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EFFECT OF SEED SCARIFICATION METHODS ON *MIMOSA PIGRA LINN.* GERMINATION

Obembe, O. A. and Folade O. Christianah
Department of Plant Science and Biotechnology
Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria

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ABSTRACT

Dormancy is a condition in which seeds do not germinate despite the provision of suitable growth conditions. This study assessed germination percentage and germination rates of *Mimosa pigra* using different pre-sowing treatments. Seeds were sown in white plastic buckets filled with loose and well-drained river sand at a sowing depth of 3 cm. Bucket diameter was 22 cm and bucket depth from base to the brim was 24 cm. Four replicates of 100 randomly picked seeds at 25 seeds per bucket were used for each treatment and the buckets were laid out in a complete randomized design. Viable seeds determined by floatation method were subjected to pre-sowing treatments using control, 98% concentrated Sulphuric acid, hot water (wet heat) and physical abrasion for 40, 80 and 120 seconds. Data were subjected to statistical analysis. Results showed that physical abrasion resulted in the highest germination percentage of 74 to 83% and the lowest mean emergence time of 6 and 7 days while the control resulted in 16% germination rate and a mean emergence time of 23 days. Therefore, physical scarification is recommended for the propagation of *Mimosa pigra* for its medicinal use.

Keywords: *Mimosa pigra*, pre-sowing treatment, germination percentage, germination rate

INTRODUCTION

Mimosa pigra Linn. is a prickly (thorny) shrub belonging to the Angiospermae, Order Fabales, Family Fabaceae (Synonym Leguminosae) and Sub- family Mimosoideae. *Mimosa* genus consists of about 500 tropical species (Willis and Airyshaw, 1973).The common English names of *Mimosa pigra* include cat claw mimosa, great sensitive plant and thorny sensitive plant amongst others. Etymologically, the generic name *Mimosa* is derived from Greek meaning to mimic or imitate animals because their sensitive leaflets move or are sensitive to touch and the species epithet derived from Latin *pigra* means slow, referring to the slow movement of the leaflets.

Mimosa pigra is a plant of moist, open sites, usually found on disturbed and waste areas around water ways such as roadside of water reservoirs, canals, river- banks and over- grazed flood plains (Burkill, 1995).

The plant reaches up to 6 meters in height; stems are branched with scattered prickles or thorns. Leaves are bi- pinnate about 20 cm long, flowers pale- mauve to pink in colouration in sub-globose pedunculate heads. Pod-fruits 5-10 cm long, about 2 cm, hirsute and breaking into partially dehiscent segments each with a seed. The seeds are olive-green in colouration, oblong, 4-6 mm long, and 2 mm wide (Hutchinson and Dalziel, 1995). The seeds spread through river systems by floating downstream; they are also carried between river systems by animals.

Mimosa pigra is economically important in African traditional medicine as an infusion or decoction of its leafy twigs is used as a wash for febrile convulsions and also as a mouth wash for thrush and tooth-ache (Burkill, 1995). The seed is emetic and expectorant (Odugbemi, 2006). The roots of *Mimosa pigra* also yield about 10% tannins.(World agroforestry centre.org.)

A seed is a fertilized, ripe or matured ovule one or two of which are contained in an ovary as in spermatophytes (the gymnosperm and angiosperm plants). A typical seed consists of three (3) basic parts (i) an embryo (ii) the cotyledon (s) and or endosperm and (iii) a protective seed coat consisting of an inner tegmen and an 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 dormant embryo grows out of the seed coats and establishes itself as a seedling.

One pertinent question in the field of seed germination biology and dormancy studies is what controls the timing of seed germination. Many factors such as levels of carbon dioxide, improper aeration, disease, nature of growth medium and presence of allelo-chemicals have all been suggested as being capable of preventing germination (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). According to Baskin and Baskin (2004), dormancy is when seeds are unable to germinate in a specific period of time under a combination of environmental factors that are normally favourable for germination.

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

Methods used to artificially break down or overcome seed coat dormancy include scarification with sand paper, emery-cloth, concentrated Sulphuric acid and other acids, addition of organic solvents such as acetone, alcohol and carbon disulphide, wet heat (hot water), cutting, filing, nicking or treatment of seeds with objects such as pins, razor blade, knife or even cutlass. In some cases, plant hormones, oven or dry heat treatments that is analogous to heating by vegetation fires are applied (Martins *et. al.*, 1975).

MATERIALS AND METHODS

Source of seeds

Seeds of *Mimosa pigra* used for the experiment were sourced from Ayede Ogbese (Latitude $6^0 43^1$N and Longitude $5^0 26^1E^1$), Ondo State, Nigeria.

Study site and management

The study was conducted at the Screen house of the Department of Plant Science and Biotechnology, Adekunle Ajasin University, Akungba-Akoko for a period of 60 days. Seeds were sown in perforated white plastic buckets filled with loose and well-drained river sand; the buckets were laid out in a complete randomized design. Four (4) replicates of 100 randomly picked seeds (25 seeds per bucket) were used for each treatment at a sowing depth of 3 centimetres.

Seed viability test

The floating method of Pandey and Sinha (2010) was used to test for seed viability. The process involved dipping the seeds in a beaker filled with water; 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 (hot water), physical abrasion and control treatment at 100 seeds for four (4) replications at 25 seeds per bucket and then sown.

Acid treatment

Concentrated Sulphuric acid (98%) was poured on the seeds and stirred for 40, 80 and 120 seconds. The acid was decanted and the seeds were rinsed several times in distilled water and sown.

Wet heat (hot water) treatment

Boiled water at 100°C was poured on the seeds and stirred for varying time durations of 40 seconds, 80 seconds and 120 seconds before sowing.

Physical scarification treatment

Seeds were manually or physically abraded with rough sand paper on all sides for varying time durations of 40 seconds, 80 seconds and 120 seconds before sowing.

Control treatment

One hundred (100) untreated seeds were sown as control.

Germination counts

The number of days taken for individual seeds to emerge was recorded. The duration of the experiment was 50 days.

Germination percentage

Germination percentage was recorded as the ratio of the number of seeds that emerged to the total number of seeds sown and multiplied by 100.

$$\text{Germination percentage} = \frac{\text{Total number of seeds that germinated}}{\text{Total number of seeds sown}} \times 100$$

RESULTS

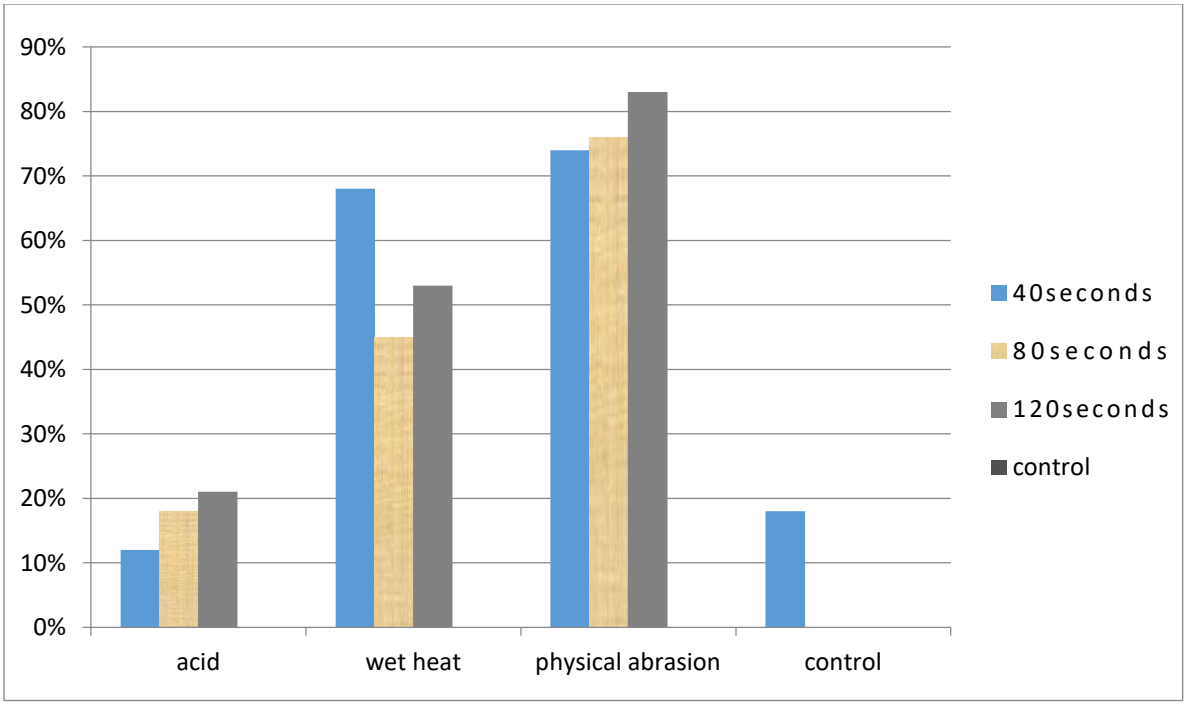

Figure1 . Effects of time and pre-sowing treatment on percentage germination of *Mimosa pigra.*

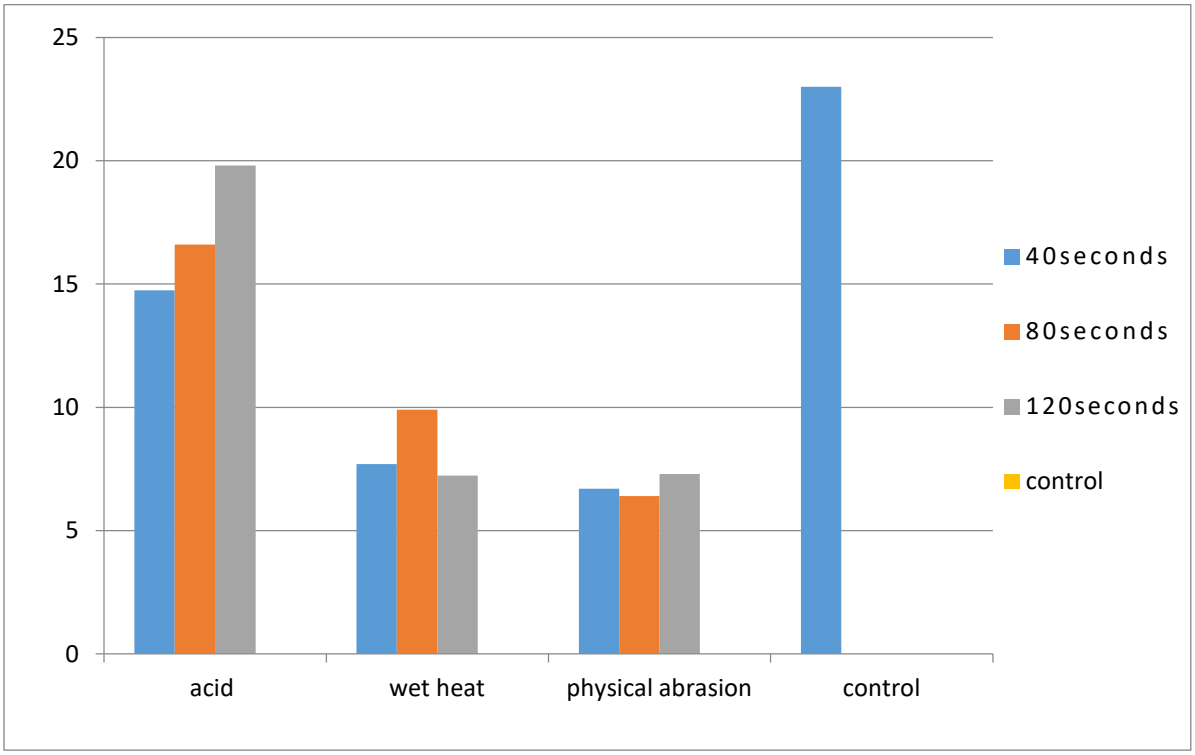

Figure 2: Influence of time and pre-sowing treatments on germination rate of *Mimosa pigra* seeds

Table 1. Statistical inference of pre-sowing treatments on germination of *Mimosa pigra* seeds

DURATION/ TYPE OF TEST	SULPHURIC ACID	BOILING	PHYSICAL ABRASION
40 Seconds	1.17 ± 3.848	2.91 ± 2.868	2.36 ± 3.258
80 Seconds	1.36 ± 3.757	2.48 ± 3.509	2.15 ± 2.463
120 Seconds	1.70 ± 3.855	2.41 ± 2.511	2.49 ± 2.890
Control	1.17 ± 2.951		

Table 1 shows the effects of methods of scarification on germination of *Mimosa pigra* seed. Figure 1 shows mean germination of 74 to 82% for physical abrasion, 44-66% wet heat, 12-22% for acid and 16% for the control. Figure 2 shows mean germination period of 6- 7 days for physical abrasion, 6-9 days for wet heat, 14-16 days for acid and 23 days for the control.

DISCUSSION

Results of this study have shown that impervious seed coat may be the cause of dormancy in *Mimosa pigra.* Breaking or overcoming seed coat dormancy in legumes using concentrated Sulphuric acid, wet heat (hot water), oven or dry heat, plant hormones, physical abrasion and other methods has been demonstrated by Ajiboye and Agboola (2010), Ajiboye *et al.* (2011), Missanjo *et al.* (2014).

Copeland (1976) and Egley (1989) reported that hard seed coat created barriers to water uptake and entry of gases and that the presence of continuous layers of tightly packed cells in the seed coat constitutes a barrier to gases and water imbibition.

The control (18%) and acid treatment (12-21%) resulted in relatively low germination percentage compared to wet heat (45-68%) and physical abrasion (74-83%), which also resulted in the shortest period of germination (6-7 days).

CONCLUSION

Breaking of dormancy by hot or boiling water (wet heat) may explain how moist heat resulting from burning or charring of dry vegetation that precedes the planting season overcomes seed coat dormancy in the soil. The result of the physical scarification test may be explained by abrasion of the seed coat by soil during ploughing and harrowing of seed coats by field implements (Awodoyin *et. al.,* 2000). The physical abrasion of seeds for 40, 80 and 120 seconds enhanced the breaking of seed dormancy in *Mimosa pigra*.

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