



Research Paper

Morphological Characterization of Two Exotic And Two Indigenous Cultivars of Cucumber (*Cucumis sativus L.*) In Humid Tropical Agro-Ecological Zone

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ABSTRACT

Two exotic (Markmore 76 and Tablegreen 72) and two indigenous (Ex – Eket and Ex – Calabar) cultivars of *Cucumis sativus* were morphologically characterized in 2005 cropping season at the University of Calabar Teaching and Research Farm. A plot size measuring 11.2 m x 14.1 m (157.92 m²) was laid out in randomized complete blocks design (RCBD) with three replications. Data were collected on morphological traits and analyzed for variance components. There were variation for vine length per plant at six weeks WAP, number of leaves per plant at two and six WAP, number of branches per plant at two, four and six WAP, number of days to 1st flowering initiation, number of days to 50% flowering, number of male flowers and mean fruit number. Result showed that most of the agronomic traits showed significant differences between the exotic and local cultivars. The exotic cultivar (Markmore 76) had the highest mean fruit number (8.50 t/ha) than Ex – Eket (3.67 t/ha) and others cultivars. The exotic cultivars fruited earlier than the local cultivars. However, the indigenous cultivars producing the highest number of pollens (7.67) than exotic cultivars (3.33). The variation observed among the cultivars seems to suggest that there are varietal differences which should be exploited for future breeding work on this crop.

Keywords: Morphological traits, genotypic variation, variance components

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I. INTRODUCTION

Cucumber (*Cucumis sativus L.*) is a member of the plant family Cucurbitaceae, along with crops like melons, squash and fluted pumpkin. India had been proposed as the center of origin (Renner *et al.*, 2007 and Anonymous, 2012). Cucumber crop is grown in both temperate and tropical regions (Eifediyi and Remison, 2010). It is an important source of minerals and vitamin such as calcium, phosphorus, iron, sodium, potassium vitamins A and C, Riboflavin, Thiamine, Niacin, Ascorbic acid but low in protein and carbohydrate. Some cultivars have high medicinal value like snake gourd Eno-obong (2001), Whitaker and Davis (1996).

A large number of local lines are cultivated in Nigeria but there is no recommended cultivar. No serious attempts have been made to upgrade the productivity and acceptability of this crop. The productivity of the vegetable can be increased to greater extent through varietal improvement. For developing superior varieties, it is necessary to improve yield components in cucumber. Morphological traits contribute significantly to yield improvement and each of these components adds its own value to the genetic system and is useful in the improvement of yield trait (Ndukauba *et al.*, 2015, Om and Vijay, 2016). Characterization of these morphological traits is a mean of identifying and selecting superior genotypes among the exotic and indigenous cultivars. Fruit yield in cucumber is quantitatively inherited, thus improvement in yield trait requires an indirect approach of selecting yield characteristics that have high response to selection. Genetic studies rely on analysis of statistical tools to measured variations of morphological traits for selection response. The tools include mean, variance, heritability and genetic advance. These tools are not only helpful in evaluating the genetic stability and performance of genotype but it is also a measure to determine the effectiveness of selection for a particular trait

in that genotype. . The success of any breeding programme depends greatly on the genetic diversity available in a population (Afangideh *et al.*, 2005; Subramanian and Subbaraman, 2010). The variation among the genotypes performance in Cucurbitaceae has been widely studied by many scholars (Afangideh *et al.*, 2005; Ene *et al.*, 2016; Bernard *et al.*, 2014; Adjoumaniet *al.*, 2016; Ajisefinanni, 2004; Agah and Ittah, 2018) but systematic work to compare the vegetative and reproductive traits, characterized the performance of exotic and indigenous cultivars for selection response in the humid agro – ecology zone is scanty. This has poses a challenge in cucumber breeding programme in Nigeria, as the plant breeders rely heavily on the variability among genotypes as a mean of identifying, classifying and obtaining germsplam for effective selection. This study is therefore designed to bridge the gap of comparing the morphological traits among the cultivars studied, providing adequate information about the genotypes and make possible recommendation of genotypes for selection response. This research was therefore designed to characterize two exotic and two local cultivars of cucumber based on various vegetative and reproductive parameters and make possible genotypes recommendation the will suit in humid agro – ecological zone.

II. MATERIALS AND METHODS

Study Area

The experiment was conducted at the University of Calabar Teaching and research farm, Cross River State, Nigeria. The University of Calabar is located at Latitude 4^o56' to 17.39'N and longitude 8^o 21' 0.37 E.

Planting materials and Experimentation

The seeds of the four varieties of *C. sativus* were obtained from three different places. The exotic varieties (Markmore 76 and Tablegreen 72) was obtained from Cucumber Breeding Station (CBS), United States of America (USA) at North Carolina State University, (North Central Regional plant introduction station) while one of the local variety Ex-Eket was obtained from Eket farmers in Akwa Ibom State and the other local variety, Ex-Calabar was obtained from local farmers in Calabar, Cross River State, Nigeria.

The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications and (16) sixteen stand per replicate; the four cucumber varieties formed the four treatments. A plot of land, 11.2 m x 14.1 m (157.92 m²) was manually cleared, prepared and planted in March 2005. Two seeds were sown per hole at a spacing of 60 cm x 60 cm and seedlings were thinned to one at two weeks after sowing. N. P. K fertilizer (18g N/ha) was incorporated into the soil a day before sowing while N was split applied twice ½ before planting and ½ at 5th weeks after sowing. A spacing of 60 cm x 60 cm to give a plant population of 27,777 plants / ha and a net plot size of 0.6 m x 0.6 m (0.36 m²) were maintained and set aside for data collection.

Data, based on four tagged plants, were collected on number of leaves per plant at two, four and six weeks after planting (WAP), vine length per plant at two, four and six weeks after planting (WAP), number of branches at two, four and six weeks after planting (WAP), number of days to flowering initiation, number of days to 50 % flowering number, number of male flowers, number of female flowers and mean fruit number.

Data were subjected to analysis of variance (ANOVA) and significant means were separated using L.S.D at 5% probability level, variance components of vegetative and reproductive trait for both exotic and local cultivars.

III. RESULTS AND DISCUSSIONS

The result of characterization studies in the cucumber cultivars are presented in Table 1.

The data on morphological traits for means value of four cultivars of *C. sativus* is presented in table 1. Characters assessed included the vine length per plant, number of leaves per plant, number of branches per plant, number of days to 1st flowering, number of days to 50 % flowering, number of male flowers, number of female flowers and mean fruit number. The length of vines per plant at two WAP ranged from 4.62 cm in Tablegreen 72 to 6.77 cm in Ex – Eket. There was increased with time in Ex – Eket, producing the longest vines (71 cm) at six WAP. However, there was no significant difference in length of vine among the cultivars except at six weeks. The number of leaves per plant produced at 2 weeks after planting (WAP) ranged from 4.0 in Tablegreen 72 to 7.33 in Ex - Calabar, the number of leaves per plant produced by the cucumber cultivars was not significantly different ($p \geq 0.05$) at four WAP except two and six WAP, Ex – Eket producing the highest number of leaves (122.33) at six WAP. There was significant difference in the leaf number among the cultivars for two and six WAP. This result agrees with the reports of Adjoumaniet *al.*, 2016, Agah and Ittah 2018 that observed no significant difference for length of vine, number of leaves per plant and number of branches per plant for cucumber and watermelon. The number of branches per plant at two, four and six WAP ranged from 2 in Ex – Eket, to 13.67 in Ex – Calabar. The indigenous cultivars producing the highest number of branches 13.67 at six WAP. However, there were varietal similarity in Markmore 76 and Tablegreen 72 for number of branches at two WAP. The result also agrees with the report of Afangideh *et al.*, 2005 that observed significant

differences for number of branches in cucumber. The higher number of branches, number of leaves and length of vine observed among the different cultivars could increase the rate of photosynthetic activities in growth stage and yield stages in the crop. This observation is similar to report by Adjoumaniet *al.*, 2016 that noted significant difference in indigenous cultivars and exotic cultivars on cucumber for vine length, number of branches, leaves and mean fruits number. This result also agrees with Afangideh *et al.*, 2005 that observed longer vine in exotic cucumber. There could be an indication of genetic similarity among exotic cultivars evaluated for number of branches at two WAP for Matkmore 76 (2.33) and Tablegreen 72 (2.33). There was significant difference ($p \leq 0.05$) in reproductive characters such as number of days to 1st flowering, number of days to 50 % flowering, number of male flowers and mean fruit number.

Markmore 76 had the lowest number of days to 1st flowering initiation (28.67) while Ex – Eket producing the highest number of days to 1st flowering of (58.67). Days to 50% flowering per plant ranged from 36 days in Markmore 76 to 68.33 days in Ex – Calabar that produced flowers earliest to 68.33 days than others cultivars (Table 1). There were varietal differences for number of days to 50 % flowering. This result agrees with Adjoumani, *et al.*, 2016 and Afangideh *et al.*, 2005 that observed significant difference in days to 50 % flowering of cucumber. Number of male flowers ranged from 3.33 in Markmore 76 to 7.67 in Ex – Calabar. The indigenous cultivars producing the highest number of pollens than exotic cultivars. Among the reproductive attributes measured only number of female flowers per plant is not significant among cultivars evaluated. However, there was increased in number of female flowers from 5.94 in Tablegreen 72 to 3.42 in Ex – Eket. The exotic cultivar producing higher number of flowers per plant while the local cultivars producing lowest number of female flowers. There were significant differences for mean fruit number among cultivars studied. The exotic cultivar Markmore 76 producing the highest mean fruit number (8.50 t /ha) and Ex – Eket producing the lowest mean fruit number of (3.67 t /ha). This report was at variance with Adjoumani, *et al.*, 2016 and Afangideh *et al.*, 2005 that observed higher mean fruit number in indigenous cultivars than exotic cultivars. It appears from this study that branching was more profuse in the exotic cultivars and this could be due to apical dominance in local cultivars. Apical dominance is generally associated with vine length in vegetable like pumpkin, muskmelon, watermelon, snake gourd and cucumber. In this study, the local cultivars had longer vines, lower yield than the exotic cultivars. The higher yields of the exotic cultivars could be due to increase number of branches which resulted in more fruits (Table 1). This would agrees with the reports by Adjoumani, *et al.*, and 2016 Afangideh *et al.*, 2005 that noted high positive and significant correlation between fruit number per plant and yield. This could be as a result of superior performance of Markmore 76 is attributed to longer vine, higher number of branches, leaves and yield observed in exotic cultivars.

When comparing L.S.D values with the mean value of the four cultivars, the results indicate that number of leaves at 2wks, number of branches at 2wks, number of branches at 4wks, number of branches at 6wks, number of days to 1st flowering, number of days to 50% flowering, number of male flowers and mean fruit number value were greater than L.S.D values in the four cultivars. Only vine length at 6wks, in Tablegreen and Ex-Calabar, number of leaves at 6wks, in the two exotic an Eket Local had L.S.D value which were greater than the mean values as presented in table 1. This could be an indication that there are enough differences between the cultivars to suggest that hybridization among the exotic and indigenous cultivars and subsequent progeny selection over generation might result in improved cucumber varieties.

Table 1: Means of vegetative and reproductive attributes for exotic and local cultivars of *C.sativus*

| A | VL | 2 VL | 4 VL | 6 VL | NL | 2 NL | 4 NL | 6 NL | NB | 2 NB | 4 NB | 6 DF | D50% F | MF | FF | MFN |
|---------------|------|-------|-------|------|-------|--------|------|-------|-------|-------|-------|------|--------|------|-----|-----|
| | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP | WAP |
| C | | | | | | | | | | | | | | | | |
| Markmore 76 | 5.47 | 50.78 | 52.11 | 4.67 | 17.10 | 50.00 | 2.33 | 9.33 | 10.67 | 28.67 | 36.00 | 3.33 | 5.14 | 8.50 | | |
| Tablegreen 72 | 4.62 | 20.62 | 17.83 | 4.00 | 10.33 | 17.83 | 2.33 | 10.33 | 11.33 | 26.33 | 37.00 | 3.50 | 5.94 | 6.83 | | |
| Ex- Eket | 6.77 | 55.80 | 71.00 | 4.08 | 11.50 | 37.52 | 2.00 | 6.00 | 9.00 | 58.67 | 66.33 | 6.00 | 3.42 | 3.67 | | |
| Ex - Calabar | 6.67 | 31.50 | 35.33 | 7.33 | 24.33 | 122.33 | 3.00 | 8.67 | 13.67 | 46.67 | 68.33 | 7.67 | 5.42 | 4.17 | | |
| L.S.D | NS | NS | 35.86 | 1.36 | NS | 7082 | 0.66 | 2.68 | 2.68 | 7.99 | 4.54 | 2.79 | NS | 2.63 | | |

Key:A = Attributes, C = Cultivars, L.S.D. = Least significant different, VL = Vine length, WAP = Week after planting, NL = Number of leaves, NB = Number of branches, DF = Days to 1st flower initiation, D 50 % F = Number of days to 50 % flowering, MF = Number of male flowers, FF = Number of female flowers , MFN = Mean fruit number

IV. CONCLUSIONS, SUMMARY AND RECOMMENDATIONS

A field experiment conducted at University of Calabar teaching and research farm in 2005 cropping season to characterized two exotic and two local cultivars of *Cucumis sativus* in a randomized complete block designed (RCBD) with three replications. Most agronomic traits showed some variations among the cultivars tested. The indigenous cultivars produced high number of branches, leaves, pollen (male flowers) and flowers earlier than exotic cultivars which produced low number leaves, branches, pollen but high yield and early fruiting. Genetic similarity existed between exotic cultivars in number of leaves at two weeks after planting. The exotic cultivars fruited earlier than the indigenous cultivars. The exotic cultivars (Markmore 76) with high performance of (8.50 t/ha) for mean fruit number than Ex – Eket (3.67 t/ha) and other varieties is recommended for cultivation in the humid agro – ecological Zone.

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