COMPARISON OF NUTRITIONAL CHARACTERISTICS OF BAOBAB (*ADANSONIA DIGITATA* L.) WITH SOME COMMON KENYAN FRUITS

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Abstract

The current study was undertaken to compare nutritional characteristics of baobab (Adansonia digitata) with popular consumed fruits in Kenya (Mangoes and bananas). Total ash, moisture content, total soluble solids, water extractible values, ethanol extractible values, dry matter, organic matter and crude fat were conducted using standard methods.Baobab pulp gave the highest dry matter, total soluble solids than mangoes and bananas and the difference was statistically significant. Several authors have published about the important nutritive value of baobab food products. The initial moisture content (%db) was 8.45, 51.65, 84.27 and 10.43 for Baobab, banana, mango and vitex payos respectively. Vitex payos gave the highest value of total ash. Baobab pulp gave the highest dry matter, total soluble solids than mangoes and bananas and the difference was statistically significant. The values for baobab ash were within range (1.9 - 6.4%). The total soluble solids were similar to reported values (11.6 %) However, the nutritional value of any food depends on a wide range of variables, such as its ripeness, the climatic conditions under which it is grown, the quality of the soil, and of particular importance the variety. These results validate the use of baobab fruits and baobab fruit products. Baobab has high nutrition composition compared to popular consumed fruits in the Kenyan market.

Key words: Indigenous fruit trees, nutrition, Baobab

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1. INTRODUCTION

Research on Indigenous Fruit Trees (IFTs) has been considerably done in Sub-Saharan Africa, and their role is being recognized in improving rural livelihoods (Akinnifesi, *et al* 2007;Alireza *et al.,*2009; Chikamai *et al.,* 2001, 2004; Wekesa et *al.,* 2010). Majority of rural communities throughout Africa depend on IFTs for their livelihoods (Akinnifesi *et al.,* 2007; Chikamai *et al*., 2004; Mbabu *et al*., 2004; Leakey *et al.,* 2005). The use of these fruits has been shown to substantially boost rural income and employment opportunities in Africa (Leakey *et al.*, 2005; Muok *et al*., 2000, 2001, 2002; Kiptot *et al.,* 2001; Wekesa *et al.*, 2009, 2010; Ruiz-Perez *et al.*, 2004). Researchers are focusing on exploring on utilization of IFTs for food security. (Leakey *et al.,* 2005; Tchoundjeu *et al.*, 2006; Akinnifesi *et al.*, 2006, 2007).Social-economic studies have been conducted to identify potential IFTs in Kenya (Maundu, 1996; Kiptot 1996; Muok and Kariuki 2001; KEFRI, 2002b). *Adansonia digitata* has been identified among the top priority fruit species (Chikamai *et al*., 2004; Wekesa *et al.,* 2010).

Baobab (*Adansonia digitata*) is characterized by swollen, relatively short, bottle shaped trunk (about 15 m in height) in which spongy fibers store water for the dry season. It is a deciduous tree found in the Bombacaceae plant family (Akinnifesi *et al*., 2006, 2007). The baobab is an extremely useful multipurpose tree (Sidibe et al., 2002; Ndabikuze et al 2011). The fruit, the seeds and the leaves are all utilized and are consumed daily by rural populations in Africa (Chadare, 2010). The fruits are also commercialized both in the developing and developed world (Sidibe *et al*, 2002; Codjia *et al.*, 2003; Chadare, 2010). Past work has shown baobab leaves, pulp and seeds are rich in nutrients (Busson, 1965; Wehmeyer, 1966; Nour *et al.*, 1980; Becker, 1983;Yazzie *et al.*, Prentice *et al.*, 1993; Obizoba et al., 1993; 1994; Saka et al, 1994; Nordeide *et al.*, 1996;

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Sidibe *et al.*, 1996; Glew *et al.*, 1997;Sena *et al.*, 1998; Lockett *et al.,*2000;Codjia *et al.*, 2001; Ondachi, 2001; Murray *et al.*, 2001; Sidibe *et al.,* 2002; Osman, 2004; Soloviev *et al.*, 2004; Ndabikize *et al.,* 2011).

Until now, limited studies have been undertaken to promote the acceptability and consumption of indigenous fruits. This study was undertaken to determine the physicochemical characteristics of Baobab (*Adansonia digitata*) and compare with an indigenous fruit (*Vitex payos*) and common consumed fruits in Kenya (Mango and bananas)

2. MATERIALS AND METHODS

Harvesting

Baobab fruits were harvested in Kibwezi, Kenya, sorted, packed and transported to the Forest Products Research Center for further analysis. The mango and banana were randomly purchased from the market and used for analysis.

Fruit preparation

The hard shells of the baobab were opened by hand using machete to obtain seeds. The seeds were mechanically dehulled then to separate the pulp from the seeds. The baobab fruit powder was sieved through sieved to obtain a fine powder. The powder was packed in polyethylene bags sealed and stored in a dark cool place. The mango and banana were peeled, sliced and stored in the oven at 30^0C for 7 days, ground to fine powder and used for analysis.

Moisture Content

The sample (one gram) was weighed in a drying dish of known weight using an electronic weighing balance and its wet weight was recorded as (W_t). The sample was placed in a constant-temperature oven set at a temperature of 105^oC for 12 hours. The moisture content was calculated on dry basis.

Total ash

The sample was dried at 100°C to 105°C for 12 hours. The reading was taken and sample was ignited to constant weight in a muffle furnace at 600° ± 25°C. The percentage of ash with reference to the dried substance was calculated.

Water soluble ash

The ash was boiled with 25 ml water and the liquid filtered through an ash less filter paper and thoroughly washed with hot water. The filter paper was then ignited in the original dish, cooled and the water insoluble ash weighed.

Acid-insoluble ash

The ash was boiled with 25 ml of dilute hydrochloric acid (10 per cent m/m HCI) for 5 min, the liquid was filtered through an ash less filter paper and thoroughly washed with hot water. The filter paper was then ignited in the original dish, cooled and weighed. In some instances it is advisable to commence by evaporating the ash to dryness with concentrated hydrochloric acid to render the silica insoluble before repeated treatment with hot dilute acid.

Sulphated ash

The ash was moistened with concentrated sulphuric acid and ignited gently to constant weight.

Alcohol Soluble Extractive

5g of the air dried sample that had been coarsely powdered was weighed and macerated with 100 ml of ethanol in a closed flask for 24 hours, shaking frequently during the first 6 hours. It was allowed to stand for 18 hours. Thereafter, it was filtered rapidly taking precautions against loss of ethanol. 25 ml of the filtrate was evaporated to dryness in a tarred flat-bottomed shallow dish, dry at 105C and weighed. The percentage of ethanol soluble extractive with reference to the air-dried drug was calculated.

Total Soluble Solids (Beverages Method)

2g of the samples weighed into a 500ml conical flask. Few antipumping granules were added to 200ml of boiling distilled water. The solution was refluxed gently on a hot plate for one hour swirling occasionally. The infusion was filtered through a 280 filter paper. The filtrate was allowed to cool and later transferred to 250ml volumetric flask. It was made to volume with cold distilled water and mixed thoroughly

Dry matter

2g of the samples was weighed and place in an oven for 16hours. The dry weight was recorded of sample, W_d. The percentage dry matter was then calculated as follows;

Statistical analysis

Physicochemical characteristics of the fruit were determined three times. The data were analyzed using Genstat.

3. RESULTS AND DISCUSSIONS

The initial moisture content (%db) was 8.45, 51.65, 84.27 and 10.43 for Baobab, banana, mango and *vitex payos* respectively. Vitex payos gave the highest value of total ash. Baobab pulp gave the highest dry matter, total soluble solids than mangoes and bananas and the difference was statistically significant. The values for baobab ash was within range (1.9 - 6.4%) as reported by (Busson, 1965; Wehmeyer, 1966; Nour *et al.*, 1980; Obizoba and Amaechi, 1993; Saka and Msonthi, 1994; Lockett *et al.*, 2000; Murray *etal.*, 2001; Osman, 2004). Dry matter was as reported by(Nour *et al.*, 1980; Arnold *et al.*, 1985; Obizoba and Amaechi, 1993; Prentice *et al.*, 1993; Saka and Msonthi, 1994; Glew *et al.*, 1997; Sena *et al.*, 1998; Lockett *et al.*, 2000;Osman, 2004). Ash content is a measure of the total account of minerals within a sample; it is the inorganic residue remaining after the water and the inorganic matter have been removed by heating in the presents of oxidizing agents which provides a measure of the total amount of the minerals with in a sample. Alcohol soluble extractive value is the amount of active constituents extracted with alcoholic solvents from a given amount of sample.The total soluble solids were similar to reported values (11.6 %) (Ndabikunze *et al.,* 2011). The highest values for organic matter were recorded for the banana pulp but results were not statistically significant. Previous research has suggested that bananas are among the most important food crops and are important sources of health promoting phytochemicals (Suzzane, 2000;Wang *et al.,* 1997; Setiawan *et al.,* 2001; Someya *et al.,* 2002; Rabbani *et al.,* 2004; Davey *et al.,* 2007; Arora *et al.,* 2008; Yin *et al.,* 2008; Amorim *et al.,*2009).However, the nutritional value of any food depends on a wide range of variables, such as its ripeness, the climatic conditions under which it is grown, the quality of the soil, and of particular importance the variety.

Several authors have published about the important nutritive value of baobab food products Suzzane, 2000;Wang *et al.,* 1997; Setiawan *et al.,* 2001; Someya *et al.,* 2002; Rabbani *et al.,* 2004; Davey *et al.,* 2007; Arora *et al.,* 2008; Yin *et al.,* 2008; Amorim *et al.,*2009; Ndabikunze *et al.,* 2011). These results validate the use of baobab fruits and baobab fruit products. Baobab has high nutrition composition compared to popular consumed fruits in the Kenyan market.

Table.1 Chemical Composition of Fruits

	Organic matter (%)	Crude Fat (%)	Ethanol extractible (%)	Water extractible (%)
Vitex payos	98.62	3.21	1.59	11.83
Banana	99.28	4.47	7.75	15.37
Mango	99.77	1.51	3.05	17.58
Baobab	97.03		17.88	0.23

Table. 2 Chemical Compositions of Fruits

	Dry Matter (%)	MC%(db)	Total Ash (%)	TSS (%)
Vitex payos	26.87	10.43	4.92	8.54
Banana	15.83	51.65	0.32	9.7
Mango	17.23	84.27	0.23	7.95
Baobab	91.5	8.45	2.98	11.95

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