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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 Meditarranean climatic zones of the world (SCHIPPERS, 2000). Nigeria is in the Tropical zone and lies at latitude 4^0 and 14^0 N, and 3^0 and 15^0 East of the equator. The country is divided into two major agro-ecological zones; namely the Forest and savannah agro-ecological zones (ILOEJE, 2001). The two major zones were further subdivided into three zones each; the forest consists of salt-water swamps, fresh-water swamps and rain forest. While, the Savannah zones consists of Guinea Savannah, Sudan Savannah and Sahel Savannah. The 'egusi' melon 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). This study was carried out in order to determine the variability and identification of agronomic characters that discriminates different 'egusi' melon accessions collected from various agro-ecological zones in Nigeria.

Material and Methods

Fifty genotypes of 'egusi' melon seeds were collected from five agro-ecological zones in Nigeria. Thirty-nine from South-West, a rainforest agro-ecological zone and were further sub-divided into rainforest-1, rainforest-2, rainforest-3 and rainforest-4 agro-ecological zones. Two from South-South (rainforest-5 agro-ecological zone), four from North Central (Derived Savannah), four (North West, a Sudan Savannah) and one from North East (Montainic Savannah). Two field evaluations were carried out at the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Nigeria (Latitude 7.35^0N, 3.88^0E) in April and September, 2012. The experiment was laid out in a randomized complete block design with three replicates and in single row plots of 10 m x 1m each. All cultural practices were carried out till harvest.

Data were collected on agronomic characters and subjected to statistical analysis using SAS/PC version 8.0 (SAS, 1999). Analysis of variance was done and means were separated using Duncan's Multiple Range Test. Dendrogram was constructed using the Sequential Agglomerative Hierarchical Nesting (SAHN) based Unweighted Pair Group with Arithmetic Mean (UPGMA) to infer agro-ecological relationship. In addition, the Principal Component Analysis (PCA) based clustering was also carried out using the sub-routine EIGEN to determine the character contribution to the over all variation. Two dimensional plot was constructed using the eigen values to reveal the spatial distribution of the various agro-ecological zones.

Results and Discussion

The analysis of variance revealed that sufficient variability exists in the fifty genotypes of 'egusi' melon evaluated in both seasons. Results of 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 parameters. 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) of the genotypes showed those from the rainforest-5 agro-ecological zone had the highest yield (2091.94 kg/ha) and the least for rainforest-3 and the derived savannah with 953.50 kg/ha and 942.25kg/ha, respectively. This implies that these materials could be used in conjunction with those from other zones for future hybridization purposes with the aim of improving seed yield.

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Table 1. Performance of the agronomic characters 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 brances/ Plant	Vine length (cm)	Number of days to first fruiting	Number of fruits/ plant	Fruit circumfer ence (cm)	Fruit Weight (g)	Seed weight/ Fruit (g)	100-seed weight (g)
A	1018.32d	5.40 ab	33.30bc	2.93 ab	315.75 c	38.12 a	2.54 b	34.21 a	579.17 b	113.78 b	14.27 e
B	1065.93d	6.00a	35.00ab	3.00 ab	535.01a	38.02 a	2.79 a	32.75 a	627.50a	126.04a	15.84 a
C	953.50e	5.67 ab	33.67 abc	3.00 ab	426.66 b	35.11 bc	2.50 bc	32.33 a	478.11 d	109.11 bc	14.50 de
D	691.22f	5.67ab	32.00c	2.33bc	308.99 c	33.16 c	2.83 a	35.00 a	334.00e	94.33 d	14.63 cd
E	2091.94a	5.83 a	32.67c	2.67 ab	311.25 c	38.42 a	2.58b	33.00 a	590.11b	124.33 a	15.01 b
F	942.25 e	5.42 ab	34.09abc	3.33a	327.21 c	38.00 a	2.46 bcd	34.42 a	498.25 d	104.19 c	14.78 bc
G	1131.33c	5.07c	33.50 abc	3.08ab	337.25c	37.42 ab	2.38 cd	33.08 a	548.16c	124.25 a	14.55 cd
H	1260.00b	5.83 a	35.59a	1.67c	442.11b	39.22 a	2.33d	34.44 a	503.11d	114.11b	12.53 f
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 branches per plant, vine length and fruit weight per plant showed a larger difference between phenotypic coefficient of variation (PCV) and genotypic coefficient of variation GCV (Table 2) indicating greater influence of the environment on these characters, hence their instability. The low variation between PCV and GCV for number of days to flowering and fruit circumference per plant indicates the stable nature of these characters and is indicative of less scope for improvement as also reported by (OKOYE, AND ENEOBONG, 1992). 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.

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

These findings were similar to that of KEHINDE AND IDEHEN (2008), on an earlier study on 'egusi' melon. The first component which accounted for the highest proportion of variation 35.26% (Table 3), was mostly loaded with characters such as number of days to flowering, number of days to first fruiting, fruit weight per plant and seed weight per fruit. These characters are the most important in discriminating among the genotypes evaluated. In the second component, numbers of branches per plant, number of fruits per plant and 100-seed weight were the most significant characters, while the third component was loaded mainly by number of days to germination.

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

	Principal Component			
Character	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

Cluster analysis had the singular efficacy and ability to identify crop genotypes with highest level of similarity using the dendrogram (ALIYU, AND FAWOLE, 2000). The single linkage clustering analysis (Figure 1) showed the distinction of the genotypes from rainforest-5 agro-ecological zone from all others and is evident of the high yield recorded for it. Component biplots (Figure 2) of the accessions further revealed the relationship of the genotypes 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, while all others were clustered together in the same plot.

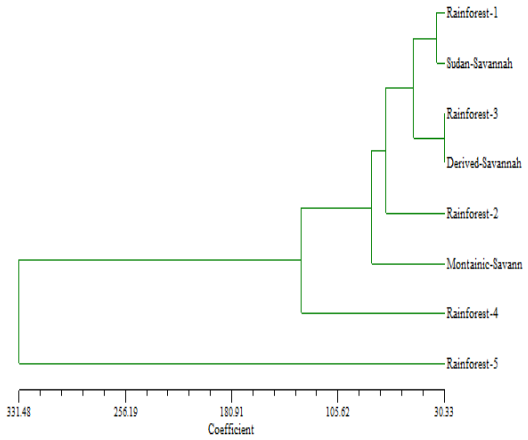

Figure 1. Dendrogram resulting from Single Linkage Cluster Analysis (SLCA) of the agronomic characters across agro-ecological zones

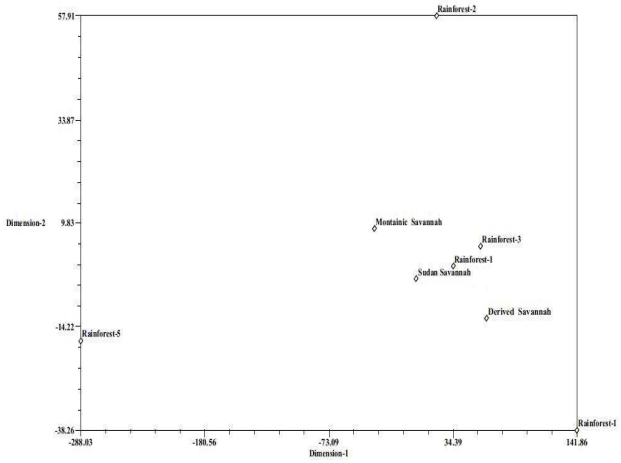

Figure 2. Biplot showing the distribution of the agro-ecological zones based on the performance of the genotypes.

Conclusions and Outlook

This study has shown that significant variability exists 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. Morphological 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 they were distinct from those from other zones, hence they could be used for future breeding programmes

References

ALIYU ,B. AND FAWOLE, I. (2000). Inheritance of pubescence in crosses between *Vigna unguiculata* and *V. rhomboidea*. Nigerian Journal of Genetics 15: 9-14

BADIFU, G. I. O. AND OGUNSUA, A. O. (1991). Chemical composition of kernels from some species of Cucurbitaceae grown in Nigeria. Plant foods Human Nutrition 41: 35-44

IDEHEN, E. O. (2012). Characterization, Reproductive Biology and In-vitro regeneration in 'Egusi' Melon (*Citrullus lanatus* (Thunb.) Matsum & Nakai). Unpublished Ph.D. Thesis. Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.

ILOEJE, N. P. (2001). A new geography of Nigeria. New revised edition. Longman , Nigeria, PLC., 200 p

KEHINDE, O. B. AND IDEHEN, E. O. (2008). Genetic Variability and Correlation Studies in 'Egusi' Melon (*Citrullus lanatus* (Thunb.) Matsum & Nakai). Acta Agronomica Hungarica 56: (2) 213–221

OKOYE, F. I. AND ENEOBONG, E. E. (1992). Genetic Variability and Correlation Studies in the African Yam Bean *Sphenostylis stenocarpa).* Nigerian Journal of Botany 5: 75 – 83.

STATISTICAL ANALYSIS SYSTEM (1999). *Statistical Methods*. SAS Institute Inc. Cary North Carolina.

SCHIPPERS, R. R. (2000). African indigenous vegetables. An overview of the cultivated species, Chathan, U. K. Natural Resources Institute ACP-EU Technial Center for Agricultural and Rural Cooperation. pp. 57-58