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VU Rathod
M.Sc., Department of Agriculture Botany, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

HV Kalpande
Associate Professor, Department of Agriculture Botany, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

PS Rathod
M.Sc., Department of Agriculture Botany, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Corresponding Author:
VU Rathod
M.Sc., Department of Agriculture Botany, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Genetic variability studies in sorghum (*Sorghum bicolor* (L.) Moench) Mutants

VU Rathod, HV Kalpande and PS Rathod

Abstract
Fifty one mutant lines were evaluated along with six checks *i.e.* Parbhani Moti, CSV-22R, P.S. Moti, PKV Kranti, CSV-29R and M-35-1in *Rabi* Sorghum (*Sorghum bicolor* L. Moench)" was carried out at Department of Agricultural Botany, V.N.M.K.V., Parbhani during *rabi* 2019-20. These genotypes were grown in Randomized Block Design with 2 replications to study genetic variability among various genotypes. Analysis of variance showed significant differences among the genotypes for all the traits indicated wide range of variability among genotypes for yield and yield contributing characters and ample scope of improvement by selection. High estimates of genotypic and phenotypic coefficient of variation were recorded for fodder yield per plant, plant height, Zn content, grain yield per plant, panicle weight. The characters fodder yield per plant, panicle weight, days to physiological maturity, Zn content, grain yield per plant, plant height and number of primaries per panicle expressed high estimate of heritability accompanied with moderate to high genetic advance.

Keywords: Genetic, variability, sorghum, *Sorghum bicolor* L.

1. Introduction
Sorghum (*Sorghum* spp.) is cultivated predominantly in USA, China, India and Africa for both human and animal consumption. In India, Sorghum is cultivated over of 4.10 million ha with an annual production of 4.17 million tonnes of grain with a productivity of 1018 Kg/ha (Ministry of Agriculture Government of India 2018) [3]. The industrial demand for the grain sorghum as a raw material is increasing. The first three largest producing states are Maharashtra, Karnataka and Madhya Pradesh (Anonymous, 2019) [3]. In India, the productivity of *rabi* sorghum is very low, and highly variable from year to year mainly due to post flowering drought the *rabi* sorghum is highly valued because of its good grain quality and fodder. This crop is usually affected by water stress has the most adverse effect on yield (Kebede *et al*., 2001) [7].
Correlation coefficients nearly describe the existence of association between characters. It is rather difficult to explain a system of correlation as there indirect association of these characters. The method of path coefficient developed by Wright (1921) [13] is helpful in assessing whether association of characters with yield is having direct or indirect effect on yield or is a consequence in indirect effect through some other traits.

2. Materials and Methods
Experimental material for the proposed work consists of Promising M_4 mutant lines of *rabi* Sorghum variety Parbhani Moti generated by gamma rays and EMS treatments. Total 51 mutant lines and six Checks (Parbhani Moti, Parbhani Super Moti, M-35-1, CSV-22R, CSV-29R and PKV Kranti), was evaluated at experimental field of Department of Agricultural Botany, VNMKV, Parbhani during Rabi 2019-20. Sowing was done by dibbling on 30th October, 2019. The mean values of all the traits under consideration were used for statistical analysis. The data were subjected to following statistical analysis. The genotypic and phenotypic variance were calculated by using the respective mean squares from variance table (Burton 1952) [5]. Heritability (Broad sense) was calculated according to the method suggested by Allard (1960) [2].

3. Result and Discussion
The results of analysis of variance for fifty seven genotypes in *rabi* sorghum are furnished in Table 1. Highly significant differences among the genotypes were observed for all the fourteen characters indicating presence of sufficient amount of variability in all the characters studied.

The present study was undertaken to study the genetic variability, association of characters and their direct and indirect effects on grain yield. Plant breeding deals with the management of genetic variability present in a population. It's assessment in available germplasm is of immense importance for further crop improvement and to identify the superior genotypes. Selection on the basis of *perse* performance for plant yield does not give fruitful results as yield is a complex character.

In general, wide range of variability was observed for majority of characters. Range of variation on the basis of mean was more for characters *viz.,* days to 50% flowering, days to physiological maturity, plant height, number of primaries per panicle, number of grain per primaries, panicle length, panicle width, panicle weight, 100 seed weight, grain yield per plant, fodder yield per plant, Zn content, Fe content and protein content. Wide range of variability for different yield contributing characters in sorghum were reported by several workers including Shinde *et al.* (1979) [9] for plant height, panicle weight and grain yield, Veerabhadiran and Kennedy (2001) [12] for grain yield per plant and days to 50% flowering, the study of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) is not only useful for comparing the relative amount of phenotypic and genotypic variations among different traits but also very useful to estimate the scope for improvement by selection. The reliability of a parameter to be selected for breeding programme among other factors is dependent on the magnitude of its coefficient of variations (CV) especially the GCV.

In the present study, genotypic variance was slightly lower than phenotypic variance for all the characters. Although the phenotypic variance was greater than genotypic variance, the difference between them were of lower magnitude suggesting the least influence of environment in the expression of these characters. High estimates of genotypic and phenotypic variance were observed for the traits plant height, fodder yield per plant, panicle weight, grain yield per plant. These results are in agreement with the results reported by Singh and Makne (1980) [10] for plant height, Seetharama *et al.* (1990) for plant height, Ali *et al.* (2009a) [1] for grain yield per plant and Tariq *et al.* (2012) [12] for primaries per panicle and fodder yield.

Table 1: Analysis of variance for fourteen characters of *Rabi* sorghum

Sr. No.	Sources of variation	d.f.	Days to 50% flowering	Plant height (cm)	Days to physiological maturity	Number of primaries per panicle	Number of grain / primaries	Panicle length (cm)	Panicle width (cm)	Panicle weight (gm)	100 seed weight (gm)	Grain yield/plant (gm)	Fodder yield/ plant (gm)	Fe content (ppm)	Zn content (ppm)	Protein content (%)
1	Replication	1	0.71	848.42	4.64	1.97	1.89	1.20	0.42	16.98	0.10	10.14	20.54	0.68	0.68	0.08
2	Treatments	56	13.57**	4737.51**	31.27**	10.37**	12.32**	6.86**	2.24**	392.29**	0.20	115.23**	1619.20**	22.93**	26.70**	3.94**
3	Error	56	1.74	643.66	2.53	1.08	1.92	0.78	0.60	24.89	0.06	11.37	35.67	9.69	2.04	0.47

Table 2: Genetic variability parameters for fourteen characters studied In *Rabi* sorghum

Sr. No.	Characters	Range		Mean	σ^2 (g) (Genotypic variance)	σ^2 (p) (Phenotypic variance)	GCV (%)	PCV (%)	h^2 b.s. (%)	GA	GA as % of mean
		Minimum	Maximum								
1	Days to 50% lowering	67.50	80.50	74.97	5.91	7.66	3.24	3.69	77	4.40	5.87
2	Plant height (cm)	91	296	259.85	2046.92	2690.58	17.41	19.96	76	81.29	31.28
3	Days to physiological maturity	109	126	117.83	14.37	16.90	3.21	3.48	85	7.20	6.11
4	Number of primaries per panicle	20.50	30.50	26.58	4.64	5.72	8.10	9	81	4.00	15.04
5	Number of grains/primaries	28	39	33.32	5.20	7.12	6.86	8,03	73	4.01	12.08
6	Panicle length(cm)	14.50	21.50	18.15	3.04	3.82	9.61	10.77	79	3.20	17.65
7	Panicle width(cm)	6.50	11.50	8.32	0.81	1.42	10.85	14.33	57	1.41	16.94
8	Panicle weight (gm)	81	139	115.14	183.70	208.59	11.77	12.54	88	26.20	22.75
9	100-seed weight (g)	3.6	4.9	4.40	0.07	0.13	6.05	8.25	53	0.40	9.14
10	Grain yield per plant (g)	42	79	55.54	51.93	63.30	12.97	14.32	82	13.44	24.20
11	Fodder yield per plant (g)	37.50	150.50	88.18	791.76	827.43	31.90	32.61	95	56.70	64.29
12	Fe (ppm)	30.65	44.10	35.82	6.61	16.31	7.18	11.27	40	3.37	9.42
13	Zn (ppm)	19.60	32.70	25.26	12.33	14.37	13.89	15.00	85	6.69	26.51
14	Protein content (%)	9.50	14.55	11.45	1.73	2.20	11.50	12.97	78	2.40	21.00

4. References

1. Ali MA, Abbas A, Awan SI, Jabran K, Gardezi SDA. Correlated response of various morpho-physiological characters with grain yield in sorghum landraces at different growth phases. The J Animal & Pl. Sci. 2011a;21(4):671-679.
2. Allard RW. Principles of plant breeding, John Wiley and Sons, New York; c1960. Anonymous; c2019. http: faostat.fao.org/foodstat/collection
3. Anonymous. Ministry of Agriculture; c2018.
4. Burton CW, Devane EH. Estimating heritability in tall Festuca (*Restuca arundinaceae*) from donar material. Agronomy Journal. 1953;45(10):1476-1481.
5. Burton GW. Quantitative inheritance in sesame. Proc, 6th International Grassland Congress; c1952. p. 277-283.
6. Kannababu N, Rakshit S, Audilakshmi S, Tonapi VA, Patil JV, Dhandapani A, *et al.* Genetic variability among Indian rainy season sorghum cultivars revealed by morpho-agronomic traits. Indian J Genet. and Plant Breeding. 2013;73(1):110-115.
7. Kebede H, Subudhi PK, Rosenow DT, Nguyen HT. Quantitative trait loci influencing drought tolerance in grain sorghum (*Sorghum bicolor* L. Moench). Theoretical and Applied Genetics. 2001;103(2-3):266-276.
8. Seetharam K, Ganesamurthy K. Characterization of sorghum genotypes for yield and other agronomic traits

through genetic variability and diversity analysis. Electronic J Plant Breeding. 2013;4(1):1073-1079.
9. Shinde VK, Nerkar YS, Katepallewar BN. Studies on genetic variability in winter sorghum selection. Sorghum Newsletter, 1979, 22
10. Singh AR, Makne VG. Estimates of variability parameters in sorghum (*Sorghum bicolor* L. Moench). Maharashtra Agric. Univ. 1980;5(1):80-81.
11. Tariq AS, Akram Z, Shabbir G, Gulfraz M, Khan KS, Iqbal MS, *et al*. Character association and inheritance studies of different sorghum genotypes for fodder yield and quality under irrigated and rainfed conditions. African J Biotechnol. 2012;11(38):9189-9195.
12. Veerabadhiran P, Kennedy VJF. Correlation and path analysis studies in selected Germplasm of sorghum. Madras Agric. J. 2001;88(4/6):309-310.
13. Wright S. Correlation and causation. J Agric. Res. 1921;20:557-585.