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Research paper

Evaluation of vegetative and yield attributes of okra (*Abelmoschus esculentus* (L.) Moench) for adaptation in Anambra State, Nigeria

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Abstract

Okra, *Abelmoschus esculentus* (L.) MOENCH, a fasting growing annual herb, cultivated for its young fruit and valued as an important vegetable in tropical and sub- tropical regions. Adequate production of okra is yet to be achieved especially in Anambra State due to certain factors such as non- utilization of improved cultivar, environmental conditions and inadequate cultural practices. Due to the importance of this vegetable to Nigerian diet, sustainable production is adequate to meet up with the increasing population and the country's economic recession. Vegetative and yield attributes of five cultivars of okra were evaluated for adaptation in Anambra State during 2014/2015 cropping season at the Department of Agricultural Education Teaching and Research Farm, Nwafor Orizu College of Education Nsugbe, Anambra State. A randomized complete block design, replicated three times was used. The results were statistically analyzed using ANOVA. Results showed significant differences ($P<0.05$) among the cultivars evaluated in both vegetative and yield attributes. Cultivar LD-88 had higher yield when compared to other cultivars evaluated. It is therefore recommended to farmers for sustainable okra production in the study area.

Keywords: Attributes; Okra; Vegetative and Yield.

1. Introduction

Okra, *Abelmoschus esculentus* (L.) MOENCH, a fasting growing annual herb, cultivated for its young fruit and valued as an important vegetable in tropical and sub- tropical regions. It is one of the most commercial and prominent vegetables grown and used extensively for soup in Nigeria (Dinakin et al. 1990). It is a fruit vegetable of national importance and is produced and consumed in all ecological zones of Nigeria (Agbogidi and Nweke 2005). Okra is a vegetable valued for many of its properties. The fruits are used in making soups, salad and for flavouring when dried and powdered (Olarewaju et al. 1997). The tender fruits contain minerals, especially calcium, magnesium, iron, phosphorus, protein, vitamin A, C and riboflavin as well as high mucilage (Ndaeyo et al. 2005). It contains 20% edible oil and helps to neutralize acid substance, thereby preventing constipation and other stomach disorders (Akoma 1985). The dried pods are used as soup thickeners or used in stew and mature pods produced fibre which is used in paper making and for textile. The stem is used as cooking fuel when dried or as support for climbing crops (Tindall 1986).

In spite of the numerous nutritive potentials of this vegetable, its volume of production is still very low especially in Anambra State. This could be attributed to non- utilization of improved cultivars and inadequate cultural practices (Dinakin et al. 1990). Odeleye and Odeleye (2001) reported that differences in the yield of crops may be due to the genetic diversity and genetic make – up. Okra shows high variability in its vegetative and fruit characters (Shoba and Mariappa 2007). According to Ariyo and Akeriova (1986), there were many lines of okra, each with striking uniformity suggesting that okra population has a wide genetic base. In Nigeria, most of the cultivars available to farmers are low yielding local cultivars. There is therefore the need to identify cultivars that would perform better in term of yield in Anambra State to replace the low-yielding local cultivars especially now that the country is facing a great economic recession. This study was undertaken to evaluate the vegetative and yield attributes of okra cultivars in Anambra State, Nigeria.

2. Materials and methods

2.1. Study area

The experiment was carried out at the teaching and research farm of Department of Agricultural Education, Nwafor Orizu College of Education Nsugbe, Anambra State (6^0 25N/, 6^0 82E/) during the 2014/2015 cropping seasons. Nsugbe is located in the tropical rainforest zone with an annual rainfall ranging from 1,500mm to 2,000mm and are characterized by a bimodal rainfall pattern that peaks in July and September with a short dry spell in August.

2.2. Collection of plant materials

The dried pods of five early maturing okra cultivars used in this study were obtained from Federal University of Agriculture, Umudike, Abia State. The okra cultivars were subjected to viability test before used for the experiment. The experiment was laid out in a randomized complete block design with three replications.

2.3. Land preparation and sowing

Site for raising seedlings was cleared using matchet and trashes packed off and burned, a nursery bed of 2.4m x 3.0m and 0.5m apart were measured using measuring tape, measuring rope and pegs and prepared to a fine tilt. Farm yard manure at the rate of 30t/ha was incorporated during this exercise. 3 seeds per stand were sown at a spacing of 40cm x 60cm and later thinned to one seedling per stand. Plots were kept weed free throughout the experiment. Hoeing and hand pulling methods were used.

2.4. Data collection

Data collected include number of leaves per plant, plant height, total leaf area, number of pods and fresh pod weight. Data collected were subjected to the analysis of variance (ANOVA) using SAS (2003) and treatment means were separated using Duncan multiple range test at 5% level of probability.

3. Results and discussion

The results are shown in Tables 1- 4

The result revealed significant differences among the cultivars in plant height across the weeks (Table 1). Cultivar TAE 38 showed superiority over the other cultivars in plant height at 8, 10 and 12WAP with the highest value of 102.90cm; this was followed by LD-88 with the value of 99. 48cm. this is in with the work of Ibrahim et al. (2000), who reported that differences in growth indices of crops was attributed to their genetic make – up. Result on the number of leaves indicated that there was gradual increase in number of leaves among the cultivars from 2WAP with the peak at 8WAP after which the number of leaves started to decrease gradually across the cultivars. Cultivar TAE 38 had the highest number of leaves at 8WAP with the value of 10.32, followed by LD-88 with the value of 9.64 (Table 2). Significant differences were not observed among the five cultivars tested in total leaf area, except on 2 WAP and 4WAP (Table 3). Although the cultivars showed no significant different at 8WAP, cultivars TAE 38 and LD- 88 had the highest total leaf area of 1,362.16cm^2 and 1,272.54cm^2 respectively. This indicated that the peak growth of cultivars in total leaf area was at 8 WAP (Table 3). These observations are in line with the work of Muoneke and Aliyu (1997), who reported increase in the leaf area index of three okra cultivars in the course of the plant growth up to 70 DAP, and thereafter declined. The result revealed also that the five cultivars differ significantly from one another in the fresh number of pods and fresh pod weight. This is in conformity with Ilodibia et al. (2013) who reported that yield of cowpea varies from one variety to another. Also in line with the work of Odeleye and Odeleye (2001) who reported that differences in yield of crops may be attributed to the cultivar grown, environmental condition and genetic make - up. Cultivar LD-88 recorded the highest number of pods and fresh pod weight with values of 4.53and 9.98respectively (Table 4).

This could be attributed to efficient conversion of assimilate to pod weight by this cultivar.

Table 1: Variability on plant height of okra cultivars

okra cultivar	2WAP	4WAP	6WAP	8WAP	10WAP	12WAP
NHAe-47.4	3.80^{ab}	5.91^{ab}	14.85^{c}	32.90^{ab}	58.82^{ab}	77.23^{c}
LD-88	3.35^{b}	5.36^{bc}	16.05^{ab}	35.61^{ab}	66.33^{a}	99.48^{b}
V.35	4.44^{ab}	6.40^{a}	17.78^{a}	33.38^{b}	54.89^{b}	75.64^{c}
V.104	4.70^{a}	6.16^{ab}	16.65^{ab}	35.62^{a}	60.37^{ab}	93.38^{bc}
TAE 38	3.35^{b}	5.20^{b}	I6.46^{ab}	37.02^{a}	71.50^{ab}	102.90^{a}

WAP: Weeks after planting.
Means in the same column followed by the same letters are not significantly different at p=0.05using DMRT

Table 2: Variability on the number of leaves of okra cultivars

okra cultivar	2WAP	4WAP	6WAP	8WAP	10WAP	12WAP
NHAe-47.4	4.06^{a}	6.01^{a}	9.21^{a}	9.59^{a}	8.24^{a}	7.23^{a}
LD-88	4.07^{a}	6.13^{a}	9.37^{a}	9.64^{a}	8.83^{a}	7.38^{a}
V.35	4.15^{a}	6.14^{a}	9.30^{a}	9.28^{a}	8.15^{a}	7.44^{a}
V.104	4.08^{a}	6.11^{a}	8.65^{a}	9.07^{a}	8.37^{a}	6.38^{a}
TAE 38	4.27^{a}	6.30^{a}	9.36^{a}	10.32^{a}	8.50^{a}	6.90^{a}

WAP: Weeks after planting.
Means in the same column followed by the same letters are not significantly different at p=0.05using DMRT

Table 3: Variability on total leaf area (cm^2) of okra cultivars

okra cultivar	2WAP	4WAP	6WAP	8WAP	10WAP	12WAP
NHAe-47.4	29.10^{c}	48.97^{b}	523.45^{a}	1,196.34^{a}	586.30^{ab}	546.62^{a}
LD-88	38.85^{bc}	117.39^{a}	482.45^{a}	1,272.54^{a}	688.80^{a}	582.85^{a}
V.35	57.38^{a}	148.90^{a}	514.17^{a}	1,123.14^{a}	842.80^{a}	494.55^{a}
V.104	39.60^{bc}	95.01^{ab}	589.62^{a}	1,175.82^{a}	869.57^{a}	611.48^{a}
TAE 38	37.03^{b}	94.60^{ab}	503.14^{a}	1,362.16^{a}	770.62^{a}	695.19^{a}

WAP: Weeks after planting.
Means in the same column followed by the same letters are not significantly different at p=0.05using DMRT

Table 4: Variability on the number of pods and fresh weight of okra cultivars

okra cultivar	No. of pods 10WAP	No. of pods 12WAP	No. of pods 14WAP	FW. of Pods (kg) 10WAP	FW. of Pods (kg) 12WAP	FW. of Pods(kg) 14WAP
NHAe-47.4	2.14^{a}	2.78^{ab}	2.66^{a}	3.09^{ab}	6.40^{b}	7.13^{ab}
LD-88	2.40^{a}	4.53^{a}	2.33^{ab}	4.26^{a}	8.00^{a}	9.98^{a}
V.35	1.69^{a}	2.10^{b}	1.69^{bc}	2.16^{b}	4.05^{c}	5.44^{c}
V.104	1.66^{a}	2.22^{b}	2.05^{ab}	2.10^{b}	6.21^{b}	5.08^{c}
TAE 38	1.52^{a}	2.41^{ab}	2.41^{a}	1.05^{c}	7.03^{ab}	6.20^{b}

FW: fresh weight
Means in the same column followed by the same letters are not significantly different at p=0.05using DMRT

4. Conclusions

The differences observed among the cultivars evaluated showed that okra has a broad genetic base with high level of variability, which can be used by plant breeders in okra improvement programme. Cultivar LD-88 performed better than other cultivars in yield attributes, indicating its better adaptation to the environmental condition in Anambra State, Nigeria.

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