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PERFORMANCE OF GENOTYPES IN CROSSES OF EGUSI MELON (*Colocynthis citrullus* L).

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ABSTRACT

Crosses were made among seven inbred lines of Egusi melon (Colocynthis citrullus L.), White, Blue, Elongated, Sewere, OV-I, W.SE and B.SE. The parents and the progenies (F_1, F_2 and BCs) were evaluated for some growth and yield attributes. The white inbred parent was found to have the highest seed yield among the parents. The F_1s were also found to perform better than their parents in the yield attributes. The hybrid (OV-I x W.SE) had the highest seed yield/plant. Delayed seedling emergence and flowering influenced seed yield negatively while large number of branches/plant and vine length enhanced seed yield/plant. All other yield attributes correlated positively with seed yield/plant, an indication that any of them can be used as an index for selection for seed yield in the crop.

Key word: Egusi melon, *Colocynthis citrullus*, hybrid.

INTRODUCTION

The "Egusi" melon, Colocynthis citrullus L is a member of the family, cucurbitaceae. It is cultivated for its seeds which are rich in oil and protein. In most of the third world countries, human beings depend more on plant materials for protein since animal protein in these areas is very scarce and expensive. "Egusi" melon is one of those plants that furnish the human diet with good quality proteins. Nwokolo and Sim (1987) reported that defatted "Egusi" melon seed contains about 56.20% protein with an excellent pattern of amino acids. Girgis and Said (1968) recommended "Egusi" seed oil for use in diets intended to reduce high levels of blood cholesterol. Production of "Egusi" melon is less demanding in terms of inputs. Early planting of "Egusi" melon usually takes advantage of soil nutrient reserves. "Egusi" melon planted after the first rain in the year grows and yields well without fertilizer application (Ogbonna and Obi 2000). The crop out competes weeds easily (Ogbonna, 2001). Seed yield of 910kg/ha has been reported by Ogbonna and Obi (2000). Recently Ojo *et al* evaluated yield potential of seven accessions of "Egusi" melon and recorded seed yield in the range of 131 to 1005kg/ha. There is the need to identify types of "Egusi" melon with high yield potential in order to meet up with the increasing demand for the crop. The objectives of this study are therefore to identify "Egusi" melon genotypes with high yield potential and to determine the relationship between seed yield and other plant attributes in the crop.

Table 1: Fruit and Seed Morphological features of the Inbred lines

Inbred Lines	Fruit Colour	Fruit Shape	Seed Shape	Seed edge Form	Seed Colour	Source
Blue	Blue	Round	Oval	Flat	Yellow	Nsukka, Eastern Nigeria
White	White	Round	Oval	Flat	Yellow	Nsukka, Eastern Nigeria
Elongated	Blue	Elongated	Oval	Flat	Yellow	Nsukka, Eastern Nigeria
Sewere	Blue	Round	Oval	Flat	Yellow	Ibadan Western Nigeria
W.SE	Blue	Round	Oval	White Encrusted	Yellow brown	Ibadan Western Nigeria
B. SE	Blue	Round	Oval	Black moulded	Yellow Brown	Ibadan Western Nigeria
Ov-I	Mottled	Round	Blocky	Edge Flat	Yellow Brown	Ovim, Southeastern Nigeria

MATERIALS AND METHODS

The experiment was carried out in the experimental farm of the Department of Crop Science, Faculty of Agriculture, University of Nigeria, Nsukka (latitude 06°52[1] North, longitude 07°24[1] East, altitude 447metres). The materials used in this study consist of seven inbred lines of "Egusi" melon; Blue, White, Elongated, Sewere, W.SE, B.SE and OV-1. These inbred lines are presented in Table 1.

Production of F_1s

Seven beds measuring 6.0m x 6.0m were prepared. Each inbred line was sown in one bed at the spacing of 0.5m x 0.5m between and within rows. Crosses were made between the inbred lines to produce the F_1s.The following crosses were successful; B x W, E x W, Sewere x W.SE, OV-1 x W.SE and OV-1 x B.SE

Production of F_2s and BCs

Twelve beds, each measuring 6.0m x 6.0m were prepared. The inbred parents; B, W, E, Sewere, OV-1, W.SE and B.SE and the hybrids; B x W, E x W, Sewere x W.SE, OV-1 x W.SE and OV-1 x B.SE were sown each in one bed at the spacing of 0.5m x 0.5m. Some of the F_1 hybrids were selfed to produce the F_2 plants. The rest F_1 plants were backcrossed to their respective parents to produce their backcrosses (BC_1 andBC_2).

EVALUATION

The parents, F_1s, F_2s and BC_1s and BC_2s were evaluated in a randomized complete block design (RCBD) with three replications. The plots were weeded before flower initiation. NPK 20:10:10 fertilizer was applied at the rate of 200kg/ha at three weeks after emergence. Data were collected on days to 50% seedling emergence, days to first flower initiation, days to 50% flowering, length of vine at 30 days after planting, number of branches/plant at 30 days after planting,(DAP) number of fruits/plant, weight of fruits/plant, average fruit weight, seed yield/plant, number of seeds/plant, seed yield/fruit, number of seeds/fruit and 100-seed weight.

STATISTICAL ANALYSIS

The data were subjected to analysis of variance for Randomised Complete Block Design according to the procedures described by Little and Hills (1980). Separation of means for statistical significance was done according to Obi (1986) Seed yield and other yield components were subjected to correlation analysis using the computer software package, Gensat 5 release (3.2), 1995.

RESULTS

The genotypes differed significantly with respect to days to 50% seedling emergence. All the parents attained 50% seedling emergence in 10 days except B.SE which had delayed emergence. The hybrids did not differ from the parents in number of days to 50% seedling emergence. The backcross of OV-1 x B.SE to the B.SE parent showed the highest number of days to 50% seedling emergence among the genotypes (Table 2). Days to first flower initiation occurred between 34 and 40 days in all the genotypes. Among the parents, B and B.SE parents took the highest number of days to flower. The value differed significantly from the other parents in this regard. Flower initiation was significantly delayed in OV-1 x B.SE and B x W when compared to the other hybrids. There were also significant differences among the F_2s and backcrosses in this attribute.

Significant differences among the genotypes were observed in number of days to 50% flowering. Parent B showed the highest number of days to 50% flowering and differed significantly (P=0.05) from the other genotypes. Significant differences were also noted in the hybrids, F_2s and backcrosses Hybrid E x W took the least number of days to attain 50% flowering among the genotypes. (Table 2).

The genotypes differed significantly in length of vine at 30 DAP. There were also significant differences among the parents, hybrids, F_2s and backcrosses with respect to this attribute. The OV-1 parent recorded the longest vine length among the parents while OV-I x W.SE, its F_2 and backcrosses showed the longest vine length among the hybrids, F_2s and backcrosses (Table 2).

Number of branches/plant at 30 days after planting differed significantly among the genotypes. The genotype, W.SE showed highest number of branches/plant among the parents. The hybrids B x W and Sewere x W.SE had the highest number of branches among the hybrids.

Table 2: Mean performance of the genotypes on some growth attributes

Genotypes	Days to 50% seeding emergence	Days to first flower initiation	Days to 50% f lowering	Length of Vine 30DAP (cm)	Branches/ plant 30DAP
Blue (B)	10.00	39.50	44.50	91.95	3.97
White (W)	10.00	35.80	37.50	86.20	4.45
Elongated (E)	10.00	37.50	38.50	91.58	4.80
Sewere (S)	10.00	34.80	37.00	88.80	4.30
Ov-I	10.00	36.80	38.30	123.20	4.00
B.SE	10.00	34.50	36.50	109.34	4.00
Blue x White	10.30	40.00	42.00	74.79	4.90
Elongated x White	10.00	38.50	39.50	128.89	3.90
Sewere x W.SE	10.00	35.00	36.80	79.20	5.80
Ov-I x W.SE	10.00	34.30	37.30	128.01	4.60
Ov-I x B.SE	10.00	35.30	42.00	159.90	5.80
(BxW) x (BxW)	10.80	39.00	36.80	120.87	4.00
(ExW) x (ExW)	10.50	34.23	36.50	117.23	5.00
(SxW.SE)x(SxW.SE)	10.30	34.23	37.00	98.90	5.40
(Ov-I x B.SE) x (Ov-I x W.SE)	10.50	34.50	37.00	90.90	4.70
(Ov-I x B.SE) x (Ov-I x B.SE)	10.00	34.80	41.50	132.80	4.70
BXW) x B	10.50	35.00	39.30	78.07	4.20
BXW) x W	10.00	38.80	36.00	10490	3.70
EXW) x E	10.80	37.80	36.80	81.30	4.67
EXW) x W	10.50	35.00	37.00	76.40	5.09
SXW.SE) x S	10.80	35.30	36.80	98.20	4.09
SXW.SE) x W.SE	10.00	35.00	36.80	99.20	4.20
Ov-I x W.SE)x Ov-I	10.50	35.80	37.30	125.40	4.20
Ov-I xW.SE)x W.SE	10.80	35.30	37.50	122.40	3.60
Ov-I xB.SE)x Ov-I	10.80	35.80	40.30	104.31	3.90
Ov-I x B.SE) x B.SE	12.00	39.50	41.80	70.60	4.80
F-LSD (P-0.05)	1.09	2.53	2.16	81.67	0.61

Significant differences were obtained among the genotypes in all the yield attributes. The parent W had the highest values in all the yield attributes among the inbred parents. The only exception was the number of fruits/plant where Sewere had the highest value. Among the hybrids, OV-1 x B.SE was the highest in number of fruit/plant; B x W the highest in weight of fruits/plant and average fruit weight; OV-1 x W.SE the highest in seed yield/plant and number of seeds/plant while Sewere x W.SE had the highest seed yield/fruit, number of seeds/fruit and 100-seed weight. It was also noted that the B x W hybrid performed better than its parents in all attributes except seed yield/fruit, number of seeds/fruit and 100-seed weight where the parent, W did better. The E x W hybrid also performed better than the parents in all attributes except average fruit weight where the parent, W showed better performance. The Sewere x W.SE hybrid recorded significantly higher performance than the parents in all attributes except in number of fruits/plant where the parent, S did better. The OV-1 x W.SE hybrid did significantly better than the parents in all attributes except in average fruit weight and 100-seed weight where the average fruit weight did not differ significantly with that of OV-1. The OV-1 x B.SE hybrid was significantly better than the parents in number of fruits/plant, seed yield/plant and number of seeds/plant.

Most of the F_2s, performed lower than their respective F_1s. The E x W and OV-1 x W.SE hybrids, however, performed lower than their F_2s in average fruit weight while B

Table 3: Mean performance of the genotypes on some yield attributes measured

Genotypes	No of fruits/ plant	Weight of fruits/ plant (kg)	Average fruit weight(kg)	Seed yield / Plant (g)	No of seed/ plant	Seed yield /fruit (g)	No of seeds/ fruit	100-seed weight(g)
Blue (B)	1.52	1.78	1.27	20.32	167.80	14.40	119.90	12.31
White (W)	2.44	2.91	1.31	53.66	104.80	24.10	185.40	13.30
Elongated (E)	2.00	1.70	0.80	26.70	222.20	14.40	122.70	11.90
Sewere (S)	2.50	1.89	0.90	73.50	296.70	16.90	132.00	13.00
Ov-I	2.10	2.50	1.30	41.70	329.50	22.00	172.30	12.90
W.SE	1.90	1.90	1.00	37.50	303.00	21.60	174.82	12.40
B.SE	3.00	2.50	1.80	35.60	336.10	10.50	99.00	10.50
Blue x White	3.95	5.18	1.34	88.84	686.90	23.40	178.10	13.10
Elongated x White	2.50	3.10	1.20	60.00	449.60	24.80	186.70	13.70
Sewere x W.SE	2.20	2.50	1.10	74.80	539.40	35.10	260.13	14.40
Ov-I x W.SE	3.00	4.20	1.30	99.70	773.60	31.40	243.20	13.00
Ov-I x B.SE	5.50	2.60	0.90	92.10	758.90	18.70	154.00	12.20
(BxW) x (BxW)	2.51	2.87	1.21	46.34	530.40	19.00	146.00	13.40
(ExW) x (ExW)	1.70	2.20	1.40	37.50	294.70	23.40	187.20	12.70
(SxW.SE)x(SxW.SE)	1.85	1.90	1.00	51.50	384.30	31.70	235.80	13.40
(Ov-I x B.SE) x (Ov-I x W.SE)	2.30	2.70	1.32	58.00	452.60	26.90	213.40	12.50
(Ov-I x B.SE) x (Ov-I x B.SE)	2.80	2.30	0.80	40.50	423.10	15.70	162.90	10.20
BXW) x B	2.06	2.29	1.14	33.76	275.20	16.70	131.70	12.90
BXW) x W	2.17	2.14	1.03	34.25	270.00	16.00	129.40	12.60
EXW) x E	1.70	2.10	1.20	30.90	226.10	19.200	140.00	13.80
EXW) x W	2.10	2.70	1.30	45.20	342.90	21.40	167.30	13.30
SXW.SE) x S	2.00	1.90	1.00	60.60	457.10	31.20	236.80	13.40
SXW.SE) x W.SE	1.60	1.50	0.90	45.10	329.30	25.10	93.50	14.30
Ov-I x W.SE)x Ov-I	2.10	2.90	1.40	50.30	423.20	29.80	216.40	13.90
Ov-I xW.SE)x W.SE	2.10	2.40	1.20	74.00	375.19	24.40	195.10	12.70
Ov-I xB.SE)x Ov-I	2.80	3.00	1.10	53.80	443.50	20.20	172.60	12.80
Ov-I x B.SE) x B.SE	2.80	2.40	1.90	37.20	356.10	14.90	142.30	10.70
F-LSD (P =0.05)	0.45	0.36	0.14	8.47	62.84	4.10	29.77	0.37

x W was lower than its F_2 on 100-seed weight. Among the backcrosses, the (Sewere x W.SE) x Sewere maintained better performance in all seed yield attributes except in 100-seed weight where the backcross, (Sewere x W.SE) x W.SE was the best. The OV-1 x B.SE backcrosses had higher number of fruits/plant than other backcrosses while (OV-1 x W.SE) x OV-1 performed best on average fruit weight. These results are presented in Table 3.

Correlation Analysis

The result of the correlation analysis showed that seed yield/plant correlated positively and significantly with all the plant attributes measured in the cross B x W. The only exception is on number of days to 50% flowering. The correlation was negative and non significant. In the cross, E x W, highly significant and positive correlation was obtained between seed yield/plant and all the yield attributes measured. The correlation was non significant and negative on all the growth attributes except number of branches/plant at 30 days after planting where the relationship was positive but non significant. Considering the cross, Sewere x W.SE , seed yield/plant correlated positively with all the attributes except for days to 50% seedling emergence and days to first flower initiation where negative and non significant correlation values were recorded. The positive correlation estimated was highly significant on weight of fruits/plant, number of seeds/plant and number of seeds/fruit. It

Table 4: Correlation of Seed/plant with other yield attributes measured in the five crosses.

Seed yield/plant vs other attributes	Blue x White	Elongated x White	Sewere x W.SE	OV.I x W.SE	OV.I x B.SE
Seed yield/plant vs Days to 50% Seedling Emergence	-0.155 ns	-0.199 ns	-0.040 ns	0.526**	-0.286 ns
Seed yield/plant vs Days to First Flowering Initiation	0.044 ns	-0.091 ns	-0.415 ns	-0.128 ns	-0.123 ns
Seed yield/plant vs Days to 50% flowering	-0.177 ns	-0.284 ns	0.125 ns	-0.153 ns	0.026 ns
Seed yield/plant vs Vine length at 30DAP	0.589**	-0.228 ns	0.337 ns	0.009 ns	0.498*
Seed yield/plant vs No. of branches/plant 30DAP	0.576**	0.355 ns	0.458*	0.336 ns	0.461*
Seed yield/plant vs. No. of fruits/plant	0.964**	0.733**	0.292 ns	0.102 ns	0.686**
Seed yield/plant vs weight fruits of plant (kg)	0.973**	0.939**	0.689**	0.102 ns	0.920**
Seed yield/plant vs Average fruit weight (kg)	0.429**	0.492**	0.268 ns	0.147 ns	0.260 ns
Seed yield vs No. of seeds/plant	0.997**	0.979**	0.983**	0.089 ns	0.975**
Seed yield/plant vs seed/fruit (g)	0.806**	0.781**	0.254 ns	-0.006 ns	0.404 ns
Seed yield/plant vs No of seeds/fruit	0.779**	0.766**	0.777**	0.036 ns	0.245 ns
Seed yield/plant vs 100-seed weight(g)	0.562**	0.545**	0.471*	-0.116 ns	0.426*

- Correlation is significant at *the* 0.05 level

** Correlation is significant at the 0.01 level

ns Non-significant

was significant on number of branches/plant and non significant on the rest. (Table 4).

Seed yield/plant showed positive correlation with some of the attributes measured in the cross, OV-1 x W.SE. However, the correlations of seed yield with days to first flower initiation, days to 50% flowering, seed yield/fruit and 100-seed weight were negative. However, among the attributes that related positively with seed yield/plant in this cross only days to 50% seedling emergence showed significant correlation. In the cross OV-1 x B.SE, seed yield/plant was positively correlated with all the attributes measured except for days to 50% seedling emergence and days to first flower initiation which were negatively correlated. Among the attributes that correlated positively with seed yield/plant in this cross, number of fruits/plant, weight of fruits/plant and number of seeds/plant showed highly significant relationships. Vine length/plant at 30DAP and number of branches/plant at 30DAP and 100-seed weight were significant while the rest had non significant relationship. (Table 4).

DISCUSSION

The significant differences recorded among the genotypes in all attributes indicate significant amount of genetic variation between the genotypes. Seedling emergence in the parents was almost the same except in B.SE where emergence was delayed probably due to the nature of the seed. With moulded edge, absorption of moisture may be slowed down in B.SE seeds. In (OV-1 x B.SE) x B.SE backcross, emergence was further delayed suggesting that the B.SE parent has the trait for delayed emergence. The B.SE parent also showed delayed flower initiation and 50% flowering and appears to suggest that this parent has a slow growth. It was also noted that the hybrids showed some degree of vigour over their parents in these attributes. These were however not significant. The OV-1 and W.SE may be regarded as long vine types while B.SE and W are short vine types. The hybrids also showed significant vigour in this attribute. On number of branches/plant the hybrids also showed better performance than their respective parents except for OV-1 x W.SE which performed lower than the parents. Considering fruit production, the B.SE parent had the highest number of fruits/plant and on fruit weight/plant the W parent was the highest. The fruits produced by B.SE were small in size compared with the other parents. This was responsible for the low average fruit weight recorded by B.SE. The small size fruit trait in B.SE was reflected in its cross with OV-1.The low performance of the segregating generations may be attributed to inbreeding depression.

The W parent maintained highest performance in all the seed yield attributes The W and OV-1 may be grouped as high yielding types while parents B.SE and E are low yielding types. It will also be noted that though B.SE recorded lower seed yield/plant than OV-1, W.SE and Sewere it had higher number of seeds/plant. This is as a result of the relatively small sized seeds produced by B.SE when compared with the other parents. This was confirmed by the 100-seed weight of B.SE which was lowest among the inbred parents. It was also observed that OV-1 x W.SE hybrid recorded the highest seed yield/plant among the hybrids. This result could be supported by the fact that when individuals of diverse origin are mated the resulting hybrid tends to produce higher hybrid vigor (Allard, 1980). The B, W and E parents were selected from the same population (Nsukka local cultivar). It can be noted that though the parent, W is high yielding, the hybrid produced by crossing it with B did not give the best seed yield because of their pedigree relationship. The high yield recorded by OV-1 x B.SE also supported this as both parents are not closely related.

Though the correlation of seed yield to seedling emergence and flowering were not significant, the negative correlation in most of the crosses is an indication that delayed seedling emergence and flowering tend to decrease seed yield. “Egusi” melon is normally planted early in the year so that flowering begins before the periods of excessive precipitation. Heavy rains apart from causing severe flower and fruit abortions, prevent bees that are the only known pollinators of the plant from visiting it (Ogbonna and Obi, 2000). Longer vine length and higher number of branches had enhancing effect on seed yield. This agrees with earlier report by Ogbonna(2001). The positive correlation between seed yield/plant and other yield attributes suggests that any of these attributes could be used as an index for selection for seed yield in the crop.

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