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PROGENY EVALUATION OF LATIN AMERICAN *Prosopis pallida* (Humboldt ex Bonpland ex Willdenow) H.B.K. IN INDIAN ARID TRACT

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Twenty two accessions of *Prosopis pallida* of Latin American origin were evaluated at 4 years growth for plant height and collar diameter in Indian arid tract. Shifting of accession rank order occured with advancement of growth; accession No. 418, 420 and 424 performed consistent and relatively better for both plant height and collar diameter upto the age of four years. Variability at genotypic level, hertibility (broad sense) and genetic advance as percent of mean were maximum at 2-year stage, indicating thereby the scope of improvement through selection at this stage.

Key words : *Prosopis pallida*, collar diameter, non-hirerchical eucleadian cluster analysis

Heritable differences among genotypes of different populations (Provenances "Sources") have been well recognised for many commercial tree species. These differences are demonstrated in designed provenance trials conducted on field, nursery or even in green house conditions. Burley *et al.*, (1984) opined that when provenance trials are carried out at a particular location, it is possible to detect some heritable differences in the provenances of same species collected from different habitats. These differences are particularly important to identify and select a suitable provenance for maximum productivity.

Importance of *Prosopis* species in and regions has been widely recognised (Muthana and Arora 1983; Felker, 1984; Sharma *et al.*, 1993, 94 and Sharma, 1995) but very little information is available regarding genetical aspects of exotic accessions on this species (when tried in India). Present Investigation was carried out on twenty two accessions of *Prosopis pallida* of Latin American origin with objectives to study the variability for plant height and collar diameter and to identify fast growing accession(s).

MATERIALS AND METHODS

Experimental site

Experiment was conduced at Silvatum of Central Arid Zone Research Institute, Jodhpur (India), located at 26° 18' N latitude and 73° 08' longitude. The climate of the area is typically arid, characterised by exceptionally hot dry summer, sub-humid monsoon and cold dry winters. The climatic details recorded at experimental site during the period of investigation are set in Fig. 1. The soil of the site is sandy-loam

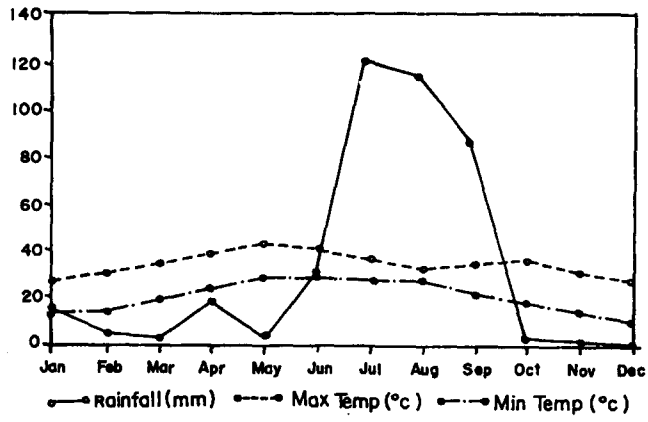

Fig. 1. Ombrothermic diagram for the study site. Data represents average of four years i.e., during course of experimentation

(Camborthid) with pH 8.1, and poor in nutrients having 0.23 per cent organic Carbon, 0.33 per cent nitrogen and 0.02 per cent phosphorus (Dhir 1984),

Field experimentation

Twenty two accessions of *Prosopis pallida* of Peruvian origin (procured from Caesar Kleberg Wildlife Research Institute, Texas A & M University, Kingville, USA) were used for the study, Except EC 308213 (US acc. no. 423) and 308214 (US acc. no. 424), all the accession belonged to Trujillo province of Peru. The EC 308213 (US. acc. no. 423) and 308214 (US acc. no. 424) owed their origin to Contumaza province. Here after only US accession numbers are used in further discussion which are simply indicated as accession number (acc. no.). The term accession is used to describe seeds from single tree representative of one location. Seeds were first scarified with conc. H_2SO_4 for 15 minutes and then washed with running tap water, and sown in Polythene bags (25 cm x 10 cm in 1:2:1) during the month of March (i.e. the onset of spring season). Five months old seedlings were then outplanted to field in the month of July (i.e. the onset of rainy season). Planting was done at the spacing of 2.5 x 4.0 in in randomised complete block design with four replications, each having five plants. Plants were veriguled fortnightly in summer and once in a month during winter (g 15 liter per plant in first year of planting only. Two hoeing (in a year) were carried out to control the weeds.

Quantitative analysis

Observations on survival, plant height and collar diameter of all the accessions were recorded in yearly interval up to four years age by following standard silvicultural measurement procedure. Replication means were used for statistical analysis using a computer software "SPAR 1" developed by Doshi and Gupta (1991).

RESULTS AND DISCUSSION

During the period of investigation, on an average, across all the accessions introduced, there was gradual increase in plant height from 89 cm per plant, at one year to 276 cm per plant, at four year age and in collar diameter from 0.88 cm per plant at one year to 3.8 crn per plant at four year age (Table 1). The characters, however, did not exhibit uniform growth in progenies of different accessions.

After one year, accessions no. 420 registered maximum plant height (128 cm/plant) as well as collar diameter (1.22 cm/plant) followed by acc. no. 418 for plant height (120 cm/plant) and acc. no. 421 for collar diameter (1.13) cm/plant). After 4 years, plant height was maximum in acc. no. 442 (387 cm/plant) followed by acc. no. 424 (373 cm/plant) and collar diameter was maximum in acc. no. 424 (6.05 cm/plant) followed by acc. no. 442 (5.35 cm/plant). For plant height, acc. no. 417, 418, 420, 424 and 4'13-, and for collar diameter, acc. no. 417, 418, 420, 421, 423 and 424 performed consistently better during all the four years. The performance of acc. no. 418, 420 and 424 was relatively better and consistent for both the characters. Therefore, these accessions may prove to be highly useful for raising plantations in the areas having similar climatic and edaphic conditions as that of experimental site.

Non-hirarchical eucleadian cluster analysis placed all the 22 accessions in four clusters across all the four years (Table 2). The cluster IV includes the accessions having comparatively higher mean values of plant height and collar diameter. Clustering pattern of accessions changed with growth. Among all 22 accessions, only acc. no. 424 found a place in cluster IV across all the four years. Inter- and intra-cluster distances revealed the presence of considerable variability in the material studied. The intra-cluster distances were less than inter-cluster distances and

Table 1. Means of plant height and collar diameter of 22 accessions of *Prosopis pallida* across four years (at early interval)

S. No.	EC no.*	US acc. no.**	Plant height (cm)				Collar diameter (cm)			
			1st yr.	2nd yr..	3rd yr.	4th yr.	1st yr.	2nd yr.	3rd yr.	4th yr.
1	3080207	417	63	134	209	266	1.01	2.32	3.04	4.53
2	3080208	418	120	269	279	323	0.94	3.56	3.99	4.65
3	3080210	420	128	288	232	326	1.22	3.74	3.60	3.85
4	3080211	421	103	227	216	271	1.13	3.03	3.09	4.38
5	3080213	423	79	162	213	289	1.03	3.29	4.48	4.46
6	3080214	424	108	235	264	373	1.08	3.31	5.09	6.05
7	3080218	428	89	156	245	315	0.81	2.32	3.60	4.57
8	3080219	429	73	126	161	189	0.67	1.26	1.66	1.99
9	3080220	430	90	146	144	228	0.90	1.65	1.54	2.81
10	3080221	431	80	126	181	256	0.77	1.67	3.19	3.52
11	3080222	432	80	104	178	227	0.77	1.32	1.74	2.58
12	3080223	433	97	164	230	301	0.85	2.05	3.57	4.10
13	3080224	434	81	124	187	260	0.81	1.41	2.84	3.31
14	3080225	435	87	122	230	311	0.88	1.57	3.41	4.62
15	3080227	437	95	163	204	254	0.88	1.89	2.88	3.56
16	3080228	438	82	124	166	236	0.75	1.80	2.04	2.80
17	3080229	439	75	114	191	215	0.78	1.47	2.05	2.90
18	3080230	440	93	152	191	247	0.68	1.75	2.58	3.34
19	3080231	441	89	143	187	254	0.91	1.89	2.58	2.89
20	3080232	442	87	132	292	387	0.75	2.23	3.81	5.35
21	3080233	443	86	162	234	296	0.96	2.13	2.74	3.78
22	3080236	446	132	196	250	0.70	1.77	2.97	3.54	
Mean			89	159	210	276	0.88	2.16	3.02	3.80
± SE			15	29	51	70	0.12	0.38	1.13	1.28
CV %			24	26	35	36	19.37	25.16	52.84	47.52
CD (5%)			30	57	-	-	0.24	0.76	-	-
CD (1%)			-	76	-	-	0.32	1.01	-	-

* EC no: Exotic collection number (EC No.) given by NBPGR, New Delhi to the seed lots received for the present study from donor agency
**US acc. no: The number given by donor agency for seed material used in the present study

inter-cluster distances were found to be to maximum between cluster I and cluster IV (Table 3).

Analysis of variance revealed that significant differences existed only during first two years of growth for plant height and collar diameter and these significant values are set in Table 4. In third and fourth years, differences were not significant for either character. In initial years, significance of differences may be attributed to

Table 2. Clustering pattern of 22 accessions of *Prosopis pallida* in four different years using non-hirerical eucleadian analysis

Years	Cluster No.	No. of obser-vation	Serial no. of accesions*	Cluster mean (cm)	
1st	I	9	8, 10, 11, 13, 16, 17, 18, 20, 22	81.87	0.74
	II	2	1, 5	70.88	1.02
	III	7	7, 9, 12, 14, 15, 19, 21	90.29	0.88
	IV	4	2, 3, 4, 6	114.50	1.09
2nd	I	9	8, 9, 10, 11, 13, 14, 16, 17, 22	124.06	1.55
	II	8	1, 7, 12, 15, 18, 19, 20, 21	150.47	2.07
	III	1	5	162.25	3.29
	IV	4	2, 3, 4, 6	254.75	3.41
3rd	I	5	8, 9, 11, 16, 17	168.00	1.81
	II	7	3, 4, 5, 7, 12, 14, 21	227.00	3.50
	III	7	1, 10, 13, 15, 18, 19, 22	193.39	2.87
	IV	3	2, 6, 20	278.33	4.30
4th	I	11	8, 9, 10, 11, 13, 15, 16, 17, 18, 19, 22	237.68	3.02
	II	6	2, 3, 7, 12, 14, 21	311.83	4.26
	III	3	1, 4, 5	275.25	4.46
	IV	2	6, 20	379.75	5.70

*Refer Table 1 for serial no. of accessions

maternal effects (due to differential seed reserves) because some accessions may have bolder seeds and some have smaller seeds, as accessions were collected from different habitats of wider locations having different climatic conditions and soil types. It is quite possible the seeds having different vigour may also vary in genetic constitution. Bolder seeds having more food reserve generally provide better nourishment to growing seedling, therefore, it is expected to give better plant type as compared to the cases of smaller seeds. The

Table 3. Average distances of cluster members from cluster centroid (diagonal) and distances between cluster centroids of four cluster during four different years in 30 accessions of *Prosopis pallida*

Years	Cluster	I	II	III	IV
1st	I	0.49	-	-	-
	II	2.02	0.55	-	-
	III	1.12	1.60	0.39	-
	IV	3.23	2.96	2.14	0.96
2nd	I	0.33	-	-	-
	II	0.88	0.36	-	-
	III	2.44	1.63	0.00	-
	IV	3.59	2.73	1.85	0.61
3rd	I	0.47	-	-	-
	II	2.44	0.62	-	-
	III	1.35	1.13	0.34	-
	IV	4.02	1.62	2.75	0.69
4th	I	0.64	-	-	-
	II	1.97	0.44	-	-
	III	1.66	0.77	0.21	-
	IV	3.98	2.02	2.41	0.39

Table 4. Analysis of variance and genetic parameters for plant height and collar diameter in *Prosopis pallida* across four years at yearly interval

Source of variation	d.f.	Mean Squares			
		Plant height		Collar diameter	
		1yr.	2 yr.	1 yr.	2 yr.
Replications	3	97.44	3040.4	0.10	0.99
Accessions	21	893.46*	10084.4**	0.09**	2.26**
Error	63	443.97	1641.2	0.03	0.29
GCV		11.87	28.87	14.01	32.48
PCV		26.41	38.49	23.90	41.08
Heritability (%)		20.20	56.30	34.30	62.50
Genetic advance (GA)		9.81	70.99	0.15	1.14
GA as % of mean		10.98	44.60	17.05	52.78

maternal effect (food reserve) will not influence the growth and development of genotypes after certain time period. Further development of plant will depend on genotypes (G), environment (E) and G x E interactions. In such cases, where variability was more at initial stage but decreased in advance stage, the accessions showing relatively better and consistent performance may be used for future course of plantations in the areas having similar climatic and edaphic conditions as that of experimental site.

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