PROXIMATE AND PHYTOCHEMICAL ANALYSIS OF CHRYSOPHYLLUM ALBIDUM SEED

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Abstract
This work presents the result of characteristics and composition of Nigerian *Chrysophyllum albidum* seed. Proximate analysis, phytochemical screenings of the seed meal and oil extraction using sohxlet apparatus were carried out. The result of proximate analysis indicates that the seed has a moisture content of 7.78 %, crude fibre of 2.3 %, ash content of 1.75 %, carbohydrate and protein contents of 42.80 % and 29.51 %, thus it can be used as a source of feed for animal. The phytochemical screening of the meal shows that it contains secondary metabolites and thus suggests the medicinal value of the seed meal.

Keywords: *Chrysophylum albidum,* proximate analysis, phytochemical, Seed

Introduction
Chrysophylum albidum (G.Don) commonly called African or white apple is locally called Otien among the Benin people, Udara in Igbo language, Osan (Ewansiha *et al.* 2011), Agbalumo in Yoruba communities. *C.albidum* is well-known in the compound of agro-forestry system for fruit, food, cash income and other supplementary uses including environmental purposes. It belongs to the *Sapotaceae* family (Oyebade *et al*., 2011, Adebayo *et al*., 2010). The plant has up to 800 species and make up almost half the order Ebernales (Oboh *et al*., 2009). The plant is *commonly* found in the Central, Eastern and Western Africa. Its natural occurrences have been reported in diverse eco zones in Cote d'Ivoire, Uganda, Niger Republic, Cameroon, and Nigeria (Bada, 1997). It is a popular tropical fruit tree that is widely distributed in the low land rain forest zones and frequently found in villages in the southern part of Nigeria.

It is a fruit of great economic value in tropical Africa due to its diverse industrial, medicinal and food uses. Its seeds have also been found to have a number of beneficial uses. The plant has in recent times become a crop of commercial value in Nigeria (Bada, 1997). The roots, barks and leaves of *C. albidum* have been employed in folk medicine for the treatment of diseases. The bark is used for the treatment of yellow fever and malaria, while the leaf is used as an emollient and for the treatment of skin eruption, stomach ache and diarrhea (Idowu *et al.,* 2006). The cotyledons from the seeds of *C. albidum* are used as ointments in the treatment of infections associated with human vaginal and skins in the Western part of Nigeria. The seed cotyledon are also reported to possess anti-hyperglycemic and hypolipidemic effects. Tannins, flavonoids, terpenoids, proteins, carbohydrates and resins are the phytochemicals that have been reported in *C. albidum* seeds (Adebayo *et al.,* 2010). The fleshy fruit pulps are suitable for jams and are eaten as snack among diverse age groups. The fruit contain high ascorbic acid content between 1000 to 3330 mg per 100 g of edible fruit. The fruit pulp is also rich in vitamin C and iron and an excellent source of raw material for industries (Adisa, 2000; Akubugwo and Ugbogu, 2007). The seeds are source of oil which are used for a variety of purposes (Idowu *et al.,* 2006). Most often the seed are discarded after the consumption of its juicy pulp. It is sometimes used for local games (Duyilemi and Lawal, 2009).

Several studies have been carried out on *C. albidum* plant; Amusa *et al.* (2003) reported seed storage and its food value. Ugbogu and Akukwe (2009) reported the use of the shell of seeds for the removal of metal ions. Oboh *et al.* (2009) reported the antimicrobial effect of seed oil against some local clinical bacteria isolates. Adebayo *et al.* (2010) studied the effects of ethanolic leaf extract of *Chrysophyllum albidum* G. on biochemical and haematological parameters of albino

Wistar rats. Studies have also examined its anti-inflammatory and antioxidant activities of eleagnine: an alkaloid isolated from the seed cotyledons (Idowu *et al.,* 2006). Oyebade *et al.* (2011) identified the various varieties of *C. albidum* using biophysical and physio-chemical methods in characterizing some of its fruit attributes as well as determining its market value following its taste and dietary composition that may amount to the species subsequent sustainable domestication and propagation in Nigeria. In another study Sam *et al.*(2008) reported the extraction and classification of lipids from seeds of *Chrysophyllum albidum.* The work was limited to phytochemical screening and determination of fatty acid composition.

In spite of the vast works on *C. albidum* plant, all samples used in the reported literatures were from the southern part of Nigeria. At present the *Chrysophyllum albidum* plant is grown and found in some part of the North central specifically Benue state. There are however no reported literature on the *Chrysophyllum albidum* plant from the North central part of the Nigerian.

The study therefore is aimed at providing information on the characteristics and composition of a typical Nigerian *Chrysophyllum albidum* seed obtained from Agbaha in Otukpa local Government of Benue state with a view of establishing its potential benefit and placing it on the world map.

Material and Methods

Collection of Plant Seeds and Preparation

The fruits of *Chrysophyllum albidum* were gotten from Agbaha in Otukpa local Government area of Benue State. The outer spongy coats of the fruits were removed and the seeds collected and dried. This was followed by removal of the shell and drying at room temperature for two weeks. Mortar and pestle were used to reduce the size of the kernel to appreciable powdered form

Proximate Analysis and Phytochemical screening

Proximate analysis was carried out according to AOAC (2000) standards to determine the percentage composition of carbohydrate, protein, moisture, lipids, crude fiber and ash contents respectively. Phytochemical screening was carried out using standard procedures (Rajkumar and Sinha, 2011) which consists of screening the meal for the presence of secondary metabolites such as glycosides, tannins, saponins, alkaloids, flavoniods, steroids and terpenes.

Results and Discussions

Table 1 shows the result of the proximate analysis of the seed.

Table 1: Proximate Analysis of the Sample

Properties	Composition (%)	
	This work	Reported Values 1
Ash content	1.75	1.25
Crude fibre	2.30	7.0
Lipid	16.85	13.43
Moisture content	7.78	5.55
Crude protein	29.51	13.13
Carbohydrate	42.80	50.98

Source: 1. (Ochigbo and Paiko, 2011)

The ash content from this study was found to be 1.75 %. This value was high when compared to ash content of 1.27 % reported by Ochigbo and Paiko (2011) for *Chrysophyllum albidum* seed. The difference observed could be attributed to geographical location of the seed, the age of the seed or storage conditions. The result was however also lower than 2.94 % reported for melon seed but higher than 1.05 % reported for coconut (Obasi *et al.,* 2011). This low value is an

indication that only minute quantity of inorganic minerals (in the form of salt and oxides) are present in *C. Albidum* seed.

The seed of *Chrysophyllum albidum* contains 42.80 % carbohydrate. This high value obtained was lower than the value of 50.98 % reported (see Table 1) but quite impressive when compared to the carbohydrate content of 32.84 % and 29.47 % for coconut and melon seeds respectively (Obasi *et al.,* 2011). The carbohydrate content compares favourably with other fast energy foodstuffs hence; it can be added to some food content as additive thereby making it a viable source of energy in the body. Carbon is a porous nature thereby plays an important role in the adsorption of substance. This is however an indication that powdered carbon form of seed of *Chrysophyllum albidum* can be effectively used in the removal of metallic ions, odour, colours and other particulate matters from aqueous media of water and waste water (Ewansiha *et al.,* 2011).

Crude protein was found to be 29.51 %, a value that is obviously higher than 13.13 % previously reported value by Ochigbo and Paiko for the seed and 7 % and 0.98 % reported for C. Albidum seed shell and fruit by Oyebade *et al.* (2011) and Ewansiha *et al.* (2011) respectively. This establishes its potential for use as an animal feed/ supplement. Seed cake from *Chrysophyllum albidum* seed have been reported to be of great significance in animal dietary intake especially during gestation period and known to help in maintaining animal body (Ochigbo and Paiko, 2011). The crude protein from this seed is much higher than the content of coconut and melon seed which were 10.57 % and 11.67 % respectively (Obasi *et al.,* 2011).

Crude fibre simply made up largely of cellulose together with lignin and includes materials that are indigestible in humans and animals. The fibre content of seed of *Chrysophyllum albidum* was determined to be 2.30 % which was lower than 7.0 % for *Chrysophyllum albidum seed,* (Ochigbo and Paiko, 2011). According to Ewansiha *et al.,* 2011 crude fibre helps in hardness of the seed thereby facilitating the ability of the seed to remove insoluble particles from solution as it acts as a semi permeable membrane. This also suggests the use of the seed for treatment and probably bio absorption of heavy metals.

Moisture content is the amount of water present in a sample that is responsible for microbial activity. When it is low, the sample can be preserved for a long time and vice versa. The moisture content obtained from this study is 7.78 % and quite consistent with the result of literatures. The low moisture content observed indicates that the seed can be stored over long period without been susceptible to oxidation due to microbial activity. However the value obtained from this study was higher than the 4.27 % reported for melon seed and shows appreciable consistency with 7.51 % for coconut (Obasi *et al.,* 2011).

Lipid materials are fats and oils derived from plants and animals. Physically, oils are liquid while fats are solids at room temperature. The Lipid content for this study was determined to be 15.86 % a value slightly higher than 12.23 % reported value in Table 1.0. The variation in lipid content may be due to the differences in the plant variety, climatic condition, ripening stage, harvesting time, ripening stage and the method of extraction employed. Fat is important in diet as it is a source of fat soluble vitamins and promotes their absorption, fat also act as a temperature sensor and add taste, colour and lubricity to most diet.
The phytochemical screening of the *C. albidum* seed were determined and shown in Table 4.2.

Table 2: Phytochemical Screening

Composition	Remarks
Alkaloids	ND
Cardiac glycosides	+
Flavonoids	+
Saponins	+
Tannins	+
Terpenoids	+

Key: absent (-), present (+), ND- Not detected

Cardiac glycosides are secondary metabolites in several plants and also in some animals. According to Ochigbo and Paiko, 2011, cardiac glycosides modify tumorigenisis, influence a stress reply and apoptosis in human breast cancer and able to prevent carbohydrate-mediated tumor growth. However, in this work it is moderately present.

Flavonoids as a secondary metabolite was slightly present in the meal. These metabolites are very strong antioxidants and effective antimicrobial substances that fight against wide array of micro organisms by preventing the membrane bound enzymes (Jimoh *et al*., 2009). As an anti oxidant flavonoids; prevent oxidative cell damage, provide excellent anti cancerous and anti inflammatory activity. The presence of this anti oxidant establishes the potential of the seed extract to be used to treat wounds, burns and ulcer in ethnic medicine (Nwali *et al.,* 2012). More so flavonoids are active substances in reducing high blood pressure (Ayinde *et al.,*2007).

The result in this work shows that saponins are slightly present. Ochigbo and Paiko (2011) reported that saponins have antioxidant, anti-inflamatory, anti-apoptosis and immune stimulant properties, which indicates that these compounds could positively affect neuro degenerative disorder and delay neural aging. Saponins have the ability to precipitate and coagulate red blood cells. Saponins are also characterized by the formation of foams in aqueous solution, haemolytic activity, cholesterol binding properties and bitter taste (Okwu, 2004). These exciting properties establish the medicinal and pharmaceutical potential of the seed meal extract.

Tannins are polymeric and phenolic substances that have the capacity for tanning of leather, precipitating of gelatic from solution, inactivating and causing the death of micro organism (Ochigbo and Paiko, 2011). It was found to be slightly present which is in agreement with the work of Adeola *et al*.(2010). The astringency of tannins is what causes the dry and puckering feeling in the mouth when unripe fruit or red wine is consumed. It is employed medicinally in anti-diarrhoea.

Terpenoids are capable of preventing cancer (Raju *et al.,* 2004). The result obtained shows that it is very present. The presence of all these active metabolites in plant based food help in enhancing metabolism in patients suffering from different ailment and provide basis for the wide varieties of its usefulness in medicine.

Conclusions

The result of proximate analysis indicates that the seed meal can be used as a source of feed for animals. The phytochemical screening of the meal shows that it contains secondary metabolites and this establishes the possibility of its usage in medicine as the mixtures of these chemicals show a broad spectrum of biological effects and pharmacological properties. The result of this study provides a solid scientific platform for developing new varieties of antimicrobial herbal formulation. It is recommended that more research be conducted to further quantify and elucidate the bioactive compounds from *C. albidum* seed, extraction and characterization of the oil.

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