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The Examination of the Abundance and Conservation Status of *Chrysophullum albidum* in Ifaki Region of Ekiti State, Nigeria

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Abstract

This study which examined the abundance and conservation status of *C. albidum* in Ifaki Region of Ekiti State Nigeria was conducted in two stages. Stage 1 involved the examination of the production of *C. albidum* in the region while stage 2 determines the acceptance and perception of residents of the region on *C. albidum*. In stage 1, 10 farmers, who have maintained continuous domiciliation in the region for over 10 years, were purposely selected from 3 strata in the region while in Stage 2, 10 residents were randomly selected from each stratum. All respondents were interviewed and the interviews were conversational, focused and two–way in communication. The respondents traversed different socio-economic classes yet all were conscious of *the species.* Few respondents' farmers possessed *C. albidum* but the number of stands was less than 10 in each farm. Production was mostly subsistent; fruits sale was slow and conducted through vendors. Harvested fruits from the mother trees were not consumed, only ripen fruits that fell themselves were consumed. The fruits are liable to fungal infections hence they have low shelf life. All these served as disincentives to its cultivation. Gross decline was observed in the number of stands and fruits as well as income derived from *C. albidum* in the region when compared to those of a decade before the study. The slow growth of the species, burnings of vegetation and land tenure were constraints to its cultivation which is presently limited to wildlings preservation. The fruits are still widely accepted in the region for their medicinal and nutritional values and cost of purchase is still low enough to make the fruits available to people in different economic classes. Strategies towards cultivation of the species were proposed.

INTRODUCTION

Chrysophullum albidum (African star apple) is an indigenous fruit tree (IFT) of the family Sapotaceae that is popularly known as "Agbalumo" among the Yoruba tribe of Ekiti State, Nigeria. The tree is popular for its sweet fleshy fruits which have been reported as an excellent source of nutrition. The fruit is a large berry containing 4 to 5 flattened seeds or sometimes fewer due to seed abortion (Keay,

1989) and the species natural occurrences have been reported in diverse ecozones in Nigeria, Uganda, Niger Republic, Cameroon and Cote d'Ivoire (Bada, 1997).

Recent initiatives revealed that the species possessed tremendous commercial potential. Its fruits are eaten especially as snack and relished by both young and old (CENRAD 1999). The fruit has been found to have high content of ascorbic acid (1000 to 3,330 mg of ascorbic acid per 100gm of edible fruit) which is about 100 times higher than that of oranges and 10 times higher than that of guava or cashew (Asenjo, 1946). It is an excellent source of vitamins, irons, flavours to diets and raw materials to some manufacturing industries (Adisa, 2000, Bada, 1997, Okafor and Fernandes 1987, Umelo, 1997). In addition, its seeds are a source of oil, which is used for diverse purposes. The seeds are also used for local games (Bada, 1997). The fruits also contain 90% anacardic acid, which is used industrially in protecting wood and as source of resin, while several other components of the tree including the roots and leaves are used for medicinal purposes (Adewusi, 1997, Bada, 1997).

The rate of vegetation disturbance in Nigeria is unprecedented thus creating fear that some tree species previously in abundance in the country might now be endangered especially the IFTs. Previous study by Kayode (2004) revealed that investment in the cultivation of tree species is poor in Ekiti State, Nigeria. In the farms, they are discriminated against due to their potentials to shade the food crops while in the urban forestry that is still in infancy in the state, IFTs have not been accommodated. Also, Awodoyin *et al.* (2015) observed that the IFTs are yet to achieve the status of international recognition in commodity markets and research arena outside Africa. Thus despite the enormous economic potentials offered by *C. albidum,* it is yet to be domesticated.

Consequent on the above, the study being reported here examined the abundance and conservation status of *C. albidum* in Ifaki Region of Ekiti State Nigeria. It is expected that strategies that will conserve the species in the study area will be prescribed.

MATERIALS AND METHODS

Description of the study Area

The Ifaki region consists of the urban Ifaki–Ekiti and its aboriginal villages and farmsteads located within 5 kilometer radius of the centre of Ifaki town, all in Ido- Osi Local Government Area of Ekiti-State, Nigeria. The region is situated on Latitude 7^{o} 47' North, Longitude 5^{o}14' East and at elevation of 457 meters above the sea level (Anon, 2020). Two climatic seasons prevailed, the rainy season between March to October and dry season between November and February (Kayode, 2004). It has a population of 9,185 who are mostly engaged in farming activities.

Methods

Sampling procedure used for data collection

This study was conducted in two stages. Stage 1 involved the examination of the production of *C. albidum* in the region while stage II determines the acceptance and perception of residents of the region on *C. albidum*.

Stage 1: Production of *C. albidum* in the Ifaki Region

The Ifaki region was divided into 3 strata using the three major roads that link the urban Ifaki-Ekiti town with her neighboring towns as follow:

Stratum A consists of area located in the left hand side of the Iworoko-Ifaki highway while entering Ifaki-Ekiti from Iworoko-Ekiti.

Stratum B consists of area located in the right hand side of the Iworoko-Ifaki highway while entering Ifaki-Ekiti from Iworoko-Ekiti.

Stratum C consists of area located in the left hand side of the Aaye-Ifaki-Ayegbaju highway while entering Ifaki-Ekiti from Aaye-Ekiti.

In each stratum, 10 farmers, who have maintained continuous domiciliation in the region for over 10 years, were purposely selected and interviewed with aim of semi-structure questionnaire matrix. The interviews were conversational, focused and two–way in communication. Issues bordering on the

production of *C. albidum* were discussed. Thus information was obtained on existing stands of *C. albidum* in the region, its cultivation, harvested fruits, proportion of the harvest sold and the income generated from the sales of its fruits. Respondents were required to make a comparison between the present productions of *C. albidum* with the production a decade before this study.

Stage II: Acceptability of *C. albidum* in the region

The division of the region into three strata, described above, was maintained also for this stage but selections of respondents in this stage were conducted randomly. 10 respondents were randomly selected and interviewed also with the aid of a semi-structured questionnaire matrix that focused on the acceptability of *C. albidum* in the region. Thus information on the consumption of the fruits of *C. albidum*, rate of consumption, cost of consumption and willingness to invest in *C. albidum* were assessed.

Key informants made up of forest, agricultural development and health officers in the Local Government Area were interviewed on the subject matter of this study.

RESULTS AND DISCUSSION

The results obtained revealed that the respondents in this study traversed the socio-economic classifications. Though dominated by males (78% and 70% farmers and residents respectively), who were mostly adults (over 60% in both farmers and residents) yet the female gender and youths were equally adequately represented. While the famers were mostly illiterates (65%), the residents were mostly educated (70%). Field observation revealed that all the respondents in this study were conscious of *C. albidum*, the species being examined in this study. This observation concurred with the previous study by Ajayi *et. al*. (2020) who observed that socio-economic classification of respondents has no negative effect on their awareness on the plant species in their environment.

Table 1: Socio-economic classification of the respondents in Ifaki Region of Ekiti State, Nigeria

Feature	Description	Proportion (%) of Respondents	
		Farmers	Residents
Gender	Male	78	70
	Female	22	30
Age (Yrs.)	< 20	0	15
	20-60	60	65
	> 60	40	20
Educational status	Literate	35	70
	Iliterate	65	30
Religious	Christian	45	75
	Muslim	50	20
	Others	5	5

Source: Field Survey 2020

Table 2 revealed that only 30% of the respondents' farmers claimed to possess *C. albidum* in their farms and the number of *C. albidum* stands were less than 10. Most of those who have the species in their farms do not harvest for sale. Only 15% of the respondents' farmers generated income of between 1,000.00 and 10,000.00 Naira from *C. albidum* per annum and the sale of the fruits sold very slowly usually through the vendors. Previous study by Oguoma *et al.* (2010) observed that the vendors increases buying prices for consumers and reduces selling prices for producers thus lowering the farmers' profit margins. They buy up the farm products at ridiculous prices and sell at outrageous prices to the consumers.

Table 2: Production of Africa star apple by respondents in Ifaki Region of Ekiti State of Nigeria

Feature	Description	Proportion (%) of Respondents
Number of *C. albidum* stands possessed	None	70
	< 10	30
	> 10	0
Income generated from sale of *C. albidum* fruits (in Naira)	None	85
	< 1,000.00	0
	1,000.00 - 10,000	15
	> 10,000.00	0
Sales of *C. albidum* in the region	Sell rapidly	20
	Slowly	80
Conduction of Marketing of *C. albidum* fruits	Vendors	95
	Sell directly to consumers	5

Source: Field Survey 2020

Field observation revealed that it is a taboo to consume harvested fruits of this tree from the mother trees. It is expected that ripe fruits must fall down themselves before they could be harvested and consume. Adebisi (1997) observed that these fallen fruits are liable to fungal infections hence they deteriorate within a very short period. The short shelf life caused rapid decrease in the quality, taste and texture of the fruits; rendered them unsuitable for haulage to urban markets, thus increase fruit wastes in this species. The relatively low shelf life of the fruit, the slow sale of the fruits and the conduction of the sale through vendors might have served as disincentives to the cultivation of this species. Hence this study tends to suggest that the lack of enough economic returns could serve as a disincentive to investment in this tree in the study area. 80% of the respondents asserted that a gross decline was observed in the number of fruits of *C. albidum* produced when compared to the number produced a decade before the study (Table 3). Consequent on this, decline was equally observed in the income derived from the sale of the fruits of this tree.

Table 3: Perception of the respondents' farmers on the economic production of *C. albidum* in Ifaki Region of Ekiti State, Nigeria

S. No.	Statement	Proportion (%) of Respondents
1.	Amount of *C. albidum* fruits produced in the study region has been in decline compared to the amount produced 10years ago	80
2.	Amount of *C. albidum* fruits produced in the study region has been on the increase compared to the amount produced 10years ago	20
3.	More income is derived now from walnut compared to 10 years ago	10
4.	Less income is derived now from walnut compared to 10 years ago	90

Source: Field Survey 2020

Table 4: Constraints to *C. albidum* production as perceived by respondents in Ifaki region of Ekiti State, Nigeria

Rank	Constraints	Proportion (%) of Respondents*	
		Primary	Secondary
1.	Land Tenure	10	35
2.	Slow growth and maturation period	60	25
3.	Vegetation clearance by burning	30	40

Source: Field Survey 2020

An array of constraints was identified as hindering *C. albidum* production in the region (Table 4). 60 % of the respondents identified slow growth as the primary constraint. Previous study by Kayode (2004) observed that residents of Ekiti State, Nigeria have continued to avoid tree cultivation claiming

that the time taken for trees to attain maturity and yield the required dividends is too long. Field observation revealed that the younger people were not willing to invest on the tree because of an existing cultural belief in the study area that only the elders can cultivate this tree. This belief is linked to the length of time required for the tree to grow into the fruiting stage. 30% of the respondents identified deforestation as their main constraint. The major cause of the deforestation was identified as burning. WDNR (2020) opined that burning kills vegetation, changes the soil structure and causes soil erosion. Field observation revealed that forest fire is now an annual event in the study area. Many farmers use fire to clear the vegetation for farm preparations usually at the onset of the dry season. At the peak of the dry season, burning becomes uncontrollable as it easily spread to unintended areas, thereby destroying numerous species including wildlings of indigenous fruit species. The proportion of land owned by respondents, that is, land tenure also affects the cultivation of this species. 10% of the respondents (Table 4) affirmed that the basal area of the crown of a single *C. albidum* tree will cast shade that will jeopardize the growth of their crops. Thus this study tends to suggests that only people with extremely large area of land could endeavour to cultivate the species. Results of study conducted elsewhere in Malawi and Zambia by German *et al.*(2009) tends to lend credence to this assertion.

Table 5: Acceptability of *C. albidum* among residents of Ifaki Region of Ekiti State, Nigeria

Feature	Description	Proportion (%) of Respondents*
Consumption	Consume *C. albidum*	85
	Do not consume	15
Average number consumed / time	< 5 fruits	75
	5- 10 fruits	25
	> 10 fruits	0
Values of consumption	Medicinal	60
	Nutritional	40
Production	Planted *C. albidum* before	6
	Did not plant *C. albidum* before	94
	Interested in planting *C. albidum*	15
Present economy of purchase	High	20
	Moderate	15
	Low	65

Table 5 also revealed that most of the residents (85%) respondents concurred to the consumption of the fruits of *C. albidum* but relatively low number of fruits was consumed. In this study, 75% of the consumers consumed less than 5 fruits per day. Field observation revealed that the fruits of this tree must not be harvested and taken until after the first rain of the year. It is being insinuated that some fruits are now manually harvested from the mother plants, even before the first rain and the fruits offered for sale. All these were at variance with the culture of the people in the study area hence many people decline consumption until the peak of the rain. The consumption of the fruits was attributed to its medicinal and nutritional advantages. Only 6% of the respondents claimed to have cultivated the species before this study but the cultivation was limited to the planting of wildlings and wildlings preservation. 15% of the respondents expressed interest in commercial cultivation of the tree. Respondents believed that the present cost of purchasing the fruits of *C. albidum* is still low enough to make the fruits available to people in different economic categories.

CONCLUSION

In conclusion, this study revealed that though there is an increasing decline in the number of *C. albidum* and its fruits in the study area. MEA (2005) observed that wild food species are declining *in*

many agricultural landscapes. Bharucha and Pretty (2010) opined that foods and income from these wild species may be declining as natural habitats come under increasing pressure from development, conservation-exclusions and agricultural expansion. This study asserts that a relatively high acceptability of *C. albidum* fruits' consumption still abounds in the study area. This constitutes a favourable incentive to its cultivation, especially in commercial quantity. A number of studies such as Garrity (2004), Russell and Franzel (2004), Schreckenberg *et. al.* (2006), Cousins and Witkowski (2015) have enumerated the potentials of the wild fruits in alleviating poverty, especially in a developing economy such as Nigeria. Sustainable strategies such as the development of improve varieties of *C. albidum* that will attain fruit production in short time and effective control of bush burning is required. The development of plantations of *C. albidum* is also required. Successful utilization of taunya method for *Gmelina arborea* and *Tectonia grandis* plantations has been attained in the study area in the past; such method can now be applied to develop plantations of *C. albidum.* The cultural myths on the species should be disabused. Appropriate time of fruits harvesting should be developed while government should invest in seedlings' production for distribution to interested people for cultivation.

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