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Phytochemical Screening, Proximate Analysis and Anti-Oxidant Activities of Ripe and Unripe Plantain Powder of *Musa paradisiaca* and *Musa accuminata*

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Abstract: The objective of the research work was to compare the phytochemical constituents, macronutrients and the antioxidant activities of two species of the unripe and ripe methanolic extracts of *Musa paradisiaca and Musa accuminata* flour. The phytochemical screening was carried out using standard procedures, while the radical scavenging ability was carried out using the stable radical 1,1-Diphenyl-1-picrylhydrazyl (DPPH). The phytochemical screening revealed that the unripe *M. Paradisiaca* powder contains steroids, terpenoids and saponins, whereas the ripe *M. Paradisiaca* powder contains volatile oil, while both the ripe and unripe *M. Paradisiaca* contain triterpenoids, cardiac glycosides, flavonoids, alkaloids and carbohydrates. The ripe *M. accuminata* powder contains steroids, terpenoids, glycosides and balsams, while the unripe *M. accuminata* does not contain any of these but both the ripe and unripe *M. accuminata* powder contain triterpenoids, cardiac glycosides, flavonoids, alkaloids, carbohydrates and saponins. The proximate composition (%) of the plantain powder are; (2.38) ash, (8.40) moisture, (0.64) crude protein, (0.77) crude fibre, (0.14) crude lipid, and (87.67) carbohydrate for the unripe powder of *M. paradisiaca*. (2.30) ash, (9.97) moisture, (0.55) crude protein, (1.00) crude lipid and (86.02) carbohydrate for the ripe powder. While, (3.23) ash, (10.97) moisture, (0.74) crude protein, (1.57) crude fibre, (0.16) crude lipid and (84.90) carbohydrate were obtained for the unripe powder of *M. accuminata*. The ripe powder has (3.36) ash, (12.15) moisture, (1.08) crude protein, (1.87) crude fibre, (0.15) crude lipid and (81.39) carbohydrate. The unripe powder of *Musa paradisiaca* shows more scavenging activity on DPPH radical than the unripe powder of *Musa accuminata*.

Keywords: *Musa paradisiaca*, *Musa accuminata*, Antioxidant, Phytochemical Sreening, Proximate Composition, Methanolic Extract, Diphenylpicrylhydrazyl

1. Introduction

Musa paradisiaca and *Musa accuminata* are species of plantain that belong to the family *Musaceae*. Plantain is cultivated in tropical and subtropical regions and is native to southeast Asia and India. The friuts are starch-rich when unripe but when they are ripen the starch turns into simple sugars (sucrose, glucose and fructose). Plantain is a source of starchy staple food for millions of people in Nigeria. The unripe plantain has been documented as Hypoglycemic plant, as it has been noted for its low sugar, as such used in the management of diabetic complications. Plantains are also reported to be a great source of calcium, vitamins A, B1, B2, B3, B6, C and minerals such as potassium and phosphorus[1]. Different varieties of plantain are consumed by the households in Nigeria but the most preferred plantain varieties are the false horn type,locally known as '*Agbagba*'[2]. When processed into flour, it is used traditionally for preparation of gruel which is made by mixing the flour with appropriate quantities of boiling water to form a thick paste,locally known as '*amala*'.This study therefore seeks to determine and compare the antioxidant properties, phytochemical constituents and proximate composition of the ripe and unripe powder of *M. paradisiaca* and *M. accuminata.*

Phytochemicals are secondary metabolites produced by plants[3].Their presence in plant gives it its medicinal value and produce physiological action in human body[4]. Natural phytochemicals formulate antioxidant based drugs.

Antioxidants are radical scavengers that inhibit the oxidation of other molecules and protects the body against free radicals that may cause pathological conditions.

2. Materials and Methods

2.1. Collection of Samples

The unripe plantain was obtained freshly from Kwali area council, Abuja, Nigeria. The two species each from separate branch were rinsed with water and divided into two parts. The unripe portion was peeled and sliced into smaller sizes and air dried for about three days then pulverized and kept in an air tight container at room temperature for further analysis. The other portion was kept at room temperature to ripe after which it was peeled and sliced into smaller sizes and air dried for about three days then pulverized and keept in an air tight container at room temperature for further analysis.

2.2. Preparation of Extracts

The powdered sample was extracted with methanol using a soxhlet extractor for a period of 5 hours. The extract was collected after concentratIon to dryness on a water bath.

2.3. Phytochemical Sreening of Extracts

The phytochemical screening was carried out on the methanolic extract using the method decribed by Uzama [5] and Sofowora [6].

2.4. Antioxidant Potential of the Extract

The following concentrations of the extract were prepared, 0.05, 0.1, 0.5, 1, 2, and 5mg/ml in methanol. Vitamin C was used as the antioxidant standard at concentration of 0.05, 0.1, 0.5, 1, 2, and 5 mg/ml.

1ml of the extract was placed in a test tube and 3ml of methanol added followed by 0.5ml of 1mM 1,1-Diphenyl-1-picrylhydrazyl (DPPH) in methanol. A blanck solution was prepared containing methanol and DPPH. The radical scavenging activity of the extract against the DPPH radical was determined by spectrophotometer at 517 nm and the radical scavenging activity was calculate using the formula % inhibition = (Ab - Aa)/Ab x 100. where Ab is the absorbance of blanck, and Aa is the absorbance of extract.

2.5. Proximate Analysis

Moisture content, crude fibre and crude lipid, were determined using the method described by Udo and Ogunwale [7]. The ash content and carbohydrate were determined by standard method, while the crude protein was determined using the Micro-kjeddahl method described by AOAC [8].

3. Results and Discussions

3.1. Proximate Composition (%)

Table 1a and 1b below summarize the proximate compositions of the varieties of the plantain powder. Moisture content of oven dried powder of ripe *M. accuminata* is (12.15 %), this value is higher compared to the unripe powdered sample (10.97 %), *M. paradisiaca* ripe powder shows a higher value of (9.97%) compared to the unripe powdered sample with a value of (8.40%). The moisture content increases as it ripes. Thus, the ripe powder would not be suitable for storage. Moisture content is a key to determining when a substance is safe to be packaged. A difference of less than 1 was observed between ash content of *M. accuminata* ripe and unripe powder samples, (2.30%) and (2.38%) respectively. On the other hand between ash content of *M. paradisiaca* (3.23%) unripe powder sample and (3.36%) ripe powder sample. Plantains are considered as starchy staple food. Starch is the major component of unripe plantain. The carbohydrate content was calculated by difference, unripe powder sample of *M. accuminata* was found to be (84.90 %) and (81.39 %) for the ripe powder. While (87.40%) was obtained for unripe powder of *M. paradisiaca*, and (86.02%) for the ripe powder. As shown in tables 1a and 1b below, the crude protein and crude lipid did not show significant difference among the four powders. The ripe powder of *M. accuminata* has more crude fibre content (1.81%) than the unripe powder with (1.57%). A little difference was observed (1.00%) for the ripe powder of *M. paradisaica*, and (0.77%) for the unripe powder.

Table 1a. *Proximate composition of the unripe and ripe powder sample of M. Paradisiaca.*

Parameters	Unripe M. paradisiaca Powder	Ripe M. paradisiaca powder
Moisture content	8.40	9.97
Ash content	2.38	2.30
Crude protein	0.64	0.55
Crude fibre	0.77	1.00
Crude lipid	0.14	0.16
Carbohydate	87.67	86.02

Table 1b. *Proximate composition of the unripe and ripe powder sample of M. accuminata.*

Parameters	Unripe M. accuminata Powder	Ripe M. accuminata Powder
Moisture content	10.97	12.15
Ash content	3.23	3.36
Crude protein	0.74	1.08
Crude fibre	1.57	1.87
Crude lipid	0.16	0.15
Carbohydrate	84.90	81.39

3.2. Phytochemical Composition of the Methanolic Extracts of M. Accuminata and M. Paradisiaca Powder

Phytochemical screening revealed some differences in the constituents in table 2a below. The unripe powder of *M. Paradisiaca* methanolic extract contains steriods, terpenoids and saponnin. Whereas, these appear to be absent in the ripe powder of *M. Paradisiaca*. Volatile oil was present in the ripe powder, but absent in the unripe powder. Both the ripe and unripe *M. Paradisiaca* contain triterpenoids, cardiac

gylcosides, flavonoids, alkaloids and carbohydrates. In table 2b below, the ripe *M. accuminata* contains steroids, terpenoids, glycosides and balsams, while the unripe *M. accuminata* does not contain any of these but both the ripe and unripe *M. accuminata* contain triterpenoids, cardiac glycosides, flavonoids, alkaloids, carbohydrates and saponins.

Table 2a. *Phytochemical composition of the methanolic extract of M. Paradisiaca powder.*

Phytochemical constituent	Unripe powder	Ripe powder
Tanins	-	-
Steriods	+	-
Glycoside	-	-
Terpenoid	+	-
Triterpenoids	+	+
Cardiac Glycoside	+	+
Flavonoid	+	+
Alkaloid	+	+
Balsams	-	-
Volatile iol	-	+
Phlobatannins	-	-
Carbohydrate	+	+
Phenol	-	-
Saponnin	+	-
Resins	-	-

+ = Present - = Absent

Table 2b. *Phytochemical composition of the methanolic extract of M. accuminata powder.*

Phytochemical constituient	Unripe powder	Ripe powder
Tanins	-	-
Steriods	-	+
Glycoside	-	+
Terpenoid	-	+
Triterpenoids	+	+
Cardiac Glycoside	+	+
Flavonoid	+	+
Alkaloid	+	+
Balsams	-	+
Volatile iol	-	-
Phlobatannins	-	-
Carbohydrate	+	+
Phenol	-	-
Saponnin	+	+
Resins	-	-

+ = Present - = Absent

3.3. Antioxidant Activities of the Extracts

The antioxidant was investigated by the ability of the plantain powder to scavenge DPPH radical in methanol. The DPPH radical scavenging ability of the methanolic extract could be attributed to the presence of the flavonoid compound. The percentage inhibition of DPPH by the methanolic extract of all the plantain powder increases with increase in concentration. Despite the presence of flavonoid in all the methanolic extract of the plantain powder, the unripe powder of *M. paradisiaca* inhibits more of DPPH radical in methanol and shows better antioxidant activity than the ripe powder. There is a variation in the studied data of antioxidant activity of *M. accuminata* powder, the ripe powder shows more scavenging activity than the unripe powder but insignificantly. This may be due to the presence or absence of other phenolic compounds. Phenolics are the most widely studied group of phytochemicals reported to possess strong antioxidant properties. Most of the antioxidant properties have been attributed to the function of flavonoids.

Table 3a. *% inhibition of DPPH radical of M. accuminata powder.*

Concentration (mg/ml)	Vit. C	Unripe powder	Ripe powder
0.05	90.19	12.26	15.15
0.1	90.49	8.07	20.13
0.5	90.77	16.77	19.86
1.0	91.32	23.37	25.89
2.0	91.50	29.77	46.12
5.0	85.00	35.32	48.74

Table 3b. *% inhibition of DPPH radical of M. paradisiaca powder.*

Conc. (mg/ml)	Vit. C	Ripe powder	Unripe powder
0.05	90.19	21.31	24.77
0.1	90.49	30.34	19.12
0.5	90.77	35.63	34.52
1.0	91.32	38.03	51.21
2.0	91.50	44.97	74.53
5.0	85.00	56.94	80.52

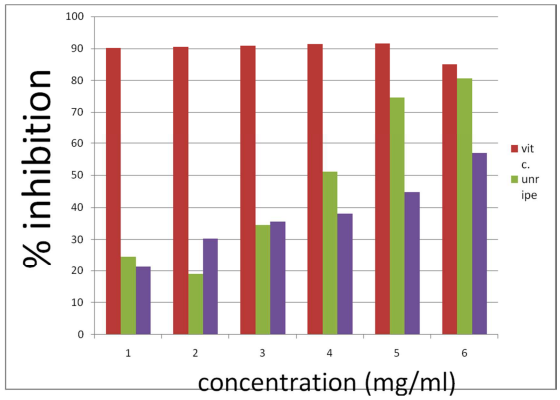

Fig. 1. *Percentage inhibition of DPPH radical by methanolic extract of M. paradisiaca powder.*

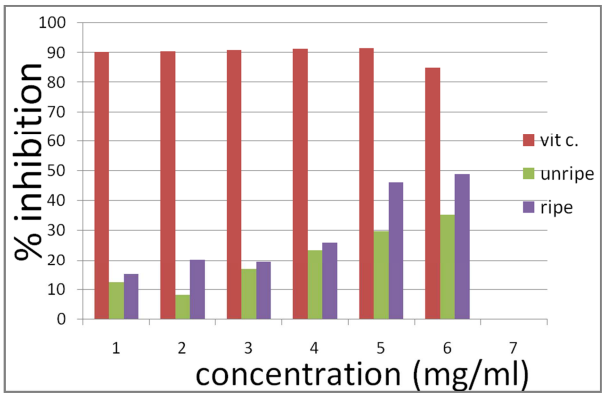

Fig. 2. *Percentage inhibition of DPPH radical by methanolic extract of M. accuminata powder.*

4. Conclusion

The unripe powder of *M. paradisiaca* has more antioxidant

effect than the ripe powder, also has more antioxidant effect than the ripe and unripe powder of *M. accuminata.* Ripe powder of the two variety of plantain obtained shows higher moisture content than the unripe powder.

Recommendation

Further work should be carried out to characterize the phenolic compounds present. It could be suggested that the consumption of unripe plantain (*M. parasidiaca)* could render protective action against reactive free radicals. The unripe plantain has been reported to have low sugar, therefore its traditional use in managing diabetic complications is recommended for diabetic patiens.

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