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Research Article

Effect of Different Collection Dates on Seed Germination of *Albizia lebbeck* in Uttar Pradesh

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ABSTRACT

Albizia lebbeck is a medium-sized, multipurpose, deciduous tree species. Its leaves are uses as fodder, mulch and green manure, and wood for furniture and structural work. The seeds of A. lebbeck have been observed to exhibit physical dormancy due to hardness of the seed coat. Collection of seeds at proper maturity gives good seed germination. Hence, the present study was carried out to determine the exact maturity stage for seed collection of Albizia lebbeck at three locations of Uttar Pradesh i.e. Agra (S_1), Mathura (S_2) and Hathrus (S_3). Among the different collection dates, IInd week of January (7th collection) across the sites was found best as it resulted maximum germination (72.1±0.66 % at S_1, 71.4±1.15 % at S_2 and 69.5±0.56% at S_3). The results also revealed that moisture content decreased with advancement of maturity. At maturity, moisture content came down from 39.5±0.47 to 32.0 ±0.60 % at Agra, 35.2 ±0.30 to 28.9±0.66 % at Mathura and 42.8±0.39 to 30.0+0.69 % at Hathrus. At this stage, the colour of pod and seed was whitish yellow and light brown respectively. Present study revealed that pods of Albizia lebbeck may be harvested during IInd week of January to get maximum germination in Uttar Pradesh.

Key words: *Moisture content, Pod colour, Seed germination*

INTRODUCTION

Albizia lebbeck (L.) Benth, belong to family Leguminosae, is a medium-sized, multipurpose, deciduous tree species. It is a valuable source of timber, fuel wood, fodder and green manure. It is native to tropical Asia and is characterized by its ability to fix nitrogen and improve soil structure[9]. It is a tree of the mixed deciduous in both dry and moist type or of and semi-ever green and evergreen forest usually occurring sporadically and not gregariously. This tree is capable of fixing nitrogen in soil and its nitrogen rich leaves are valuable as mulch and green manure[21]. Its wood is used for furniture, structural work and interior fittings. Its wood is also considered as an excellent fuel wood. Being a leguminous multipurpose tree species, it is preferred in different plantation programmes.

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The species is commonly grown as a shade tree in pastures, tea, coffee and cardamom plantations[13]. The pressure on our existing forests and agriculture fodder resources have been constantly increasing with the ever-increasing human and cattle population. The situation has reached at alarming proportion in several parts of the country and massive efforts are afoot to not only rehabilitate the degraded forests but also to bring more area under forest cover. Availability of mature and viable seeds is a pre-requisite for raising the quality seedlings at massive scale. The seeds of *A. lebbeck* have been observed to exhibit physical dormancy due to hardness of the seed coat. Seed germination can be improved by giving various pre-sowing seed treatments. Kumar *et. al.*[11] reported that more than 90 % germination can be achieved by giving different pre-sowing treatments. Seed germination is strongly influenced by the stage of harvesting and maturity of seeds. The seeds collected at proper maturity stages give good germination. The knowledge of stage and time of maturity of seeds is essential for collection of abundant quantity of healthy and vigorous seeds. Keeping in view the importance of species and the lack of information on maturity indicators of this species in arid and semi-arid condition of Uttar Pradesh, present study was carried out.

MATERIAL AND METHODS

The present study was conducted Agra (S_1), Mathura (S_2) and Hathrus (S_3) sites of Uttar Pradesh which lies between 27° 10' N to 26° '4 N' latitude and 78° 02' E to 79° 7'E longitude between elevation 165 and 179.8 m above m.s.l. Five trees with clear bole, compact crown, fair number of pods were selected for the study at each site . The pods of *Albizia lebbeck* were collected from the all three sites at different dates. First pods collection has done on 15th October 2004 and subsequent collections were made at bi-weekly intervals, until the completion of natural seed fall. Pods from different trees were separately sealed in plastic bags and brought to the laboratory. Before the seed extraction and cleaning, pod parameters like length, width, moisture content (%), weight of 100 pods, number of pod per 100 g were measure at each collection dates. The size dimensions were recorded with manual varner's calliper and digital electronic balance was used for weighing of pod weight. Moisture content (%) was determined on fresh weight basis by drying (over drying) the material at 103+ 2°C for 16+1 hrs[10]. The pods were drying for 2-3 days and thereafter beaten with a stick and cleaned by winnowing to release seeds. After the process of seed extraction and cleaning, 3 replicate of 10 seeds were measured for seed length, width and size using Varnier's calliper and weight parameters like number of seed/g, weight of 100 seed. Moisture content was recorded on fresh weight basis by dry seed at 103+1° C for 16+ 1 hrs and moisture content was calculated as[10].

$$\text{Moisture content \%} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Fresh weight}} \times 100$$

The seeds were surface sterilized with 0.1 $HgCl_2$. Seeds were rinsed thoroughly to remove traces of mercuric chloride before putting for germination.. For germination, 3 replicate of 100 seeds each were used. The germination was carried out in Petri dish at laboratory (room temperature) for each collection date. Germination was counted when visible radicles. Germination percent was calculated as the total number of germinated seeds out of 100 seeds (total number seeds put in petri dishes).

$$\text{Germination (\%)} = \frac{\text{Number of germinated seed (vissible redicle of seeds)}}{\text{Total number of seeds put in petridish}} \times 100$$

Data recorded for different characters on different sites have been tested for their significance by using statistical technique of analysis of variance with Randomized block design suggested by Panse and Sukhatame[15].

RESULT AND DISCUSSION

The change in colour of pod/fruit is an indicator of maturity. The results presented in Table 1 showed that the pod colour changed from the green ((2nd week of October) to whitish yellow (2nd week of January) across all the collection sites. Similarly, the seed colour changed from green to light brown at maturity (Table 2).

The change in pod colour with the advancement of maturity was also reported by other researchers, also, in different tree species Similar by Bonner[5], Bonner[3], Bonner[2], Bonner[4], Ramakrishan *et al.*[18], Bharathi *et al.*[1], Rai *et.al*[17], Shah[20].

With the advancement of maturity, the moisture content in pods also decreased. During the first collection in the month of October it was found maximum in all sites and thereafter it declined with the advancement of collection dates.

At Agra site (S_1), the pod moisture content decreased from 71.8 % to 60.2 %, whereas at Mathura (S_2) and Hathrus sites (S_3) it decreased from 73.4 % to 61.6 % and 73.7 % to 63.8 %, respectively (Table 1). The average pod moisture content at (S_1), (S_2) and (S_3) was 61.57 %, 62.86 % and 64.08 respectively. (Table 1). Similarly, the seed moisture content also declined with the advancement of maturity. Maximum seed moisture (S_1 39.5 %, S_2 35.2 %, and S_3 42.8 %) was observed in seeds collected during October month in all sites and the minimum (S_1 32.0 %, S_2 33.8 %, and S_3 34.0 %) was in the seeds collected during 2nd week of January (Table 2).

Loss of water during seed maturity is more inherent phase of seed development. The decline in seed moisture content during pod/seed development is often attributed to the continued deposition of storage material in seeds. Change in colour and decrease in moisture content were also identified as maturity indicator by many researchers Rediske[19], Grover *et al.*, Carl and Snaw[6], Edward[8], Cram and Linquist[7], Welbaun and Bradford[23], Maideen *et al.*[12], Singh[21], and Phyartyal *et al*[16].The mean pod/fruit length and width were recorded 24.73 cm and 2.62 cm (S_1), 23.56 cm and 2.40 cm (S_2) and 22.51 cm and 2.72 mm (S_3).

The data on seed germination (Table 2) revealed that the maximum germination (72.1±0.66 % at S_1, 71.4±1.15 % at S_2 and 69.5±0.56% at S_3) was recorded in the seeds collected during the 2 nd week of January for all the sites. At this collection date, the pods and seeds were having green and light brown, respectively. At this stage the seed moisture content was 32.0 % S_1, 33.8 % S_2 and 34.0 % S_3. similar observation found by Pandit *et al.*[14], that the maximum germination in *Populus ciliata* a broad leaf species has moisture content of capsules from 80% to 60% during maturation.

Moisture content (%) in pods and seeds were significantly different across the dates of collection and site. Interaction between collection dates x sites was also significantly different only in seed moisture content ($P<0.05$).

Seed germination (%) was significantly different across the dates of collection and sites, Interaction between collection dates x site was also significantly different ($P<0.05$).

Table 1: Physical parameter of pods of *Albizia lebbeck* over the collection period from mid-October to end of February in different sites

Site	Date	Day of collection	Pod Colours	Pod length (cm)	Pod width (cm)	Wt. of 100 pod (gm)	No. of pod/100 gm	Pod moisture content (%)
S_1	15/10	D_1	Green	22.8±0.27	2.0±0.02	357.9±1.46	20.3±0.53	71.8±0.67
	30/10	D_2	Green	23.6±0.28	2.2±0.03	345.4±1.09	24.0±0.71	69.2±0.84
	14/11	D_3	Yellowish Green	24.4±0.31	2.2±0.02	342.0±1.39	26.2±0.71	65.2±0.70
	29/11	D_4	Yellowish Green	24.9±0.53	2.4±0.03	340.5±1.31	26.6±0.81	63.3±0.95
	14/12	D_5	Yellowish Green	24.8±0.59	2.6±0.07	334.2±1.40	27.6±0.50	61.2±0.42
	29/12	D_6	Golden Yellow	25.1±0.66	2.9±0.07	289.9±3.59	30.8±1.5	61.0±0.76
	13/01	D_7	Whitish Yellow	25.3±0.56	2.9±0.07	286.2±2.33	36.2±0.35	60.2±0.41
	28/01	D_8	Whitish Yellow	25.6±0.78	2.9±0.09	279.3±1.93	36.3±0.39	58.0±0.49
	12/02	D_9	Whitish Yellow	25.7±0.41	3.0±0.07	273.9±1.88	38.9±0.98	55.2±0.37
	27/02	D_{10}	Whitish Yellow	25.7±0.47	3.0±0.6	273.8±3.45	40.5±1.35	50.1±0.54
		Mean		**24.73**	**2.62**	**312.31**	**30.74**	**61.57**
S_2	16/10	D_1	Green	21.1±0.55	1.9±0.07	346.1±2.27	23.0±0.95	73.4±0.67
	31/10	D_2	Green	21.5±0.51	2.0±0.03	338.0±2.30	27.1±1.00	68.4±1.54
	15/11	D_3	Yellowish Green	24.2±0.55	2.1±0.03	330.8±3.36	27.4±1.44	66.6±0.87
	30/11	D_4	Yellowish Green	24.4±0.51	2.1±0.02	322.6±2.08	28.1±0.92	65.3±0.66
	15/12	D_5	Yellowish Green	24.8±0.55	2.4±0.06	292.0±2.00	28.6±1.33	63.0±0.67
	30/12	D_6	Golden Yellow	24.3±0.38	2.8±0.08	268.8±2.38	31.3±0.84	62.3±0.59
	14/01	D_7	Whitish Yellow	23.8±0.65	2.7±0.05	262.0±4.22	38.0±1.14	61.6±0.39
	29/01	D_8	Whitish Yellow	23.9±0.68	2.7±0.11	261.0±2.81	39.2±0.25	60.3±0.59
	13/02	D_9	Whitish Yellow	23.9±0.49	2.7±0.06	260.8±2.22	40.3±0.89	56.4±0.42
	28/02	D_{10}	Whitish Yellow	23.9±0.15	2.8±0.03	254.3±1.93	40.5±0.80	51.3±0.74
		Mean		**23.56**	**2.40**	**293.6**	**32.25**	**62.86**
S_3	17/10	D_1	Green	20.6±0.39	1.8±0.04	342.5±1.46	24.0±0.49	73.7±0.56
	01/11	D_2	Green	20.8±0.35	1.9±0.04	332.4±3.12	26.6±0.79	69.5±1.76
	16/11	D_3	Yellowish Green	21.2±0.60	2.0±0.03	317.5±5.75	28.0±1.60	68.9±0.72
	01/12	D_4	Yellowish Green	21.2±0.79	2.1±0.02	309.7±1.86	29.3±1.24	66.7±0.45
	16/12	D_5	Yellowish Green	22.2±0.48	2.2±0.08	307.9±4.04	30.4±0.47	64.3±0.41
	31/12	D_6	Golden Yellow	22.4±0.64	2.4±0.07	284.4±3.34	32.4±0.60	63.9±0.76
	15/01	D_7	Whitish Yellow	23.5±0.54	2.6±0.05	280.4±2.59	34.6±0.73	63.8±0.64
	30/01	D_8	Whitish Yellow	24.0±0.49	2.6±0.07	276.8±1.65	37.6±0.43	62.3±0.86
	14/02	D_9	Whitish Yellow	24.7±0.35	2.6±0.05	254.4±2.18	38.8±0.92	57.2±0.74
	29/02	D_{10}	Whitish Yellow	24.7±0.39	2.6±0.05	251.7±1.04	41.4±0.70	50.5±0.75
		Mean		**22.51**	**2.72**	**295.77**	**32.31**	**64.08**
Average of Across all site				23.6	2.58	300.57	31.77	62.84
SEm ± for site				0.22	0.02	1.63	0.40	4.58
F-test				*	*	*	*	*
CD				0.44	0.52	3.24	0.79	9.06
SEm ± for Date/day				0.40	0.05	2.98	0.73	8.36
F-test				*	*	*	*	*
CD for day				0.80	0.95	5.90	1.45	16.56
SEm ± for SxD				0.70	0.08	5.16	1.27	14.48
F-test				*	*	*	NS	NS
CD for SxD				1.39	0.16	10.23	-	-

NS- Non Significant, *- Significance at 5% (P<0.05)

Table 2: Physical parameter of seed of *Albizia lebbek* over the collection period from mid-October to end of February in different sites

Site	Date	Day of collection	Seed colour	Seed length (mm)	Seed width (mm)	Seed size (mm)	No. of seed/ 100 g	Seed wt/100 seed	Seed (mm) diameter	No. of seed/ pod	Seed moisture content (%)	Germination (%)
S_1	15/10	D_1	Green	7.5±0.17	5.7±0.15	42.8±1.63	660.0±4.7	22.8±2.80	1.5±0.16	7.3±0.21	39.5±0.47	0.0±0.0
	30/10	D_2	Green	8.5±0.17	7.4±0.16	63.1±2.56	722.6±3.34	16.6±0.08	1.5±0.16	7.9±0.28	36.2±0.96	34.6±0.87
	14/11	D_3	Yellowish Green	8.6±0.16	7.5±0.17	64.7±2.52	730.5±5.01	15.6±0.12	1.6±0.17	7.9±0.23	34.5±0.83	51.2±1.48
	29/11	D_4	Yellowish Green	8.6±0.22	7.6±0.16	65.6±2.87	740.5±5.22	14.5±0.09	1.7±0.16	8.1±0.31	36.8±0.50	60.2±0.69
	14/12	D_5	Greenish Orange	8.7±0.21	7.5±0.22	65.6±3.50	773.0±4.17	12.7±0.06	1.7±0.15	8.2±0.25	33.0±0.58	63.1±0.87
	29/12	D_6	Greenish Orange	8.7±0.15	7.4±0.16	64.5±2.23	771.8±3.35	11.3±0.05	1.7±0.15	8.5±0.22	32.9±0.50	63.4±0.58
	13/01	D_7	Light Brown	8.7±0.15	7.4±0.16	64.5±6.28	747.7±3.85	14.4±0.08	1.7±0.15	8.7±0.21	32.0±0.60	72.1±0.66
	28/01	D_8	Light Brown	8.7±0.15	7.4±0.16	64.5±1.89	747.7±3.86	13.7±0.20	1.8±0.15	8.7±0.33	28.2±0.27	70.1±2.08
	12/02	D_9	Light Brown	8.7±0.15	7.4±0.16	64.5±2.23	735.0±2.52	12.9±0.30	1.8±0.13	8.7±0.30	21.7±0.42	69.2±1.10
	27/02	D_{10}	Brown	8.7±0.15	7.4±0.22	64.5±2.79	728.0±1.37	12.7±0.69	1.8±0.13	9.0±0.30	15.6±0.63	68.2±0.51
		Mean		**8.54**	**7.27**	**62.43**	**735.71**	**14.7**	**1.68**	**8.3**	**31.0**	**55.23**
S_2	16/10	D_1	Green	7.6±0.16	5.3±0.21	40.1±1.35	668.0±4.43	18.6±0.10	1.3±0.13	7.0±0.21	35.2±0.30	0.0±0.0
	31/10	D_2	Green	8.4±0.22	7.3±0.25	61.4±0.02	700.0±3.23	20.4±0.37	1.4±0.15	7.6±0.34	38.0±0.36	34.2±0.59
	15/11	D_3	Yellowish Green	8.5±0.21	7.4±0.16	61.6±2.62	712.8±6.05	14.8±0.13	1.5±0.16	7.9±0.23	37.8±0.82	52.7±0.41
	30/11	D_4	Yellowish Green	8.5±0.21	7.4±0.21	61.8±3.05	792.6±7.79	12.6±0.13	1.6±0.16	8.0±0.22	36.8±0.46	58.5±0.45
	15/12	D_5	Greenish Orange	8.5±0.33	7.4±0.31	65.2±4.88	784.1±7.97	12.2±0.13	1.6±0.16	8.1±0.23	35.9±0.51	62.5±0.54
	30/12	D_6	Greenish Orange	8.5±0.27	7.4±0.16	63.0±2.79	767.5±7.63	12.8±0.13	1.6±0.15	8.0±0.26	35.8±0.61	62.9±0.49
	14/01	D_7	Light Brown	8.4±0.22	7.3±0.21	61.7±3.24	758.2±6.46	14.8±0.14	1.6±0.16	8.0±0.20	28.9±0.66	71.4±1.15
	29/01	D_8	Light Brown	8.4±0.22	7.3±0.26	60.8±3.16	752.3±5.53	14.0±0.11	1.6±0.16	8.0±0.21	33.8±0.63	70.5±1.47
	13/02	D_9	Light Brown	8.4±0.16	7.3±0.21	60.8±2.94	754.8±5.92	13.1±0.11	1.7±0.16	8.0±0.31	24.2±0.45	69.4±0.54
	28/02	D_{10}	Brown	8.4±0.16	7.3±0.15	60.8±2.06	752.2±6.63	11.3±0.10	1.7±0.15	8.0±0.30	15.7±0.31	68.2±
		Mean		**8.34**	**7.12**	**59.77**	**744.25**	**14.46**	**1.57**	**7.83**	**32.27**	**54.83**
S_3	17/10	D_1	Green	7.5±0.16	4.7±0.15	35.3±4.54	668.3±4.05	18.1±0.10	1.2±0.15	7.1±0.18	42.8±0.39	0.0±0.0
	01/11	D_2	Green	8.4±0.22	7.3±0.15	61.5±2.61	683.7±4.89	19.1±0.14	1.4±0.13	7.3±0.15	39.2±0.32	30.1±0.63
	16/11	D_3	Yellowish Green	8.4±0.27	7.3±0.15	61.6±3.12	718.4±6.64	14.4±0.13	1.4±0.16	7.5±0.17	38.0±0.51	47.1±0.60
	01/12	D_4	Yellowish Green	8.4±0.22	7.4±0.16	62.4±2.82	752.7±6.97	13.2±0.12	1.6±0.16	7.6±0.16	36.8±0.51	57.4±0.46
	16/12	D_5	Greenish Orange	8.4±0.22	7.3±0.15	62.9±6.20	795.9±6.00	11.2±0.09	1.6±0.16	7.9±0.16	37.0±0.31	59.4±0.60
	31/12	D_6	Greenish Orange	8.4±0.22	7.2±0.13	60.6±2.35	763.6±5.76	12.1±0.10	1.6±0.16	8.1±0.18	36.0±0.52	60.9±0.59
	15/01	D_7	Light Brown	8.3±0.15	7.2±0.28	59.7±3.20	754.6±3.48	15.0±0.77	1.6±0.15	7.8±0.10	30.0±0.69	69.5±0.56
	30/01	D_8	Light Brown	8.3±0.21	7.2±0.20	59.7±2.11	754.2±7.74	13.9±0.16	1.6±0.16	7.9±0.23	34.0±0.87	67.2±1.10
	14/02	D_9	Light Brown	8.3±0.22	7.2±0.20	59.7±3.04	743.7±6.22	12.4±0.06	1.7±0.15	7.8±0.13	22.9±0.95	67.7±1.18
	29/02	D_{10}	Brown	8.3±0.21	7.2±0.20	59.7±2.44	754.3±5.80	11.0±0.09	1.7±0.15	7.8±0.13	17.9±0.51	65.4±0.63
		Mean		**8.30**	**6.99**	**58.38**	**738.94**	**14.85**	**1.41**	**7.68**	**33.48**	**52.47**
Average of Across all site				8.39	7.13	60.19	739.63	14.40	1.55	7.94	32.27	
SEm ± for site				0.09	0.08	1.20	2.78	0.25	0.61	0.10	0.36	0.38
F-test				*	*	*	*	*	*	*	*	*
CD				0.17	0.16	2.37	5.51	0.49	0.12	0.20	0.71	0.74
SEm ± for Date/day				0.165	0.15	2.18	5.08	0.46	0.11	0.18	0.65	0.68
F-test				*	*	*	*	*	*	*	*	*
CD for day				0.327	0.30	4.32	10.06	0.91	0.22	0.37	1.30	1.36
SEm ± for SxD				0.286	0.27	3.78	8.80	0.79	0.19	0.32	1.13	1.19
F-test				NS	NS	NS	*	*	*	NS	*	*
CD for SxD				-	-	-	17.43	1.57	0.38	-	2.24	2.35

NS- Non Significant, *Significance at 5% (P<0.05)

CONCLUSION

From the present study it may be concluded that colour as well as moisture content of pods and seeds are good indicators of maturity. Second week of January is a suitable period for pod collection of *Albizia lebbeck* as maximum seed germination was recorded from the seeds collected during this period in all the sites.

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