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RESEARCH ARTICLE **OJAS0501003-608**

ASSESSMENT OF GROWTH AND YIELDS COMPONENTS OF THREE IMPROVED VARIETIES OF OKRA (*Abelmoschus esculentus* (L.) Moench).

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ABSTRACT

Okra has undergone various improvements in Nigeria as a result of breeding selection; however, to determine which of the assessed improved varieties are best suited for production by farmers in Ibadan, Nigeria, it is crucial to understand the type and degree of changes that exist within these varieties. Three (3) Okra varieties (NHAe47-4, LD88, and V35) were sourced from the National Horticultural Research Institute (NIHORT), Ibadan and the seeds were sown in a randomized complete block design with three replications for the experiment between the month of May-August 2021 at Parry Road University of Ibadan with the coordinates 7˚46' N, 3˚89' E at 187 meters above sea level. The growth parameters measured include Plant height at flowering, number of flowers/plants, number of fruits/plants, number of leaves/plants, shoot dry weight at flowering, leaf dry weight at flowering, and fresh fruit weight. The result showed that LD88 produced the most pods and V35 had the largest fruit weight, NHAe47-44 flowered earliest. It is recommended that to facilitate a more robust selection of beneficial accessions for breeding programs, particularly on yield improvement, more research including a wider range of improved Okra types must be done.

Keywords: *Fruit, LD88, NHAe47-4, Okra, V35.*

INTRODUCTION

In tropical and subtropical areas of the world, okra (*Abelmoschus esculentus* (L.) Moench) is regarded as the most significant vegetable crop. Its easy cultivation, steady output, and tolerance for different moisture levels are the main reasons for its appeal. (Farinde *et al.,* 2006). This herbaceous plant features short, erect stems with heart-shaped leaves that may be hairless or spiky. According to Chaunkhande *et al.,* (2011), this annual dicotyledonous crop is a member of the Malvaceae family, which also includes hibiscus. Depending on the variety, the plants can grow up to 7 feet tall. The flowers measure 3.8 – 8.9 cm in diameter and have five white to yellow petals, each with a crimson or purple patch at the base. The fruit is a capsule with many white seeds.

The seeds of this tropical plant, which thrive in warm regions, sprout and grow more quickly in well-drained, fertile soil with an almost neutral pH (Prakash *et al.,* 2010). For its young, edible fruits to develop, it needs a moderate amount of evenly spaced rainfall. It is thought that development, flowering, and fruiting are best achieved under a monthly average temperature range of 20 to 30 °C (Mishra and Singh, 2005; Benchasri, 2012). There are numerous types of okra, from the well-known lady finger, which may grow up to two meters tall and produce fruits as long as a human finger, to dwarf, early maturing, densely branching varieties that bear small to medium-sized fruits. (Mishra and Singh, 2005). Its fruit differs in variation in terms of colour and shape. Its cylindrical shape might be short, long, smoother, ribbed, or green, reddish-green, pale green, or yellow. Its fibrous fruits or pods contain spherical, white seeds (Mishra and Singh, 2005).

Flowering can begin as early as 45 days after seeding, and pods are ready for harvest 4-5 days later. The seed pods grow quickly and are 8 – 25 cm long (as pod size grows, softness diminishes), tapering, and frequently with ribs running down the length. These soft, unripe seed pods are consumed as a vegetable, with a distinct texture and sweet flavour (Anyaoha *et al.,* 2018). However, several biotic and abiotic factors influence agricultural agriculture, including pests and diseases, insufficient soil fertility, a lack of improved seeds, and climate change (Bahkru, 2003).

There is debate over the exact origins of okra; some claim it originated in West Africa, Ethiopia, or South Asia. After being domesticated in West and Central Africa, okra is now extensively grown for local food throughout the tropics (Kumar *et al.,* 2010; Chinatu *et al.,* 2017). Production statistics according to FAOSTAT (2019) revealed that Nigeria ranked as the world's second-largest okra producer, following India, with an impressive production capacity of 1,819,018 tons.

Because of its relevance to food security, okra cultivation and production are widely practiced throughout Nigeria's Agroecological zones, and it can be found in practically every market (Christo and Onuh, 2005). According to Babatunde *et al.,* (2007). Okra production helps rural West Africans (mainly women) maintain their economic stability. It is regarded as a valuable vegetable due to its high nutrient content (Dabire-Binso *et al.,* 2009). Together with carbohydrates, fiber, sugar, and fat, it also includes several minerals and vitamins. Iron, sodium, zinc, calcium, magnesium, phosphorus, potassium, iron, B (B1, B2, B3, B6, and B9), C, and K are some of them (Aguair et al., 2011).

Okra is generally recognized as an important vegetable in the making of various soups. Okra is used in almost every Nigerian tribe's traditional dishes and delicacies. (Edet & Etim, 2010). Immature fruits can be boiled, fried, raw, or steamed. Its fruits are used to produce soups, sauces, stews, curries, and even salads, while the leaves are fed to farm animals. Okra mucilage has been utilized to replace plasma and increase blood volume (Habtamu *et al.,* 2015). Okra fruits have rekindled interest in commercializing this crop (Ngbede *et al.,* 2012).

Variations in plant architecture, days to maturity, yield, fruit color and form, and mucilaginous qualities are frequently observed in several improved okra cultivars. Additionally, the degrees of tolerance exhibited by these cultivars to biotic and abiotic stimuli vary. Finding optimal varieties for production requires an understanding of the type and degree of variation within variations. Taking all of the above into consideration, this study aimed to assess the growth and yield component of three improved varieties of okra grown in the Ibadan environment.

MATERIALS AND METHODS

Experimental Location

The location of the study was at the Department of Agronomy's Teaching and Research Farm, situated along Parry Road in the University of Ibadan, Ibadan, Oyo state, Nigeria from late May to early August 2021 with the following coordinates latitude 7˚46' N and longitude 3˚89' E at 187 meters above sea level.

Varieties used in this Study

The three cultivars used as test crops for the study were V35, NH47-4, and LD88, which were procured from the Seed Technology Department at the National Horticultural Research Institute (NIHORT) in Ibadan.

Land Preparation and Cultural Practices

The field was manually cleared using a hoe and cutlass, then it was ridged in preparation for the okra seeds. On May 30, 2021, the okra seeds were planted by hand. Two weeks after sowing, the number of seeds per hole was reduced to two seedlings. Using 60 ml/ha of cypermethrin to combat insect pests, weeds were periodically pulled by hand with a hoe and cutlass.

Experimental Design Used

The experiment followed a Randomized Complete Block Design (RCBD) with three repetitions. The overall land area measured 60 m^2. Each copy had a unit plot measuring 1.8 m × 3 m, or approximately 5.4 m^2. Each unit plot had three rows, with blocks and unit plots separated by 0.5 m^2.

Data Collection

The following data were collected:

Days to emergence (The number of days between planting and when the seeds in each plot emerged), Days to 50 % flowering (The number of days from planting until 50% of the plants in each plot flowered), Plant height (cm): This was measured with a meter rule between 8 and 13 weeks following planting. Leaf count (The number of leaves on a plant eight to thirteen weeks after planting), Fruits collected (The number of mature fruits harvested on each plot

between 8 and 13 weeks following planting), Dry weight of leaves (g): This is the value of the fresh weight of leaves gathered and oven-dried to a consistent weight. A destructive sampling procedure was employed. The dry weight of shoot (g): the fresh weight of the shoot was oven-dried and recorded, and Fresh Fruit Weight (g): The value of fresh fruits gathered 8 to 13 weeks after planting.

Statistical Analysis

The gathered data were analyzed using both descriptive statistics and analysis of variance (ANOVA). The means of significant features were separated using the Least Significant Difference (LSD) at the 5% probability level.

RESULTS

Field Performance of Okra Cultivars

The mean values of the measured agronomic parameters are displayed in Table 1.

Meantime (days) of Emergence

The findings show that the days to emergence were significantly influenced by the variations. The okra varieties LD88 (10.3), V35 (9.9), and NHAe47-4 (10.5) have average days to emergence, meaning that V35 emerged first and NHAe47-4 emerged last.

Table 1: Mean squares of measured traits of three improved okra varieties

SV	Df	DE	D50% F	NF	FW(g)	NL	NoF	LDMW(g)	PH (cm)	SDMW(g)
Variety	2	10.6	67.1*	49.1	282.6	5.9	0.4	38.8*	78.6*	13.8
CV %	4	0.3	9.8	32.1	419.3	6.7	1.9	8.9	0.1	13.2

Df: Degree of Freedom; DE: Days to Emergence; D50%F: Days to 50% Flowering; NF: Number of Fruits; FW: Fruit Weight; NL: Number of Leaves; NoF: Number of Flowers; LDMW: Leaves Dry Matter Weight (g); SDMW: Shoot Dry Matter Weight (g); SV: Sources of Variation; PH: Plant Height
NB: * shows that there is a significant difference among the means.

Mean plant height at flowering:

Table 1 shows the plant heights of the three improved varieties. V35 was observed to have recorded the tallest height of 92.3 cm which is above the mean (78.6 cm) and is significantly higher than NHAe47-4 and LD88 which recorded heights of 56.9 cm and 86.5 cm respectively.

The average number of leaves during flowering:

The Okra variety V35 had the highest mean number of leaves during blooming (34.5), followed by LD88 (33.4), and NHAe47-4 (31.9).

The mean number of flowers

Each plant yielded an average of 7.3 to 8.0 g of fresh fruits, with no significant differences observed at the $p \leq 0.05$ threshold of significance between the varieties. There are LD88 (7.8), V35 (7.3), and NHAe47-4 (8.0) flowers on average.

Dry Matter Weight of Leaves (g/plant)

From 48.7 to 54.4 g, on average, each plant's dry matter of leaves during flowering was displayed in Table 1. With 54.4g of shoot dry matter weight during harvest, V35 was found to have the highest weight.

Dry Matter Weight of Shoot (g/plant)

The average dry matter of shoot per plant at flowering as shown in Table 1 ranged from 59.5 to 729 g. V35 was observed to have had the highest shoot dry matter weight with 72.9 g at harvest.

Meantime (days) of 50% flowering

According to Table 2, there was a significant difference between the three Okra varieties in terms of the number of days to 50% flowering, with LD88 having the highest mean at 70.7, V35 having the highest at 71.7, and NHAe47-4 having the lowest at 63.3 on the $p \leq 0.05$ threshold of significance. In comparison to the other two types, this indicates that NHAe47-4 had an earlier time to flower.

Mean Fresh Fruit Yield of Okra

The mean number of fruits produced by each variety was found to be highest in LD88 (24.7), followed by V35 (24.7), and lowest in NHAe47-4 (22.1). The varieties in Table 2 had an average fruit weight of 89 to 107g of fresh fruits per plant, but there was no significant difference at the $p \leq 0.05$ threshold of significance.

Table 2: Mean values of measured traits of three improved Okra varieties planted.

Trait	LDMW (g)	D50%F	PH (cm)
LD88	48.7	70.7	86.5
NHAe47-4	49.7	63.3	56.9
v35	54.4	71.7	92.3
LSD	0.5235	0.5235	0.5902

LDMW: Leaves Dry Matter Weight (g); D50%F: Days to 50% Flowering; PH: Plant Height (cm)

DISCUSSION

Improved Okra varieties are important for selection purposes to increase production and bring about more profit for the farmers which will translate into food and livelihood security. This has informed the decision to explore the possibilities of assessing three Okra varieties in Ibadan, Oyo State that will ensure the best decision and recommendation is made to farmers to improve production.

The growth, yield, and yield component means squares for the three okra cultivars are displayed in Table 1. Except for the plant height, as indicated by Table 2, there were no significant differences in the growth characteristics. Furthermore, the leaf dry matter weight and the 50 % days to flowering were the only yield and yield component parameters that showed significant differences among the varieties for the study (Tables 1 and 2).

The three varieties of okra assessed were known to have differed significantly in some morphological traits but not in major yield attributes (Table 2). This factor could be due to the environmental influences that are known to be affecting okra and the lines. This supports the findings of Chaukhande *et al*., (2011) that the genetic composition of various okra cultivars and environmental conditions influence okra yield and production.

The three Okra varieties selected for this study have shown that plant height is a significant indicator for selection for production. This is very vital for farmers in determining the best pick for production purposes and profit-making. According to reports, environmental elements that influence agricultural plant height include temperature, precipitation, sunshine availability, soil fertility, and water availability. These parameters are significant because they play a large role in crop competition for light (Moles *et al.,* 2009). There were notable variations in plant height amongst the kinds, which may have been caused by variations in their genetic makeup and how they responded to the biotic and abiotic conditions that were prevalent.

Furthermore, the three Okra varieties selected for the study showed significant differences in their 50 % days to flowering (Table 2). According to reports, 50 % of the crop's days remaining till blooming are a significant yield component indication that influences the crop's potential for yield, making it useful as a selection criterion for production before making recommendations to farmers (Machikowa and Laosuwan, 2009; Ranga *et al.,* 2021). Based on this, the study demonstrates that out of the three Okra varieties chosen for the investigation, variety v35 had the longest time to bloom (days to 50 %), whereas variety NHAe47-4 had the lowest time (days to 50 %).

Table 2 demonstrates the large differences in leaf dry matter weight amongst the three Okra varieties. These differences translate into varying leaf yield potentials, should the leaves be selected for eating. Okra leaf has been reported to be consumed for its mucilaginous properties and its potential to be used as soups in some countries in sub-Saharan Africa due to its phytochemical components that have medicinal and nutritious properties (Elumalero *et al.,* 2022). Therefore, the leaf dry matter weight is an important selection criterion for this study as they have been found useful in the selection of good traits for production purposes (Udpuay *et al.,* 2023). The potential leaf dry matter produced by the Okra varieties are important production parameter of profit for farmers.

CONCLUSION

Food and livelihood security is essential for the well being of mankind and Okra is an integral vegetable used by locals in Ibadan, Nigeria for food consumption and profit after sales of produce. Therefore, this study shows that the three varieties of Okra selected for this study show the potential to fulfil the sustainable development goals of reducing hunger, zero poverty and promoting decent work and economic development. The three Okra varieties have shown immense potential to help farmers achieve optimum fruit and dry leaf matter yield that will sustain livelihood and it

is recommended that to facilitate a more robust selection of beneficial accessions for breeding programs, particularly on yield improvement, more research including a wider range of improved Okra varieties must be considered for more studies.

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