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Nutritional and Phytochemical Composition of Utu (Icacina Senegalensis) and Sycamore (Ficus Sycomorus). Seeds

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Abstract: *The nutritional and phytochemical composition of Utu (Icacina senegalensis) and sycamore (Ficus sycomorus) were studied using standard analytical techniques. The results revealed that the moisture content of sycamore (9.65 ± 0.10%) is lower than 12.89 ± 0.26% of Utu seeds respectively. therefore, sycamore will have more storage advantage than the Utu seeds. The crude fat value of both seeds are 28.62% and 31.34% for Utu and sycamore respectively. This means that both seeds can serve as energy supplier in food. The mineral composition of both seeds were analyzed. The results obtained revealed that copper, sodium and zinc have the least value of minerals in the seeds. Phosphorus, magnesium and calcium content of sycamore seeds are 380.24 ± 0.031, 300.67 ± 0.021, 390.77 ± 0.012mg/100g respectively, they are higher than the results of the utu which are 119.14 ± 0.040, 138.15 ± 0.040, 309.71 ± 0.023% mg/100g. Phytochemical screening of the two samples show small amount of antinutrient like saponin, phytate and flavonoid etc. The tannin content of Utu is 5.84 ± 0.012% which is higher than 4.03 ± 0.015% of Sycamore. The alkaloid content is higher in sycamore (5.65 ± 0.021%) than that of utu (3.92 ± 0.025%). These values are below the toxic levels, which means that they will not be harmful when consumed.*
Keywords: *Icacina senegalensis, ficus, sycomorus, seeds, nutritional, phytochemicals.*

I. Introduction

Utu (Icacina senegalensis) is a shrubby perennial, variable in form, which sends up glabrous or puberscent erect leafy shoots from a large, underground fleshy tuber (Dalziel, 1990). The aerial stems are light green and may reach about 1m in height (Irvine, 2001).

Icacina senegalensis is a savannah shrub, indigenous to west and central Africa, the wild plant simultaneously produces three types of food; a fruit that is enjoyed as a snack, a seed that is utilized as a staple, and a tuberous root that is eaten as emergency food when other crops have failed and communities are threatened with famine (Tourner, 1978).

Icacina senegalensis is a drought-resistant plant in west and central Africa that produces a large tuber with a high starch content, but also contains phytochemical factor such as terpenes (Dei, 2001).

The bright red fruits of the Utu (Icacina senegalensis) shrub are particularly sweet with a plume-like flavor and a favorite for children. They are eaten fresh but are sometimes dried. Not much is known about the nutritional quality of the fruit pulp itself, each wild shrub yields large number of fruits (Woot et al., 1999). Icacina senegalensis fruits ripens at the end of the dry season when other food producing wild plants have generally run out of produce, this makes it an especially important food store for the hungry who otherwise have very little food options during this time (Irvine, 2001).

Utu (Icacina senegalensis) plant is known to it's edible starchy root-where it gets it's name, the root contains significant amounts of protein, calcium and iron and is eaten when yams are in short supply (Purseglove, 1991).

The leaves of Icacina senegalensis can be used as a medicine (valentine and sulemana, 2012), the seeds, fruits and tubers are used as food (Fay, 1987). Udeh and Nwachujor, (2011) observed that Icacina senegalensis can be use as feed for animals.

Sycamore seed (Ficus sycomorus) is a variety of maple; it is not indigenous to Britain having been introduced by the Romans (Galant, 2001). Sycamore is a native to Central and Southern Europe as for north as Paris, it is found mostly in city streets, parks and gardens and is maintained in public places for the beauty and shelter of it's large and generous canopy (David,2005).

Ficus sycomorus called the sycamore fig or the fig mulberry; they are attributed as belonging from fig species that has been cultivated since ancient times (David, 2005).

Ficus sycomorus is also native to Africa, south of the sahel and north of the tropic of Capricorn also excluding the central west rain forest areas. It also grows naturally in Lebanon to about 20 miters tall and 6 meters wide with a dense round crown of spreading branches (Purseglove, 1991). The fruit is a large edible fig, 2-2cm in diameter, ripening from buff green to yellow or red, they are borne in thick clusters on long branchlets

(Daniel, 2001). Flowering and fruiting occur year round, peaking from July to December, the bark is green-yellow to orange and its papery strips reveal the yellow inner bark like all other fig, it contains a latex (Daniel, 2000).

Little research is available in Utu (Icacina senegalensis) and sycamore seeds (Ficus sycomorus) than there is for other shrubby perennial and maple plants. This motivated the need to study the nutritional and phytochemical content of the two seeds in order to produce a baseline data that will be relevant to the Food and Agricultural Organization (FAO) and academic community for further research.

II. Materials And Methods

Sample Collection and Treatment

The fruits of Sycamore (Ficus sycamorus) and Utu (Icacina senegalensis) were bought from the local market, Isiokporo market in Orlu, Imo State Nigeria. Their respective botanical identities were confirmed at the Horticulture unit of National Root Crops Research Institute (NRCRI) Umudike, Abia State, Nigeria.

The seeds of the samples were washed, chopped into pieces and dried under the sun. After drying, the seeds were ground into a fine powder using a mortar and pestle, and then sieved through a 1mm mesh sieve and stored in a well labeled air-tight container for analysis.

Proximate Analysis

The percentage moisture content of the sample was determined by the method of AOAC, (1990) as reported by Okoronkwo et al.,(2013) and the crude protein was also determined by the kheldahl method described by Fay, (1991). The ashing was done by the furnace incineration using the gravimetric method described by James, (1995), Crude fat was determined by fat extraction using a soxhlet system HT_2 as described by Udensi et al , (2007). Crude fibre was determined by the method of AOAC, (1990) as reported in Ekop,(2007) whereas the Carbohydrate content was done by the difference.

Determination Of Mineral Content

The Atomic Absorption Spectrophotometry as described by Okwu and Ndu (2006) and Odom et al., (2013) was used in the mineral analysis, magnesium and calcium was determined by complexometric titration described by James, (1995), Shimoyamada,(1998) whereas Potassium was by flame photometry explained in AOAC (1990).

Determination of Phytochemicals

The determination of flavonoid was done by the repeated extraction method described by Ladeji et al., (2004). Tannin was determined by the Spectrophotometric method adopted by Nkafamiya et al.,(2010). Saponin was analyzed following the method of the Udensi et al (2007) by the acetone and methanol extraction. Cyanogenic glycoside content of the samples was determined by the alkaline titration method of AOAC, (1995). Phytic acid contents was determined by the method of Abulade (2004) Oxalate was determined by the titrimetric method described in Jansen, (2000). Alkaloid was determined by the precipitation method of Harborne, (1973) as reported by Obadoni and Ochuko, (2001).

III. Results And Discussion

Table 1: Proximate Composition Of Utu (Icacina Senegalensis) And Sycamore (Ficus Sycomorus) Seeds.

Parameter (%)	Utu	Sycamore
Moisture	12.89 ± 0.26	9.65 ± 0.01
Protein	5.41 ± 0.02	9.23 ± 0.01
Crude fat	28.62 ± 0.012	31.52 ± 0.029
Ash	2.77 ± 0.142	7.24 ± 0.006
Carbohydrate	48.70 ± 0.170	39.34 ± 0.029
Crude fibre	1.61 ± 0.012	3.02 ± 0.017

Mean $\pm$ standard deviation of triplicate samples (g/100g dry weight basis).

The result in fig 1 revealed that the moisture content of Sycamore (9.65 ± 0.010g/100g) is lower than that of Utu (12.89 ± 0.26g/100). The protein and fat composition of Utu which are 5.41 ± 0.02 and 28.62 ± 0.012g/100g respectively are lower than that of the Sycamore which are 9.23 ± 0.01 and 31.52 ± 0.029g/100g). This show that the two seeds can be used as alternative source of plant seed protein. The lipid content of sycamore also proved that the seeds could be used as a good source of vegetable oil. The fat content of Ficus sycomorus seed is higher compared to lipids of S. indiana (1.66 ± 0.24g/100g and B. aegptica (2.90 ± 0.07g/100g) as reported by Nkafamiya et al., (2010). The Carbohydrate content of I. senegalensis (48.70 ± 0.170g/100g) is higher than F. sycomorus (39.34 ± 0.02g) respectively. This means that the seeds could be a good source of starch for human consumption and/ or industrial use (Abulade et al., 2008).

The ash composition of the seeds obtained in this study was 2.77 ± 0.142g/100g for Utu and 7.24 ± 0.006g/100g for sycamore). This are quite low compared with a reported value of 8.05g/100g for S. nigrum seeds (Akubugwo et al., 2007).

This value is higher when compared with the findings of vegetable seeds such as C. africanum (1.2g/100) as reported by (Purseglove, 1991). The higher fibre if ingested will help to reduce blood cholesterol level and the risk of bowel cancer and gall stones (Taylor et al.,1997).

Table 2: Results Showing The Mineral Composition Of Utu And Sycamore Seeds (MG/100G).

Parameters	Utu	Sycamore
Phosphorus	119.14 ± 0.040	380.24 ± 0.031
Magnesium	139.15 ± 0.040	300.67 ± 0.021
Calcium	309.71 ± 0.023	390.77 ± 0.012
Iron	71.19 ± 0.030	11.64 ± 0.031
Zinc	10.10 ± 0.025	9.56 ± 0.021
Copper	8.22 ± 0.017	1.52 ± 0.021
Sodium	18.37 ± 0.006	3.48 ± 0.006
Potassium	9.64 ± 0.012	5.84 ± 0.021

Mean Standard deviation of triplicate determinations (mg/100g dry weight basis)

The iron and zinc value of Icacina senegalensis are 71.19 ± 0.030 and 10.10 ± 0.025 mg/100g while that of sycamore are 11.64 ± 0.031 and 9.56 ± 0.021 mg/100g respectively. Though the iron and zinc are lower than three found in Moringa oleifera, Adansonia digitata, colocasia esculenta and cassiatora as reported by Barminas et al., (1998) but the iron concentration of I. senegalensis is higher compared to the findings of Nkafamiya et al., (2010). The differences maybe attributed to the locality of it's growth and the stage of maturity prior to harvesting. The composition of copper in I. senegalensis (8.22 ± 0.017mg/100g) is higher than the work reported by Mutayobe et al., (2011) on the copper level of moringa oleifera. The level of phosphorus, magnesium and calcium of sycamore (380.24 ± 0.031, 300.67 ± 0.021 and 390.77 ± 0.012mg/100 respectively is higher than the values obtained in Utu (119.14 ± 00.040, 138.15 ± 0.040 and 309.91 ± 0.023mg/100g respectively.

The sodium and potassium level of sycamore (3.48 ± 0.006mg/100 and 5.84 ± 0.021mg/100g) are lower than that of Utu which are 18.37 ± 0.006mg/100g and 9.64 ± 0.012mg/100g respectively. Minerals are required for normal growth, activities of muscles and skeletal development, cellular activities and oxygen transport, chemical reaction in the body and intestinal absorption, fluid balance, nerve transmission, acid-base regulation (Berg and Corner, 2005, Ledeji et al., 2004).

Table 3 Phytochemical Composition Of Utu (Icacina Senegalensis) And Sycamore (Ficus Sycomorus) Seeds

Sample (%)	Utu	Sycamore
Oxalate	2.02 ± 0.015	2.85 ± 0.029
Tannine	5.84 ± 0.012	4.03 ± 0.015
Saponin	2.59 ± 0.012	1.75 ± 0.031
Phytate	2.17 ± 0.012	1.98 ± 0.006
Alkaloid	3.92 ± 0.025	5.65 ± 0.021
HCN	3.39 ± 0.474	3.05 ± 0.030
Flavonoid	2.82 ± 0.012	3.63 ± 0.015

Mean + standard deviation of triplicate determinations

Phytochemical are compounds that limit the wide use of many plants due to their ubiquitous occurrence. They are compounds capable of eliciting deleterious effect in man and animals (Kubamarawa et al., 2008).

Oxalate for example tends to render calcium unavailable by binding to the calcium ion to form complexes (calcium oxalate crystals). These oxalate crystals formed prevents the absorption and utilization of calcium. The calcium crystals may also precipitate around the renal tubules thereby causing renal stones (Ladeji et al., 2004). The oxalate composition of F. sycomorus (2.85 ± 0.029%) is higher compared to I. senegalensis (2.02 ± 0.075%). The value obtained is lower compared to the results of Nkafamiya et al., (2010)[a]. Phytates composition of I. senegalensis (2.17 ± 0.012%) is higher compared to F. sycomorus (1.98 ± 0.006%) seeds. Phytates in food are known to bind with essential minerals (such as calcium, iron, magnesium and zinc) in the digestive tract, resulting in mineral deficiencies (Bello et al., 2008).

The tannin, saponin and HCN composition of I. senegalensis (5.84 ± 0.012, 2.59 ± 0.040 and 3.39 ± 0.47%) respectively are higher compared to the tannin (4.03 ± 0.015%), saponin (1.75 ± 0.031%), and HCN (3.05 ± 0.30%) of F. sycomorus. Tanning are plant polyphenols, which have ability to form complexes with metal ions and with macro-molecules such as protein and polysaccharides (Dei et al., 2007).

Excess of consumptions of tannins in human could be toxic (Ferreira et al., 2008). This is because tannin are metal ionscheletors and tannin-chelated metal ions are not bioavailable hence could decrease the bioavailability of iron leading to anaemia.

The saponin concentration of the two seeds, I. senegalensis and F. sycomorus are higher compared with a value of 0.66 $\pm$ 0.10mg/100g (S. Nigrum seeds) as recorded by Akubugwo et al., (2007). Saponins are glucosides, which includes steroid saponins and triterpenoid saponins (Dei et al., 2007). Saponin in excess could cause hypocholestrolanemia because it binds cholesterol making it unavailable against red blood cell (Khahlil and Eladomy, 1994).

Saponin protein complex formation can reduce protein digestibility (Shimoyamada et al., 1998).

The presence of spaonin in the body can help to fight infection and microbial inversion (Sadipo et al., 2000). Hydrogen cyanide is toxic when injected by monogastric animals in large quantity (Obadoni and Ochuko, 2001). Alkaloid concentration of F. sycomorus (5.65 $\pm$ 0.021%) is higher when compared to that of F. senegalensis (3.92 $\pm$ 0.025%). The alkaloid inspite of the medical uses of alkaloids, they cause gastrointestinal upsets and neurological disorders (Ogbuagu, 2008). Flavonoids have good antioxidant properties including protection against allergies, inflammation, free radicals, platelet aggregation microbes, ulcers, hepatoxins, virus and tumors (Okwu, 2004)

IV. Conclusion And Recommendation

The human guest for a balanced diet demands the search for local food materials that could be genetically mass produced to meet up the human nutritional needs. This research work show that the seeds of Utu and Sycamore contains considerable amount of fat and carbohydrate for adults for these macro nutrients.

Generally, the result of the seed flours of Utu and Sycamore recorded rich sources of minerals e.g. phosphorus, magnesium, calcium and iron. The phytochemicals components of both seed are below the recommended toxic levels and this implies that the overall nutritional value of the seeds will not be toxic to human. Since processing methods like boiling and fermentation reduces the antinutrients present in food materials, the seeds will receive some degree of boiling and or fermentation to reduce the antinutritional factors(Udensi et al., 2008). The seeds of Utu and Sycamore contains substantial level of nutrients and could therefore, contribute alternative source of human food.

Few research papers are available on the nutritional composition of Utu and Sycamore, more work is needed on the seed and it's characterization. More work is also needed on the bacteriological examination of it's flour and fruit.

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