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Full Length Research Paper

Floral characteristics and seed production in "Egusi" melon (*Colocynthis citrullus* L.)

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A research was carried out in the experimental farm of the Department of Crop Science, University of Nigeria, Nsukka to study some aspects of floral, fruit and seed yield characteristic of accessions of "Egusi" melon (*Colocynthis citrullus* L.). It was observed that male flower anthesis occurred earlier than female flower anthesis. Male flowers opened between 30 to 32 days after seedling emergence while female flowers opened at 32 to 34 days after seedling emergence. Number of male flowers at first female flower anthesis was in the range of 27 to 32. First male flower bud was produced in the fourth node on the main vine while the first female flower bud was produced in the ninth node on the main vine in all the accessions. The male flowers were also produced in a higher proportion than the female flowers. The ratio of male to female flowers produced/plant was in the range of 4:1 and 7:1. Number of fruits/plant, fruit yield/plant (kg) and average fruit weight (kg) ranged between 3.42 and 4.54, 3.08 and 3.72 and 0.78, and 0.90, respectively. Number of seeds/fruit, number of seeds/plant, seed yield/fruit (g) and seed yield/plant (g) ranged between 162.82 and 190.88, 652.81 and 815.25, 18.8 and 23.02, and 76.52 and 101.74, respectively.

Key words: Egusi melon, accessions, flower, fruit.

INTRODUCTION

The Egusi melon *Colocynthis citrullus* L. is a member of the family *cucurbitaceae* and belongs to the tribe Benicaseae. The *colocynthis* is a small genus of 4 to 5 species found in Africa, one of which is the *C. citrullus*. There is confusion in the nomenclature of the crop. In some text it is referred to as *Citrullus vulgaris* (Philip, 1977). Others called it *Citrullus lanatus* (Ogunremi, 1978; Okoli, 1984). Some authors had mistaken it for *Citrullus colocynthis* Schrad, which is a wild species of the cucurbitaceae growing in Morocco, Algeria, the Sahara desert and India (Abu-Nasr and Pott, 1953). In order to check this confusion, the use of the name *Colocynthis citrullus* together with the vernacular name "Egusi" was recommended to represent this crop (Oyolu, 1977). Egusi melon originated in Africa and has been cultivated in the drier part of the continent for many centuries (Cobley, 1951). It thrives in hot regions with rich light soil and can tolerate periods of low rainfall. The crop is cultivated for its seeds which are prepared into condiments used especially in preparing soup. The Egusi melon seed like soya bean *(Glycine max*) is rich in oil and protein, about 53.1% and 33.8%, respectively. Egusi melon being a member of the group of crops referred to as neglected crops (Okigbo, 1975) has suffered more neglect than other members of the group. There is a dearth of information on many aspects of the crop especially the botany. Most botanical description of the crop are made with reference to other closely related members of the family such as the water melon (*C. lanatus*) which has received more attention of researchers. It is true that

Table 1. Flower characteristics of five accessions of Egusi melon (*Colocynthis citrullus* L.).

Accessions	DSE	DFMFA	DFFFA	NMF/FFA	NPOMF	NPOFF	M:F
Zaki	7	30	32	28.0	4	9	0.80(4:1)
Keffi	7	31	34	29.0	4	9	0.80(4:1)
Igara	7	30	33	30.0	4	9	0.88(7:1)
Taraba	7	30	33	31.7	4	9	0.83(5:1)
Nsukka	7	32	34	27.3	4	9	0.86(6:1)
LSD(0.05)	NS	NS	NS	1.4	NS	NS	NS

DSE=Days to seedling emergence, DFMFA=Days to first male flower anthesis, DFFFA=Days to first female flower anthesis, NMF/FFA=Number of male flowers at first female flower anthesis, NPOMF=Nodal position of first male flower, NPOFF=Nodal position of first female flower, M:F=Male : Female flower ratio.

these crops have some common features, it is still necessary to identify specifically the habits of the Egusi melon *C. citrullus*. This will help in developing production and breeding techniques that will enhance and improve the economic importance of the crop. This study is therefore aimed at identifying some reproductive attributes of Egusi melon.

MATERIALS AND METHODS

The study was carried out in the Department of Crop Science Research Farm, University of Nigeria, Nsukka located on latitude 06° 52^{1} N and longitude 07° 24^{1} E and an altitude of about 447 metres above sea level.

Five local cultivars of Egusi melon seed types; Zak, Keffi, Igara, Taraba and Nsukka purchased from local farmers in 5 states; Benue, Nasarawa, Kogi, Taraba and Enugu in Nigeria were used. These are areas of high Egusi melon production in Nigeria.

The experiment was laid out in a Randomised Complete Block Design (RCBD) with four replications. The treatments consisted of the 5 cultivars of Egusi melon. Each block was divided into 5 plots. The Egusi melon seeds were sown in April 9th 2009. The plant spacing was 1.0 × 1.0 m on flat and at the depth of 4.0 cm. Poultry manure at the rate of 10 tons/ha was applied to the plots 2 days before sowing. The plot was weeded twice manually. The first weeding was done at 2 weeks after seedling emergence with hoe while the second weeding was done by hand picking at 8 weeks after seedling emergence just before flowering. No further weeding was done to avoid flower abortion and injuring the delicate vines. At maturity, the fruits were collected and heaped together per plot and processed appropriately to extract the seeds.

Data collection and analysis

Records were taken on number of days to first male flower anthesis after sowing, number of days to first female flower anthesis after sowing, nodal positions of male and female flower in the plant, number of male flowers at first female flower anthesis, male to female flower ratio, number of fruits/plant, number of fruits/ha, weight of fruits/plant, weight of fruits/ha, average fruit weight, seed yield/fruit, seed yield/plant, seed yield /ha, number of seed/fruit, number of seeds/plant, number of seeds/ha and 100-seed weight. Data collected were subjected to analysis of variance (ANOVA) according to the procedure outlined for RCBD experiment by Steel and Torrie (1980). The square root data transformation method was used to transform the data where zero values were obtained.

Separation of treatment means was carried out using the Fisher's least significant difference (F-LSD) method (Obi, 2001) at 0.05 probability level.

RESULTS

First seedling emergence occurred 7 days after planting in all the accessions. Among the accessions, male and female flowers anthesis took place at between 30 to 32 days for the male and 32 to 34 days for the female flowers, after sowing. Number of male flowers at first female flower anthesis was in the range of 27 to 32. Nodal positions of the male and female flowers in the plant were 4th and 9th nodes. These were the same in all the accessions. It was also observed that male flowers are of higher proportion than female flowers in all the accessions. The ratio was in the range of 7 : 1 and 4 : 1.The accessions Igara had the highest ratio while accessions Zaki and Keffi had the least male to female ratio. There was however non significant difference among the accessions in all the floral attributes with the exception of number of male flowers at first female flower anthesis, in which accession Taraba produced the highest number of males at first female flower anthesis(Table 1).

The result showed significant differences in the fruit yield attributes measured (Table 2). Taraba produced the highest number of fruits/plant. It however did not differed significantly from accessions Zaki and Nsukka. The least number of fruits/plant was realized from accession Keffi. A similar trend was observed in number of fruits/ha. Weight of fruits/plant was highest in accession Taraba and least in Keffi. While Taraba differed significantly from the other accessions, there was non significant difference between accessions Keffi, Nsukka and Zaki in the attribute. A similar observation was recorded in weight of fruits/ha. Accessions Keffi produced fruits with highest average fruit weight among the accessions. It was however statistically the same to Igara in this regard. The least average fruit weight was recorded in Nsukka accession which was however statistically the same with Zaki and Igara. Significant differences were also observed on the seed

Table 2. Fruit yield attributes of five accessions of Egusi melon (*Colocynthis citrullus* L.).

Accessions	Average fruit weight (kg)	No. of fruits/plant	No. of fruits/ha	Weight of fruits/ plant (kg)	Weight of fruits/ha (kg)
Zaki	0.81	4.02	40200	3.26	32600
Keffi	0.90	3.42	34200	3.08	30800
Igara	0.88	3.88	38800	3.41	34100
Taraba	0.82	4.54	45400	3.72	37200
Nsukka	0.78	4.07	40700	3.18	31800
F-LSD(0.05)	0.06	0.22	2200	0.36	3600

Table 3. Seed yield attributes of five accessions of Egusi melon (*Colocynthis citrullus* L.).

Accessions	100-seed weight (g)	No. of seeds/fruit	No. of seeds/plant	Seed yield/fruit(g)	Seed yield/plant (g)	No. of seeds/ha	Seed yield/ha (kg)
Zaki	12.38	162.82	654.54	20.16	81.043	6545400	810.43
Keffi	12.06	190.88	652.81	23.02	78.73	6528100	787.28
Igara	11.68	176.71	685.64	20.64	80.08	6856400	800.80
Taraba	12.48	179.57	815.25	22.41	101.74	8152500	1017.40
Nsukka	12.42	164.62	670.00	18.80	76.52	6700000	765.20
F-LSD(0.05)	0.32	10.41	126.10	2.52	16.30	12610	52.04

yield attributes (Table 3). Accession Keffi produced the highest number of seeds/fruit which differed significantly from the other accessions. Accession Zaki was the least and differed significantly from other accession with the exception of Nsukka accession. Highest number of seeds/plant was obtained from Taraba accession and was significantly higher than what were obtained from the other accessions. A similar trend was observed among the accessions on number of seeds/ha. The seed yield/plant recorded from Taraba was significantly higher than what were produced by the other accessions. The same trend was maintained in seed yield/ha. The accessions also differed in 100-seed weight. Taraba recorded the highest 100-seed weight while the least was obtained from Nsukka accession.

DISCUSSION

The opening of the male flowers earlier than the female flowers observed in this study was in agreement with earlier reports (Ashworth and Galetto, 2002). These researchers reported that it was a common feature of most cultivated cucurbit species. It however differed with the finding of in cucumber where female flowers reach anthesis earlier than male flowers (Atsmon et al., 1965). It was also observed that irrespective of the short time interval between first male and first female anthesis and the fact that the first female flower bud emanated just 5 nodes away from the first male flower in the main vine, the number of the male flowers that opened before the first female flower anthesis was large. This is an indication that anthesis of the male flowers had started even in the branches before the female started opening in the main vine. This further suggests that some of the male flower buds produced later than the female flower buds on the branch vines opened earlier than the female flowers. This also appeared to suggest slower rate of development of the female flowers relative to their male counterparts in Egusi melon. This might be responsible for the greater proportion of male flowers relative to the females/plant. The male to female flower ratio obtained in this study was a bit higher than 3 : 1 ratio reported by an earlier work in water melon (Ashworth and Galetto, 2002), but lower than 25 : 1 noted by Bewley et al. (2006). It has however been shown that these flower traits are affected by environment. In most monoecious plants, change of environment has been shown to cause changes in sex ratio of cucurbits. It has been demonstrated that adequate moisture, light intensity and soil fertility increases the proportion of female flowers (Poole and Grimball, 1939). It has also been reported that day length of 16 h and day temperature of 32°C inhibited the development of female flowers in watermelon (Rudich and Peles, 1976). On the other hand, short day length and low temperatures during winters has been shown to favour female flower production in cucumber (Atsmon et al., 1965). High temperatures and day length are prevalent in the study area during most part of the growing season and might be responsible for the high proportion of male flowers. There is also a report that insect attack influences sex ratio in watermelon. Earlier study has indicated that Squash bug (Anasa tristis) attack

causes change in floral sex ratio in favour of femaleness (Biernacki and Lovett-Doust, 2002). It has also been demonstrated that ethylene promotes male flower development in watermelon.

Sex ratio did not appear to have any effect on fruit production. The accession Igara with highest male to female flower ratio produced fewer fruits/plant than Zaki with lower male: female ratio. The highest fruit yield was however recorded by Taraba accession with medium male: female flower ratio. Fewer fruits/plant however resulted to higher average fruit weight which agreed with the findings of Ogbonna and Obi (2007).

Taraba accession with medium male: female ratio produced the highest seed yield/plant. The seed yields were also in the range reported by earlier studies in the crop (Ogbonna and Obi, 2007; Ogunremi, 1978; Olaniyi, 2000). It has however been noted that fruit and seed yield are affected by both biotic and abiotic factors of the environment and farm management (Ogbonna, 2000; Ogbonna and Obi, 2007; Ogbonna, 2009). Seed yield forms the economic basis for Egusi melon production, but the study has shown that gender features have no effect on seed yield in Egusi melon.

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