EVALUATION OF 12 (TWELVE) OKRA (*Abelmoschus esculentus* (L). MOENCH). ACCESSIONS FOR YIELD AND YIELD COMPONENT IN LAFIA, NASARAWA STATE, NIGERIA.

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ABSTRACT
12 Accessions of okra (Abelmoscus esculentus (L) Moench) were evaluated at the College of Agriculture, Lafia research farm during the rainy season of 2012 and 2013 for yield and yield components. The experimental design was a Randomized Complete Block Design (RCBD) with three replications. Data were collected on Days to flowering, Days to fruiting, plant height, Number of branches per plant, fruit weight per plant and fruit weight per hectare. The highest number of days to blooming was in accession NH/GB/10/101, spending 71.67days with the second lowest yield of 3091.6kg/ha after Okra 47-4, accession with the yield of 3025kg/ha. Minimum number of days to flowering (30.33 and 38.00) and maximum fruit weight per plant (470.13g and 460.38g) gave the maximum yield of the fruits (7858.3kg/ha and 7733.3kg/ha) obtained from accessions NG/SA/DE/07/0475 and CEN/6, respectively. This suggests that these accessions could be adapted for cultivation.
Keyword: Okra, *Abelmoscus esculentus*, accessions, evaluation.

INTRODUCTION

Okra (*Abelmoschus esculentus*, L.Moench) belongs to the family malvaceae, one of the most important vegetable crops grown throughout the tropical and west temperate regions of the World. Globally, Okra is cultivated in an area of 0.78million ha producing 4.99 million MT with an average yield of 6.39t/ha(Thanavendan and Jeyarani, 2009).It is usually grown by small scale farmers as cash crops to obtain regular income during planting season The West African genotypes are very common within the house hold gardens due to its late maturity and prolonged harvesting period even after the rainy season (Aladele,*et al*; 2011). Okra is also an important vegetable crop in Africa, India, USA, Brazil, Australia and Turkey. Nigeria is the second largest producer of okra in the world with an estimated 0.72 million ton produced annually, this represent 15% of total world annual production (Khan *et al*;2001,Gulsen *et al*; 2007) It is consumed as fresh as well as canned products. It is beneficial as anti ulcer, comparable to a standard drug misoprotol with good results. Its alkaline pH could also contribute to its effect in gastro- intestinal ulcers by neutralizing the digestive acids (Wammanda *et al*;(2010).In Nigeria, okra is usually boiled in water resulting in slimy soups and sauces are relished. The fruits also serve as soup thickeners (Schppers, 2000).In areas where the meals and drinking water lack iodine, okra could play a key role in preventing goiter. Okra cultivar may be classified on the basis of plant height fruit size; pod shape and pod color (Tindal, 1983). All the popular cultivars have spineless pods in fresh form and the pod color ranging creamy white to dark green (Farooq *et al;* 2002).

Okra like any local vegetables had hitherto not received as much research attention in Nigeria as most arable crops (Ogunlela *et al.*, 1989). Ariyo *et al;* (1990) reported that very few local cultivars have been receiving attention at IAR, Samaru Zaria on the genetic Improvement. Even though planting areas are increasing, the production of okra for exportation in Nigeria is facing a problem of low yield and quality does not meet with marketing standard. This is because their yields are affected by different abiotic (poor soils, climate etc) and biotic (insect pests and various diseases) factors. Insect pest such as *Podagrica uniforma* (Jac.) and *Podagrica sjostedti.* Caused damage to different stages of development in okra plant(Oke and Adebiyi, 2008). These insects attack leaves and fruits thereby reducing photosynthetic area of attacked plant and economically reducing their yield. So there is intense need to introduce some new cultivars with higher yield and better quality product. As a result, research must be done in order to find the right varieties of okra in accordance with the demand of the market and identify the varieties that perform best in this environment. Therefore, the objective of this study is to evaluate the performance of okra for yield and yield component and use them as a guide to develop okra varieties in future.

MATERIALS AND METHODS

The twelve accessions were cultivated in two years during 2012 and 2013 rainy seasons at the College of Agriculture, Lafia, Nasarawa State; Nigeria. The Experiment was laid out in randomized complete block design 4 replications. After ploughing and ridging the land the plot size was kept at 2 x 5 meters. Three seeds of okra were sown at a distance of 50cm on the rows and 75cm apart. Compound fertilizer NPK(20:10:10) was applied in two doses at the rate of 60kg N/ha. Thinning was done to reduce the trial to one plant per stand to give a population of 2,666 plants per hectare. All cultural practices remain uniform for all the experimental plots. The parameters recorded during the course of the study were: days to flowering, days to fruiting, plant height, stem girth, number of branches/plant (NBP), weight of fruits per plant (WFPP) weight of fruit per plot and wt of fruit per hectare. The statistical analysis was performed by using ANOVA techniques (steel and Torrie, 1984). Duncan Multiple Range test, 1955) was adopted to detect the statistical difference between treatment means.

RESULTS AND DISCUSSION

The analysis of variance of the treatment means revealed significant differences for all the traits of the okra accessions (Table 1& 2). In table 1, the morphology of the 12, okra accessions showed wide variation in all characters except for the shape of leaves and colors which were found to be entirely palmate and light yellow respectively. The pods of the accessions had two colors, found to be dark green and light green. However, the height of the accessions were partitioned into three, which were Tall, Medium and Dwarf plant types.

The data pertaining to number of days taken to flowering showed a significant behavior. Maximum number of days (71.67) to flowering was shown by NHGB/10/101 and LD88 respectively, followed by NG/TO/Jun/09/013 and NG/TO/Jun/09/007 with 48.33 and 48.00 respectively and both accessions were statistically at pair with each other. However, accessions NG/SA/ DE.07/0475 and NG/AA/SEP/09/04 took 30.33 and 38.00, respectively to flower and remained minimum among other treatments.

Plant height (cm): Results on the plant height(cm) showed the significant variation for all the varieties of okra. Maximum height(106.9cm) was recorded in NG/TO/Jun/09/007, closely followed by NHGB/10/048 with 76.00cm, these showed similar performance as in the case of plant height between two cultivars as reported by Hussain (1980) that pusa sawani and penta green as the tallest cultivar of okra with high yield. The minimum heights were in accessions NG/SA/DEE/07/498, NG/SA/ DEC/007/0528, NHG/10/015 and OKRA 47-4; whereas, the remaining accession had moderate heights.

Number of branches/plants: The highest number of branches per plant was in accessions NG/SA/DE/07 0475 and CEN/6 with 14.87 and 12.53 respectively. These accessions gave the highest yield of 7.85 7t/ha respectively among the other accessions. This results are in agreement with the findings of Launentin and Mantilla (2000), Abimiku *et al* (2014) in which they stated that profuse branching is a useful agronomic trait for pod yield as established between the number of branches and pod yield per plant in soybean. The number of branches could serve as a good index for fruit yield selection in Okra accessions.

Weight of pod fruits per plant (g): Statistical analysis of the data revealed significant differences among the various treatment means of the okra accessions (Table 2). Maximum weight of pods per plant (470.13) was recorded in accessions NG/SA/DE/07/0475 plots, followed by CEN/6 and NG/TO/JUN/09/013 with the pod weight of 460.38g and 370.03g respectively. Statistically, all these three were at par with each other. The moderate fruit weight were observed in accessions LD/88, NHG/10/015, and NHGB/10/048 with fruit weights of 353.41g, 320.76g and 302.10g respectively. However, the minimum fruit weight was observed as 181.53g and 191.23g in accessions NHGB/10/101 and NG/SA/DEE/07/498, respectively.

Yield of fruits (kg/ha): The analysis of the treatment means revealed significant differences for different okra accessions. Fresh fruits are the economic portion of the okra. Different cultivar gave almost similar trend as it was in the case of fruit weight. Maximum yield (7858.3kgha-1 and 7733.3kg/ha) were recorded in accessions NG/SA/DE/07/0475 and CEN/6 were sown. The results of these accessions were statistically at par and also non-significant among each other. Accession NG/TO/Jun/09/013 gave the yield of 6175kg/ha which was close to the two higher yield accessions. The minimum fruit yield was observed in accessions okra 47-4, NHGB/10/10/and NG/SA/DEE/07/498 with the fruit yield of 3025.10kg/ha, 3091.6kgha and 3208.3kg/ha respectively. The minimum fruit yield observed in these accessions could be attributed to the incidence of insect pest infestation .This is in agreement with the report of Oladeneji and Kannike (2010) that insect infestation causes defoliation and consequent reduction in photosynthetic ability of the crop resulting to low yield. The other accessions yield moderate fruit weights per hectare. The results suggest that these accessions differed markedly in certain agronomic characters. Such characters that

Table 1: Morphological characters of the entire 12 accessions

Accessions	Flower color	Fruit color	Leaf shape	Plant type
NG/SA/DEE107/498	Light yellow	Light green	Palmate	Dwarf
NHG/101/015	Light yellow	Dark green	Palmate	Dwarf
Okra47-4	Light yellow	Light green	Palmate	Medium of bushy
NG/AA/SEP/09/040	Light yellow	Light green	Palmate	Tall
NG/SA/DEC/007/0528	Light yellow	Light green	Palmate	Tall
CEN/6	Light yellow	Dark green	Palmate	Medium –red stem
NGGB/10/101	Light yellow	Light green	Palmate	Medium
LD/88	Light yellow	Light green	Palmate	Medium
NHGB/10/048	Light yellow	Dark green	Palmate	Medium
NG/SA/DE/07/0475	Light yellow	Dark green	Palmate	Medium
NG/TO/Jun/09/007	Light yellow	Light green	Palmate	Dwarf and red stem
NG/TO/JUN/09/013	Light yellow	Light green	Palmate	Tall and red stem

Table 2: Performance of 12 okra accessions in 2012/2013 rainy season

Accessions	Characters					
	Days to flowering	Days to fruiting	Plant height	Number of brads/plant	Fruit weight per plant	Yield of fruit per hectare
NG/SA/DEE/07/498	43.00bcd	51.003b	33.1f	7.33cd	191.23f	3208.3h
NHG/101/015	43.67bc	46.67cd	30.9f	4.33e	320.76e	5458.3d
Okra 47-4	45.67bc	47.00c	37.1e	4.73e	211.79i	3025.1h
NG/AA/SEP/09/040	38.00cd	43.00cd	44.2d	3.53f	221.30i	3716.6g
NG/SA/DEE/007/0528	40.00c	43.00cd	37.3e	8.97c	262.11f	4600.0f
CEN/6	48.00b	49.33bc	51.2c	6.40d	46038b	7733.3a
NHGB/10/101	71.67a	73.00a	56.0c	14.87a	181.53h	3091.6h
LD/88	70.67a	74.00a	47.45d	6.40d	353.41d	5900.0c
NHGB/10/048	47.00bc	50.67c	76.4b	10.20bc	300.10f	5016.6e
NG/SA/DE/07/0475	30.33e	34.00d	39.2e	10.00bc	470.13a	7858.3a
NG/TO/JUN/09/007	48.00b	50.00b	106.99a	12.53ab	265.09g	4600.0f
NG/TO/JUN/09/013	48.33b	52.00b	51.0c	8.20cd	374.03c	6175.0b
F-test	**	**	**	**	**	**
SE +	2.14	3.02	6.81	1.416	2.97	243

Table 3: Simple linear correlation coefficients among seven characters of okra

	Characters	1	2	3	4	5	6	7
1	PHT		-·0328*	-·0377*	·584**	·635**	·909*	·909*
2	DFL			·871**	.653**	·434**	·357	−·357
3	DFR					·382*	·386	·3 86
4	NBR						·616*	·412*
5	SGPP						·385	·245*
6	FRWPP						·910	·040
7	FRW/HA							1·00

- ** Significant at 5% and 1% level, respectively.

PHT= plant height, DFL= Days to flowering ,DFR= Days to fruiting, NBR=,Number of branches, SGPP =, Stem girth per plant, FRWPP = Fruit weight per plant, ERW/HA =Fruit weight per hectare.

show wider gaps between the minimum and maximum could be used as guide for selection depending on which character is desirable.

Simple correlation coefficients among the seven characters of okra are presented in table 3.Fruith weight per hectare was positively correlated with plant height (r=0.909*) but highly correlated with number of branches (r= 0.548**) and stem girth per plant(r= .0635**) . Non significant negative association was observed between days to flowering (r= -.0328*) and days to fruiting (r = .0377*). Similar results were also reported (Abimiku *et al*, 2014) on castor yield. Days to flowering had significant positive correlation with days to fruiting (r = .0871**) and number of branches (r =.0653**). This indicates that flower production increases as a result

of increase in number of branches leading to higher fruit yield. This result corroborates with the findings of Idahosa and Egbon (2010).Branches per plant had positive correlation with fruit yield per plant (r =.0416*). This indicates that higher number of branches lead to increase in yield of okra In conclusion, NG/SA/DE/07/0475 and CEN/6 gave the maximum pods per plant, higher pod weight per plant and maximum yield of fruits per hectare and therefore are recommended for cultivation.

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