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METROGLYPH ANALYSIS IN SEWAN GRASS (*LASIURUS SINDICUS* HENR.) ACCESSIONS

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SUMMARY

The present investigation was carried out to estimate morphological variation for green fodder yield and related traits in sewan grass (*Lasiurus sindicus* Henr.) for 273 accessions. The observations were recorded for eleven characters during *kharif*-2017 at Agricultural Research Station, Bikaner. Out of 273 accessions, metroglyph analysis study was done for 30 best accessions based on green fodder yield per plant. Among all the characters, two characters *viz*., number of tillers per plant and dry matter yield per plant showed high phenotypic coefficient of variation, respectively. These two characters were represented as glyph for metroglyph analysis; other nine characters were represented as rays on glyph at various lengths at different positions on the basis of their means criteria. On this basis, the 30 accessions were classified into seven clusters which had low-yielding, medium-yielding and high-yielding groups. The accessions from the low and high groups, respectively, generally possessed low and high values for each of the characteristics. The accessions from the medium-yielding group were intermediate for most of the characters. It can be also inferred that the scoring procedure would be utilized in the preliminary screening of a large number of genotypes for selection of accessions with desirable combination of various characters influencing the number of tillers per plant with dry matter yield per plant in sewan grass. Highly diverse accessions, on the basis of their total index score; (RLSB 1-41, RLSB 10-1, RLSB 4-41, RLSB 4-37 and RLSB 10-17) were identified.

Key words : Sewan grass, variability, metroglyph analysis, accessions

The dominant perennial grass is the indigenous sewan grass popularly known as the “king of desert grasses”. The only known species is sewan grass (*Lasiurus sindicus* Henr.) belongs to family: *Poaceae* is native to dry areas of North Africa, Sudanese and Sahelian regions, East Africa, and Asia. Sewan grass is a diploid species with somatic chromosome number (2n) 20. Sewan grass is a perennial grass that can live up to 20 years. Propagation is done either by sowing or root slips. It grows best on alluvial soils or light brown sandy soils with a pH of 8.5. This grazing pasture is of utmost importance in areas where annual rainfall is below 250 mm. The crude protein in the sewan herbage is high (8.14 per cent) in the early vegetative stage of growth. A 30-day cutting interval at a height of 15 cm gives the best dry matter yields. Sewan grass yields 2.7 to 10.5 tonnes fresh forage/ha/year and up to 3.4 tonnes DM/ha in well-established swards. Species like sewan grass are very important in arid environments because they provide forage, which maintains both wild mammals and livestock, and soil cover (Assaeed, 1997). Though, sewan grass tolerates prolonged droughts, but has not been found growing in higher rainfall zones and faces a serious threat of becoming an endangered species due to changes in the land use pattern and overgrazing (Sharma *et al.*, 2017). In India, sewan grass covers 0.1 million hectares of area (Bhagmal, *et al.*, 2011). Until the last decade, about 80 per cent of the total geographical area of Jaisalmer district covering Nachana, West Puggal, Mohangarh, Sultana and Binjewala supported sewan grasslands. The amount of variability in the accessions of any crops sets the limits of progress that can be achieved through selection. Meteroglyph analysis is a semigraphic method for assessing the pattern of morphological variation in a large number of germplasm lines taken at a time. This technique can be applied to both unreplicated as well as replicated data, because the analysis is based on the mean values of each character.

So, the present investigation was conducted to study the morphological variations in 30 best accessions out of 273 accessions of sewan grass based on mean values of green fodder yield per plant.

MATERIALS AND METHODS

All the germplasm accessions are established in germplasm block of AICRP on Forage Crops and Utilization, Agricultural Research Station, SKRAU, Bikaner. Each accession was established inunreplicated design with length spaced at 1m between rows and 1m between plants. The observations were recorded for eleven characters viz., days to 50% flowering, days to complete seed maturity, plant height, numbers of tillers per plant, leaf length, leaf width, spike length, green fodder yield per plant, leaf: stem ratio, dry matter percentage and dry matter yield per plant. For leaf length, leaf width, and spike length, five observations were recorded on each plant and averaged to obtain mean. Mean values for the different characters are presented in Table 3. The mean values were used to construct the metroglyph analysis as per the model suggested by Anderson (1957). In this, the glyphs were first plotted on the basis of two extremely variable traits namely number of tillers per plant (X axis) and dry matter yield per plant (Y axis) all the other characters were represented by rays on the glyph (Fig.1) Each ray represents a particular character obtained by dividing the range of variation into three equal classes giving the grades low, medium and high for each characters. The length of ray assigned to the characters depends upon the index scores of accessions for that character. The glyph positions and rays were used to assess the variability pattern and correlated traits for assessment of their divergent groups. Each germplasm accession has a special number and is represented as a glyph which is the intersection point of mean values of X and Y co-ordinates. The index values and the position of rays and arrows for the different characters are given in Table 1.

RESULTS AND DISCUSSION

In present study, graph plotted between number of tillers per plant and dry matter yield per plant which had high PCV (67.68, 29.84 for number of tillers per plant and dry matter yield per plant, respectively) and classified the thirty accessions of sewan grass into 7 clusters (Table 2). Similar results were obtained by Gupta *et al.* (1974) in pearl millet between number of tillers and grain yield.

In general, the number of accessions manifested medium range for dry matter yield per plant (Table 3. Highest total index score (68) was obtained for plant height. Similar result was reported by Sagar (2002) in

TABLE 1
Index score and signs used for nine characters for metroglyph analysis of 30 accessions of sewan grass

S. No.	Character	Range	Score 1		Score 2		Score 3	
			Value less than	Sign	Value from-to	Sign	Value more than	Sign
1.	Days to 50% flowering	36-48	40		41-44		44	
2.	Days to complete seed maturity	66-81	71		72-76		76	
3.	Plant height (cm)	55.3-110.3	73.6		73.7-92.0		92	
4.	Leaf length (cm)	15.10-39.52	23.50		23.51-32.00		32.01	
5.	Leaf width (cm)	0.32-0.68	0.44		045-0.60		0.61	
6.	Spike length (cm)	7.08-11.04	8.10		8.11-9.40		9.41	
7.	Green fodder yield per plant (kg)	0.873-1.971	1.239		1.240-1.605		1.605	
8.	Dry matter %	27.49-62.19	39.088		39.09-50.69		50.69	
9.	Leaf : Stem ratio	0.50-1.48	0.829		0.83-1.15		1.15	

TABLE 2
Distribution of thirty accessions of sewan grass into different clusters

Cluster	Number of accessions	Composition of cluster	Distribution
I	2	RLSB 7-41, RLSB 9-44	Low dry matter yield per plant with low number of tillers per plant
II	10	RLSB 1-9, RLSB 8-20, RLSB 11-47, RLSB 4-41, RLSB 11-26, RLSB 3-26, RLSB 10-17, RLSB 2-34, RLSB 1-22, RLSB 2-46	Medium dry matter yield per plant with low number of tillers per plant
III	8	RLSB 8-6, RLSB 4-21, RLSB 11-7, RLSB 3-28, RLSB 1-31, RLSB 4-31, RLSB 7-25, RLSB 10-23	Medium dry matter yield per plant with medium number of tillers per plant
IV	3	RLSB 1-19, RLSB 2-45, RLSB 4-43	Medium dry matter yield per plant with high number of tillers per plant
V	2	RLSB 8-4, RLSB 11-50	High dry matter yield per plant with low number of tillers per plant
VI	4	RLSB 1-27, RLSB 1-38, RLSB 4-37, RLSB 10-1	High dry matter yield per plant with medium number of tillers per plant
VII	1	RLSB 1-41	High dry matter yield per plant with high number of tillers per plant

pearl millet. In present investigation, accession RLSB 1-41 of cluster VII had the highest total index score (24) which grouped into high score for dry matter yield per plant and high score for number of tillers per plant. In cluster II accession RLSB 2-46 had the lowest total index score (12) which distributed into low score for number of tillers per plant and medium score for dry matter yield per plant. In cluster I accession, RLSB 7-41 and RLSB 9-44 grouped into low score for number of tillers per plant and low score for dry matter yield per plant. In cluster III, accessions RLSB 8-6, RLSB 4-21, RLSB 11-7, RLSB 3-28, RLSB 1-31, RLSB 4- 31, RLSB 7-25 and RLSB 10-23 showed medium score for number of tillers per plant and medium score for dry matter yield per plant. In cluster II, the highest number of accessions (10) was observed which were distributed into medium dry matter yield per plant with low number of tillers per plant. Cluster VII observed the lowest number of accession (1) which was distributed into high dry matter yield per plant with number of tillers per plant. This finding indicated the linear relationship of these two characters with green fodder yield. These results support our contention that groupings made on the basis of metroglyph of diagnostic features contribute towards preliminary identification of diversity grouping of breeding entries which have undergone random mating for several generations and also for their worth in the breeding programme.

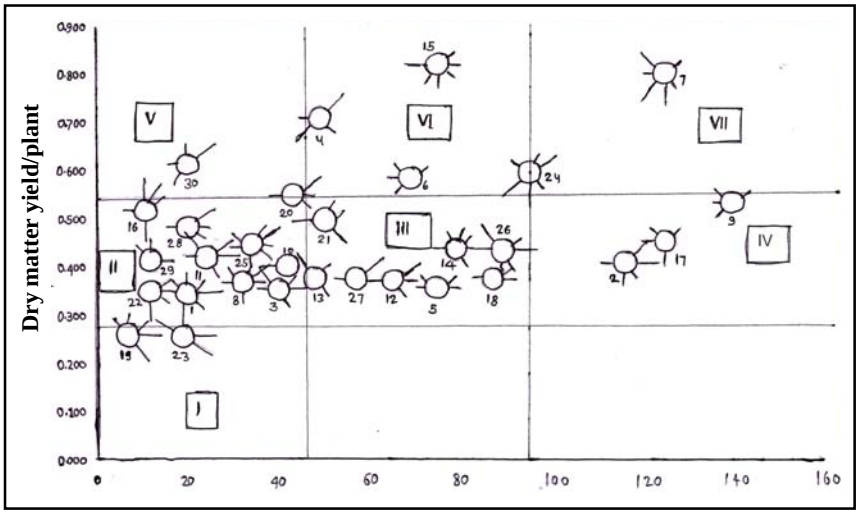

Fig. 1. Scattered diagram of metroglyph analysis of sewan grass accessions.

TABLE 3
Mean performances of 30 best accessions of sewan grass for eleven characters

S. No.	Accessions No.	Days to 50% flowering	Days to complete maturity	Plant height (cm)	No. of tillers/ plant	Leaf of tillers (cm)	Leaf length (cm)	Spike length (cm)	Green fodder yield/ plant (kg)	Dry matter %	Dry matter yield/ plant (kg)	Leaf : stem ratio
1.	RLSB 1-9	42	71	84.3	20	38.30	0.60	7.18	1.015	34.21	0.347	1.04
2.	RLSB 1-19	36	66	110.3	116	36.18	0.48	8.72	1.031	40.15	0.414	0.59
3.	RLSB 1-22	38	69	80.2	40	33.36	0.50	7.82	0.900	39.66	0.357	1.30
4.	RLSB 1-27	36	69	98.4	49	20.98	0.56	7.08	1.753	40.66	0.713	0.82
5.	RLSB 1-31	38	71	89.1	75	24.60	0.40	7.58	0.902	40.02	0.361	0.94
6.	RLSB 1-38	37	71	74.3	69	23.26	0.38	7.64	1.340	43.75	0.586	0.85
7.	RLSB 1-41	36	68	91.1	125	17.32	0.48	9.60	1.971	40.89	0.806	1.24
8.	RLSB 2-34	37	72	93.4	32	27.64	0.40	8.14	0.873	42.58	0.372	1.09
9.	RLSB 2-45	37	68	83.4	140	22.72	0.42	7.42	1.310	40.99	0.537	0.99
10.	RLSB 2-46	38	70	73.2	42	23.32	0.40	7.16	0.970	41.82	0.406	0.79
11.	RLSB 3-26	38	68	96.4	24	39.52	0.54	7.46	1.065	39.62	0.422	1.21
12.	RLSB 3-28	38	70	97.4	65	26.90	0.56	8.08	0.924	40.74	0.376	0.78
13.	RLSB 4-21	37	71	79.3	48	17.36	0.46	7.18	1.020	37.28	0.380	1.16
14.	RLSB 4-31	37	72	90.1	79	32.72	0.50	7.50	0.965	45.62	0.440	0.89
15.	RLSB 4-37	37	70	90.1	75	26.56	0.60	9.16	1.327	62.19	0.825	0.50
16.	RLSB 4-41	48	81	76.2	11	22.48	0.32	9.76	1.187	43.79	0.520	1.48
17.	RLSB 4-43	37	71	84.3	125	19.32	0.32	8.14	1.154	39.41	0.455	0.89
18.	RLSB 7-25	39	70	80.6	87	27.04	0.40	7.58	0.963	39.43	0.380	0.57
19.	RLSB 7-41	43	70	83.4	7	36.40	0.68	7.16	0.908	28.79	0.261	1.07
20.	RLSB 8-4	39	71	103.4	43	30.36	0.60	7.80	1.163	47.53	0.553	0.56
21.	RLSB 8-6	37	72	80.6	50	19.26	0.66	7.64	0.967	51.79	0.501	0.64
22.	RLSB 8-20	39	70	83.3	12	24.96	0.50	10.06	1.060	33.42	0.354	0.70
23.	RLSB 9-44	45	69	71.3	19	37.40	0.66	7.80	0.945	27.49	0.260	1.18
24.	RLSB 10-1	39	75	107.3	95	22.52	0.48	11.04	1.806	33.10	0.598	0.88
25.	RLSB 10-17	39	72	93.8	34	24.46	0.58	10.06	1.067	41.99	0.448	1.09
26.	RLSB 10-23	38	71	78.3	89	35.34	0.56	8.52	1.167	37.42	0.437	1.29
27.	RLSB 11-7	37	70	94.3	57	21.12	0.42	7.82	0.927	40.93	0.379	0.69
28.	RLSB 11-26	39	71	102.1	20	15.10	0.50	8.76	1.128	43.05	0.486	0.77
29.	RLSB 11-47	42	70	55.3	12	25.16	0.34	7.14	1.203	34.54	0.416	0.96
30.	RLSB 11-50	43	66	109.3	20	22.42	0.42	7.78	1.347	45.70	0.616	0.74

CONCLUSION

In present investigation, to assess the pattern of morphological variation used, metroglyph analysis was used. Analysis revealed that number of tillers per plant and dry matter yield per plant had high phenotypic coefficient of variation. Accessions with high index scores *viz.*, RLSB 1-41 (24) followed by RLSB 10-1 (23), RLSB 4-41 (22), RLSB 4-37 (21) and RLSB 10-17 (21) and low index score *viz.*, RLSB 2-46(12), RLSB 11-47(14), RLSB 7-25(15), and RLSB 11-7(15) were identified. It can be also inferred that the scoring procedure would be utilized in the preliminary screening of a large number of accessions for selection of accessions with desirable combination of various characters influencing the number of tillers per plant with dry matter yield per plant in sewan grass.

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