EFFECT OF SEED TREATMENT ON THE GERMINATION OF RAKTA KAMBAL SEEDS

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The germination percentage of Rakta Kambal (*Adenanthera pavonia* Linn.) seed is very low (2.5%). Soaking of seeds in 20, 40, 60 or 80 percent sulphuric acid for 20, 40 or 60 minutes increased the germination percentage. Maximum germination (82.5%) was obtained when seeds were soaked in 60% sulphuric acid for 20 minutes. Germination percentage of seeds treated with 40, 60 or 80% sulphuric acid was significantly better than that of the 0% or 20% sulphuric acid treated seeds.

INTRODUCTION

Rakta Kambal (*Adenanthera pavonia* Linn. ; Family : Leguminosae, Sub-Family ; Mimosoideae) is a moderate sized deciduous tree of the eastern Sub-Himalayan tract, Burma, the Andamans and the Western Ghat (Troup 1921, Anon. 1948). The red wood of Rakta, Kambal is reported to be used as a substitute for true sandal wood (Anon. 1948). This tree grows well in moist areas and is propagated by cuttings (Troup 1921, Anon. 1948). It is often planted in road side plantations especially in southern India. Troup (1921) reported that the seed of Rakta Kambal is difficult to germinate.

In 1970 two Rakta Kambal seedlings were planted in the Bangladesh Forest Research Institute (BFRI) Arboretum, Chittagong. These achieved about 30 metres in height and 17 cm diameter at breast height. These trees produced enormous amount of seeds but the germination percentage of the seeds was very low (2.5%). Kramer and Kozlowski (1960) stated that a common cause of dormancy especially among seeds of Leguminous species is impermeability of seed coat to water. A study was, therefore, undertaken to soak the seeds in different concentrations of sulphuric acid for different time periods

to soften the seed coat and to determine the effect on the germination of seed.

MATERIALS AND METHODS

Pods of Rakta Kambal were collected from the tree in the month of January, 1985 and seeds were separated from the pods. The seeds were then treated with 0, 20, 40, 60 or 80 percent sulphuric acid for 20, 40 or 60 minutes sparately. The treated seeds were washed with water and then kept in petridishes on filter paper for germination. In each petridish 10 seeds were set and a measured amount of distilled water was added every day. For each treatment four replicates were taken. The germination percentages were recorded and the germinated seeds were removed from the petridishes and planted in polyethylene bags in the nursery. The temperature of the room (where the experiment was set) was recorded from the date of setting of experiment to the last day of germination of seeds. Average maximum and minimum temperatures of the room at 8 am, were 23.3° and 20.8°C respectively and at 2 pm 24.9° and 22.6°C respectively.

OBSERVATION AND RESULTS

The results are given in Table 1. The colour of the acid became dark brown when seeds were treated with 80% sulphuric acid, whereas it was light brown in case of 20% sulphuric acid. Due to acid treatment a number of white striations developed on the seed coat.

From the results it is clear that maximum germination (82.5%) was obtained when seeds were soaked in 60% sulphuric acid for 20 minutes. However, statistical analyses of the data revealed no significant differences in seed germination between 40, 60 or 80 percent sulphuric acid, treatment but germination percentage of seeds due to 40, 60 or 80% sulphuric acid treatment was found significantly better than that of 0% or 20% sulphuric acid treated seeds. Length of treatment period of seeds with acid showed no significant difference in germination percentage. Concentration of acid showed a positive effect on the day of initiation of germination. When the seeds were treated with 20, 40, 60 or 80 percent sulphuric acid, germination started 7, 4, 3 and 2 days respectively following treatment and continued for 36, 31, 20, 19 and 7 days respectively. The germinated seeds were planted in polyethylene bags. About 90% germinated seeds survived in the bags.

DISCUSSION

The seeds of many tree species exhibit some degree of dormancy and do not germinate even if placed under the most favourable environment (Kramer and Kozlowski 1960). A common cause of dormancy, especially among the seeds of leguminous species is water impermeability of the seed coat (Kramer and Kozlowski 1960). Usually, seeds do not resume physiological activity until imbibed with a certain amount of water. An effective treatment to break the seed coat is to soak the seed in sulphuric acid until the coats are soft and permeable (Kramer and Kozlowski 1960). Kozlowski (1971) stated that seed coat dormancy of many tree species may be broken by soaking seeds in concentrated sulphuric acid for periods varying from 15 to 60 minutes.

Table 1. Germination percentage of Rakta Kambal seeds under different concentrations of sulphuric acid treatment for different time period

Treatment period (minutes)	Concentrations of sulphuric acid				
	0%	20%	40%	60%	80%
20	2.5	27.5	67.5	82.5**	67.5
40	2.5	30.0	45.0	50.0	60.0
60	2.5	25.0	40.0	50.0	65.5

***Highly significant at P. O. 01 level*

Rakta Kambal is a leguminous tree and its seeds show low germination (2.5%). But soaking of seeds in 60% sulphuric acid for 20 minutes increased germination to 82.5 percent. A similar trend was also observed in Teak. Bamrungrars (1964) obtained best germination when Teak seeds were soaked for 40 minutes in 5% sulphuric acid. Nagaveni and Srimathi (1981) obtained 80% seed germination in *Santalum album* Linn. when seeds were soaked in concentrated sulphuric acid for 60 minutes. Treatment of *Pinus albicaulis* seeds with sulphuric acid or cutting of seed coat also improved seed germination (Pitel and Wang 1980).

In Rakta Kambal, germination of seed started earlier in the case of seed soaked in high concentration of sulphuric acid. This is probably because when seeds were treated with high concentration, the seed coat became very soft for the enhanced chemical reaction between seed coat and the acid. Seeds, thus, imbibed immediately after treatment and physiological activity resumed. With further dilution it took more time to soften the seed coat and seed germination was delayed.

Germination percentage of treated Rakta Kambal seeds increased with the increase of sulphuric acid concentration. Though statistically there was no significant differences in germination among 40, 60 and 80% sulphuric acid treatment, yet, in the case of seeds treated with 80% for various periods or 60% for 40, or 60 minutes the germination percentage was reduced than in the 60% sulphuric acid treatment for 20 minutes (Table 1). This is probably because high concentration of sulphuric acid or soaking of seeds in acid for a longer period affected the embryo directly or softening of seed coat made thorough permeability of water which resulted in the reduction of oxygen supply to the embryo. Kramer and Kozlowski (1960) also observed that excess of water in some tree seeds reduced or in some cases prevented germination by reducing oxygen supply.

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