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Effect of Pre-Sowing Treatments on *Enterolobium Cyclocarpum*

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Abstract
This study assessed seed coat dormancy of *Enterolobium cyclocarpum* using different pre-treatments. Seeds were sown in white plastic buckets filled with loose and well drained river sand at 2x 2cm spacing and at sowing depth of 3cm. Bucket diameter was 22 cm and bucket depth from base to the bream was 24 cm. 5 replications of 100 randomly picked seeds at 20 seeds per bucket was used for each treatment and were laid out in complete randomized design. Viable seeds determined by floatation method were subjected to pre-treatments using control, 98% concentrated Sulphuric acid and physical abrasion for 1, 2 and 3 minutes. Results shows that physical abrasion (55 to 58%) were most efficient with lowest mean emergence time of 15 to 18 days. Acid scarification (13 to 18%) with mean emergence time of 30 to 33 day and. wet heat (21 to 35%) with mean emergence time of 35 to 50 days. Control experiment gave 13% and mean emergence time of 53 days. Thus, 1, 2 and 3 minutes physical scarification is highly recommended for the propagation of *Enterolobium cyclocarpum.*

Keywords: *Enterolobium cyclocarpum,* Seed pre-treatments, Seedling emergence percentage, Mean emergence time

1. Introduction

Enterolobium cyclocarpum (Jacq) Griseb Synonym *Mimosa cyclocarpum* Jacq,common name Enterolobium, Ear fruit, Ear pod and Elephant ear is a tree plant belonging to the natural Angiospermae. Order Fabales, Family Fabaceae Synonym Leguminosae and sub-Family Miimosoideae. *Enterolobium* Mart Genus comprises of 10 tropical American and West Indies tree species (Willis and Airyshaw, 1973) with centers of origin in Central and United States of America but now introduced to many tropical region including Nigeria in West Africa.

Enterolobium cyclocarpum is one of the largest trees in dry forest formations, standing up to 40 meters in height and 3 meters in diameter with a wide spreading crown, Stem glabrous, Leaves bi-pinnate with opposite leaflets. Flowers white, indehiscent Pod-fruit spiral or cyclic, thickened and contorted or twisted resembling a mammalian ear in shape and with 10 to 16 seeds. Seeds ovate and reddish brown, marked with yellow band on each surface, 20 x 15mm in size.

Economically important for its foliage and most importantly for its pod fruits that is readily consumed by livestock, tannins also derived from its pods. Wood useful for household construction as well as in interior decorations including paneling and has been found excellent for producing quality paper, the wood may also be used for boat building because of its durability in water.

The wide spreading canopy of the tree makes it an ideal shade tree for perennial crops such as coffee and for shading livestock in pasture lands, it is a great ornamental and shelter tree, highly suitable in biological parks and gardens. *Enterolobium cyclocarpum* has ability to fix nitrogen into the soil. Bark extracts of the tree are used in traditional medicine to treat bronchitis and cold infections (Http.www.com).

A seed is a fertilized, ripe or matured ovary containing one or more ovules as in Spermtophyta- Gymnosperm and Angiosperm plants. A typical seed consist of three basic parts i) an embryo ii)a supply of nutrients for the embryo and iii) a protective seed coat

consisting of an inner tegmen and outer testa. The seed has the ability to regenerate into a new higher green Spermatophyte plant. Karuiki and Powell (1988) defined seed germination as the process by which the dormnant embryo grows out of seed coats and establishes itself as a seedling

One of the most pertinent questions in the field of germination biology is what controls the timing of seed germination in soils. Many factors such as levels of carbon dioxide, improper aeration, age of seeds, poor seed storage, and diseased soils and have been suggested as preventing germination in soils. Many factors such as level of carbon dioxide, improper aeration, age of seeds, poor seed storage, diseased soils and production of allelo-chemical have been suggested as preventing germination in soils (Holm, 1979). However, in many leguminous seeds, hard seed coat prevents imbibition of water and exchange of gases, thus preventing initiation of the germination process (Maguire, 1975).

A healthy seed that does not germinate after providing it with the necessary conditions for germination is said to be in a dormant state (Lawal, 2004), dormancy is the condition of seed when it fails to germinate because of internal conditions, even though external conditions of light, temperature, sufficient oxygen, disease free soil and moisture are favourable (Osonubi and Chukwuka, 1999), Baskin and Baskin(2004) also defined.seed dormancy as a state in which seeds are unable to germinate in a specific period of time under a combination of environmental factors that are normally favourable for germination.

Dormancy may be caused by immaturity of the embryo, mechanical resistance of the seed coat and its impermeability to water and gases, activity of growth inhibitor such as Abscisic acid,tarring periods after seed ripening or maturation, it may also be due to too low or too high environmental temperatures and un-favourable light conditions

Any pre-treatment which reduces or destroys seed impermability by weakening or softening the seed coat is known as Scarification.Scarification treatment is used to soften the seed in order to make the seed coat permeable to water and gases without destroying the embryo (Seedbrock, 2006).

Methods used to artificially breakdown seed coat dormancy includes scarification with emery cloth, sand paper, concentrated sulphuric acid and other acids, addition of organic solvents such as acetone, alcohol and carbon disulphide, wet heat or hot water (parboiling), cutting,filing, nicking or treatment of seeds with objects such as pins, razor blade, knife or even cutlass and dry heat treatments which is analogous to heating by vegetation fires (Martins, et.al., 1975).

The present study have been undertaken using control,98% concentrated Sulphuric Acids wet heat (hot water) and physical abrasion pre-treatments focused at terminating seed coat dormancy to effect increased emergence rate and percentage of *Enterolobium cyclocarpum.*

Materials and Methods

Source of Seeds

Seeds of *Enterolobium cyclocarpum* used for the experiment were sourced from Obafemi Awolowo University (OAU), Ile-Ife, Nigeria [Latitude 7.5165^0N, Longitude 4.5286^0E and Altitude 256 metre.

Study Site and Management

The study was conducted at the Screen House of Plant Science and Biotechnology Department, Adekunle Ajasin University, Akungba Akoko for a period of 90 days. Seeds were sown in perforated white plastic buckets filled with loose and well drained river sand; the buckets were laid out in complete randomized design. Five (5) replications of 100. Randomly picked seeds- 20seeds per bucket were used for each treatment. Seed spacing was 2 x 2 centimeter and at sowing depth of 3 cm.

Seed viability test

Floating method after Pandey and Sinha, 2010 was used to test for seed viability. The processes involved dipping the seeds in a beaker,while seeds that sank to the bottom of the beaker were regarded as viable and were used for the experiment.

Dormancy Studies

Seeds for the experiment were subjected to 98% concentrated Sulphuric acid, wet heat (boiled or hot water), physical scarification and control treatments at 100 seeds for five (5) replications and then sown.

Acid Treatment

Concentrated Sulphuric acid (98%) were poured on the seeds and stored for 1, 2 and 3minutes. The acid was decanted and seeds were rinsed several times in distilled water and then sown.

Wet heat (Parboiling) Treatment

Boiled water at 100 0 Celsius were poured on the seeds and stirred for varying time durations of 1, 2 and 3 minutes and then sown

Physical Scarification Treatment

Seeds were manually or physically abraded with sand paper on all sides for varying time durations of 1, 2 and 3minutes and then sown.

Control

100 un-treated Seeds were sown as Control.

Emergence Counts

Seeds were recorded as emerged when the plumule attains a height of 1centimeter above the soil surface after Missanjo et. al., 2014

Emergence days

Emergence days were recorded as how many days that it took for individual seed to emerge, the experimental duration was 90 days.

Emergence Percentage

Emergence percentage were recorded as the total number of seeds that grew out or emerged out of a sample of 100 seeds per treatment.

$$\text{Emergence percentage} = \frac{\text{Total Number of seeds that emerged}}{\text{Total number of seeds sown}} X \frac{100}{1}$$

Graphical Representations

Bar graphs were plotted both for emergence percentage and rate of *Enterolobium cyclocarpum*

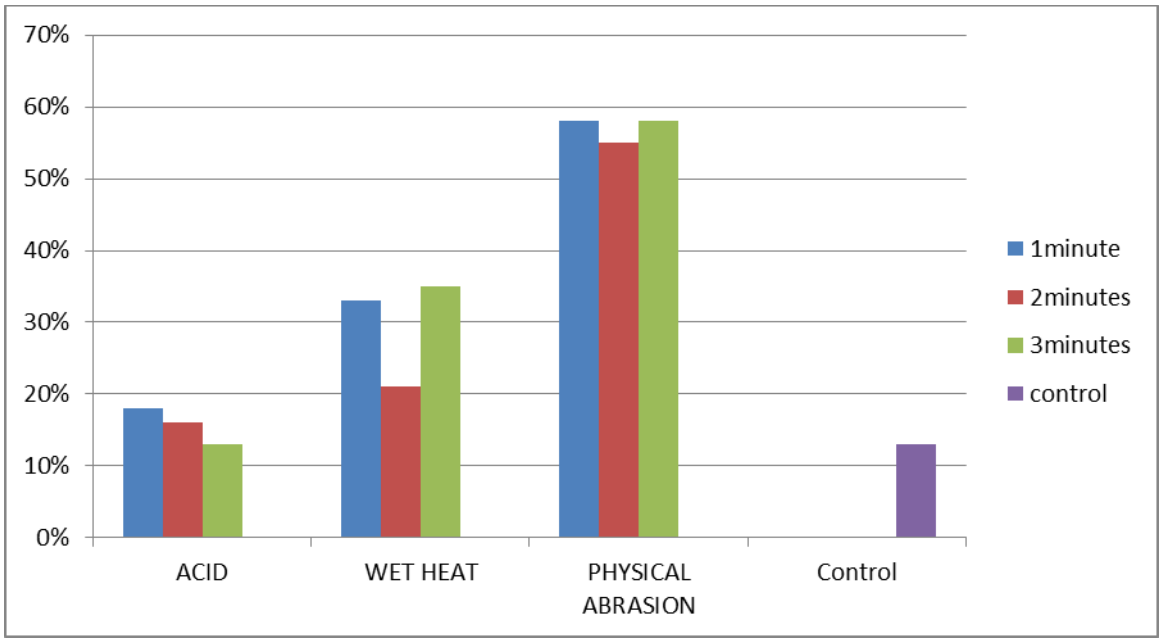

Fig 1: Effect of 1, 2 and 3 minutes pre-treatments on Percentage seedling emergence of *Enterolobium cyclocarpum*

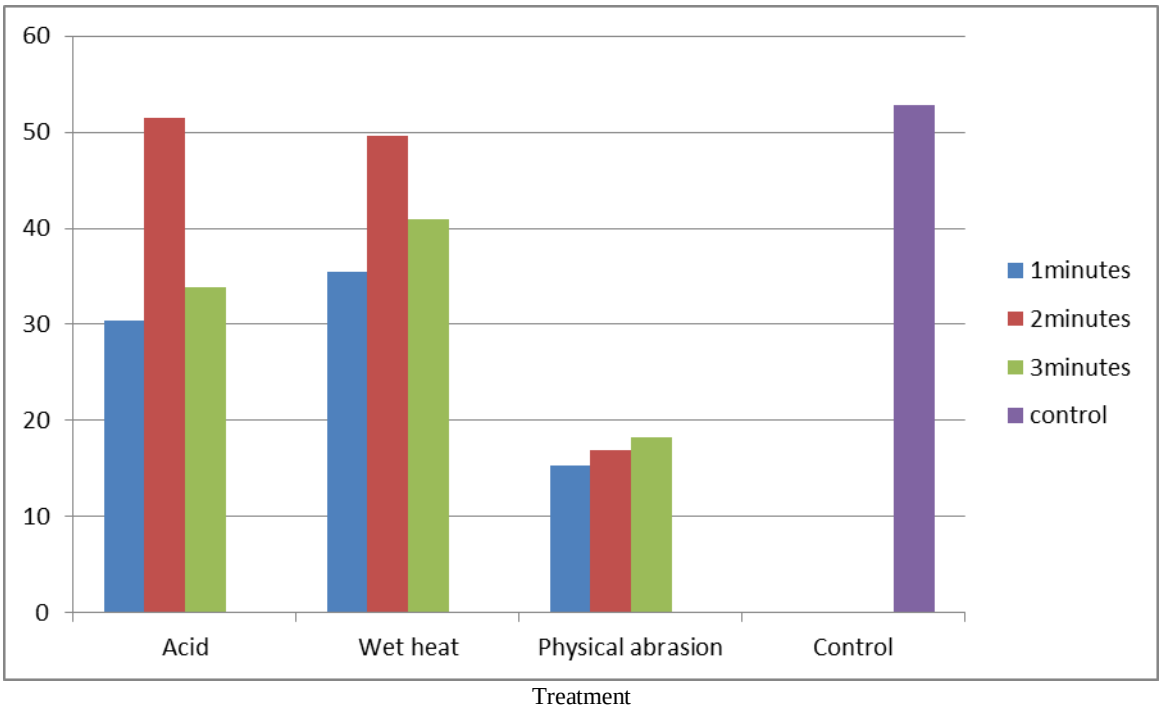

Fig 2: Influence of 1, 2, 3 minutes pre-treatments on Seedling emergence rate of *Enterolobium cyclocarpum*

Statistical Analysis

Data were subjected to Statistical analysis and Standard errors were derived.

DURATION/ TEST	SULPHURIC ACID	BOILING	MECANICAL SACRIFICATION
ONE MIN	0.49 ± 1.48	1.43 ± 2.57	0.70 ± 0.718
TWO MIN	0.73 ± 2.09	0.82 ± 2.129	0.88 ± 1.104
THREE MIN	0.38 ± 1.413	1.80 ± 2.792	0.83 ± 1.272

Control 0.42 ± 1.327

Discussion

Results from this experiment show that impervious seed coat may be the cause of dormancy in *Enterolobium cyclocarpum*. Breaking or overcoming seed coat dormancy in legumes using concentrated Sulphuric acid, wet heat or parboiling, physical abrasion and other treatments has been demonstrated by Ajiboye et. al., 2011, Missanjo et.al. 2014. Copeland, 1976 and Egley 1989 reported that hard seed coat create barriers to water uptake and entry of gases and that the presence of continuous layers of tightly packed

cells in the seed coat constitutes barrier to water and gases uptake.

Control (13%), Acid treatment (13 to 18%) and wet heat (21 to 35%) gave relatively low results compared to physical abrasion (55 to 58%) with faster mean emergence time of 15 to 18 days,physical scarification may explain how abrasion of the seed coat caused by ploughing, harrowing and and charring of the seed coat by field implements (Awodoyin et.al., 2000). Thus, 1,2 and 3 minutes physical scarification treatments is recommended for overcoming dormancy and increased emergence percentage and emergence rate of *Enterolobium cyclocarpum*.

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