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# SEED PRE-TREATMENTS FOR IMPROVED EMERGENCE PERFORMANCE OF *Senna obtusifolia*

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**Abstract:** Viable seeds sometimes fail to germinate due to dormancy. This study assessed emergence percentage and emergence rate of Senna obtusifolia following pre-treatments using wet heat (boiling/hot water) and physical scarification for varying time durations of 20, 40 and 60 seconds and control treatment for 28days. Viable seeds determined by floatation method were used for the experiment. 100 seeds were used for the experiment in four replicates and sown 25 seeds per each perforated white plastic bucket filled with loose and well drained river sand. Buckets were laid in a randomised design. The bucket diameter was 22cm and bucket depth from the base to the bream was 24cm. Seed spacing was 2 x 2 centimeters and at sowing depth of 3centimetres. Results showed that 40seconds acid scarification had higher emergence percentage of 49% and mean emergence time of 3.3 days. Control treatment gave the lowest emergence percentage of 10% and mean emergence time of 7days. Thus 40seconds acid treatment is recommended for over-coming seed coat dormancy of *Senna obtusifolia.*

**Keywords:** *Senna obtusifolia*, Seed coat dormancy and pre-treatments, Emergence percentage and rate.

## INTRODUCTION

*Senna obtusifolia* (L) Irwin and Barneby Synonyms Cassia obtusifolia L. and Cassia tora L. plant, commonly called Sickle Pod or Foetid cassia is a Shrub belonging to the Natural Angiospermae Order Fabales, Family Fabaceae and Sub-family Caesalpinoideae. Senna or Cassia Genus consist of 6,000 tropical and warm temperate plant species (Willis and Airyshaw, 1973).

Etymologically, *Senna* Genus is the classical name for all plant species producing senna dye extracted from their leaves and the species obtusifolia from the obtuse round or plant nature of the plants leaflet apex. The plants center of origin is tropical America but now a pan-tropical weed of roadsides, grasslands and cultivated fields, common near human settlements and now much widespread n west Africa (Akobundu and Agyakwa, 1998).

*Senna obtusifolia* shrub stands up to 90 centimeters in height, stem sparingly hairy, leaves pari-pinnate, alternate with petioles 2-2.5cm long with each leaflet obovate, sessile and obtuse at apex. Flowers yellow, zygomorphic on pedicels 3- 3.5cm long, Pod fruits 15-20cm

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long, seeds of brownish colouration and rhombold in shape, about 5mm long and 2mm wide. (Akobundu and Agyakwa, 1998).

*Cassia obtusifolia* is economically important for its leaves used in dyeing fabrics and for staining boards in India Cameroons and southern parts of Nigeria (Dalziel,1955). Though the plant is regarded as a weed of agriculture, it has been recognized to have great potentials as much and green manure (Awodoyin and Ogunyemi, 2006, Dupriez and De Leener, 1989). Leaves and root powders of *Senna obtusifolia* are used to treat eczema, ringworm and scabies (Gill, 1992).

A seed is a fertilized, ripened and mature ovary, containing one or more ovules as in Gymnosperm and Angiosperm plants. A typical seed constite of three basic parts i) an embryo ii) a supply of nutrients for the embryo and iii) a) protecture seed coat consisting of an inner tegmen and outer testa. The seed has the capability to regenerate into new Spermatophyte- Gymnospermae and Angiospermae plants (Http.www.google.com).

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 level of carbon dioxide in soils, improper aeration,, age of seeds diseased soils, production of allelo-chemicals within the soil environment poor seed storage 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, 2014), 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 (Http. www.google.com Osonubi and Chukwuka, 1999).

Dormancy may be caused by immaturity of the embryo, growth inhibitors, it may also be due to too low or too high temperatures and un-favourable light conditions. Methods used to artificially break down seed coat dormancy includes scarification with emery cloth, sand paper, sulphuric acid and other acids, addition of organic solvent such as alcohols. Wet heat (boiling or hot water) and dry heat treatments which is analogous to heating by vegetation fire (Martins et.al., 1975).

The present study have been undertaken on the effective of pre-treatments using sulphuric acid acid, wet heat (boiling or hot water) physical abrasion and control treatment focused at termination seed coat dormancy to effect increased emergence of *Senna obtusifolia*.

**Materials and Methods**

**Source of seeds**

Seeds of *Senna obtusifolia* used for the experiment were sourced from the natural environments in Akungba Akoko, Ondo State, Nigeria (Lat$7^0$20N, $5^0$44 and of altitude 432metres above sea level).

**Study Site and Management.**

The study was conducted at the Screen house of Plant, Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria, for a period of 28days. Seeds were sown in perforated, white plastic buckets filled with loose and well drained river sand, the bucket were laid out in a randomized design.

Viable seeds determined by floatation method after Pandey and Simha, 1992) were used for the experiment. Four replications of 100-randomly picked seeds -25seeds per bucket were used for each treatment. Seed spacing was 2 x 2 centimeter. Buckets were kept free of weeds throughout the study period and watering was done regularly.

**Seed Viability test.**

Floating method after Pandey and Sinha, 1972 was used to test for seed viability. The process involved dipping the seeds in a beaker, seeds that floated were regarded as non- viable and were discarded, while seeds that sank to the bottom were taken as viable and were used for the experiment.

**Dormancy studies**

Seeds for the experiment were subjected to sulphuric acid, wet heat (boiling or hot water) and physical scarification and control treatments at 100 seeds for four replications which was 25seeds per replicate bucket.

**Acid treatment**

Concentrated sulphuric acid (98%) were poured on the seeds and stirred for 20, 40 and 60 seconds. The acid was decanted and seeds were rinsed several times in distilled water and then sown.

**Wet heat (boiling or hot water) treatment.**

Boiled water at 100% Celsius were poured on the seeds and stirred for varying time durations of 20, 40 and 60 seconds and sown.

**Physical scarification**

Seeds were manually of physically abraded with sand paper on all sides for varying time durations of 20, 40, and 60 seconds and sown.

**Emergence counts**

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

**Emergence days.**

Emergence days were recorded as how many days that it took for individual seeds to emerge, the experimental time lag was 28days.

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

$$\text{Emergence Percentage} = \frac{\text{Total number of seeds that emerged X 100}}{\text{Total number of seeds sown.}}$$

**Graphical representations**

Bar graphs were plotted both for emergence rate of Senna obtusifoliaa

**Statistical analysis**

Data were subjected to statistical analysis and standard errors were derived.

## Results

### Bar Graphs

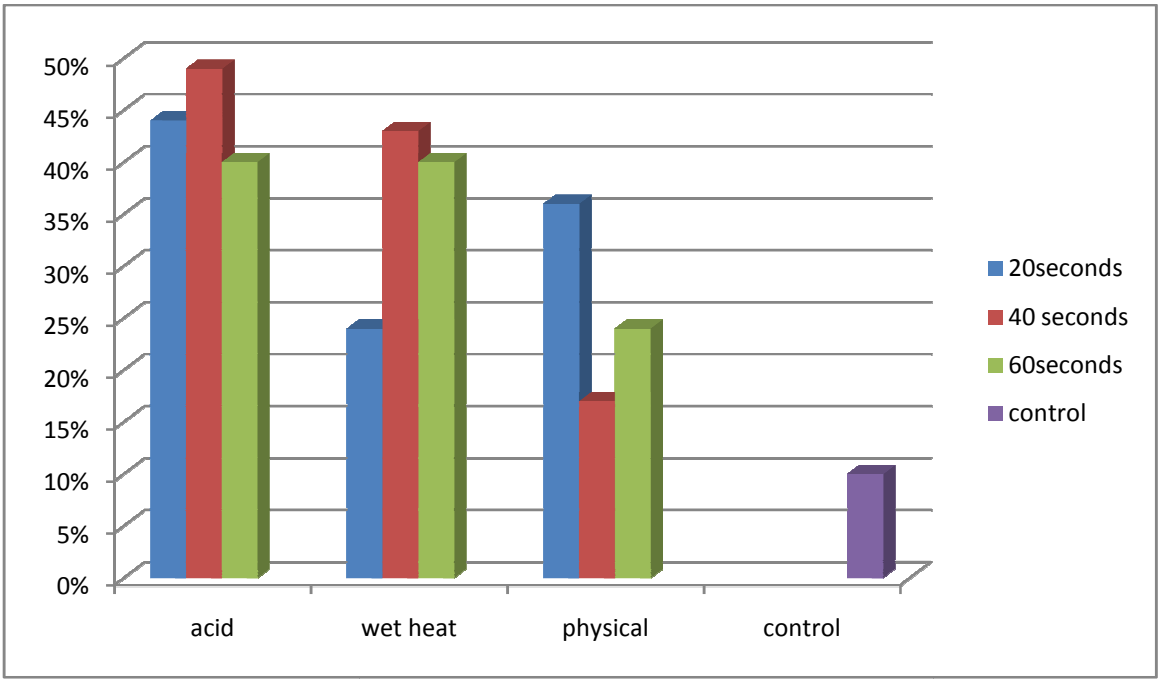


**Figure 1:** Effects of 20, 40 and 60 seconds pre-treatment on percentage seedling emergence of *Senna obtusifolia*

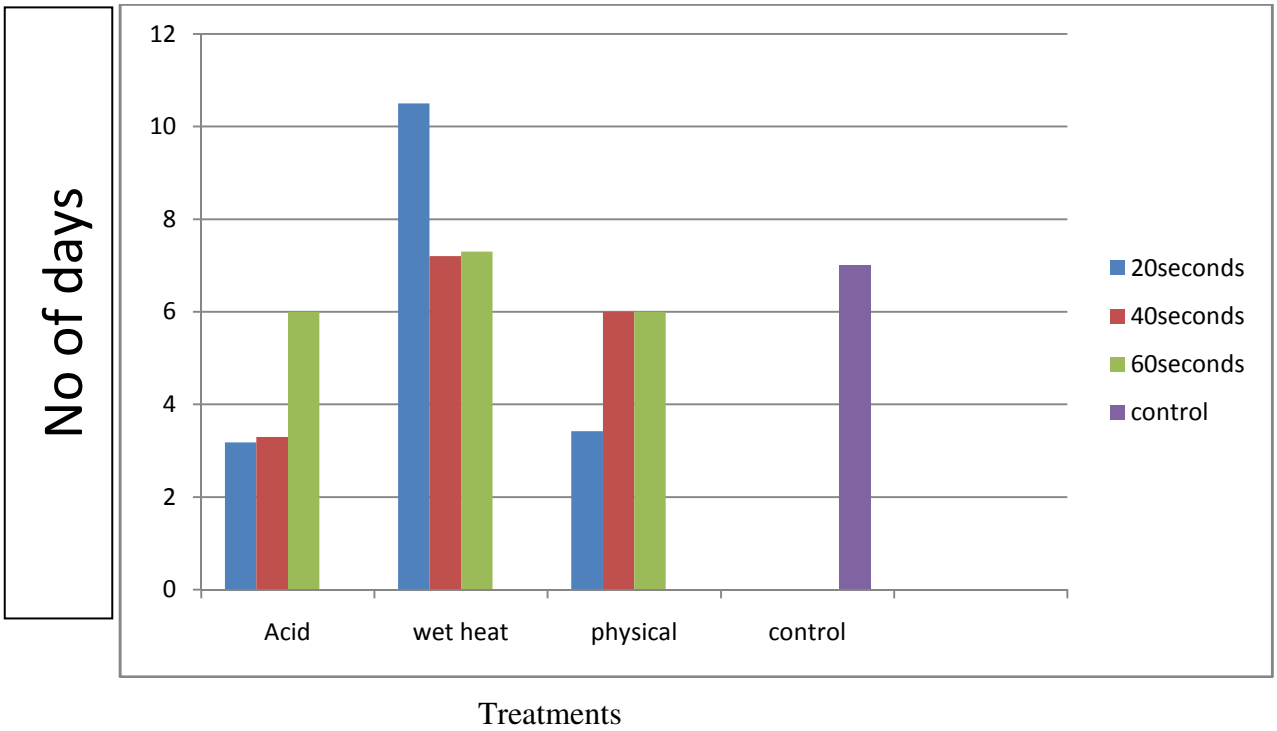


**Figure 2:** influence of 20, 40 and 60 seconds pre-treatment on seedling emergence rate of *Senna obtusifolia.*

## Statistical analysis results

| DURATION/ TYPE OF TES | SULPHURIC ACID | BOILING | PHYSICAL SCARIFICATION |
|---|---|---|---|
| 20SEC | 0.52 ± 0.69 | 1.22 ± 0.219 | 0.51 ± 0.93 |
| LSD (P<0.5) | 0.404 | 0.280 | 0.265 |
| 40 SEC | 0.56 ± 0.72 | 1.38 ± 0.185 | 0.34 ± 0.76 |
| LSD (P<0.5) | 0.29 | 0.23 | 0.457 |
| 60 SEC | 0.40 ± 0.49 | 0.93 ± 0.118 | 0.24 ± 0.43 |
| LSD (P<0.5) | 0.561 | 0.812 | 0.732 |
| CONTROL | 0.28 ± 0.094 | | |
| LSD (P<0.5) | 0.882 | | |

### Discussion

Result from this experiment showed that impervious seed coat may be the cause of dormancy in *Senna obtusifolia* since pretreatments aimed at reducing the seeds coat thickness improved seeds germination compared to the control treatment.

Breaking or overcoming seed coat dormancy in legumes using sulphuric acid, wet heat (boiling or hot water), physical abrasion and other treatments have been demonstrated by Ajiboye et.al. 2011, Missanjo et.al., 2014.

Cope land, 1976 and Egley,1989 reported that hard seed coat creates barriers to water uptake and entry of gases in most legumes and that the presence of continuous layers of tightly packed cells in the seed coat constitutes barrier to water and gases uptake.

Breaking seed coat dormancy in legumes by acid scarification in the laboratory explains the gradual action of permanently weak acids in the soil. Over-coming of dormancy by boiling water may explain how moist heat resulting from burning of thrash that precedes cropping, also physical scarification may explain how abrasion of the seed coat caused by ploughing, harrowing and charring of the seed coat by field implements (Awodoyin *et.al.,* 2000).

Both acid and wet heat scarifications were effective in over-coming seed coat dormancy of Senna obtusifolia but 40seconds acid scarification had higher emergence percentage (49%) and Mean emergence time of 3.3 days. Control treatment gave the lowest emergence percentage (10%) and Mean emergence time of 7 days.

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