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Phytochemical Screening, Proximate Analysis and Mineral Composition of Riped and Unriped Musa Species Grown in Anyigba and its Environs.

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Abstract **– Plantain and Banana fruits are widely consumed in Africa and some other parts of the world. Their peels (pericarp) which constitutes about 40% of the whole fruit weight is thought to be little or no significance, and hence, often discarded. The study was carried out to investigate the presence of mineral, nutrient and phytochemical to chemical composition on the riped and unriped peels of both *Musa parasidiasca* and *Musa sapientum*. The result for the nutritional contents were ranged as follows: moisture content (12.35 – 13.57%); fibre (8.17 – 29.45%); nitrogen free extracts (39.71 – 69.09%); protein (0.523 – 0.649%); fat (6.25 – 6.60%); and ash (3.14 – 10.50%). The mineral content for the samples; potassium (21,569.2 – 68,236.5mg/kg); Calcium (2,874.0 – 11.389.0 mg/kg); Magnesium (1020.5 – 4372.0mg/kg); sodium (972.1 – 2874.6 mg/kg); iron (171.0 – 406.0 mg/kg). Lead was not detected. The results indicated low ash contents (3.14 – 10.50%) and lipid content (0.21% - 0.35%). The results indicated that if the peels are properly exploited and processed, they could be a high quality and cheap sources of carbohydrate and minerals for livestock as well as sources for alkali for alkali based materials like soap.**

Keywords **– Minerals, Musa Parasidiasca, Musa Sapientum, Proximate Analysis, Phytochemicals.**

I. INTRODUCTION

Musa parasidiasca (plant) belongs to the natural order, *plantaginaceae* which contains more than 200 species, twenty-five or thirty of which have been reported [1]. The common plantain (*Plantango* major) has broad, irregular oval leaves, abruptly contracted at the base into a long broad, channelled footstack. The number of plantain cultivars has been reported to vary from one country to another [2]. In Nigeria, more than 20 cultivars have been reported, although only a few are important commercially. Plantain is a major starch crop of importance to humans in the tropical zone of Africa, Asia, Central and South America. It is consumed as an enough yielding food and desert, while Banana is a general term embracing a number of species or cultivars in the genus *Musa* of the family *Musaceae*. Most edible fruited bananas are usually seedless and belong to the species *Musa acuminata*, *Musa sapientum*, *Musa* cavedenshii, etc. Other species include *Musa balbisiano colla* of Southern Asia which bears a seeded fruit [3]. Plantain and Banana are very similar in appearance although the plantain is much taller in height, bigger in length and width and starchier rather than being sweet, plantain can be used unriped and cooked while banana is usually eater raw.

The chemical contents of various part of plantain and ba--nana plants have been reported and it varies with their level of maturity, degree of ripeness and soil type. Nutritional compositions of banana pulp studies showed to be affected by ripening [3]. Thus, understanding of the chemical changes associated with ripening may form the basis of expanding the utilization of every part of the crop [4]. The fruits are reported to compose mainly of water and carbohydrates. Indeed they are reliable sources of starch and energy ensuring food security for millions of households worldwide. The water content in the green plant is about 61% and increases on ripening to about 65%.

Plantain and Banana peels are agro-industrial by-products left behind after the edible portion has been processed into various food items by cooking, roasting or milling into flour. Locally, riped or unriped peels or wastes may be used to feed live stocks or in the production of local soaps, but in the areas where these are not feasible, these wastes end up polluting the environment [5].

The fundamental problem of this study is the continuous dumping of waste peels of plantain and banana. There is no little account of the reuse or recycle of the waste peels and this is perhaps because there is lack of information on the resources inherent in the peels. It has been reported that in Nigeria, especially in Kogi State, there is a large consumption of the plantain and banana fruits, eaten raw, cooked or milled into flour and local beer. Akinyele and Agboro reported over 2000 small scale plantain chips processing companies in Lagos metropolis alone that discards the peels after utilizing the starch fruits, hence constituting on environmental and disposal problems [6].

Although various studies have been carried out on the plantain and banana fruits (mesocarp), the purpose of the research therefore is to evaluate the plytochemical, proximate and mineral content on the riped and unripe peels (pericarp) of Plantain and Banana fruits.

II. MATERIALS AND METHODS

A. Study Area

Plantain and Banana fruits were sampled from orchards within Anyigba town in Dekina Local Government Area. Bunches of matured unripe fruits were harvested from their plants using sterilised knife. About 4.0g of the fruits were selected randomly from the braches. Half (2.0g) of the fruits were set aside to ripen and then sampled as the ripe fruits. The other half (2.0g) was immediately taken in clean polythene bags to the laboratory as the unripe fruit samples) [7].

B. Sample Preparation

In the laboratory, the unripe Plantain and Banana fruits

were carefully separated into mesocarp and pericarp. The mesocarps were discarded while the pericarps were thinly sliced and dried at room temperature and pounded with mortar and pestle into powdered form and kept air tight in previously washed, dried and labelled sample containers. The same applied to the riped samples. The powdered samples were used for ash, crude protein, crude fibre, crude fat, Nitrogen free extract, lipid extract and moisture content determination.

C. Phytochemical Analysis

Phytochemical screening of the peels was carried out on the aqueous extract and dried powdered specimens using standard procedures as described earlier by some researchers [8, 9, 10].

D. Proximate Analysis

Proximate analysis was carried out by the methods of Association of Official Analytical Chemicals (AOAC) [11]. Crude protein (Cp) was determined by multiplying crude nitrogen by a factor 6.25 which is based on the fact that most protein contains 16% nitrogen using Kjeldahl method. The moisture content (hot air oven method), Crude fat (soxhlet extraction method) using Pearson method [12], Ash content was determined using Forster, et al., method [13], lipid contents was determined using AOAC method. The total carbohydrate content was by the method of difference [14]. Mineral elements were estimated after wet oxidation of samples using concentrated nitric acid and perchloric acid as described by Osborne and Voogt [15]. The concentrations of the minerals in the digested samples were estimated with the thermo Scientific S Series Atomic Absorption Spectrophotometer and Flame Photometer.

III. Results

Table 1. Phytochemicals Present in Musa paradisiacal and Musa sapientum Peels.

Phytochemical	Riped plantains	Unripe plantains	Riped banana peels	Unripe banana peels
Tannins	+	+	+	+
Phlobatannins	+	+	+	+
Flavonoids	+	+	+	+
Glycosidea	+	+	+	+
Terpenoids	+	+	+	+
Alkaloids	+	+	+	+

+ = present.

Result of the proximate analysis of *Musa paradisiacal* and *Musa sapientum* (ripe and unripe) peels showed that the peels contain varying percentage content of carbohydrate, crude protein, fat, fibre, ash, lipid and moisture.

Table 2. Proximate Composition of Musa paradisiacal and Musa sapientum peels (ripe and unripe peels).

Composition	Unriped plantain	Riped plantain	Unriped banana	Riped banana
% Moisture	12.35	14.24	12.54	13.57
% Ash	3.14	4.99	6.80	10.50
% Fat	6.60	5.70	7.59	6.25
% Protein	0.65	0.50	0.78	0.52
% Lipid	0.30	0.21	0.35	0.52
% Fibre	8.17	19.48	18.60	29.45
% NFE.	69.09	55.09	53.69	39.71

Musa paradisiacal and *Musa sapientum* peels (ripe and unripe) showed that the peels contain iron (Fe), Potassium (K) , Sodium (Na), Lead (Pb), Magnesium (Mg), Copper (Cu), Zinc (Zn), Calcium (Ca).

Table 3. Mineral Composition of Musa Paradisiacal and Musa Sapientum Peels (ppm).

	Samples			
Mineral (ppm)	Riped plantain	Unriped plantain	Ripe banana	Unriped banana
Fe	254.0	268.0	406.0	171.0
K	26,526.5	21,569.2	68,236.5	24,904.3
Na	2801.6	972.1	1933.7	2077.6
Pb	ND	ND	ND	ND
Mg	3782.0	`4364.0	4372.0	1020.5
Cu	120.4	125.0	130.3	133.0
Zn	ND	ND	ND	ND
Ca	8386.0	7470.5	11,389.0	2874.0

ND = Not detected

IV. Discussion

There is documented information on the presence of some active substances in various plants, which basically serve as food and medicinal herbs abound [16]. Many works has been done to determine the phytochemical compositions as well as mineral composition of different parts of diverse plants, with the aim of using these plants for various purposes. The objective of this study was to evaluate the phytochemical profile, proximate composition and mineral composition of *Musa paradisiacal* and *Musa sapientum* peels.

The bioactive compounds contained in plants are majorly responsible for their medicinal properties [16]. Flavoniods, phlobatannins, tannins, glycosides, terpenoids and alkaloids were found to be present in both ripe and unripe peels of *Musa* P*aradisiaca* and *Musa Sapientum*. It has been reported previously that these phytochemicals perform multiple biological and pharmacological functions/activities [1]. The presence of these bioactive substances in both *Musa Paradisiaca* and *Musa Sapientum* peels therefore suggests that the peels possess valuable medicinal potential yet to be explored. Both peels showed relatively high levels of Iron (171.0 – 268.0 ppm), Potassium (21,569.2 – 68,236.5 ppm), Sodium (972.1 – 2801.6 ppm), Magnesium (1020.5 – 4372.0 ppm), Calcium (2874.0 – 11,389.0 ppm), Copper (120.4 – 133.0 ppm).

Both riped and unriped peels of plantain and banana showed relatively high level of potassium, magnesium and calcium. The dominating alkali metal in all the samples was found to be potassium (2156.2 – 68236.5mg/kg). The result agrees with Debabandya, *et al*. who stated that banana fruit

has high concentration of potassium, which explains the use of plantain and banana peels as source of alkali in soap making [17]. The appreciable high content of potassium signifies that if the peel is taken by animals, it will help in the regulation of body fluids and maintain normal body pressure. The substantial amount of iron in the peels is important as the element plays a critical role in blood formation and overall improvement of the haemopoetic system [1]. The heavy metal, lead and zinc were not detected.

The nitrogen free extract (NFE) which comprises of all soluble carbohydrates and other digestible and easily utilizable nitrogenous substances was the most abundant components in all the peels. Plantain samples have higher values of NFE (69.09% for unriped and 55.09% for riped peels) which decreased on ripening. The moisture content increased on ripening for both plantain and banana samples with riped plantain having the highest moisture content 14.24%. This increase explains the softening texture of the plantain and banana peels. This agrees with values obtained by a researcher where moisture level of most fresh fruits is in the range 75 – 90% [18].

Crude fibre content from the different samples was found to increase on ripening and was highest in riped banana (29.45%). Crude fibre and NFE contents are main sources of dietary energy and have relatively values suitable for use as feed supplements for animals, thus the peels can be used as replacement for the more expensive feed alternatives thereby reducing the cost of animal production and curtail environmental filth and disposal problems associated with the peels of plantain and banana in Nigeria.

Fat extract obtained ranged from 5.70 to 7.59%. Unriped banana had the highest fat content of 7.59% and this value decreased on ripening to 6.25%. This is in agreement with the statement that peels contained almost four times more lipid than the pulp and unsaturated fatty acids decreases in both pulp and peel during ripening (Bayeri, et al, 2011) [19]. Protein content obtained was quite low and ranges from 0.5009% to 0.7793% and showed little decrease on ripening. Ash content values increases with ripening and ranged from 3.14% to 10.5% similar to result from ash analysis of banana fruits [4]. The relatively high ash, crude fibre and crude protein contents of the pericarps (peels) likely gives the pericarps a good taste and perhaps explains why animals seem to relish the pericarps, especially those of the fruits.

V. Conclusion

The variation in the result gathered from the research work correlates with the statement that ripening occurs as a result of chemical changes; as such the following conclusions on the proximate analysis of plantain and banana peels were made.

Plantain and banana peels contain good nitrogen free extract, lipid and crude fibre contents which are all the main sources of dietary energy and have values that are suitable for the use as feed supplements for feeding animals such as sheep's and even fishes thus replacing the more expensive maize, thereby reducing the cost of production and curtail environmental filth and disposal problems associated with plantain peels in Nigeria.

The peels also showed favourable concentrations of minerals. The appreciable high content of potassium signifies that the peel taken by animals will help in the regulation of body fluids and maintain normal body pressure. The low non content of the peels is also necessary as too much of it would lead to abnormal functioning of the immune system, cell growth and the heart. Iron is essential as it carries oxygen to the cells and is necessary for the production of energy. Plantain and banana peels contain high contents of potassium and thus the peels are very good sources of the much needed alkali based products, for example, in the production of locally made soap.

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