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APPRAISAL OF SOME CHEMICAL ELEMENTS OF PLANTAIN (MUSA PARADISIACA) CULTIVARS IN BAYELSA STATE, NIGERIA

Ogidi I.A., Wariboko C. and A. Alamene

Department of Crop and Soil Science, Faculty of Agriculture, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria.

ABSRACT: We are aware that many studies had been carried out in plantain research but less attention has been paid to individual characteristics of the nutrient composition in cultivars. A knowledge about specific traits in a cultivar will help to address issues concerning dieticians, nutritionists (human and animals), medical questions, pharmaceutical industries and others to effectively utilize the findings in their various disciplines. Appraisal of ten plantains(Musa paradisiaca) cultivars was carried out in Wilberforce Island, 2016, Bayelsa State, Nigeria. Materials were collected from Bayelsa State and Rivers State all in Nigeria. Crops were harvested late 2017 and samples were collected randomly and were subjected to proximate (%) and mineral nutrient analyses (mg/100g). Our records showed that moisture content in peels and food ranged from 73.825% Taraipe to 86.67% Indouberiba with a mean value of 81.6404% while in food it ranged from 53.8% Oyobaberiba to 78.64% Kalaasinberiba with an average value of 68.98%. Percentage ash content in peels swayed from 1,48% Keniipe to 2,124% Opuasinberiba and the mean value is 1.65%, while that of the food ranged from 1,36% Keniipe to 2,246% Opuasinberiba with average content 1.806%. The values of percent protein in peels ranged from 3.87% Kalaasinberiba to 5.56% Agalaberiba and mean value 4,557%, that of food from 6.482% Sorainipe to 8,84% Agalaberiba with an average level of 7.661%. Lipid content in peels and food ranged from 1.488% Opuasinberiba to 3,28% Agalaberiba in peels and 1.426% Nianipe to 2.86% Agalaberiba in food with subsequent mean values of 2.1249% and 1.9971%. Percent composition of NFE in peels and food ranged from 86.03% Agalaberiba to 88.939% Taraipe and 0% Indouberibato 86.42% Niaipe with averages 88.1741% and 76.7284%. Calcium content in peels and food ranged from 16.64mg/100g *Opoasinberiba to 34.72 mg/100g Agalaberibaand14.92mg/100g Opuasinberiba* to 30.84mg/100g Keniipe with mean values of 23.721mg/100g and 22.092mg/100g.Magnesium (Mg) content in peels and food varied from 7.54mg/100g Keniipe to 10.6mg/100g Agalaberiba and 5.78mg/100g Maiipe to 8.74mg/100g Agalaberiba, while their mean values are 8.871mg/100g and 7.118mg/100g. Sodium (Na) content (mg/100g) in peels and food ranged from 10.66mg/100g Soranipe to 19.9mg/100g Agalaberiba and 8.46mg/100g Sorainipe to 17.84mg/100g *Oyobaberiba* with mean values of14.414mg/100g and 12,217mg/100g.Potassium (K) content (mg/100g) in peels and food in ranged from 14.36mg/100g Oyobaberiba to 16.76mg/100g Indouberiba and 10.6mg/100g Keniipe to13.6mg/100g Sorainipe having mean values of 15.623mg/100g and 12.502mg/100g.Iron (Fe) content (mg/100g) in peels and food of plantain cultivars varied from 0.168mg/100 Indouberiba to 0.74mg/100gKeniipe and 0.287mg/100g Indouberiba to 0.725mg/100g Keniipe with average values of 0.4065mg/100g and 0.4687mg/100g. Manganese (Mn) of content in peels and food swayed from 0.138mg/100g Indouberiba to 0.216mg/100g Agalaberiba and 0.194mg/100g Taraipe to 0.242mg/100g Agalaberiba, while their mean values are 0.1749mg/100g and 0.2176mg/100g respectively. Copper (Cu) content (mg/100g) in peels and food ranged from 0.02038mg/100g Indoubariba to 0.092mg/100g Keniipe and 0.0342mg/100g Nianipe to 0.087mg/100g Keniipe with average values of 0.05054mg/100g and 0.0545mg/100g.Zinc (Zn) content (mg/100g) in peels and food oscillated from 0.106mg/100g

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Indouberba to 0.426mg/100g Keniipe and 0.136mg/100g Opuasinberiba to 0.42mg/100g Keniipe and means 0.2255mg/100g and 0. 2262mg/100g.Phosphorous (P) content (mg/100g) in values varied from 0.227mg/100g Indouberiba to 0.486mg/100g Agalaberiba and 0.354mg/100g Indouberiba to 0.542mg/100g Sorainipe with average values of 0.3214mg/100g and 0.424mg/100g.

KEYWORDS: Beriba, Cultivars, Food, Nutrients, Peels, Plantain.

INTRODUCTION

Plantain (Musa paradisiaca) is a large herbaceous perennial crop belonging to the family Musaceae. Records shows that plantains originated from Southeast Asia (IITA - 1997). Investigation results of scientist recorded 68 species of plantains in the world with two hybrids (FAO, 2013). The family Musaceae also include bananas (Musa sapientum and Musa cavandish). Plantains and bananas in the same family have the same method of growth and development, but can be differentiated from one another by form of stem, colour and size, leaf colour, fruit (finger) shape and size, composition of nutrients in fruits (food and peel), in plantains is mostly carbohydrates while in banana fruit is sugar (1976). Reports from (Hugues, 2005) plantain and banana came into existence by natural hybridization between two species of Musa acuminata (genome A) and Musa balbisiana (genome B). Furthermore, results showed that the family *Musaceae* is triploid in nature (2n = 3x = 33 Chromosomes). Plantain and banana are all having fibrous root system, hence are characterized as monocotyledonous plants. Thus, Class -Monocotyledonae, Order - Scitamineae, Family -Musaceae, Genus -Musa, Section - Eumusa and species (M. acuminata AA, M. balbisiana-BB, Group - AAA (dessert and highland beer) and cooking banana - AAB (plantain and dessert banana), ABB (cooking banana).

Cultivated plantain and bananas serves as traditional staple food in so many countries in African continent (Cameroon, Cote d'Ivoire, Democratic Republic of Congo, Gabon, Ghana, Guinea, Niger and Nigeria etc), Asia Oceania and Central Americas (Engberger et al., 2006; USDA, 2013). By level of production in the world, Africa occupies a little over 50% (FAO 1990) Out of this percentage (50%) West Africa alone produces about 61% (FAO, 2012).

Swennen (1990), Swenne and Ortiz (1997) reported that over 70 million people in Africa consume 25% of carbohydrate and 10% of calories from plantain. In Nigeria, mostly in the Southern part, the people of Izon Tribe can prepare so many types of assorted dishes (Kekefiyai–plantain porridge, fufu – alone or with cassava or yam or cocoyam, fuinberiba – roasted plantain, furaiberiba – fried plantain, puunberiba – parboiled plantain, Chips and Cakes – baribaIkpa from plantain (Ogidi *et al.*, 2017).

Swennen *et al.*, (1997) gave the following descriptions of the parts of plantain as the edible portion which is the fruit (both peels and food) is called fingers. Which are formed when the rhizome is fully developed and matured. The flower on full development will form a bunch (beriba-tin) with 1, 2, 3 to 10 hands (1pe) each holding at least 3, 4, 5 to 10 fingers (beribagbasa). However, there are some hands in some cultivars with 2, 3 to 12 fingers with 7.5cm to 30cm by length. By weight, length and girth of fingers some fingers can weigh from 100g to 400g,5.0cm to 40cm length and2.5cm to 5.4cm by girth depending on the type of varieties or cultivars by our records.

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LITERATURE

Results of plantain fruit (peel and food) analysis shows that it is made up of many minerals that are organic in nature which are formed naturally (IFAD, 2011). The healthygrowth and development of plantains greatly depend on optimum amount of these organic nutrients present in them. Plantain obtain these natural organic nutrients from the soil and atmosphere through the roots when dissolved in water.

Such elements that can be found in plantain fruits are As, Ca, Co, Cr, Cl, Cu, F, Fe, I, K, Mg, Mn, Mo, Na, Ni, P, Se, Si, Sn, V and Zn. Although they can also be obtained through vegetables as essential elements for human and animals consumption. Their role in improving human health is considered very important by consuming plantain, they regulate high blood pressure and heart diseases. It is also reported that plantain has low level of toxic and anti-nutrient substance such as cyanogenic glucosides and gluco alkaloids that guan free safe consumption for human (Lahava E, 1995).

Recent publications on some nutritional properties of thirteen plantain cultivars after proximate analysis reveals that moisture content in cultivars (peels) range from 78.74% Asinberiba to 87.33% Izuberiba (Biou) with an average of 83.75%, and food the average content is 58.05% and ranged from 38.78% - okpoisan to 66.03 Ikpriberib.

Ash content in the cultivars studied swayed in peels from 0.87% Asinberiba to 2.38% Ikpriberiba with an average of 1.74%, while Ash level in food had a value of 0.68% Okpoisan to 1.78% makomuberiba H₁ and average content is 1.27%. Protein content in peels ranged from 1.67% Kalabiouberiba to 4.2% Ikpiriberiba and for food from 2.76% kalabiouberiba to 6.75% Ikpiriberiba with mean values of 3.04% (peels) and 5.04% (food). Lipid content in peels varied from 0.84% - Asinberiba to 2.24% Biriyereyereberibawhile for food it is 0.96% Auberiba to 2.36% Ikpiriberiba. The mean values in each of the sections were 1.37% (peel) and 1.57% (food).

Fibre values in peels oscilates between 2.38% Izonberiba and 3.72% Makomuberiba (H₁) and in the edible portion 1.88% Auberiba to 3.0% Okpoisan with means of 2.91% (peel) and 2.47% (food). Whereas Dry matter content in peels fluctuated between 12.67% Izuberiba (Biou) and 21.26 Asinberiba, in food it ranged from 33.97% Ikpiriberiba to 65.74% Auberiba, the average values are 16.28% (peel) and 44.26% (edible portion).

Carbohydrate content in peels from 88.84% Ikpiriberiba to 92.91% Makomuberiba (H₂), while in food from 87.22% Ikpiriberiba to 91.67% Kalabiouberiba with average values of 85.47% (peels) and 89.66% (food) (Ogidi*et al.*, 2017).

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Results of nutrient elements in peels and edible portion are presented in the following order i.e in milligram per one hundred grammes.

S.NO	CULTIVAR		NUTRIENT CONTENT (mg/100g)	AVERAGE
				(mg/100g)
1	Calcium (Ca)	Peel	19.54 Izuberiba to 28.56 Ikpiriberiba	23.72
2		Food	16.78 Okpoisan to 25.80 Ikpiriberiba	18.50
3	Magnesium	Peel	5.53 Izuberibabiou to 9.2 Asinberiba	7.62
	(Mg)			
4		Food	4.5 Auberiba to 5.83 Makomu. H ₁	5.04
5	Sodium (Na)	Peel	9.28 Izuberiba-biou to 14.72 Ikpiriberiba	12.12
6		Food	7.73 Izuberiba-biou to 13.60 Ikpiriberiba	8.82
7	Potassium (K)	Peel	4.81 Izuberiba-biou to 9.52 Okpoisan	7.16
8		Food	4.0 Izuberiba-biou to 8.55 Ikpiriberiba	5.52
9	Iron (Fe)	Peel	0.57 Auberiba to 2.23 Ikpiriberiba	1.56
10		Food	0.63 Auberiba to 2.54 Makomu. H ₂	1.42
11	Manganese	Peel	0.12 Ikpiriberiba to 0.56 Izonberiba	0.31
	(Mn)			
12		Food	0.05 Auberiba to 0.57 Makomu. H ₂	0.33
13	Copper (Cu)	Peel	0.02 Makomu. H2 to 0.22 Izonberiba	0.08
14		Food	0.04 Biriyereyere to 0.22 Makomu. H ₂	0.13
15	Zinc (Zn)	Peel	0.35 Auberiba to 1.14 Makomu. H ₂	0.78
16		Food	0.21 Biriyereyere to 1.07 Makomu. H ₂	0.64
17	Phosphorus (P)	Peel	0.17 Izuberiba-biou to 0.55 Makomu. H ₁	0.30
		Food	0.13 Izuberiberiba-biou to 0.43 Makomu.	0.23
			H_1	

(Ogidi et.al., 2017)

Results of proximate and mineral composition of plantain (*Musa paradisiaca*) wastes, flour as potential nutrient source in the formulation of animal feeds were carried out and the following results were obtained in the various parts analysed (bract, ripe peels, fruit stalk and leaf). In these wastes the moisture content ranged from 9.39 to 9.53%, crude protein 1.87 to 19.37g, crude fat 0.73 to 1.83g, and crude fibre 8.10 to 15.5g and carbohydrate 54 to 68.00g/100g sample. Iron in plantain bract ranged from 10.50 to 14.00mg, Calcium 120.00 to 150mg and phosphorus (110.00 to 180.00mg)/100g sample (Oladapo *et. al.*, 2015).

Okorie *et. al.*,(2015) reported that nutrient content of ripe plantain peels ranged in the following orderCa, 6.81 ± 1.15 ; Mg, 0.84 ± 0.23 ; K ,10.60 ± 0.85 ; Na, 6.09 ± 1.29 ; P, 0.59 ± 0.01 ; Zn, 1.49 ± 13 ; Cu, 0.95 ± 0.35 ; Pb, 0.05 ± 0.03 .

Nutrients in unripe plantain peels were Ca, 7.62 ± 0.17 ; Mg, 1.22 ± 0.45 ; K, 9.32 ± 0.59 ; Na, 6.07 ± 0.10 ; P, 0.60 ± 0.14 ; Zn, 2.60 ± 28 ; Cu, 0.86 ± 0.06 ;Pb, 0.11 ± 0.01 . Nutrients in ripe banana peels were Ca, 6.01 ± 0.27 ; Mg, 2.31 ± 0.44 ; K, 9.83 ± 1.17 ; Na, 6.09 ± 0.13 ;P, 0.49 ± 0.01 ; Zn, 1.86 ± 0.23 ; Cu, 0.85 ± 0.07 and Pb, 0.40 ± 0.01 . Last, results of nutrients in unripe banana peels were Ca, 11.02 ± 1.44 ; Mg, 3.04 ± 0.06 ; K, 9.89 ± 1.17 ; Na, 6.18 ± 0.03 ; P, 0.61 ± 0.01 ; Zn, 0.95 ± 0.07 ; Cu, 0.49 ± 0.01 and Pb 0.07 ± 0.03 and were analyzed in mg/100g.

The percentage of crude protein content of Unripe Banana Peel (UBP) range from 2.5 to 7.8% and was sig. higher than in Ripe Plantain Peel (RPP), Unripe Plantain Peel (UPP) and Ripe Banana Peel (RBP).

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The presence of Lead, Cadmium, Mercury and Arsenic (Known as heavy metals) in food is poisonous to human and animal health. Lead is poisonous to the heart, bones, intestines, kidneys, reproductive organs and nervous system. It interferes with healthy growth and development of children that cause hearing and behavior disorder Jarup(2003).

Oladejo (2012) reported that edible portion of unripe plantain was analyzed and the following results were obtained: Moisture content 59.4g, Crude protein 7.7g, Crude lipid 1.5 ± 0.2 , Ash 1.4g, Crude fibre 1.4g, Carbohydrate 24.4g, Sodium 80mg/100g, Potassium 120mg/100g, Calcium 66.6mg/100g, Magnesium 275mg, Phosphorus 195mg, Iron 2.53mg, Zinc 3.7mg and yielded 128.6kcal of energy/100g. He emphasized that the low Sodium content in plantain makes it suitable for hypertensive patients to consume, while low level of carbohydrate content coupled with relatively high energy makes it suitable for diabetic patients to consume. He further stressed that 100g of plantain products can contribute between 6.3 to 15.3% energy, 5.9 to 30.2% protein, 7.8 to 16% Calcium, 9.2 to 23.3% Iron and 28.5 to 33.7% Zinc.

Scientists reported that results obtained after proximate analyses of eight (8) unripe plantain cultivars the contents of moisture, ash, fibre, fat, protein and carbohydrate were 1.0 to 18.3%, 0.55 to 2.53, 0.19 to 0.61, 2.05 to 4.07, 1.12 to 7.24 and 69.96 to 81.18% on dry weight basis accordingly. While the ranges of mineral elements of Na, 18.47 to 27.78; K, 264.75 to 452.50; Ca, 102.15 to 162.04; Mg, 86.72 to 150.05; P, 152.69 to 260.21 and Iron (Fe) 11.92 to 21.46mg/kg weight of sample. Average Amylose content among cultivars ranged from 40.25 to 70.75% and Glycine Index ranged from 39.04 to 51.05%, (Oko *et.al.*, 2015).

PROXIMATE COMPOSITION OF RAW SUNDRIED, FERMENTED, BOILED AND ROASTED (g/100g)

SAMPLE	RAW	SUNDRIED	FERMENTED	BOILED	ROASTED
Moisture	59.4 ± 0.02	11.1 ± 0.03	11.2 ± 0.02	62.6 ± 0.03	47.3 ± 1.10
Crude Protein	7.7 ± 0.13	16.9 ± 0.12	3.4 ± 0.16	7.5 ± 0.09	3.3 ± 0.10
Crude Lipid	1.5 ± 0.02	3.9 ± 0.03	1.7 ± 0.01	3.8 ± 0.02	1.0 ± 0.02
Ash	1.4 ± 0.02	1.5 ± 0.01	0.8 ± 0.02	1.3 ± 0.02	2.4 ± 0.03
Crude Fibre	1.4 ± 0.02	3.8 ± 0.11	2.5 ± 0.02	1.5 ± 0.01	1.3 ± 0.02
Carbohydrate	24.4 ± 0.19	60.2 ± 0.11	78.5 ± 0.15	18.8 ± 0.11	44.8 ± 1.19
Gross Energy	148.6 ±	350.5 ± 0.28	350.9 ± 0.14	144.4 ± 0.22	169 ± 1.00
(Kcal)	0.14				
Sodium (Na)	200.0 ±	245.0 ± 21.21	85.5 ± 2.12	195 ± 21.21	55.7 ± 1.15
	1.41				
Potassium (K)	370.0 ±	380.0 ± 21.21	160.0 ± 14.14	365.0 ±	270.0 ± 1.00
	14.41			14.14	
Calcium (Ca)	126.5 ±	140.0 ± 3.50	77.5 ± 2.12	93.0 ± 2.83	160.0 ± 10.00
	2.12				
Magnesium (Mg)	375.0 ±	405.0 ± 15.36	195.2 ± 21.21	340.0 ±	350.0 ± 13.61
	21.21			14.14	
Iron (Fe)	2.53 ± 0.03	3.50 ± 0.02	1.38 ± 0.02	2.45 ± 0.04	3.48 ± 0.01
Phosphorus (P)	220.0 ±	225.0 ± 17.43	165.0 ± 11.21	190.0 ±	217.0 ± 11.16
	21.21			14.14	
Zinc (Zn)	3.74 ± 0.02	3.66 ± 0.02	3.13 ± 0.01	3.60 ± 0.02	3.70 ± 0.02
Manganese (Mn)	2.99 ± 0.05	2.74 ± 0.03	2.47 ± 0.02	2.65 ± 0.03	2.8 ± 0.02
Cupper (Cu)	1.66 ± 0.04	1.47 ± 0.02	1.47 ± 0.02	2.20 ± 0.02	1.6 ± 0.01
.al., 2015).					
	SAMPLE Moisture Crude Protein Crude Lipid Ash Crude Fibre Carbohydrate Gross Energy (Kcal) Sodium (Na) Potassium (K) Calcium (Ca) Magnesium (Mg) Iron (Fe) Phosphorus (P) Zinc (Zn) Manganese (Mn) Cupper (Cu) <i>cal.</i> , 2015).	$\begin{array}{llllllllllllllllllllllllllllllllllll$	$\begin{array}{llllllllllllllllllllllllllllllllllll$	$\begin{array}{llllllllllllllllllllllllllllllllllll$	$\begin{array}{llllllllllllllllllllllllllllllllllll$

Results obtained from USDA (2017) on nutrient values and weight of edible portion of plantain predicate, the proximates of water/100g = 62.28, 1 cup, sliced 148g = 96.28g and 1 medium 179g = 116.85g, energy 1 value /100g = 122g; 1 cup, sliced of 148g = 1.92kcal and 1 medium

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of 179g = 218kcal, protein 1 value /100g =1.30g, 1 cup, sliced 148g = 1.92g 1 medium of 179g = 2.33 kcal, total lipid (fat) 1 value/100g =0.37g, 1cup, sliced 148g = 1.55g I medium of 179g = 0.66. Carbohydrate by difference I value /100g = 31.89g, 1 cup, sliced 148g = 47.20g and I medium of 179g = 57.08g; fiber total dietary I value/100g = 2.3g; 1 cup, sliced 148g = 3.4g and 1 medium 179g = 4.1g; sugar total 1 value/100g = 15.00g; 1 cup sliced 148g = 22.20g and 1 medium 179g = 26.85g. Mineral nutrients composition in the same analysis connoteCalcium (Ca) 1value/100g = 3mg, 1cup sliced 148g = 0.89mg and 1 medium 179g = 5mg; Iron (Fe) 1value/100g = 0.60mg 1 cup, sliced 148g = 55mg and 1 medium 179g = 66mg; Phosphorus (P) I vale/100g=34mg, 1 cup sliced 148g=739mg and 0 ne medium 179g = 893mg. Sodium (Na) 1 value/100g = 4mg, 1 cup, sliced = 6mg and 1 medium 179g = 7mg; Zinc (Zn) 1 value/100g = 0.14mg, 1 cup, sliced 148g = 0.21mg and 1 medium 179g = 0.25mg.

While in the same studies of USDA (2017) vitamin composition in plantain indicated that in 1 value/100g vitamin C is 18.4mg, 1 medium 179g is 32.9mg while that of Folate, DFE in 1 value/100g = 22mg and 1 medium 179g is 39mg and that of Vitamin A, RAE in 1 value/100g is 56mg and in 1 medium 179g is 100Ng. The value of Vitamin A, 1 U in 1 value /100g is 1127 1U, whereas zero values Vitamin B – 12 and D (D2 + D3) were recorded in plantain.

Results of lipid analysis was highest by 1 value/100g on fatty acids total saturated equals 0.143g and in 1 medium 179g is 0.256g followed by fatty acid, total polyunsaturated in 1 value/100g recorded 0.069g and in 1 medium 179g I 0.124g. The value of fatty acids, total trans and cholesterol were all zero in plantain.

Furthermore, an indepth study of nutrients in plantain was carried out by scientists with the following results in nutrient value and percent Recommended Daily Allowances(RDA) ; energy 122kcal, 6%; carbohydrate 31.89g, 24.5%; protein 1.30g, 2%; total fat 0.37g, 2%; cholesterol o mg, 0%; dietary fire 2.30g, 6%; folates 22µg, 5.5%; niacin 0.686mg, 4%; pyridoxine 0.299mg, 23%; Riboflavin 0.054mg, 4%; vitamin A 1127 iu, 37.5%; vitamin C 18.4mg, 31%; vitamin E 0.14mg, 1%; vitamin K 0.7µg, 1%; sodium 4mg, < 1%; potassium 499mg, 10.6%; calcium 3mg, < 0.5%; iron 0.60mg, 7.5%; magnesium 37mg, 9%; phosphorus 34mg, 5% and zinc 0.14mg, 1%.(USDA 2017).

Reports obtained from researchers suggest that plantain is an important food source thatcan easily be digesteddue to the presence of constituents such as water 10.62%, albuminoids 3.35%, fat 1.15%, carbohydrates 81.67% (more than 2/3 starch), fibre 1.15%, phosphates 0.26% sugar (sucrose) 1.60% high content of vitamin C and potassium (Chung *et al.*, 2007). Vitamin A (fresh ripe plantain) is an antioxidant that plays valuable role in visual cycle, maintaining healthy mucosa and enhances skin complexion. Vitamin B6 (pyridoxine) in plantain is helpful in the treatment of neutritis, anemia and decrease homocysteine (one of the causative factors for coronary artery disease and stroke episodes) in the body. High levels of vitamin C help to develop resistance against infectious agents and scavenge harmful oxygen-free radicals, but if boiled and cooked the level of this vitamin is drastically reduced (UmeshRudrappa, 2009-17).

The importance of nutrient elements in plantain consumptionas presented by researchers in the variousparts in relation to health benefits are as follows. That calcium(Ca) is an important component of intracellular process that occur within insulin responsive tissues like skeletal muscle and adipose tissue. Alteration of calcium influx can have adverse effect on insulin secretion so, the peels of plantain are important for diabetic patents. (O Connell *et.al.*,2010).

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Magnesium (Mg) is a co-factor f hexokinase and pyruvate kinase and helps in the modulation of glucose transport across cell membranes. Consumption of plantain peels helps in the control of diabetes, (O Connell .*et.al.*, 2010).

A higher amounts of potassium(K) than sodium(Na) in peels of unripe plantain and banana will reduce hypertension incidence while consumption of higher sodium to potassium ratio will lead to incidence of hypertension, (Chen*et.al.*, 2010).

Phosphorus(P) helps in bone mineralization, energy production, cell signaling, and regulation of acid- base homeostasis, plantain is an important source of this element.

Zinc (Zn) regulates the production of insulin by pancreatic tissues and glucose utilization by muscles and fat cells, (Eleazu, *et.al.*,2013). Plantain is a sure source of this element

Copper (Cu) is important in redox chemistry, growth and development. It helps in treating degenerating neurological disoreder, Alzheimers disease, Parkinsonsdesease; (Tisato*et.al.*, 2010).

Iron (Fe) is an important component of hemoglobin which has direct influence in proper functioning of immune system and production of energy, (Chen *et.al.*, 2010). All the elements are found in high amounts in both peels and food in plantain as presented above,(Ogidi, *et.al.*,2017).

MATERIALS AND METHODS

Ten cultivars of plantain (Musa paradisiaca),Keniipe ,Agalaberiba, Kalaasinberiba, Oyobaberiba,Sonrainipe, Maiipe(French true horn , control), Taraipe, Nianipe,(there are seven cultivars of the French true horns, but we were lucky to cultivate only five), Opuasinberiba and Indouberiba. These cultivars (Keniipe, Agala, Kalaasinberiba, Oyobaberiba, Maiipe, Taraipe, Nianipe,Sonranipe and Opuasinberba)were collected from Okoloba and Sabagreia in kolokuma/ OpokumaLocal Government Area,Bayelsa State. While Indouberiba sucker was obtained from ImbiamaAhoada West Local Government Area, Rivers State all from South-South Nigeria. The cultivars were cultivated in 2017 and harvested in the year 2018 in the Niger Delta University Teaching and Research Farm, Wilberforce Island. The crops were cultivated without the use of synthetic chemicals during cultivation and post-harvest storage periods. Samples were collected from cultivars randomly and were subjected to proximate and mineral nutrientanalyses in the Central Laboratory of the Niger Delta University by Chief S. Spiff within one week. In our investigations, cholesterol, individual amino acids and lipids, caffeine, heavy metals and vitamins were not included.

Data Analysis

The data collected to further analyses by using a software developed by Seimokuko S.Angaye Junior and Sidi A

The methods used were Microsoft Excel Quantitative Data Analysis Tool and Visual Basic Programming Language in Integrated Development Environment.

RESULTS AND DISCUSSIONS

All results obtained in peels and edible portions(food) from all the cultivars are presented in charts and in measures of statistical values in which the X-axis is the value of the characteristic analyzed in percentage of moisture, ash, protein, lipid, fibre, dry matter, carbohydrate and nitrogen free extracts, while N,P,K, Ca, Mg, Na, Fe, Mn, Cu, and Zn are expressed in mg/100g. The Y-axis is the different plantain cultivars investigated.

Results of moisture content (%) in peels and food of ten plantain cultivars

Results of moisture content in peels and food of ten plantain cultivars showed that in peels, it ranged from 73.825% Taraipeto 86.67% Indouberiba with a mean value of 81.6404% while in food it ranged from 53.8% Oyobaberiba to 78.64% Kalaasinberiba with an average of 68.98%. At Confidence levels of 95.0% in peels and food were 2.775 and 5.034, while the kurtosis areplatykurticand leptokurtic distributions.

PROXIMATE ANALYSIS OF	PLANTAIN		
	moist F	moist P	84.80
Mean	69.98	81.6404	90 84.36 82.56 82.86 81.662 80.326 86.1
Standard Error	2.225747999	1.22692463	80 73.825 76.546
Median	71.004	82.6325	70 76.42 78.64 72.483
Standard Deviation	7.038433175	3.87987635	60 68.47 53.8 70.584 71.424 74.852
Sample Variance	49.53954156	15.05344049	50 - 64.382 - 68.745
Kurtosis	2.550845479	0.686125526	40
Skewness	-1.340547896	-1.013964763	30
Range	24.84	12.845	20
Minimum	53.8	73.825	
Maximum	78.64	86.67	
Sum	699.8	816.404	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Count	10	10	nine sente sente sente sint wait set usn't set ben't
Largest(1)	78.64	86.67	* 23 2 50 00 50 1 1 5 50 ¹
Smallest(1)	53.8	73.825	62 732 OL ODN, N.
Confidence Level(95.0%)	5.034991779	2.775496341	Ť Ť

Fig.1. Moisture content (%) in peels and edible portions of ten cultivars of plantain, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba. 2018.

Analysis of ash content (%) in peels and food of ten plantain cultivars

Percentage ash content in peels and food of ten plantain cultivars are presented in fig.2. showed that this trait in peels swayed from 1,48% Keniipe to 2,124% Opuaasinberiba and the mean value is 1.65%, while that of the food ranged from 1,36% Keniipe to 2,246% Opuasinberiba, the values of this characteristics in the control are 1.824% and 1.653%. The kurtosis are leptokurtic and platykurtic at Confidence levels of 0.132and 0,216.



2.246

1.36

Confidence Level (95. 0.21596218 0.13207221

Largest(1) Smallest(1) 2.124

1.48

Fig.2. Ash content (%) in peels and edible portions of ten cultivars of plantain, Keniipe, Agalaberiba, Kalaasinberiba, Ovobaberiba, Sorainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Explanation of percent protein (%) content in peels and food of ten plantain cultivars

The importance of protein in any food marks the positive quality of that substance. The values of percent protein in the cultivars shown in fig.3 reflects the true position in peels ranging from 3.87% Kalaasinberiba to 5.56% Agalaberiba and mean value 4,557%, that food from 6.482% Soranipe to 8,84% Agalaberiba with an average level of 7.661%. This trait at Confidence level of 95.0% in peels and food are 0.364 and 0.475, with their kurtosis all leptokurtic.



Fig.3. Protein content (%) in peels and edible portions of ten cultivars of plantain, Keniipe, Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Results of lipid content (%) in peels and food of ten plantain cultivars

%Ash

ĭ%Ash F

■%Ash P

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Lipid content in pees and in food as presented in fig. 4, ranged from 1.488% Opuasinberiba to 3,28% Agalaberiba in peels

And 1.426% Nianipe to 2.86% Agalaberiba in food subsequent mean values of 2.1249% and 1.9971%. The Confidence levels (95.0%) of the analyses in peels and food are 0.50767, and 0.37490 while their kurtosis are all platykurtic distributions.

PROXIMATE ANALYSIS OF	PLANTAIN		
	%Lipid F	%Lipid P	
Mean	1.9971	2.1249	3.5 - 3.28
Standard Error	0.16572846	0.22442026	2.942.86
Median	1.7845	1.669	3
Standard Deviation	0.52407939	0.70967918	2.5
Sample Variance	0.27465921	0.50364454	2 -
Kurtosis	-0.9731191	-1.63972719	
Skewness	0.72027519	0.64495789	1.5
Range	1.434	1.792	1
Minimum	1.426	1.488	0.5
Maximum	2.86	3.28	
Sum	19.971	21.249	0 +,,
Count	10	10	ipe the sti
Largest(1)	2.86	3.28	tell Be UBE
Smallest(1)	1.426	1.488	· ** ** ``
Confidence Level (95.0%)	0.37490381	0.50767391	#31.



Fig.4. Lipid content (%) in peels and edible portions of ten cultivars of plantain, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Analyses of fibre content (%) in peels and food of ten plantain cultivars

Figure.5. explains percent fibre content in peels and food, ranging from 3.26% Keniipe to3.89% Kala-asinriba and 2.726%

Opuasinberiba to 3.72% Kala-asinberiba with mean values of 3.4926% and 3,2218%. At Confidence levels (95.0%) in peels 0.12196 and food0.26105 their kurtosis are leptokurtic and platykurtic distributions.

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PROXIMATE ANALYSIS O		
	%Fibre F	%Fibre P
Mean	3.2218	3.4926
Standard Error	0.11540054	0.057100146
Median	3.34	3.442
Standard Deviation	0.36492855	0.180566516
Sample Variance	0.13317284	0.032604267
Kurtosis	-1.65470483	1.618518359
Skewness	-0.26011082	1.201248632
Range	0.994	0.625
Minimum	2.726	3.265
Maximum	3.72	3.89
Sum	32.218	34.926
Count	10	10
Largest(1)	3.72	3.89
Smallest(1)	2.726	3.265
Confidence Level(95.0%	0.26105416	0.129169504



Fig.5. Fibre content (%) in peels and edible portions of ten cultivars of plantain, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Results of dry matter (%) composition in peels and food of ten plantain cultivars

Results of dry matter content in peels and food as reflected in fig.6, ranged from 13.33% Indouberiba to 26.18% Taraipeand 21.36% Kala-asiberiba to 46.2% Oyobaberiba with mean values 18.3608% and 30.0209%. At Confidence levels (95.0%) of peels and food 2.77619 and 5.03501 their kurtosis are all leptokurtic distributions.



Fig.6. Dry matter content (%) in peels and edible portions of ten cultivars of plantain, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

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Analyses of percent nitrogen free extracts (NFE) in peels and food of ten plantain cultivars

Percent composition of NFE in peels and food in fig.7, showed that the values ranged from 86.03% Agalaberiba to 88.939% Taraipe and 0 % Indouberibato 86.42% Niaipe with averages 88.1741% and 76.7284%. At Confidence levels (95.0%) of peels and food are 0.61986 and 19. 29828 their kurtosis are all leptokurtic distributions.

PROXIMATE ANALYSIS OF	PLANTAIN						
	%NFE F	%NFE P	87.9	2 85 03		88.939 g	8 0 2
Mean	76.7284	88.1741	90	87	.74 88.731		
Standard Error	8.530917141	0.27401279	80			8,702	
Median	85.371	88.3595	70 -85.14	83.4 8	3.97	05 705	1.42
Standard Deviation	26.9771287	0.86650453	60	84.78	86.172	-85.796	8
Sample Variance	727.7654727	0.7508301	50		86	004	
Kurtosis	9.964249137	4.18756571	40				
<mark>S</mark> kewness	-3.15462276	-1.8598452	30				
Range	86.42	2,909	20 -				
Minimum	0	86.03	10 -				
Maximum	86.42	88,939	0				
Sum	767.284	881.741		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	S. 2.	2. 2.	
Count	10	10	dille de	erip serip serip.	ainit Mait	arally janit	sel
Largest(1)	86.42	88.939	40, 3/2	SIL 303	30	1 4	Se .
Smallest(1)	0	86.03	P.6 . 3	10 OT		000	14
Confidence Level(95.0%)	19.29827532	0.61986	4.			0	

Fig.7. Nitrogen free extract (%) in peels and edible portions of ten cultivars of plantain, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Results of Calcium (Ca) content (mg/100g) in peels and food in ten plantain cultivars

Figure 8. shows results of calcium content in peels and food that ranged from 16.64mg/100g Opoasinberibato 34.72mg/100g Agalaberiba and14.92mg/100g Opuasinberiba to 30.84mg/100g Keniipe with mean values of 23.721mg/100g and 22.092mg/100g. At Confidence levels (95.0%) of this trait in peels and food as 5.61007 and 5.11468, their kurtosis recorded all platykurtic distributions.

%NFE

™%NFE F ™%NFE P European Journal of Agriculture and Forestry Research

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MINERAL ANALYSIS OF PL	ATAIN	
	Ca F	Ca P
Mean	22.092	23.721
Standard Error	2.260976092	2.479966151
Median	19.23	18.53
Standard Deviation	7.149834186	7.842341558
Sample Variance	51.12012889	61.50232111
Kurtosis	-2.18483604	-2.04454714
Skewness	0.330887336	0.536055798
Range	15.92	18.08
Minimum	14.92	16.64
Maximum	30.84	34.72
Sum	220.92	237.21
Count	10	10
Largest(1)	30.84	34.72
Smallest(1)	14.92	16.64
Confidence Level(95.0%)	5.114683262	5.610073192



Fig.8. Calcium content(mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Results of Magnesium (Mg) content (mg/100g) in peels and food of ten plantain cultivars

Magnesium (Mg) content in peels and food varied tremendously in fig.9, ranging from 7.54mg/100g Keniipe to10.6mg/100g Agalaberiba and 5.78mg/100g Maiipe to 8.74mg/100g Agalaberiba, while their mean values are 8.871mg/100g and 7.118mg/100g. The Confidence levels (95.0%) of trait at 0.67012 and 0.70832 the kurtosis are all platykurtic distributions.

MINERAL ANALYSIS OF P		
	Mg F	Mg P
Mean	7.118	8.871
Standard Error	0.313116237	0.296229828
Median	7.215	8.955
Standard Deviation	0.990160481	0.936760968
Sample Variance	0.980417778	0.877521111
Kurtosis	-0.70959351	-0.07321499
Skewness	0.277357259	0.202995352
Range	2.96	3.06
Minimum	5.78	7.54
Maximum	8.74	10.6
Sum	71.18	88.71
Count	10	10
Largest(1)	8.74	10.6
Smallest(1)	5.78	7.54
Confidence Level(95.0%	0.708318138	0.670118428



Fig.9. Magnesium (Mg) content(mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

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Results of Sodium (Na) content (mg/100g) in peels and food of ten plantain cultivars

Figure 10. presents the values of Sodium (Na) content (mg/100g) in peels and food that ranged from 10.66mg/100g Soranipe to 19.9mg/100g Agalaberiba and 8.46mg/100g Soranipe to 17.84mg/100g Oyobaberiba with mean values of 14.414mg/100g and 12,217mg/100g. At Confidence levels (95.0%) of this trait 2.86134 and 2.93455 their kurtosis recorded all platykurtic distributions.



Fig.10. Sodium (Na) content (mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Potassium (K) content (mg/100g) in peels and food of ten plantain cultivars

Results of Potassium (K) content (mg/100g) in peels and food in fig.11, ranged from 14.36mg/100gOyobaberiba to 16.76mg/100g Indouberiba and 10.6mg/100g Keniipe to13.6mg/100g Sorainipe having mean values of 15.623mg/100g and 12.502mg/100g. At recorded Confidence levels (95.0%) of 0.678303 and 0.673270 their values of kurtosis are all platykurtic distributions.

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Fig.11. Potassium (K) content (mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe, Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Results of Iron (Fe) content (mg/100g) in peels and food of ten plantain cultivars

Figure 12. captured results of Iron (Fe) content (mg/100g) in peels and food of plantain cultivars varied from 0.168mg/100 Indouberiba to 0.74mg/100g and 0.287mg/100gIndouberiba to 0.725mg/100g Keniipe with average values of 0.4065mg/100g and 0.4687mg/100g. The Confidence levels (95.0%) of this traits are 0.17878 and 0.10749 with their kurtosisall platykurtic distributions.

MINERAL ANALYSIS OF PL	ATAIN	
	Fe F	Fe P
Mean	0.4687	0.4065
Standard Error	0.04751445	0.07901044
Median	0.405	0.275
Standard Deviation	0.1502539	0.24985296
Sample Variance	0.02257623	0.0624265
Kurtosis	-1.271957	-2.096557
Skewness	0.51989148	0.44017127
Range	0.438	0.572
Minimum	0.287	0.168
Maximum	0.725	0.74
Sum	4.687	4.065
Count	10	10
Largest(1)	0.725	0.74
Smallest(1)	0.287	0.168
Confidence Level(95.0%)	0.10748516	0.17873404



Fig.12. Iron (Fe) content (mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

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Manganese (Mn) content (mg/100g) in peels and food of ten plantain cultivars

Results of Manganese (Mn) of content in peels and food are presented in fig.13, with values from 0.138mg/100g Indouberiba to 0.216mg/100g Agalaberiba and 0.194mg/100gTaraipe to 0.242mg/100g Agalaberiba, while their mean values are 0.1749mg/100g and 0.2176mg/10g respectively. At Confidence levels (95.0%) of this trait in peels and food 0.02265 and 0.00934, their kurtosis are all mesokurtic distributions.

MINERAL ANALYSIS OF P	LATAIN		
	Mn F	Mn P	
Mean	0.2176	0.1749	0.25
Standard Error	0.00412903	0.01001382	
Median	0.218	0.174	0.2
Standard Deviation	0.01305714	0.03166649	0.45
Sample Variance	0.00017049	0.00100277	0.15
Kurtosis	0.93807391	-1.8500839	0.1
Skewness	0.12889524	0.19260189	0.1
Range	0.048	0.078	0.05
Minimum	0.194	0.138	0.05
Maximum	0.242	0.216	0
Sum	2.176	1.749	
Count	10	10	
Largest(1)	0.242	0.216	te
Smallest(1)	0.194	0.138	
Confidence Level(95.0%)	0.00934051	0.02265284	



Fig.13. Manganese (Mn) content (mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Appraisal of Copper (Cu) content (mg/100g) in peels and food of ten plantain cultivars

Figure 14, represent results of Copper (Cu) content (mg/100g) in peels and food of ten plantain cultivars that ranged from 0.02038mg/100g Indoubariba to 0.092mg/100g Keniipe and 0.0342mg/100g Nianipe to 0.087mg/100g Keniipe with average values of 0.05054mg/100g and 0.0545mg/100g. The Confidence levels (95.0%) of this trait in peels and food are 0.02038 and 0.01468 with kurtosis of platykurtic distributions.

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Fig.14. Copper (Cu) content (mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe,Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

Evaluation of Zinc (Zn) content (mg/100g) in peels and food of ten plantain cultivars

Results of evaluation of Zinc (Zn) content (mg/100g) in peels and food are presented in fig .15 oscillated from0.106mg/100g Indouberba to 0.426mg/100gKeniipe and 0.136mg/100g Opuasinberiba to 0.42mg/100g Keniipe and means 0.2255mg/100g and 0 2262mg/100g. At Confidence levels (95.0%) of 0.10732 and 0.08536 their kurtosis are all platykurtic distributions.



Fig.15. Zinc (Zn) content (mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe, Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

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Assessment of Phosphorous (P) content (mg/100g) in peels and food of ten plantain cultivars

Results of assessment of Phosphorous (P) content (mg/100g) are presented in fig,16, with values from 0.227mg/100g Indouberiba to 0.486mg/100g Agalaberiba and 0.354mg/100g Indouberiba to 0.542mg/100g Sorainipe with average values of 0.3214mg/100g and 0.424mg/100g. Confidence levels (95.0%) of this trait in peels food are 0.06333 and 0.04040 with their kurtosis platykurtic and leptokurtic distributions

MINERAL ANALYSIS OF PL	ATAIN	
	PO4 F	PO4 P
Mean	0.424	0.3214
Standard Error	0.01786119	0.0279973
Median	0.416	0.306
Standard Deviation	0.05648205	0.08853524
Sample Variance	0.00319022	0.00783849
Kurtosis	0.78011946	-0.5975302
<mark>S</mark> kewness	0.94873772	0.7143147
Range	0.188	0.259
Minimum	0.354	0.227
Maximum	0.542	0.486
Sum	4.24	3.214
Count	10	10
Largest(1)	0.542	0.486
Smallest(1)	0.354	0.227
Confidence Level(95.0%)	0.04040483	0.0633343



Fig.16. Phosphorous (P) content (mg/100g) in peels and edible portions of ten plantain cultivars, Keniipe, Agalaberiba, Kalaasinberiba, Oyobaberiba, Sonrainipe, Maiipe, Taraipe, Nianipe, Opuasinberiba and Indouberiba, 2018.

DISCUSSION

Proximate and mineral nutrient analyses of ten plantain cultivars in our study recorded variable composition of mineral nutrients in peels and food. The proximate of moisture, ash,fibre and carbohydrate in peels are relatively higher than in food,while other traits of proximate (protein and dry matter) are more in food, this is in line with Ogidi*et al.* (2017). Composition of mineral nutrients (Ca, Mg, Na and K) in peels are relatively higher than food of the investigated plantain cultivars, while other mineral nutrients (P, Mn, Cu and Fe) are relatively higher in food confirming the results of Ogidi*et al.* (2017).

Considering the importance of these mineral nutrients (Ca, Mg,Na, K, Fe, Mn, Cu, Zn and P) and proximate composition of Moisture, Ash, Protein, Lipid, Fibre, Dry matter and Carbohydrate in human health, both peels and food of plantain can serve as a major source of human diet when consumed whole.

Investigation of specific cultivars on mineral nutrient composition paves the way for more intensive studies by choosing the appropriate cultivar with the desired qualities for medicinal, industrial, animal and human consumption.

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CONCLUSION

The conclusions of our study are presented in the following order with the consideration of nutrients in peels and food.

- 1. Moisture content in peels and food ranged from 73.825% Taraipe to 86.67% Indouberiba with a mean value of 81.6404% while in food it ranged from 53.8% Oyobaberiba to 78.64% Kalaasinberiba with an average value of 68.98%.
- 2. Percentage ash content in peels swayed from 1,48% Keniipe to 2,124% Opuaasinberiba and the mean value is 1.65%, while that of the food ranged from 1,36% Keniipe to 2,246% Opuasinberiba with average content 1.806%.
- 3. The values of percent protein in peels ranged from 3.87% Kalaasinberiba to 5.56% Agalaberiba and mean value 4,557%, that of food from 6.482% Sorainipe to 8,84% Agalaberiba with an average level of 7.661%.
- 4 Lipid content in peels and food ranged from 1.488% Opuasinberiba to 3,28% Agalaberiba in peels. And 1.426% Nianipe to 2.86% Agalaberiba in food with subsequent mean values of 2.1249% and 1.9971%.
- 5 Percent fibre content in peels and food, ranging from 3.26% Keniipe to 3.89% Kalaasinberiba and 2.726%. Opuasinberiba to 3.72% Kala-asinberiba with mean values of 3.4926% and 3,2218%.
- 6 Dry matter content in peels and food ranged from 13.33% Indouberiba to 26.18% Taraipe and 21.36%. Kala-asinberiba to 46.2% Oyobaberiba with mean values 18.3608% and 30.0209%.
- 7 Percent composition of NFE in peels and food ranged from 86.03% Agalaberiba to 88.939% Taraipe and 0% Indouberibato 86.42% Niaipe with averages 88.1741% and 76.7284%.
- 8 Calcium content in peels and food ranged from 16.64mg/100g Opoasinberiba to 34.72 mg/100g Agalaberiba and14.92mg/100g Opuasinberiba to 30.84mg/100g Keniipe with mean values of 23.721mg/100g and 22.092mg/100g.
- 9 Magnesium (Mg) content in peels and food varied from 7.54mg/100g Keniipe to 10.6mg/100g Agalaberiba and 5.78mg/100g Maiipe to 8.74mg/100g Agalaberiba, while their mean values are 8.871mg/100g and 7.118mg/100g
- 10 Sodium (Na) content (mg/100g) in peels and food ranged from 10.66mg/100g Soranipe to 19.9mg/100g Agalaberiba and 8.46mg/100g Sorainipe to 17.84mg/100g Oyobaberiba with mean values of 14.414mg/100g and 12,217mg/100g.
- Potassium (K) content (mg/100g) in peels and food ranged from 14.36mg/100g
 Oyobaberiba to 16.76mg/100g Indouberiba and 10.6mg/100g Keniipe to13.6mg/100g
 Sorainipe having mean values of 15.623mg/100g and 12.502mg/100g.
- 12 Iron (Fe) content (mg/100g) in peels and food of plantain cultivars varied from 0.168mg/100g Indouberiba to 0.74mg/100gKeniipe and 0.287mg/100g Indouberiba to 0.725mg/100gKeniipe with average values of 0.4065mg/100g and 0.4687mg/100g.
- 13 Manganese (Mn) of content in peels and food swayed from 0.138mg/100g Indouberiba to 0.216mg/100g Agalaberiba and 0.194mg/100g Taraipe to 0.242mg/100g Agalaberiba, while their mean values are 0.1749mg/100g and 0.2176mg/10g respectively.
- 14 Copper (Cu) content (mg/100g) in peels and food ranged from 0.02038mg/100g Indoubariba to 0.092mg/100g Keniipe and 0.0342mg/100gNianipe to 0.087mg/100g Keniipe with average values of 0.05054mg/100g and 0.0545mg/100g.

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- 15 Zinc (Zn) content (mg/100g) in peels and food oscillated from 0.106mg/100gIndouberba to 0.426mg/100g Keniipe and 0.136mg/100g Opuasinberiba to 0.42mg/100g Keniipe and means 0.2255mg/100g and 0 2262mg/100g.
- 16 Phosphorous (P) content (mg/100g) in values varied from 0.227mg/100g Indouberiba to 0.486mg/100g Agalaberiba and 0.354mg/100g Indouberiba to 0.542mg/100g Sorainipe with average values of 0.3214mg/100g and 0.424mg/100g.

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- 1. Department of Biotechnology Ebonyi State University, Abakaliki, Ebonyi State, Nigeria.
- 2. Department of Medical Biochemistry, Faculty of Basic Medical Sciences, Federal University Ndufu-Alike Ikwo, Abakaliki, Nigeria.
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APPENDIX

PROXIMATE ANALYSIS OF COCOYAM VARIETIES

%Moisture			
Mean	60		
Standard Error	5.163977795		
Median	61		
Standard Deviation	12.64911064		
Sample Variance	160		
Kurtosis	-1.03325		
Skewness	-0.249029366		
Range	34		
Minimum	42		
Maximum	76		
Sum	360		
Count Largest(1)	6 76		
Smallest(1)	42		
Confidence Level(95.0%)	13.27442752		



%Ash	
Mean	1.05
Standard Error	0.062981
Median	1.04
Standard Deviation	0.154272
Sample Variance	0.0238
Kurtosis	-2.63945
Skewness	0.109813
Range	0.36
Minimum	0.88
Maximum	1.24
Sum	6.3
Count	6
Largest(1)	1.24
Smallest(1)	0.88
Confidence Level(95.0%)	0.161899



%Protein	
Mean	7.78
Standard Error	0.310441
Median	7.75
Standard Deviation	0.760421
Sample Variance	0.57824
Kurtosis	-0.00304
Skewness	-0.4765
Range	2.1
Minimum	6.58
Maximum	8.68
Sum	46.68
Count Largest(1)	6 8.68
Smallest(1)	6.58
Confidence Level(95.0%)	0.798013



%Lipid		
Mean	1.203333	
Standard Error	0.093047	
Median	1.3	
Standard Deviation	0.227918	
Sample Variance	0.051947	
Kurtosis	-1.20028	
Skewness	-0.89358	
Range	0.56	
Minimum	0.86	
Maximum	1.42	
Sum	7.22	
Count	6	
Largest(1)	1.42	
Smallest(1)	0.86	
Confidence Level(95.0%)	0.239185	



%Fibre	
Mean	2.17
Standard Error	0.094622
Median	2.2
Standard Deviation	0.231776
Sample Variance	0.05372
Kurtosis	-1.82023
Skewness	-0.25849
Range	0.56
Minimum	1.88
Maximum	2.44
Sum	13.02
Count Largest(1)	6 2.44
Smallest(1)	1.88
Confidence Level(95.0%)	0.243234



%DM		
Mean	40	
Standard Error	5.163978	
Median	39	
Standard Deviation	12.64911	
Sample Variance	160	
Kurtosis	-1.03325	
Skewness	0.249029	
Range	34	
Minimum	24	
Maximum	58	
Sum	240	
Count	6	
Largest(1)	58	
Smallest(1)	24	
Confidence Level(95.0%)	13.27443	



%NFE	
Mean	87.79667
Standard Error	0.335526
Median	87.72
Standard Deviation	0.821868
Sample Variance	0.675467
Kurtosis	-0.42965
Skewness	0.51093
Range	2.26
Minimum	86.81
Maximum	89.07
Sum	526.78
Count	6
Largest(1)	89.07
Smallest(1)	86.81
Confidence Level(95.0%)	0.862497



MINERAL ANALYSS	
Са	
Mean	32.8533333
Standard Error	1.24918818
Median	32.8
Standard Deviation	3.05987364
Sample Variance	9.36282667
Kurtosis	-1.443771
Skewness	-0.1241207
Range	7.62
Minimum	28.66
Maximum	36.28
Sum	197.12
Count	6
Largest(1)	36.28
Smallest(1)	28.66
Confidence Level(95.0%)	3.21114045



MINERAL ANALYSS	
Mg	
Mean	16.97333333
Standard Error	0.580566773
Median	17.08
Standard Deviation	1.422092355
Sample Variance	2.022346667
Kurtosis	-2.317275924
Skewness	-0.13572058
Range	3.16
Minimum	15.36
Maximum	18.52
Sum	101.84
Count	6
Largest(1)	18.52
Smallest(1)	15.36
Confidence Level(95.0%)	1.492394401



MINERAL ANALYSS	
Na	
Mean	25.64666667
Standard Error	0.833301333
Median	25.97
Standard Deviation	2.041163067
Sample Variance	4.166346667
Kurtosis	-0.39609819
Skewness	-0.73244723
Range	5.22
Minimum	22.4
Maximum	27.62
Sum	153.88
Count	6
Largest(1)	27.62
Smallest(1)	22.4
Confidence Level (95.0%)	2.142069269



MINERAL ANALYSS	
К	
Mean	31.55
Standard Error	2.671702329
Median	29.59
Standard Deviation	6.54430745
Sample Variance	42.82796
Kurtosis	-1.651699668
Skewness	0.5818481
Range	16.04
Minimum	24.34
Maximum	40.38
Sum	189.3
Count	6
Largest(1)	40.38
Smallest(1)	24.34
Confidence Level(95.0%)	6.867829476



MINERAL ANALYSS	
Fe	
Mean	0.356333333
Standard Error	0.029154378
Median	0.365
Standard Deviation	0.071413351
Sample Variance	0.005099867
Kurtosis	1.959899581
Skewness	-1.30628813
Range	0.198
Minimum	0.228
Maximum	0.426
Sum	2.138
Count	6
Largest(1)	0.426
Smallest(1)	0.228
Confidence Level(95.0%)	0.074943715



MINERAL ANALYSS	
Mn	
Mean	0.0355
Standard Error	0.002028957
Median	0.0365
Standard Deviation	0.004969909
Sample Variance	0.0000247
Kurtosis	-0.309626449
Skewness	-0.388573294
Range	0.014
Minimum	0.028
Maximum	0.042
Sum	0.213
Count	6
Largest(1)	0.042
Smallest(1)	0.028
Confidence Level(95.0%)	0.0052156



MINERAL ANALYSS	
Си	
Mean	0.02033333
Standard Error	0.00181965
Median	0.02
Standard Deviation	0.0044572
Sample Variance	1.9867E-05
Kurtosis	-1.12832755
Skewness	-0.14756294
Range	0.012
Minimum	0.014
Maximum	0.026
Sum	0.122
Count	6
Largest(1)	0.026
Smallest(1)	0.014
Confidence Level(95.0%)	0.00467755



MINERAL ANALYSS	
Zn	
Mean	0.113
Standard Error	0.002352304
Median	0.111
Standard Deviation	0.005761944
Sample Variance	0.0000332
Kurtosis	3.549136304
Skewness	1.806619145
Range	0.016
Minimum	0.108
Maximum	0.124
Sum	0.678
Count	6
Largest(1)	0.124
Smallest(1)	0.108
Confidence Level(95.0%)	0.00604679



MINERAL ANALYSS	
PO4	
Mean	0.5155
Standard Error	0.03229835
Median	0.5335
Standard Deviation	0.07911447
Sample Variance	0.0062591
Kurtosis	0.41525195
Skewness	-0.7970197
Range	0.224
Minimum	0.386
Maximum	0.61
Sum	3.093
Count	6
Largest(1)	0.61
Smallest(1)	0.386
Confidence Level (95.0%)	0.08302555



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	QUANTITATIVE		
WHITE COCOYARED COCOYAR			
Mean	16.27	10.616	
Standard Error	5.252100532	4.578886983	
Median	18.2	14.62	
Standard Deviation	11.74405381	10.23870255	
Sample Variance	137.9228	104.83103	
Kurtosis	-1.451596714	-2.28599404	
Skewness	-0.559130809	-0.11187741	
Range	27.3	23.07	
Minimum	0	0	
Maximum	27.3	23.07	
Sum	81.35	53.08	
Count	5	5	
Largest(1)	27.3	23.07	
Smallest(1)	0	0	
Confidence Level(95.0%)	14.58216881	12.71302835	



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	MINERAL ANALYSIS	
	WHITE COCOYAM	RED COCOYAM
Mean	8.087333333	11.28688889
Standard Error	4.003230695	5.667390337
Median	6.98	8.48
Standard Deviation	12.00969209	17.00217101
Sample Variance	144.232704	289.0738191
Kurtosis	6.202180433	5.767831729
Skewness	2.361565269	2.308894326
Range	38.174	53.442
Minimum	0.026	0.038
Maximum	38.2	53.48
Sum	72.786	101.582
Count	9	9
Largest(1)	38.2	53.48
Smallest(1)	0.026	0.038
Confidence Level(95.0%)	9.231466538	13.06902555



	PROXIMATE ANALYSIS	
	WHITE COCOYAM	RED COCOYAM
Mean	28.57142857	28.6
Standard Error	13.45699118	13.20635291
Median	5.8	7.26
Standard Deviation	35.60385205	34.94072552
Sample Variance	1267.634281	1220.8543
Kurtosis	-0.837154288	-0.722688542
Skewness	1.034900523	0.981900045
Range	84.92	85.46
Minimum	1.24	1.35
Maximum	86.16	86.81
Sum	200	200.2
Count	7	7
Largest(1)	86.16	86.81
Smallest(1)	1.24	1.35
Confidence Level (95.0%)	32.92807119	32.31478144

