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Variation in Morphological and Agronomic Traits of Selected African Eggplant Accessions

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ABSTRACT

The African eggplant is an important indigenous vegetable crop in Africa. However, there is limited information on variations among the wild species that could potentially act as a source for crop improvement. A study conducted in Kenya at the University of Nairobi's field station evaluated the agro-morphological traits of 72 accessions of African eggplant sourced from the World Vegetable Center and the National Gene Bank of Kenya. Randomized complete block design with three replications was used. Based on qualitative traits, cluster analysis grouped the accessions into two main groups. Cluster I had 51 accessions while cluster II had 21 accessions. Two of the three principal components axes had Eigen values > 7 and cumulatively accounted for 67.5% of total variability. Fruit and leaf characters supported the largest portion of variability among the African eggplant genotypes. Analysis of variance revealed significant differences (*P*<0.05) among accessions in all quantitative traits evaluated. The average yield per plant ranged from 72.3 g to 2902.3 g while the mean number of fruits ranged from 2 to 360 fruits per plant. The average weight of a single fruit per plant recorded a highly significant positive correlation with fruit length (r=0.73) and breadth (r=0.71). However, a negative but highly significant correlation was observed between fruit weight and the number of days to 50% flowering (r= -0.24). Generally, the study revealed significant morphological and agronomic differences among the accessions evaluated, indicating genotypic diversity that can be incorporated into breeding programs.

INTRODUCTION

Vegetables are important components of all human diets and traditional vegetable species are especially important due to their nutritional and medicinal value due to their richness in vitamins, minerals, phytochemical compounds, and dietary fiber content (Taha *et al.,* 2018). Africa is home to diverse traditional vegetable species that have been used as food for years. The African eggplant (*Solanum aethiocum*, *S. anguivi, S. macrocarpon* and additional *S.* sp.), is one of the indigenous vegetables that play a significant role in both subsistence production and income generation among rural and urban resource-poor communities in Africa (Majubwa et al., 2015). In Kenya, the leading counties in production and marketing of both fruits and leafy parts of African eggplant are Makueni, TaitaTaveta and Kilifi each contributing 21.8%, 16.2% and 14.2% respectively (HCDA 2014). According to the horticultural crops development authority, there are five main commercial varieties of eggplant currently grown in Kenya, including cvs. Black beauty, Florida High Bush, Ravaya, Long Purple and Early Long Purple. Recent studies on African eggplant in Kenya have focused on carotenoid profiling of leaves (Mibei *et al.*, 2016) and the effect of post-harvest practices on nutritive content (Mbondo et al., 2018).

Despite the importance of African eggplant, the crop remains neglected and underutilized in most African countries. Cultivated local varieties are largely landraces and their production is in drastic decline due to pest and disease pressures, poor yield and small fruit size (Nyadanu et al., 2014). The African eggplant wild relatives represent immeasurable source of genetic variation for the development of novel cultivars to address the challenges posed by biotic and abiotic stresses (Mutegi et al.,2015). Singh et al., (2014) reported that morphological characterization is essential to describe the characteristics of cultivars and landraces which then serve as a genetic guide in selection of parents for hybridization while broadening the genetic base of the cultivated plant varieties. However, there are limited studies that have characterized the African eggplant genotypes. Previous studies focused narrowly on only a few genotypes collected from limited regions. For example, studies by Nyadanu et al., (2014) characterized 23 African eggplant accessions sourced from Ghana based on their agro-morphological traits. Similarly, studies by Kumar et al. (2016) also characterized the seedlings of 52 African eggplant accessions collected within Nigeria. Although studies by Osei et al., (2010) characterized the African eggplant accessions based morphological characteristics, the authors only evaluated 28 accessions from four African countries. In the current study, we evaluated a wider collection including 72 accessions from 14 African countries. The current study also evaluated additional traits related to yield and yield components of the accessions, which were otherwise not reported in the previous study.

MATERIALS AND METHODS

Experiments were conducted on humic nitisols soils at Kabete Field Station, University of Nairobi, Kenya. A total of 72 African eggplant accessions from four species including *Solanum aethiopicum* (50), *Solanum anguivi* (6), *Solanum macrocarpon* (1) and *Solanum* sp. (15) were evaluated in this study. Seventy (70) of the accessions were sourced from the World Vegetable Centre, Arusha, Tanzania, and one breeding line obtained from the National Gene Bank of Kenya. The experiments were carried out over two seasons (July 2014 to October 2014 and March 2015 to June 2015). The seedlings planted were first sown in germination trays containing peat moss germination media and transplanted to the field after four weeks where they were planted in a randomized complete block design with three replications. Two handfuls of well decomposed manure and one teaspoon of compound fertilizer N: P: K (23:23:0) at the rate of 250 kg/ha were thoroughly mixed with soil for each planting hole before transplanting the seedling. Inter-row and intra-row spacing of 80 cm and 50 cm was used with one-meter path separating the blocks. Split application of calcium ammonium nitrate (CAN) was applied during top dressing at the rate of 200kg/ha and 500kg/ha when the plants were 25cm high and six weeks respectively. During the trial, plants were sprayed using pesticide solutions namely Actara®, Karate® and Ortiva® at the rate of 20g/ 20 liter of water for each to kill whiteflies, thrips and aphids. Four plants of each accession were randomly sampled in each plot and tagged for data collection.

The genotypes were evaluated for eight (8) qualitative and nine (9) quantitative traits. The qualitative traits which included growth habit, leaf prickles, leaf hairs, flower colour, fruit shape, fruit position, fruit length and fruit breadth were characterized based on the list of modified eggplant descriptors of FAO. The quantitative traits were; plant height, leaf blade length, leaf blade width, fruit length, fruit breadth, weight of a single fruit, number of fruits per plant, days to 50% flowering and SPAD (chlorophyll content). All observations for each character were made on the same day for all accessions after 50% flowering to avoid differences in the developmental stages of growth. Dissimilarities among accessions were estimated using DARwin 6.0 software based on the Euclidian distance matrix and hierarchical clustering analyses of unweighted pair group method of arithmetic averaging. The clusters and relationships were displayed as a phenogram. Multivariate-principal component analysis (PCA) was conducted between variance-covariance matrix using GENSTAT Release 7.2 Discovery Edition 14 to identify the most significant descriptors in capturing the morphological variation in the germplasm. Analysis of variance (ANOVA) was performed for quantitative data using GENSTAT Release 7.2 Discovery Edition 14 and means of significant variables separated using Fisher's least significant difference (F-LSD) at 5 % level of significance.

RESULTS

Qualitative traits.

Most of the eggplant accessions (86.1%) showed an upright growth habit with only 4.2% being prostrate (Table 1). Accessions without leaf prickles but with very many leaf hairs formed the majority of the accessions recording 72.2% and 70.0% respectively. White coloured flowers (87.5%) dominated among the accessions with the rest having greenish white (1.4%), bluish violet (1.4%), light violet (2.8%) and pale violet (7.0%) flowers. Most of the accessions had rounded fruit shape (81.9%) with only 18.1% being long. Fruit position showed predominance of pendant trait (77.8%) while the rest were semi-erect (4.2%), semi-pendant (6.9%) and horizontal (11.1%). Fruit length was mostly intermediate (58.3%); others were short (27.8%) and long (13.9%). Similarly, more than half of the accessions had an intermediate fruit breadth (47.2%) while those that were small and large accounted for 25.0% and 27.8%, respectively.

Cluster analysis.

The dendogram grouped the accessions into two major clusters, I and II with 51 and 20 accessions, respectively (Figure 1). Cluster I comprised of 39 accessions from S. *aethiopicum*, 10 accession whose species unidentified (*Solanum* sp.), and two S. *anguivi* accessions, while cluster II had one S. *macrocarpon*, four *Solanum* sp., four S. *anguivi* and 11 S. *aethiopicum* accessions. Within species variation was observed in sub-cluster ‘a’ where a close relationship between S. *aethiopicum* accessions with those from S. *anguivi* (RV100364) and *Solanum* sp. (RV100194, RV100449 and RV100382) was revealed. Similarly, sub-cluster ‘b’ had a mixture of accessions from different species for example, accessions RV100438, RV100332 and RV100264 from S. *aethiopicum,* RV100447, RV100445 and RV100456 from S*olanum* sp. and RV100359 from S. *anguivi*. However, all accessions in sub-cluster ‘b’ recorded the presence of very many leaf hairs on the lower surface of the leaf blade. Accessions in sub-cluster ‘c’ had white flowers, these accessions included RV100247, RV100239 and RV100234 representing S. *aethiopicum*, RV100455, RV100432 and RV100453 from *Solanum* sp., RV100360, RV100356 and RV100335 from S. *anguivi* and only RV100343 from S. *macrocarpon.* Sub-cluster‘d’ was made up of accessions RV100273 and RV100266 belonging to S. *aethiopicum*. These accessions had no leaf prickles and had the same fruit length.

Principal component analysis.

The amount of variation explained in each principle component is represented by Eigen values. Two of the three principal components axes had Eigen values > 7 and cumulatively accounted for 67.5% of total variability in 72 accessions involving all the eight traits studied (Table 2). The first principal component explained 46.2% of the total variation among the accessions. The presence of leaf hairs contributed more to variation followed by leaf prickles and the type of fruit shape in PC1. Other characters including fruit position, fruit breadth, fruit length and fruit colour contributed less to variation while plant growth habit contributed a negative value. The PC2 accounted for 21.3% of the total variation with leaf hair and fruit position contributing more to the divergence among the accessions. The PC3 contributed 11.58% of the total variation in the population with the highest contribution to variation from fruit length, fruit breadth and fruit shape.

Quantitative traits.

Significant ($P<0.05$) differences among accessions were observed in all quantitative traits evaluated in the study. Plant height ranged from 9.5 cm (RV100271) to 79 cm (RV100458) (Tables 3). Earliness and lateness in flowering were observed in accession RV100190 and RV100432 that recorded 49 and 56 days to flowering, respectively. SPAD value ranged from 40.2 (RV100243) to 72.1 (RV100199). The longest and shortest leaf blades were recorded in accessions RV100352 (28.8 cm) and RV100261 (6.7cm), respectively. On the other hand, leaf blade width ranged from 3.1 cm (RV100261) to 22.8 cm (RV100332). African eggplant with the highest values for the fruit length and breadth had a mean of 15.9 cm (RV100445) and 8.4 cm (RV100200) respectively while accession RV100343 which had the smallest fruit recorded a mean fruit length of 1.4 cm and fruit breadth of 1.3 cm. Accession RV100453 recorded the highest number of fruits per plant (360 fruits) while accession RV100236 produced the least number of fruits with an average of 2 fruits per plant. Similar variations were observed for single fruit weight that ranged from 0.9 g (RV100360) to 143.5 g (RV100200) as well as for yield per plant that ranged from 72.3 g (RV100356) to 2902.3 g (RV100200).

Correlation among the traits.

The average fruit weight per plant recorded a highly positive significant correlation with fruit length (r=0.73) and breadth (r=0.71) (Table 4). Similarly, significant positive correlations between fruit weight and leaf blade width (r=0.19) was identified. However, a negative but highly significant correlation was observed between fruit weight and the number of days to 50% flowering (r= -0.24). On the other hand, number of fruits per plant had a negative but highly significant association with fruit length (r= -0.31), fruit breadth (r= -0.45) and fruit width (r= -0.37). Fruit length showed a highly positive significant correlation with fruit breadth (r=0.60), fruit width (r=0.73) and leaf blade width (r=0.28). Positive and highly significant association was also observed between SPAD value and number of fruits per plant (r= -0.26)

DISCUSSION

This study revealed the diversity, taxonomic relationship and agro-morphological information of African eggplant landraces. The phenogram generated shows the presence of both inter and intra species diversity among the 72 accessions from the four African eggplant species, *S. aethiocum*, *S. anguivi, S. macrocarpon* and *Solanum* sp. These findings are in agreement with that reported by Osei et al. (2010), who characterized 28 African eggplant landraces based on their morphological traits. Their findings revealed distinct and wide variation between the three *Solanum* species with many similarities between the *S. aethiopicum* and *S. anguivi* lines. The close phenetic relationship among accessions from the different species as identified in this study could be attributed to the fact that those accessions share some similarities. This findings are also in agreement with that of Aguoru et al. (2015) who characterized eggplant seedlings using quantitative traits. In their findings, the authors suggest that the close similarity among the different species of eggplant could be attributed to a common progenitor in their phylogenetic history. Similarly, within species variation among the accessions might in part be explained to the accessions being collected from distinct and heterogeneous ecologies with non-uniform climatic conditions. According to Uddin et al. (2014), the clustering of accessions in different groups may be useful to provide base for further crop improvement in African eggplant.

Multivariate principal component analysis has previously been used to identify the most important traits for characterizing landraces of different species including, sweet potato (Yada and Tukamuhabwa, 2010), spider plant (Wasonga et al., 2015) and African tomato landraces (Tembe et al., 2018). In the present study, PCA identified fruit and leaf characters were the most important traits that supported the largest portion of variability among the genotypes. These fruit traits were fruit shape, fruit length and fruit position while leaf characters included the presence of leaf hair and leaf prickles. This findings are in agreement with that of Kumar et al. (2016) who evaluated the genetic diversity in eggplant germplasm by principal component analysis. These authors found that fruit characteristics were the most important traits contributing to total variability. Future collections and characterization to improve eggplant resource base could therefore focus on such traits.

Quantitative statistics from this study demonstrated significant variation among the accessions in all the traits. These findings are in agreement with that of Uddin et al., (2014) who evaluated the genetic diversity in eggplant genotypes for heat tolerance. In that study, the researchers reported significant variations among the genotypes for traits such as leaf length, leaf width, fruit length and fruit width. The variations observed could be attributed to the differences in genetic and environmental conditions from which the eggplant accession were obtained since different genotypes can potentially perform differently in the same environment.

The correlation coefficient displayed significant results for various quantitative traits. Yield components such as fruit length, fruit breadth and single fruit weight revealed a highly significant correlation with each other. Similar findings were reported by Kumar et al. (2016) in their study on genetic diversity in eggplants. They reported that fruit yield per plant was significantly, and positively, correlated with fruit circumference followed by fruit width. Their findings suggest that maximum fruit circumference increased fruit width and fruit weight resulted in higher fruit yield per plant. There was a highly significant but negative correlation between number of fruits per plant and fruit length, fruit breadth and fruit weight. Similar findings by Uddin et al. (2014) suggested that the higher the number of fruits per eggplant, the lower would be the fruit breadth, fruit weight and reduced fruit length. Less number of fruits per plant translates to larger fruits.

CONCLUSION

High level of variation was observed for both quantitative and qualitative traits among the different species of African eggplant including: *S. aethiopicum, S. anguivi, S. macrocarpon and Solanum* sp. evaluated. Fruit and leaf characters were the main qualitative traits that supported the largest portion of variability among the African eggplant genotypes**.** The wide variation among the accessions as observed in their quantitative traits indicates the potential for genetic improvement of the African eggplant through selection and cross breeding. Accessions such as RV100200, RV100456, RV100246, RV100161 and RV100458 that registered high fruit yield per plant have the potential for use in eggplant crop improvement. Similarly, the significant positive relationships among traits that influence yield in African eggplant such as fruit breadth, number of fruits per plant and single fruit weight are important characters that should be considered during crop improvement through selection. Generally, the study strongly recommends the use of African eggplant accessions from different species and originating from different geographical areas for breeding that seeks to improve and develop new varieties of African eggplant with strong field performance.

Table 1: Variation in qualitative traits among 72 African eggplant accessions evaluated at Kabete Field Station, University of Nairobi, Kenya from July 2014 to October 2014.

Trait	Observation	Frequency	Percentage (%)
Growth habit	Upright	62	86.1
	Intermediate	7	9.7
	Prostrate	3	4.2
Leaf Prickles	None	52	72.2
	Many	20	27.8
Leaf hairs	Very few	21	29.2
	Very many	51	70.8
Flower colour	White	63	87.5
	Greenish white	1	1.4
	Pale violet	5	6.9
	Light violet	2	2.8
	Bluish violet	1	1.4
Fruit shape	Round	59	81.9
	Long	13	18.1
Fruit position	Semi erect	3	4.2
	Horizontal	8	11.1
	Semi pendant	5	6.9
	Pendant	56	77.8
Fruit length (cm)	Short	20	27.8
	Intermediate	42	58.3
	Long	10	13.9
Fruit breadth (cm)	Small	18	25.0
	Intermediate	34	47.2
	Large	20	27.8

Table 2: Eigenvalues and percentage of variation for the 72 African eggplant accessions

Qualitative character	**Principal component**		
	1	**2**	**3**
Variation explained (%)	46.23	21.3	11.58
Eigenvalue[a]	16.676	7.683	4.178
Fruit breadth	0.052	0.058	**0.56**
Flower colour	0.088	-0.04	0.002
Fruit length	0.063	0.074	**0.748**
Fruit position	0.051	**0.159**	0.098
Fruit shape	**0.14**	0.057	**0.278**
Leaf hairs	**0.815**	**0.529**	-0.173
Leaf prickles	**0.548**	-0.824	0.038
Plant growth habit	-0.002	0.042	0.092

[a]Eigenvalues indicate the amount of variance explained by each principal component
Values in bold indicate the most relevant descriptors that contributed most to specific components

Table 3: Quantitative trait means of 72 African eggplant accessions

Sn	Acc codes	P H	DTF	SPAD	LBL	LBW	FL	FB	N O F	FW	YPP
1	GBK 050572	43.4	55.0	67.5	9.3	9.1	13.7	5.1	20.0	49.5	990.0
2	RV1001201	49.4	53.0	46.6	16.6	10.9	13.9	6.1	6.7	79.7	533.0
3	RV100161	27.9	53.7	56.7	18.5	9.7	8.5	4.7	55.7	38.5	2145.7
4	RV100165	28.3	53.0	62.2	15.3	8.5	8.1	4.5	20.6	29.0	597.3
5	RV100169	66.7	53.7	58.9	14.6	10.4	6.7	4.7	37.3	38.1	1421.0
6	RV100185	47.6	53.0	57.7	16.9	6.8	6.2	2.6	37.0	7.2	266.0
7	RV100190	26.7	49.0	65.1	17.3	9.2	8.4	4.7	131.7	6.3	829.7
8	RV100194	24.5	53.7	63.3	15.2	9.9	5.2	4.1	136.3	12.3	1675.7
9	RV100199	13.4	51.3	72.1	12.6	7.3	5.4	3.6	8.7	53.2	462.0
10	RV100200	58.8	53.0	62.5	21.6	11.4	13.5	7.7	20.7	140.2	2902.3
11	RV100215	23.1	52.3	61.2	14.9	7.8	8.5	4.6	11.0	42.7	469.3
12	RV100217	49.3	52.3	53.8	13.5	4.9	3.1	2.8	92.3	5.4	497.7
13	RV100218	58.0	52.7	63.1	14.6	7.4	3.1	2.0	39.0	2.6	101.3
14	RV100234	17.9	50.3	63.6	17.5	17.1	9.1	4.6	6.7	33.6	225.7
15	RV100236	12.8	50.7	61.3	17.4	16.3	7.8	5.0	4.0	73.3	293.0
16	RV100239	42.6	53.3	56.3	20.7	9.5	5.5	4.8	9.7	43.4	420.7
17	RV100240	36.6	54.7	61.9	10.4	6.7	4.3	3.3	8.7	19.2	167.0
18	RV100241	46.2	55.7	55.9	15.5	8.3	7.2	4.2	11.7	18.2	212.3
19	RV100242	32.4	55.0	58.1	13.6	9.2	6.6	4.9	29.0	27.9	809.7
20	RV100243	56.4	51.7	40.2	15.5	10.5	8.0	4.4	5.0	18.4	92.0
21	RV100246	43.7	55.7	60.5	14.6	9.3	6.8	5.1	73.0	30.0	2190.0
22	RV100247	29.1	52.3	52.4	14.5	7.5	7.7	4.6	26.7	28.7	766.3
23	RV100248	25.7	55.3	60.6	112.9	8.3	6.3	3.4	10.0	15.8	158.3
24	RV100249	44.0	54.0	61.4	19.2	15.2	6.3	6.0	26.3	30.9	812.0
25	RV100250	17.3	52.7	60.9	16.1	10.9	7.2	4.3	19.0	17.0	323.3
26	RV100252	42.4	51.7	65.7	14.6	9.4	6.6	3.6	61.7	18.9	1166.7
27	RV100259	16.4	53.3	64.2	14.4	9.4	7.9	4.0	10.0	67.1	671.3
28	RV100260	15.2	51.3	55.7	14.4	9.6	8.3	6.4	17.7	18.4	325.0
29	RV100261	33.0	50.3	58.1	7.5	3.5	4.6	3.9	8.0	15.4	123.0
30	RV100262	24.7	53.0	55.4	14.5	8.2	7.1	4.6	17.3	7.7	133.7
31	RV100263	45.8	52.7	61.2	17.3	11.5	8.4	4.9	23.3	19.6	456.3
32	RV100264	19.4	53.7	62.8	16.5	9.4	6.5	4.0	11.0	20.8	229.0
33	RV100265	24.8	49.3	57.4	16.6	13.3	4.3	2.8	33.7	32.8	1105.3
34	RV100266	31.6	49.7	55.3	14.0	8.9	5.0	3.9	73.0	21.3	1553.7
35	RV100268	29.8	52.7	57.1	13.4	9.0	6.7	5.3	9.0	68.7	618.0
36	RV100270	26.2	49.7	65.3	18.4	9.8	6.6	4.3	33.3	39.9	1328.0
37	RV100271	9.5	54.3	53.7	7.6	7.5	6.6	4.7	16.7	24.3	405.0
38	RV100273	24.4	53.3	61.2	17.2	9.6	7.4	4.8	9.0	40.6	365.0
39	RV100274	49.7	49.7	52.5	14.9	8.9	8.2	7.0	12.7	17.0	215.3
40	RV100300	72.6	50.3	57.0	21.2	14.4	9.7	7.7	14.3	59.0	844.0
41	RV100325	49.5	53.7	67.4	15.0	8.4	7.3	4.6	16.3	27.3	444.0

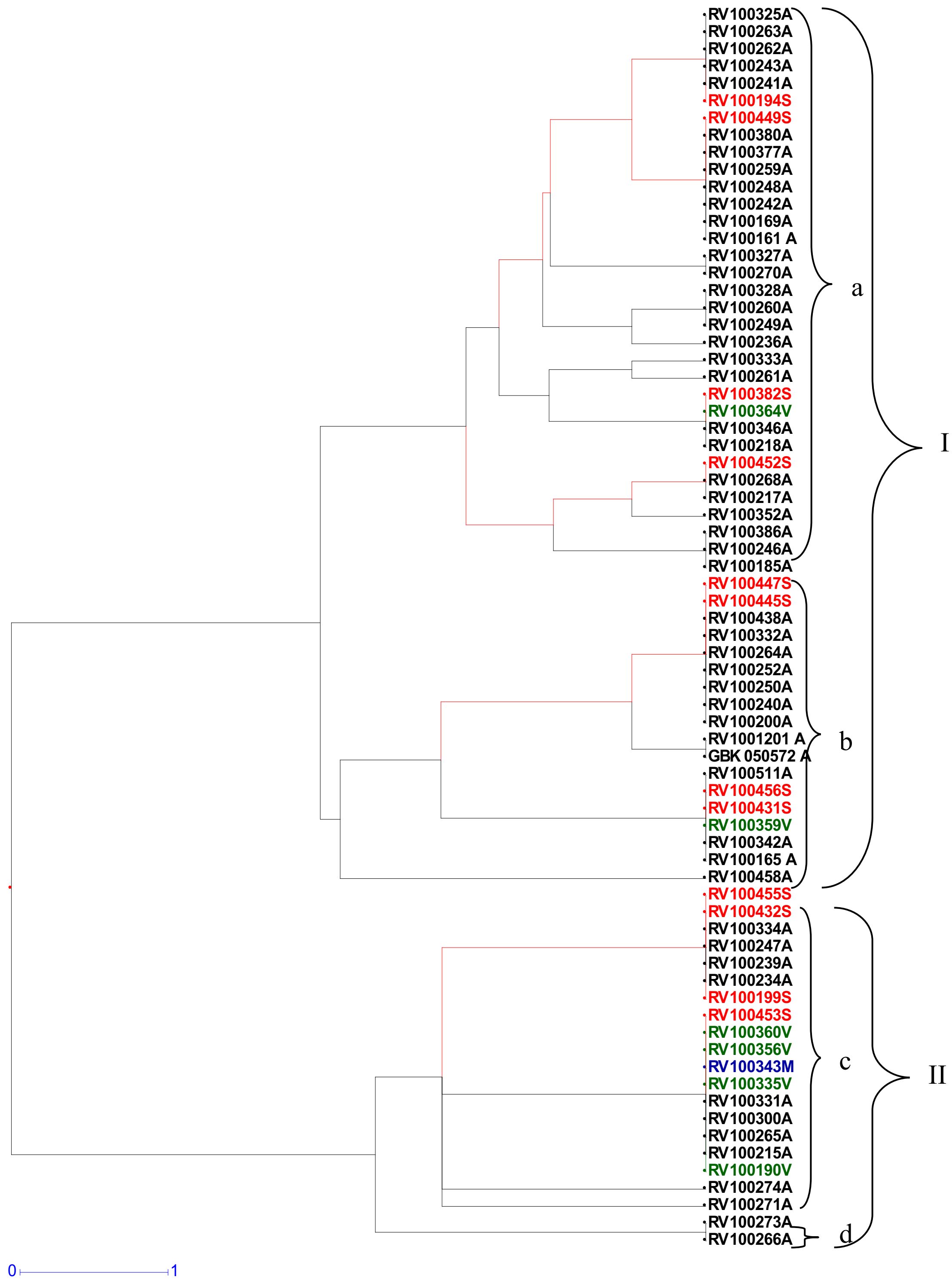
Sn	Acc codes	P H	DTF	SPAD	LBL	LBW	FL	FB	N O F	FW	YPP
42	RV100327	14.9	54.3	56.8	12.5	7.6	5.4	4.4	9.7	30.2	293.3
43	RV100328	42.6	52.0	62.0	20.0	14.8	11.0	7.6	7.0	73.7	515.0
44	RV100331	17.3	51.3	63.9	14.2	9.3	10.0	7.3	10.0	75.4	754.0
45	RV100332	48.0	52.7	69.2	23.7	21.6	4.5	3.2	29.3	24.4	714.7
46	RV100333	12.8	54.7	66.2	8.7	5.5	4.7	3.7	8.3	25.1	208.3
47	RV100334	35.4	51.7	56.8	12.7	8.8	9.0	4.8	9.3	23.1	214.7
48	RV100335	56.5	54.0	57.9	11.0	7.1	5.0	2.7	189.0	3.6	680.0
49	RV100342	52.5	52.7	56.7	20.8	9.2	7.5	3.8	49.3	33.4	1647.0
50	RV100343	45.0	50.7	63.6	19.4	6.4	2.1	1.7	149.3	1.3	194.7
51	RV100346	19.3	54.0	61.5	17.6	6.5	4.3	2.8	34.0	7.3	248.0
52	RV100352	15.8	54.0	52.0	27.3	14.4	4.1	3.9	15.3	18.4	281.3
53	RV100356	64.2	52.0	64.8	17.0	9.0	4.4	2.1	30.3	2.4	72.3
54	RV100359	61.2	52.3	61.3	15.5	10.4	3.8	2.5	50.3	20.7	1041.0
55	RV100360	20.3	53.0	60.3	15.6	11.4	2.0	1.7	205.0	1.3	266.3
56	RV100364	64.0	52.3	68.8	25.4	14.2	5.0	2.5	14.7	7.6	112.0
57	RV100377	60.3	50.3	59.0	18.4	11.3	7.6	4.7	20.0	10.0	200.7
58	RV100380	29.2	52.3	63.0	13.5	13.6	8.4	4.5	24.7	22.2	548.3
59	RV100382	41.5	52.0	58.7	17.4	11.4	3.3	2.4	14.0	21.7	302.7
60	RV100386	30.6	52.0	64.5	16.1	9.6	7.4	5.8	15.0	37.8	569.7
61	RV100431	51.4	55.3	48.4	22.4	8.7	8.8	3.3	30.0	33.4	1002.7
62	RV100432	15.9	56.0	66.6	14.6	8.1	5.4	3.3	9.3	18.2	169.7
63	RV100438	45.0	55.0	59.4	19.8	11.4	5.7	2.6	222.7	7.7	1715.0
64	RV100445	47.0	53.0	57.3	13.5	8.4	15.4	5.0	23.3	82.3	1917.0
65	RV100447	20.8	53.3	61.7	15.6	7.6	4.7	2.6	31.0	31.9	988.3
66	RV100449	32.2	53.0	45.6	16.7	8.3	9.8	4.7	23.7	54.4	1288.7
67	RV100452	46.5	51.3	57.5	21.9	10.4	8.3	6.3	7.3	73.5	536.0
68	RV100453	53.2	53.0	63.4	14.6	9.2	4.4	3.5	354.7	2.5	885.7
69	RV100455	48.3	51.7	60.2	19.6	13.7	8.3	4.5	55.7	33.1	1844.0
70	RV100456	65.5	52.0	66.4	14.6	10.6	9.6	4.1	118.3	20.8	2460.0
71	RV100458	79.0	52.0	51.9	21.9	14.3	9.5	3.4	72.0	28.1	2022.3
72	RV100511	29.4	53.7	57.3	16.6	15.4	6.7	2.9	82.7	10.0	826.7
	lsd (*p*=0.05)	4.18**	3.82*	5.02**	1.36**	0.81**	1.06**	0.83**	4.96**	3.69**	42.50**
	Cv (%)	6.9	4.5	5.2	5.2	5.0	9.4	12.2	7.1	7.5	3.5

Sn=Serial number, PH=Plant growth habit (cm), DTF=Days to 50% flowering, SPAD=Chlorophyll content, LBL=Leaf blade length (cm), LBW=Leaf blade width (cm), FL=Fruit length (cm), FB-Fruit breadth (cm), NOF=Number of fruits per plant, FW=Fruit weight (g), YPP=Yield per plant (kg), LSD=Least significant difference **-Highly significant, *-significant, ns-not significant, Sn=Serial number

Table 4: Correlation for the quantitative traits recorded for the 72 eggplant accessions

TRAITS	DTF	FL	FB	SFW	LBL	LBW	NOF	PH	SPAD
DTF	-								
FL	-0.16	-							
FB	-0.03	**0.60****	-						
SFW	**-0.24****	**0.73****	**0.71****	-					
LBL	0.06	0.06	0.02	0.08	-				
LBW	0.07	**0.28****	0.14	**0.19***	**0.58****	-			
NOF	-0.05	**-0.31****	**-0.45****	**-0.37****	-0.05	-0.17	-		
PH	0.12	0.16	-0.07	-0.03	**0.28****	0.13	0.12	-	
SPAD	0.06	-0.04	**-0.18***	-0.09	0.01	-0.08	**0.26****	0.08	-

** Correlation is highly significant at P>0.05 level, *correlation is significant at *P*>0.05 level,
DTF-Days to 50% flowering, FL-Single fruit length, FB-Fruit breadth, FW-Fruit weight, LBL-Leaf blade length, NOF-Number of fruits per plant, LBW-Leaf blade width, SPAD- Soil plant analysis development
-‘Negatively correlated, PH-Plant height



A-*S. aethiopicum*, S- *Solanum. sp.*, V- *S. anguivi*, M- *S. macrocarpon*

Figure 1: Cluster analysis showing the relationships among the 72 African eggplant accessions

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