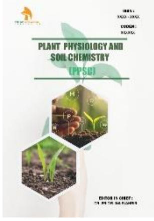
ZIBELINE INTERNATIONAL PUBLISHING
ISSN: 2805-5063 (Online)
CODEN: PPSCCU

Plant Physiology and Soil Chemistry (PPSC)

DOI: http://doi.org/10.26480/ppsc.02.2021.58.62



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RESEARCH ARTICLE

STUDIES OF VARIABILITY AND YIELD PERFORMANCE IN SOME ACCESSIONS OF SORGHUM (*Sorghum bicolor* (L.) Moench)

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ARTICLE DETAILS

Article History:

Received 05 September 2021
Accepted 07 October 2021
Available online 15 October 2021

ABSTRACT

Field trial was conducted at the Teaching and Research Farm of the Federal University of Technology, Minna, Niger State, to evaluate some accessions of sorghum. Nineteen (19) sorghum accessions were characterized and yield determined with its component traits. A randomized complete block design with three replicate was used for the experiment. Data were collected on plant height, number of leaves/plants, leaf length, leaf width, grain weight and 1000 seed weight. Data on the various morph-agronomical traits were subjected to individual and combined analysis of variance (ANOVA). Highly significant differences among accessions were found for all characters. Phenotypic coefficient of variation (PCV) was higher than genotypic coefficient of variation (GCV) and high phenotypic and genotypic variability was observed between the nineteen sorghum accessions. The highest value of heritability was observed in grain weight (99 %), and the highest yielding accession was AKV11 (Kaura) with grain weight of 614g and 514.33g for the two consecutive years, therefore, AKV11, AKV9 and AKV14 were recommended for Sorghum improvement programme and for farmers in Southern guinea zones of Nigeria.

KEYWORDS

Accessions, sorghum, variation, correlation, heritability

1. INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench) is a cultivated tropical cereal grass. The largest diversity of cultivated and wild sorghum is in Africa (Kimber et al., 2013). Numerous varieties of sorghum were created through the practice of disruptive selection, selection for more than one level of a particular character within a population occurs, this result from a balance of farmer selection for cultivated traits and natural selection for wild traits, generating both improved sorghum types, wild types and intermediate types (Olembo et al., 2010). It is an important staple food crops and provide bulk of raw materials for the livestock and many agro-allied industries in the world (Ahmed et al., 2012). It had been reported that, area under sorghum cultivation in Sub- Sahara Africa has steadily increased over the years but the average yield trends are downwards (Olembo et al., 2010).

Around the world, Sorghum is grown for the production of dense grain panicles; for food, and energy (Kimber et al., 2013). Sorghum in Africa is processed into a wide variety of attractive and nutritious traditional foods, such as semi-leavened bread, couscous, dumplings and fermented and non-fermented porridges. It is the grain of choice for brewing traditional African beers (Taylor, 2003). Sorghum straw (stem fibers) can also be made into excellent wallboard for house building, as well as biodegradable packaging. It is also used in packaging materials for sensitive electronic equipment. A more recent use of sorghum is for ethanol, By-products from ethanol production, such as sorghum-DDGS (distillers dried grains with soluble), are also finding a place in the market (US Grain Council, 2006). In Nigeria, sorghum is mainly used in the form of flour or paste processed into two main dishes *Tuwo* a thick porridge and *Ogi* or *Akamu*, *Kunu* a thin diet or porridge. Other dishes that are sometimes made from sorghum include; a number of deep fried snacks, steamed dumplings and other boiled or roasted snack foods. (Ratnavathi and Patil, 2013).

Genetic variability studies provide the basic information regarding the genetic properties of the population based on which the breeding methods are formulated for further crop improvement. For any progress in plant breeding, there is the need to study the genetic variability which cannot be easily quantified. Genetic improvement for quantitative traits depends on the nature and amount of variability present in any genetic stock and the extent to which the desirable traits are heritable (Sami et al., 2013). Knowledge of association between yield and its component traits and among the component parameters themselves can improve the efficiency of selection in plant breeding. Therefore, there is the need to characterize as much as possible sorghum genotypes available in Nigeria to identify traits for yield against future sorghum improvements for better food production and security. The present study aimed at characterize sorghum accessions base on their morph-agronomic traits.

2. MATERIALS AND METHODS

2.1 Study Area

The trial was conducted in 2015 and 2016 rainy seasons at the Teaching and Research Farm of Crop Production Department, Federal University of Technology, Gidan kwano campus Minna, Niger state. The site is located in the Southern Guinea Savanna of Nigeria, with Global Positioning System

Quick Response Code	Access this article online	
	Website: www.ppsc.org.my	**DOI:** 10.26480/ppsc.02.2021.58.62

Cite The Article: Akinyele, M. O., Oyewale, R. O., Nasiru, I., Ogunremi, O.C., Ekwere, U. A., Joseph, R. I., Adeshina D.A. (2021). Studies of Variability and Yield Performance in Some Accessions of Sorghum (*Sorghum Bicolor* (L.) Moench). *Plant Physiology and Soil Chemistry, 1(2): 58-62.*

(GPS) co-ordinates of (Latitude 9.523N, and Longitude 6.445E). Minna is located in the Southern Guinea Savanna agro-ecological zone of Nigeria with a mean annual rainfall of 1200mm (Adeboye et al., 2011). The rainfall which has its peaks in September and it usually begins in April and ends in the first week of October. The temperature ranges between 35 and 37.5°C, with relative humidity between 60 and 80 % in the month of July and 40 and 60 % in January.

2.2 Planting Materials

The Sorghum germplasms used in this study comprised nineteen sorghum accessions collected from Institute for Agricultural Research (IAR) Ahmadu Bello University Zaria.

2.2.1 Experimental Design and Field Layout

The experiment was laid out in a Randomized Complete Block Design (RCBD) with three (3) replications. The gross plot size was 4m by 2m ($8m^2$); 5 ridges of 2m long each. The net plot size was 2.4m by 2m ($4.8m^2$); 3 ridges of 2m long each. Gross plots were separated by a distance of 0.5m each while a distance of 1m separated one replication from the other.

2.2.2 Land Preparation

The total land area of $658m^2$ was measured, ploughed, harrowed mechanically and was ridged manually.

2.2.3 Sowing

Two seeds were sown per ridge and each stand was later thinned to one plant per stand.

2.2.4 Fertilizer Application

NPK fertilizer was applied at the rate of 60 kg N ha^{-1}, 30 kg ha^{-1} of phosphorus (P_2O_5) and 10kgha^{-1} Potassium (K_2O) at 3 weeks and Nitrogen was split at 6 weeks after sowing (WAS).

2.2.5 Weeding

In each year, 1.5 L/ha of Atrazine was applied as pre-emergence, followed by supplementary hoe weeding at 6 WAS and ridge remolding at 9 WAS, respectively.

2.2.6 Data Collection

In each net plot, five plants were tagged and used to obtain the following parameters at 2, 4 ,6, 8 and 10 WAS:

Plant height (cm), Number of leaves, Leaf length (cm), Leaf width (cm), Grain yield (g), 1000 Seed weight (g)

2.3 Data Analysis

Data collected were subjected to Analysis of Variance (ANOVA) using Statistical Analysis System (SAS Version 9, 2009). The treatment means were separated using Student-Newman-Keuls Test (SNK) at 5% probability level. Cluster analysis was done using the unweight pair group method with arithmetic mean (UPGMA) analysis and dendrograms were constructed using the SAHN program.

3. RESULTS

3.1 Growth Phonology and Yield Components for 2015

Result in Table 1 showed there were significant differences in plant height among the Sorghum accessions. AKV19 gave the tallest height (247 cm) and was significantly different ($p \leq 0.05$) from all others. The number of leaves/plants revealed significant differences ($p \leq 0.05$) among the accessions. AKV19 had the highest number of leaves (19) but not significantly different from 12 other accessions. Also leaf length showed significant differences ($p \leq 0.05$) among the accessions. AKV8 had the longest leaf length (141.3cm) but not significantly different from eleven others. Five others (AKV12, AKV5, AKV3, AKV4 and AKV6) had the same ranking and therefore, not significantly different. Leaf width indicated that there were no significant differences among the accessions. The result of grain yield showed significant differences among accessions. AKV11 had the highest grain yield (614g) and was significantly different from 18 others. There were significant differences among accessions for 1000 seed weight. AKV11, AKV17 and AKV11 had the highest weights (35g) and were significantly different from other accessions.

3.2 Growth Phonology and Yield Components for 2016

Table 2 showed significant differences in plant height among the Sorghum accessions. AKV12 gave the tallest height (165cm) and was significantly

Table 1: Mean Values for agronomic traits (quantitative) of nineteen sorghum accessions evaluated in minna southern guinea of Nigeria for 2015

ACCESSIONS	PLHT (cm)	NOF	LVT (cm)	LVW (cm)	ND	DFL	DM	PL (cm)	PW (cm)	GY (g)	SW (g)
AKV12	195.66^{b}	15^{abc}	121.47^{bc}	8.07^{a}	7^{b}	105^{cd}	140^{c}	43.33^{bc}	2.60^{cdefg}	363.67^{c}	30.00^{d}
AKV8	183.33^{bc}	15^{abc}	141.3^{a}	8.53^{a}	7^{b}	95^{efgh}	125^{d}	31.33^{i}	2.80^{bcd}	294.67^{ef}	32.00^{c}
AKV13	132^{cd}	15^{bc}	130.27^{ab}	7.57^{a}	7^{b}	102^{de}	140^{c}	38.33^{def}	2.73^{bcd}	264.33^{gh}	27.00^{f}
AKV4	166.23^{bcd}	14^{bc}	118.33^{bc}	7.40^{a}	9^{a}	101^{def}	140^{c}	43.07^{bc}	2.83^{bc}	186.00^{j}	25.00^{g}
AKV17	179.80^{bc}	16^{abc}	126.27^{abc}	7.20^{a}	7^{b}	92^{gh}	125^{d}	19.50^{k}	2.67^{bcde}	325.00^{d}	35.00^{a}
AKV15	194.67^{b}	16^{abc}	132.33^{ab}	9.37^{a}	7^{b}	113^{b}	145^{b}	35.27^{fgh}	3.37^{a}	355.00^{c}	23.00^{i}
AKV5	141.33^{bcd}	16^{abc}	119.2^{bc}	7.80^{a}	7^{b}	110^{bc}	155^{a}	44.67^{ab}	2.63^{bcdef}	257.00^{h}	32.00^{c}
AKV1	116.33^{d}	14^{bc}	112.33^{c}	7.63^{a}	8^{b}	101^{def}	140^{c}	38.53^{def}	2.33^{g}	244.67^{h}	24.00^{h}
AKV14	178.00^{bc}	16^{abc}	134.37^{ab}	8.73^{a}	7^{b}	101^{def}	140^{c}	36.33^{efg}	2.50^{defg}	388.00^{b}	30.00^{d}
AKV3	160.33^{bcd}	15^{abc}	118.67^{bc}	8.97^{a}	7^{b}	104^{cd}	140^{c}	40.07^{cde}	3.20^{a}	254.67^{h}	24.00^{h}
AKV11	112.33^{d}	16^{abc}	134.8^{ab}	8.37^{a}	7^{b}	93^{gh}	125^{d}	35.33^{fgh}	3.40^{a}	614.00^{a}	35.00^{a}
AKV18	129.00^{cd}	17^{ab}	131.8^{ab}	8.20^{a}	7^{b}	112^{b}	140^{c}	47.07^{a}	2.80^{bcd}	266.00^{gh}	23.00^{i}
AKV6	141.33^{bcd}	16^{abc}	117.27^{bc}	7.77^{a}	7^{b}	103^{d}	140^{c}	36.47^{efg}	2.90^{bc}	188.00^{j}	25.00^{g}
AKV7	112.00^{d}	15^{abc}	132.37^{ab}	9.03^{a}	7^{b}	102^{def}	140^{c}	38.13^{def}	2.43^{efg}	285.00^{fg}	28.00^{e}
AKV19	247.00^{a}	19^{a}	132.93^{ab}	8.267^{a}	9^{a}	119^{a}	140^{c}	40.67^{cd}	2.93^{b}	305.67^{e}	35.00^{a}
AKV2	131.67^{cd}	13^{c}	88.00^{d}	8.67^{a}	7^{b}	63^{i}	95^{e}	12.30^{l}	1.50^{i}	165.33^{k}	24.00^{h}
AKV9	138.00^{cd}	15^{bc}	126.97^{abc}	7.67^{a}	7^{b}	94^{fgh}	125^{d}	24.00^{j}	2.80^{bcd}	389.67^{b}	32.00^{c}
AKV10	150.67^{bcd}	14^{bc}	128.23^{ab}	9.03^{a}	7^{b}	98^{defg}	140^{c}	33.60^{ghi}	2.37^{fg}	267.00^{gh}	28.00^{e}
AKV16	132.67^{cd}	15^{abc}	130.43^{ab}	7.37^{a}	7^{b}	89^{h}	125^{d}	32.60^{hi}	1.83^{h}	210.00^{i}	34.00^{b}
±SE	**11.80**	**0.69**	**3.41**	**0.45**	**0.25**	**1.68**	**0**	**0.88**	**0.07**	**5.96**	**0**
CV%	**13.2**	**7.7**	**4.7**	**9.5**	**5.9**	**2.9**	**0.0**	**4.3**	**4.5**	**3.5**	**0.0**

Means with the same letter(s) are not significantly different at ($p<0.05$) by Student-Newman-Keuls Test (SNK).

PLHT=Plant Height, NOF=Number of Leaves/Plant, LVT=Leaf Length, LVW=Leaf Width, ND=Number of Nodes, DFL= Days to 50 % Flowering, DM=Days to 95 % Maturing, PL=Panicle Length, PW= Panicle Width, GY=Grain Yield, SW=1000 Seed Weig different from all others. There was no significant difference among the other eighteen accessions. The numbers of leaves were also significantly different among the accessions. AKV19 had the highest number of leaves (18) but not significantly different from AKV18, AKV6, AKV11, AKV14 and AKV5. There were no significant differences among the thirteen others accessions. Leaf length also showed significant differences among the accessions. AKV8 had the longest leaf length (135.67cm) and was not significantly different from eleven others. Result of Leaf width showed no significant differences among the accessions. Grain yield also revealed significant differences among accessions. AKV11 had the highest grain yield (514.33g) and was significantly different from all others. There were significant differences among accessions for 1000 seed weight. AKV11, AKV17 and AKV11 had the highest weights (35g) and were significantly different from other accessions.

3.3 Genetic Variability for Yield and Yield Components

The result of combined genetic variability for yield and yield components is shows in Table 3. Genotypic and phenotypic variances, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), broad sense heritability and genetic advance for morph agronomic traits in nineteen accessions of sorghum, evaluated in 2015 and 2016 cropping seasons. Grain yield recorded the highest values of 9396.2 and 9478.48 for genotypic and phenotypic variances respectively. Plant height recorded the values of 487.68 and 647.06 followed by days to 95 % maturity that recorded approximately equal values of 169.83 and 169.8. Panicle width recorded the lowest values of 0.19 and 0.2. Figure 1 revealed that grain weight recorded the highest percentage value of 36 % for genotypic and phenotypic coefficients of variation followed by 1000 seed weight that recorded the same value of 26 %. Days to 95 % maturity recorded the lowest percentage value 9.5 % for PCV.

3.4 Cluster analysis for quantitative traits of nineteen sorghum accessions evaluated during 2015 and 2016 in Minna, Southern Guinea Savanna of Nigeria

The dendogram in Figure 2 produced three clusters; the first consisted of eleven accessions (Bukwakana, Mori, Danyana, Harju, Wagofari, Falafate, Panpara, Chakeilare, Nduvori, Yimshi and Samsorg 40). Two sub groups existed within cluster one, the first sub group consisted of seven accessions (Bukwakana, Mori, Danyana, Harju, Wagofari, Falafate and Panpara), Bukwakana and Mori, Harju and Wagofari formed a close relationship with each other. The second sub group consisted of three accessions (Chakeilare, Nduvori and Yimshi) while Chakeilare and Nduvori are closely related, Samsorg 40 appeared to be an outlier of the sub groups. The second cluster was made of seven accessions (Adamumakiwa, CSRO2, Farefare, Shawimpe,Bogfarwa, Cham and Paul Noel). Two sub groups existed, first are (Adamumakiwa, CSRO2, Farefare, and Shawimpe) Adamumakiwa and CSRO2 formed a very close relationship. Second sub group consisted of Bogfarwa and Cham that appeared closely related; Paul Noel appeared to be an outlier of the sub groups. Kaura was the only member of cluster three and appeared an outlier to other clusters.

Table 2: Mean values of agronomic traits (quantitative) of nineteen Sorghum accessions evaluated in minna southern guinea zone of Nigeria for 2016

ACCESSIONS	PLHT (cm)	NOF	LVT (cm)	LVW (cm)	ND	DFL	DM	PL (cm)	PW (cm)	GY (g)	SW (g)
AKV12	165.00^{a}	14^{b}	116.17^{bcdef}	7.93^{a}	6^{b}	115^{c}	145^{d}	41.33^{bc}	2.53^{bcde}	298.00^{c}	30.00^{d}
AKV8	127.33^{b}	14^{b}	135.67^{a}	8.37^{a}	6^{b}	100^{e}	130^{g}	29.67^{j}	2.63^{bc}	246.00^{d}	32.00^{c}
AKV13	103.97^{b}	14^{b}	125.27^{abcde}	7.50^{a}	6^{b}	112^{c}	145^{d}	36.33^{efg}	2.63^{bc}	213.00^{e}	27.00^{f}
AKV4	115.00^{b}	13^{b}	113.00^{cdef}	7.43^{a}	8^{a}	111^{cd}	142^{e}	40.97^{bcd}	2.73^{b}	125.00^{f}	25.00^{g}
AKV17	134.00^{b}	15^{b}	122.47^{abcde}	7.40^{a}	6^{b}	102^{e}	130^{g}	17.93^{l}	2.57^{bcde}	278.33^{cd}	35.00^{a}
AKV15	133.00^{b}	15^{b}	128.83^{abc}	9.47^{a}	6^{b}	123^{b}	150^{b}	33.33^{ghi}	3.17^{a}	279.67^{cd}	23.00^{i}
AKV5	105.67^{b}	15^{ab}	114.00^{cdef}	7.83^{a}	6^{b}	120^{b}	160^{a}	43.00^{b}	2.53^{bcde}	201.00^{e}	32.00^{c}
AKV1	109.67^{b}	14^{b}	106.67^{f}	7.63^{a}	7^{b}	111^{cd}	146^{c}	36.50^{efg}	2.13^{f}	208.33^{e}	24.00^{h}
AKV14	115.00^{b}	15^{ab}	127.97^{abcd}	8.70^{a}	6^{b}	111^{cd}	145^{d}	34.33^{gh}	2.40^{cdef}	332.33^{b}	30.00^{d}
AKV3	123.67^{b}	14^{b}	110.33^{ef}	8.77^{a}	6^{b}	114^{c}	145^{d}	38.17^{def}	3.10^{a}	205.00^{e}	24.00^{h}
AKV11	102.67^{b}	15^{ab}	129.43^{abc}	8.27^{a}	6^{b}	99^{e}	130^{g}	33.33^{ghi}	3.20^{a}	514.33^{a}	35.00^{a}
AKV18	124.33^{b}	16^{ab}	128.13^{abcd}	8.27^{a}	6^{b}	122^{b}	145^{d}	45.40^{a}	2.70^{bc}	204.67^{e}	23.00^{i}
AKV6	109.00^{b}	15^{ab}	112.17^{def}	7.60^{a}	6^{b}	110^{cd}	145^{d}	34.87^{fgh}	2.80^{b}	121.67^{f}	25.00^{g}
AKV7	103.33^{b}	14^{b}	127.13^{abcd}	8.97^{a}	6^{b}	112^{c}	142^{f}	36.57^{efg}	2.30^{def}	251.67^{d}	28.00^{e}
AKV19	132.00^{b}	18^{a}	131.83^{ab}	8.33^{a}	8^{a}	128^{a}	145^{d}	38.67^{cde}	2.83^{b}	262.67^{d}	35.00^{a}
AKV2	126.67^{b}	13^{b}	83.07^{g}	8.50^{a}	6^{b}	63^{f}	95^{h}	12.30^{m}	1.53^{g}	121.67^{f}	24.00^{h}
AKV9	135.67^{b}	14^{b}	121.23^{abcde}	7.60^{a}	6^{b}	104de	130^{g}	22.70^{k}	2.60^{bcd}	334.67^{b}	32.00^{c}
AKV10	102.67^{b}	13^{b}	123.57^{abcde}	8.90^{a}	6^{b}	108^{cd}	145^{d}	31.63^{hij}	2.27^{ef}	208.67^{e}	28.00^{e}
AKV16	110.33^{b}	14^{b}	125.83^{abcde}	7.53^{a}	6^{b}	98^{e}	130^{g}	30.87^{ij}	1.73^{g}	143.33^{f}	34.00^{b}
±SE	**6.23**	**0.66**	**3.29**	**0.44**	**0.27**	**1.61**	**0.08**	**0.82**	**0.07**	**8.93**	**0.00**
CV%	**9.0**	**7.9**	**4.7**	**9.3**	**7.3**	**2.6**	**0.1**	**4.2**	**4.8**	**6.5**	**0.0**

Means with the same letter(s) are not significantly different at (p<0.05) by Student-Newman-Keuls Test (SNK).

PLHT=Plant Height, NOF=Number of Leaves/Plant, LVT=Leaf Length, LVW=Leaf Width, ND=Number of Nodes, DFL= Days to 50 % Flowering, DM=Days to 95 % Maturing, PL=Panicle Length, PW= Panicle Width, GY=Grain Yield, SW=1000 Seed Weig

Table 3: Estimates of genetic variability for yield and yield components in nineteen accessions of Sorghum in Minna Southern guinea ecological zone of Nigeria for two cropping seasons of 2015 and 2016

Parameters	Mean	σ^2g	σ^2ph	GCV (%)	PCV (%)	h^2B	GA	GAM (%)
Plant Height (cm)	137.41	487.68	647.06	16	18	75	39.3	24.6
Number of Leaves/Plant	15.00	0.91	2.2	6.35	9.9	41	1.2	8
Leaf Length (cm)	122.63	129.4	162.19	9.2	10.3	79.8	20.9	17
Leaf Width (cm)	8.17	0.2	0.78	5.2	10.67	25	0.45	5.6
Grain Yield (g)	267.75	9396.2	9478.48	36	36	99	198.5	74

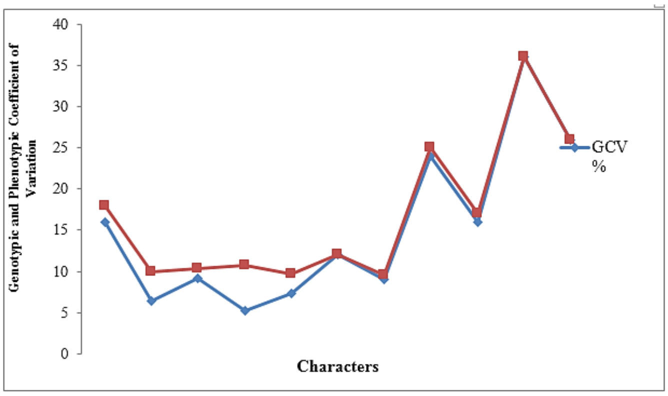

Figure 1: Phenotypic and genotypic coefficients of variation for yield and yield Components of nineteen accessions of sorghum evaluated 2015 and 2016 cropping seasons in Minna southern guinea of Nigeria

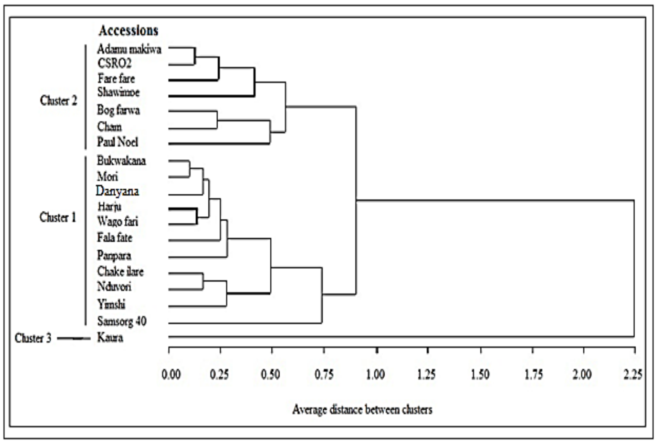

Figure 2: Dendogram of the relationship among Sorghum accessions based on their growth and yield parameters, depicted by Unweight Pair Group Method with Arithmetic (UPGMA)

4. Discussion

Crop improvement activities through breeding are aimed at boosting the genetic potential for yield. Selection based on yield alone is not effective. Therefore, breeders select for high yield indirectly through yield association and highly heritable characters after eliminating environmental components of phenotypic variation (Tadele and Assefa, 2012). Effort to improve a character by selection would be futile unless a major portion of variation is heritable. The amount of variation existing in a population is of great importance for any successful application of selection procedure used for crop improvement (Mba et al., 2012). It is therefore important to get information on both genotypic and phenotypic coefficients of variation to know about the heritability of a character. The information on phenotypic coefficient of variation and heritability will be helpful at predicting the possible genetic advance by selection for the character. Knowledge of principal component, direct and indirect contributions of yield components and path analysis would assist in setting up selection indices.

There were high significant differences in most of the characters investigated which indicated the presence of wide range of variability, and in agreement with that reported similar result of high significant differences in the characters of 224 genotypes investigated (Khandelwal et al., 2015). A studied 32 sorghum genotypes for yield and yield component traits reported existence of diversity in nine quantitative traits among the genotypes (Jain and Patel, 2016). The phenotypic coefficient of variability (PCV) was higher than genotypic coefficient of variability (GCV) for most of the traits investigated except for grain yield that both PCV and GCV maintain the same values. High (PCV %) and (GCV %) were observed in some of the characters studied.

A studied 224 genotypes of sorghum for genetic parameters and characters association among yield components, the result revealed that phenotypic coefficients of variation (PCV) were higher than genotypic coefficients of variation (GCV) for all the traits investigated (. The estimate of heritability alone may not indicate the response to selection therefore; the heritability estimate appeared to be more meaningful when accompanied by estimate of genetic advance. High heritability was observed for plant height, leaf length and grain yield. For grain yield similar high broad sense heritability was reported by who also found similar high heritability investigated in 102 land races of forage sorghum for plant height, number of leaves per plant, leaf length and fodder yield (Jain and Patel, 2012). The clustering pattern showed that there was significant genetic variability among the accessions of sorghum tested, that means the presence of excellent opportunity to bring about improvement through hybridizing accessions from different clusters and assemble desirable traits with higher hetrotic potential.

5. Conclusions

The information about components of variance, broad sense heritability, genetic advance, in respect of sorghum yield and yield contributing traits obtained could be used as guide for the improvement of sorghum. It can also help farmers to select productive and profitable accessions. The most outstanding performance accessions for grain weight are AKV11 (kaura), followed by AKV9 (shawimpe) and AKV14 (farefare).

Recommendation

AKV11, AKV9 and AKV14 were recommended for Sorghum improvement programme and for farmers in Southern guinea zones of Nigeria.

References

Adeboye, M.K.A., Bala, A., Osunde, A.O., Uzoma, A.O., Odofin, A.J., Lawal, B.A., 2011. Assessment of soil quality using soil organic carbon and total nitrogen and microbial properties in tropical agro ecosystem, Agricultural Science, 2, Pp. 34-40.

Ahmed, M.E., Ibrahim, M.I., Mohammed, E.A. Elshiekh, A.I., 2012. Evaluation of some local Sorghum.(*Sorghum bicolor* L. Moench). Genotypes in Rain-Fed. International Journal of Plant Research, 2 (1), Pp. 15-20.

Jain, S.K., Patel, P.R., 2016. Principle Component and Cluster Analysis in Sorghum (*Sorghum bicolor (L.) Moench*). Forage Res.,42 (2), Pp. 90-95 September, 2016.

Khadelwal, V., Shukla, M., Jodha, B., Nathawat. V., Dashora, S., 2015. Genetic Parameters and Character Association in Sorghum (*Sorghum bicolor (L.) Moench*). Indian Journal of Science and Technology, 8 (22).

Kimber, C.T., Dahlberg, J., Kresovich, S., 2013. The Gene Pool of Sorghum bicolor and Its Improvement. A. H. Paterson (ed.), Genomics of the Saccharinae, Plant Genetics and Genomics: Crop and Models 11, 10.1007/978-1-4419-5947-8-2, Springer Science +Business Media New York.

Mba, C., Gumaraes, E., Ghosh, K., 2012. Re- orienting crop improvement for the changing climatic conditions of the 21st century. Agriculture & food security 10.1186/2048-7010-1-7 1:7 June, 2012.

Olembe, K.N., M'mboyi, F., Kiplagat, S., Sitieney, J.K., Oyugi, F.K., 2010. Sorghum Breeding in Sub- Sahara Africa: The Success Stories Publisher Africa Biotechnology Stakeholders Forum (ABSF). Nairobi Kenya.

Ratnavathi, C.V., Patil, J.V., 2013. Sorghum Utilization as Food. J. Nutr Food Sc., 4, Pp. 247, 10.4172/2155-9600,1000247.

Sami, R.A., Yeye, M.Y., Ishiyaku, M.F., Usman, I.S., 2013. Heritability studies in some sweet sorghum (*Sorghum Bicolor. L. Moench*) genotypes. J. Biol. Agri. Healthcare., 3, Pp. 49–51.

Tadele, Z., Assefa, K., 2012. Increasing food production in Africa by Boosting the productivity of understudied crop. Journal of Agronomy, 2 (4), Pp. 240 – 283, volume 2, Issue 4 Ethiopia. October, 2012.

Taylor, J.R.N., 2003. Overview: Importance of Sorghum in Africa. In proceedings of AFRIPRO workshop on the proteins of Sorghum and Millets. Enhancing nutritional and functional properties for Africa, vol 9.Pretoria South Africa.

US Grain Council, (2006) Sorghum" www.grains.org.