

Pre-Treatment of Seeds of *Annona Squamosa* (Sugar Apple) A Non Timber Forest Product

Adeniji I.T*, Adio A.F., Iroko O.A., Kareem A.A., Jegede O.C., Kazeem-Ibrahim F, Adewole T.O., Adeosun A.O.

Department of Sustainable Forest Management, Forestry Research Institute of Nigeria, Ibadan, Nigeria

*Corresponding author: okedunni@yahoo.com

Received June 05, 2014; Revised July 25, 2014; Accepted August 07, 2014

Abstract An experiment was carried out at the seed laboratory of Forestry Research Institute of Nigeria on effect of pre-treatment on seed germination of *Annona squamosa*. Seeds were subjected to four mechanical scarification, where seeds were filled at the hilum point, hilum and distal, distal, and around the edges of the seed. Four acid treatment (H_2SO_4) where seeds were soaked for 10 minutes, 20 minutes, 30 minutes, 40 minutes. Three water scarification at room temperature of 30°C for 6 hours, 12 hours, 24 hours. Result showed that (T0) has 26.6% germination, T4 seems to perform better with 80% total germination, T1 with 73.33% and T2 with 60%, T10 gave 53.33%. All other treatment gave germination percentage that is less than 50%. The analysis of variance showed that the mechanical scarification round the edges gave the best result (4.00^a) which was not significantly different from the hilum point (3.67^{ab}) and hilum and distal (3.00^{ab}). These were also not significantly different from 12 hours (2.67^{abc}) this was also not significantly different from 24 hours that gave 2.33^{bcd}. The mechanical scarification distal, 10 minutes and 20 minutes have the same value of (1^{de}). Scarification 30 minutes, 40 minutes and 6 hours have value of 0.33^e, 0.00^e and 0.33^e respectively. These were not significantly different from control which have a value of 1.33^{de}. From the experiment, mechanical scarification method can be recommended for an effective and good germination percentage. Soaking seed in water at room temperature for 12 hrs and 24 hrs will also perform fairly well and can be recommended as it is not tedious but cost effective.

Keywords: dormancy, pre-treatment, *annona squamosa*, non-timber forest product

Cite This Article: Adeniji I.T, Adio A.F., Iroko O.A., Kareem A.A., Jegede O.C., Kazeem-Ibrahim F, Adewole T.O., and Adeosun A.O., "Pre-Treatment of Seeds of *Annona Squamosa* (Sugar Apple) A Non Timber Forest Product." *Research in Plant Sciences*, vol. 2, no. 3 (2014): 50-52. doi: 10.12691/plant-2-3-1.

1. Introduction

Plants had been the major source of food for man and animal and one of the important sources of medicines since the beginning of human. There is a growing demand for plant based medicines, health products, pharmaceuticals, food supplements, cosmetics etc.

Annona squamosa Linn is a non timber multipurpose tree, small, well-branched tree or shrub, from the family Annonaceae that bears edible fruits called sugar-apple, sweetsop, or sugar-pineapple. The flesh is fragrant and sweet, creamy white to light yellow, and resembles and tastes like custard and it is a source of medicinal & industrial product [1]. The plant is an exotic species native to the tropical Americas but now distributed throughout the tropics. Trees do well in hot and relatively dry climates such as those of many tropical countries. It is found in south-western and northern parts of Nigeria. It mature fast and tree may flower and bear fruit starting from 2–3 years of age and a five years old tree may produce as many as 50 fruits [2] it is nutritious, highly consumable and popular in tropical markets [3].

A. squamosa is mainly grown in garden for its fruits and ornamental value. The fruits are generally eaten fresh,

or used to make juice beverages or sorbet. It is high in calories, an excellent source of vitamin C and manganese, a good source of thiamine and vitamin B₆, and provides vitamin B₂, B₃, B₅, B₉, iron, magnesium, calcium, phosphorus and potassium in fair quantities [4]. It is considered beneficial for cardinal diseases, diabetes, hyperthyroidism and cancer. Many research works prove that every parts of *Annona squamosa* possesses medicinal property. [5,6,7]. The root is considered as drastic purgative and the crushed leaves are sniffed to overcome hysteria and fainting spells. They are also applied on ulcer and wounds; the dried unripe fruit powder is used to destroy vermin. The heat-extracted oil from the seeds has been employed against agricultural pests [8].

Seeds are black or dark brown, oblong, shiny and smooth with hard seed coat. Storage behavior is orthodox. If kept dry, seeds retain their viability for several years [9]. Seeds which are not given appropriate pre-treatment may fail to germinate altogether, germination may be slow or germination can take place in an individual seed over a long period of time. Seed treatment is to ensure and enhance uniform germination [10].

The seeds of this highly economic importance species have been recorded to have dormancy problems and also poor fruit production due to few natural pollinators [11]. In as such, there is need for appropriate pre-treatment to

improve its germination potentials so as to enhance its mass production, management of healthy seeds and vigorous seedlings. The purpose of this experiment is to ensure that seed of the species germinate and that germination is on time and uniform.

2. Materials and Method

Seeds of *Annona squamosa* were collected from Omi-Adio in Ibadan, Oyo State Nigeria. Seeds were subjected to 11 different pre-treatment methods 4 mechanical scarification, 4 acid scarification, 3 water scarification (room temp at 30°C) and a control. Each treatment was replicated 3 times with 10 seeds in each replicate as follows:

T₀. Control

T₁.-Scarified with file at the hilum point

T₂-Scarified with file at the hilum and distal point

T₃. Scarified with file at the distal point

T₄-Scarified with file round the seed

T₅- .Soaked in concentrated H₂SO₄ for 10 minutes

T₆.Soaked in concentrated H₂SO₄ for 20 minutes

T₇.Soaked in concentrated H₂SO₄ for 30 minutes

T₈.Soaked in concentrated H₂SO₄ for 40 minutes

T₉- Soaked in water at room temperature for 6 hours

T₁₀- Soaked in water at room temperature for 12 hours

T₁₁- Soaked in water at room temperature for 24 hours

The seeds were placed in between Whatman No 1(9 cm) filter paper and set inside Copenhagen Germination tank in the seed laboratory of Forestry Research Institute of Nigeria where they were being maintained. Seeds were daily observed for 28 days to check for germination. The parameters assessed include total germination count and Percentage germination. Germination data collected were analyzed using analysis of variance (ANOVA) and mean separated with Duncan Multiple Range Test at 5% level of probability

3. Results and Discussion

Trend observed on the chart (Figure 1) shows that *A. Squamosa* seeds with no treatment (T₀) have 26.6% total germination percentage. The percentage germination was improved upon when pre-treated. The mechanical scarification round the longitudinal axis (T₄) seems to perform better with 80% total germination, followed by Scarification at the hilum point (T₁) with 73.33% and scarification at the hilum and distal T₂ with (60%). This better performance may be attributed to the fact that there are spaces in the seed to imbibe moisture. This is in line as reported for the seed of *Canavalia ensiformis* (Jack beans) *Afzelia africana* and *Parkia biglobosa* [12,13,14]. Soaking the seed in water for 12 hours (T₁₀) gave 53.33%, soaking for 24 hours (T₁₁) gave 46.60% while that of 6 hours (T₉) was 6.6%. This also agrees with the work of [15]. Their work indicated that soaking seeds of *Tamarindus indica* in water for 12 and 24 hours enhances germination. Acid treatment seems not to enhance germination of the species as soaking the seed in acid for 10 minutes (T₅) gave 20%, 20 minutes (T₆) gave 20%, 30 minutes (T₇) gave 6.66% and 40 minutes (T₈) did not germinate at all. This may be because acid must have scorched the seed coat and damage the cotyledon. (Figure 1).

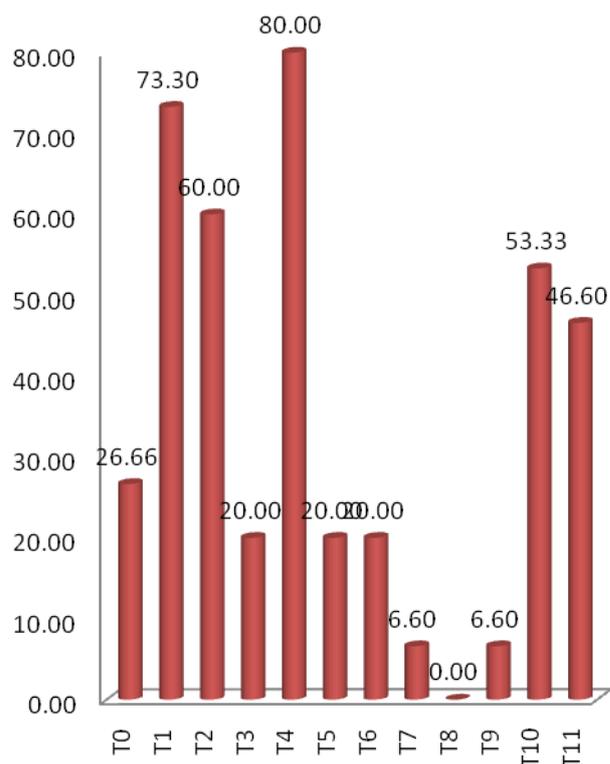


Figure 1. Percentage germination of *A. squamosa* using different pre-treatment methods



Plate 1. Freshly extracted seeds of *Annona squamosa*

Table 1. Germination of *Annona squamosa* as influenced by different pre-sowing treatment

TREATMENT	MEAN GERMINATION
T0	1.33 ^{de}
T1	3.67 ^{ab}
T2	3.00 ^{ab}
T3	1.00 ^{de}
T4	4.00 ^a
T5	1.00 ^{de}
T6	1.00 ^{de}
T7	0.33 ^e
T8	0.00 ^e
T9	0.33 ^e
T10	2.67 ^{abc}
T11	2.33 ^{bcd}

Mean with the same letters are not significantly different at P<0.05

Result from the analysis of variance showed that T₄ gave the best result (4.00^a) which was not significantly different from T₁ (3.67^{ab}) and T₂ (3.00^{ab}). These were not also significantly different from T₁₀ (2.67^{abc}), this was also not significantly different from T₁₁ that gave 2.33^{bcd}. Furthermore, T₃, T₅ and T₆ have the same value of (1^{de}) and T₇, T₈ and T₉ have value of 0.33^e, 0.00^e and 0.33^e

respectively. These were not significantly different from control which have a value of 1.33^{de}. All at 5% level of significant (Table 1).

Table 2. analysis of variance table (anova) on the effect of pre-treatment on seed germination of annona squamosa

SV	DF	SS	F	P.Level
TRT	11	61.22	8.384	0.0008*
ERROR	24	0.67		
TOTAL	35			

Significant at 5%

4. Conclusion

Seed germination of *Annona squamosa* was improved upon when pre-treated, scarification at all sides around the longitudinal axis and at the hilum of seeds of *A. squamosa* seems to perform better compare to other treatment used. This method can be adopted for an effective and good germination percentage. Soaking seed in water at room temperature at 30°C for 12 hrs and 24 hrs also perform well with no significance differences between their values and that of the mechanical scarification. In summary, soaking the seed of *Annona squamosa* in water can be adopted as this is quite simple and cost effective.

References

- [1] Nwokocha, L.M. Williams, P. A., (2009) 'New starches: Physicochemical properties of sweetsop (*Annona squamosa*) and soursop (*Annona muricata*) starches'. Centre for Water Soluble Polymers 78 (3), 462-468.
- [2] Wikipedia, the free encyclopedia.
- [3] Neha P. and Dushyant B. (2011) Phytochemical and Pharmacological Review on *Annona squamosa* Linn. In *Agro Forestry Tree* International Journal of Research in Pharmaceutical and Biomedical Sciences 2011.
- [4] Onimawo, I.A. (2002). Proximate composition and selected physicochemical properties of the seed, pulp and oil of soursop (*Annona muricata*). *Plant Foods for Human Nutrition* 57 (2), 165-171.
- [5] Atique A, Iqbal M, Ghouse, A K M. Use of *Annona squamosa* and *Piper nigrum* against diabetes. *Fitoterapia*. 1985; 56 (3): 190-192
- [6] Rao VSN, Dasaradhan P, Krishnaiah KS, (1997) Antifertility effect of some indigenous plants, *Indian Journal of Medical Research*, 70, 517-520.
- [7] Suresh K; Mamoharan S; Panjamurthy K and Kavita., "Chemopreventive and antilipidperoxidative efficiency of *Annona squamosa* bark extract", *Pakistan journal of Biological sciences*; 2006, 9 (14); pp. 26002605.
- [8] Gajalakshmi S., DivyaR., DivyaY., DeepikaV., MythiliS., Sathiavelu. A (2011) Pharmacological activities of *ANNONA SQUAMOSA*: A REVIEW; Article-004 School of Biosciences and Technology, VIT University, Vellore, T.N, India Volume 10, Issue 2.
- [9] Lars S. (2000) Guide to handling of Tropical and Subtropical forest seed. Danida Forest Seed Centre Denmark. Pp. 265.
- [10] Azad M.S, Islam M.W, Matin M.A, Bari M.A. (2006) Effect of pre-sowing treatment on seed germination of *Albizia lebbek* (L.) Benth. *South Asian Journal of Agriculture*, 1 (2): 32-34.
- [11] Morton, Julia (1987). "*Annona squamosa*" *Fruits of warm climates*. p. 9.
- [12] Asinwa I.O., AdioA.F., Lawal I.O., NsienI.B., KareemA.A, and Iroko A.O (2008) Pretreatment effect on seed germination of *Canavalia ensiformis* (Jack bean). *Journal of Sustainable Environmental Management* Vol. 1 No. 1.
- [13] AdioA.F., Gbadebo J.O., Iroko O.A and Kareem A.A. (2008) The influence of pre treatment on germination of seed of *Azalia Africana*. *Journal of Sustainable Environmental Management* Vol. 1 No. 1.
- [14] Ailero B.L. (2004) Effect of Sulphoric acid, mechanical scarification and wet heat treatment on germination of seeds of Africa locus beans (*Parkia biglobosa*). *Africa journal of biotechnology* vol. 3 pp 179-181.
- [15] Gbadebo J.O. and Salami A.O. (2008) Effect of pre treatment on seed germination and seedling emergence of *Tamarindus indica* (Linn) *Journal of Sustainable Environmental Management* Vol. 1 No. 1.