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ASPECTS OF SEED TREATMENT FOR GERMINATION IN*Tamarindus Indica Linn*

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ABSTRACT

Investigation were carried out to determine the effects of varying mechanical seed scarification, storage options, ratios of seed weight to hot water volume and ratios of acid concentrations to treatment time on the germination of Tamarindus indica seeds, a potential refforestation tree in marginal lands. Highest germination percentage of 90 was recorded in seeds scarified along the circumference. Germination was enhanced by increased acid concentration for 60 minutes. Highest percentage germination of 92 was obtained when seeds were treated with 10% sulphuric acid for 60 minutes. Seeds weight to acid ratio did not exert significant influence on germination potential. Poor germination response was obtained from hot water treatment. Highest germination value obtained from hot water treatment was 65 per cent. Acid treated seeds stored in the refrigerator and laboratory maintained increasing germination percentage with time of storage. Irrespective of storage options, lower germination percentages were obtained in untreated seeds.

Keywords: Tamarindus indica, scarification, germination potential

INTRODUCTION

The semi-arid northern region of Nigeria is characterised by low rainfall, high potential evaportranspitation and sandy soil, is faced with the menace of encroaching Sahara desert. This situation has lead to extensive afforestation programmes in this fragile ecological environment. In Nigeria, most of the tree species, currently in use for combating desertification are exotic. Prominent among them are *Azadirachta indica, Albizzia lebbeck* and the Eucalyptus species. These species provide a short term solution, but in the long run may pose great ecological problems particularly because of their low rates of litter mineralization (Okoro *et al., 1986)*

Tamarindus indica is an indigenous legume, which has been recognised as a potential agroforestry tree (Awodola, *1989).*

The pulp from the fruit is used for pap (Oboho, *1989)* while the bark is known to have medicinal properties. With its ability to coppice, Tamarindus can be incorporated into refforestation programmes. It is known that the seed coats of most legumes are hard (Ovcharov, *1977;* Agboola *1995)* and that maturity of seed, water and chemical treatments are factors that could influence seed germination (Awodola and Abdullahi, *1990;* Agboola and Adedire, *1998).* Some of these requirements for satisfactory germination of seeds of *Tamarindus indica* have not been determined. This study was designed to assess the effects of mechanical seed scarification, acid concentration and treatment time, hot water treatment and storage conditions on the germination of seeds of *Tamarindus indica.*

MATERIALS AND METHODS

This study comprise of five trials. Seeds of *Tamarindus indica* Linn were used. In all trials, seed germination was measured by placing seeds between wetted filter papers in petri dishes under laboratory condition (32 + 4°C). In each trial, 10 seeds represents a replicate.

A completely randomised design with three replication was employed to assess the effect of mechanical scarification by comparing three methods of seed coat clipping namely: (a) clipped 2 mm from the micropyle (b) clipped 2 mm at distal end and (c) clipped around the seed circumference.

Sulphuric acid treatment was carried out to assess the effect of sulphuric acid concentration and treatment time on germination percentage. The trial was carried out in a split plot design with four replications. Three sulphuric acid concentrations (10%), (50%) and (98%); and three treatment times (10, 30, 60 min) made up the main-plot and sub-plot treatments respectively. Within each mainplot treatment the sub plot treatments were replicated four times at the rate of 10seeds per replicate. At the end of treatment application, seeds were rinsed with distilled water and tested for germination.

A split-plot experimental design with 4 replications was adopted to determine the optimum ratio of sulphuric acid to seed weight and treatment time. Treatment time (10, 30 and 60 min) made up the main-plot. The ratios of seed weight to acid volume (10 g to 40 ml, 20 g to 40 ml, 50 g to 40 ml) made up the sub-plots. After treatment
application, seeds were rinsed with distilled water and tested for germination.

The effect of hot water treatment on germination percentage in *Ta indica* seeds was assessed using split-plot design with 4 replications. Two volumes of hot water (land 2) litres made up the main plot treatment and three seed weights (10 g 50 g, 100 g) made up the sub-plot treatment. The water temperature was 100°C before seeds were immersed for 30 min. Treated seeds were subsequently tested for germination.

The effect of mode of storage option on germination percentage was investigated. Germination of untreated and sulphuric acid treated seeds of *T indica* which has been stored for varing periods in the screen house (35 + 5°C), laboratory (32+4°C) and in the refrigerator (2(°C) was assessed. Germination percentage of the seeds was assessed after one, two, three and four months of storage.

RESULTS AND DISCUSSION *Effect of mechanical scarification*

Result showed that site of scarification affected germination percentage in T. *indica* seeds (Table 1). Although there was no significant difference (P>0.05) between the three sites of mechanical scarification. the highest germination percentage of 90 was recorded in seeds which were scarified around the circumference. This is in agreement with earlier findings (lyamabo, 1967; Duguma *et al.*, 1988) that mechanical scarification is an efficient way of improving seed coat permeability in *Pterocarpus angolensis* and *Leucaena leucoephala.*

Table *1.* Effect *of* mechanical scarification *on* percentage germination in *T. indica* seeds

Scarification site		Percentage germination
A	2 mm from micropyle	70

B	2 mm from distalend	80
	Around the circumference	90
	L.S.D. (0.05)	28.25

Effect of sulphuric acid treatment

Results of the effect of sulphuric acid concentration and soaking period on seed germination are presented in Table 2. From this table it is apparent that seed germination increased with acid concentration and treatment time except for seeds treat for 60 min in 98% acid concentration.
Lowest germination
percentage of 47.5 was obtained in seeds treated in 10% sulphuric acid for 10 min. This is similar to the report by Duguma *et al (1988)* that germination percentage increased with longer treatment time in
Leucaena leucoephala seeds. The result of the effect of seed weight to acid volume (w/v) ratio and soaking period on germination are presented in Table 3. The results show that the various ratios of seed weight to acid volume gave uniformly high germination.

Effect of hot water treatment

The effect of the ratio of seed weight to hot water on seed germination is presented in Table 4. Higher percentage germination was maintained with increasing ratio of seed weight to hot water volume. Highest germination percentage of 65 was obtained when 100 g of seeds were soaked in 2 litres of hot water, while lowest germination percentage of 35.5 was recorded when 10g

Table *2.* Effect of sulphuric acid concentration and treatment time on percentage seed germination

Treatment time (min)	Acid concentration (%)			Mean
	10	50	98	
10	47.5	62.5	92.5	67.5
30	62.5	80	92.5	78.3
60	92.5	92.5	65	83
mean	67.5	78.5	83.5	-
L.S.D (0.05)				
Between treatment time mean				*4.1*
Between concentration mean				*4.1*
Between acid concentration for same treatment time				*7.6*
Between acid concentration for different treatment time				*7.6*

Table 3. Effect of seed weight to acid ratio and treatment time on seed germination in T.

indica seed

Treatment time (Min)	Seed wt to Acid _			Mean
	I0g to ml	20g to 40 ml	50g to 40 ml	t
1	10			
30	100	100	100	100
60	100	100	100	100
Mean	100	100	100	100

of seeds were soaked in one litre of hot water. This is in agreement with reports of earlier investigations (Duguma *et al., 1988;* Awodola and Abdullahi, *1990)* that high percentage germination was obtained with increasing ratio of seed weight to hot water in seeds of *Leucaena leucocephala* and *Acacia nilotica.*

Effect of storage options

The mode of storage on germination is presented in Table 5. Results show that irrespective of mode of storage, acid treated seeds had significantly higher germination percentage than untreated seeds stored either in the refrigerator or laboratory. It generally increased with time of storage. However germination percentage in untreated seeds stored either in refrigerator or in the laboratory. This is similar to the results obtained by other investigators (Attah-Krah, *1984;* Awodola and Abdullahi, *1990)* that storage for a long period at a relatively high temperature enhance seed germination through reduction in seed coat impermeability.

CONCLUSION

It is inferred from this study that mechanical seed scarification, mode of storage, acid and hot water treatments are

Table 4. Effect of hot water treatment on percentage seed germination in *T. indica*

Water Vol. (1)	Seed wt (g)			Mean
	10	50	100	
	33.75	37.5	42.5	37.9
2	48.75	61.25	65	58.3
Mean	41.25	49.4	53.75	-
L.S.D (0.05)				
Between water volume mean			*14.13*	
Between seed weight mean			*7.99*	
Between seed weight for same water volume			*14.13*	

Between seed weight for different water volume	*7.99*

Table 5. Effect of mode of storage and sulphuric acid treatment on germination percentage in seeds of *T. indica*

Storage condition	Period of storage	Acid treated seeds	Untreated seeds
Refrigerator	1	*91*	*27.5*
	2	*98.8*	*48.8*
	3	100	100
	4	*100*	*52.0*
Laboratory	*1*	*91*	*32.5*
	2	*98.8*	*45*
	3	100	*50*
	4	*100*	*53.5*
Screen house	*1*	*91*	*60*
	2	*98.8*	*60*
	3	100	*60*
	4	*100*	*52.5*

some of the factors that can significantly influence germination percentage in seeds *of T. indica*. Seeds mechanically scarified along the circumference gave higher percentage germination than those scarified elsewhere. Seed germination increased with increasing acid concentration and treatment time. Higher percentage germination was maintained with higher ratio *of* seed weight to volume *of* hot water. Germination percentage in untreated seeds stored in the laboratory increased with time *of* storage in 4 months but acid treated seeds stored or untreated seeds stored in the screen house were unaffected within same period.

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