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Principal Component Analysis in *Rabi* Sorghum [*Sorghum bicolor* (*L.*) Moench] for Yield Attributing Traits

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A B S T R A C T

An experiment was done to study the principal component analysis in *rabi* sorghum [*Sorghum bicolor* (*L.*) Moench] with a set of fifty genotypes of sorghum grown in Randomized Block Design with two replications for ten traits *viz.*, days to 50% flowering, plant height (cm), total number of leaves per plant, leaf length (cm), leaf width(cm), ear head length(cm),ear head width(cm),100 grain weight(g), grain yield per plant(g) and harvest index(%). Principal component analysis revealed four principal components which explained about 68.60 % of variability. PC 1 loaded with 26.62 % maximum variability of total variation, PC 2 explained 17.76 % of total phenotypic variability and PC 3 had contributed 12.10 % and PC 4 loaded with 11.66% of total variation.

Introduction

Sorghum is the fifth most important cereal crop world-wide and it is grown for food and feed. Sorghum is the dietary staple for most of the developing countries. It is well adapted to the range of environmental conditions with high variability. *Sorghum bicolor* contains both cultivated and wild relative races, and it provides a substantial amount of genetic diversity for traits of agronomic importance to develop the crops different variety of interest for plant breeders.

A better understanding of the genetic diversity in sorghum would greatly contribute to crop improvement with a view to food quality and other important agronomic traits. Therefore, there is a need to evaluate the available genotypes for genetic diversity and identify the best genotypes according to their performance.

Materials and Methods

Fifty germplasm lines were evaluated to study the genetic divergence analysis during *rabi* 2016-2017 at Agricultural college farm, Bapatla. The experiment was laid out in Randomized Block Design (RBD) with two replications. Spacing between row to row and plant to plant was kept 45cm and 15 cm respectively. Recommended package of practices were followed for raising a normal

crop. In each genotype 10 plants were selected and used for collecting data days to 50% flowering, plant height (cm), total number of leaves per plant, leaf length (cm), leaf width(cm), ear head length(cm), ear head width(cm),100 grain weight(g), grain yield per plant(g) and harvest index(%).

The principal component analysis was carried out as suggested by Rao (1952) and was computed using the following formula:

PCA

$PC1 = {}^{P}\pounds_{1}\, a_j X_j$

Where; PC = Principal component, a1j = Linear coefficient – Eigen vectors

Results and Discussion

The analysis of variation revealed significant genetic diversity among the genotypes of sorghum for all the traits studied. Principal component analysis was performed in order to reduce a large set of phenotypic traits to a more meaningful smaller set of traits and to know which trait is contributing to maximum variability, because genetic improvement depends on the magnitude of genetic variation.

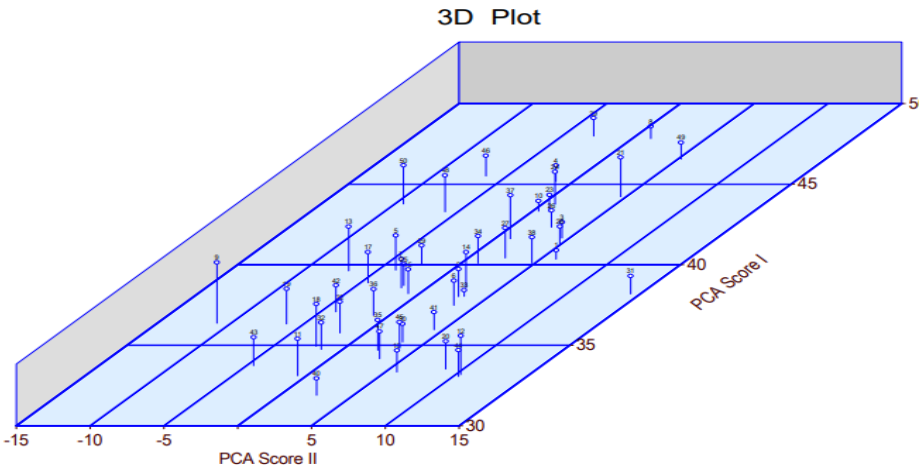
Table.1 The eigen values, percent variability, cumulative percent variability for four principal components in sorghum [*Sorghum bicolor* (L) Moench]

	Principal component 1	Principal component 2	Principal component 3	Principal component 4	Principal component 5
Eigen Value	2.662	1.777	1.211	1.166	0.869
% Var. Exp.	26.625	17.766	12.107	11.660	8.694
Cumulative total % variation	26.625	44.391	56.498	68.158	76.852

Table.2 Character loading of four principal components for different genotypes of sorghum [*Sorghum bicolor* (L) Moench]

Character	Principal component 1	Principal component 2	Principal component 3	Principal component 4	Principal component 5
Days to 50% flowering	0.205	0.445	0.136	0.127	0.295
Plant Height(cm)	0.340	-0.428	0.002	0.244	-0.288
Leaves/ Plant	0.166	-0.145	-0.583	0.463	-0.295
Leaf Length (cm)	0.157	0.274	-0.478	0.285	0.575
Leaf Width(cm)	-0.060	0.554	-0.212	-0.278	-0.486
Ear Head Length (cm)	0.526	0.141	-0.054	-0.236	-0.081
Ear Head Width (cm)	0.407	-0.066	-0.038	-0.210	0.054
Grain Yeild Per Plant (g)	0.519	0.082	0.074	-0.208	-0.115
100 grain Weight (g)	0.076	-0.428	-0.185	-0.492	0.385
Harvest Index (%)	0.264	0.042	0.570	0.408	0.067

ig.1 Principal component analysis diagram for 50 sorghum genotypes



Principal component analysis

The four principal components explained about 68.60 % of total variation among genotypes of all traits (Nachimuthu *et al.*, 2014) (Table 1 and Table 2). The first principal component (Fig. 1) obtained was 26.62% Ahmed *et al.*, 2015of total variance and had high contributing factor loading from ear head length(cm) which was the most important contributing traits for relative magnitudes of eigen vectors for the first principal component, while the second principal component had high contributing factor loading from leaf width, which was 17.76 %, thirdly it had a high contributing factor from harvest index for the third principal component (12.107 %), and, finally it had a high contributing factor loading from number of leaves for plant for the fourth principal component (11.66 %).Similar results were also reported by Ganesamurthy *et al.*, 2010, vara Prasad *et al.*, 2019 Jain and Patel (2016).

References

Ahamed, K.U., Akhter, B., Islam, M.R., Alam, M.K., and Hossain., M.M. (2015). An assessment of genetic diversity in sorghum (*Sorghum bicolor L.* Moench) germplasm. *Bull. Inst. Trop. Agr., Kyushu Univ.*, 38: 47-54.

Ganesamurthy K, Punitha D, Elangovan M. (2010). Genetic diversity among the land races of sorghum collected in Tamil Nadu. *Electron J Plant Breed* 1:1375–1379.

Jain, S. K. and P. R. Patel. (2016). Principal component and cluster analysis in sorghum (*Sorghum bicolor (l.)* Moench) Forage Res.,42 (2): pp. 90- 95.

Nachimuthu, V. V., Robin, S., Sudhakar, D., Raveendran, M., Rajeswari, S., and Manonmani, S. (2014). Evaluation of rice genetic diversity and variability in a population panel by principal component analysis. *Indian J. Sci. Technol.*, 10: 1555- 1562.

Rao, C. R. (1952). Advanced statistical methods in biometrical research. *John Wiley and Sons Inc., New York.* Pp. 236-272.

Vara Prasad, B. V. and Sridhar, V. (2019). Diversity Studies in Yellow Pericarp Sorghum [*Sorghum bicolor* (L.) Moench] Genotypes for Yield Attributes. *Int.J.Curr.Microbiol.App.Sci.* 8(12): 361-366.

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