FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 10 No. 2, June 2024: Pp.116-120

https://doi.org/10.33003/jaat.2024.1002.17

EFFECTS OF FOUR DIFFERENT PLANTING MEDIA ON THE GERMINATION AND SEEDLING GROWTH OF AFRICAN CHERRY *(Chrysophylum albidum)*

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ABSTRACT

A study was conducted in 2022 and repeated in 2023 to examine the effects of five different planting media on the germination and selling growth of African Cherry (*Chrysophylum albidum*). The planting media were sandy soil, clay soil, top garden soil, saw dust, and a mixture of top soil and saw dust in a ratio of 50:50 percent. It was a Randomized Complete Block Design (RCBD) experiment with three replications. Five parameters were tested to achieve the objectives of the study, including: germination percentage, plant height, number of leaves, leaf area and collar diameter of seedlings. The results showed that seeds planted on top garden soil were superior with respect to germination percentage of 94% in 2022 and 96% in 2023 and the following parameters measured at 9 weeks after planting: plant height of 29.0cm in 2022 and 29.4cm in 2023, number of leaves of 9.2 in 2022 and 9.4 in 2023, leaf area of 78.2cm^2 in 2022 and 78.6cm^2 in 2023 and collar diameter (3.6cm). Seeds planted on clay soil had the lowest germination percentage of 62% in 2022 both 2022 and 2023. The superiority with respect to germination percentage and other growth characters of the seeds planted in the five different planting media was TS > TS + SD > SS > SD > CS. Based on the findings of the study, it was recommended that farmers should grow African cherry on top soil for enhanced germination and seedling growth.

Key words: African cherry, planting media, germination percentage, seedling growth

INTRODUCTION

African Cherry (*Chrysophyllum albidum*) or white star apple belongs to the *Sapotaceae* family. It is found throughout tropical Africa (Allabi *et al*., 2011). Its flesh contains ascorbic acid and the fruit is an excellent source of vitamins, iron and flavors (Assogbadjo *et al.*, 2011 and Adeboyejo *et al*., 2019) as it helps to balance the diet of an individual. It also contains calcium which strengthens human body as well as reduces such premenstrual syndromes as cramping and abdominal bloating (Vodounou *et al*., 2022). White star apple provides 3g of fiber to the recommended daily intake of 25 to 38g. Such fiber not only helps in loosing weight but also protects you from diabetes and some forms of cancer (Sossa-Vihotogbé *et al*., 2012 and Nwoboshi L. C., 2000). The ripe fruits are used for production of juice which is sweet and nourishing (Ureigho and Ekeke, 2010), while gathering of the fruits provide employment and income for a great majority of the rural populace (Agbogidi, *et al.*, 2007)

The numerous uses of African Cherry notwithstanding, the potentials of this non-timber forest product has long been neglected and underexploited. Like many tree crops, the fruit productiion is seasonal, while the fruits do not store for so long a time (Oroka and Ureigho, 2019). Though Moyin-Jesus and Ani (2014) posited that the use of poultry manure as planting media increases the growth parameters of *Cocos nucifera*, a practical investigation has not been done in *C.albidum* using similar media as sand, clay, top soil or their mixture. Also, there is paucity of information on the type of planting media suitable for seed germination and seedling growth of this crop species which may go into extinction if nothing is done about it. The objective of this research therefore is to investigate the effects of four different planting media on the germination and seedling growth of African Cherry in Abraka, Delta State, Nigeria.

MATERIALS AND METHOD

Site description

This research was carried out in the Teaching and Research Farm of Delta State University, Abraka in 2022 and repeated in 2023. Abraka is located between Latitude $6^0 4^0$E and Latitude $5^0 54^0$N. the rainy season starts in April and terminates in October, while the dry season comes in November and ends in March. Annual rainfall is between 2000mm and 3000mm, while the temperature ranges from 25^0 to 31^0C (Efe, 2003). Matured fruits of *C. albidum* were purchased from Abraka market and the seeds were extracted from the pulp. Using flotation method as recommended by Agbogidi and Eshegbeyi (2006) healthy seeds were selected. Poly pots of 45cm X 30cm with perforated bottom were filed with sandy soil (SS), top garden soil (TS), saw dust (SD), clay soil (CS), top soil + saw dust mixture in a ratio of 50:50 percent according to the treatments. Four seeds of *C. albidum* were planted in each polypot, and each treatment consisted of fifteen poly pots. The experiment was laid out in a randomized complete block design with three

replications. The parameters were measured at fortnight interval starting from 3 weeks after planting.

Seedling emergence or germination percentage (%) of treatments was obtained by counting the number of seedlings that emerged on the 18th day after planting, dividing by number of seeds planted per treatment and multiplying by 100 according to the procedures of Abogidi *et al*., (2007) and Enujeke (2013). Plant height was measured from the top of the soil to the top of the terminal bud. Number of leaves was determined by counting the leaves. Leaf area was obtained by multiplying the length and breadth of the leaf and multiplying by the number of leaves in the plant and finally multiplying by correction factor of 0.75 as recommended by Agbogidi *et al*., (2007). Collar diameter at 3cm above soil level was obtained using veneer calipers. Data collected was subjected to analysis of variance and significant means were separated with Duocan Multiple Range Test (DMRT) using SAS (2005).

RESULTS AND DISCUSSION

Effects of planting media on germination percentage of *C. albidum* seedlings in 2022 and 2023

The effects of planting media on germination percentage of *C. albidum* seedlings at the 18th day after planting is shown in Table 1. Seeds grown in poly pots containing top garden soil had the highest germination percentage of 94% in 2022 and 96% in 2023, followed by seeds planting in mixture of top garden soil and saw dust at ratio of 50:50 which had 82% in 2022 and 84% in 2023. Seeds planted in poly pots containing clay soil had the lowest percentage emergence of 62% in both years of the evaluation. The superiority in percentage emergence of the seedlings based on the different planting media was TS > TS + SD > SS > SD > CS.

The outstanding percentage emergence of seedlings grown in top garden soil over other planting media could be attributed to abundance of decayed plant and animal materials with high microbiological population, which interplay to improve soil fertility required for fast germination as well as plant growth and productivity. This is consistent with findings of Iwena (2018) who recommended the use of top garden soil in the nursery to enhance germination and seedling growth of such crop plants as cocoa, oil palm, oranges, African cherry, and advocado pear.

Table 1: Effects of planting media on germination percentage of seedling *C. albidum*

Plant media	Germination (%)		
	2022	2023	Mean
SS	70c	72c	71
CS	62d	62d	62
TS	94a	96a	95
SD	66d	68d	67
50% TS + 50% SD	82b	84b	83

Means with same alphabets under the same column are not significantly different at $p \leq 0.05$ using Duncan's multiple range test.

Legend: SS=Sandy Soil, CS=Clay Soil, TS=Top Soil, SD=Saw Dust

Effect of planting media on growth parameters of *C. albidum* seedlings

The response of plant height of *C. albidum* seedlings to five different planting media is shown in Table 2. Significant differences were observed in the plant height of the seedlings grown in the five different planting media. At 3 weeks after planting, seedlings grown on poly pots containing top garden soil had the highest plant height of 11.8cm in 2022 and 12.2cm in 2023, while seedlings planted in poly pots containing clay soil had the lowest plant height of 3.0cm in 2022 and 2023 respectively.

Similar trend was observed during the 6th week when seedlings planted in poly pots containing top garden soil had outstanding plant height of 25.2cm in 2022 and 25.4cm in 2023, while seedlings grown in poly pots containing clay soil had the lowest plant height of 9.2cm in 2022 and 9.6cm in 2023. There were significant differences also observed with respect to the plant height of the seedlings grown in the planting media at the 6 week after planting.

During the 9th week after planting, significant differences were also observed in the plant height of the seedlings grown in the different treatments. Seedlings grown in poly pots containing top garden soil also had the highest plant height of 29.0cm in 2022 and 29.4cm in 2023 respectively, while seedlings grown in poly pots containing clay soil which had plant height of 10.2cm in 2022 and 10.6cm in 2023, respectively. Similar trend was observed with respect to the number of leaves, leaf area and collar diameter at 3, 6 and 9 weeks after planting of C. albidum. Seedlings that were grown in poly pots containing top garden soil were superior to other seedlings with respect to plant height, number of leaves, leaf area and collar diameter possibly because of preponderance of essential nutrient elements and better utilization of carbon as well assimilates

supplied by manure in the soil. This is synonymous with the findings of Eifediyi and Remison (2010) who indicated that cucumber had enhanced growth and yield due to preponderance of nutrient supply, better utilization of carbon and synthesis of assimilates provided by the applied manure. It is also consistent with the findings of Gudugi (2013), Thakur *et al*., (2002), Stevens *et al*., (2018) and Tilley (2022) which reported increased vegetative growth of vegetables due to addition of nitrogen released from organic fertilizers.

The poor performance of seedlings grown in poly pots containing clay soil could be attributed to its poor physio-chemical properties including, insufficiency of oxygen, poor soil structure, high compaction rates and poor drainage which can cause root rot in some plants species. This is consistent with the findings of DIPA (2006) reported that clay soil as high moisture content in the pore spaces, which thus limits the quantity of oxygen in the soil. The report further posited that clay soil can easily turn into hard pan with cracks because of its poor soil structure, thus making it unfavorable for seed germination and seedling emergence. There were no significant differences observed throughout the period of evaluation of collar diameter of C. albidum seedlings possibly because of the slow growth and development characteristics associated with some crop species due to its genetic makeup. This is similar to the findings of Ibrahim *et al*., (2000) who reported that the growth characters of crops varied because of their differences in their genetic makeup.

Table 2: Effects of planting medium on plant height (cm) of *C. albidum* seedlings

	Weeks after planting								
	3			6			9		
	2022	2023	Mean	2022	2023	Mean	2022	2023	Mean
Planting Media									
SS	8.8_c	9.0_c	8.9	19.0_c	19.2_c	19.1	22.4_c	22.8_c	22.6
CS	3.0e	3.0e	3.0	9.0e	9.2e	9.1	10.2e	10.6e	10.4
TS	11.8_a	12.2_a	12.0	25.0_a	25.2_a	25.2	29.0_a	29.4_a	29.2
SD	6.0_d	6.4_d	6.2	12.0_d	12.4_d	12.2	20.0_d	20.2_d	20.1
50% TS + 50% SD	9.8_b	10.2_b	10.0	22.2_b	22.6_b	22.4	25.2_b	25.6_b	25.4
Mean	7.9	9.6	8.0	17.4	17.7	17.6	21.4	21.7	

Means with same alphabets under the same column are not significantly different at $p \leq 0.05$ using Duncan's multiple range test.

Table 3: Effects of planting media on number of leaves of *C. albidum* seedlings

	Weeks after planting								
	3			6			9		
	2022	2023	Mean	2022	2023	Mean	2022	2023	Mean
Planting Media									
SS	2.4_b	2.6_b	2.5	4.2_b	4.4_b	4.3	7.2_b	7.4_b	7.3
CS	1.6_b	1.8_b	1.7	3.0_b	3.2_b	3.1	5.6_b	5.8_b	5.7
TS	14.2_a	4.4_a	4.3	6.4_a	6.6_a	6.5	9.2_a	9.4_a	9.3
SD	2.0_b	2.2_b	2.1	3.4_b	3.6_b	3.5	6.2_b	6.4_b	6.3
50% TS + 50% SD	3.0_b	3.2_b	3.1	5.0_b	5.2_b	5.1	8.0	8.2_b	8.1
Mean	2.4	2.8	2.7	4.4	4.6	4.5	7.2	7.4	

Means with same alphabets under the same column are not significantly different at $p \leq 0.05$ using Duncan's multiple range test.

Table 4: Effects of planting media on leaf area (cm^2) of *C. albidum* seedlings

	Weeks after planting								
	3			6			9		
	2022	2023	Mean	2022	2023	Mean	2022	2023	Mean
Planting Media									
SS	26.0_c	26.2_c	26.1	34.0_c	34.2_c	34.1	58.0_c	58.4_c	58.2
CS	19.0e	19.2e	19.1	28.0_c	28.2e	28.1	51.2e	51.6e	51.4
TS	31.0_a	31.4_a	31.2	42.4_a	42.8_a	42.6	78.2_a	78.6_a	78.4
SD	22.0_d	22.2_d	22.1	30.0_d	30.4_d	30.2	54.2_d	54.4_d	54.3
50% TS + 50% SD	28.0_b	28.4_b	28.2	38.2_b	38.6_b	38.4	64.0_a	64.2_b	64.1
Mean	25.2	25.5	25.3	34.5	34.8	34.7	61.1	61.4	

Means with same alphabets under the same column are not significantly different at $p \leq 0.05$ using Duncan's multiple range test.

Table 5: Effects of planting media on collar diameter (cm) of *C. albidum* seedling

	Weeks after planting								
	3			6			9		
	2022	2023	Mean	2022	2023	Mean	2022	2023	Mean
Planting Media									
SS	1.2_a	1.4_a	1.3	1.4_a	1.6_a	1.5	1.8_a	2.0_a	1.9
CS	0.6_a	0.8_a	0.7	1.0_a	1.2_a	11.1	1.2_a	1.4_a	1.3
TS	2.0_a	2.2_a	2.1	2.6_a	2.8_a	2.7	3.4_a	3.6_a	3.5
SD	0.8_a	1.0_a	0.9	1.2_a	1.4_a	1.3	1.6_a	1.8_a	1.7
50% TS + 50% SD	1.6_a	1.8_a	1.7	2.2_a	2.4_a	2.3	3.0_a	3.2_a	3.1
Mean	1.24	1.4	1.34	1.7	1.9	1.8	2.2	2.4	

Means with different letters in the same column are significantly different at $P < 0.05$ using Duncan's multiple range test

CONCLUSION

This research work has established that planting media significantly affects the germination and seedling growth of *Chrysophyllum albidum*, and that best performance is obtained when seeds are grown with top soil. It is therefore recommended that farmers adopt the use of top soil to promote nutrient availability for enhanced germination and seedling growth of Africa cherry.

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