International Journal of Interdisciplinary Innovative Research &Development (IJIIRD)

ISSN: 2456-236X

Vol.04 Issue 01|2019

Proximate and Mineral Composition of Ackee Apple (*Blighia Sapida*) Fruits, Harvested In Owo, Ondo State

Dada I.B.O.[1], Bada, S. O.[2] and Akintemi A.O.[3]

[1,2,3] *Biochemistry and Toxicology unit, Department of Science Laboratory Technology, Rufus Giwa Polytechnic, P.M.B 1019, Owo, Nigeria.*

ABSTRACT

Ackee (Blighia sapida)is a beautiful evergreen plant of tropical West Africa. The present study therefore, evaluated the proximate and mineral composition of Blighia sapida fruits using standard analytical methods. The result of Proximate composition (%) revealed crude fat 37.00± 3.5, crude protein 17.85 ± 2.35, moisture content 19.00 ± 1.50, crude fibre 17.01 ±1.20, ash content 5.62± 0.55 and carbohydrate 2.05 ± 0.15. The mineral composition (mg/100g) in the sample indicated calcium 0.97±0.15, copper 2.47 ± 0.45, iron 7.63 ± 0.50 magnesium 1.44± 0.24, Potassium 0.90± 0.10, Sodium 150.00± 15.0, while lead and nickel had 0.40 ± 0.06 each. Overall, the results confirm that the fruits are good for human consumption when ripped and a good source of nutrients and minerals.

Key words: Blighia sapida, proximate composition, mineral composition.

1. INTRODUCTION

Fruits are those parts of a plant or tree that contains the seeds and are used as food (Sarojimi, 2004). In the strict biology sense, a fruit is the structure that develops from the fertilized ovary of the flower. However, some fruits develop not from the fertilized ovary but also from other pars such as calyx, corolla and receptacle. Fruits is one of the true recommendation for a healthy diet, and for a good reason, eating plenty of fruits can help ward off nutritional disorders. There are compelling evidences that a diet rich in fruits has a long term advantage as shown that the higher the average daily intake of fruits, the lower the chances of developing cardiovascular disease (Djouesse *et al.,* 2004). Fruits form about 4% of the world food supply which form an integral part of African diet and are consumed as relishes and snacks (Ogbona, 1991).

Ackee Apple *(Bligha sapida*) is widely cultivated in tropical and sub-tropical regions of the world. It is a perennial herbaceous plant that is indigenous to the forest of Tropical West Africa where it is little eaten but various parts have domestic uses. In Ghana, the fruiting tree is admired as an ornament and in village along streets for share. The tree reaches 33 to 44ft with a short trunk of up to 6ft in circumference and dares crown of spreading branches. Its back is grey and nearly smooth. The evergreen leaves are compound with 3-5 pairs of oblong or ethptical leaflets. It is bisexual.

The Ackee Apple was brought to Jamaica in 1973 by the renowed Captain Williams Bligh to furnish food for the slaves. In his honour, the plant was named "BligliaSapion" (Lancashire, 2004). Ackee tree grows well in Jamaica with two peak fruiting season of January to March and June to August (Lancashire, 2004). Ackee is widely consumed in Jamaica as part of the national dish. It is also popular among Jamaicans in the United State and Canada. The Ackee Apple is the national fruit of Jamaica and is borne in clusters on an evergreen tree. The ackee is indigenous to the forest of Ivory Coast and Gold Coast of West tropical Africa where it is little eaten but various parts have domestic uses. In South West Nigeria, it is called "Ishin" where the fruit is eaten raw when ripe. The plant was named *Blighia sapdia* in honour of Captain William Bligh who took samples to Kew in 1793. The fruit is leathery; pear shaped more or less distinctly long, basically yellow, more or less flushed with bright scarlet. The fruits truns red on reaching maturity and splits open or after frying in oil, the fruits are often cooked with codfish, onions and tomatoes.

The main drawback to the consumption of Ackee is its toxicity which manifest as Diarrhea, hypoglycemia, nausea and vomiting or toxicity hypoglycemia syndrome (Mitchell *et al.,* 2008). An essential link between ackee poisoning and Jamaican vomiting sickness (JVS) was first noted and documented in 1937. Jordan and Burrows (1937) found a water soluble toxic material in the seed and pod of the akee fruit. They were

the first to isolate two toxic substances in their crystalline form which are called hypoglycin A and hypoglycin B. this toxicity become imminent when the unripe fruit is eaten (Barceloux, 2008 and Blake, 2003).

There have been intensive and chemicals studies of the ackee and its effect since 1940s and it is known that the unripe arils contain hyogylcin α-amino-β-(2-methylene cycloproplyl) propionic acid, formerly called hypoglycin A. This toxic property is largely dispelled by the light as the jacket opens. Ackee poisoning in human is evidence by acute vomiting, sometimes repeated, without diarrhea followed by drowsiness, convulsions, coma and often death.

The ackee must be allowed to open fully or at least partly before it is detached from the tree when it has yawned; this is to reduce the toxicity of ackee which was long understood and believe to reside in the membrane attaching the arils to the jacket or only in the overlap and decomposing the arils. Self-opened ackee-fruits have been found to be quite safe for consumption. Also hypoglycin is water soluble (Willington 1999), therefore boiling ackee before consumption greatly reduces the toxicity.

Because of its hypoglyceamic effects administration of aqueous extract has been found helpful on normoglyceamic albino rats (Saidu *et al.*, 2012). The arils while still fresh and firm are the best when parboiled in salted water or milk and slightly fried on butter (Andrea, 1997). In Cuba, the ripe arils are blended with sugar and cinnamon and give the mixture as treatment for dysentery. The crushed new foliage is applied on the fore head to relieve headache. Various preparations are made from the ackee for treatment of epilepsy and yellow fever (Oguntuga *et al.*, 1992).

Ackee arils contain many important nutrients, especially fatty acids, linoleic, palmitic and stearic acids, (Oguntuga *et al.*, 1992). Virtually all parts of the plants are useful. For instance, in West Africa (Mostly Ivory Coast), the green fruits which produces lather in water are used for laundry. Cowshed fruits are employed in fish poison. The seeds because of the oil content and the jacket because of the potash content are burnt and the ashes are used in soap making. In Cuba, an extract of the flower is appreciated as cologne. In Ghana, a mixture of the pulverized bark and ground pepper is rubbed on the body as a stimulant (Ekué *et al.*, 2010).

The wood is white or light greenish brown and is hard and brittle, it is immune to termites and used locally for construction and pilings and has been recommended for railway sleepers. It is also fashioned into oars, paddles and casks. In Brazil, repeated small dose of an aqueous extract of the seed has been administered to expel parasite. The leaves, crushed with salt have been used in the treatment of ulcers. The leaves extract is employed as eye drops in ophtalmia and conjunctivitis. In Columbia, the leaves and bark has been found effective in complication arising from the eating of unripe Ackee. Various preparations are made from the ackee for the treatment of epilepsy and yellow fever. (Oguntuga, *et al.*,1992).

Despite these reports, detailed scientific reports as per the proximate and mineral analyses of the fruit is still very scanty, it is on this basis that this work is designed to quantitatively evaluate its chemical composition viz: proximate and mineral composition.

2. MATERIALS AND METHODS

2.1 Collection of Ackee fruits

Ackee were collected from botanical garden premises of Rufus Giwa Polytechnic Owo, Ondo State, Nigeria and identified. The fruits were randomly collected and thoroughly mixed to reduce errors arising from varietal differences.

2.2 Proximate Composition Determination

Proximate analysis of Moisture, ash, fat, carbohydrate, crude protein (nitrogen x 6.25) and crude fibre contents were carried out using standard AOAC, 2005 methods.

2.3 Determination of mineral Composition of Ackee Apple fruits

The mineral contents were determined using an Atomic Absorption Spectrophotometer (AAS) model 210VGP according to AOAC, 2005 methods. The ashing was carried out in a muffle furnace at 55˚C to 60˚C for three hours.

2.4 Statistical analysis

The results were analysed by one-way Anova, using SPSS Microsoft Excel package version 22.0. All data is expressed as Mean ± SE (Mean of 3 determinations) and difference between groups considered significant at $p < 0.05$.

3. RESULTS AND DISCUSSION

Results of the proximate and mineral composition of *Blighia sapida* fruits are presented in tables I and II. The medicinal properties of plants have been attributed to the biochemical residents in the plant, hence the determination of proximate and mineral composition of ackee apple fruit in this study.

Table I: Proximate Composition of Ackee Fruit

Parameters	Percentage (%)
Crude Fat	37.00 ± 3.50
Crude Protein	17.85 ± 2.35
Moisture	19.00 ± 1.50
Crude Fibre	17.01 ± 1.20
Ash Content	5.62 ± 0.55
Carbohydrate	2.05 ± 0.15

Result is expressed asmean score of three determinations ± SEM

Table II: Mineral Compositionof Ackee Fruit

Mineral	Mg/100g
Calcium (Ca)	0.97 ± 0.15
Magnesium (Mg)	1.44 ± 0.24
Potassium (Mg)	0.90 ± 0.10
Iron (Fe)	7.64 ± 0.50
Zinc (Zn)	2.07 ± 0.20
Copper (Cu)	2.47 ± 0.45
Lead (Pb)	0.40 ± 0.06
Sodium (Na)	150.00 ± 15.00
Nickel (Ni)	0.40 ± 0.60

Result is expressed asmean score of three determinations ± SEM

The result of proximate composition of Ackee fruit as presented in table I showed that crude fat, crude protein, moisture, crude fibre, ash and carbohydrate are 37.00 ± 3.5, 17. 85 ± 2.35, 19.00 ± 1.50, 17.01 ± 1.20, 5.62 ± 0.55 and 2.05 ± 0.15 percent respectively.The above results differ from Morton (1987) for fresh arils of ackee fruit the difference may be attributed to seasonal variation, geographical location and varietal differences. Comparing these results with similar results on Ackee, high fat content corroborates the use of the oil arils for medicinal purpose and for soap making (Aladekoyi *et al.,* 2019). The arils of ackee fruit have moderately high crude fibre which can be used to calm the irritable bowel and relieve constipation. Plants proteins are sources of food nutrients especially for the less advantaged in developing countries including Nigeria, the moderately high protein content makes the fruit a good source of dietetic protein. The fruit can be considered a good source of protein as it provides more than 12% of caloric value from protein (Pearson, 1976). Fibre cleanses the digestive tract by removing latent cancer-causing agents from the body and prevents the absorption of excess cholesterol, adds bulk to the diet and may therefore guide against metabolic disorders like diabetes mellitus. Moderately high ash content is as a result of high mineral deposit which is in agreement with Anita *et al.,* 2006. Carbohydrates are indispensable for the maintenance of life and animals (Ebun-oluwa and Alade, 2007). This fruit when consumed is a good source of carbohydrates because it meets the recommended dietary allowance (RDA) values (FND, 2002).

The Mineral composition of Ackee apple (mg/100 g) as shown in Table II is seen to be moderately rich in sodium and fairly rich in Iron. Other minerals present includes calcium, magnesium, potassium, zinc, copper, lead and nickel. Sodium is one of the major electrolytes in the blood without which the body would be dehydrated. Sodium and potassium are vital intracellular and extracellular cations. Sodium involves in acid-base balance, the regulation of plasma volume, nerve and muscle contraction (Akpanyung, 2005). Iron plays critical roles in haemopoiesic, control of infection and cell mediated immunity (Bhaskaran, 2001). Iron is an essential element for haemoglobin formation, normal functioning of the central nervous system and metabolism of carbohydrate, protein and fats (Adeyeye and Otokili, 1999). The deficiency of iron is the most prevalent nutritional deficiency and iron deficiency anemia is estimated to affect more than one billion people worldwide (Trowbridge and Martorell, 2002). The implication of iron deficiencies include impairments in behaviour and intellectual performance, reduced work capacity and decrease resistance to infection (Dioxin *et al.,* 2004).

Calcium helps in the formation of teeth and bones. It is also important in the proper performance of the heart, nervous system and necessary for blood coagulation. Deficiency of calcium has been implicated in rickets, osteoporosis, arthritis and tooth decay. Copper helps in the absorption of iron. Copper is important for cellular defense and protection of the mucous membranes, it is anti-anemic and essential for the formation of iron and haemoglobin (Claude and Paule, 1979). Magnesium is a component of chlorophyll and it is an important mineral element in connection with ischemic heart disease and calcium metabolism in bones (Ishida *et al.*, 2000). Zinc is involved in normal function of immune system and is a component of over 50 enzymes in the body (Okaka *et al.*, 2006). An estimated 20% of the world population is reported to be at risk of inadequate zinc intake (Hotz and Brown, 2004). According to Dioxin *et al.*, 2004, Studies on Nigerians show that zinc deficiency affects 20% of children less than five years, 28.1% of mothers and 43.9% of pregnant women.

By and large, the fruit can be said to have a good spread of essential minerals required by the body and can be good source mineral supplement in the diet and this assertion is in agreement with the report of Atangwho *et al.*, 2009. The proximate and mineral results revealed that ackee apple could be a possible component of human foods.

4. CONCLUSION

It is clear from this study that Ackee apple could be moderately nutritional and beneficial for human consumption. Also the proximate and mineral composition showed that ackee apple could be a good source of oil and a veritable source of essential minerals. Ackee apple arils should be included in the diet and the plant itself should be encouraged to be grown around houses just like we have oranges, grapes, lemons, etc.

5. REFERENCES

[1] Djousse, L., Arnett, D. K., Coon, H. and Moore, L. L. (2004). Fruit and Vegetable consumption and LDL cholesterol: National Heart, Lung and Blood institute Family Heart Study Am J ClinNutr, 79:213-217.
[2] Lancashire, R. J. (2004): The Jamaican National Fruit. www.chem.uwimona.edu.jm. Retrieved December 2005.
[3] Mitchell, S., Seymour, A.W. and Ahmad, M. (2008) Akee, Jamaica's top fruit. Jam. J Sci.Technol. 31: 84-89.
[4] Oguntuga, A. A., Asemoto, H.N., Musac, I., Golden, K. D and Kean, E. A. (1992). Jamaica Journal of Science and Technology (3), 30-32.
[5] Sarojimi, I. R. (2004). Modern Biology for Secondary School 5th edition. Africa Federal Republic Publisher, Nigeria P. 493.
[6] Wellington, M.A. (1999). Composition of Oil extracted from fresh and cooked Jamaican Akee (*BlighiaSapida*) aril. Jamaican Journal Science and Technology 10: 37-40.
[7] Aladekoyi, G., Ajongbolo, K. F. and Bada, S. O. (2019). Physicochemical, Antibacterial Activity and Fatty Acid composition of Oil extracted from Sprouted Ackee Apple (*Bligha sapida*). International Journal of Microbiology, Genetics and Molecular Biology Research. Vol.4, no 1, pp. 1-7.
[8] AOAC (2005). "Official Methods of Analysis Association of Analytical Chemist" 18thedition Washington DC USA.
[9] Andera Robins (1997). The akee issue JAGRIST; Proceeding Second Annual Conference of America Society for Agricultural Science. Vol. 4 (1997, pp 4-9).
[10] Barceloux, D.G. (2008). "Ackee fruit and Jamaican vomiting sickness", In Barceloux, D.G.(ed.), Medical Toxicology of Natural Substances: Foods, Fungi, Medicinal Herbs, Toxic Plants, and Venomous Animals, John Wiley & Sons Inc., New Jersey, pp. 318-326.
[11] Blake, O. (2003). Chemical and Toxicological Characterisation of Selected Components of the Ackee (Blighia sapida) Fruit, M.Phil. Thesis (Unpublished), Department of Chemistry,University of the West Indies (Mona), Kingston, Jamaica.
[12] Ekué, M .R. M., Sinsin, B., Eyog-Matig, O. and Finkeldey, R. (2010). Uses, traditional management, perception of variation and preferences in ackee (Blighia sapida K.D. Koenig) fruit traits in Benin: implications for domestication and conservation, Journal of Ethnobiology and Ethnomedicine, 6 (12): 1-14.
[13] Jordan, E.O. and Burrows, W.M. (1937), "The vomiting sickness of Jamaica and Its relation to ackee poisoning", American Journal of Hygiene, Vol. 25, pp. 520-545..
[14] Morton, J. F. (1987). Akee, In: Fruits of warm climates, Miami, Fl., pp. 269- 271.
[15] Saidu, A. N., Mann, A. and Onuegbu, C. D. (2012), Phytochemical Screening and Hypoglycemic Effect of Aqueous *Blighia sapida* Root Bark Extract on Normoglycemic Albino Rats. British Journal of Pharmaceutical Research, 2 (2): 89 - 97, 2012.

[16] Adeyeye, E. and Otokili M. K. O. (1999). Proximate composition and some nutritionally valuable minerals of two varieties of Capsicum annum. Discov. Innov.11: 75-81.
[17] Akpanyung, E. O. (2005). Proximate and mineral composition of bouillon cubes produced in Nigeria. Pakistan Journal of Nutrition 4(5), 327-329.
[18] Antia, B. S., Akpan, E. J., Okon, P. A. and Umoren, I. U. (2006). Nutritive and Anti-Nutritive Evaluation of Sweet Potatoes (Ipomoea batatas) Leaves. Pak. J. Nutr.5:166-168.
[19] Bhaskaran, P. (2001). Immunobiology of mild nutrient deficiency. Br. J. Nutr., 85, S75- S80.
[20] Claude, B. and Paule, S. 1979. Text book of Manual of Natural Living.1st ed. Biddles Ltd.Guildford, Surrey, 98- 101.
[21] Dioxin, B. M., and Haris, E. M. (2004). Nigeria food consumption and nutrition survey, 2001-2003. FNB. Food and Nutrition Board, Institute of medicine: Dietary reference intakes for calcium, phosphorus,magnesium. Washington DC, National Academy Press.
[22] Ebun-Oluwa P.O., and Alade A.S. (2007). Nutritional potential of Belandiern Nettle spurge Jatropha cathatica seed. Pak. J. Nutr. 6:345:348.
[23] Hotz, C. and Brown, K. C. (2009). International Zinc Nutrition Consultative Group (IZINCG) Technical document.
[24] Ishida, H., Suzuno, H., Sugiyama, N., Innami, S., and Todokoro, T. (2000). National evaluation of chemical component of leaves stalks and stem of sweet potatoes. Ipomea batatas poir. Food Chem. 68: 359-367.
[25] FND. Food and nutrition board, Institute of medicine. National Academy of Sciences. (2002). Dietary reference Intake for Energy, Carbohydrate, Fibre, Fat, Fatty Acids, Cholesterol, protein and Amino acid (micronutrients).www.nap.edu
[26] Okaka, J. C., Akobundu, E. N. T. and Okaka, A. C. N. (2006). Food and Human Nutrition, an Integrated Approach. O. J. C. Academic Pub. Enugu, Nigeria.
[27] Trowbridge, F., and Martorell, M. (2002). Forging effective strategies to combat iron deficiency.Summary and recommendations. J. Nutri., 85, 875- 880.
[28] Pearson, D. H. (1976). Chemical Analysis of Foods. Churchhill London. pp. 335-336.
[29] Atangwho, I. J., Ebong, P. E., Eyong, E. U., Williams, I. O., Eteng, M. U. and Egbung, G. E. (2009).Comparative chemical composition of leaves of some antidiabetic medicinal plants: Azadirachta indica, Vernonia amygdalina and Gongronema latofolium. African jounal of biotechnology. Vol.8 (18), pp. 4685-4689.
[30] Ogbona, C. E. (1999). Functional Characteristics and Chemical Composition of Indigenous Wild herbs, species, Fruits and leafy Vegetables used as Foods .M. phil thesis, River State University of Science and Technology, Port Harcourt, Nigeria.