TECHNICAL NOTE ON THE GERMINATION OF LEGUMINOUS TREE SEEDS

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ABSTRACT - Seeds of 33 leguminous tree species were tested for germination following mechanical or chemical scarification. The treatments gave germination of over 50% for 28 of the species. Mechanical or chemical scarification of about three times the number of seeds needed for an experiment with leguminous tree species is recommended as a rule of thumb when the germination rate of the seeds is in doubt.

Index terms: scarification, dormancy.

NOTA PRELIMINAR SOBRE QUEBRA DE DORMÊNCIA EM SEMENTES DE LEGUMINOSAS ARBÓREAS

RESUMO - A germinação das sementes de 33 leguminosas arbóreas foi testada após escarificação mecânica ou química. As sementes de 28 espécies, após escarificação, apresentaram mais de 50% de germinação. Quando não se conhece a taxa de germinação, como regra geral, recomenda-se fazer escarificação química ou mecânica de, aproximadamente, três vezes a quantidade de sementes de leguminosas arbóreas a serem usadas.

Termos para indexação: germinação de sementes, escarificação.

INTRODUCTION

An ability to germinate seeds of leguminous trees reliably is an essential prerequisite for systematic research with this class of plants. For researchers more accustomed to dealing with crop legumes, poor germination of the seeds of leguminous trees can be especially frustrating. While there may be particular techniques known to some researchers for certain species, it is difficult to obtain sound guidelines for germinating seeds of leguminous tree species dependably.

Obstacles to derivation of comprehensive germination guidelines are formidable. The legume family has arboreal species that are numbered in the thousands. Many of the species have physical and/or physiological dormancy. Commonly the degree of dormancy is dependent on the age of the seeds. Dormancy is often confounded by loss of viability, a factor heavily dependent on the conditions of seeds storage. Perhaps most seriously, the genetic heterogeneity in the majority of leguminous tree species makes it difficult to conceive of a germination procedure that will work consistently at the species level.

This brief paper is offered as a record of the experiences in one laboratoy with certain seed batches of an array of leguminous tree species. There is little guarantee that these procedures will give the same results in the hands of other researchers using different batches of seeds of the same species. It is even

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unlikely that the same procedures applied to the same seed batches will give the same results at a later date. These considerations notwithstanding, there is value in sharing and accumulating such data from which more reliable guidelines might be derived at some point in the future.

MATERIALS AND METHODS

Seeds were obtained from the Nitrogen Fixing Tree Germplasm Resource housed at the University of Hawaii NifTAL Project. Background information on the source of the seeds is presented in Table 1.

TABLE 1. Source of seed batches used in germination studies.

Species	Accession N.º	Source	Seed age (months)
Acacia albida	(NFT 101)	Ethiopia via Kew Gdns	> 10
Acacia auriculiformis	(NFT 136)	By NifTAL from Malaysia	7
Acacia cyanophylla	(NFT 111)	Kiryat Hayim, Israel	> 9
Acacia holoserica	(NFT 106)	Brisbane, Australia	3
Acacia mangium	(NFT 171)	Brumas, Sabah, Malaysia	8
Acacia mellifera	(NFT 152)	Khartoum, Sudan	> 12
Acacia nilotica	(NFT 103)	Ludhiana, Punjab, India	> 8
Acacia nubica	(NFT 154)	Khartoum, Sudan	> 12
Acacia pennatula	(JR 1)	Xalapa, Mexico	17
Acacia senegal	(NFT 151)	Shambat, Sudan	> 12
Acacia seyal v. seyal	(NFT 157)	Khartoum, Sudan	> 12
Albizia chinensis	(NFT 338)	Manoa, Oahu, Hawaii	> 3
Albizia falcataria	(NFT 181)	Bislig, Philippines	> 7
Albizia lebbek	(NFT 328)	Paia, Maui, Hawaii	3
Albizia lebbek	(JR 2)	Cardel, Mexico	5
Albizia julibrissin	(NFT 185)	Longwood Gdns, USA	> 7
Albizia moluccana	(NFT 182)	Manoa, Oahu, Hawaii	> 7
Albizia polyphylla	(NFT 339)	Los Angeles, USA	> 3
Brachystegia spiciformis	(NFT 135)	Zimbabwe	12
Calliandra calothyrsus	(NFT 161)	Java, Indonesia	21
Cassia siamea	(NFT 321)	Puunene, Maui, Hawaii	4
Enterolobium cyclocarpum	(NFT 320)	Puunene, Maui, Hawaii	1
Enterolobium cyclocarpum	(JR 3)	Cempoala, Mexico	5
Gliricidia sepium	(JR 4)	Cempoala, Mexico	4
Julbernardia globiflora	(NFT 127)	Salisbury, Zimbabwe	12
Leucaena leucocephala	(JR 5)	Buena Vista, Mexico	4
Leucaena leucocephala	(NFT 569)	Pukalani, Maui, Hawaii	1
Pithecellobium dulce	(NFT 327)	H'poko, Maui, Hawaii	4
Pithecellobium lanceolatum	(JR 6)	Cempoala, Mexico	1
Prosopis africana	(NFT 114)	Senegal	> 10
Prosopis juliflora	(NFT 116)	California, USA	> 10
Prosopis tamarugo	(NFT 169)	Chile	> 9
Pscidia communis	(JR 7)	Cempoala, Mexico	4
Samanea saman	(NFT 323)	H'poko, Maui, Hawaii	4
Sesbania grandiflora	(NFT 303)	Kohala, Hawaii	5
Tamarindus indica	(NFT 120)	Townsville, Australia	> 8

> The collection date was not known. Seeds are at least as old as stated based on the known date of receipt at NifTAL.

Treatments used to improve germination were: a) snipping; b) immersion in acid for varying periods of time; c) immersion in hot (80 degrees C) water; or d) no treatment. Snipping involved cutting off a small portion of the seed coat at the end of the seed opposite the embryo with nail clippers. Concentrated sulphuric acid was used in the acid immersion treatment. At the end of the immersion period, seeds plus acid were tipped into a large excess volume of sterile, distilled water at ambient temperature. Seeds were then imbibed in sterile water and germinated on water agar in a 28 degrees C incubator.

RESULTS AND DISCUSSION

The percentage germination of the various species is given in Table 2. Mechanical scarification by snipping or chemical scarification with concentrated sulphuric acid gave germination of more than 50% with 28 out of the 33 species listed. Only two of the accessions had germination of less than 30% and these were not scarified. Determination of the duration of immersion was largely subjective and based on seed size, shape and apparent hardness. These results suggest that if scarification, whether mechanical or chemical, is employed then satisfactory germination can be expected with many leguminous tree species. The results also suggest that at least three times the number of seeds actually needed for an experiment should be treated.

TABLE 2. Percentage germination of seeds of leguminous trees following treatment as specified.

Species	Accession N.º	Treatments				
		a	b		c	d
Acacia albida	(NFT 101)	79	77	(10 min)	-	-
Acacia auriculiformis	(NFT 136)	-	58	(30 min)	21	-
Acacia auriculiformis	(NFT 136)	-	70	(40 min)	-	-
Acacia cyanophylla	(NFT 111)	-	1	(10 min)	-	-
Acacia holoserica	(NFT 106)	-	45	(15 min)	-	-
Acacia mangium	(NFT 171)	-	74	(15 min)	-	-
Acacia mellifera	(NFT 152)	100	-		-	-
Acacia nilotica	(NFT 103)	31	13	(15 min)	-	-
Acacia nubica	(NFT 154)	-	100	(25 min)	-	-
Acacia pennatula	(JR 1)	-	13	(20 min)	-	-
Acacia pennatula	(JR 1)	-	79	(30 min)	-	-
Acacia pennatula	(JR 1)	-	7	(60 min)	-	-
Acacia senegal	(NFT 151)	-	-		-	7
Acacia seyal v. seyal	(NFT 157)	67	30	(10 min)	-	-
Albizia chinensis	(NFT 338)	100	-		-	-
Albizia falcataria	(NFT 181)	-	57	(30 min)	-	-
Albizia lebbek	(NFT 328)	90	-		-	-
Albizia lebbek	(JR 2)	100	-		-	-
Albizia julibrissin	(NFT 185)	90	-		-	-
Albizia moluccana	(NFT 182)	68	-		-	-
Albizia polyphylla	(NFT 339)	100	-		-	-
Brachystegia spiciformis	(NFT 135)	93	-		-	-
Calliandra calothyrsus	(NFT 161)	64	52	(15 min)	-	-
Cassia siamea	(NFT 321)	68	51		-	-
Enterolobium cyclocarpum	(NFT 320)	-	78	(30 min)	-	-
Enterolobium cyclocarpum	(JR 3)	-	58	(30 min)	-	-

TABLE 2. Continuation

Species	Accession N.º	a	b	Treatments	c	d
Enterolobium cyclocarpum	(JR 3)	-	95	(40 min)	-	-
Gliricidia sepium	(JR 4)	30	-		-	-
Julbernardia globiflora	(NFT 127)	-	-		-	71
Leucaena leucocephala	(JR 5)	-	100	(25 min)	-	-
Leucaena leucocephala	(NFT 569)	100	-		100	-
Pithecellobium dulce	(NFT 327)	94	-		-	-
Pithecellobium lanceolatum	(JR 6)	45	-		-	-
Prosopis africana	(NFT 114)	100	-		-	-
Prosopis juliflora	(NFT 116)	33	-		-	-
Prosopis tamarugo	(NFT 169)	-	100	(20 min)	-	-
Psidia communis	(JR 7)	-	-		-	16
Samanea saman	(NFT 323)	58	-		-	-
Sesbania grandiflora	(NFT 303)	94	36	(10 min)	-	-
Tamarindus indica	(NFT 120)	93	97	(15 min)	-	-

Treatments: (a) snipping opposite end of seed from embryo;
(b) immersion in acid for stated periods of time;
(c) immersion in hot water (80 degrees C);
(d) no treatment.

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