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Phytochemical analysis and nutraceutical studies on aril of *Blighia sapida* K.D Koenig

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Abstract
The ripe arils of *Blighia sapida* K.D Koenig (Family *Sapindacea),* was made to analyse the phytochemical components and thereby its nutraceutical value. The result revealed the presence of carbohydrate, protein, fat, reducing sugar, ascorbic acid, flavonoid, phenolic compound, alkaloid, amino acid, calcium magnesium& phosphorous in the aril.

Keywords: *Blighia sapida* K.D Koenig, phytochemical, nutraceutical

1. Introduction
Medicinal plants plays a vital role in the health of individuals and the communities. The medicinal value of some plants lies in some chemical substances that produces definite physiological actions in human body. Phytochemicals act as natural defense system for host plants and provide colour, aroma and flavor. They either alone or in combination, have tremendous therapeutic potential in curing various ailments. Nutraceuticals are products; which other than nutrition are also used as medicine. They may be used to improve health, delay the aging process, prevent chronic diseases, increase life expectancy, or support the structure or function of the body.

1.1 *Blighia sapida* K.D Koenig, commonly known as *Ackee* is a soap berry plant of the family *Sapindaceae.* It is the National Fruit of Jamaica' It is a perennial herbaceous plant that is prominently found in Western Tropical Africa and was imported to Jamaica in the 16th century mainly as food for residents. The Ackee is native to tropical West Africa. Ackee was introduced to Jamaica and later to Haiti, Cuba, Barbados and others. It was later introduced to Florida in the United States. Ackee trees may also be found in many Caribbean countries (Jamaica, Trinidad, Haiti, Bahamas), Central America (e.g., Costa Rica, Panama, Guatemala), South America (Brazil, Venezuela, Surinam, Colombia, Ecuador), as well as the United States, (Florida). Ackee is an evergreen tree that grows about 10 metres tall, with a short trunk and a dense crown. Large tree to 18 m (60 feet), densely branched and symmetrical, with smooth gray bark.

The leaves
Leaves 23-38 cm (9-15 inches) in length, alternate, compound, with 3-5 pairs of glossy leaflets. Each leaflet is 8-12 centimetres (3.1-4.7 in) long and 5-8 centimetres (2.0-3.1 in) wide.

The flowers
The inflorescences are fragrant, up to 20 cm long, with unisexual flowers that bloom during warm months. Flowers are greenish, small, staminate and hermaphroditic in axillary racemes. Each flower has five greenish-white petals.

The fruits
The fruit is pear-shaped. Fruit has a red, yellow or orange capsule, 5-10 cm (2-4 inches) long, opening at maturity, with 3 cream colored arils, each tipped with a black seed. When it ripens, it turns from green to a bright red to yellow-orange, and splits open to reveal three large, shiny black seeds, each partly surrounded by soft, creamy or spongy, white to yellow flesh - the aril. The fruit typically weighs 100-200 grams. The fruit splits open while still on the tree to let slip 3 dead flat black seeds encircled by a thick, oily, yellow aril.
The Ackee fruit has three black seeds with the size about 1-3 cm. The seeds of the tree's fruit are poisonous and cannot eat the pulpy aril inside the Ackee fruit until it matures.

The Ackee tree can grow on lands with elevations at sea level up to 1000 m above sea level. At higher altitudes, the wind prevents growth. Favourable temperatures for the cultivation of Ackee range from 21 °Cto 27 °C. The tree grows well in fertile soils that have good drainage with optimum pH between 5.5and 7.5 although it can tolerate slightly alkaline soils. Black ants and scale aphidsare thecommon pests of the Ackee tree and the most common disease is fruit rot. Ackee trees bear fruits year round but usually have two major fruiting seasons; from January to March (spring) and June to August (summer). In the Bahamas, harvesting of fruits from July through to October has been reported (Moya, 2001) [11]

1.2 Health Benefits of *Blighia sapida* K. D Koenig

- **Membrane Development:** Linoleic acid (a polyunsaturated omega-6 fatty acid) is an essential fatty acid found in Ackee which is not made in our body and it is necessary for membrane development in the eye and brain.
- **Control Cholesterol Levels:** Ackee is a good source of beneficial fats like linoleic, palmitic and stearic acids and provides an excellent source of fatty acids in the traditional Jamaican diet. It has been believed that high amount of fats in Ackee increase cholesterol levels but research has proven that these fats are good for health. These unsaturated fatty acids help control cholesterol levels.
- **Dietary Fiber Maintain Digestive Health:** Ackee contains high amount of dietary fiber that is beneficial for maintaining digestive health. Fiber helps in proper bowel movement, thus preventing many stomach-related conditions of constipation and obesity. Also, it reduces the risk of colon diseases and type 2 diabetes.
- **Epilepsy and other Nervous Problems:** Niacin is a crucial vitamin required for better functioning nervous system. Ackee contains adequate amount of niacin that helps in curing nervous problems like epilepsy and maintain overall nervous health.
- **Healthy Skin:** Presence of many vitamins and minerals in Ackee keeps skin healthy and repairs cartilage. Vitamin C prevents acne and pimples too.
- **Other Uses:** Folate helps in preventing birth defects while minerals like iron and calcium maintain proper hemoglobin levels in blood and are also good for bone and teeth health. Also, presence of all the necessary nutrients in Ackee helps in curing conditions like fever, colds and edema. The trunk of the mature tree can be used to make furniture. Ackee heartwood is hard, durable and immune to termites. It can be used for construction, and can be fashioned into oars, paddles and casks. The green fruits produce soapy suds in water and have been used for washing. Ackee pod extracts can be used in cosmetics. Crushed fruits can be used to poison fish. The oil extracted from the Ackee seeds also has pesticidal properties.
- **Traditional Uses:** Ackee has many folk medicinal benefits. Repeated doses of aqueous seed extract have been used to expel parasites. Also, Ackee pod poultice has been used to treat skin infections, ringworm and liver spots. The ripe arils of Ackee along with sugar and cinnamon have been used to treat fever and dysentery. The Ackee tree bark mixed with certain spices has been applied as ointment to relieve pain. The new leaves are crushed and applied to the forehead to ease severe headache; when mixed with salt, it is applied on ulcers. Ackee leaf tea can also be used to alleviate cold. (Rashford, 2001) [14].

Limited information exists on the health beneficial components of the arils. Substantial scientific knowledge on the health beneficial constituents like phytochemicals of Ackee arils could ensure the development of more efficient ways to convert the fruit into useful products with improved commercial value. This study, therefore, aims to trace out the secracy behind the nutritional value of Ackee arils. For this the edible fleshy part of the Ackee fruit (Aril) is analysed chemically to detect the presence of carbohydrate, protein, amino acid, phenolic compounds, ascorbicacid, reducing sugar, alkaloid, flavonoid and minerals like calcium, magnesium and phosphorous.

2. Materials and Methods

Present work focused on carrying out phytochemical and nutraceutical studies on *Blighia sapida* K.D Koenig.

2.1 Literature Review

Refered Floras and journal publications

2.2 Collection of Plant Material

Fresh and ripe Ackee fruits were collected from Mullackal street Alappuzha and also from the house of Suresh, former lab assistant of our Department, SD College Alappuzha. The botanical identity of plant studied, authenticated by a taxonomic expert.

Fig 1: Fruit of *Blighia Sapida* K.D Koenig

Fig 2: *Blighia Sapida* K.D Koenig Fruit Showing Fleshy Aril And Seed

2.3 Sample Preparation

2.3.1. Harvesting and Cleaning of Samples

Mature Ackee fruits were harvested from the trees using a sickle. About five to ten fruits were collected. The fruit arils were separated from the pink membranes and seeds. The separated arils were cleaned by washing under running tap water.

2.4 Preliminary Phytochemical Analysis

Phytochemical analysis were conducted by analyzing total carbohydrate, protein, fat, reducing sugar, phosphorous, ascorbic acid, flavonoid, phenolic compound, alkaloid, amino acid, calcium and Magnesium. The analysis of fresh sample were estimated in Uni Biosys Biotech Research Lab, South Kalamassery, Cochin. Following methods are used for estimation.

2.4.1 Procedure

2.5 Test for Carbohydrate

To 1ml of the extract few drops of Molisch's reagent was added and mixed well. Followed by the addition of 1ml concentrated H2SO4 to form a layer below the aqueous solution.

2.5.1 Estimation of Carbohydrate (Anthrone Method)

Carbohydrate from the sample are extracted as follows:100 mg of the sample was weighed into a boiling tube and hydrolysed by keeping it in a boiling water bath for 3 hours with 5 ml of 2.5N HCL and cool to room temperature. It was then neutralized with solid sodium carbonate until effervescence ceased and was made up to 100 ml in a standard flask and centrifuged. The supernatant was collected and used for estimation. Estimation of carbohydrate was done using anthrone method (Hedge *et al*., 1962) [7]. 4 ml of anthrone reagent was added and heated for 8 minutes in a boiling water bath, cooled rapidly and read the green to dark green colour at 630 nm.

2.6 Test for Protein (Biuret Test)

Add 4% NaOH and few drops of 1% $CuSO_4$ solution to 3 ml of the extract.

2.6.1 Estimation of Protein (Lowry's Method)

Weigh 1gm of the sample and grind well with a pestle and mortar in 10ml of phosphate buffer. The extract was centrifuged and the supernatant was used for estimation. Quantitative estimation was done using Lowry's method (Lowry et. al., 1951).Pipette out 0.1ml &0.2 ml of the sample extract on two test tubes. Make up the volume to 1ml in all tubes. A tube with 1ml of water serves as a blank. Add 5ml of Alkaline copper solution to each tubes including blank. Mix well and allow to stand for 10 mins. Then add 0.5 ml of Folin-ciocalteau Reagent, mix well and incubate at room temperature in the dark for 30 mins. Blue colour is developed. Take the reading at 660 nm in UV-VIS Spectrophotometer.

2.7 Estimation of Fat

Dissolve sample in 50ml of the neutral solvent in a 250ml conical flask and few drops of phenolphthalein was added. This was titrated against 0.1 N KOH until a pink colour which persists for 15 sec is obtained (Cox, H. E., & Pearson, D. (1962).

2.8 Determination of Reducing Sugar (Dinitrosalicylic Acid Method)

- Pipette out 0.5 to 3 mL of the extract in test tubes and equalize the volume to 3 mL with water in all the tubes.
- Add 3 mL of DNS reagent.
- Heat the contents in a boiling water bath for 5 min.
- When the contents of the tubes are still warm, add 1 mL of 40% potassium sodium tartarate.
- Cool and read the intensity of dark red colour at 510 nm using spectrophotometer.

2.9 Extraction of Ascorbic Acid

Weighed about 1 gm tissue and homogenized in 10 ml of 4% oxalic acid. Filtered the extract and centrifuged at 10000 rpm for 10 minutes. Took the supernatant and made up to a known volume and it was used for estimation. Ascorbic acid content of the sample was estimated by employing the method of Ranganna. Pipetted out of 5 ml of the working standard solution in a 100 ml conical flask. To this added 10 ml of 4% oxalic acid and titrated against dye (V1ml).End point is the appearance of pink colour, which persists for few minutes. The amount of dye consumed is equivalent to the amount of ascorbic acid. Pipetted out 5 ml of the sample into a 100 ml conical flask and added 10 ml of 4% oxalic acid and titrated against dye (V2ml).

2.10 Test for Flavonoids

A portion of crude powder was heated with 10 ml of ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 ml of the filtrate was shaken with 1 ml of dilute ammonia solution.

2.10.1 Estimation of Flavonoids

- 0.5 ml of aqueous extracts of sample is diluted with 3.5 ml of distilled water at zero time and 0.3 ml of 5% sodium nitrate was passed to the tubes.
- After 5 minutes, 0.3 ml of aluminum chloride (10%) was adds to all the tubes.
- At the 6th minute, 2ml of sodium hydroxide (1M) was added to the mixture.
- Immediately, the contents of the reaction mixture were diluted with 2.4 ml of distilled water and mixed thoroughly.
- Absorbance of the mixture was determined at 510 nm versus a prepared blank immediately.
- Gallic acid was used as the standard compound for quantification of total flavanoids as mg/100g.

2.11 Test for Phenols

A 2 ml of test solution in alcohol is added with one drop of neutral ferric chloride (5%) solution. Formation of an intense blue color indicates the presence of phenols.

2.11.1Estimation of Phenol

1000 mg crude extracts of sample of was weighed and phenolic compounds were extracted with 10 ml of chloroform. The solvent was allowed to evaporate and redilute with 5 ml of chloroform. Take the complete extract in a fresh test tube.Then300 µl of 0.2M CH_3COONa was added to each test tube (sample & standard tubes) in order to keep the solution acidic (3-4 pH).200 µl of 0.1M $FeCl_3$ and 200 µl of 0.5% o-phenanthroline solution were added to the above test tubes and make up the volume to 10 ml by adding distilled water. Absorbance was measured after 24 hours in the dark at 500 nm using UV-VIS Spectrophotometer.

2.12 Test for Alkaloids

Methanolic extract was warmed with 2% H2SO4 for two

minutes. It is filtered and a few drops of Dragendorff's reagents were added and the red precipitate indicates the presence of alkaloid.

2.12.1 Extraction of Alkaloid

A part of extract residue was dissolved in 2N HCL and then filtered. 1 ml of this solution was transferred to separatory funnel and washed with 10 ml chloroform (3 times). The pH of this solution was adjusted to neutral with 0.1 N NaOH. Then 5 ml of Bromocresol green solution and 5 ml of phosphate buffer were added to this solution. The mixture was shaken and complex extracted with 1, 2, 3 and 4 ml chloroform by vigorous shaking, the extract was then collected in a 10 ml volumetric flask and diluted with chloroform.

2.13 Determination of Amino Acid (Ninhydrin Test)

To the extract add 0.25% ninhydrin reagent and boil for a few minutes.

2.13.1 Estimation of Amino acid

Weigh 500mg of the plant sample and grind it in a pestle and mortar with a small quantity of acid washed sand. To this homogenate, add 5 to 10 mL of 80% ethanol. Filter or centrifuge. Save the filtrate or supernatant. Repeat the extraction twice with the residue and pool all supernatants. Use the extract for the quantitative estimation of total free amino acids. To 1mL of extract, add 1mL of ninhydrin solution. Make up the solution to 2mL with distilled water. Heat the tubes in boiling water bath for 20 min. add 5ml of diluents and mix the contents. After 15 min read the intensity of the purple color against a reagent blank in a UV-VIS Spectrophotometer at 570 nm. The color is stable for 1 hr. Prepare the reagent blank as above by taking 0.1mL of 80% ethanol instead of the extract.

2.14 Determination of Phosphorus by Colorimetric Method

Reagents

- Ascorbic acid (10%): Prepare by dissolving 10 g Ascorbic acid to 100 ml of distilled water
- Ammonium molybdate 2.5%: Prepare by dissolving 2.5 g Ammonium molybdate to 100 ml of distilled water
- Reagent C: Prepare by mixing 6 N Sulphuric acid, distilled water, 2.5% Ammonium molybdate and 10% Ascorbic acid in the ratio of 1:2:1:1 (v/v) at the time of use

Procedure

- Take 1 ml of the diluted extract (1 ml extract + 9 ml distilled water), in a test tube and make volume to 4 ml with distilled water
- Then, add 4 ml of reagent C to it and mix well
- Incubate the contents at *37 °C* in a water bath for 90 minutes and cool at room temperature
- Read the absorbance at 820 nm against a suitable blank and calculate the phosphorus content.

2.15 Determination of Calcium Using Flame Photometry

- Pipette 5 ml of sample into a 10 ml graduated stoppered centrifuge tube
- Add 5 ml of 1% Ammonium oxalate and 3 drops ammonia solution
- Shake and allow standing for30 minutes
- Centrifuge at 300 rpm for 2 minutes
- Decant the supernatant and allow the tube to drain inverted for 30 seconds
- Add 0.5 ml 4 M Perchloric acid and shake
- Heat for 1 minute in a boiling water bath
- Cool and dilute to the 10 ml mark with distilled water
- Calibrate the flame photometer using a 100 mg/I calcium standard solution containing 50 ml 4 M Perchloric acid
- Aspirate the sample directly into the flame photometer
- The calcium concentration is calculated in milli equivalence.

2.16 Estimation of Magnesium

Standard solutions of Mg was prepared from the stock standard solutions containing 1000 mg/L of the element in distilled water. In each analytical batch, at least five reagent blanks and three international reference materials were included, to assess precision and accuracy for chemical analysis. Calibration and measurement of all of the above mentioned elements were done on an atomic absorption spectrometer, using the flame method with air and acetylene. The calibration curves were prepared for each element individually applying linear correlation. A blank reading was also taken and necessary correction was made during the calculation of the concentration of the various elements. Nutrient concentration of magnesium was expressed as 100mg/g.

3. Result

3.1 Preliminary Phytochemical Screening

Results of the Preliminary Phytochemical Screening tests performed on aqueous extract of *Blighia sapida* aril is given in Table 1. Phytocompounds of Carbohydrate, protein, amino acid, alkaloids, phenols, flavonoids was positively answered in the test.

Table 1: Qualitative Phytochemical constituents of ripe *Blighia sapida* aril

Phytochemical compounds	Remarks
Carbohydrate	+
Protein	+
Amino acid	+
Alkaloid	+
Flavanoid	+
Phenol	+

(+) indicates positive.

3.1.1Test for Carbohydrate

To 1ml of the extract few drops of Molisch's reagent was added and mixed well. Followed by the addition of 1ml concentrated H2SO4 to form a layer below the aqueous solution. A brown ring is formed at the interface indicating a positive result.

3.1.2Test for Protein (Biuret Test)

Add 4% NaOH and few drops of 1% $CuSO_4$ solution to 3 ml of the extract. Formation of violet or pink colour indicates the presence of proteins.

3.1.3Test for Amino acid (Ninhydrin Test)

To the extract add 0.25% ninhydrin reagent and boil for a few minutes. Formation of blue colour indicates presence of amino acid.

3.1.4Test for Alkaloid

Methanolic extract was warmed with 2% H2SO4 for two

minutes. It is filtered and a few drops of Dragendorff's reagents were added and the red precipitate indicates the presence of alkaloids.

3.1.5 Test for Flavonoids

A portion of crude powder was heated with 10 ml of ethyl acetate over a steam bath for 3 min. The mixture was filtered and 4 ml of the filtrate was shaken with 1 ml of dilute ammonia solution and observed a yellow coloration.

3.1.6 Test for Phenols

A 2 ml of test solution in alcohol is added with one drop of neutral ferric chloride (5%) solution. Formation of an intense blue color indicates the presence of phenols.

Table 2: Test for Phenols

Test	Concentration
Total Carbohydrate (mg/g)	10.31
Fat (mg/g)	4.7
Reducing sugar (mg/g)	0.001
Ascorbic acid (mg/g)	1.15
Flavanoid (mg/g)	1.133
Phenolic compound (mg/g)	9.9
Alkaloid (mg/g)	116.33
Protein (mg/g)	0.415
Aminoacid (µg/g)	45
Calcium (mg/kg)	1426
Magnesium (mg/Kg)	346
Phosphorous (mg/g)	0.49

3.2 Quantitative phytochemical Analysis

The phytochemical components of the Ackee aril studied are presented in table 2. From the result, the *Blighia sapida* aril shows the highest values in alkaloid content (116.33 mg/g), total carbohydrate (10.31 mg/g), phenolic compound(9.9mg/g), fat (4.7 mg/g), calcium (1.426 mg/g), Ascorbic acid (1.15mg/g), flavonoid (1.133mg/g), phosphorous (0.49mg/g),protein(0.415mg/g), magnesium (0.346 mg/g) and reducing sugar (0.001mg/g).

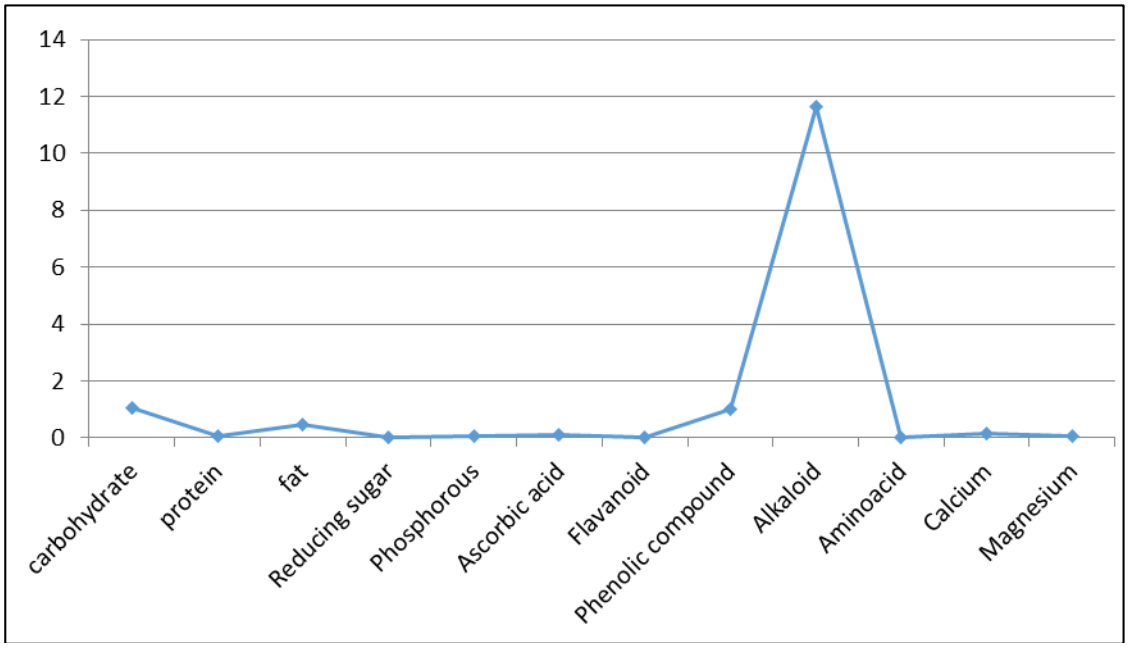

Fig 3: Line graph showing the amount of phytochemicals

4. Discussion

The result revealed the presence of medicinally important constituents in this fruit aril. The result obtained from the qualitative phytochemical screening showed the presence of alkaloid, flavonoid, phenolic compound, carbohydrate, protein and amino acid. Quantitative phytochemical analysis were also done for the estimation of the selected phytochemicals in the aril (table 2). Many evidences gathered in earlier studies which confirmed the identified phytochemicals to be bioactive. Several studies confirmed the presence of these phytochemicals contribute medicinal as well as physiological properties to the plants studied in the prevention of different diseases. Therefore, this ackee fruit could be recommended as nutraceutical.

The Phytochemical test result indicated the presence of carbohydrate in the extract. The principal nutritional role of carbohydrate is the production of energy. It is reported to have numerous roles in living things. carbohydrates and their derivatives play major roles in the working process of the immune system, fertilization, pathogenesis, blood clotting and development (Maton *et al*., 1993) [10]. Carbohydrates and fats account for the greater energy fraction of the diet (Duncan *et al*., 1983) [4]. Thus although the fat content is reduced when compared with the carbohydrate content, the increased carbohydrate content ensures that the contribute significant

amount of energy in the diet. A reducing sugar is an aldehyde or a ketone group. This allows the sugar to act as a reducing agent. The Ackee aril contains 0.1mg/100gm of reducing sugar.

The presence of natural antioxidants (flavonoids, phenolic compounds) in Ackee arils play a key role in health maintenance and prevention of chronic and degenerative diseases. Flavonoids have been referred to as nature's biological response modifiers because of its ability to modify the body's reaction to allergies, viruses, and carcinogens. They show antiallergic, anti-inflammatory microbial and anti-cancer activity (Yamamato and Gayor, 2002) [16]. Amounts of flavonoids analysed confers the aril with biological functions such as protection against allergies, inflammation, free radical, platelet aggregation, microbes, ulcers, hepatoxins, viruses and tumor. They are potent water soluble antioxidants and free radical scavengers which prevent oxidative cell damage, have strong anticancer activity and protect against the different levels of carcinogenesis (Okwu D.E, 2004). Phenolic compounds have been reported to serve as antioxidants, and exhibit a wide range spectrum of medicinal properties such as anti-cancer, antiinflamatory and diabetes (Hamzah *et al*. 2013; Nagavani *et al*., 2010). phenolic contents of Ackee arils indicate that Ackee is a good source of phenols and can be used for reducing blood pressure, lowering of cancer and cardiovascular diseases, for level free radical adsorption and neutralization, as anticancer and antibacterial agents. They are antimicrobial agents which inhibit the growth of pathogens. These natural phenolics in Ackee aril have the potential for application in food systems to maintain food quality. Consumption of approximately 1000 mg GAE/day of total phenolic compounds was recommended by Scalbert and Williamson (2000) [15]. Therefore consuming 100g of Ackee fruit aril a day can help achieve the normal daily intake of total phenols.

The considerable amount of vitamin C in the Ackee arils enables its usage as an antioxidant, thus stabilizing folate in food and in plasma, by increasing excretion of oxidized folate derivatives in human scurvy as well as aiding in metabolism such as tyrosine metabolism. According to Brody (1999) [1], the RDA of vitamin C is 60 mg/100 g, therefore consuming about 200 g of Ackee fruit aril can help achieve recommended daily intake of vitamin C.

Protein is the source of amino acid of food. The value reported in this work is lower ($p>0.05$) than the percentage recommended by the Food and Agriculture Organisation which is ranged from 12-15%. The lower protein content reported in this work suggests that adding complementary protein sources into a diet base on aril could prove more efficient.

Minerals are critical in the regulation of a number of cell membrane, permeability, muscles contraction, heart function, blood clothing, protein and red blood synthesis (Hendricks DG (2002) [8]. The presence of considerable amount of magnesium, calcium, phosphorus in the fruit aril is an indication that it can supply some essential minerals needed for healthy life. Fruit aril with the highest contents of calcium, magnesium could contribute to the control of hyperglycaemic cases through the enhancement of insulin secretion. The current literature search indicated that *Blighia sapida* K.D Koenig aril contains up to 142.6 mg/100gm, indicating significantly high levels of this mineral in the aril. Magnesium is vital in human nutrition due to its function as a cofactor for more than 300 essential enzyme systems, its requirement for increased DNA and RNA synthesis, energy generation as well as glycolysis and has also been shown to be essential for mitochondria to carry out oxidative phosphorylation (Food and Nutrition Board, 1997) [5]. The current literature search indicates that Ackee aril contains about 34.6 mg/100 g of Mg which could significantly increase this mineral's availability in the human body if they are consumed. Phosphorus is needed for healthy bones and teeth, energy metabolism, and acid base balance in the body. It maintains blood sugar level and normal heart contraction and also important for normal cell growth, bone growth, kidney function and cell growth. The current literature search indicates that Ackee aril contains about 49 mg/100 g of phosphorus.

5. Conclusion

Phytochemicals are natural bioactive compounds working together with nutrients, protect our health from many diseases. Main objective of this study was to analyse the phytochemical and nutritional component present in Ackee fruit aril. The Ackee fruit aril screened for phytochemical constituents seemed to have potential to act as a source of useful drugs and also to improve the health status of man as a result of the presence of various compounds that are vital for good health. These can be incorporated in other foods as nutraceuticals for effective and proper metabolism as well as for the maintenance of good physiological state in man and animals. Ackee aril have potential to be used as food ingredient. The study has revealed that the Ackee aril possess certain medicinal values is due to their phytochemical contents which can be utilized in the treatment of many diseases and also be explored for use in pharmaceutical industries, food preparation, and also in areas like cosmetics and raw materials for other products. The result of the study indicated that Ackee aril are nutritionally rich and high in phytochemicals, especially antioxidants and therefore can possibly play a significant and positive role in delivering a healthy and balanced diet. From the ongoing research worldwide and with the current database, it is evident that the underutilised fruit reviewed in this study do possess high nutraceutical value. More scientific research including agronomy, breeding, postharvest handling and value addition and linking farmers to markets should be done to promote them. The presence of certain antinutrients might not be the greatest impediment in the safe use of this fruit, as proper processing methods have been shown beyond any doubt to detoxify the seeds to make them edible.

Although the study reveals enormous knowledge about ackee aril, some more studies are needed to exploit the ethnobotanical and chemical importance of this fruit. Further research is required to establish the *in vivo* activities and therapeutic index of the aril.

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