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Effect of Pre-Sowing Treatments on Seed Germination of *Gymnocladus burmanicus* Parkinson

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Abstract

Gymnocladus burmanicus is a leguminous tree species found in north-east India. Mature pods of this tree species yield soap material and are collected by local people for domestic purposes. The natural regeneration of the species is poor due to the presence of hard-waxy seed coats. Hence, the present investigation was carried out to enhance the germination by giving pre-sowing treatments. Among different pre-sowing treatments, H_2SO_4 treatment for 15 minutes gave the highest germination (70%) followed by the same acid pre-treatment for 10 minutes (63.67%). The other germination parameters viz., mean daily germination (2.50%), peak value (3.67%), germination value (9.17%) and germination energy (51.00%) were also maximum when the seeds were treated with H_2SO_4 treatment for 15 minutes. Hot water treatment, also, gave better germination (60.33%) as compared to cold water and urine soaking treatments. The minimum germination (5.33%) was recorded in untreated seeds.

Key words : Pre-sowing treatment, Germination, *Gymnocladus burmanicus*.

Gymnocladus is a small primitive genus (Fabaceae : Caesalpinioideae) with only five species of which *Gymnocladus angustifolia* occurs in Vietnam, *G. diocus* occurs in N. America and the remaining three species namely *G. chinensis, G. assamicus,* and *G. burmanicus* are confined to the trijunction of India, China, and Myanmar (1). *Gymnocladus burmanicus* has been reported in East Siang district of Arunachal Pradesh at 160 to 200 m above mean sea level within geographical limit of latitude 28.06, 28° 4′ 0′′N and longitude 95.33, 95° 19′ 60′′ E. It is a medium sized tree (average 14.5 m) having compound leaves, pods 12.5–17 × 2.7–3.7 cm, seeds globose, black, shining. It is commonly known as Dekang among the 'Adi' a tribal community of Arunachal Pradesh. This tree is culturally and medicinally important. The pods of the tree are used in shampoo, soap, dermatological disorders. Adi, a tribal community of Arunachal Pradesh, uses its pods as alternative of soap and for attracting the deer for hunting in traditional ways. Use of this tree among Pasi, Padam, Pangi, Minyong and other ethnic groups of Arunachal Pradesh is also well known (2). Mature pods are largely collected by local people and stored for future use. Deer were found to eat the mature fallen pods. These activities simultaneously affect its natural regeneration. Presence of hard-waxy seed coat is also one of the major constraints for its natural regeneration. Keeping in view, the importance of this tree species in the tribal community and problem in its natural regeneration. Keeping in view, the importance of this tree species in the tribal community and problem in its natural regeneration, the present investigation was carried out to improve the seed germination by giving different pre-sowing treatments.

Methods

The present investigation was carried out at College of Horticulture and Forestry, CAU, Pasighat. The matured pods were collected from tree growing in the nearby forest, and healthy and vigorous seeds were used for the study. The different pre-sowing treatments given were : Control (T_1, without treatment), cold water soaking for 24 hours (T_2), cold water soaking for 48 hours (T_3), hot water soaking and subsequent cooling for 2 hours (T_4), soaking in cow urine for 48 hours (T_5), H_2SO_4 treatment for 5 minutes (T_6), H_2SO_4 treatment for 10 minutes

Table 1. Effect of pre-sowing treatments on seed germination of *Gymnocladus burmanicus.* Figures in parentheses are arcsine transformed values.

	Treatments	Germination (%)	Mean daily germination (%)	Peak value (%)	Germination value (%)	Germination energy (%)	Germination initiation (days)
T_1	Control	5.33 (13.33)	0.19	0.24	0.04	4.33	19.67
T_2	Cold water soaking for 24 h	6.00 (14.13)	0.21	0.26	0.05	5.00	19.33
T_3	Cold water soaking for 48 h	10.67 (19.07)	0.38	0.43	0.16	7.67	16.00
T_4	Hot water soaking and subsequent cooling for 2 h	60.33 (50.97)	2.15	2.71	5.82	45.33	14.00
T_5	Cow urine soaking for 48 h	20.33 (26.80)	0.73	0.80	0.58	17.33	15.00
T_6	H_2SO_4 for 5 min	61.33 (51.57)	2.19	2.97	6.50	41.33	14.00
T_7	H_2SO_4 for 10 min	63.67 (52.90)	2.27	3.17	7.19	37.33	14.00
T_8	H_2SO_4 for 15 min	70.00 (56.83)	2.50	3.67	9.17	51.00	14.00
T_9	H_2SO_4 for 20 min	55.33 (48.07)	1.97	3.34	6.58	43.33	14.00
	CD (5%)	(1.53)	0.08	0.28	0.72	8.17	0.99

(T_7), H_2SO_4 treatment for 15 minutes (T_8) and H_2SO_4 treatment for 20 minutes (T_9). The seeds were thoroughly washed with water after giving H_2SO_4 treatments. The experiment was laid out in complete randomized block design in three replications. In each replicate 100 seeds were sown. The seed, after giving pre-treatment, were sown in poly bags and placed under Toko-patta (*Livistonia jekintiana*) thatch house. The observation on daily germination was recorded up to 28 days and thereafter, germination per cent, mean daily germination, peak value, germination value, and germination energy were worked out as per the procedure prescribed by International Seed Testing Association (3). The data were analyzed following the analysis of variance (ANOVA) technique for a complete randomized block design as suggested by Panse and Sukhatme (4).

Results and Discussion

Table 1 shows that among different pre-sowing treatments, the maximum germination per cent (70%) was recorded when the seeds were treated with H_2SO_4 for 15 minutes (8). The other germination parameters viz., mean daily germination (2.50%), peak value (9.17) and germination energy (51.00) were also found to be maximum in the same treatment. Although, the other acid treatments viz., H_2SO_4 for 5 minutes (T_6) and H_2SO_4 for 10 minutes (T_7) were also found to be superior as they gave 61.33 and 63.67% germination, respectively, which is higher than other treatments. Acid seems to soften the seed coat causing uniform inflow of water and unrestricted expansion of the embryo. The seeds treated with acid not only gave the highest germination, but also registered the early germination as seeds started to germinate after 14 days of sowing. But, the germination per cent decreased with the increase in duration of sulphuric acid treatment from 15 to 20 minutes (55.33%). This indicates that longer dip in H_2SO_4 is lethal for germination. The effectiveness of chemical treatments in breaking dormancy has been documented by many workers (5—7). Sulfuric acid pre-treatment has improved germination in species like *Acacia mellifera* (8) and *Robinia pseudoacacia* (9).

Hot water treatment (T_4) gave 60.33% germination which is significantly higher than cold water treatments. It indicates that hot water treatment soften

the seed coat properly and resulted higher and early germination. Hot water treatments also improved the germination percent in many tree species like *Cassia fistula* (10) and *Alstonia scholaris* (11). Cold water treatment for 24 hours (T_2) and 48 hours (T_3) did not improve the germination considerably. It indicates that the duration of cold water soaking was not sufficient. Soaking of seeds in cow urine gave higher germination (20.33%) as compared to cold water treatment and untreated seeds. The minimum germination (5.33%) was recorded in untreated seeds (T_1). Similarly, the other germination parameters viz., mean daily germination (0.19%), peak value (0.24%), germination value (0.04) and germination energy (4.33%) were, also, minimum in the untreated seeds.

The present study insinuated that pre-treatment of seeds with H_2SO_4 for 15 minutes is best among the different treatments employed as it gave highest germination, but keeping in view the high cost involved in acid, it is economical to treat the seeds with hot water and subsequent cooling for 2 hours for better germination.

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