

Full Length Research Paper

Studies on the isolation of normal and abnormal seedlings of *Chrysophyllum albidum*: A step towards sustainable management of the taxon in the 21st century

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The authors' field trip revealed that the local populace attempted to plant *Chrysophyllum albidum* seeds but met with severe limitation. In the light of the above a study was designed to determine the optimum seed germination medium, normality and abnormality of seedlings. Of all the growth media used, 4 parts topsoil (4PTS) + 4 parts farm yard manure (4PFYM) had the best result. A mean seed germination value of 83% was obtained. Biomass accumulation was also highest in the medium of (4PTS + 4PFYM) from which mean fresh weight of 1.7 and 0.98 g dry weight were obtained respectively. Abnormality of seedlings was detected. It was such that the seed coat attached to the cotyledon and could not be removed without damage to the tender shoot. The study concluded that farmers generally sowed seeds directly, though the seeds may be viable and could germinate, most of the plantings failed due to seedling abnormality. Seedlings of *C. albidum* be raised in a tree nursery in a growth medium of 4PTS + 4PF YM, where the seedlings can easily be assessed. The abnormal seedlings should be identified, thinned out and well discarded. This will ensure successful forest plantation of *C. albidum* that can guarantee good returns on investment.

Key words: Normal, abnormal, sustainable management, *Chrysophyllum albidum*.

INTRODUCTION

Chrysophyllum albidum (G. Don) is a tropical edible fruit tree. It belongs to the family sapotaceae which has up to 800 species and make up almost half the order Ebernales (Keay et al., 1964). Okigbo (1977) and Okafor (1975) reported that a few species of *Chrysophyllum* grow in the boarder regions between the forest and Savanna in Nigeria. The plants as reported by Bada (1997) can be found in Nigeria, Cameroon, Cote d' Ivoire, Uganda and Niger republic. The species is called different names depending on the locality. Table 1 shows some locality and names of the species.

Flowering is usually from to April to June. The flowers are sessile and occur in clusters in the leaf axil of the fruiting branch (Figure 1A). The fruits are normally Jan-

uary to March but the fruit have been seen recently in November. When ripe the fruits are pale orange, edible, ovoid in shape and pointed at the apex. It is a berry with crescent shaped seeds (Figure 1B).

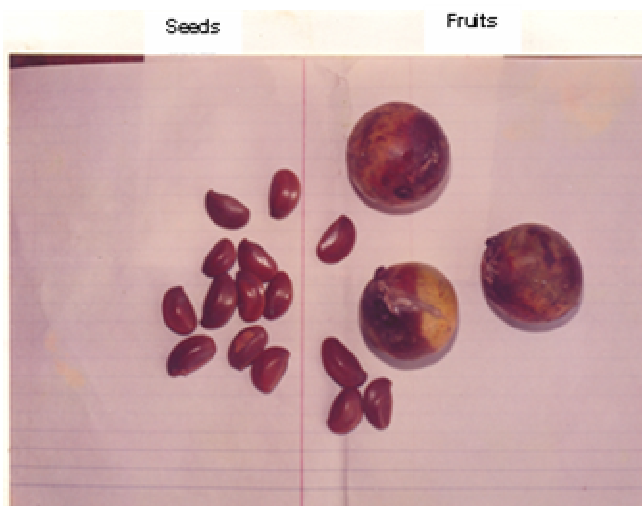
C. albidum fruit contains 8.8% protein, 17.1% oil, 21% sugar 11% starch (Ogbe et al., 1992). Cenrad (1999) reported that *C. albidum* fruits are generally eaten by both old and young people. *C. albidum* fruits have been reported to be the highest source of ascorbic acid, excellent source of vitamins, irons, flavour to diets and raw material to some manufacturing industries (Adisa, 2003).

C. albidum has been classified by Okafor (1975) and Okigbo (1977) as a wild uncultivated fruit tree which occurs naturally in the high forests or bushes and seldomly planted as a fruit tree. Boys, girls and women generally pick *C. albidum* fruits from the wild for their consumption and sales. Prior to this formalized study the authors visited Ogiso market in Benin City to assess the

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Table 1. Some localities and the species names.

Locality	Name
Common Name	African Star apple
Ibo	Udala
Yoruba	Agbalumo
Edo	Otien
Scientific Name	<i>Chrysophyllum albidum</i> (G. Don)

**Figure 1A.** Fruiting branch of *C. albidum*.**Figure 1B.** Fruits and seeds of *C. albidum*.

level of sales and discovered that three *C. albidum* fruits of the size of table tennis ball sold for N10 (ten naira) and big ones sold for N10 (N120 = \$1) each. This is a great source of poverty alleviation and economic empowerment to rural women in particular. Trial seed germination and seedling evaluation were conducted. The outcome of these led to the conclusion that a formal study be conducted to determine optimum germination medium and the optimum normal field plantable seedlings to guarantee successful forest plantation of *C. albidum* establishment. The available information will encourage private forestry and individuals wishing to own stands of *C. albidum*, all geared towards sustainable management of *C. albidum* in the 21st century. In this way the species will continue to subsist and play its vital role in the interest of humanity. This is the core essence of the study.

MATERIALS AND METHODS

Study area

The study was carried out in the botanic garden of Ambrose Alli University, Ekpoma, Edo State, Nigeria.

Planting material

Matured and ripe fruits of *C. albidum* were purchased from Ekpoma market in Edo State. The seeds were extracted from the fruits, washed with several changes of tap water and sun dried for a period of 3 h. The seeds were satisfactorily dried when they no longer stuck together. The dried seeds were stored in the Ambrose Alli University botany laboratory in open baskets.

Polythene bags

Standard polythene bags of 13 x 26 cm diameter depth with drainage holes used for the experiment were purchased locally.

Viability test

Chemical method was used. It was made up of 1% solution of T.T.C. (triphenyltetrazolium chloride). Samples of the seeds were soaked in the solution for 24 h; the seeds were thereafter taken out and a cut made through the embryo. The seeds whose embryo stained red or pink were regarded viable. The seeds with colourless embryo were regarded not viable.

Seed germination/seedling evaluation studies

A modification of the method described by (Egharevba et al., 1994b) was adopted. Forest topsoil (PTS) and farm yard manure (PFYM) used were sieved to remove coarse materials. They were mixed in various proportions: IPTS + 4PFYM, 2PTS + 4PFYM, 3PTS + 4PFYM, 4PTS + 4PFYM and control which were only topsoil. These mixtures were used to fill the polypots and the pots were arranged in complete randomized block design under a light shade made of palm leaves. Ten seeds were sown in each polypot replicated 3 times. Control was also replicated 3 times. Watering was done every other day as necessary. Mean percentage germination and seedling emergence was assessed 30 days after

Table 2. Mean germination in the various growth media.

Forest topsoil/FYM	Mean germination (%)
1PTS + 4PFYM	23.3
2PTS + 4PFYM	36.3
3PTS + 4PFYM	76.0
4PTS + 4PFYM	83.3
Control (Only Forest topsoil)	23.3

P = Part, TS = topsoil, FYM = farm yard manure.

Table 3. Mean fresh and dry weight (g) in various growth media.

Various growth media	Weights (g)	
	Fresh	Dry
1PTS + 4PFYM	1.66	0.87
2PTS + 4PFYM	1.46	0.86
3PTS + 4PFYM	1.65	0.93
4PTS + 4PFYM	1.71	0.98
Control (only forest topsoil)	0.66	0.50

**Figure 2A.** Abnormal (deformed) seedling of *C. albidum*.

sowing and data recorded for each growth medium. In each growth medium 3 seedlings were randomly selected on the basis of uniformity of height for seedling evaluation study while other seedlings were thinned out. The method described by International Seed Testing Association (I.S.T.A., 1970) was adopted in the assessment of normality or abnormality of seedlings 60 days after sowing. Mean fresh and dry weight (g) of 3 randomly selected seedlings were obtained by the method of Egharevba et al. (1994b). Results were statistically analysed where necessary.

RESULTS AND DISCUSSION

Viability tests

C. albidum fruits when matured and ripe without fungi or insect attack can produce seeds of high viability. From the seeds tested, 80% viability obtained. However, if the fruits are infected by fungi there is always significant deterioration of nutrient of the fruit (Amusa et al., 2003).

Seed germination

Significant differences were observed in the mean percentage germination in the various growth media used. The results are shown in Table 2. Growth medium of 4 PTS + 4PFYM had the highest mean germination (83.3%) while the control had 23.3% (Table 2). In a bid to enhance seed germination and seedling growth many authors have studied the effect of many media. Olubosipo et al. (1988) reported best growth of *Treculia Africana* when sown in sand gave 74% germination. Boado (1976) recorded best growth from seeds of *Eucalyptus deglupta* sown in white sand. However, (Garcia et al., 1983) observed best seed germination for the seeds of *Shorea negrosensis* sown in a mixture of garden soil and sand from which 84% was obtained. That good seed germination can be influenced by enhanced growth medium has been confirmed in this study. The value from the control (23%) was lower than the ones obtained from the experiments except from 1PTS + 4PFY (Table 2). The optimum growth medium is 4PTS + 4PFY (Table 2).

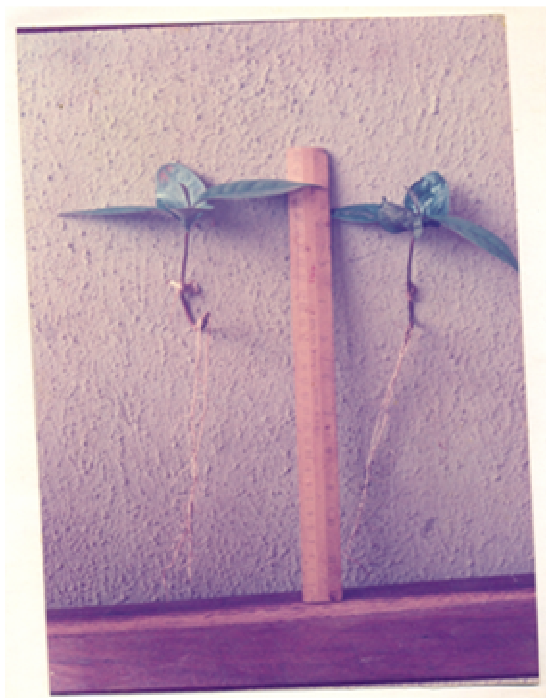
At the end of the study mean fresh and dry weights (g) of three seedlings in each growth medium was determined. Best seed germination (Table 2), seedling growth and biomass accumulation were observed in 4PTS + 4PFYM (Table 3).

Seedling evaluation

Some *C. albidum* seedlings manifested abnormality (Figure 2A). The normal seedlings are shown in Figure 2B. Significant differences were observed in the parameters of normal and abnormal seedling of *C. albidum* (Table 4). While the normal seedling had leaf length of 5 cm, root length of 17.5 cm and 18 numbers of root hairs, the abnormal seedling had leaf of 2.3 cm length, width of 1 cm and 1 leaf, root length of 2.2 cm and no root hairs (Table 4). The normal seedling had optimum morphological structures which enhanced photosynthesis, absorption of essential nutrients from the soil and development into normal plants with great field plantable value. Conversely, the abnormal seedling was grossly deficient in the normality of morphological structures leading to severely impaired physiological processes. The seedlings were with retarded growth, eventually died and thus had

Table 4. Leaf and root data of normal and abnormal seedlings of *C. albidum*.

Seedling	Leaf (cm)			Root (cm)	
	Length	Width	No.	Length	No. of root hairs
Normal	5	1	6	17.5	18
Abnormal	2.3	1	1	2.2	-

**Figure 2B.** Normal seedling of *C. albidum*.

no field plantable value.

To ensure success in raising good forest plantation of any species, Gill (1992) stressed the critical need for seedling evaluation. International Seed Testing Association (I.S.T.A, 1979) recommends assessing normality of seedling structures and also prescribed standard methods. These have been found useful in this study as they proved that abnormalities of seedlings exist.

Conclusion

Farmers were observed to have generally sowed seeds directly. Though the seeds may have been viable and could germinate, most failed due to seedling abnormality. It is recommended that seedlings of *C. albidum* be raised in a tree nursery in growth medium of 4PTS + 4PFYM. The abnormal seedlings should be identified, thinned out and discarded. This will ensure successful forest plantation of *C. albidum* that can guarantee good returns on investment. In this way *C. albidum* can be sustainably managed in the 21st century.

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