
**PRE – GERMINATION TREATMENTS AND STORAGE MEDIA ON SEED EMERGENCE
AND GROWTH OF SOURSOP (*Annona muricata* Lin) WITHIN SIXTY DAYS AFTER
EMERGENCE**

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DOI: <https://doi.org/10.70382/sjratr.v8i1.007>

Abstract

Experiment was conducted to investigate the response of different pre – germination treatments and storage media on seed emergence and growth of soursop (*Annona muricata* Lin) within sixty days after emergence. The experiment was conducted in a 5 x 5 factorial layouts using a Randomized Complete Block Design (RCBD), replicated three times. These treatments were scarification of seeds by filling (SF), scarification of seeds by filling followed by soaking of seeds for three days in cold water (SS), soaking of seeds for three days in cold water (CW), soaking of seeds in a 50 O^c hot water for 10 minutes followed by soaking of seeds for three days in cold water (HC) and without treatment (Control). The storage media used were plastic container, glass bottle, paper envelope, earthen pot and aluminum foil. The perimeters measured were percentage emergence, seedling height, number of leaves and leaf area. The data collected was subjected to analysis of variance (ANOVA) and significant treatment means were separated using Duncan Multiple Range Test (DMRT) at 5% probability level. The result showed that seeds that were scarified by filling and soaked in water for three days exercised superiority over others in all the parameters measured. This was followed by seeds soaked in a 50 O^c hot water for 10 minutes and later soaked seeds for three days in cold water. The result of response of different storage media on seed emergence and growth of soursop

showed that plants that were stored in earthen pot had higher percentage of seed emergence, followed by paper envelope, while the least was glass bottle in all the parameters measured. It is therefore, suggested that farmers who wish to cultivate soursop in large quantity should apply these two seed treatments to break the seed dormancy and for quick and effective germination.

Keyword: Pre/planting, treatments, germination, emergence

Introduction

Seed storage media is one of the crucial factors that affects crop production due to their influence on seed viability. Storage media can determine the amount of water content that remain in the seeds. The environmental temperatures in different storage media differ and that is why seeds stored in one storage medium differs from another in amount of water content hence viability. The rate of seeds viability is always affected if the moisture content has reduced beyond what will enhance germination when they are sown. If the storage environmental temperature is low, this can speedily facilitate the growth of mold on the seeds, hence reduce the viability of the seeds (Nakada-Freitas, 2022). The amount of moisture content present in seeds before planting determine the rate of germination, ability to emerge and the vigour of seedlings. Seeds stored in storage media that are water resistant and airtight containers can maintain their water content than those which are not.

Pre – seed germination treatments as seen by Diamante & Vallesteros (2022) are all the treats applied to seeds to facilitate the germination and emergence of seedlings of a plant. These treatments could be physical (light), chemical (enzymes or any other synthetic substances) and mechanical applications (such as breakage of seed coat or filling to reduce seed coat). Combination of these treatments if necessary can give better result. These applications are very essential in some seeds as a result of the nature of their seed coats which they have. Zucarelli *et al.* (2015) stated that seed are important part of a flowering plant, contain gene that helps to transmit traits of one or two parents to their off springs and can be used to grow new plants. They may be of different shapes, colours and sizes such round, wrinkled, winged or hairy. They are in a dormant

condition until they receive adequate conditions that favour germination. The growth of the plant from a seed is known as germination. A typical seed of a flowering plant has three parts namely Seed Coat, endosperm and embryo. Seed coat protects the seed from sunlight and water from entry and leaving the seed as well as a protective agent against pathogens (Osmar, 2020). At the first stage of germination, the seed takes up water rapidly, it begins to swell and soften seed coat at an optimum temperature. This stage is referred to as Imbibition. Once the water is absorbed into the seed, the enzymes in the seed are activated immediately, which starts growth process. Other physiological processes start in the seed such as respiration and production of proteins, also the stored food are metabolized. As the physiological processes have started taken place, the seed coats will rupture, emergence of radicle from the seed to form a primary root and seed will starts absorbing underground water. After the emerging of the radicle, the plumule emerges and shoot starts growing upwards (Morad, 2013). The cell of the seeds will become metabolically active, elongates and divides to give rise to the seedling. Plant species respond differently to different favourable conditions such as availability of water. It takes time for untreated seeds to germinate, which with time loss its viability, or may not even germinate because of their recalcitrant nature, therefore affecting crop production. One of those seeds that have such nature is the *Annona muricata* Lin seeds (Ajeigbe, 2018). The seed coat of *Annona muricata* Lin is smooth, hard, dark brown and protects the internal parts of a seed. It has two layers. The outer layer is thick and known as the testa. The inner layer is thin and known as tegmen. The thickness of the testa has hinder the growth and emergence of seeds and seedlings of *Annona muricata* Lin. *A. muricata* is a plant that is grown because of its juicy fruits and etho-medicinal properties of the plant. The Soursop fruit are eaten raw, this is done by cutting it into smaller portions or half depending the size and the flesh are scooped out. The fruits and leaves contain antioxidants. Antioxidants are compounds that help neutralize harmful compounds called free radicals, which can cause damage to cells. The leaves are taken as green tea because of its cancer cell-killing properties, and may help reduce inflammation. The leaves of the plant are used for the treatment of cancer, malaria and regulate blood sugar traditionally (Wahua and Ogan (2024).

Irrespective of these economic importance of the plant, it is highly neglected as it is gradually going into extinction as a result of dearth of information or ignorance of on how to break the seed dormancy. This research work is to investigate the pre-treatment methods and storage media that would facilitate germination and emergence of vigor seedlings within a short period of time to enhance production of *A. muricata* in Delta State. The outcome of this research work will help progressive farmers who want to invest on the cultivation of *A. muricata* will grow the plant with ease without the fear of seedling emergence failure, also the finance that is ploughed into the farming business.

Materials and methods

The fresh seed from healthy fruit of *A. muricata* was gotten from a tree growing in the wild, in Abavo, Delta State. The seeds were extracted from ripe soursop fruit and viability test was carried out by introducing the seeds into a bucket filled with clean water and it was observed that some of the seed sank, while some were floating. Those that sank were collected for the experiment and consider having an active embryo, those that floated were discarded.

Representative soil (0 cm – 15 cm) was collected with sampling augur. The samples were air dried at room temperature (25 °C) for five days and pulverized to pass through a 2 mm mesh sieve. The sample was analyzed to determine the physical and chemical properties of the soil. These were analyzed in Nigeria Institute for Oil palm Research (NIFOR) Benin City.

This experiment was conducted in 5 x 5 factorial layouts using a Randomized Complete Block Design (RCBD), replicated three times. These treatments were scarification of seeds by filling (SF), scarification of seeds by filling followed by soaking of seeds for three days in cold water (SS), soaking of seeds for three days in cold water (CW), soaking of seeds in a 50 °C hot water for 10 minutes followed by soaking of seeds for three days in cold water (HC) and without treatment (Control). The storage media were plastic container, glass bottle, paper envelope, earthen pot and aluminum foil. The perimeters measured were percentage emergence, seedling height, number of leaves and leaf area. The percentage of emergence was determined by number of emerged seedlings divided by total number of seeds sown multiplied by 100 over one number of leaves was

determined by direct counting, seedling height was done by measuring the length of seedlings from the soil surface to the tip of the plant and the leaf area was determined by multiplying the product of leaf length (L) and width (W) by Montgomery parameter of a value of 0.68. The data collected was subjected to analysis of variance (ANOVA) and significant treatment means were separated using Duncan Multiple Range Test (DMRT) at 5% probability level.

Results and discussion

The chemical and physical properties of the soil used for the field experiment is presented in Table 1. The soil of the experimental site is neutral in pH (7.5). The total nitrogen, available phosphorus, and exchangeable potassium values were 0.4g/kg, 4.50mg/kg and 0.31 Cmol/kg, respectively. These values are below the critical values of 2.2 g/kg, 8 mg/kg and 0.70 Cmol/kg respectively for crop production (Nmosi, 2018).

Figure 1. Revealed the result obtained from response of seeds of *A. muricata* to different pre – germination treatments. The result showed that seedlings grown from seeds that were scarified by filling and later soaked in cold water for three days exhibited superiority in percentage emergence. This was followed by seeds that were soaked in a 50 O^c hot water for 10 minutes and soaked seeds for three days in cold water. The least percentage was obtained from control which were seeds that were not treated. The result of response of different storage media on seed emergence and growth of soursop showed that plants that were stored in earthen pot was significantly different in percentage of seed emergence from others, followed by paper envelope, while the least was glass bottle (Figure 2). This is in accordance with the findings of Azubuike (2023) who affirmed that scarification helps to break or reduce the hard coat of seeds that makes water necessary for germination permeable. After scarification and the seeds are soaked in water, it is easy for water to penetrate into the seeds and this activates the enzymes as the physiological processes have started taken place and this will lead to breaking of seed dormancy. Anuku (2024) opined that the best way to store seeds in order to avoid affecting the viability is exposing the seeds to environment that appears to be their natural habitat. Most seeds when stored on

earthen container, retain their viability more than those stored on synthetic materials.

The length of seedlings of *A. muricata* to different pre – germination treatments and storage media showed that seedlings grown from seeds that were scarified and soaked in water for three days were taller than others with a height of 38.6 cm. This was followed by seeds soaked in a 50 °C hot water for 10 minutes and soaked for three days in cold water, the seeds that were soaked for three days in cold water (CW) and seeds that were scarified by filling only were not significantly different from each other ($P>0.05$), while control was the least (Table 2). The result of height of seedlings grown from seeds stored in different storage media showed that seedlings grown from seeds stored in earthen pot out grown others with a length of 38 cm followed by seedlings grown from seeds stored in envelope and aluminum foil that were not significantly different from each other while glass bottle and plastic container were the least.

The response of different pre – germination treatments and storage media on length of *A. muricata* within sixty days after emergence showed that the same trends were followed as that of results of height of seedlings. This is in line with Azuh (2023) that when seedlings emerged from viable seeds, they grow in vigour and this is clearly seen on their vegetative parts which are the height attained, number and length of lateral shoots and leaves.

The results of leaf area (m^2) of soursop grown from seeds that were treated with different pre – treatment and stored in different storage media also showed that the same trends were followed. Chigozie (2023) affirmed that the expansion of leaves is correlation of the condition of seeds during germination. He agreed that the expansion of leaves reflects the viability of the seeds that produced these seedlings.

Conclusion

Based on the results of this finding, it is clearly observed that seeds that were scarified and soaked in water for three days had highest seedling emergence percentage, followed by seeds that were soaked in a 50 °C hot water for 10 minutes and soaked seeds for three days in cold water. It is therefore, suggested that farmers who wish to cultivate soursop in large quantity should apply these

two seed treatments to break the seed dormancy and for quick and effective germination.

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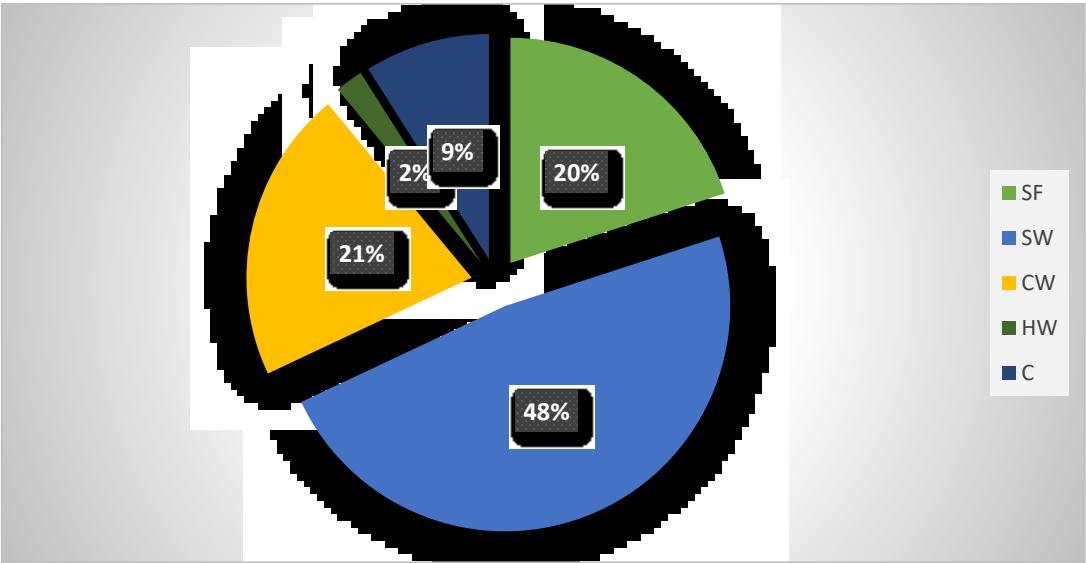


Figure 1. Response of different seed pre-treatment methods on percentage seed emergence of *Annona muricata*.

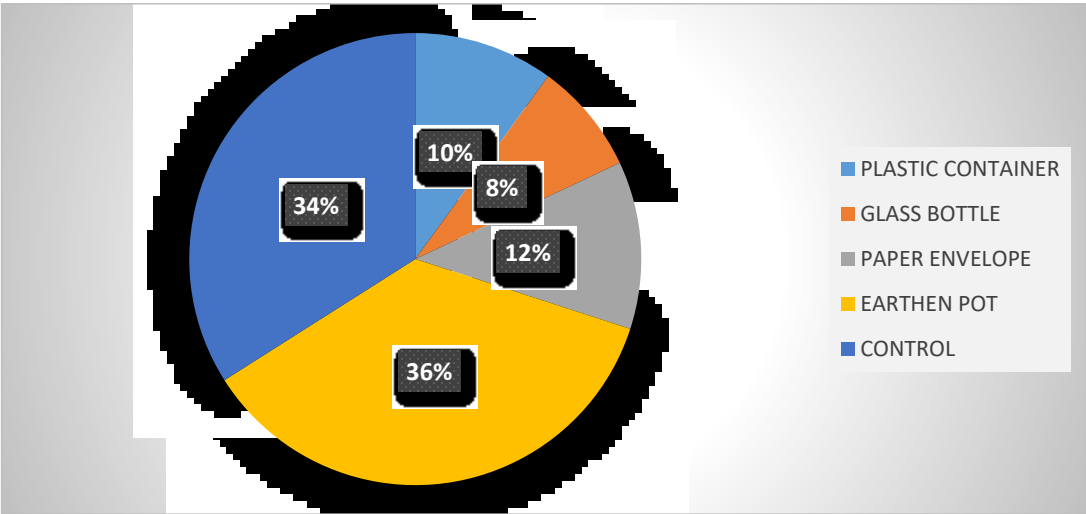


Figure 2. Response of different storage media on percentage seed emergence of *Annona muricata*.

Table 1: Result of analysis of physio – chemical

Properties of experimental site

Parameters	soils
PH	7.10
Sandy (%)	86.70
Clay (%)	3.30
Silt (%)	10.00
Organic carbon (%)	0.4
Total Nitrogen (g/kg)	0.70
Available P (mg/kg)	4.5
Exchangeable K (Cmol/kg)	0.31
Exchangeable Na (Cmol/kg)	0.32
Exchangeable acidity	0.40
ECEC	0.02
Mn (mg/kg)	5.4
Cu (mg/kg)	1.45

Figure 2. Response of different pre-treatment methods and storage media on plant height, number of leaves and leaf area of *Annona muricata*.

Treatment	Plant height (cm)	Number of leaves	Leaf area (m ²)
Pre-treatment			
SS	28.6 ^a	16 ^a	0.854 ^a
SF	16.2 ^b	6 ^d	0.256 ^c
CW	6.4 ^b	6 ^a	0.219 ^b
HC	23.2 ^b	12 ^c	0.616 ^d
C	16.2 ^b	6 ^b	0.210 ^d
Mean	18.1	9.2	0.43
LSD _{0.05}	2.13	1.54	0.87
Storage media			
Plastic container	12.2 ^d	6 ^d	0.314 ^d
Glass bottle	11.4 ^d	8 ^d	0.305 ^d
Paper envelope	23 ^b	11 ^b	0.619 ^b
Earthen pot	38 ^a	16 ^a	0.859 ^a
Aluminum foil	16.6 ^c	8 ^c	0.393 ^a
Mean	20.4	9.8	0.47
LSD _{0.05}	2,16	1.64	0.76
Interaction			
Pre - treatment	*	*	*
Storage Media	*	*	*
Pre-treatments X storage media	NS	NS	NS

* Significant at 5% level of probability, ns not Significant at 5% level of probability. Pre – treatment, storage media