentage (%) sand, % silt and % clay respectively, gave values of 76.4%, 9.4% and 14.2%. The pH in water was slightly acidic. The textural class of soil was sandy-loam.

Growth and Yield Components of Three Okra Varieties at Makurdi, Nigeria in Year 2015

The growth and yield components of three okra varieties at Makurdi, Nigeria in year 2015 are presented in Table 3. The popularly grown local okra variety 'Atuur a nyiom' took significantly ($P \leq 0.05$) more days to attain 50% flowering (76.3 days), while okra varieties 'NH47 – 4' and 'Clemson spineless' took earlier days to attain 50% flowering. Although the commonly grown local variety 'Atuur a nyiom' produced the tallest height (45.2cm), significantly ($P \leq 0.05$) taller than that recorded for the other varieties. The number of branches produced from 'NH47 – 4' was significantly ($P \leq 0.05$) higher than that obtained from 'Clemson spineless', however, number of branches produced from 'NH47 – 4' and that produced from the popularly grown local variety was significantly ($P \leq 0.05$) different. Although the number of leaves produced were not significantly ($P \leq 0.05$) affected by the okra varieties tested, however, the largest leaf area (465.4cm²), longest pod length (9.3cm) and widest pod diameter (9.1cm) were obtained from 'NH47 – 4'. Okra variety 'NH47 – 4' also gave the highest number of pods per plant and pod weight (35.1g), significantly ($P \leq 0.05$) higher than the other varieties. Okra variety 'NH47 -4' gave the highest pod yield of 5.4tha⁻¹. The yield produced from 'NH47-4' was significantly ($P \leq 0.05$) higher by 14.8% and 40.7% respectively, as compared to that obtained from 'Clemson Spineless' and that produced from the popularly grown local 'Atuur a nyiom'.

DISCUSSION

The difference in the number of days taken to attain 50% flowering by the okra varieties could be attributed to varietal response, since varieties differ in the length of time they may remain at the vegetative stage before flowering. This view agreed with Ijoyah *et al.*, (2008) who reported that difference in the length of time taken by varieties to attain 50% flowering could be linked to variability in varietal response. The significant difference in height across the okra varieties might be due to variation in genetic composition of the varieties in addition to their response to the prevailing environmental conditions. Variety 'Atuur a nyiom' could have been more tolerant to the prolonged high temperatures recorded, which might have the taller height.

Highest number of pods obtained from 'NH47 – 4' could be linked to the highest number of branches produced by the variety. Ali (1999) reported that increase in branching could be a major cause in the increase in number of pods. Similarly, the highest number of pods produced from 'NH47-4' could be attributed to the heaviest pod weight. Okra variety 'NH47-4' could have demonstrated a high capability to tolerate soil with low organic matter, thus producing the highest yield as compared to other varieties that might have proved sensitive to soil fertility. This view agreed with Ijoyah and Koutatouka (2008) who reported that muskmelon variety 'Joker F₁,' produced the highest yield on Seychelles soil with low organic matter. From the result obtained, it can be concluded that the highest pod yield was obtained from variety 'NH47 – 4. Therefore okra variety 'NH47-4 has potential of replacement for the low yielding commonly grown variety 'Atuur a nyom'. Based on the study, for maximum yield of okra in Makurdi, variety 'NH47 – 4' is therefore recommended.

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Journal of Agriculture and Social Research (JASR) Vol. 15, No. 2, 2015

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Table 1: Metrological Information for Makurdi, Nigeria (August to October) in Year 2015

Month	Average monthly rainfall (mm)	Number of rain days	Average monthly temperature (⁰ C)		Average relative humidity (%)	Average solar radiation (hrs.)
			Min.	Max.		
August	232.1	16	24.4	30.2	80.3	6.0
September	235.6	18	22.3	31.6	84.3	5.6
October	101.2	10	22.4	31.4	85.2	5.8

Source: Air Force Base, Makurdi Meteorological Station

Table 2: Physico-Chemical Properties of the Soil of Experimental Site Before Planting in Year 2015

Parameters	Quantity in Soil
Organic matter (%)	1.62
Nitrogen (%)	0.09
P ₂ O ₅ (ppm)	4.4
K(Cmol kg ⁻¹ of soil)	0.26
Sand (%)	76.4
Clay (%)	14.2
Silt (%)	9.4
pH (H ₂ O)	6.3
pH (CaCl ₂)	4.6
Textural class	Sandy-loam

Source: Soil Science Laboratory, University of Agriculture, Makurdi, Nigeria
 PPM: Parts per million

Table 3: Growth and Yield Components of Three Okra Varieties at Makurdi, Nigeria in Year 2015

Varieties of okra	Days to attain 50% flowering	Plant height (cm) at 50% flowering	Number of branches per plant	Number of leaves per plant	Leaf area (cm ²) at 50% flowering	Pod length (cm)	Pod diameter (cm)	Number of pods per plant	Pod weight (g)	Yield (t ha ⁻¹)
NH47-4	59.2	42.9	4.8	10.3	465.4	9.3	9.1	6.3	35.1	5.4
Clemons	54.4	42.5	3.2	9.8	313.3	8.2	8.0	5.2	29.2	4.6
Atuur	76.3	45.2	4.7	10.2	225.5	7.1	6.4	3.4	22.4	3.2
nyiom (local)										
LSD (P≤0.05)	3.7	1.3	1.4	Ns	10.2	0.8	0.5	0.6	4.7	0.6

NS: Not significant

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