

Variability and Changes in Genetic Parameters for Plant Height in *Prosopis Pallida* (Humboldt and Barplant ex. Willdenow) H B K

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Prosopis pallida, a native of south America was introduced in India in 1984 to study its adaptability in arid region. Ffolliott and Thames (1983) reported that it is a fast growing tree, adaptable to arid region and useful for fuel, fodder and soil conservation. Establishment and attainment of more plant height in a short period are considered as desirable traits in tree species of arid region as it combines fast early growth and production of more fuel and fodder.

The genetic parameters have been reported earlier to change with age (Samuel & Johnstone 1979, Jindal *et al.* 1991). In the present paper, attempts have been made to study the variability in plant height and change as in genetic parameters over time in *Prosopis pallida*.

Experimental material comprised of six exotic accessions (Table 3) of *Prosopis pallida* obtained from Peru. Seedlings were raised in nursery in polythene tubes containing uniform rooting media composed of FYM, soil and sand in 1:1:2 ratio and 5 months old seedlings were then transplanted in the field at CAZRI, Jodhpur research farm in July

1985. The planting was done at spacing of 4.0 x 2.5m in randomized block design with three replications.

The data were recorded every year for nine years starting from 1985 for survival and plant height then analysed to work out the variability (GCV and PCV), heritability and genetic advance (as per cent of mean) following standard procedures.

A perusal of data revealed significant differences among six accessions in respect of plant height over nine years except the first year of planting (1985). This indicated that the accessions did not show any significant variation during establishment period. Thus selection could not be practised at juvenile stage. Similar results were reported by Jindal *et al.* (1991) in *Tecomella undulata*. There was gradual increase in height in all the accessions over time from 0.70 m (1985) to 4.08 m (1993). Growth rate however changed over the years but maximum growth occurred during the period of 1990-91 (Fig. 1a). It may be due to favourable growing conditions, as maximum rainfall (844 mm) was recorded during this period. Amongst the acces-

Table 1 Mean values and estimates of variability for plant height over nine years

Genetic parameters	1985	1986	1987	1988	1989	1990	1991	1992	1993
Range									
Min	0.48	0.63	0.53	0.95	1.3	1.43	2.2	2.73	3.06
Max	1.2	1.25	1.36	1.54	2.29	2.28	3.72	4.37	4.61
Mean ± SE	0.70	0.94	1.02	1.23	1.80	1.92	3.10	3.72	4.08
	(±0.10)	(±0.09)	(±0.37)	(±0.09)	(±0.15)	(±0.23)	(±0.22)	(±0.25)	(±0.23)
F value	2.01	2.78*	2.90*	5.62**	4.95**	2.56*	4.71**	2.95*	4.89**
GCV (%)	9.40	0.72	16.96	11.59	11.67	10.94	9.68	6.72	7.99
PCV (%)	18.64	1.95	47.25	14.81	15.56	18.23	12.90	10.75	10.64
Heritability % (Broad sense)	25.12	37.16	12.91	60.24	56.96	34.24	54.38	39.38	56.38
Genetic advance as % of mean	9.66	10.04	12.56	18.40	18.39	13.09	14.45	8.71	12.34

*, ** Significant at p = 0.1 and 0.05, respectively

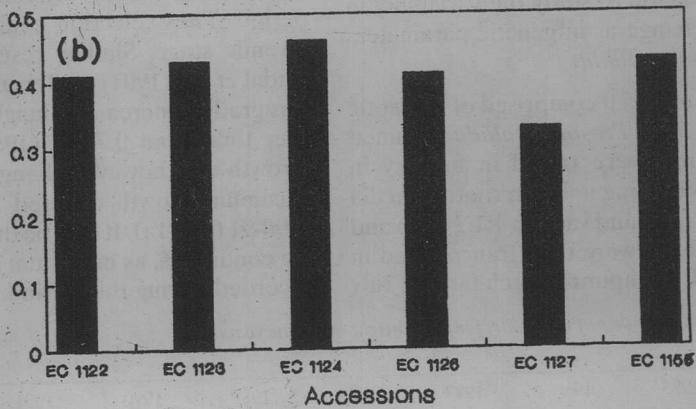
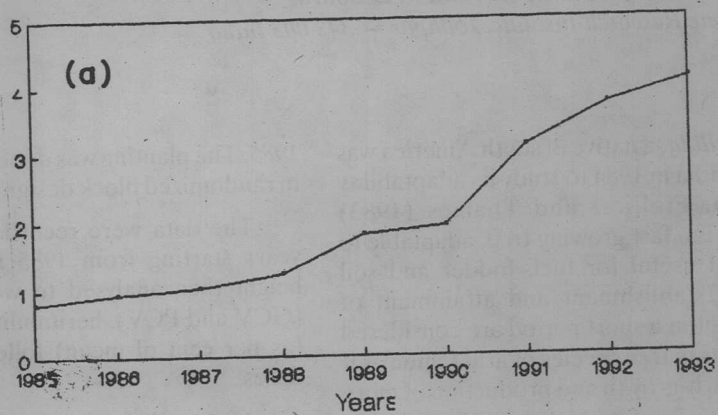


Fig 1 (a) Average growth rate of accession over years (b) Mean annual increment of different accessions of *Prosopis pallida*

Table 2 Pooled analysis of variance for plant height in six accessions over nine years

Source of variation	Degree of freedom	MSS
Accessions (X)	5	0.352**
Years (Y)	8	9.485**
X x Y	40	0.023
Error	90	0.047

**Significant at $p = 0.01$

In present investigation, pooled analysis showed that both accessions and years were showing significant effects but accessions x years interaction was not significant indicating thereby that the accessions maintained their ranks in plant height over the years (Table 2). Results of investigation indicated that in *Prosopis pallida*, selection for improved plant height neither at juvenile nor at much older stage is perfect, but 4th and 5th years old plantation is the best stage for effective selection. The results also revealed that *Prosopis pallida*

Table 3 Survival percentage of *P. pallida* over years

Acc. No.	1985	1986	1987	1988	1989	1990	1991	1992	1993
EC 1122	94.44	88.80	63.90	63.90	63.90	63.90	63.90	63.90	63.90
EC 1123	96.11	89.70	71.11	59.20	59.20	59.20	59.20	59.20	59.20
EC 1124	90.00	98.00	90.56	80.56	80.56	79.60	79.60	79.60	79.60
EC 1126	97.20	96.11	78.61	72.22	72.22	69.40	68.50	68.50	68.50
EC 1127	94.40	82.20	61.94	43.53	42.50	40.70	39.80	39.80	39.80
EC 1156	95.28	89.70	71.11	54.64	54.64	53.70	53.70	53.70	53.70

sions EC 1124 showed good, whereas EC 1127 showed poor performance in respect of plant height (Fig. 1b). Maximum survival was recorded in EC 1124 followed by EC 1126 and lowest was in EC 1127 (Table 3). The results also revealed that in all the accession mortality was higher in first and second years and after that it was negligible except in EC 1127 and EC 1156.

The estimates of parameters showed a wide range over the years (Table 1). The genetic variability expressed as GCV was highest in 1987 followed by 1988 and 1989. However, high magnitude of variability alone will not lead to much improvement unless coupled with high heritability. The maximum GCV was in 1987 but heritability was very low (12.91) indicating selection would not be effective. However, high GCV together with higher heritability (60.24 and 56.96) were observed during 1988 and 1989, respectively. This showed that maximum gain would be realized if selection is done in 4-5 years old plantation. It was further substantiated by maximum value of genetic advance in 1988 and 1989 (Table 1).

is a fast growing and well adapted to Indian arid regions, and it could be used for further mass multiplication to cater the needs of desert dwellers.

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References

- Ffolliott Peter F & Thames John L 1983 *Hand Book on Taxonomy of Prosopis in Mexico, Peru and Chile*. Food and Agriculture Organisation of the United Nations, Rome. P. 31.
- Jindal SK, Mangit Singh, Solanki KR & Kackar NL 1991 Variability and changes in genetic parameters of height in juvenile progenies of *Tecomella undulata* (sm.) Seem. *Journal of Tree Science* 10(1) 25-28
- Samuel CJA & Johnstone RCB 1979 A study of population variation and inheritance in sitka spruce, results of glass house, nursery and early forest progeny test. *Silva Genetica* 28 (1) 26-32