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Proximate Compositions of fruits of Three Musa Species at Three Stages of Development

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Abstract: *This study was designed to evaluate the proximate compositions of fruits of three Musa species at three stages of development. Proximate analyses of the samples were carried out using the method as explain by the Association of Official of Analytical Chemists A.O.A.C., (2000). Results of the qualitative proximate analyses revealed the presence of carbohydrates and proteins in the samples at all the stages of development. Reducing monosaccharide was observed at the ripe stages of the three Musa species and absent at the immature stages. Oil was observed only at the ripe stages of the samples. The result of the percentage proximate composition of three Musa species revealed that the ash content was highest at the green mature stages with 0.71%, 1.09% and 1.29% for banana, plantain and saba banana respectively, than at the immature stage (0.63%,0.80%,0.88% respectively) and least at ripe stages (0.32%, 0.82%, 1.26% respectively). Oil content was only detected at the ripe stages of the three species and the oil contents of the three species were not significantly different at P≤ 0.05. Crude fiber was higher at the immature stage of plantain than at the immature stage of banana and Saba banana. The protein content at the green mature stage in plantain (3.54%) was observed to be more than in saba banana (1.06%) and banana (0.35%). Carbohydrate content of the samples decreased as the sample developed. At the immature stage carbohydrate content of plantain was observed to be higher than that of saba banana followed by dwarf banana. The carbohydrate content of saba banana decreased from immature to green mature but later increased as fruits ripened unlike at the immature and ripe stages. Most of the proximate compositions differed significantly among the stages of ripeness as well as fruit species. Proximate assay revealed the distribution of vital nutrients especially in these days of food selection where Musa species have been listed as material for flour production. Diabetics and those in need of fibre can easily select the best species and used as a daily supplement.*

Keywords: *Proximate, Musa species, A. O. A. C., Qualitative and Quantitative*

I. Introduction

Since the dawn of human civilization plants have made large contributions to facilitate human health and well being [1]. The stage of maturity of plants greatly affects the concentrations of nutrients in plants [2], thus it is very important to choose suitable stage of harvesting [3]. Medicinal potentials of most common plants have been extensively studied and compiled but the lack of information regarding the potential of these plants at varying stages of development makes these plants to be highly underutilized.

During the process of growth and development of fruit, series of developmental transitions are undergone. These processes involve coordinated changes in a number of catabolic and anabolic reactions [4], which leads to the synthesis or degradation of wide range of bioactive compounds. Hence, fruits at varying maturity levels may possess vivid bioactive compounds, which need to be studied so as to provide maturity indices for its usage as a source of food or medicine. It has also been proven that ethno-botanically derived compounds have potential bioactive compounds and they therefore provide greater potential for product development [5].

In Nigeria, fruits can be harvested at all stages of development (from immature to overripe) and can be used as a source of food in one form or the other. Some fruits are picked when they are mature but not yet ripe [6]. According to [7], plantain fruits may be consumed unripe (green), yellow-green, or ripe.

The stage of maturation at which any fruit is harvested also influences the fruit's green-life or its ability to be stored for long periods (DFID, 1995). Fruits harvested at an early stage of maturity are of poor quality upon ripening, despite having a long storage life [8]. Similarly, harvesting at an advanced stage of maturity is unsuitable for fruits intended for long distance shipment due to their shorter storage life. However according to [9], the appropriate time to harvest unripe plantain for maximum benefit is between the 12th and 14th week. This two week period provides enough time for harvest, distribution, marketing and utilization of the produce before ripening.

Increased vegetable utilization and consumption are critical to alleviate world-wide incidence of nutritional deficiencies. Investigations have shown that some plants contribute to increased intake of some essential nutrients and health-promoting phytochemicals. Phytochemicals are present in virtually all of the fruits, vegetables, legumes (beans and peas), and grains we eat, so it is quite easy for most people to include them in their diet.

Musa paradisiaca L is an herbaceous plant (up to 9 m long) with a robust treelike pseudostem, a crown of large elongated oval deep-green leaves (up to 365 cm in length and 61 cm in width) with a prominent midrib. Each plant produces a single inflorescence like drooping spike, and large bracts opening in succession, ovate, 15-20 cm long, concave, dark red in color and somewhat fleshy. Fruits are oblong, fleshy, 5-7cm long in wild form and longer in the cultivated varieties. The ripe fruits are sweet and full of seeds and the peel is thicker than other banana. *Musa paradisiaca* is a type of plantain, which is normally cooked before it is eaten. It belongs to the AAB genomic group.

Musa sapientum L is a treelike perennial herb that grows 5 - 9 m in height, with tuberous rhizome, hard, long pseudostem. The inflorescence is big with a reddish brown bract and is eaten as vegetables. The banana plant grows up to 10 to 26 feet. Musa *sapientum* known as true banana or dessert banana is usually eaten raw at maturity. It belongs to the AAA genomic group.

Musa saba L is primarily a cooking banana although it can also be eaten raw. It is one of the most important banana varieties in Philippine cuisine. It is also known as the Cardaba banana or simply Saba banana. Saba bananas are part of the Saba subgroup (ABB). Saba banana is a triploid (ABB) hybrid of the seeded banana *Musa balbisiana* and *Musa acuminata* [10]. It has predominant *Musa balbisiana* gene. It's also designated as *Musa acuminata* × *balbisiana* Colla (ABB Group) 'Saba'.

The fruits otherwise known as fingers are 8 to 13 cm long and 2.5 to 5.5 cm in diameter. Saba Bunches are big with 8 to 16 hands having 12 to 20 fingers per hand. The fruits are short and stubby and highly angular (plate 1b). Saba banana is a beautiful plant with an unusual bluish-green colored fruit. The pulp is white and starchy, making it ideal for cooking. The bright white interior contrasts with the outer peel. They are usually harvested while still green after about 150 to 180 days after planting [11]. The skin is thick and yellow when ripe (Plate 1c). Saba banana has the largest and tallest stem attaining a height of four meters. It can grow to 25 feet and is very tolerant of cold and resistant to wind. The trunk can be as thick as 24 inches. Its leaves are dark green, and the banana is green skinned or green verging toward yellow. This plant is often grown for shade. The Saba plant's pseudo stem is robust and grows taller than the dessert cultivars, producing about 8 suckers per mat at harvest. Its fruit, however, has a longer gestation period at 150 to 180 days after flowering. The plant's potential yield is 26 to 28 kg per bunch with one bunch containing up to 16 hands, each hand having 12 to 20 fingers.

In Nigeria, *Musa saba* is available year round in Southern part of the country but highly underutilized. It is highly restricted in utilization to production of flour and fried chips, thereby predisposing it to rapid post harvest spoilage contributed by its physiological metabolic activities and high moisture content. It is relatively cheaper as compared to dessert bananas and plantains and has been reported to be rich in minerals, ash and ascorbic acid [12].

Banana and plantain fruits can be used industrially in the production of baby food and pastries [13 and 14]. The peels of plantain can be dried and made into meal which can be used to substitute up to 70 – 80% of the grain in pig and dairy diets with little change in performance [15]. The meals are also used in poultry diets but when in high level tends to depress growth and reduces feed efficiency. The leaves, sheaths and petioles are used in tying, roofing, wrapping, and packaging of food. Plantain and banana are also used in beer production. In Central and East Africa, the juice from the ripe fruits is fermented to make beer with low alcohol content [15 and 16].

Akpabio *et al*, (2012), [17], also observed that green plantain and banana pseudo stems can be used in alcohol production, paper making and in the preparation of cellulose derivatives. Unripe plantain because of its starch content indicates wider utility in alcohol production, fuel and sugar industries, and as drug binder in pharmaceuticals.

Plantain and banana play important role in income generation for both large scale and small holders' farmers in the country, especially for those who produce them within their homestead or gardens [18].

Plantains and bananas are known to contain bioactive compounds (phytochemicals) such as alkaloids, flavonoids, tannins and phenolic compounds [19 and 20]. According to [21], knowledge of the chemical composition of a plant together with its antioxidants activity will give a fair estimate of its therapeutic potential furthermore.

From the ongoing it is clear that knowledge of the constituents of any plant at each usable stage of development is necessary for better understanding of when it will be used to achieve desired result. Information about the stages of development of banana and plantain used to realize certain objectives in literature are scanty.

Since these plantation crops can be utilized at different stages of development there is therefore an increased need to reveal the constituents at possible usable stages.

Proximate analysis of plants samples, gives valuable information about the nutritional composition of such sample and help to access the quality of the sample. It provide information on moisture content, ash content, volatile matter content, ash, fixed carbon etc [22]. Ash is the inorganic residue remaining after water and organic matter has been removed by heating, which provides a measure of total amount of minerals within the food [22]. Studies have shown that fruits (seeds) and vegetables contain among other vital nutrients an appreciable quantity of carbohydrate, proteins fats, fibers and phytochemicals [23]. Carbohydrate is the chief source of energy to the body; they are constituent of compound lipid, conjugated protein and mucopolysaccharides which form ground substance of mesenchymal tissues [24]. Protein provides amino –acids which are the substrates required for the support of body protein synthesis and maintenances of cell and organ protein content. Thus it furnishes amino acid the building block of all protein [24].

The functions of lipid may be divided into two categories. The lipid in food and in animal bodies serving as the densest form of stored energy and the physiological role in the body in organ protection, temperature regulation, and as major component of biological membrane [25].

II. Aims And Objectives

This study was designed to evaluate the proximate compositions of fruits of three *Musa* species at three stages of development

Plate 1a: Fruits of Saba Banana { *Musa acuminata x balbisiana* Colla (ABB Group) cv saba}at the immature stage**.**

Plate 1b: Fruits of Saba Banana {*Musa acuminata x balbisiana* (ABB Group) cv saba}at green mature stage

Plate 1c: Fruits of Saba Banana {Musa *acuminata x balbisiana* (ABB Group) cv saba} at the ripe stage of development**.**

Plate 2 a Fruits of plantain (*Musa paradisiaca* L) at the immature stage Plate

Plate 2 b Fruits of plantain (*Musa paradisiaca* L) at the Ripe Stage

Plate 3a Fruits of banana (*Musa sapientum* L) at the immature stage of development

Plate 3b Fruits of banana (*Musa sapientum* L) at the green mature stage

Plate 3c Fruits of banana (*Musa sapientum* L) at the ripe stage of development

III. Materials And Methods

Sources of Materials

Fresh plantain, banana and saba banana fruits used in this work were supplied through special arrangements with plantation farmers at Nike town in Enugu State, Nigeria. The three *Musa* species used were *Musa paradisiaca* L, *Musa sapientum* L *and Musa saba* L. The species were identified and authenticated by a plant taxonomist of the Department of Botany Nnamdi Azikiwe University, Awka. The fruits were collected fresh and used immediately in the analyses. The collection of the samples in these analyses was based on the rate of their development as recommended by [26]. Immature, green mature and ripe fruits were collected for the analyses (Plate $1a^{-c}$, 2^{a-c} and 3^{a-c}). Fruits at each these stages of development were aged 30 – 45 days following fruit set for immature; 70 – 90 days of fruit set for green mature: while the ripe stage were those whose peels were showing 50% or more visible xanthophylls exposures or yellowing.

Sample Preparation

The samples were thoroughly washed under running water and the back removed exposing the pulp which was homogenized using a Kenwood warring blender and kept in the refrigerator until required for analysis.

Proximate Analyses of Samples

Proximate analyses of the samples were carried out using the method as explain by the [28].

Qualitative Proximate Analysis

Test for Proteins

(a) Millon's Test

To a little portion of the filtrate in a test tube, two drops of millions regent were added. A white precipitate indicated the presence of proteins.

(b) Xanthoproteic Reaction Test

About five ml of the filtrate was heated with few drop of concentrated nitric acid; a yellow colour that changed on addition of an alkali indicated the presence of aromatic amino acid in the protein.

(c) Biuret Test

A crystal of copper sulphate was added to 2ml of the filtrate, and 2 drops of potassium hydroxide was added. A purple or pink colour showed the presence of proteins.

(d) NinhydrinTest

To a little portion of the filtrate was added a few drops of Ninhydrin reagent and heated for 2mins. The presence of amino acids in protein was indicated by the formation of a purple colour.

Tests for Carbohydrates

Molich's Test

To 1ml of the extract in a test tube, 2 drops of Molish's reagent was added, Concentrated H_2SO_4 was added carefully along the side of the test tube. Violet coloured ring formed at the junction of the two layers indicates the presence of Carbohydrate.

Test for Reducing Sugar

A quantity 0.1mg of the extract was shaken vigorously with 5ml of distilled water and filtered. The filtrate was used for the following test.

a) Fehling's test

To 1ml portion of the filtrate was added equal volume of the Fehling solution 1 and 2 and boiled on a water bath for few minutes. Brick red precipitates indicated the presence of reducing sugar.

b) Benedicts test

To 1ml portion of the filtrate 2ml of Benedict's reagent was added. The mixture was shaken, heated on a water bath for 5 minutes. A rusty brown precipitate indicated the presence of reducing sugar.

Test for reducing monosaccharide

Barfoed Test

To 2ml portion of the filtrate, Barfoed reagent was added and boiled for 3mins. A brick red precipitate obtained at the bottom of the test tube indicated the presence of reducing monosaccharide.

Test for Starch

a. Iodine Test

A quantity 0.1g of the extract was mixed with a drop of iodine solution. A blue-black colour indicated the presence of starch.

Quantitative Proximate Analysis

Quantitative Proximate analysis involves the determination of the percentage (%) constituents of the parameters below.

Ash Content

The ash content was determined using the gravimetric method [28].

Empty platinum crucible was washed, dried and weighed. One gram of sample was weighed into the platinum crucible and placed on the Bunsen burner to burn for 1hr.It was heated until it turns to ash. The sample was cooled after ashing and then weighed.

% ASH CONTENT

CALCULATION

A. Weight of empty Platinum crucible = W_1
B. Weight of empty Platinum crucible + sample after ashing = W_2

Ash content = W_2-W_1

% Ash content = (W_2-W_1) / 1g *100

Crude Fibre

Crude fiber was determined by the Wende method [23].

Acid treatment

Two grams of the sample was weighed into a 250ml conical flask. It was then soaked in 200ml of 1.25 %(v/v) H_2SO_4 that is 1.25ml in 98.75ml of H_2O and then heated for 30mins on a hot plate. The mixture was filtered and the residue washed with hot H_2O until it is no more acidic, using pH paper.

Base treatment

The residue was re-soaked with 200ml of 1.25%NaOH (1.25g of NaOH dissolved with 10ml of H_2O in a 100ml volumetric flask and made up to 100ml mark with H_2O) and heated for another 30mins. The solution was filtered in a weighed filter paper and dried in an oven after which the weight was noted.

The filter paper containing the residue was transferred to a weighed empty Platinum crucible and burnt to ash using a Bunsen burner.

After ashing, it was cooled in a desiccators containing silica and weighed again.

% CRUDE FIBER

CALCULATION

Weight of sample = 2g
Weight of filter paper = Xg
Weight of residue + filter paper after oven dry
Weight of residue
Weight of P.C only
Weight of P.C + ash after ashing
Weight of ash = weight of P.C + ash – weight of P.C
Weight of fiber = weight of residue – weight of ash
% crude fiber = weight of fiber/ (weight of sample) * 100/1

Protein Content

The crude protein content of the samples was determined using micro-Kjeldahl method described by [23], by digesting 0.5 g of the sample with 10g of $NaSO_4$, 20ml conc. H_2SO_4 and 1g $CuSO_4$ in Kjeldahl flask and heated with Bunsen burner till solution digests completely (changes to bluish green). It was then poured into a beaker and allowed to solidify for 24hrs (colour turns to white). The digest was made up to 200 ml to dissolve the solidified sample and then allowed to cool in the refrigerator. 60ml of 40% (w/v) NaOH solution and two pieces of zinc metal were added. The mixture was poured into a round bottom flask of a distillation column. 100ml of 4% Boric acid and 2 drops of screened methyl red indicator were added into a labeled conical flask and placed on the receiving end of the distillatory apparatus.

A light pink color appeared when boric acid and screened methyl red indicator came in contact. When the whole liquid in the receiver reached 200ml on the conical flask, distillation was stopped by dismantling the distillatory apparatus.

The distillate (content on the conical flask) (200ml) was titrated with 0.1m H_2SO_4.

Note ; Titration was stopped when the color of the distillate came to the initial color of the mixture of boric acid and screened methyl red indicator (pink)

% CRUDE PROTEIN

CALCULATION

% Crude Protein = 100× T v × 0.0014 × 6.25/weight of the sample

Tv =Titre value.

Fat Content (Lipid- Fat & Oil)

Fat was extracted using Soxhlet extraction method as described by [29 and 23]

The soxhlet extractor consists of reflux condenser, Heating mantle and n-hexane as the solvent.

Five grams of sample was wrapped very well in a filter paper and put in a soxhlet extractor. n- Hexane was put into a conical flask and a heating mantle was applied below it. The n-hexane evaporates and then cools in the condenser and went back into the conical flask. The system was recycled 8-9 times to achieve maximum yield of oil. After the recycling, the extractor was disconnected and a distillation apparatus set up to separate the solvent (n-hexane) from the oil. This was done so as to recover the solvent.

The mixture containing oil and traces of the solvent after distillation was transferred into a weighed beaker and heated so that the remaining n-hexane escaped leaving only the oil. It was allowed to cool in desiccators and the beaker was re- weighed.

% FAT CONTENT

Calculation

A. Weight of empty beaker $=W_1$
B. Weight of beaker + oil $=W_2$
C. Weight of oil $= W_2 – W_1$
D. % Oil & Fat = $(W_2 – W_1)$ / weight of sample × 100.

Carbohydrate Content

The carbohydrate content was calculated by difference as the nitrogen Free Extract (NFE), a method described by [29 and 23].

%NFE = Carbohydrate content (%) = 100 – (MC +AC+ CF+ CP+ FC)

MC = Percentage moisture content
AC= Percentage Ash content
CF = Percentage Crude fiber
CP = Percentage Crude Protein
FC = Percentage Fat content or Ether extract

IV. Results

Results of Qualitative Proximate Compositions of Fruits of Three Musa Species at Three Stages of Development

Results of the qualitative proximate analyses showed the presence of carbohydrates and proteins in the samples at all the stages of development. Reducing monosaccharide was observed at the ripe stages of the three *Musa* species and absent at the immature stages. Oil was observed only at the ripe stages of the samples. (Table 1)

Table 1: Qualitative Proximate Compositions of fruits of Three Musa Species at Three Stages of Development

Proximate Components	**Banana**			**Plantain**			**Saba Banana**		
	R	G M	IM	R	GM	IM	R	GM	IM
Carbohydrates	+	+	+	+	+	+	+	+	+
Starch	+	+	+	+	+	+	+	+	+
Reducing Sugar	+	+	+	+	+	+	+	+	+
Reducing Monosacharides	+	+	-	+	-	-	+	-	-
Protein	+	+	+	+	+	+	+	+	+
Amino Acids	+	+	+	+	+	+	+	+	+
Aromatic Amino Acids	+	+	+	+	+	+	+	+	+
Oil	+	-	-	+	-	-	+	-	-

+ =detected - = Not detected

R= Ripe stage GM = Green mature stage IM = Immature stage.

Results of Percentage Proximate Compositions of Fruits of Three *Musa* Species at Three Stages of Development

The result of the percentage proximate composition of three *Musa* species showed that the ash content was highest at the green mature stages with 0.71%,1.09% and 1.29% for banana, plantain and saba banana respectively, higher at the immature stage (0.63%,0.80%,0.88% respectively) and least at ripe stages (0.32%, 0.82%, 1.26% respectively). Also the ash contents of saba banana at all the stages of development was observed to be higher than the ash contents of plantain and banana (Table 2). Oil content was only detected at the ripe stages of the three species and the oil contents of the three species were not significantly different at $P \leq 0.05$ (Table 2). Crude fiber was higher at the immature stage of plantain than at the immature stage of banana and Saba banana. The protein content at the green mature stage in plantain (3.54%) at the green mature stage was observed to be more than in saba banana (1.06%) and banana (0.35%). Carbohydrate content of the samples decreased as the sample developed. At the immature stage carbohydrate content of plantain was observed to be

higher than that of saba banana followed by dwarf banana. The carbohydrate content of saba banana decreased from immature to green mature but later increased as fruits ripened unlike at the immature and ripe stages (Table 2). Plantain had the highest protein content at green mature and ripe stages and the difference in protein contents of were significant using Duncan's multiple range tests. Most of the proximate compositions differed significantly among the stages of ripeness as well as fruit species.

Table 2: Percentage Proximate Compositions of Fruits of Three *Musa* Species at Three Stages of Development

Proximate component	Developmental stage	Proximate Compositions %		
		Banana	**Plantain**	**Saba Banana**
Moisture Content	Immature	71.37 ± 0.015^{d}	60.44 ± 0.005^{i}	66.19 ± 0.005^{g}
	Green Mature	73.66 ± 0.005^{c}	62.35 ± 0.185^{h}	74.57 ± 0.220^{b}
	Ripe	81.68 ± 0.010^{a}	67.45 ± 0.025^{f}	70.31 ± 0.005^{e}
Ash Content	Immature	0.64 ± 0.005^{f}	0.79 ± 0.005^{d}	0.93 ± 0.005^{c}
	Green Mature	0.71 ± 0.015^{e}	1.09 ± 0.005^{b}	1.29 ± 0.005^{a}
	Ripe	0.33 ± 0.005^{g}	0.82 ± 0.010^{d}	$1.29 + 0.005^{a}$
Crude Fiber	Immature	1.91 ± 0.015^{f}	3.47 ± 0.000^{a}	3.00 ± 0.020^{b}
	Green Mature	1.19 ± 0.010^{i}	2.15 ± 0.005^{e}	1.60 ± 0.030^{g}
	Ripe	1.43 ± 0.020^{h}	2.28 ± 0.030^{d}	2.51 ± 0.010^{c}
Crude Protein	Immature	0.18 ± 0.000^{g}	0.88 ± 0.005^{e}	1.58 ± 0.005^{c}
	Green Mature	0.35 ± 0.000^{f}	3.45 ± 0.045^{b}	1.06 ± 0.010^{d}
	Ripe	0.35 ± 0.000^{f}	4.42 ± 0.005^{a}	1.05 ± 0.000^{d}
Fat Content	Immature	ND	ND	ND
	Green Mature	ND	ND	ND
	Ripe	0.25 ± 0.002^{a}	1.01 ± 0.009^{a}	0.83 ± 0.005^{a}
Carbohydrate	Immature	25.90 ± 0.153^{d}	34.42 ± 0.000^{a}	28.30 ± 0.018^{c}
	Green Mature	24.09 ± 0.245^{e}	30.68 ± 0.061^{b}	21.48 ± 0.188^{f}
	Ripe	15.96 ± 0.500^{c}	24.02 ± 1.047^{e}	24.01 ± 0.000^{e}

Values are in Means ± Standard Error. Means ± Standard Error followed by the same letter(s) in a column are not significant

ND = Not Detected

V. Discussion

The ash content of the three *Musa* species revealed significant decrease as development progressed. The percentage ash of sample gives an idea about the inorganic content of the sample from where the mineral content could be obtained. The ash content of banana increased from immature (0.63%) to green mature (0.70%) then later dropped at the ripe stage (0.32%). This is in agreement with [22], who reported that the ash content of ripening plantain is affected by developmental stage and unripe plantain contains higher ash content as compared to ripe ones. Another reason for variation in ash might be due to differential absorption capacity of minerals at different stages of development. The ash contents of Saba banana at the different stages of development were observed to be higher than the ash content of banana and plantain. This increase in ash content can be said to be concomitant with the mineral element composition [22].

The protein content of banana, plantain and Saba banana revealed no significant difference as regards the stages of development or ripening, although some significant difference between the different species was observed (Table 4.3). There was an increase in the protein content of plantain from the immature stage (0.87%) to ripe stage (4.37%), unlike banana with 0.18% at immature stage and 0.35% at ripe stage. The protein content of Saba increased from 1.06% at immature stage to 1.57% at the green mature stage and later dropped to 1.05% at the ripe stage. Although a significant difference between banana and plantain was observed.

Protein is an essential component of diet needed for survival of animals and human beings. Their main function in nutrition is to supply adequate amount of amino acids [30]. Its deficiency causes retardation, muscle twisting, oedema, abnormal swelling of the body and collection of fluid in the body [24 and 26]. The values obtained for crude protein in this study were an indication that the fruits might not be able to supply adequate amino acid needed in the body. However, the values were less than 19.0g/100g reported for *Colla mellani* mesocarp, [27].

Fat or oil was not detected at the immature and green mature stages. It was observed only at the ripe stage. This fat content observed at the ripe stage of the different *Musa* species had no significant difference at $p=0.05$. The little or no amount of fat at the stages of maturity indicates that the Banana, plantain and Saba banana are not sources of lipid accumulation which can cause arteriosclerosis, aging [25]. Also, the low level of oil content implies that the fruit may not be good source of oil, hence may not be commercially extracted and refined to edible vegetable oil.

The crude fiber compositions of banana and plantain at the immature stage were observed to be high, it later dropped at the green mature stage and then increased slightly as the development or ripening progressed.

No significant difference was statistically observed. Fiber content also gradually increased as maturity progressed, indicating there were differences due to stage and the highest amount was recorded at the ripe stage. Egbebi and Bademosi, (2012), [31], also reported crude fiber content in unripe and ripe plantain and increased significantly with progress of maturity. Crude fiber content in banana was observed to be lower than in plantain and saba banana. The low fiber level of banana implies that banana can be used as weaning food. However, those fruits with high fiber are desirable in adult diet, in that, it promote the wave-like contraction that move food through the intestine, expands the inside walls of the colon, easing the passage of waste, thus making it an effective anti-constipation [32]. The increase in fiber content at matured stage over tender stage might be due to increase in soluble and insoluble dietary fractions. Crude fibers are known to aid digestion, absorb water and make stools larger and softer so as to prevent constipation [26]. The high level of fiber in plantain suggests that it is capable of promoting digestion as fibers are known to aid and speed up the excretion of wastes and toxins from the body, and also prevent colon cancer as it prevents waste or toxins to stay in the intestine for too long.

In terms of the carbohydrate content, banana was high in the ripe stage this can be attributed to high level of sugar, starch and dietary fibers [33]. There is no significant difference observed at the stages of development. Although between the carbohydrate content of banana and plantain, saba banana and banana a significant difference was observed. The variation in carbohydrate contents during growth might be due to degradation of starch for synthesis of sugars [34 and 35].

VI. Conclusion

Proximate assay revealed the distribution of vital nutrients especially in these days of food selection where *Musa* species have been listed as material for flour production. Diabetics and those in need of fibre can easily select the best species to use.

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