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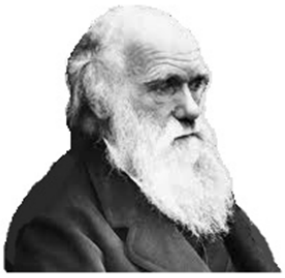

World News of Natural Sciences

An International Scientific Journal

WNOFNS 53 (2024) 86-93 EISSN 2543-5426

Nutritional Composition, Minerals, Vitamin C and Antioxidant Analysis of Yellow Mombin (*Spondias mombin* L.) Nut

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ABSTRACT

The nutritional, mineral, Vitamin C and antioxidant capacity profiling of the nut of *Spondias mombin* has been carried out. The nut of *S. mombin* (NSM) was extracted from its fruit and then profiled quantitatively for its nutritional, mineral and vitamin C contents using the AOAC standard procedures. The antioxidant capacity of the methanol extract of NSM was carried out using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical assay and ferric reducing antioxidant potential (FRAP) techniques. The nut was found to have nutritional facts of: moisture content (12.24±0.06%), lipid content (1.69±0.01%), fibre content (45.27±0.32%), protein content (5.69±0.04%), ash content (0.41±0.02%) and carbohydrate content (34.70±0.33%). The mineral content in mg/g of sample was found to contain: K (7.014), Na (2.966), Ca (1.333), Mg (0.690), Fe (0.131), Cu (0.079), Zn (0.015), Cd (0.004) and Cr (0.009). Pb was not detected. The vitamin C content was 3.89 mg, DPPH antioxidant potential increases as concentration of NSM increases from 25.00 µg/ml to 400 µg/mL and FRAP was observed at 400 µg/ml NSM to be 75.304±0.002 mgAAE. The nut of *S. mombin* has shown to be good sources for alternative nutrition and as a base for minerals rich in cellular ions. The nut of *S. mombin* has exhibited antioxidant capacity which can be attributed to the presence of some vital phytoconstituents.

***Keywords*:** Proximate, minerals, Vitamin C, antioxidant, *Spondias mombin*

(Received 28 December 2023; Accepted 19 January 2024; Date of Publication 23 January 2024)

1. INTRODUCTION

Myriads of health related challenges abound everyday ranging from cancers, diabetics, ageing, neurogenerative diseases and catarrah to pandemic graded classes of communicable diseases. These sets of health conditions could be associated with daily lifestyle and exposure to oxidants responsible for these myriads of health deficits. Combating this trends with limited drugs availability and when available they are either not within the economic wellbeing of the poor masses. These events are of great concern to the clinical world.

The wonder drug substances like the antibiotics are equally faced with the menace of multidrug resistance, thus, prompting issue of global concern for constant research and development with the aim of developing complimentary or alternative medicine from the various sources nature has offered mankind [1]. The present research work is focused on the nutritional, minerals, vitamin C and antioxidant profilling of the nut of *Spondias mombin*.

2. MATERIALS AND METHODS

2. 1. Collection and Identification of Plant Material

The fruit *Spondias mombin* was collected from a local outlet in Yenagoa, Bayelsa State, Nigeria. The plum like fruit was identified at the Department of Biology, Federal University, Otuoke, Bayelsa State by a Biologist. The nut of the fruit was extracted by removing both its outer (pericarp) and inner fleshy (mesocarp) layers. The nut of *S. mombin* (NSM) was then investigated for its proximate, mineral and vitamin C constitutions.

2. 2. Proximate Composition

Nutritional parameters such as the moisture, lipid, protein, ash and fibre composition of the NSM were investigated by the procedures of AOAC [2]. The carbohydrate content of NSM was obtained as:

$$\text{NSM} = [100 - (MC + LC + FC + PC + AC)] \qquad (1)$$

where

MC - Moisture Content
LC - Lipid Content
FC - Fibre Content
PC - Protein Content
AC - Ash Content.

2. 3. Determination of Minerals

The mineral level of NSM was evaluated using procedures as reported [3, 4]. 1 g of nut was dried-ashed with a muffle furnance at 550 °C. The ash obtained was then digested using 2 ml conc. HNO_3. The residue of the digest was filtered off and the filtrate was transferred into a 100 standard volumetric flask and made up with a deionized water. Mineral contents were probed using flame photometer (Jenway model PFP7) and atomic absorption spectrophotometer (Perkin Elmer Model 3030). The minerals analyzed for were: K, Na, Ca, Mg, Fe, Cu, Zn, Pb, Cd and Mn.

2. 4. Determination of Vitamin C

The vitamins C content of NSM was determined using titrimetric method [5]. 25 ml of the filtrate of aqueous extract of 2 g NSM was transferred into a 100 ml conical flask. 1 ml of starch solution (0.5 % w/v) was added to the solution as an indicator. The sample was then titrated against iodine solution (0.005 M). The endpoint of the titration was identified as the first permanent trace of a dark blue-black colour due to the starch-iodine complex. The analysis was repeated thrice and the amount of vitamin C in the sample was calculated. Every 1 ml of 0.005 mole of iodine consumed is equivalent to 8806×10^{-4} g vitamin C.

2. 5. Antioxidant Profiling

5 g of NSM was extracted using methanol at room temperature, concentrated under vacuum and then divided into two for both DPPH and FRAP analysis.

2. 5. 1. 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical assay

The antioxidant profiling of NSM was carried out using the 2,2-diphenyl-1-picrylhydrazyl, DPPH method [6, 19] with absorbance read at 517 nm in a triplicate concentration dose range. The percentage inhibition, %*I* was calculated using the relationship:

$$\% I = \frac{A_{BLANK} - A_{\mathrm{NSM}}}{A_{BLANK}} \qquad (2)$$

where:

% *I* – percentage inhibition,
A_{BLANK} – Blank absorbance,
A_{NSM} – NSM absorbance

2. 5. 2. Ferric Reducing Antioxidant Potential (FRAP)

Fe-reducing potential of NSM was evaluated by a modified procedure described by Oche *et al*. [7]. 400 µg/ml NSM was mixed with 2.5 ml 200 nM sodium phosphate buffer (pH 6.6) and 2.5 ml 1% potassium ferricyanide. The mixture was incubated at 50 ^{o}C for 20 min, then 2.5 ml 10% trichloroacetic acid was added. To the mixture was further added 1 ml distilled water and 1 ml ferric chloride was added to the mixture. The absorbance was read at 700 nm and the ferric reducing antioxidant potential was subsequently calculated and expressed as mg of ascorbic acid equivalent (AAE) using the formula:

$$\text{Fe Reducing pontential} = \frac{A_{\mathrm{NSM}} \times C_{std}}{A_{std} \times NSM_{stk}} \qquad (3)$$

where:

A_{NSM} - Absorbance of NSM
C_{std} - Concentration of standard
A_{std} - Absorbance of standard
NSM_{stk} - Sample stock

2. 6. Statistical Analysis

Data obtained were expressed as mean of triplicates determinations ± standard deviation (SD). The Statistical Package for Social Scientists (SPSS version 20.0) was used for all data analysis.

3. RESULTS AND DISCUSSION

3. 1. Nutritional Profiling

The nutritional composition of NSM is indicated in Table 1. The moisture content ranges from 12.30 to 12.23% with a mean value of 12.24±0.06%. The lipid content ranges from 1.70 to 1.68 with a mean value of 1.69±0.01. The fiber content ranges from 45.00 to 45.27% with a mean value of 45.27±0.32%. The protein content ranges from 5.65 to 5.69% with a mean value 5.69±0.04%. The ash content ranges 0.40 to 0.40 with a mean value of 0.41±0.02%. The carbohydrate content ranges from 34.95 to 33.44% with a mean value of 34.70±0.33%. The nut of *S. mombin* is high in both its fibre and carbohydrate contents and could serve as sources of these important nutritional facts. The presence of these nutritional facts agrees with the report of [4].

Table 1. Proximate Analysis

Parameter (%)	Mean±Sd
Moisture Content	12.24±0.06
Lipid	1.69±0.01
Fiber	45.27±0.32
Protein	5.69±0.04
Ash	0.41±0.02
Carbohydrate	34.70±0.33

3. 2. Mineral Profiling

The mineral constitution of NSM (Figure 1) is mostly rich in cellular ions such as the potassium and sodium. Metal ions that are constituents of the tooth and bone, calcium and magnesium are also detected. Metal ions such as the iron, copper, zinc, cadmium and manganese are detected in trace quantity. Pb was not detected in NSM. These minerals have been identified and reported by [4]. The presence of these mineral shows that NSM is a rich source of mostly cellular metal ions and trace metals with biochemical significant.

3. 3. Vitamin C and Antioxidant Profiling

The vitamin C content of NSM from the mean value of the titre values ranging from 4.40 to 4.60 ml was determined to be 3.89 mg. Vitamin C is a well established phyto-organic

compound with antioxidant signature with profound physiological functions of immunity boosting [8], increase Fe absorption, improves cardiac health and also employed in the treatment and prevention of common cold [9, 10], sepsis [11, 20, 21], respiratory infection [12], wound healing and skin protection [13] covid-19 [14], arthrithis, inflammation [15], anemia [16] Alzheimer's disease, hypertension[17], enhances quality of life and reduces side effect of cancer chemotheraphy [18, 22].

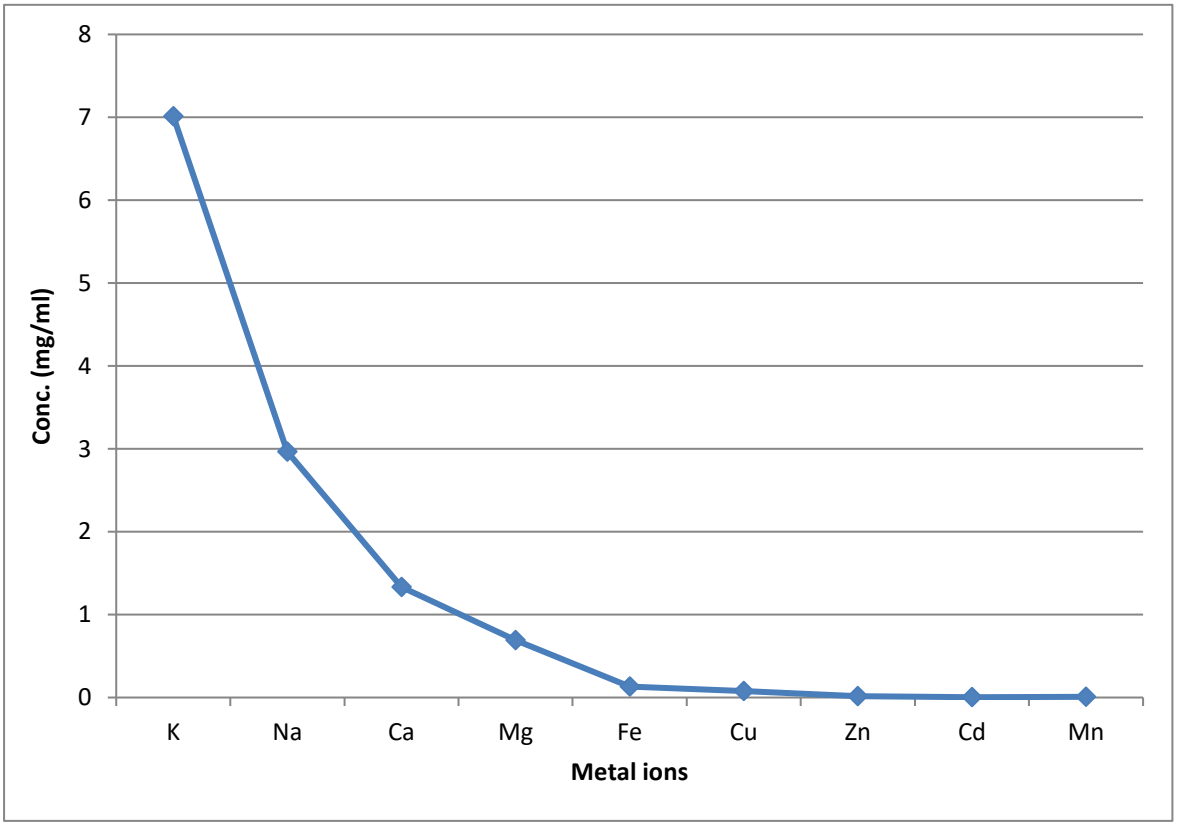

Figure 1. Trend of metal ion concentrations

The antioxidant capacity of NSM was observed via the DPPH free radical assay and FRAPS techniques. The antioxidant activity of NSM (table 2) was dose depended and increases from 25 µg/ml to 400 µg/ml via the DPPH analysis. The ferric ion reducing capacity (Table 3) was observed in the range of 75.303 to 75.306 mg AAE/g of NSM with a mean value of 75.304±0.002 mg AAE/g of NSM. The DPPH characteristics of NSM have shown that it has the capacity to scavenge free radicals from impaired biochemical systems. The FRAP technique has also confirmed the ability of NSM to reducing ferric ions in an electron transfer reaction as shown in eqn 4. This antioxidant capacity of NSM can be attributed to the presence of secondary metabolites (phytochemicals) such as the vitamin C and other primary metabolites present in the matrix of NSM.

$$NSM + Fe^{3+} \longrightarrow NSM^{+} + Fe^{2+} \qquad (4)$$

Table 2. 2,2-Diphenyl-1-picrylhydrazyl (DPPH) free radical assay

Conc.(µg/mL)	Mean±Sd
400.00	21.87±0.56
200.00	20.19±0.02
100.00	19.06±0.03
50.00	19.06±0.06
25.00	18.15±0.02

Table 3. Ferric Reducing Antioxidant Potential (FRAP)

Sample	1	2	3	Mean	Sd	Mean±Sd
NSM (mg AAE/g)	75.303	75.306	75.303	75.304	0.002	75.304±0.002

AAE – Ascorbic acid equivalent, sd – Standard deviation

4. CONCLUSIONS

The nut of *S. mombin* has shown to be good sources for alternative nutrition and as a base for minerals rich in cellular ions and other trace elements of biochemical relevance. The nut of *S. mombin* has exhibited antioxidant capacity which can be attributed to the presence of some vital phytoconstituents.

Acknowledgement

The authors of this work wish to acknowledge the role of Mr. Oladayo Adegboyega, a laboratory technologist of the Department of Pharmaceutical Chemistry, University of Ibadan, Ibadan, Oyo State, Nigeria for providing technical input in the course of this research.

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