Performance Of Three Varieties Of Okra (Abelmoschus esculentus (L.) Moench) In Mubi North Local Government Area, Adamawa State Nigeria.

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Abstract: The performance of three Okra (Abelmoschus esculentus (L.) Moench) varieties were evaluated at Wuro Baraka river site Mubi Adamawa State, Nigeria under irrigation during 2010 dry season. The treatments consisted of three Okra varieties viz: V1 (Improved), V2 (Serial) and V3 (Local) laid out in a randomized complete block design and replicated three times. The land was cleared, ploughed, harrowed, leveled and marked into blocks and plots with 1m between replication and 0.5m between plots. Okra seeds were sown by dibbling 3 seeds per hole at 50cm spacing. The seedlings were later thinned to two plants per stand two weeks after emergence. Phosphorus fertilizer was applied in split doses at the rate of 45kg P2O5 ha-1 as single super phosphate. Nitrogen was also applied 2-4 weeks after emergence as urea. The plots were irrigated on weekly basis. The results obtained were subjected to analysis of variance and means separated using Duncan's Multiple Range Test. The parameters measured includes: vegetative parameters (plant height cm) at 2, 4, and 12 weeks and the number of branches per plant and fruit parameters: (number of fruits at 1st, 2nd and 3rd harvest, fruit length (cm) at harvest, Days to 50% flowering, harvested fruit weight (g) and yield tons/ha. Significant ($p<0.05$) differences were observed for all the parameters measured. V1 (Improved) recorded the highest fresh fruit yield of 10.7 tons/ha compared to V3 (Local) that recorded the lowest fresh fruit yield of 4.9 tons/ha. V1 (Improved Okra) is therefore the most appropriate for Mubi North.
[Kaki Ngodi Futuless, Onoja Batholomew and Ibrahim Dauda Bake. **Performance Of Three Varieties Of Okra (Abelmoschus esculentus (L.) Moench) In Mubi North Local Government Area, Adamawa State Nigeria.** *Rep Opinion* 2014;6(11):59-62]. (ISSN: 1553-9873). http://www.sciencepub.net/report. 9

KeyWords:,Yield,Okra,Varieties,,Performance,Stability

1. Introduction

Okra is a vegetable crop that belongs to the genus Abelmoschus, family Malvaceae and has two main species: Abelmoschus esculentus (L.) Moench and Abelmoschus caillei (A. Chev.) stevels (Siemonsma, 1982). It originated probably from East Africa and today is widely distributed in the tropics, subtropics and warmer portions of temperate region (ECHO, 2003). Okra is widely cultivated and can be found in almost every market allover Africa (Schippers, 2000). Okra contains carbohydrate, protein, and vitamin C in large quantities (Adeboye and Oputa, 1996) others are iron, magnesium and phosphorus. It also contains essential and non essential amino acid which is comparable to that of soybean. It is grown mainly for it leaves and young pods which are frequently eaten green vegetable. The young immature fruits are the important fresh fruit-vegetable consume in different forms which can also be sliced, dehydrated and preserved as dry okra for later use.

Worldwide production of Okra as fruit vegetable was estimated at 6 million tons per year. In West Africa it was estimated at 500,000 to 600,000 tons per year (Burkil, 1997). Okra production is very low in many developing countries. Raemacker (2001) observed that Africa, there is great diversification of Okra is the most important production regions in Ghana, Burkina Faso and Nigeria which has rapidly increased in recent years. The seasonal supply of this vegetable to a large extent determines how much of it is being consumed by the majority of the people. In Nigeria, there are two distinct seasons for Okra production, the raining season and the dry season. In the areas where Okra is cultivated, two main varieties are known viz: the dwarf early fruiting ones and the tall type (Schippers, 2000). Okra requires a temperature range of 25-35^{o}c with relative humidity and a well drained sandy loam soil with a P^{H} of 6-6.8 (Massean, 1992). Schippers (2000) reported that, to obtain high fruit yield, farmers will need to pick fruit regularly, since plant will direct its energy toward seed production at the expense of new growth. Overcrowding of seedlings or plant in a particular area or spot may lead to competition among the plants for essential growth resources like sunlight, space, water and nutrients; which may affect plant performance and yield (Anon, 1989). Most soils in the tropics have low plant nutrients which are necessary for plant growth and high yield. Despite the importance of Okra in Mubi North, no much work has been done on varietal influence on yield and yield determining factors. This study was therefore conducted with the objective of determining the most appropriate variety of okra for adoption by farmers in the study area.

2. Materials and Methods

The experiment was conducted during the 2010 dry season at Wuro Barka river site at Mubi Adamawa State. Mubi is located in the Northern part of the old Sardauna province which now forms part of Adamawa North Senatorial district (INEC, 1996). The area falls under the Sudan savanna belt of Nigerian's vegetation zone with a population of 151,072 (FRIN, 2007). Mubi North is located at latitude 90^{o} and 30^{0} 11^{1} north of the equator and longitude 13^{o} and 13^{o} 45^{1} East of Greenwich meridian. It is bounded in the North by Borno State, in the West by Hong and Song local government areas in the South by Mubi south local government area and in the East by the Republic of Cameroon.

The area is characterized by woody plants, grasses, aquatic weeds and river valley and dry land weeds inter spaced by shrubs. The vegetation is influenced by relief pattern and climate. It further consists of game reserve, forest and plantation. The soil in Mubi north falls under the ferruginous tropical soil of Nigeria (FAO, 19880). It is characterized by underlain rock, sloppy in nature and ranges from yellow, red to brown in color, coarse in nature with almost undefined profile. Mubi north is characterized by wet and dry tropical climate. Temperature is normally warm to hot throughout the season. Minimum temperature can be as low as 12^{o}c and as high as 37^{o}c (Adebayo, 1997).

Experimental design consist of three Okra varieties viz: local dwarf, improved and serial obtained from local market. The treatments were laid out in a randomized complete block design (RCBD) replicated three times. The total land of the experiment was $77m^2$. Each plot was 2m x 3m ($6m^2$), with 1m between replication and 0.5m between each plot (fig.1). The land was cleared, ploughed, harrowed and later leveled manually using hand hoe. The field was marked in to blocks and plots in a randomized complete block design (RCBD). There were three replications and treatments. Each block has three treatments giving a total of nine plots. The materials used were cutlass, hoe, pegs, rake, thread, weighing scale, meter rule and tape. The Okra seeds used during this study were bought from open market in Mubi. Sowing was done on the 16^{th} February, 2010 dibbling 3 seeds per hole, at 50cm within row and 50cm between rows. The seedlings were later thinned to two per stand two weeks after emergence. Other cultural practices like fertilizer application, pest control were also done. The seed rate was $0.21kgha^{-1}$ with a total of 16 plants/plots. Phosphorus was applied to each plot at two week after emergence at the rate of 45kg P_2O_5 ha^{-1} using the super phosphate. Nitrogen was split applied at two and four weeks after emergence using urea at the rate for each treatment. All fertilizer applications were through side placement. Weeds were controlled manually using hoe and hand pulling at 2, 6, and 8weeks after sowing (WAS) to minimize weed-crop competition. Black ants *messer babbarus* which caused poor seedling establishment in some plots were controlled using permethrin (0.6%). Harvesting was thrice by hand picking when the fruits were fresh and immature.

Parameters Measured: The following data were measured:

Plant Height (cm): The height of three selected plants from each net plot was taken at 2 weeks and at flowering period by measuring from the ground to the highest point of the plant using a meter rule. Their average was computed and recorded as mean height.

Number of Fruit per Plant: Three plants were randomly selected from each net plot at harvest; their fruits were counted and the mean fruit per plant were then determined.

Days To 50% flowering: This was determined by counting the number of days from sowing to the time that half of the plants in the plot have flowered.

Fruit Length at Harvest (cm): The lengths of three fruits selected randomly from the plot were taken and the mean computed as mean length of fruit.

Number of Branches per Plant: Three plants were randomly selected from each net plot and number of branches per plant counted for the three Okra varieties at 12 weeks after sowing and the mean was recorded.

Fresh Fruit Yield (g): Fresh fruits yield was determined as the total fresh fruit weight from the three pickings from each net plot and converted to yield per hectare.

Statistical Analysis: Data collected were subjected to data analysis of variance (ANOV A) according to Gomez and Gomez (1984). The treatment means were separated using Duncan's multiple range test (SAS, 1993).

3. Results and Discussion

Table 1: The effect of varietal difference on the height of Okra at 2, 4, and 12 weeks after sowing (WAS) and number of branches per plant at 12 WAS.

Okra variety	Plant height at 2WAS(cm)	Plant height 4WAS(cm)	Plant height at 12WAS(cm)	Number of branches/plant
V_1	11.7a	21.0_a	34.2_a	7.7_a
V_2	10.8a	22.1a	32.7_a	6.3_b
V_3	7.1_b	14.1_b	25.2_b	5.0_c
Significant	*	*	*	*

Note: Means with the same letter are not significantly different (Duncan's Multiple Range Test at P<0.05).

Key

*: Significant

V_1: improved Okra

V_2: Serial Okra

V_3: Local Okra

The influence of variety and the height of Okra and the number of branches is presented in Table.1.The serial Okra variety (V_2) recorded the highest mean of 10.3 at 2WAS and 22.1 at 4WAS whereas the highest mean of 32.2 at 12WAS was recorded by improved (V_1) Okra variety. Significant ($P<0.05$) difference were observed among all the means due to treatment effects. The local (V_3) Okra variety was shorter in height compared to improved and serial varieties. It was also clearly noticed that, the improved and serial varieties performs better during the dry season irrigation with high temperature. These findings agrees with that of Thamburaji (1979) and Massean (1992) who reported that taller Okra plants were obtain at maximum temperature of 25-35^{o}c. high maximum temperature was experienced during the vegetative growth and consequently more assimilates production which probably induced better yield in the dry season. This result support similar work on okra by Randhawa (1967) who reported that growth and development of okra can be influenced by time of sowing. The number of branches at 12WAS for all the three varieties recorded a significant ($P< 0.05$) difference as presented in Table 1. V_1 produced the highest number of branches (7.7) more than that of V_2 and V_3. The higher number of branches could in turn lead to higher fruit production. The three okra varieties differed in the number of branches.

Fruit Parameter

Table 2: The effect of varietal difference on the number of fruit at 1, 2 and 3rd harvest.

Okra varieties	No. of fruit at 1st harvest	No. of fruit at 2nd harvest	No. of fruit at 3rd harvest
V_1	12.33_a	13.67_a	16.67_a
V_2	11.00a	13.00_a	15.67_a
V_3	9.00_b	10.00_b	12.33_b
Significant	*	*	*

Note: Means with the same letter are not significantly different (Duncan's Multiple Range Test at P<0.05).
Key
*: Significant
V_1: Improved Okra
V_2: Serial Okra
V_3: Local Okra

The influence of variety on the number of fruit is presented in Table.2. Number of fruit at 1st, 2nd and 3rd harvest is summarized in table.2. Significantly ($P<0.05$) superior number of fruits were produced with V_1 in all the three harvesting period compared to other treatment. Significantly lower numbers of fruits were recorded with V_3. This performance may not be unconnected with the more favorable environmental conditions provided during the dry season irrigation. This result collaborate the findings of Katung (2007) who reported that changes in environmental conditions influence growth and performance of Okra. Abdul and Aarf (1986) also observed that the number of fruits of Okra per plant increases under optimum environmental conditions and performs well.

Table 3: The effect of varietal difference on fruit length (cm), Days to 50% flowering, harvested fruit weight (g) and yield of fresh fruit (kg/ha).

Okra varieties	Fruit length (cm) at harvest mean	50% Days to flowering mean	Harvested fruit weight (g) per plot mean	Yield of fresh fruit (tons ha-1) mean
V_1	7.23_a	66_b	802.68_a	10.7_a
V_2	7.10_a	58_c	727.17_a	9.7_a
V_3	4.87_b	71_a	370.99_b	4.9_b
Significant	*	*	*	*

Note: Means with the same letter are not significantly different (Duncan's Multiple Range Test at P<0.05).
Key
*: S significant
V_1: Improved Okra
V_2: Serial Okra
V_3: Local Okra

The effect of varietal difference on fruits length (cm), days to 50% flowering, harvested fruit weight (g) and yield of fresh fruit (kg/ha) is presented in Table.3.The result of the values of fruits length showed that, there was a clear significant ($P<0.05$) difference with V_1 recording the highest fruit length of 7.23cm and V_3 the lowest with 4.87 cm. Significant difference was also observed with days to 50% flowering V_2 recorded the lowest days (58) to flowering compared to V_1 (66) and V_3 (71) resp1ectively. This result therefore implies that V_2 (serial variety) matures earlier than other varieties and stands a better chance of return. Superiority recorded by V_1 (improved variety) with the parameters might be due to the conducive environment that expressed the genetic potentials there by eliciting their differential performance. Fertilizer was applied to the 3 Okra varieties which boosted their yield and yield parameters. This result supports Ayodele, (1993) who reported that improved variety of Okra performed best under fertilizer application. In the same line, Anjum and Anijad (1999) observed that applying Nitrogen fertilizer at different rates to Okra influence the performance of pods per plant, pod length and pod yield significantly. The harvesting of the Okra fruits was done at the proper early stage which indeed enhanced the blooming of the plants. Also, the most important factor of production solar radiation might have been utilized differently by the by the varieties. This is in agreement with the findings of Daughtry *et al* (1983) who reported that photosynthetic efficiency and growth in crop were strongly related to the effect of canopy architecture or vertical distribution of light within the canopy. Several researchers have noted that the yield advantage of one variety over other variety varies by environment (Foley *et al; 1986,* Wilcox 1998). This result is in total agreement with these

findings because the environment may not be favorable in same manner to all the varieties.

4. Conclusion

The optimum productivity of Okra in Mubi, during the dry season irrigation is considered more appropriate. V_1 (improved) and V_2 (serial) varieties performed better than the V_3 (local Okra) variety during the dry season irrigation period. V_3 recorded the lowest fresh fruit yield of 4.9 tons/ha compared to V_1 that recorded the highest fresh fruit yield of 10.7 tons/ha. Based on the findings of this study V1 and V2 are recommended to farmers for optimal productivity.

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2/11/2014