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GENETIC VARIABILITY, HERITABILITY AND GENETIC ADVANCE FOR GRAIN YIELD AND YIELD COMPONENTS IN SOME OF THE DERIVED LINES OF SORGHUM

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ABSTRACT
Twenty six derived lines (named as AKENT number) along with one resistant line and two susceptible lines of kharif sorghum were evaluated for yield and yield components. High genotypic coefficient of variation was observed for the character fodder yield per plant (27.31%) followed by 1000 seed weight (25.33%) whereas moderate for panicle breadth (15.17%), plant height (14.36 %) and grain yield per plant (13.94 %) and low for the character days to 50 per cent flowering (7.96 %). High phenotypic coefficient of variation was observed for the character fodder yield per plant (27.86%) followed by 1000 seed weight (26.78%) and panicle breadth (21.25%) whereas moderate for plant height (16.27 %) and grain yield per plant (15.24 %) and low for the character days to 50 per cent flowering (10.94 %). High heritability in broad sense was recorded for fodder yield per plant (96%), 1000 seed weight (89.4), grain yield plant (83.6) and plant height (77.9), while moderate heritability was recorded for days to 50% flowering (52.9%) and panicle breadth (50.9 %). The highest genetic advance percent over mean was observed for the character fodder yield per plant (55.14%) followed by 1000 seed weight (49.35%), grain yield per plant (26.25%), plant height (26.10%) and panicle breadth (22.32 %), while for days to 50% flowering, the expected genetic advance was moderate (11.93%). the characters fodder yield per plant, 1000 seed weight, grain yield per plant and plant height exhibited high heritability values along with high values of expected genetic advance. The phenotypic expression of these characters may be governed by the genes acting additively and thereby indicating the importance of these characters for selection.

INTRODUCTION

Sorghum is one of the important food grain crops of the country. Yield being a polygenic character is highly influenced by the fluctuations in environment. Hence, selection of plants based directly on yield would not be very reliable. Improvement in sorghum yield depends on the nature and extent of genetic variability, heritability and genetic advance in the base population. (Elangovan *et al.,* 2013, Seetharam and Ganeshmurthy, 2013). Genetic variability studies provide basic information regarding the genetic properties of the population based on which breeding methods are formulated for further improvement of the crop. These studies are also helpful to know about the nature and extent of variability that can be attributed to different causes, sensitive nature of the crop to environmental influences, heritability of the characters and genetic advance that can be realized in practical breeding. The progress in any crop improvement venture depends mainly on the magnitude of genetic variability and heritability present in the source material. Since the heritability is also influenced by environment, the information on heritability alone may not help in pin pointing characters enforcing selection. Nevertheless, the heritability estimates in conjunction with the predicted genetic advance will be more reliable (Johnson *et al.,* 1955). Heritability gives the information on the magnitude of inheritance of quantitative traits, while genetic advance will be helpful in formulation suitable breeding procedures. Therefore the present study was undertaken to study the genetic parameters such as variance, coefficient of variation, heritability and genetic advance in the kharif sorghum derived lines.

MATERIALS AND METHODS

Twenty six derived lines (named as AKENT number) were selected to study the variability for yield and yield components. These lines have been derived from involvement of at least one resistant parent in their crossing programme and these lines are supposed to be with resistant blood for shoot fly reaction. In addition to these 26 lines, one resistant line (IS 18551), two susceptible lines (AKMS-14 B, DJ-6514) were used in the present study. Most of the entries were having good agronomic background. The experiment was sown at Sorghum Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) during kharif, 2013. Material was sown in randomized block design. Observations were recorded on the six characters like days to 50 per cent flowering, plant height, panicle breadth, 1000 seed weight, fodder yield per plant and grain yield per plant. Analysis of variance was done as per the method suggested by Panse and Sukhatme (1967). Genotypic and phenotypic coefficients of variation were estimated as per formulae given by Burton

(1951). Heritability and genetic advance were estimated as per Johnson *et al*. (1955).

RESULTS AND DISCUSSION

The analysis of variance indicated highly significant differences among the genotypes for all the characters under study. High magnitude of variation in the experimental material was also reflected by wider range for all the characters under study (Table 1).

Days to 50% flowering ranged from 61 (AKENT-116) to 88.67 (IS-18551). Plant height ranged from 72.33 cm (AKENT-115) to 134.66 cm (AKENT-107). Panicle breadth ranged from 2.71 cm (AKENT-104) to 5.32 cm (AKENT-108). 1000 seed weight ranged from 16.50 g (AKENT-106) to 50.64 g (AKENT-107). Fodder yield per plant varied from 72.6 g. (AKENT-115) to 192.6 g. (AKENT-117). Grain yield per plant ranged from 40.20 g (AKENT-124) to 66.6 g (AKENT-117).

The Genotypic coefficient of variation, Phenotypic coefficient of variation, Heritability in broad sense and Expected Genetic Advance per cent over mean for various characters are presented in Table 2. The genotypic coefficient of variation (GCV) ranged from 7.96 to 27.31 percent for various characters under study. High genotypic coefficient of variation was observed for the character fodder yield per plant (27.31%) followed by 1000 seed weight (25.33%) whereas moderate genotypic coefficient of variation values were observed for panicle breadth(15.17%),plant height (14.36 %) and grain yield per plant (13.94 %). The character days to 50 per cent flowering showed low magnitude of genotypic coefficient of variation (7.96 %).

The phenotypic coefficient of variation (Table 2) ranged from 10.94 to 27.86 percent for various characters under study. High phenotypic coefficient of variation was observed for the character fodder yield per plant (27.86%) followed by 1000 seed weight (26.78%) and panicle breadth (21.25%) whereas moderate phenotypic coefficient of variation values were observed for plant height (16.27 %) and grain yield per plant (15.24 %). The character days to 50 per cent flowering showed low magnitude of phenotypic coefficient of variation (10.94 %).

The characters fodder yield per plant and 1000 seed weight showed high GCV and PCV values. It indicated that there is greater scope for improvement in these traits either by direct selection among the collection of genotypes or by involving chosen parents in hybridization. For fodder yield per plant similar results were obtained by Godbharle *et al*. (2010) and Arunkumar (2013-b). Moderate values of PCV and GCV were recorded for plant height and grain yield per plant indicating that these are amenable for improvement. Similar results were reported by Mahajan *et al*. (2011). Arunkumar (2013-a) also reported moderate values of GCV and PCV grain yield/ha. Low GCV and PCV values were observed for days to 50% flowering which was in agreement to Mahajan *et al*. (2011) and Dhutmal *et al*. (2014).

The genotypic coefficient of variation is not sufficient to determine the amount of variation which is heritable. Burton (1951) also made clear that the heritable variation cannot be estimated through genetic coefficient of variation and as such the genotypic coefficient of variation together with heritability would furnish the most reliable information on the magnitude of genetic advance to be expected from selection. In the light of this explanation, heritability was calculated to assist the breeder in choosing the characters that can be relied upon for selection.

The present study revealed high heritability in broad sense for fodder yield per plant (96%), 1000 seed weight (89.4), grain yield plant (83.6) and plant height (77.9) indicating that these characters would respond positively to selection because of their high broad sense heritability. Moderate heritability was recorded for days to 50% flowering (52.9%) and panicle breadth (50.9 %). For fodder yield per plant high heritability estimates were reported by Jain and Patel (2012). For grain yield per plant and plant height similar high heritability estimates were reported by Seetharam and Ganeshmurthy (2013). Dhutmal *et al*. (2014) also reported high heritability for grain yield per plant. Elangovan *et al*. (2013) reported moderated heritability for days to 50% flowering and panicle breadth.

Expected genetic advance percent over mean was estimated

Table 1: Range, mean and the best genotype for different characters

Sr.No.	Character	Range	Mean	Best genotype
1	Days to 50% flowering	61.00 - 88.67	72.97	AKENT-116
2	Plant height (cm)	72.33 - 134.66	93.63	AKENT-107
3	Panicle Breadth (cm)	2.71 - 5.32	3.82	AKENT-108
4	1000 seed weight (gm)	16.5 - 50.64	35.85	AKENT-107
5	Fodder yield/plant (gm)	72.66 - 192.6	101.66	AKENT-117
6	Grain yield/plant (gm)	40.2 - 66.66	48.78	AKENT-117

Table 2: Estimation of genetic parameters -GCV, PCV, h^2 and EGA

Sr.No.	Character	Genotypic coefficient of variation	Phenotypic coefficient of variation	h^2 %	EGA as % over mean
1	Days to 50% flowering	7.96	10.94	52.9	11.93
2	Plant height (cm)	14.36	16.27	77.9	26.10
3	Panicle Breadth (cm)	15.17	21.25	50.9	22.32
4	1000 seed weight (gm)	25.33	26.78	89.4	49.35
5	Fodder yield/plant (gm)	27.31	27.86	96	55.14
6	Grain yield/plant (gm)	13.94	15.24	83.6	26.25

for different characters and it was observed that expected genetic advance percent over mean was in the range of 11.93 to 55.14 percent for different characters. The highest genetic advance percent over mean was observed for the character fodder yield per plant (55.14%) followed by 1000 seed weight (49.35%), grain yield per plant (26.25%), plant height (26.10%) and panicle breadth (22.32 %). All the characters except days to 50 % flowering recorded high genetic advance percent over mean. For days to 50% flowering, the expected genetic advance was moderate (11.93%). For the character fodder yield per plant similar findings were obtained by Godbharle *et al*. (2010). Higher values of genetic advance for grain yield per plant and plant height were reported by Seetharam and Ganeshmurthy (2013) and Dhutmal *et al*. (2014). Higher values of expected genetic advance for plant height and panicle breadth along with moderate value of expected genetic advance for days to 50% flowering were in conformity with the results of Elangovan *et al*. (2013).

In general high heritability accompanied with high expected genetic advance for the characters suggest that the genes governing these character may have additive effect. It can be mentioned here that the characters fodder yield per plant, 1000 seed weight, grain yield per plant and plant height exhibited high heritability values along with high values of expected genetic advance. The phenotypic expression of these characters may be governed by the genes acting additively and thereby indicating the importance of these characters for selection. For characters fodder yield per plant and grain yield per plant similar results were reported by Godbharle *et al*. (2010). For 1000 seed weight similar high heritability accompanied with high expected genetic advance was reported by Mahajan *et al*. (2011). Dhutmal *et al*. (2014) reported similar high heritability along with high expected genetic advance for grain yield per plant. For plant height similar high heritability accompanied with high expected genetic advance was reported by Seetharam and Ganeshmurthy (2013).

REFERENCES

Arunkumar, B. 2013-a. Studies on genetic parameters and inter relationships among yield and yield contributing traits in sorghum (Sorghum bicolar (L.) Moench). *The Bioscan*. **8(4):** 1311-1314.

Arunkumar, B. 2013-b. Genetic variability, character association and path analysis studies in sorghum (Sorghum bicolar (L.) Moench). *The Bioscan*. **8(4):** 1485-1488.

Burton, G. W. 1951. Quantitative inheritance in pear millet. *Agron. J.* **43(9):** 409- 417.

Dhutmal, R. R., Mehetre, S. P., More, A. W., Kalpande, H. V., Mundhe, A. G. and Sayyad Abu Bakar, A. J. 2014. Variability parameters in *rabi* sorghum drought tolerant genotypes. *The Ecoscan*. **VI:** 273-277.

Elangovan, M., Kiran Prabhu, P. , Chandra Sekara Reddy, D., Saxena Usha, Vincent Reddy, G. and Tonapi, V. A. 2013. Genetic and environmental variability in sorghum (Sorghum bicolor (L.) Moench) germplasm collected from Rajasthan and Madhya Pradesh. *Ind. J. Plant Genet. Resour.* **26(1):** 19-24.

Godbharle, A. R., More, A. W. and Ambekar, S. S. 2010. Genetic variability and correlation studies in elite 'B' and 'R' lines in kharif sorghum. *Electronic J. Plant Breeding.* **1(4):** 989-993.

Jain, S. K. and Patel, P. R. 2012. Genetic variability in land races of forage sorghum (Sorghum bicolor (L.) Moench) collected from different geographical origin of India. *International J. Agric. Sci.* **4(2):** 182-185.

Johnson, H. W., Robinson, H. F. and Comstock, R. E. 1955. Estimate of genetic and environmental variability in Soybean. *Agron. J.* **47(6):** 314.

Mahajan, R. C., Wadikar, P. B., Pole, S. P. and Dhuppe, M. V. 2011. Variability, correlation and path analysis studies in sorghum. *Research J. Agricultural Science.* **2(1):** 101-103.

Panse, V. G. and Sukhatme, P. V. 1967. Statistical methods for Agri. workers. *ICAR Publication,* New Delhi.

Seetharam, K. and Ganeshmurthy, K. 2013. Chracterization of sorghum genotypes for yield and other agronomic traits through genetic variability and diversity analysis. *Electronic J. Plant Breeding.* **4(1):** 1073-1079.