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Evaluation of Agronomic Characters of 'Egusi' Melon Genotypes from Various Agro-Ecological Zones of Nigeria

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Introduction

The cultivated melon, *Citrullus lanatus* (Thunb.) Matsum. & Nakai is an important vegetable crop throughout the Tropical, Subtropical and Mediterranean climatic zones of the world (SCHIPPERS, 2000). The plant is grown virtually in all agro-ecological zones of Nigeria and frequency of production, ranges from its use as a cover crop, mixed crop and also its nutritional benefits (BADIFU AND OGUNSUA, 1991). The fruits vary much in shape and seed coats are flattened, black, reddish brown or white at the edges (IDEHEN, 2012).

Plate 1: Variation in seeds of 'egusi' melon
a) Brown seeds with black edges
b) Light brown seeds with smooth edges
c) Light brown seeds with white edges
d) Large, brown seeds with 'capped' tips
e) Large, cream coloured seeds with smooth edges
f) Large, brown seeds with smooth edges

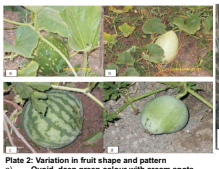

Plate 2: Variation in fruit shape and pattern
a) Ovoid, deep green colour with cream spots.
b) Ovoid and cream coloured fruits
c) Spherical with deep green longitudinal stripes
d) Spherical, light green stripeless fruits

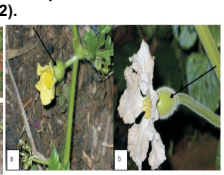

Plate 3: Flower types showing developing ovary
a) Yellow
b) White

Objectives

This study was carried out in order to determine the variability and identification of agronomic characters that discriminates different 'egusi' melon genotypes collected from various agro-ecological zones in Nigeria.

Materials and Methods

Seeds of fifty genotypes of 'egusi' melon were collected from five agro-ecological zones in Nigeria. Two field evaluations were carried out at the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Nigeria (Latitude 7.350N, 3.880E) in April and September, 2012. Data collected on agronomic characters were subjected to statistical analysis using SAS/PC version 8.0 (SAS, 1999).

Results and Discussion

This study revealed that the 'egusi' melon genotypes from various agro-ecological zones exhibited a wide range of genetic variation in most of the agronomic characters. The high significant difference for vine length, fruit weight, seed weight and 100-seed with respect to the agro-ecological zones shows that these characters could be useful as selection indices for improvement in seed yield and this trend was reported in an earlier study on 'egusi' melon (KEHINDE, AND IDEHEN, 2008). Mean performance (Table1) showed that genotypes from the rainforest-5 agro-ecological zone had the highest yield (2091.94 kg/ha) which implies that these materials could be used with those from other zones for future hybridization purposes.

Table 1. Performance of the 'egusi' melon genotypes across agro- ecological zones

Agro-Ecological Zones	Seed yield (Kg/ha)	Number of days to germination	Number of days to flowering	Number of branches/ plant	Vine length (cm)	Number of days to first fruiting	Number of fruits/ plant	Fruit circumference (cm)	Fruit weight (g)	Seed weight/ fruit (g)	100-seed weight (g)
A	1018.32d	5.40 ab	33.30bc	2.93ab	315.75c	38.12a	2.54b	34.21a	579.17b	113.78b	14.27e
B	1065.93d	6.00a	35.00ab	3.00 ab	535.01a	38.02a	2.79a	32.75a	627.50a	126.04a	15.84a
C	953.50e	5.67ab	33.67 abc	3.00 ab	426.66 b	35.11bc	2.50bc	32.33a	478.11d	109.11bc	14.50de
D	691.22f	5.67ab	32.00c	2.33bc	308.99c	33.16c	2.83a	35.00a	334.00e	94.33d	14.63cd
E	2091.94a	5.83a	32.67c	2.67ab	311.25c	38.42a	2.58b	33.00a	590.11b	124.33a	15.01b
F	942.25e	5.42ab	34.09abc	3.33a	327.21c	38.00a	2.46bcd	34.42a	498.25d	104.19c	14.78bc
G	1131.33c	5.07c	33.50abc	3.08ab	337.25c	37.42ab	2.38cd	33.08a	548.16c	124.25a	14.55cd
H	1260.00b	5.83a	35.59a	1.67c	442.11b	39.22a	2.33d	34.44a	503.11d	114.11b	12.53f
Mean	1144.31	5.61	33.73	2.75	375.53	37.19	2.55	33.65	519.80	113.77	14.51

A-South-West 1(Rainforest-1), B-South-West 2 (Rainforest-2), C- South-West 3 (Rainforest-3), D- South-West 4 (Rainforest-4), E-South-South (Rainforest-5), F-North-Central (Derived Savannah), G-North West (Sudan Savannah), H-North East (Montainic Savannah)

Characters like number of days to germination and fruit circumference per plant showed a larger difference between phenotypic and genotypic coefficients of variation (Table 2) indicating greater influence of the environment on these characters, hence their instability. The high broad sense heritability estimates for vine length, number of fruits per plant, fruit weight per plant, seed weight per fruit, 100-seed weight and seed yield indicated that these characters were less influenced by environmental factors, hence high response to selection. These findings were similar on an earlier study on 'egusi' melon (KEHINDE AND IDEHEN, 2008).

Table 2. Variance components and heritability estimates of the agronomic characters of the 'egusi' melon genotypes

Character	Mean	Phenotypic variance	Genotypic variance	Genotypic coefficient of variation (%)	Phenotypic coefficient of variation (%)	Heritability (%)
Seed yield (Kg/ha)	1144.31	521187.82	520051.92	63.09	63.02	99.78
Number of days to germination	5.61	0.27	0.15	9.24	6.79	53.90
Number of days to flowering	33.73	4.11	2.80	6.01	4.96	68.10
Number of branches/plant	2.75	0.84	0.58	33.25	27.71	69.41
Vine length/plant (cm)	375.53	20749.23	20304.70	38.36	37.94	97.86
Number of days to first fruiting	37.19	12.19	9.95	9.39	8.48	81.65
Number of fruits/plant	2.55	0.10	0.09	12.14	11.76	93.75
Fruit circumference/plant(cm)	33.65	2.85	0.89	5.02	2.81	31.27
Fruit weight/plant (g)	519.80	24803.53	24558.65	30.30	30.15	99.01
Seed weight/fruit(g)	113.77	369.95	360.71	16.91	16.69	97.50
100-seed weight (g)	14.51	2.61	2.59	11.13	11.09	99.23

Multivariate analysis (Table 3) showed the first principal component with the highest eigen value and accounted for the highest proportion of variation 35.26% and was loaded with number of days to flowering, number of days to first fruiting, fruit weight per plant and seed weight per fruit. Thus, indicating these variables as useful candidates for effective discrimination of melon genotypes.

Table 3. Eigen vectors, eigen values and percentage variance of first four principal components of the agronomic characters of the 'egusi' melon genotypes

Character	Principal Component			
	1	2	3	4
Seed yield (Kg/ha)	0.31	-0.01	-0.14	0.62
Number of days to germination	0.13	0.02	0.58	0.33
Number of days to flowering	0.30	-0.29	0.24	-0.43
Number of branches/plant	0.05	0.43	-0.32	-0.37
Vine length/plant (cm)	0.21	0.02	0.54	-0.33
Number of days to first fruiting	0.40	-0.27	-0.10	0.03
Number of fruits/plant	-0.16	0.41	0.37	0.20
Fruit Circumference (cm)	-0.32	-0.30	0.01	0.08
Fruit weight/plant (g)	0.46	0.11	-0.11	-0.01
Seed weight/fruit(g)	0.46	0.10	-0.09	0.07
100-Seed weight(g)	0.06	0.59	0.03	-0.02
Eigen Values	3.87	2.60	2.13	1.33
Variance (%)	35.26	23.70	19.37	12.12
Cumulative Variance (%)	35.26	58.96	78.34	90.46

The single linkage clustering analysis (Figure 1) showed the distinction of the genotypes from rainforest-5 agro-ecological zone from all others and this is evident of its high seed yield. Component biplots (Figure 2) of the genotypes further revealed their relationship based on the agro-ecological zones via clusters. Genotypes from rainforest-2, rainforest-4 and rainforest-5 were distinct from those from all other zones.

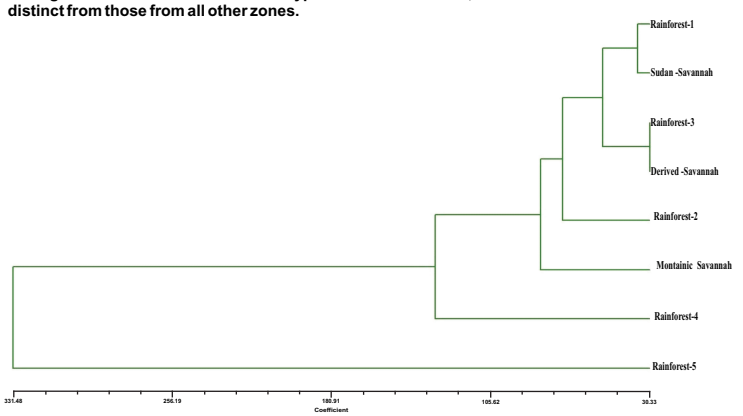

Figure 1. Dendrogram resulting from Single Linkage Cluster Analysis of the agro-ecological zones based on the performance of the genotypes

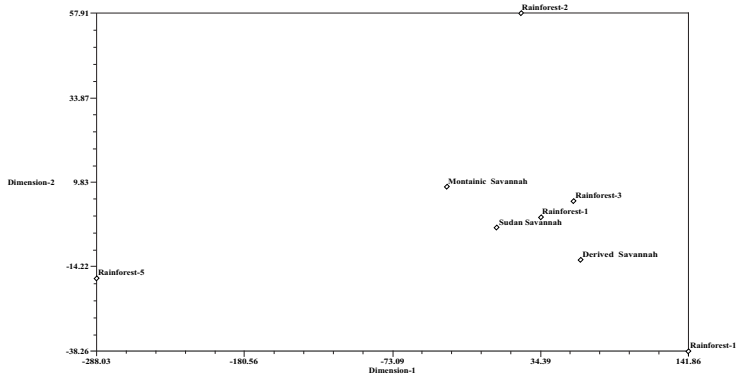

Figure 2. Biplot showing the agro-ecological zones based on the performance of the genotypes

Conclusion

This study shows significant variability in the genotypes from the various agro-ecological zones and number of days to flowering, number of days to first fruiting, fruit weight per plant and seed weight per fruit were the most discriminatory characters. Dendrogram generated from similarity or genetic matrices provided an overall pattern of variation as well as the degree of relatedness among the genotypes. Genotypes from the rainforest-5 agro-ecological zones were the highest yielder and distinct from those from other zones, hence they could be useful for future breeding programmes

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