

# Provenance Variation in Seed Germination and Seedling Growth of *Prosopis cineraria* (L.) Druce in Arid India

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## Summary

*Prosopis cineraria*, an extremely important agroforestry tree species in the "Thar Desert", showed significant variation in seed germination, seedling survival and growth among 31 provenances collected from India. The seed germination varied from 5% to 74%, seedling survival from 39% to 87%, seedling height from 9 cm to 20 cm and collar diameter from 1.6 mm to 2.4 mm. The provenances from north-west India showed superior seed germination and seedling growth over those of south and middle India.

**Key words:** *Prosopis cineraria*, provenances, seed germination, seedling growth.

**FDC:** 165.5; 181.525; 232.12; 176.1 *Prosopis cineraria*.

*Prosopis cineraria* (L.) DRUCE (KHEJRI) is a true agroforestry species due to its very deep root system (TOKY and BISHT, 1992), monolayered canopy (BISHT and TOKY, 1993) and nitrogen fixing ability (ARYA *et al.*, 1992). This paper reports variation in seed germination and seedling growth of 31 provenances of this species collected from a wide range of latitude from 16°50' N to 29°55' N in India.

The trial was conducted at Hisar (29°10' N lat., 75°46' E long., 215 m alt., 350 mm to 500 mm annual rainfall) situated in an arid region of north-western India. Seeds of 31 provenances (Table 1) were collected from 5 to 15 trees in each site. The seeds were sown in September, 1991, in polythene bags (46 cm x 15 cm) in the nursery. There were 300 bags per provenance arranged randomly into 3 blocks. The bags contained sand and soil (1:1). *Rhizobium* inoculum was applied to the seeds. The seed germination was recorded at three day intervals up to the 30th day. The survival of seedlings was recorded after 6 months. The observations on height and collar diameter were made on 30 seedlings of each provenance picked up randomly from the 3 blocks. The data were subjected to an analysis of variance.

Seed germination started on the third day, was complete after 24 days. There was rapid germination during the first 15 days. The seed germination percentage differed significantly ( $P < 0.05$ ) among the seed sources and it ranged from 5% in Bijapur provenance to 74% in Jasrasar provenance (Table 1). After 6 months the seedling survival varied significantly ( $P < 0.05$ ) from 39% in Gandhinagar to 87% in Nagaur provenance.

Similarly the seedling height after 6 months differed significantly ( $P < 0.05$ ) among most of the provenances, and it ranged from a minimum of 9 cm in Barmer and Gulberga provenances to a maximum of 20 cm in Ganganagar provenance. The collar diameter was the greatest (2.4 mm) in Ganganagar, Vishnagar and Surat provenances, while it was the least (1.6 mm) in those of Sanchole and Bidhasar. The provenances of south and middle India showed lower seed germination and

Table 1. – Seed germination (G), seedling survival (SS), height (H) and collar diameter (CD), of 6-month old seedlings.

Places	Lat.		Long.		G (%)	SS (%)	H (cm)	CD (mm)
	°	'N)	°	'E)				
Bijapur	16	50	75	48	5	72	10	2.1
Gulberga	17	19	76	54	23	48	09	1.9
Parola	20	33	75	48	43	41	14	1.9
Aidlabad	21	05	75	52	35	54	13	2.0
Surat	21	12	72	52	21	64	18	2.4
Ankleshwar	21	38	78	03	34	76	13	1.7
Bharuch	21	44	72	58	33	72	18	2.0
Bhuj	23	15	69	49	30	39	14	2.1
Gandhinagar	23	15	72	17	26	39	10	1.7
Himmatnagar	23	37	72	59	42	64	15	2.0
Vishnagar	23	43	72	38	32	64	17	2.4
Sanchole	24	36	71	54	30	68	14	1.6
Jalore	25	21	72	37	36	74	17	2.0
Barmer	25	45	71	22	31	53	09	1.9
Nokha	26	00	73	22	70	76	15	2.0
Jasrasar	26	05	73	24	73	82	19	2.1
Jodhpur	26	17	73	03	41	65	14	1.9
Nagaur	27	12	73	44	34	87	13	1.8
Bidhasar	27	43	74	30	50	80	12	1.6
Jaisalmer	26	55	70	53	48	79	16	2.0
Bikaner	28	00	73	20	64	72	15	1.8
Sikar	28	05	75	00	17	59	15	2.0
Jhunjhunu	28	10	75	22	48	73	16	2.0
Churu	28	17	74	57	18	73	16	2.1
Bhiwani	28	46	76	18	13	63	12	1.9
Hisar	29	10	75	46	48	56	16	2.1
Anupgarh	29	12	73	13	69	82	15	2.1
Suratgarh	29	20	73	52	40	66	13	1.9
Sirsa	29	23	75	07	34	72	14	2.0
Hanumangarh	29	35	74	20	39	60	16	2.0
Ganganagar	29	55	73	50	51	73	20	2.4

poorer seedling growth than those from north and north-west India.

The wide variation in seed germination and seedling height and diameter were essentially genetic in origin. Similar variations have been reported in other arid and semi-arid trees such as *Acacia albida* (SNIETZKO and STEWART, 1989), *Eucalyptus* spp. and *Casuarina* spp. (TOKY and BISHT, 1991), *Prosopis alba*, *P. chilensis*, and Australian acacias (BISHT and TOKY, 1991). These variations are useful in selection of superior provenances for tree improvement programme.

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## Literature cited

ARYA, S., TOKY, O. P., BISHT, R. P. and TOMAR, R.: Potential of *Prosopis cineraria* (L.) DRUCE in arid and semi-arid India. In: *Prosopis* species-Aspects of their value, research and development. (Ed. R. DUTTON). Centre for Overseas Research and Development, University of Durham, Durham, U. K. pp 61–70 (1992). — BISHT, R. P. and TOKY, O. P.: Growth performance of some exotic fuelwood species tried in arid parts of India. *Myforest* 27:167–170 (1991). — BISHT, R. P. and TOKY, O. P.: Growth pattern and architectural analysis of nine important multipurpose trees in an arid region of India. *Can. J. For. Res.* 23:722–730 (1993). — SNIETZKO, R. A. and STEWART, H. T. L.: Range wide provenance variation in growth and nutrition of *Acacia albida* seedlings propagated in Zimbabwe. *For. Ecol. Manage.* 27:179–197 (1989). — TOKY, O. P. and BISHT, R. P.: Provenance trials of *Eucalyptus* and *Casuarina* in arid climate of north-western India. *Ind. J. For.* 14:315–317 (1991). — TOKY, O. P. and BISHT, R. P.: Observations on rooting patterns of important agroforestry trees growing in arid climate of north-western India. *Agroforestry Systems* 18:245–263 (1992).

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