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ALLEVIATING SEED DORMANCY OF *TECTONA GRANDIS* L. BY TEMPERATURE, PLANT GROWTH REGULATERS AND INORGANIC SALTS

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Abstract

Preliminary studies on the germination of teek seeds (*Tectona grandis* L.) were carried out at the institute of Plant Sciences, University of Sindh by subjecting the seeds with some physical and chemical methods. The viability of seeds were confirmed by 2,3,5- triphenyltetrazolium Chloride. Results revealed that by altering temperature at the germination stage the inhabitatry effect of seed coat was reduced. However scarification treatment with GA_3, Kinetine, H_2SO_4 and KNO_3 also promote the seed germination due to increased softening of the seed coat.

Introduction

Seed of the majority of land plants pass through a phase of dormancy that may be caused by several factors, delaying the whole life cycle of the plant. Ecophysiological studies thus are important for the formation of most desirable means of determining seed viability and consequently germination (Sen, 1977). *Tectona grandis* L. commonly known as Teak or Sagwan is the more prized timber tree by dint of its grain color and strength, the best teak develops in well drained deep alluvial soil with a pH 6.5 – 8.0 and a relatively high Ca and P content (Masilamani, 1996).

The main problem in teak is poor germination in nurseries, only 3% seeds results in a plantable seedling where teak found naturally, because of irregular dormancy cycle. The nature of barriers which prevent germination can be physiological (presence of germination inhibitors in felty mesocarp), physical (thick and hard endocarp) and morphological (hormone imbalance in seeds) which results in low germination (Masilamani, 1996). In Pakistan the cultivation of teak has continued to some extent however, the dormancy of its seeds remain hurdle for enhanced spreading of teak population. Application of chemical have been found to bring about the germination of dormant seeds (Bradbeer, 1968) alternating soaking and drying of seeds gave fairly constant results. The present studies were therefore, carried out to break the dormancy of seed of *Tectona gradis* L., by using physical and chemical treatments.

Material and Methods

Mature fruits/seeds were collected from the ground at the Miani Forest during January to April 2000. The seed were washed with sterile distelled water after removing apocarps and then subjected to scarification hot temperature (40ºC), cold temperature (4ºC) treatments, absolute H_2SO_4 and HCL treatment were given for softening of hard seed coat followed by KNO_3 treatment. Seeds were pre-incubated in Gibberlic acid ($GA_{3)}$ and Kinetine for 1to 6 weeks at different concentrations. Before setting them for germination, the seeds were decoated or split open by pressing along the margins and break them. Drying and soaking method was also used.

The seeds under each treatment were prepared for germination, for which 20 seeds were plated on Petri dish with sterile filter paper and moistened with 20 ml sterile distilled water. Five replicates from each treatment were placed in germination in cabinets running at constant temperature of 30ºC ± 1ºC and an alternating day/ night regime of 30/27ºC twelve hour period of light were used per day and seeds were watered when necessary. Seed viability was confirmed by 2,3,5 triphenyltetrazolium Chloride. Embryos that turned red were counted as viable (Copeland, 1995).

Results and Discussion

The present study focuses how to induce germination in seeds through physical or chemical treatments with greater understanding of the nature of dormancy (Dharmalingam, 1995). Seeds viability was confirmed by 2,3,5 triphenyltetrazolium Chloride which showed only 25% viability of embryos. Various pre-treatments were attempted on teak fruit to enhance the germination percentage. Soaking the seeds for 2 days, drying them for 1 day, and repeating this procedure four times promotes germination (Masilamani, 1996).

In the present study the problem of breaking dormancy was investigated in the different ways. When teak seeds (split at micropyle end) were subjected to (GA_3) (5-50 ppm) treatment for 6 days and scarification by H_2SO_4 for 20 minutes showed 4 to 16% germination, while pre soaked seeds in GA_3 if not split to expose the micropyle induce only 4% germination (Table 1). GA_3 seems to have a promotory role on seed germination in *Tectona grandis* L. Similar results were shown by Basn & Sur (1988) using GA_3 treatment of teak seeds. Teak seeds (split at micropyle end) when subjected to different kinetine concentrations for six days after scarification by H_2SO_4 for 20 minutes induced only 4 to 8% germination (Table 2), while pre-soaked seeds in Kinetine if not split to expose the micropyle not induced any germination. Gupta & Pattanath (1975) reported that nutrient deficiencies in some cases resulted in lower germination or early seedling failure.

Table 1. Seed Germination after incubation of 45 to 60 days

Scarification by H_2SO_4 minutes ↓					
GA_3 Treatment with different concentration in ppm for 6 days					
	5ppm	**10ppm**	**20ppm**	**25ppm**	**50ppm**
Open at Micropylar end	-	-	4%	16%	8%
With out open or split the seeds	-	-	4%	-	-

Table 2. Seed Germination after incubation of 80 to 120 days.

Scarification by H_2SO_4 minutes ↓					
Kinetine treatment with different concentration in ppm for 6 days					
	5ppm	**10ppm**	**20ppm**	**25ppm**	**50ppm**
Open at Micropylar end	1%	2%	4%	8%	6%
With out open or split the seeds	-	-	-	-	-

Table 3. Germination of *Tectona grandis* seeds by alternate temperature.

Treatments	Alternate	Temperature	Germination %
HCL → KNO_3	4°C	40°C	4%
H_2SO_4 → KNO_3	4°C	40°C	6%
Controlled	4°C	40°C	--

The effect of alternate heating and chilling (40ºC/ 4ºC for 24 hours) treated with 90% HCL and 90% H_2SO_4 for 15 minutes followed by KNO_3 treatment for 4 hours to teak seeds showed 4 to 6% germination (Table 3). These results are in agreement with those of Mayer (1963) who reported that endocarp is the main hindrance in teak seed germination. In treated teak seeds (40ºC/ 4ºC for 15 minutes) the quick change in temperature resulted in splitting endocarp and facilitated the emergence to solve the germination problem. However, continuous experimentation may find out the way to increase the germination rate of this economically important tree for wide spread cultivation in the country.

References

Basu, R.N. and K. Sur. 1988. Seed germination and viability, In: *Plant Physiology Research in India*. (Ed.): S.P. Sen. Soc. Pl. Physio. Biochem., New Delhi, 117-137.

Bradbeer, J.W. 1968. Studies in dormancy. IV. The role of inhibitors and gibberellins in the dormancy of *Corylus avellana* L., seeds. *Planta* (Berlin), 78: 266-276.

Copeland, L.O. and M.B. McDonald. 1995. *Seed Science and Technology*. New York: Champman and Hall.

Dharmalingam, C. 1995. *Workshop on Seed Technology*, Certain New Approaches in Bringing out the Innate Germination problems of Teak (*Tectona grandis* Linn.) Seeds, IFGTB, Coimbatore, India, pp. 75-83.

Gupta, B.N. and P.G. Pattanath. 1975. Factors affecting germination behavior of teak seeds of eighteen Indian origins. *Indian Forester*, 101(10): 584B588.

Machenzie, J.A. 1996. Hedegart, T., In: *FAO/DANIDA Training Course of Forest Seed Collection and Handling*, 1975, vol. 11: pp. 274-279.

Masilamani, P.P. 1996. Tamil Nadu Agricultural University, Coimbatore, Improving the quality of Teak germination.

Mayer, A.M. 1963. The Germination of Seed. 61: 94.

Sen, D.N. 1977. In: *Environment and Seed Germination of Indian Plants*. The Cronica Botanica Co. New Delhi.

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