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SHORT COMMUNICATION

STUDY OF GENETIC VARIABILITY OF FODDER YIELD AND IT'S COMPONENTS IN FORAGE SORGHUM [*SORGHUM BICOLOR* (L.) MOENCH]

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SUMMARY

Sixteen genotypes of sorghum viz., UP Chari-4 G-48 HC-260 UP Chari-2 SSV-84 SSV- 84 Pusa Chari-6, Pant Chari-4, HC-136, Pant Chari-7, Pant Chari-3, UP Chari-1, Jawahar Chari-6, MP Chari, HC-171, UP Chari-3 and HJ-513 were studied for genetic variability, heritability and genetic advance for green fodder yield, days to 50% flowering, plant height, number of leaves per plant, stem girth, leaf length, leaf breadth, total soluble solids, leaf area, leaf stem ratio, protein content and green fodder yield. Analysis of variance showed highly significant differences among the parents and F_1s for all the eleven traits. The parent's vs hybrids revealed highly significant differences for all the observations. The F test indicated that the variance due to treatments were highly significant for all the attributes which indicated that the presence of substantial genetic variability in the present set of material. The highest values of genotypic and phenotypic coefficient of variation (more than 25%) were observed for plant height, stem girth, leaf stem ratio and green fodder yield per plant, suggested that there was a possibility of improvement of fodder yield through direct selection. High heritability coupled with high genetic advance as percent of mean was recorded for leaf length, days to 50% flowering, leaf breadth, leaf area, leaf stem ratio, protein content and green fodder yield per plant, indicating that these characters are governed by additive gene action. Direct selection of these attributes will be effective and profitably for yield improvement.

Key words : *Sorghum bicolor,* variability, heritability, genetic advance

Sorghum [*Sorghum bicolor* (L.) Moench] is an important *Kharif* fodder crop of India. It is used in both human nutrition and animal nutrition. It has been used as fodder and grain as it's a good source of protein, fibre and minerals for animals. It is used as green crop, hay and silage for animal feed alone or in mixture feed to dairy cattle, horses, mules and turkeys, with lesser quantities feed to hogs, beef cattle and sheep. India is increasing on a fast scale as sorghum meal, animal food, baby food and breakfast cereal. Sorghum has adequate soluble carbohydrates to make good silage. In India, it is third major cereal after rice and wheat and it is most important food crop grown under rainfed conditions. Knowledge of genetic diversity of a crop usually helps the breeder in choosing desirable parents for the breeding program and gene introgression from distantly related germplasm. Understanding the wealth of genetic diversity in sorghum will facilitate further improvement of this crop for its genetic architecture (Santosh *et al*., 2015).

Sorghum is popular as a dual purpose crop also and is next to rice and wheat in its acreage and importance in India. Sorghum grain is used as staple food by millions of people and is grown in Northern states of the country it is mainly grown as fodder during summer and *kharif* seasons as a single as well as multicut crop. The grain of sorghum forms a stable food in the diets of the rural people and used as fodder for livestock. Sorghum is cultivated during rainy and post rainy seasons. This crop is well adapted to drought-prone regions with poor soil than other cereal crops. Forage sorghum seems to be a promising option in meeting out the increasing gap between fodder requirement and availability because it bears xerophilic characteristics, wide adaptation, fast growth habit, good ratoonability, palatability and digestibility and diversified uses such as green fodder, dry roughage and silage (Ahlawat *et al*., 2018).

Assessment of the genetic variability can be achieved by using morphological measurements and phenotypic characterization. The characterization of forage and fodder crops requires the availability of the variable genetic material for the component characters that is a major assets for initiating a fruitful crop improvement programme. Initiation of breeding programme for -forage crop improvement has developed only a few varieties of sorghum those are available for commercial forage cultivation and their grain yield. The present study was conducted to analyze the genetic diversity among the quantitative traits in sorghum germplasm accessions received from S.V.P.U.A & T., Meerut (U.P).

The experimental material for the present investigation was comprised of sixteen promising diverse parents namely UP Chari-4 G-48 HC-260 UP Chari-2 SSV-84 SSV- 84 Pusa Chari-6, Pant Chari-4, HC-136, Pant Chari-7, Pant Chari-3, UP Chari-1, Jawahar Chari-6, MP Chari, HC-171, UP Chari-3 and HJ-513 and their all possible 48 F_1's, developed through crossing sixteen parental lines in Line x Tester mating design. All genotypes were evaluated in a complete randomized block design with three replications at Crop Research Center (Chirodi) of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, (U.P.) during *Kharif* season 2016-17 and 2017-18. The observations were recorded on ten characters *viz*., days to 50% flowering, plant height, number of leaves per plant, stem girth, leaf length, leaf breadth, total soluble solids, leaf area, leaf stem ratio, protein content and green fodder yield. The data recorded on all these traits were subjected to various statistical and biometrical analyses *viz*., to work out analysis of variance, genotypic and phenotypic coefficient of variation, heritability and genetic advance. The experiment for raising parents and F_1's was conducted in a complete randomized block design with three replications. Seeds of sixteen parents and 48 F_1's were sown by hand dibbling method and the length of each row was kept 4m with rows were spaced 30 cm apart and plant to plant distance was maintained at 10 cm by proper thinning. The border rows were also planted to neutralize the border effect. The coefficients of variation, heritability in broad sense and expected genetic advance were calculated by the formula given by Burton (1952) and Johnson *et al.* (1955), Crumpacker and Allard (1962) and Robinson *et al.* (1949).

Analysis of variance for the randomized complete block design was carried out for all the eleven attributes of 64 treatments *i.e.* 48 F_1's, 12 lines and 4 testers. The Mean square values due to treatments showed highly significant differences among the used material in the present investigation for all the traits *viz*., days to 50% flowering, plant height, number of leaves per plant, stem girth, leaf length, leaf breadth, total soluble solids, leaf area,, leaf stem ratio, protein content and green fodder yield per plant, which indicated the wide spectrum of variation among the genotypes. Highest percentage of genotypic and phenotypic coefficient of variation (more than 25%) were recorded for plant height, stem girth, leaf stem ratio and green fodder yield per plant. Moderate (10-25%) was recorded for leaf area and low (<10%) for days to 50% flowering, leaf length, leaf breadth, number of leaves per plant, total soluble solids and protein content (Table 1).

Estimates of phenotypic coefficient of variation were generally higher than their corresponding genotypic coefficient of variation for all the attributes. Similar views have been reported by earlier workers Singh *et al.* (2017) and Kalpande *et al.* (2018). The high values of genotypic and

TABLE 1

Mean performance and parameters of variability for various traits studied in forage sorghum

S. No.	Character	Range	GCV (%)	PCV (%)	Genetic advance	GA as % mean	Heritability (%)
1.	Days to 50% Flowering	70.60-100.33	8.45	8.51	15.15	17.29	98.70
2.	Plant height (cm)	209.27-391.23	31.30	32.08	67.62	21.74	87.37
3.	Leaf length(cm)	65.67-85.67	5.46	5.77	8.11	10.65	89.58
4.	Leaf breadth(cm)	6.27-9.28	8.15	8.33	1.31	16.43	95.76
5.	No. of leaves per plant	12.00-17.00	7.00	8.27	1.82	12.19	71.53
6.	Leaf area (cm2)	349.06-518.22	10.07	10.12	84.32	19.45	93.33
7.	Stem girth (mm)	13.92-24.54	31.16	32.27	4.16	20.92	82.72
8.	Leaf stem ratio (w/w)	0.29-0.63	27.40	27.96	0.14	34.72	93.82
9.	Total Soluble Solids (%)	6.73-11.22	9.04	9.74	1.69	17.26	86.01
10.	Protein content (%)	6.51-9.67	9.46	9.85	1.54	18.72	92.23
11.	Green fodder yield per plant (g)	318.80-697.90	25.03	25.38	216.61	40.55	96.58

phenotypic coefficient of variation for these characters, suggested that there was a possibility of improvement of fodder yield through direct selection. High (>60%) heritability was observed for days to 50% flowering, green fodder yield per plant, leaf breadth, leaf stem ratio, leaf area, protein content, leaf length, plant height, total soluble solids, stem girth and number of leaves per plant. The high or moderate degree of heritability estimates for these characters suggested that the attributes were under genotypic control. This result is in agreement with finding of Kour and Pradhan (2016), Singh *et al.* (2017) and Kalpande *et al.* (2018).

High (>20%) estimates of genetic advance expressed as percent of mean have been observed for Stem girth, Plant height, Leaf stem ratio and Green fodder yield per plant. Moderate genetic advance as percentage of mean (10-20%) expressed for Leaf area, Protein content, Days to 50% flowering, Total soluble solids, Leaf breadth. No. of leaves per plant and Leaf length, suggesting good response for selection based on *per se* performance. Earlier research have reported similar finding with respect to genetic advance, Singh *et al.* (2017) and Kalpande *et al.* (2018). Direct selection of these attributes will be effective and profitably for yield improvement. The above finding is in agreement with those of Singh *et al.* (2017) and Kalpande *et al.* (2018) and Rajarajan *et al.* (2018). Therefore, on the basis of study of all the variability parameters, it may be interpreted that maximum improvement through direct selection can be brought for number of plant height, number of leaves per plant, stem girth, leaf length, leaf breadth, total soluble solids, leaf area,, leaf stem ratio, protein content and green fodder yield per plant.

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