

## Full Length Research Paper

# Anti-oxidant vitamins, phytochemicals and proximate composition of the ethanol extract of the leaves of *Musa paradisiaca*

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The leaves of *Musa paradisiaca* are used in the treatment of diverse ailments including diabetes mellitus and diarrhoea and hence, the anti-oxidant vitamins, phytochemicals and proximate composition of the ethanol extract of its leaves were investigated using standard methods. The results show that the concentrations of vitamins A, C and E in the extract were found to be  $1.972 \pm 0.013$   $\mu\text{g/g}$ ,  $0.686 \pm 0.030$  and  $1.884 \pm 0.042$   $\text{mg}/100$  g, respectively. The qualitative phytochemical screening of the extract showed the presence of alkaloids, flavonoids, proteins, carbohydrates, saponins, tannins, fats and oil, steroids and terpenoids. Glycosides, reducing sugars, resins and acidic compounds were not detected in the extract. Similarly, the quantitative phytochemical analyses of the extract showed that the concentrations of alkaloids, flavonoids, saponins, tannins and steroids were found to be  $0.374 \pm 0.026$ ,  $0.581 \pm 0.010$ ,  $0.198 \pm 0.004$ ,  $1.464 \pm 0.071$  and  $0.271 \pm 0.007$   $\text{mg/g}$  respectively while the percentage contents of moisture, fibre, ash, fats, proteins and carbohydrates were found to be  $44.51 \pm 0.21$ ,  $3.86 \pm 0.07$ ,  $2.58 \pm 0.06$ ,  $2.23 \pm 0.05$ ,  $16.81 \pm 0.12$  and  $27.86 \pm 0.17$  respectively. In conclusion, the findings of this study indicate that the leaves of *M. paradisiaca* possess nutritional and health benefits and thus, substantiate their medicinally multidimensional applications in different parts of the world.

**Key words:** *Musa paradisiaca*, anti-oxidant vitamins, phytochemicals, proximate composition.

## INTRODUCTION

For a long period of time, plants have been valuable sources of natural products for maintaining human health especially in the last decade with more intensive studies for natural therapies. About 80% of the individuals from developed countries use traditional medicine which has compounds derived from medicinal plants (Karadi et al., 2011). Plants are important sources of many biologically active compounds. Plants used in traditional medicine provide an interesting and still largely unexplored source for the development of new drugs (Cos et al., 2006).

*Musa paradisiaca* Linn (Figure 1) (Musaceae) commonly

known as plantain is a perennial tree-like herb widely distributed in the tropics. Due to its enriched food value and versatile medicinal potential, it is one of the most important fruits and vegetable crops of several countries. The fruits, leaves, peels, root and stalks of the plants have been used orally or topically as a medicine for treating diarrhoea and dysentery, healing of intestinal lesions in colitis, lithiasis, inflammation, pains, snakebite and ulcer. They equally possess hypoglycaemic, hypolipidaemic and anti-oxidant effects. A constituent, hydroxyyanigorufone obtained from the plant was shown

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**Figure 1.** The leaves, fruits and flowers of *M. paradisiaca* Linn.  
Source: [www.tropicalspicegarden.com](http://www.tropicalspicegarden.com)

to be a potential cancer chemo-preventive agent (Weremfo et al., 2011; Onyenekwe et al., 2013). Despite the avalanche of medicinal effects exhibited by *M. paradisiaca*, there is still paucity of information on its nutritional and phytochemical constituents. For this reason, the aim of this study was to evaluate the antioxidant vitamins, phytochemicals and proximate composition of the ethanol extract of the leaves of the plant.

## MATERIALS AND METHODS

### Plant

Fresh and apparently uninfected leaves of *M. paradisiaca* were harvested from the Botanical Garden of the University of Nigeria, Nsukka. The leaves were identified by Prof. (Mrs.) May Nwosu of the Department of Botany, University of Nigeria, Nsukka where the voucher specimens were deposited in the herbarium.

### Preparation of the extract

Fresh leaves of *M. paradisiaca* were washed with distilled water and spread on a clean mat in a well-ventilated room with regular turning to enhance even drying and avoid decaying. The leaves were shade-dried for three weeks and homogenised into fine particles using an electric blender. A known weight (50 g) of the ground leaves was macerated in absolute ethanol for 36 h at room temperature. The mixture was thereafter filtered, concentrated in a rotary evaporator, dried in a boiling water bath and weighed.

### Chemicals and reagents

The chemicals and reagents used for this study were of analytical grade and included the following: 99% (v/v) methanol (BDH Chemicals Ltd., Poole, England), absolute ethanol (BDH Chemicals Ltd., Poole, England), chloroform (BDH Chemicals Ltd., Poole, England), petroleum ether (BDH Chemicals Ltd., Poole, England), acetone (BDH Chemicals Ltd., Poole, England), dilute tetraoxo-sulphate (VI) acid, 0.5%  $\alpha$ ,  $\alpha$ -dipyridine, 2% (v/v) hydrochloric acid, 1% (w/v) picric acid, boric acid, oxalic acid, trichloroacetic acid,

**Table 1.** Anti-oxidant vitamin content of the ethanol extract of the leaves of *M. paradisiaca*.

Anti-oxidant vitamin	Concentration
A ( $\mu\text{g/g}$ )	$1.972 \pm 0.013$
C ( $\text{mg}/100 \text{ g}$ )	$0.686 \pm 0.030$
E ( $\text{mg}/100 \text{ g}$ )	$1.884 \pm 0.042$

**Table 2.** Qualitative phytochemical constituents of the ethanol extract of the leaves of *M. paradisiaca*.

Phytochemical constituent	Inference
Alkaloids	+
Flavonoids	+
Glycosides	ND
Proteins	+
Carbohydrates	+
Reducing sugars	ND
Saponins	+
Tannins	+
Fats and oil	+
Resins	ND
Steroids	+
Terpenoids	+
Acidic compounds	ND

+ = present; ND = not detected.

acetic anhydride, methyl orange, Dragendorff's reagent, Mayer's reagent, Wagner's reagent, Millon's reagent, Fehling's solution, 5% (w/v) ferric chloride solution, potassium sulphate, copper sulphate, potassium hydroxide solution, sodium hydroxide solution, aluminium chloride solution, lead subacetate solution, ammonium solution, Molisch's reagent and distilled water.

#### Anti-oxidant vitamin content

The concentration of vitamins A, C and E of the extract were determined using the methods described by Pearson (1976).

#### Phytochemical analyses

Qualitative phytochemical analyses were carried out on the extract according to the procedures outlined by Harborne (1998) and Trease and Evans (1989). Quantitative phytochemical analyses were carried out to determine the concentration of the following: alkaloids and flavonoids by the methods of Harborne (1998); tannins by the method of Swain (1979); steroids by the method of Okeke and Elekwa (2003); and saponins by the method of Obadoni and Ochuko (2001).

#### Proximate composition

The percentage content of moisture, fibre, ash, fats, proteins and

carbohydrates of the extract was determined according to the methods described by AOAC (1990).

#### Statistical analysis

The results of the analysed data were expressed as means of three replicates  $\pm$  standard deviations (SD). The bar charts were constructed using Excel graphic plots. This analysis was done using the computer software known as Statistical Package for Social Sciences (SPSS), version 18.

## RESULTS

#### Anti-oxidant vitamin content of the ethanol extract of the leaves of *M. paradisiaca*

As shown in Table 1, the concentrations of vitamins A, C and E in the extract were found to be  $1.972 \pm 0.013 \mu\text{g/g}$ ,  $0.686 \pm 0.030$  and  $1.884 \pm 0.042 \text{ mg}/100 \text{ g}$  respectively.

#### Qualitative phytochemical constituents of the ethanol extract of the leaves of *M. paradisiaca*

The qualitative phytochemical screening of the extract showed the presence of alkaloids, flavonoids, proteins, carbohydrates, saponins, tannins, fats and oil, steroids and terpenoids (Table 2). Glycosides, reducing sugars, resins and acidic compounds were not detected in the extract.

#### Quantitative phytochemical constituents of the ethanol extract of the leaves of *M. paradisiaca*

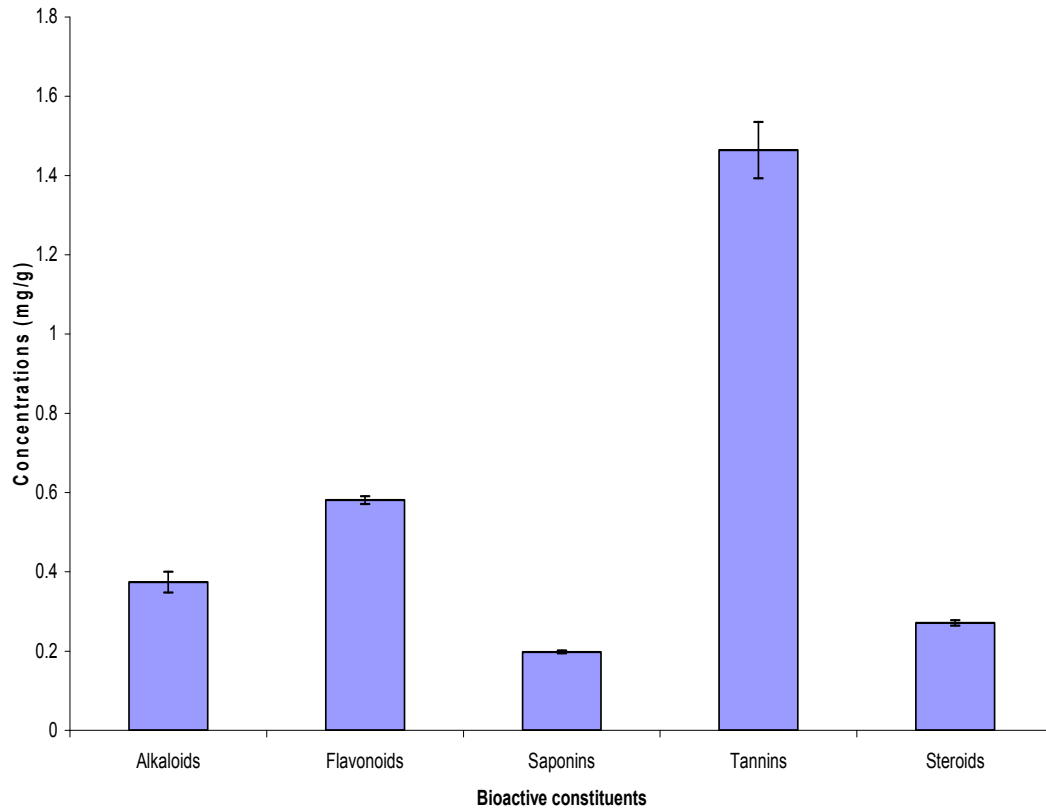
The quantitative phytochemical analyses of the extract showed that the concentrations of alkaloids, flavonoids, saponins, tannins and steroids were found to be  $0.374 \pm 0.026$ ,  $0.581 \pm 0.010$ ,  $0.198 \pm 0.004$ ,  $1.464 \pm 0.071$  and  $0.271 \pm 0.007 \text{ mg/g}$  respectively as shown in Figure 2.

#### Proximate composition of the ethanol extract of the leaves of *M. paradisiaca*

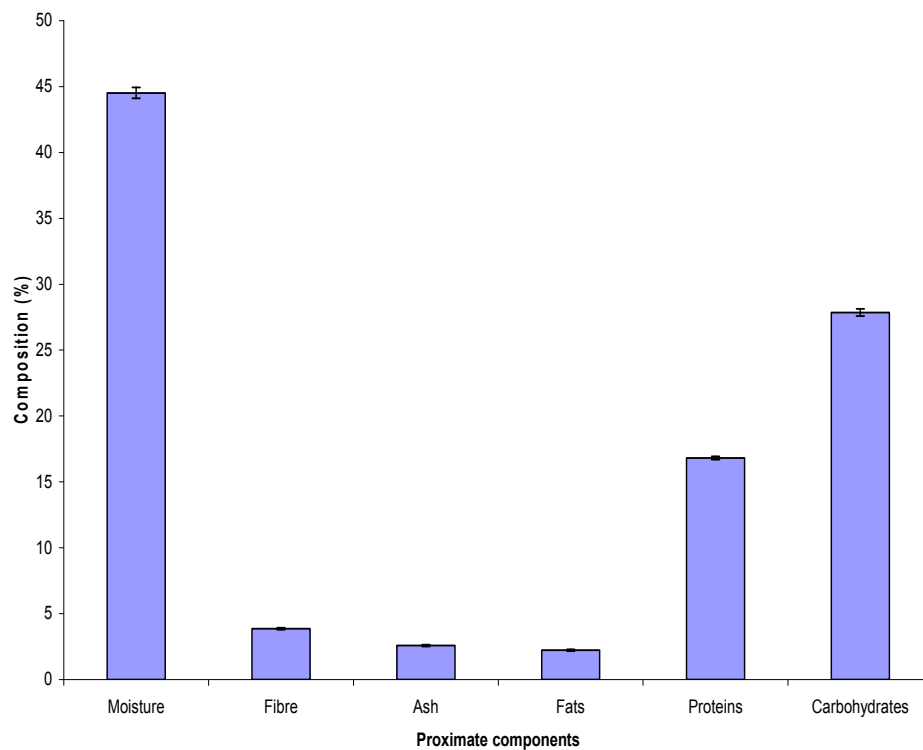
Figure 3 shows that the percentage contents of moisture, fibre, ash, fats, proteins and carbohydrates in the extract were found to be  $44.51 \pm 0.21$ ,  $3.86 \pm 0.07$ ,  $2.58 \pm 0.06$ ,  $2.23 \pm 0.05$ ,  $16.81 \pm 0.12$  and  $27.86 \pm 0.17$  respectively.

## DISCUSSION

The concentrations of the anti-oxidant vitamins in the ethanol extract of the leaves of *M. paradisiaca* were found to be in the order of vitamin A < vitamin C < vitamin E (Table 1). The presence of these anti-oxidant vitamins



**Figure 2.** Quantitative phytochemical constituents of the ethanol extract of the leaves of *M. paradisiaca*.



**Figure 3.** Proximate composition of the ethanol extract of the leaves of *M. paradisiaca*.

in the plant part studied indicate that *M. paradisiaca* leaves might be useful in curbing the harmful effects of free radicals in human health. Anti-oxidants are first line of defense against free radical-mediated damage and are therefore, critical for maintaining optimum health and wellbeing. The need for anti-oxidants becomes even more critical with increased exposure to free radicals (Yusuf and Muritala, 2013).

Qualitative phytochemical tests carried on the extract revealed the presence of tannins, saponins, flavonoids and alkaloids among others (Table 2). This agrees with the work of Onyenekwe et al. (2013) who reported the presence of the aforementioned phytochemicals in the stem extrude of *M. paradisiaca*. Quantitative phytochemical analyses of the extract showed that the concentration of tannins was the highest and that of saponins was the lowest (Figure 2). Alkaloids, tannins and saponins have been reported to have medicinal properties (Agoreyo et al., 2012). The presence of these phytochemical constituents in the extract shows that the leaves of *M. paradisiaca* have medicinal property. Sofowora (1993) reported the roles of these phytochemicals as analgesic, anti-inflammatory, anti-hypertensive and anti-microbial. Saponins and tannins also exhibit cytotoxic effects and growth inhibition making them suitable as tumour-inhibiting agents (Asl and Hossein, 2008).

Proximate analysis of the extract showed the presence of relatively high and low percentage contents of proteins and fats respectively (Figure 3). Although, the high percentage moisture content of the leaves of *M. paradisiaca* as ascertained in the present study may undermine their shelf life, their relatively low fat content and high protein content make them recommendable for the individuals who are watching their weights and the general public as their protein content could be used to supplement the proteins from stable food.

In conclusion, the results of the present study generally imply that the leaves of *M. paradisiaca* possess nutritional and health benefits and thus, substantiate their medicinally multidimensional applications in different parts of the world. However, further studies on the comparisons of the data of the present study and those of other nutritionally and medicinally promising plants are recommended.

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