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VARIATION AMONG AGRONOMIC TRAITS AND MINERAL CONTENTS IN 15 ACCESSIONS OF GARDEN EGG PLANT (*Solanum aethiopicum*) IN SOUTHWEST OF NIGERIA

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ABSTRACT

Throughout Africa, *S. aethiopicum* is very popular and plays a vital role in many human diets. Despite the fact that there are previous reports on yield characteristics and nutrition of the crop, there is a need to assess the crop for variations in mineral properties. This study aimed at determining the amount of genetic variability and level of heritability of agronomic and mineral contents of *S. aethiopicum* accessions. Fifteen accessions of *S.aethiopicum* were evaluated in an RBCD experimental design to generate data for use. Data were collected for agronomic, morphological and mineral contents. Data collected were subjected to ANOVA and the significant means were also separated using Duncan Multiple Range Test (DMRT) at 5% probability level. Variance component method was used to estimate phenotypic and genotypic variations as well as heritability. Significant differences were observed among accessions for the various morphological and mineral nutritional traits evaluated. High heritability estimates, Phenotypic and Genotypic variances were observed for mineral content and fruit yield. Genotypic and phenotypic variances ranged between 0.31 and 11078.85 for the agronomic traits. The hierarchical cluster analyses revealed five distinct clusters at similarity index of 85%. The first cluster included 6 accessions; the second included accessions NHS 101A, and OG 03; the third were NHS 104 and OG 01; the fourth included NHS 105; and the fifth included NHS 106, NHS 108, OS 02 and OS 03. Accessions OS 01 and OS 03 appear unique based on the traits for which the accessions were assessed.This study revealed that substantial variation exists within the accessions of *S.aethiopicum* evaluated, hence, it will help in breeding process of good quality genotypes for higher yields and mineral content.

Keywords: *S. aethiopicum*; Heritability; Genetic; Phenotypic variability; Mineral content.

INTRODUCTION

African eggplant (*Solanum gilo Raddi*) is synonymous to *Solanum aethiopicum* Gilo group otherwise known as garden egg (Norman, 1992; Lester and Daunay, 2003, Shacketon *et al.*, 2009). In the remote east, it holds a position similar to that of tomato in other parts of the world. Indeed, it is sometimes referred to as "Asia's tomato" (Khan*, et al.,* 2009).

Eggplant (*Solanum species*) is one of the most broadly cultivated vegetable crops in many tropical and subtropical regions of the globe, mainly for its fruits and leaves as vegetables (Manoko and Van der Weerden, 2004). According to Daunay *et al*., (2001), it is classified under the family Solanaceae.

African garden eggs have indigenous medicinal values, which include, weight reduction use for treatment of several diseases such as asthma, skin infections, constipation, and lots more. Various parts of the plant are used to cure certain body ailments such as diabetes, leprosy, gonorrhea, cholera, bronchitis, dysuria, dysentery, asthenia, and hemorrhoids (Gill, 1992). In addition, the crop is also used in preventative medicine to prevent heart infections and control blood pressure (Grubben and Denton, 2004; Okon *et al*., 2010). Eggplant consumption has a lot of health aids including effectiveness in blood cholesterol reduction, positive help in heart problems, and weight loss (Muanya, 2009).

Increasing the yield of any crop through breeding largely depends on the presence of variability among the breeding materials (Adeyemo and Ojo, 1991). The choice of breeding programs depends on the knowledge of the nature and magnitude of variations of crops in the available material, magnitude of association of characters with the crop yield, the extent to which these characters are heritable and the extent at which environmental factors affect them (Aruah *et al*., 2011).

Four cultivar-groups are recognised in *S. aethiopicum*, which include: Gilo, Shum, Kumba, and Aculeatum (Lester and Daunay, 2003). The Gilo group characterizes what is largely known in Ghana as garden eggs. The Gilo group is the most important cultivar-group, which includes cultivars with smooth fruits that are common in the Western and Eastern parts of Africa, and cultivars with more or less strongly ribbed fruits. *Solanum aethiopicum* variety varies in fruit shape, fruit size, length, diameter, weight, seed content, colour as well as taste. The cultivars vary in petiole length, leaf blade, branching habit, time of flowering, time of fruit set, and maturity (Blay, 1991; Ofori, 2008).

Throughout Africa, local eggplants are very popular and therefore play a vital role in human diets. The plants are easy to raise with moderate resistance of diseases and pests, and also provide a steady supply of food and income for farmers and market women. Eggplants are very rich in iron and low in vitamin C relative to tomato (Okon *et al*., 2010) and also contain a considerable amount of calcium (Horna *et al*., 2007).

Habitual consumption of diets that are inadequate in protein and essential micronutrients is an important contributing factor to the significant nutritional challenges affecting a large proportion of Africa's population (Swaminathan, 2012).

Previous reports on yield characteristics and nutrition of eggplant crop abound, but there is a need to assess the variations in Agro-mineral contents of different accessions of the crop. Hence, this study aimed at determining the amount of genetic variability and heritability of agronomic and mineral content of *Solanum aethiopicum* accessions in the South Western part of Nigeria.

MATERIALS AND METHODS

Experimental Location and climatic condition

The experiment was carried out at the Department of Plant Science, Faculty of Science, Olabisi Onabanjo University, Ago Iwoye, Ogun state. The study area experiences humid tropical climate characterized by alternate wet and dry seasons (Aiyelokun *and* Odekoya*,* 2016). Ago Iwoye region is influenced by hot-wet tropical maritime air mass during the rainy season (April-October) and hot-dry tropical continental air mass during the dry season (November-March the following year) Rainfall is generally heavy, with peaks occurring in July and September (double maxima); with high temperature, high evapotranspiration, and high relative humidity. Mean annual rainfall is between 1575 and 2340 mm. The rains may be unduly prolonged in some years while their onset may be delayed as short spell between late July and Mid-August. (Aiyelokun and Odekoya*,* 2016).

Experimental Design, Planting method and Data collection

The 15 accessions were LA 01, OS 02, OS 03, OG 01, ON 02, OG 03, NHS 106, NHS 107, NHS 105, NHS 101B, NHS 108, NHS 104, NHS 101A, EK 01, and LA 03. They were collected within Lagos, Osun, Ogun, Ekiti, Ondo and Oyo (Table 1).
The Experiment was carried out using Randomized Complete Block Design (RCBD) with three replications on the field. Each replicate consisted of a single row plot of seven seedlings of each genotype on one row. Seedlings were planted at 90 x 90 cm between rows and 80 x 80 cm within heaps in a row. Each accession was planted in one row with seven plants per row providing a total of twenty plants per accession for the three replicates. Each accession seedlings was randomly planted on different rows on the field.

Data were collected from five tagged plants for each accession per replicate, making a total of fifteen tagged plants per accession for the three replicates throughout the experiment.

Data were collected for agronomic, morphological and mineral properties. These include: Days to sprouting/Emergence, Plant height (cm), Number of branches at maturity, Girth (mm), Span of canopy at maturity(cm), Leaf length with petiole(cm), Leaf width at maturity(cm), Days to first flowering, Days to 50% flowering, Days to fruiting, Fruit's yield and Fruit & seed weight (g).

Analysis was also done for four mineral contents: Calcium (Ca), Potassium (K), Zinc (Zn) and Magnesium (Mg) on the fruits of each accession.

The concentrations of the minerals were determined through a Flame Atomic Absorption Spectrometer (Thermo S4 AA system).

Statistical Analysis

Data collected were subjected to Analysis of Variance (ANOVA) to determine significance of the differences among accessions using Statistical Analysis System (SAS), 2001. The least significant difference (LSD) was used to separate the mean performance of accessions that were significantly different. To estimate the degree of variability, genotypic and phenotypic coefficients of variability (GCV and PCV) were estimated by adopting the formula described by Johnson and Robinson (1955).

Significant means were separated using Duncan Multiple Range Test (DMRT) at 5%

probability level. Phenotypic and Genotypic variances were calculated using procedure outlined by Burton (1952).

RESULTS

For all the characters, highly significant differences ($P \leq 0.01$) among the accessions were observed on the measured traits. The block effect was not significant for any of the characters except days to first flowering (Table 2).

Significant differences were observed among accessions for the various morphological and mineral contents evaluated (Table 3). For each trait, the minimum and maximum values varied largely from their respective means based on the standard error. Days to sprouting recorded the lowest standard error with respect to its mean of minimum of 3.00 and maximum of 5.00.

Phenotypic, genotypic variances and broad sense heritability estimates

The genotypic and phenotypic variances recorded ranged between 0.31 for days to sprouting and 1107885.0 for Potassium content (Table 4). Other parameters considered also showed high genotypic and phenotypic variances: 3155.659 for Magnesium content; 2308.75 for fruit and seed weights; 354.01 for fruit yield per plant; 156.89 for plant height at flowering, and so on (Table 4).

Potassium content showed the highest Phenotypic and genotypic variance of 11078.85 (Table 4). The phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) in most of the traits evaluated. Both PCV and GCV were moderately low, ranging from 8.11 to 119.08 and 8.17 to 119.24, respectively (Table 4). The heritability estimates were high for all the traits ranging from 60% to 99% (Table 4).

The genetic advance as percentage of mean (GAM) was low for days to fruiting after transplanting (16.58%), 50% flowering after transplanting (21.92%), Days to sprouting (27.50%), span of canopy (26.38%), moderate width at maturity (65.02%), plant height at flowering (58.13%), and high for number of branches at flowering (150.72), traits. The highest GAM was from fruit yield per plant (244.98%) and fruit and seed weight (212.10%). The GAM for the contents of potassium, calcium and magnesium were also very high (Table 4).

Principal Component and Cluster Analysis

The first component accounted for 42.8% of the total variation, the second contains 16.4% and the third contains 12.3%, amounting in total to 71.5% of the variation explained in the data. The first component was accounted for by days to sprouting (Table 5).

The hierarchical cluster analyses revealed five distinct clusters (Table 6). At similarity index of 85%, the first cluster includes 6 accessions. The second includes accessions NHS 101A, and OG 03. The third include NHS 104 and OG 01. The fourth include NHS 105 and the fifth include NHS 106, NHS 108, OS 02 and OS 03. Accessions OS 01 and OS 03 appear unique based on the traits for which the accessions were assessed.

In the current study, *S. aethiopicum* accessions exhibited considerable amount of variability for all the minerals assessed (Table 6).

The first five PCs accounted for 87% of the total variation observed among the 15 accessions of *S. aethiopicum*. The first PC accounted for 43%, second 16%, third 12%, forth 8% and fifth 7%.

The clustering pattern of the 15 accessions of *S. aethiopicum* revealed by Word's clustering methods indicated that five clusters were formed between 1 and 6. Where Cluster 1 consist of six accessions: EK 01, LA 01, LA 03, NHS 101B, NHS 107 and ON 02; Cluster 2: NHS 101A, and OG 03; cluster 3: OG 01 and NHS 104; Cluster 4 had a single accession; NHS 105; cluster 5 had NHS 106, NHS 105, OS 02 and OS 03 (Table 6). The accessions show closely related attributes and variability as seen in the dendrogram (Fig 1).

Table 1: List of the accessions, source and morphological attributes of 15 Genotypes of *S.aethiopicum* used in the study

Serial No.	Genotype	Source	Shape and colour of fruit
1	LA 01	Lagos	Medium, round and green
2	OS 02	Osun	Small, Round and light green
3	OS 03	Osun	Small, tomato shape with light green
4	OG 01	Ogun	Round and green with deep green stripes
5	ON 02	Ondo	Medium, round and light green
6.	OG 03	Ogun	Big, Tomato shape and yellow with deep green stripes
7	NHS 106	NIHORT Ibadan	Round with light green
8	NHS 107	NIHORT Ibadan	Tomato shape with deep green
9	NHS 105	NIHORT Ibadan	Small, round with white and green stripes
10	NHS 101B	NIHORT Ibadan	Medium, Oblong and white with green stripes
11	NHS 108	NIHORT Ibadan	Round, and white with green stripes
12	NHS 104	NIHORT Ibadan	Round, and light green with deep green stripes
13	NHS 101A	NIHORT Ibadan	Small, Oblong and white with green stripes
14	EK 01	Ekiti	Big, Tomato shape and light green
15	LA 03	Lagos	Big, Oblong and cream with green stripes

Table 2: Analysis of variance (ANOVA) for fruit yield, yield components and fruit and seed mineral nutrients for 15 *S.aethiopicum* accessions evaluated in the study

SV	df	Days to sprouting	Days to 1st Flowering	Days to 50% flowering	Plant Height (cm)	Number of Branches at maturity	Girth (mm)	Span of Canopy (cm)	Leaf length with petiole (cm)	Leaf width at maturity (cm)	Days to fruiting	Fruit's yield per plant	Fruit & seed weight (g)	Zn	K	Ca	Mg
Rep	2	0.00	2.96*	1.689	0.15	0.37	0.64	6.92	0.79	0.31	0.87	0.200	4.01	0.00	0.060	0.00	0.00
Genotype	14	0.94**	141.01**	99.99**	471.28**	172.44**	14.69**	174.32**	101.71**	52.52**	49.42**	1063.47**	6927.24**	40.25**	3323655.6**	1782.28**	9466.98**
Error	28	0.00	0.93	0.808	0.52	0.14	0.23	7.52	0.82	0.37	0.34	1.44	1.00	0.001	0.73	0.01	0.00
Total	44																

** and * significant at P ≤ 1% and 5% probability, respectively.
SV = Source of variation; Gen = Genotype; df = Degree of freedom;
Mineral nutrients in Fruit; Zn = Zinc; K = Potassium; Ca = Calcium; Mg = Magnesium

Table 3: Means, standard errors, of 16 traits including yield related traits and fruit elemental minerals, evaluated in *S.aethiopicum*

Characters	Mean±se	Min	Max
Days to sprouting	4.20±0.08	3.00	5.00
Days to first flowering	29.42±1.01	23.00	43.00
Days to 50% flowering	35.16±0.81	30.00	47.00
Plant Height(cm)	44.35±1.83	22.00	67.40
Number of branches at maturity.	10.35±1.11	3.20	30.00
Girth (mm)	8.84±0.33	3.20	12.40
Span of canopy(cm)	55.77±1.16	24.60	70.10
Leaf length with petiole (cm)	21.76±0.86	8.80	30.00
Leaf width at maturity (cm)	13.12±0.61	5.50	18.00
Days to fruiting	47.80±0.57	40.00	55.00
Fruit yield per plant	15.80±2.75	5.00	82.00
Fruit & weight(g)	46.66±7.00	3.00	163.30
Zn	13.44±0.53	7.42	19.63
K	1864.06±153.30	358.62	4353.63
Ca	36.49±3.55	4.21	93.39
Mg	104.17±8.18	19.15	216.35

Se = Standard error;

Mineral nutrients in Fruit; Zn = Zinc; K = Potassium; Ca = Calcium; Mg = Magnesium.

Table 4: Genotypic and phenotypic variances, Genotypic and phenotypic coefficients of variation, genetic advance and heritability estimates for 16 traits assessed on 15 *S.aethiopicum* accessions

Characters	s^2g	s^2p	GCV (%)	PCV (%)	Hb^2 (%)	GAM%
Days to sprouting	0.31	0.31	13.35	13.35	92	27.50
Days to first flowering	46.71	47.33	23.23	23.39	98	47..54
Days to 50% flowering	23.12	38.20	13.68	17.58	60	21.92
Plant Height (cm)	156.89	157.23	28.24	28.27	99	58.13
Number of branches at maturity	57.43	57.52	73.22	73.28	99	150.72
Girth (mm)	4.82	4.97	24.84	25.23	96	50.37
Span of canopy (cm)	55.62	60.63	13.37	13.96	91	26.38
Leaf length with petiole (cm)	33.62	34.18	26.65	26.87	96	54.46
Leaf width at maturity (cm)	17.39	17.64	31.79	32.01	98	65.02
Days to fruiting	15.03	15.25	8.11	8.17	98	16.58
Fruit yield per plant	354.01	354.97	119.08	119.24	99	244.98
Fruit & weight (g)	2308.75	2309.41	102.98	103.00	99	212.10
Zn	13.42	13.42	27.25	27.25	90	56.14
K	11078.85	11078.85	56.47	56.47	95	116.32
Ca	594.09	594.10	66.80	66.80	99	137.60
Mg	3155.66	3155.66	53.93	53.93	98	111.09

σ_p^2 = phenotypic variance; σ_g^2 = genotypic variance; GCV = Genotypic Coefficient variation; PCV = Phenotypic Coefficient Variation; Hb^2= Broad sense Heritability; GAM = Genetic advance as percentage of mean; Mineral nutrients in Fruit; Zn = Zinc; K = Potassium; Ca = Calcium; Mg = Magnesium

Table 5: Principal components analysis for 16 quantitative characters measured in fifteen accessions of *S. aethiopicum*.

Character	**PCA1**	**PCA2**	**PCA3**	**PC4**	**PC5**
Days to sprouting	0.04	0.11	0.11	**0.54**	-**0.67**
Days to first flowering	0.21	0.28	**-0.37**	-0.05	-0.03
Days to 50% flowering	0.21	**0.37**	**-0.34**	0.10	-0.07
Plant Height (cm)	-0.11	**0.43**	**0.41**	-0.04	0.19
Number of branches at maturity	**-0.35**	0.07	-0.00	0.17	-0.18
Girth (mm)	0.27	0.16	**0.32**	-0.16	-0.05
Span of canopy (cm)	-0.03	0.17	**0.57**	0.16	0.02
Leaf length with petiole (cm)	**0.36**	0.01	0.02	0.08	0.20
Leaf width at maturity (cm)	**0.35**	-0.09	-0.01	-0.05	0.19
Days to fruiting	0.22	**0.40**	-0.18	-0.10	-0.20
Fruit yield per plant	**-0.33**	-0.01	-0.12	0.18	0.09
Fruit & weight (g)	0.21	**-0.42**	0.12	0.21	0.08
Zn	0.10	-0.11	-0.18	**0.64**	**0.31**
K	**-0.33**	0.13	-0.18	0.08	0.29
Ca	0.18	**0.32**	0.13	**0.31**	**0.36**
Mg	**-0.33**	0.26	-0.09	0.01	0.18
Eigen value	6.85	2.63	1.97	1.25	1.19
Proportion variation	0.43	0.16	0.12	0.08	0.07
Cumulative variation	0.43	0.59	0.72	0.79	0.87

†**Bold** values indicate correlation coefficients with value ≥ 0.5 in absolute value.
PC = Principal components;
Mineral nutrients in Fruit; Zn = Zinc; K = Potassium; Ca = Calcium; Mg = Magnesium

Table 6: Mean values for the observed 16 agro-nutritional characters for the 15 genotypes of *S .aethiopicum* and for the five groups distinguished by cluster analysis

Characters	**Cluster I** EK 01, LA 01, LA 03, NHS 101B, NHS 107, ON 02	**Cluster II** NHS 101A, OG 03,	**Cluster III** OG 01, NHS 104,	**Cluster IV** NHS 105	**Cluster V** NHS 106, NHS 105, OS 02, OS 03
Days to sprouting	*4.00*	4.00	**5.00**	4.00	4.00
Days to first flowering	29.00	**32.00**	31.00	*24.00*	25.00
Days to 50% flowering	**35.14**	35.09	38.50	*31.33*	32.17
Plant Height (cm)	*37.70*	**54.10**	43.10	43.00	52.10
Number of branches at maturity	6.23	12.07	*4.35*	**29.67**	15.10
Girth (mm)	9.57	9.59	**10.22**	*3.70*	6.39
Span of canopy (cm)	52.69	59.23	**60.50**	57.33	*52.30*
Leaf length with petiole (cm)	24.54	21.05	**25.94**	*8.97*	17.04
Leaf width at maturity (cm)	15.20	12.00	**17.40**	*5.80*	8.80
Days to fruiting	46.00	50.00	**51.00**	*41.00*	47.00
Fruit yield per plant	*8.00*	14.00	8.00	**80.00**	21.00
Fruit & weight (g)	**82.53**	19.69	57.43	*3.70*	8.42
Zn	**15.69**	12.62	12.90	13.93	*10.56*
K	1367.20	2045.00	*554.50*	**4351.00**	3172.40
Ca	**43.46**	37.61	33.70	*7.45*	37.74
Mg	70.09	134.80	*43.57*	**216.26**	159.14

Numbers in *italics* are lower values across the clusters
Bold numbers are higher values across the clusters
Mineral nutrients in Fruit; Zn = Zinc; K = Potassium; Ca = Calcium; Mg = Magnesium

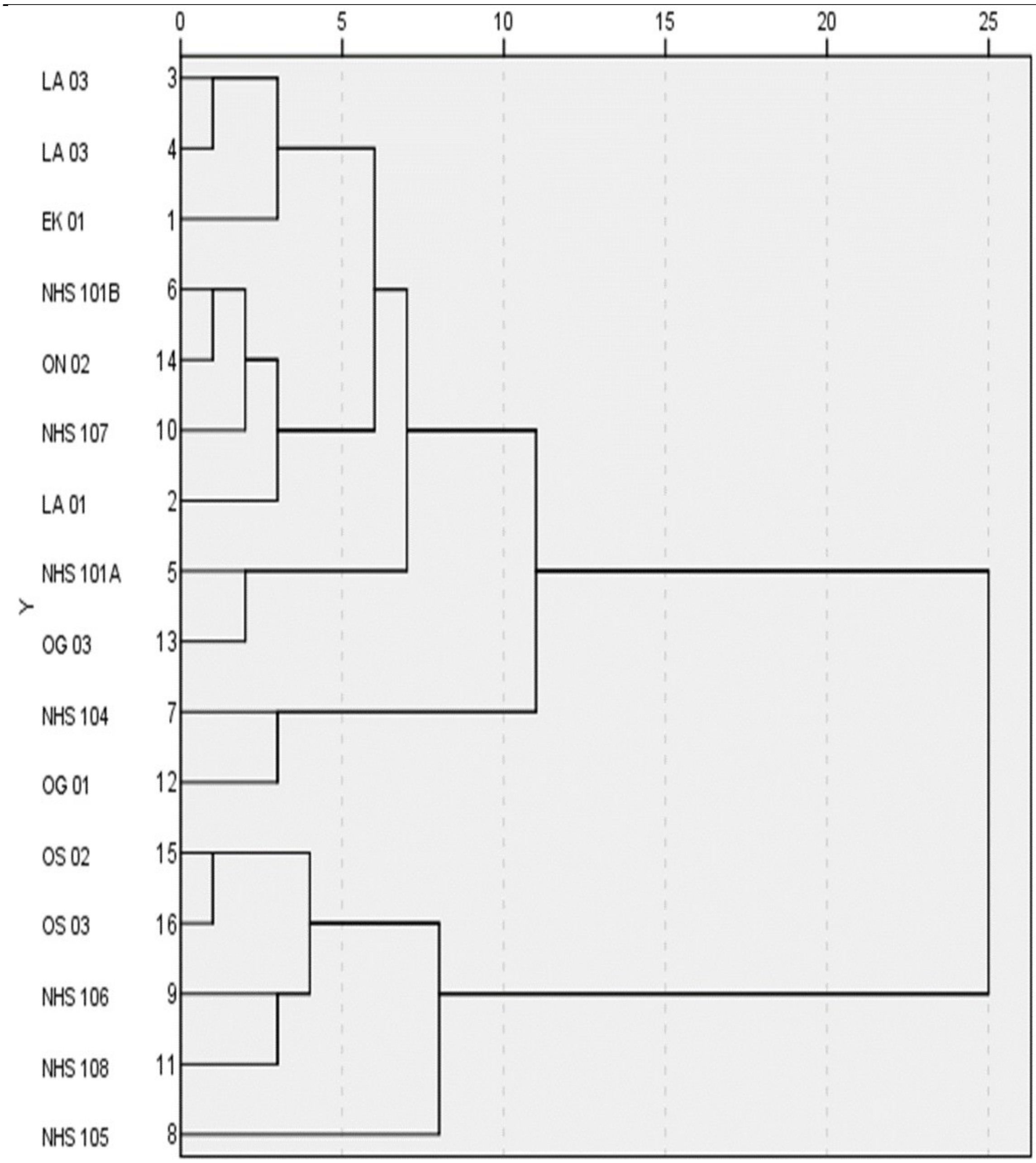

Figure 1: Dendrogram for the 15 accessions of *S.aethiopicum* following Ward's cluster analysis based on the squared Euclidean distance for the first five significant principal components

DISCUSSION

The significant estimates of the genetic variance for all traits evaluated provided an indication that the assembled accessions as a group have an appreciable level of genetic variability. These observed variabilities among the accessions play a significant role in any crop-breeding programme and will determine the limit of selection for yield improvement in the eggplant.

Genetic assessment of germplasm is normally undertaken by plant breeders to identify genetic variation in the accessions and to discover patterns of genetic diversity. Analysis of genetic diversity in accessions helps plant breeders to make proper choices of parents for use in breeding programs (Acquaah, 2007). The result of cluster analysis grouped the genotypes of eggplant into five clusters for the agronomic and mineral contents. This is in harmony with Kumar *et al.*, (2008) and Nyadanu *et al.*, (2014) who reveal wide diversity in eggplant. This result is also in line with Kumar *et al.*, (2013), who had earlier reported the existence of genetic variation among eggplant genotypes.

Estimation of variability is an imperative prerequisite for realizing response to selection as the progress in breeding depends upon its amount and nature (Kumar *et al.*, 2013). Genetic variation in populations of crop species is sacrosanct for successful selection and yield improvement programs (Idahosa *et al.*, 2010). The significant differences observed among the accessions for all the traits in both plant locations suggest the existence of sufficient inherent genetic variability among the accessions. This variation can be exploited for further yield improvement of eggplants.

The relative amount of genotypic variation is best expressed as the genotypic coefficient of variation (GCV), since this variable takes into account the mean value as well as takes the unit of measurement into consideration, and provides a measure for comparing genetic variability in various morphological characters. Among the traits evaluated, fruit yield per plant had the highest proportion of GCV: PCV estimates with corresponding high estimates of broad sense heritability, contrary to findings in many other crops, that time to flowering is typically under strong genetic control (Thurling and Ratinam, 1989).

Heritability estimates are indicative of the relative importance of genetic variation to the total variation in a population and hence they depend on the absolute size of genetic and environmental variations. The genetic component varies with the type of population (e.g. individuals, as in the study, or progenies of particular mating designs) while the environmental component is dependent on the experimental conditions and number of replications in which the traits are measured (Hallauer, 2007). In this study, the broad-sense heritability estimates were very high for Zn, K, Mg and Ca contents of the fruit, suggesting how rich these accessions are in mineral content. The value of heritability estimates is enhanced when used together with the selection differential or genetic advance (Falconer and Mackay, 1996). Combined high heritability estimate and genetic advance is an indication that variation is attributable to high degree of additive effect and selection would prove effective (Panse, 1957).

Multivariate statistical tools have found extensive use in summarizing and describing the inherent variation among crop genotypes. In particular, principal component analysis (PCA) and hierarchical cluster analyses techniques identified plant traits that characterize the distinctness among selected genotypes. In this study, the agronomic and mineral content traits show high heritability estimates. These are often extended to the classification of a population into groups of distinct orders based on similarities in one or more characters, and thus guide in the choice of parents for hybridization and development of crop ideotypes (Donald, 1968). The first component accounted for 42.8% of the total variation, the second contains 16.4% and the third contains 12.3%, amounting to a total of 71.5% of the variation explained. The first component was accounted for by date of sprouting. Both traits had negative scores, indicating they are positively correlated, with some accessions having the best expression for the index of these traits that dominated the first principal component axis.

It has been noted that crosses between unrelated and consequently genetically distant parents show greater hybrid vigour than that between closely related parents (Mehta *et al.*, 2004). Information about genetic diversity also permits the classification of parent lines into heterotic groups, which is particularly important for hybrid breeding. Thus, the prominent characters coming together in different principal components and contributing towards explaining the variability have the tendency to remain together which may be kept into consideration during utilization of these characters in breeding program.

The cluster analyses revealed five distinct clusters. At similarity index of 85% the first cluster includes 6 accessions. The second includes accessions NHS 101A, and OG 03. The third include NHS 104 and OG 01. The fourth include NHS 105 and the fifth include NHS 106, NHS 108, OS 02 and OS 03. Accessions OS 01 and OS 03 appear unique based on the traits for which the accessions were assessed.

The result of principal component analysis of the present study corroborated with the findings of Rahman (1999); Uddin *et al.*, (2014) and Akpan *et al.,* (2016) who found that number of fruits per plant contributed the highest for total variation in eggplant accessions as observed in this study. Rahman (1999) and Uddin *et al.* (2014) further noted that fruit weight, fruit length, and days to 50% flowering were also important to some extent for the variation. Similar observation was noted by Rajput *et al.*, (1996) in eggplant. Correlation of yield and other traits is important in indirect selection of genotypes for yield improvement (Machikowa and Laosuwan, 2011). Significant and positive correlation between two characters suggests that these characters can be improved simultaneously in a selection programme. This is because it shows mutual relationship among characters and selection for one will translate to selection and improvement of the other (Fayeun *et al.*, 2012; Akpan *et al.,* 2016).

CONCLUSION

The study revealed that substantial variation exists within the accessions of eggplant evaluated. Most of the traits had high volumes for both broad sense heritability and genetic advance which provide indications that recurrent selection procedures may be used to fix these traits after hybridization and selection. Most of the accessions also showed wide variability for mineral contents of Zn, Ca, K and Mg; hence, the fruits should be considered for mineral nutritional purpose. Accessions NHS 105, OS 02 and NHS 108 are recommended for selection for agronomic traits such as high yield and NHS 105 can also be selected for mineral nutrients of Potassium and Magnesium.

Some accessions were very distinct from others and also show significant heritability estimates among the traits studied. Hence, genetic improvement is recommended for eggplant to enhance yield and mineral contents.

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