

**PHYTOCHEMICAL SCREENING OF SOME SELECTED BANANA PEELS OF MUSA ACUMINATA SPECIE**

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**ABSTRACT**

The study investigates the phytochemicals present in peels of selected banana species (*Musa accuminata* cv cavendish banana, *Musa accuminata* cv red skin banana, *Musa accuminata* cv white skin banana). The banana fruits used were bought at Apata market, Ibadan, and later peeled. The peels were air dried and subjected to extraction process using methanol maceration. The phytochemicals screened were tannin, flavonoid, saponin, oxalate, T. phenols, steroids, and terpenoid. The results showed that all phytochemicals screened were present in the peels at appropriate levels recorded (Oxalate ranges between 4.33 – 1.16, tannin between 5.00 – 5.75, flavonoid between 6.94 – 8.75, steroid between 0.1 – 0.185, terpenoid ranges between 0.21 – 0.28, T. phenol range between 53.35 – 82.20 and saponin between 0.075 – 0.25).

**Keywords:** Saponin, Phytochemicals, Banana, Peels.

**1. INTRODUCTION**

Bananas constitute the fourth most important global food commodity (after rice, wheat and maize) grown in more than 100 countries over a harvested area of approximately 10 million hectares, with an annual production of 88 million tonnes (Frison and Sharrock, 2001). The all year round fruiting habit of bananas put the crop in a superior position in bridging the ‘hunger gap’ between crop harvests. It therefore contributes significantly to food and income security of people engaged in its production and trade, carbohydrate requirement for over 70 million people (IITA, 2002). Eastern and Southern Africa produces over 20 million tonnes of bananas which accounts for 25.58% of total world output (Karamura *et al.*, 2006). The Great Lakes region covering parts of Uganda, Rwanda, Burundi, Tanzania, Kenya and DRC is the largest producer and consumer of bananas in Africa (Smale, 2006) where per capital consumption has been estimated at more than 250kg; the highest in the world (FAO, 2002).

All parts of the banana plant have medicinal applications (Amit and Shailandra, 2006): The cooked flowers are given to diabetics; the astringent plant sap in cases of hysteria, epilepsy, leprosy, fevers, hemorrhages, acute dysentery and diarrhea, and it is applied on hemorrhoids, insect and other stings and bites; young leaves are placed as poultices on burns and other skin afflictions; the astringent ashes of the unripe peel and of the leaves are taken in dysentery and diarrhea and used for treating malignant ulcers (Girish and Satish, 2008); the roots are

administered in digestive disorders, dysentery and other ailments; banana seed mucilage is given in cases of diarrhea in India (Bhat *et al.*, 2010).

Antifungal and antibiotic principles are found in the peel of fully ripe bananas (Brooks, 2008). The antibiotic acts against Mycobacteria (*Omojasola and Jilani, 2009*). A fungicide in the peel of green fruits is active against a fungus disease of tomato plants (Ponnuswamy *et al.*, 2011).

Norepinephrine, dopamine, serotonin are also present in the ripe peel (Ratule *et al.*, 2007). The first two elevate blood pressure; serotonin inhibits gastric secretion and stimulates the smooth muscle of the intestines (Anhwang *et al.*, 2009).

Some of the specific diseases known to be cured by banana are Anaemia, High in iron: bananas are believed to stimulate the production of haemoglobin in the blood and also help in cases of anaemia (Amit and Shailandra, 2006). Blood Pressure: Banana is extremely high in potassium yet low in salt, making it the perfect food for helping to beat down blood pressure (Debabandya *et al.*, 2010). Depression: This is because bananas contain tryptophan, a type of protein that the body converts into serotonin known to make you relax, improve your mood and generally make you feel happier (Girish and Satish, 2008).

Banana peels are widely used by smallholders as supplementary feeds for cattle and small ruminants in the tropics (Onwuka *et al.*, 2009; Emaga *et al.*, 2011). There are nutritive values for ruminants are estimated to be similar to that of cassava peels or citrus. Green peels contain more metabolized than ripe peels. More research is needed into the value of the pods as feed as also the potential effect of the change in tannin content during ripening (Happ Emaga *et al.*, 2011).

Although the use of peels of the fruit are not well recognized and its wider use can only be know through phytochemical analysis. Peels of some fruits are tightly stuck with other parts of the fruit while some are loosely peeled off when ripe. (Banana and Orange). Depending on the thickness and taste, fruit peel is basically an essential part for some. (Wiki, 2004)

Reports have shown that fruit and vegetable are sources of phytochemical thereby; discovery needs to be made on their potential even in some parts named as waste (peels). These natural secondary metabolites (phyto-nutrient) can inhibit the growth of pathogen or kill them and have at least toxicity effect (compare to the synthetic counterparts) to host cell that make them good alternatives to develop new antimicrobial medicine (Sheikhlar *et al.*, 2013).

A large number of research studies have shown that a diet rich in antioxidant (vitamins) and other compound such as flavonoids is associated with improved health with lower risk in coronary disease and to prevent cancer. In addition to these antioxidants, and their function, improve the immune system. In other to determine the level of antioxidant or have knowledge of phytochemical present in certain food supply, there is need for research on such. The general term used for this is phytochemical or phytonutrient (Chung, 1998).

Phytochemicals are non-nutritive plant chemicals possessing varying degrees of disease-preventive properties. They are invaluable sources of raw materials for both traditional and orthodox medicine. Phytochemicals may display their health protective effects in diverse ways.

They can act as antioxidants and protect cells against free radical damage, e.g. polyphenols, carotenoids etc (Omoregiem and Osagie, 2012). They may also help in reducing risk for cancer by inhibiting tumor production (Devasagayam *et al.*, 2004). Other modes of action are via antibacterial activity and hormonal stimulation (Mathew *et al.*, 2012).

Phytochemical are plant derived chemicals, which are beneficial to human's health and disease prevention. In their primary state, plants, phytochemicals attract beneficial and repel harmful organism. Phytochemical like flavonoid functions as pathogen resistance (Agte,2000).

Phytochemicals are bioactive chemicals of plant origin. They are regarded as secondary metabolites because the plants that manufacture them may have little need for them. They are naturally synthesized in all parts of the plant body; bark, leaves, stem, root, flower, fruits, peel, seeds, etc. i.e. any part of the plant body may contain active components. T P. Tiwari, 2011.

The quantity and quality of phytochemicals present in plant parts may differ from one part to another. In fact, there is lack of information on the distribution of the biological activity in different plant parts essentially related to the difference in distribution of active compounds (or active principles) which are more frequent in some plant parts than in others .M. Lahlou,, 2004.

Phytochemicals have been recognized as the basis for traditional herbal medicine practiced in the past ( Lalitha *et al.*, 2012). In the search for phytochemicals that may be of benefit to the pharmaceutical industry, researchers sometimes follow leads provided by local healers in a region [D. K. Shrivastava, 2010]. Following such leads, plant parts are usually screened for phytochemicals that may be present. The presence of a phytochemical of interest may lead to its further isolation, purification and characterization. Then it can be used as the basis for a new pharmaceutical product. The general objective of this study is to screen the phytochemical in the peels of some selected varieties of banana and to compare the phytochemicals in the three selected species.

## **2. MATERIALS AND METHOD**

### **SAMPLES COLLECTION**

The fruit of the samples used are *Musa acuminata* cv cavendish banana, *Musa acuminata* cv red skin banana, and *Musa acuminata* cv white skin banana, were bought at Apata Market, Ibadan, Oyo state. The fruit were washed in clean water and dried with towel and after drying, the peels were carefully stripped off from the fruit. The stripped peels were then sun dried to reduce the moisture. After drying, the peels are packed in a container and carefully label to avoid misrepresentation during pounding into powdery form.

### **Preparation Of Extracts**

The dried powder of each peel was subjected to maceration by 95% methanol in a 1L capacity conical flask and dispensed in 900ml of distilled water. The mixture was stirred vigorously intermittently with a magnetic stirrer and then allowed to stand for 48h. It was stirred again and filtered through a Whatman filter paper lined funnel into a conical flask. The obtain extracts were

used for the phytochemical screening. (Harikrishnam *et al.*, 2009) All extracts obtained were stored in a refrigerator until required for use.

### **Phytochemical Analysis**

The extracts of *Musa acuminata* cv cavendish banana, *Musa acuminata* cv red skin banana, and *Musa acuminata* cv white skin banana peels were analysed for T.phenol, tannins, oxalate, steroids, flavonoids, saponins and terpenol using standard procedures.

#### **Test for Flavonoids**

This was determined according to the method of Harborne (1973). 2gram of the sample was boiled in 20ml of methanol, a chip of magnesium metal was served to the mixture and thereafter a few drops of HCl solution were added into it. The existence of a pink – red or orange colour displayed the presence of flavonoids (Harborne, 1998).

#### **Test for Oxalate**

1gram of the extracts was dissolved in 5ml of HCL (11%) on steam bath. One milliliter of the filtrate was supplemented with few drops of Dragendoff's reagent. Greenish precipitate was considered as an indicator for the presence of oxalate. (Trease and Evans, 1989)

#### **Test for Saponins:**

Test of froth was used to indicate the presence of saponin. 5gram of the extract was treated with 15ml methanol. After evaporation, the residue was shaken strongly, with ethyl ether and 5ml of HCL. The formation of a stable emulsion indicated the presence of saponins (Trease and Evans, 1996)

#### **Test for Tannins:**

One gram of each extract made was dissolve in 10ml of distilled water and filtered a blue colour resulting from FeCl<sub>3</sub> ferric chloride reagent to the filtrate indicated the presence of tannins in each extract. (Trease and Evans, 1996)

#### **Test for T. Phenols**

To determine the presence of T. phenol compound in extracts, 2gram of the extract was treated with 2ml ferric chloride. A deep blue or black color that appear was an indicator of phenols (Houghton and Raman, 1998).

#### **Test for Steroids**

Steroid content of the plant sample was determined using the method described by Trease and (Evans, 1996). A portion of 2 mL was taken from a solution of 2.5 g of powdered plant material prepared in 50 mL of distilled water after vigorous shaking for some minute. The extract solution was washed with 3 mL of 0.1 M NaOH (pH 9) and later mixed with 2 mL of chloroform and 3 mL of ice-cold acetic anhydride followed by adding two drops of concentrated H<sub>2</sub>SO<sub>4</sub>

cautiously. The absorbance of both sample and blank were measured spectrophotometrically at 420 nm. A red colouration confirmed the presence of steroids

### Test for Terpenoids

1ml of chloroform was added to 2ml of each extract followed by a few drops of concentrated sulphuric acid. A reddish brown precipitate produced immediately indicated the presence of terpenoids. (Houghton and Raman, 1998)

### Statistical Analysis

Homogenous sample of each of the peel of the *Musa acuminata* cv cavendish banana, *Musa acuminata* cv red skin banana, and *Musa acuminata* cv white skin banana was subjected to phytochemical analysis for qualitative and quantitative determination of phytochemical (Sofowora, 1993). The quantitative data obtained was statistically analyzed using one way Analysis of Variance.

### Analysis Of Variance

Analysis of Variance (ANOVA) was conducted to estimate the relative significance of various source of variation on T phenol, tannins, oxalate, steroids, flavonoids, saponins and terpenol.

## 3. RESULT AND DISCUSSION

**Table 4.1: Phytochemical analysis of three Banana Fruit Peel**

Banana Species	Cavendish Peel	Red Skin Peel	White Skin Peel
Flavonoids	++	+++	+++
Saponin	-	-	-
Tannin	+	+	+
T.phenol	+++	+++	++
Oxalate	-	-	-
Steroid	+	+	+
Terpenoid	+	+	+

All tests were carried out in triplicates.

KEY: +++ = Highly present; ++ = Moderate present; + = Less present; - = Absent

Flavonoids are known for their antioxidant and anti-inflammatory health benefits as the support of cardiovascular and nervous system. (Hollman, 1997 and Kumar, 1991). Cavendish banana contain anthocyanins which belong to the parent class of molecules called flavonoids. Based on this, the laboratory research as well as studies in animals and humans suggested that anthocyanins may play important roles in helping reduced the risk of cardiovascular disease (CVD), cognitive decline and cancer. Wallace T.C (2011). Some plant saponins (e.g. from oat and spinach) may enhance nutrient absorption and aid in animal digestion. However saponins are often bitter to taste, and so can reduce plant palatability (e.g., In livestock feeds) or even imbue them with life threatening animals toxicity. Foerster, Hartmut (2006). The saponin content of the peel meals were observed to be absent which was reported by Kumar (1991) to be responsible for cattle losses when they grazed on *Drymaria acrenaroides (alfonibrilla)* and thus may not be hazardous to livestock. Oxalate, in the body, oxalic acid combine with divalent metallic cations such as calcium and iron to form crystals of the corresponding oxalates which are then excreted in urine as minute crystals. These oxalates can form larger kidney stones that can obstruct the kidney tubules. An estimated 80% of kidney stones are formed from calcium oxalate. Worcester (2005). At high concentrations, oxalate causes death in animals due to its corrosive effects (Kumar 1991). Those with kidney disorders, gout, rheumatoid arthritis, or certain of chronic vulvar pain (vulvodynia) are typically advised to avoid foods high in oxalic acid. Fretzdorff, B (2005).

Tannins compound are widely distributed in many species of plants, where they play a role in protection from predation, and perhaps also a pesticides, and in plant growth regulation. Katie E, Ferrell (2006). The astringency from the tannins is what causes the dry and pucker feeling in the mouth following the consumption of unripened fruit or red wine or tea. M.C Gee, Harold (2004). Recent studies have demonstrated that product containing chestnut tannins included at low dosages (0.15-0.22) in the diet of chickens may be beneficial. Schavone. *et al.*, (March 2008). Barry (1987) opined that tannin if less than 2-3% is beneficial for feeding ruminant animal.

Steroid is an organic compound with four rings arranged in a specific configuration. Example include the dilatory lipid cholesterol, the sex hormones estradiol and testosterone. Adolf Butenandt and Leopold Ruzicka (1939). Steroids have two principal biological function; certain steroid (such as cholesterol) are important component of cell membranes which alter membrane fluidity, and many steroids are signaling molecules which activate steroid hormone receptors.

Terpenoid are used extensively for their aromatic qualities and play a role in traditional herbal remedies. Terpenoids contribute to the scent of eucalyptus, the flavors of cinnamon, cloves, and ginger, the yellow color in sunflowers, and the red color in tomatoes. Ayoola, GA (2008). The steroid and sterols in animals are biologically produced from terpenoid precursors. Sometimes terpenoid are added to protein, e.g., to enhance their attachment to the cell membrane.

Many recent reports had shown that there is a direct relationship between total phenol content and the antioxidant activity in some food (Obboh, 2006), hence, could have antioxidant activity. In his work, Pieta (2000) reported that the phenolic compound are responsible for the most of the antioxidant in plant and these are packed in bra for maize and peels for banana all this are known as a waste. Obboh (2006) concluded that peels of banana are capable of causing various

inhibitor of lipid peroxidation in liver, kidney and in tested cow's heart. Organically grown potatoes, orange and leaf vegetables have more phenolic compound and this may provide antioxidant protection against heart disease and cancer. Asami, Danny K. (2003).

**Table 4.2: Quantitative analysis of phytochemical (mg/g) in three banana peels**

Samples	Flavonoid	Saponin	Terpenoid	Oxalate	Steroid	Tanin	T phenol
T1	6.94 ± 0.02	0.25 ± 0.01	0.28 ± 0.01	2.75 ± 0.25	0.185 ± 0.00	5.60 ± 0.02	74.45 ± 0.95
T2	8.75 ± 0.11	0.135 ± 0.02	0.23 ± 0.00	4.33 ± 0.23	0.175 ± 0.00	5.75 ± 0.03	82.20 ± 0.10
T3	8.53 ± 0.04	0.075 ± 0.02	0.21 ± 0.00	1.16 ± 0.08	0.10 ± 0.01	5.00 ± 0.37	53.35 ± 1.85
GM	8.07	0.153	0.24	2.75	0.15	5.28	70.00
Fcal	229.98	43.14	117.61	61.88	235.88	10.45	445.86
LSD	0.382	0.079	0.02	1.185	0.02	1.24	6.79
CV (%)	1.14	12.49	2.07	10.37	2.78	5.67	2.33

Key: T1= Cavendish Banana, T2 = Red Banana, T3 = White Banana

Oxalate was detected in banana peel meal and its concentration was between 1.16 - 4.33. White skin banana has the lowest concentration which is 1.16. The concentration seems low compare with 100-900mg for sweet potatoes, cocoa powder, beets and spinach. At high concentration/oxalate intake may be linked to the development of autism. Many of the food that contain oxalate are healthy foods that contain important antioxidants, fiber and other nutrient. At high concentration, oxalate causes death in animals and calcium oxalate stones.(Kumar, 1991)

Tannin range between 5.00 - 5.75 in banana peels. This is lower than 1-2mg commonly found in cereals and legumes reported to have depressed the growth rate, resulted in a poor feed efficiency ratio and increases the amount of food per unit weight gain in non-ruminants (Price and Bulter, 1980). Tannin negatively affect an animal's feed intake, feed digestibility, and efficiency of production.

Also, steroid range from 0.1 - 0.185 in this sample analyzed. In a study, steroid in the body can act as hormones, and, therefore, their presence can impact a number of things from growth to sexual development. Adolf Butenandt (1939). Steroid such as cholesterol are important component of cell membranes which alter membrane fluidity.

Flavonoid range between 6.94 - 8.75 in the sample analyzed. In a study, in terms of their anti-cancer potential, research on flavonoids has been somewhat mixed. Due to their well documented antioxidant and anti-inflammatory properties, flavonoids would be expected to lower risk of certain cancers since chronic oxidative stress and chronic unwanted inflammation can place cells at greater risk of becoming cancerous.

Furthermore, terpenoid range between 0.21 - 0.28 in banana fruit. This is observed to be low when compared with terpenoid content of 146mg and 353mg in maize, 206 and 280mg in shorgum, 14mg in potato (Concon, 1988), 624mg,855mg and 637mg in cassava, cocoyam and yam respectively (Marfo and Oke, 1988). Since it is low it is considered to be safe livestock consumption.

Quantitatively, Total phenol range between 53.35 - 82.20mg/g in the sample. it is believed that phenol inhibit the growth of microbial organism when extracted with methanol after been tested on *staphylococcus aureus* (Gam-positive bacterial). (Sheikhlar, *et al.*,2013). They are also produced by plants and microorganisms, with variation between and within species.

Saponin level range from 0.075- 0.25 in the samples. In a research project, banana peel meals research were between 0.30 and 0.140 comparatively, the saponin level in is low and Kumar (1991) reported meals containing appreciably below3mg% is safe for livestock to feed on.

#### **4. CONCLUSION AND RECOMMENDATION**

Phytochemical screening test reveal the presence of Tannin, Saponin, Flavonoid, Oxalate, Terpenoid, Steroid, T.phenol in the extract of banana peels samples. Each of these phytochemical is responsible for various protective and therapeutic effects. Phenol in proper level serves as erythrocyte membrane modifiers. The use of banana peels as food for animal supplement could be accountable for their uses and various antioxidants present in them which may be due to desirable presence of antioxidant properties molecules found in them. It was also observed that the concentration of these phytochemical were lower than the levels at which they are toxic to the body

#### **5.RECOMMENDATION**

Banana peels are major agricultural wastes which have been used as medicine, animal feeds, blacking of leathers (Hephburn and Blow, 2003; Wikipedia, 2007).

Banana peels are not poisonous. In fact, they're edible, and packed with nutrients. It contains high amounts of some vitamins, as well as magnesium and potassium, it also contain some fiber and protein. In the field of medicine, cavendish banana peel has been found to suppress testosterone-induced prostate gland enlargement. Red skin banana are exceptionally high in antioxidants they also contain high content in some compounds that protect cells from the sort of mutations that lead to cancerous tumors. It is also help prevent red blood cells from breaking down. The peels of banana were found not to be toxic for human when use at appropriate level. The use of white skin banana according to research has proven countless studies to aid in lowering cholesterol.



The use of banana peels will reduce environmental pollution, cost incurred and full usage of natural nutrient found in them. In Nigeria, the use of banana peels can serve as source of employment and therefore, reducing the level of unemployment in our country. From the result obtained, it can be recommended for the quantification of various phytochemicals then isolation of characterization of pure compounds from the extracts for future studies.

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