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Phytonutrient, Antioxidant and Mineral Composition of Some Wild Fruits in South West Nigeria

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ABSTRACT

This study was carried out to determine the chemical composition, antinutrient and phytonutrient contents of some wild fruits, namely African star apple (*Chrysophyllum albidum G. Don.*), hog plum (*Spondias mombin Linn.*), bush mango (*Irvingia gabonensis Baill.*) and monkey cola (*Cola millenii K. Schum.*). Samples of the wild fruit commonly consumed were collected from some villages in Ido Local Government Area, Oyo State Nigeria. The wild fruits were analysed for phytonutrients, antioxidants and mineral composition. Ranges of total phenolics and total anthocyanin content of these wild fruits were 27.78 ± 6.01 in *I. gabonensis*, 57.42 ± 4.47 in *S. mombin,* 121.29 ± 4.97 in *C. millenii* and 398.23 ± 0.00 in *C. albidum* respectively. Significant differences ($p < 0.05$) were found in antinutrient, phytonutrient and mineral composition of *C. albidum*, *I. gabonensis* and *C. millenii*. The analysis of variance revealed that calcium and manganese contents of *I. gabonensis* were significantly ($p < 0.05$) higher than those of *C. albidum* and *C. millenii*. The antioxidants especially vitamin C content ranged from as low as 15.87 mg/100 g in *C. albidum* to as high as 204.86 mg/100 g in *S. mombin*. The values for total carotenoid ranged from 172.77 µg/100 g (in *C. millenii*) to 1380.17 µg/100 g (in *C. albidum*). The wild fruits are sources of phytonutrients, antioxidants such as vitamin C, total carotenoids and some minerals. Planting of the wild fruit trees or the incorporation in farming systems should thus be encouraged to increase production and availability to consumers and as industrial raw materials.

Keywords: Wild fruits, minerals, vitamins, phytonutrients, Nigeria.

Introduction

Fruits and vegetables have plenty of natural antioxidants, especially vitamin C and E. Contained in fruits are beta-carotene, phenolic compounds, such as anthocyanin and other flavonoids, which showcase a wide range of biological benefits, including antioxidant (Elliot, 1992), anti-inflammatory (Bertuglia *et al.*, 1985; Borissora *et al.*, 1994) and anticarcinogenic properties (Hou 2003; Hou *et al.*, 2004; Kang *et al.*, 2003; Bomser *et al.*, 1996). When fruits and vegetables, as well as antioxidant rich supplements, are taken in substantial amounts, there is a release of antioxidants into the body which literally come between free radicals and the body's healthy molecules. By offering up electrons, antioxidants stabilize free radicals and prevent further damage. These antioxidants are available in fruits and even wild fruits. The wild fruits are coloured fruits, which may be due to the presence of carotenoids and phytonutrients as these are responsible for colours in plants. However, data are missing for phytonutrient composition of these wild fruits. Vitamin C, carotenoids and plant pigments such as anthocyanin have powerful antioxidant capability and are responsible for the colour of many fruits. Despite the fact that wild fruits are widely consumed and tend to be nutritious (Umaru, *et al.*, 2007; Abitogun 2010), there is still lack of sufficient information on the

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phytonutrient composition of these wild fruits. An understanding and knowledge of the composition of antioxidants in these wild fruits may encourage wider acceptability and utilisation as antioxidant resources and consumption as fruit or for nutraceutical purposes. Thus, this paper determined the micronutrient and phytonutrient composition of some wild fruits in South West Nigeria.

Materials and Methods

Sampling procedure

Oyo State, which is one out of six states in South West Nigeria was randomly selected for the study. Six out of 30 local government areas (LGAs) in Oyo State were selected based on the concentration of the wild fruits. Four wild fruits, namely African star apple (*Chrysophyllum albidum G. Don.*), hog plum (*Spondias mombin Linn.*), bush mango (*Irvingia gabonensis* Baill.) and monkey cola (*Cola millenii K. Schum.*) were sampled from the major villages within the six LGAs (Ido, Ona Ara, Lagelu, Akinyele, Oluyole and Egbeda) of Oyo State, South West Nigeria.

Analysis of mineral composition

Edible portion (1 g) of the ground was digested using nitric acid and perchloric acid and made to a final volume of 25 ml. The digest was made up to 100 ml in a standard flask. The atomic absorption spectrophotometer was used to determine all the minerals (except phosphorus) using appropriate lamps. Phosphorus was determined with vanadomolybdate using a spectrophotometer at 425 nm while sodium and potassium were determined with flame photometer (AOAC, 2005).

Determination of phytonutrients

Determination of total phenolic content

The total phenolic content of the samples was determined according to the spectrophotometric method based on the ability of the phenolic substances to form blue molybdenum – tungstic complex with the reagent Folin-Ciocalteu (Singleton and Rossi, 1965). The total phenol content was determined by mixing 0.5 ml aliquot (0.2 g of the sample extracted by 20 ml 70% acetone) with an equal volume of water, 0.5 ml Folin-Ciocalteu's reagent and 2.5 ml of sodium carbonate were subsequently added. The absorbance was measured after 40 min at 725 nm (Singleton *et al.*, 1999).

Determination of total monomeric anthocyanin by the pH differential method

Solvent extraction

To prepare the sample, 5 g of the raw and processed, was extracted twice with 10 ml of 80% acetone containing 0.2% formic acid for 2 min and then centrifuged at 20000 G (G = 0.001118rN2 where: r = radius of the curve in metre and N = revolution per minute) for 20 min (Zheng, *et al.*, 2003). The supernatants were combined and then used for analysis of total anthocyanin.

Anthocyanin analysis

Total anthocyanin was determined by pH-differential spectrophotometry at pH 1.0 and pH 4.5. (Guisti and Wrolstad, 2000). The spectrophotometer was turned on and allowed to warm up to at least 30 min before taking measurements. Appropriate dilution factor for the sample was determined by diluting with potassium chloride buffer (pH 1.0) until the absorbance of the sample at the λvis-max is within the linear range of the spectrophotometer (i.e. for most spectrophotometer, the absorbance should be less than 1.2). The final volume was divided by the initial volume to obtain the dilution factor. The spectrophotometer standardised with distilled water at all wavelengths that were used (λvis-max and 700 nm). Two dilutions, one with potassium chloride buffer (pH 1.0) and the other with sodium acetate buffer (pH 4.5), diluting each by the previously determined dilution factor. These dilutions were equilibrated for 15 min.

The absorbance of each dilution at the λvis-max and at 700 nm against a blank cell filled with distilled water was measured. The absorbance of the diluted sample (A) was calculated as follows:

A = (A λvis-max – 700 nm) pH 1.0 – (A λvis-max – 700 nm) pH 4.5