

**EFFECT OF SEED PRE-GERMINATION TREATMENT ON THE
GROWTH OF *Anacardium occidentale* (cashew)**

**Adedipe J.O¹, Ibiyeye D.E¹, Ajiboye O.O¹, Olatunji B.T²,
Afolabi R.T¹, Ekaun A.A¹**

Federal College of Forestry, P.M.B. 5087 Jericho, Ibadan¹

Forestry Research Institute of Nigeria²

Crowndipe04@gmail.com, 08066208261

Abstract

This study covers the pre-germination treatment of the seed of *Anacardium occidentale* (cashew) and its early growth in the nursery. The plant height, stem girth and number of leaves were examined. The seeds were subjected to 6 (six) different pre-germination treatments, before they were sown directly into polythene bags filled with top soil. The experiment was laid out in complete randomized design consisting of six (6) treatments with control and each was replicated five times. The data collected in the course of the experiment was subjected to analysis of variance (ANOVA). The means were further separated using least significant difference (L.S.D) where significant differences were observed. The readings from the experiment were taken over ten (10) weeks. Germination result showed that all the treatments grew up except treatment D seeds which were cracked. Height result from showed that treatment (C), seeds soaked in water for 24 hours had the highest growth of 15.66 cm at week 1 and 31.74 cm at the 10th week. The result of analysis of variance for periodic changes in the height revealed that there was no significant difference among the treatments applied at 0.05 level of probability. Leaf

count shows that treatment C was ahead of other treatments at week 1 with 5, while at week 10, treatment C took over the lead with leaf production of 14.80. The result of analysis of variance for periodic changes in leaf count revealed that there was no significant difference among the treatments applied at 0.05 level of probability.

KEYWORDS: Cashew, Growth, Effect, Pre-germination, treatment

Introduction

The easiest means by which plants can be raised is from seeds. Seed dormancy is an obstacle to the success of the nursery man whose aim is to obtain the largest possible number of seeds sown to germinate in the shortest possible time (Nwoboshi 1982). There are various treatments applied to seeds before sowing to increase rapidity of germination. Elimination of inferior seeds will ensure the establishment of forest plantation. Dormancy is the quiet period between maturation and germination during which the seed will not germinate even if placed under optimum and favorable condition (Irving, 1982). The absence of some external factors considered necessary for process to occur inhibits the germination of seeds these include absence of water, adequate temperature and adequate mixture of gases which before inhibits seeds germination. (Devlin et al, 1992, Deng et al. 1991). However, the seeds may be placed in an environment considered for germination and still not germinate, because the seeds have hard coat (impervious seed coat). *Anacardium occidentale* is originated from the Amazon. Cashew is one of the major foreign exchange earning horticulture crops of India. Though India exports annually about 1.2 lakh tonnes of cashew kernels worth about 2,500 crores (Bhat *et al.*, 2007), shortage of raw nuts still remains to be the major problem in the cashew industry and export earnings. As the viability of nuts deteriorated rapidly on storage (Aravindakshan and Gopikumar, 1979), there is a problem for year round production of good planting material.

The fruit was part of the local Indians diet. Cashew was brought to India by the Portuguese during the first half of the sixteenth century to prevent soil erosion (first recorded in Cochin during 1578) but has adopted itself along the entire west and south of the Indian subcontinent. The production and export of cashew nuts soon became one of Indians leading industries, as it remains today. The Portuguese were also the one that introduced cashew into Africa during the second half of the sixteenth century. *Anacardium occidentale* was introduced to Nigeria from Brazil by the Europeans arrival in the new world. The tree is mainly used in Nigeria to control soil erosion. *Anacardium occidentale* is a tree commonly found in arid regions because of its high drought tolerance. This means that *Anacardium occidentale* resists drought by accumulating a supply of water that is used when none can be absorbed from the soil. By studying its growth and economic importance will be able to know how long it will take to germinate and grow, and also its numerous vital uses.

Anacardium occidentale (cashew) is a tree that has been found to be of immense use to mankind. Its fruits are eaten raw, its bark cures cough, the seed is used as foil and also used for other economic purposes. More, because of its pre-dominance in the tropical region, it helps in controlling erosion and consequently preserves its little moisture in the soil to facilitate agricultural activities. Furthermore, there is no large scale establishment of plant species although this is due to the hardness of seed coat which affects its rate of germination and man contribute greatly to the rate of elimination of this tree, by consuming without renewing or planting them back. One of the major production constraints in the country is that most of the plantations are senile and unproductive which has to be replaced with clones of high yielding variety (Huballi, 2009). Finally, this study therefore seeks to find the suitable pre-germination treatment that is necessary or best to break *Anacardium occidentale* seed dormancy with a view to making recommendation for raising the seedlings in our own environment on a large scale.

Materials and Method

Materials used for the experiment

The following materials were used for the experiment:

Cashew seeds	Polythene bags
Top soil	Vernier caliper
Hammer.	H ₂ SO ₄ (tetra-oxo- sulphateVI acid)
Water	Ruler
Thermometer	Sand paper

Procurement of seeds

The seeds of *Anacardium occidentale* were collected from a mother tree located at the Federal College of Forestry, Ibadan premises.

Experiment site

The experiment was carried out in the Federal College of Forestry, Jericho, Ibadan, Nigeria. The college is situated on Western district of Ibadan township a latitude 75°N and longitude 3.9°E. The climatic condition of the area is tropical with an annual rainfall of 180-200 mm where the average annual temperature is 34.4°C.

Methodology

The project covers the pre-germination treatment of the seed of *Anacardium occidentale* (**cashew**) and its early growth in the nursery. The seeds were subjected to 6(six) different pre-germination treatments, before they were sown directly into polythene bags filled with top soil.

The pre-germinating treatments given to the seed include:

- i. A control
- ii. Soaking of seed in hot water for ten minutes.
- iii. Scratching of seed with sand paper.
- iv. Soaking of seed in water for 24 hours.

- v. Cracking of seed with hammer.
- vi. Soaking of seed in H₂SO₄ for 30 minutes.

The seeds were directly planted into a polythene pot containing top-soil afterwards. The parameter readings were taken within ten weeks, Parameters assessed include the following, height, stem girth and leaf count.

Procedural definitions

The following pre-treatments were carried out in preparing the seeds for planting:

- i. *Mechanical scarification* ... The seeds were scratched with sand paper to enable water penetrate easily.
- ii. *Acidification* ... The seeds were treated with dilute sulphuric acid for thirty (30) minutes and later rinsed thoroughly with distilled water to remove the acid before the seeds were sown.
- iii. *Soaking (1)* ... The seeds were soaked into hot water, boiled for ten (10) minutes and later dropped into cold water to lower the temperature of the seeds, and sown immediately after cooled.
- iv. *Soaking (2)* ... The seeds were soaked in cold water for a day to soften the seeds coat.
- v. *Cracking* ... The seeds were cracked with hammer to allow easy penetration of water.
- vi. *Control* ... The dried seeds were sown without any pre-treatment.

Experimental layout

The experiment was laid out in complete randomized design consisting of six treatments with control and each was replicated five times.

T1R1	T4R2	T2R3	T6R4	T5R5
T2R1	T5R2	T3R3	T1R4	T6R5
T3R1	T6R2	T4R3	T2R4	T1R5
T4R1	T1R2	T5R3	T3R4	T2R5

T5R1 T2R2	T6R3	T4R2	T3R5
T6R1 T3R2	T6R3	T5R3	T4R5

Keyword:

T15 Seeds soaked into hot water for ten (10) minutes.

T25 Seeds scratched with sand paper.

T35 Seeds soaked in water for twenty-four (24) hours.

T45 Seeds cracked with hammer.

T55 Seeds soaked in H₂SO₄ for thirty (30) minutes.

T65 Seeds used as control experiment i.e. no treatment.

Seed sowing

The seeds of *Anacardium occidentale* were sown on the 19th of March, 2019 and started germinating on the 2nd of April 2019.

Data collection and analysis

The data collected in the course of the experiment was subjected to analysis of variance (ANOVA). The means were further separated using least significant difference (L.S.D) where significant differences were observed.

Result and Discussion

The readings from the experiment were taken over ten (10) weeks; the collated data and data analysis were carefully recorded. Table 1 shows that all the treatments grew up except treatment D seeds which were cracked; this could be because the embryos were destroyed during cracking.

The result from table 2 shows that treatment (C) i.e. seeds soaked in water for 24 hours had the highest growth of 15.66cm at week 1, the trend was maintained through-out the period of the experiment with 31.74cm at the 10th week. The result of analysis of variance for periodic changes in the height revealed that there was no significant difference among the treatments

applied at 0.05 level of probability. This suggests that soaking *Anacardium occidentale* for a full day would enhance quick growth.

Table 3 below shows the result of leaf count; treatment C was ahead of other treatments at week 1 with 5.20. It was then followed with treatment A and F with 4.40 each. At week 4, treatment F i.e. the controlled seeds, had the highest leaf production of 7.60, and maintained the lead up to week 9 with 13.0. But at week 10, treatment C took over the lead with leaf production of 14.80. The result of analysis of variance for periodic changes in leaf count revealed that there was no significant difference among the treatments applied at 0.05 level of probability.

Table 4 shows the result of stem diameter, treatment C also performed best; it had a diameter of 0.65mm as at the 10th week, while treatment A had the least performance of 0.46mm. The result of analysis of variance for periodic changes in the girth revealed that there was no significant difference among the treatments applied at 0.05 level of probability.

Table 1: Germination percentage

TREATMENT	TOTAL SEEDS GERMINATED	% OF SEEDS GERMINATED
Hot water for 10 mins	5	100%
Scratched	5	100%
Water for 24 hours	5	100%
Cracked	0	0%
Acid scarification	5	100%
Control	5	100%

Table 2: Periodic changes in the height of *Anacardium occidentale*

Week	1	2	3	4	5	6	7	8	9	10
Treatment										
A	13.28	15.68	17.22	18.96	21.86	25.32	27.44	28.96	29.54	29.96
B	11.52	13.56	14.78	15.64	16.80	20.26	22.24	25.22	26.98	27.60
C	15.66	17.50	19.46	21.62	23.70	26.20	27.86	29.96	30.92	31.74
D	-	-	-	-	-	-	-	-	-	-
E	12.10	13.96	15.70	16.96	20.14	22.04	23.84	24.84	25.88	26.48
F	14.38	15.70	17.18	18.20	19.92	21.32	23.60	26.30	27.32	28.02
G. Mean	13.39	15.28	16.87	18.28	20.48	23.03	25.00	27.06	28.13	28.76
Sig. diff.	2.16ns	3.16*	3.50*	4.56*	3.91*	3.05*	2.38ns	1.67ns	1.37ns	1.48ns
L.S.D.5%	1.35	1.41	1.63	2.16	1.40	2.30	2.06	1.57	0.81	1.29

.ns=Not significant ***=significantly different (p <0.05)

Table 3: Periodic changes in the leaf count of *Anacardium occidentale*

WEEK	1	2	3	4	5	6	7	8	9	10
A	4.40	5.40	6.60	7.20	8.60	10.00	10.60	11.80	12.40	13.20
B	3.80	4.80	5.80	6.80	8.00	9.00	9.80	11.20	12.00	12.80
C	5.20	6.00	6.60	7.20	8.00	9.20	10.60	11.00	12.80	14.80
D	-	-	-	-	-	-	-	-	-	-
E	4.20	5.20	6.60	6.80	7.80	8.80	9.60	10.60	11.40	12.2
F	4.40	5.80	6.60	7.60	9.00	10.80	10.80	12.20	13.0	13.86
G.MEAN	4.40	5.44	6.44	7.12	8.28	9.48	10.28	11.36	12.32	13.36
SIG.DIFF	2.36 ns	1.73n	1.83n	0.86n	2.52n	0.33 ns	1.10 ns	1.85 ns	1.92ns	4.37ns

		s	s	s	s					
L.S.D 5%	0.42	0.34	0.15	0.15	0.42	0.62	0.10	0.47	0.28	0.94

.ns=Not significant ***=significantly different (p <0.05)

Table 4: Periodic changes in the girth of *Anacardium occidentale*

Week	1	2	3	4	5	6	7	8	9	10
Treatment	0.32	0.33	0.35	0.37	0.39	0.41	0.42	0.44	0.45	0.46
	0.36	0.38	0.41	0.43	0.45	0.48	0.51	0.52	0.53	0.55
	0.42	0.46	0.49	0.51	0.54	0.56	0.58	0.60	0.62	0.65
	-	-	-	-	-	-	-	-	-	-
	0.32	0.34	0.35	0.37	0.39	0.42	0.43	0.46	0.47	0.49
	0.34	0.37	0.40	0.42	0.44	0.46	0.48	0.51	0.53	0.55
G.mean	0.35	0.38	0.40	0.42	0.44	0.47	0.48	0.51	0.52	0.54
Sig. diff	1.32ns	2.81ns	0.57ns	0.76ns	2.95ns	1.70ns	1.74ns	1.50ns	1.34ns	1.79ns
L.S.D 5%	0.012	0.13	0.021	0.024	0.026	0.027	0.016	0.072	0.021	0.032

.ns=Not significant ***=significantly different (p <0.05)

Conclusion

Based on the result of the study, it was observed that all the treatments germinated expect treatment D that was cracked. Cashew seeds that were soaked in water for 24 hours before planting performed best among all the other treatments carried out. The result indicated that *Anacardium occidentale* (cashew) yielded best in terms of height growth, leaf count and stem diameter when soaked in water for 24 hours.

Recommendation

For best performance of *Anacardium occidentale* seedlings at the nursery stage, the seeds should be soaked in water for 24 hours before planting. Further research work should be carried out to determine if this same treatment favors the fruiting of *Anacardium occidentale*.

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