Short communication: Proximate chemical and nutritional composition of *Moringa oleifera,* and *Adansonia digitata* leaves

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Abstract

This study was conducted in the powder leaves of *Moringa oleifera*, and *Adansonia digitata*. Samples were collected from different areas in Sudan. The leaves were washed, crushed and analyzed for approximate chemical composition. *M. oleifera* contained the highest percentage of protein 28.3%, fat 8.0% and fiber 18.5%, while *A. digitata* has the highest percentage of moisture 7.2%, and ash 16.0%. *M. oleifera* showed the highest percentage in minerals.

Keywords: *Moringa oleifera, Adansonia digitata*, leaves, composition

Review article

INTRODUCTION

Starting late there is a development in the undertakings to examine the activity of green leaves in the eating schedule. Both the incredible references and more forward-thinking conveyances on nutrition are of worth. From trees the physical necessities of life are taken e.g. wood for safe house and for cooking, bark and fiber to be beat or to be woven into texture, both sweet and insipid natural items, nuts, and rich wellsprings of edible oils, fluids to be used as refreshments with or without fermentation, or to be scattered to yield sugar. Notwithstanding their abundance and their assortment of jobs, trees are infrequently thought of as source of edible green leaves. Believe it or not, relatively few trees of the quiet zone are utilized in that plan. Some sort of pruning of trees bearing tasteful leaves is continually appealing to keep the leaves inside straightforward reach (Martin et al. 1998).

Adansonia digitata

family Malvaceae, is the most widespread of the Adansonia species on the African mainland, arrive at heights of 5 to 30 meters and have trunk distances across of 7 to 11 meters, fruit is 15 to 20 cm long. Leaves are commonly having 5 leaflets when experienced. The leaflets have entire edges and are elliptic to obovate-elliptic, with hone zenith and a repetitive base. Old leaf size may touch base at a broadness of 20 cm (Sidibe and Williams, 2002). It's found in the hot, dry savannahs of sub-Saharan Africa. Tabaldi is the name of the Baobab tree in Sudan and its regular fruit is Gongolaze. Baobab's trunk is used as a tank to store water. People in west Sudan use the void in the capacity compartment to extra water in the downpour season. Gongolaze is used to make juice or to fix stomach and various ailments. It understands that baobab particular life outperforms a period of 5,000 years. A.digitata fruit contains half more calcium than spinach, is high in cancer prevention agents, and has a high more vitamin C than orange In Kordofan and Darfour states, Sudan, the leaves blended with onion slides, lemon juice, peanut paste and eaten as salad of mixed greens, in other African nations the fruits broke down in milk or water and utilized as a beverage. The seeds additionally produce palatable oil. In 2008, the European Union affirmed the utilization and consumption of baobab fruit as a component in smoothies and grain bars (http://en.wikipedia.org). The baobab fruit mash is likely the most significant staple. It tends to be dissolved in water or milk as in some Sudanese areas where young children shepherds used to mix baobab fresh fruit with goat milk to have thick delicious paste known as *ummartabo*. In other African countries the produced liquid is then utilized as a beverage, a sauce for food, an aging operator in neighborhood fermenting, or as a substitute for cream of tartar in baking (Sidibe and Williams, 2002). No studies to our knowledge have been carried out on leaf protein and its concentrate (http://www.bigbaobab.co.za).

Moringa olifera (Rawag)

Moringa (*Moringa oleifera*) tree belong to family Moringaceae, known in Sudan a s rawag tree which means tree that used to clean and purify drinking water, It grows fast and reaches up to 12 m moringa tree is developed for the most part in semi-dry, tropical, and subtropical territories.

While it develops best in dry sandy soil, it endures poor soil, including waterfront regions. It is viewed as one of the world's most valuable trees, as pretty much all aspects of the Moringa tree can be utilized for food or has some other helpful property. In the tropics, it is utilized as animal feed (Ray et al., 2003).

The leaves have 7 times more vitamin C than oranges and 15 times more potassium than bananas. It also has calcium, protein, iron, and amino acids, which help your body heal and build muscle. leaves contain high levels of nutrients and could reduce cancer symptoms associated with mesothelioma. Moringa leaf powder has been appeared to contain: 46 sorts of cancer prevention agents, 18 amino acids,10 times the vitamin A of carrots, multiple times the potassium of bananas, multiple times the calcium of cow's milk and multiple times the iron of spinach. Chemical composition of leaves powder vary depending on type of leaf powder where, for example in the *Moringa Olefira* leaves has different proportions, of moisture (7.6%), ash (7.1%), fat (2.23%), and protein(27.51%), and Carbohydrate (43.8) (Oduro *et al.*, 2008). While Freiberger et al. (1998) reported 17% protein for Moringa leaves contained which is found to be favorable when compared with the WHO standard.

Leaf protein concentrate (LPC)

It is a concentrated type of the proteins found in the leaves of plants. It has been inspected as a human or animal food source, since it is conceivably the least expensive, most inexhaustible source of accessible protein. In spite of the fact that people can get some protein from the immediate utilization leaves as leaf vegetables, the human stomach system would not have the option to manage the colossal greater part of leaves expected to meet dietary protein prerequisites with leaf vegetables alone. LPC was first recommended as a human food during the 1960s, however it has not made much progress, in spite of early guarantee of Pirie 1971 and Pirie 1975, evaluated and underlined significance of its advantages which presented the subject. The expanding dependence on feedlot based animal raising to fulfill human cravings for meat has expanded interest for less expensive vegetable protein sources. This has as of late prompted recharged enthusiasm for LPC to lessen the utilization of human-edible vegetable protein sources in animal feed. Leaf protein is a decent wellspring of amino acids, with methionine being a restricting variable (Hussein, et al. 1999) (Ayodeji, et al, 2005). Leaf proteins can likewise be rich in polyphenols (Rambourg and Monties 1983).

The challenges that must be overcome before LPC transforms into an appropriate protein source for individuals consolidate the high fiber content and anti-nutritional of factors, for instance, phytate, cyanide and tannins (Ayodeji and Fasuyi, 2005; Pirie, 1971). For the most part, LPC is created by pulping leaves and squeezing the juice out, warming the juice to coagulate the protein, and sifting the protein through and drying it. This study aims to study the proximate chemical composition, percentage of protein and minerals of the Moringa and baobab leaves

MATERIAL and METHOD

Material

Samples were collected from different areas. *A. digitata* and *M. oleifera* leaves were collected from Khartoum north, Sudan. Leaves of Roselle were collected from University of Khartoum, farm of Medicinal and Aromatic Plants at Shambat, Khartoum north, Sudan. The collected leaves were washed with tap water and sun dried at room temperature (30°C) for 2-3 days, then grinded and stored at 4°C.

Method

A .digitata, and *M.oleifera* leaves proximate analysis

Moisture content

For the determination of moisture content and volatile matter of the leaves in the three samples, A.O.C.S official method Ab 2-49 reapproved (2006) was followed.

Ash content

For the determination of ash content of the leaves A.O.C.S official method Ba 5a-49 reapproved (2006) was followed.

Fiber

A.O.C.S method Ba 6-84 (2006) was followed for the determination of the crude fiber.

Oil content

The obtained clean, dried and fine powdered collected leaves of baobab, rossele and moringa were weighed using a sensitive balance, the official A.O.C .S method Aa 4-38 reapproved (2006) was followed for oil content determination.

Protein

A.O.C.S official method Ba4d –90 reapproved (2006) modified Kjeldahl method was followed, for the determination of protein content in the dried leaves.

Carbohydrate

Carbohydrates were calculated by difference using this equation
(Moistuer+Ash+Fiber+Protein+Fat)-100)

Preparation of leaf protein concentrates (LPC)

The dried powdered leaves were weighed using a sensitive balance (KERN GMBH, d-72336 Balingen, Germany) and suspended in distilled water at a 1:3 ratio, utilizing a magnetic stirrer, the blend was mixed for 3 minutes while altering the pH at 8.5 with NaOH (4 M). At that point, the blend was centrifuged at 3500 rpm for 15 min at room temperature. The supernatant was moved into a measuring utensil, blended for another 30 min, and the pH changed in accordance with 4.5. The supernatant was left undisturbed for cold precipitation medium-term at 4°C in a cooler. From that point onward, the supernatant was painstakingly redirected and the protein slurry was washed multiple times with refined water by centrifuging at 3500 rpm for 10 min, at 4°C. The pellet was then resuspended in refined water, and the pH was balanced at 7.0. The slurry was kept medium-term at 80°C (Chandi and Sogi, 2007). The example was totally dried. The protein concentrates got were gauged utilizing logical adjusts.

Statistical Analysis

Determinations were carried out in triplicate. Their mean values with standard error were calculated. Analysis of variance with critical difference was applied to to identify significant differences among treatment means ($p<0.05$).

RESULT and DISCUSSION

Proximate chemical composition

Table 1. Proximate chemical analysis (%) of *M.oleifera* and *A.digitata*, leaves powder

Leaf sample	Moisture	Ash	Fat	Fiber	Carbohydrate	Protein%
M .oleifera	6.7	13.8	8.0	18.5	24.7	28.3
A. digitata	7.2	16.0	6.9	14.4	33.4	22.1

Table 1. *A. digitata* showed the highest percentage of moisture 7.2%, followed *M. oleifera* 6.0%. The highest percentage of ash was found in *A. digitata* 16% followed by *M. oleifera* which was found to be 13.8%. The highest percentage of fat was found in *M. oleifera* 8.0%, followed by *A. digitata* 6.9%.

From the same table it was clear that the highest percentage of fiber was found in *M. oleifera* 18.5%, followed by *A. digitata* 14.4% and the highest percentage of protein was found in *M. oleifera* which was 28.3%, and followed by *A.digitata* which was 22.1%. The lowest carbohydrates were found in *M. oleifera* which was 24%.

Table 2. The proportion of protein in the leaves of the protein concentrates (*A.digitata* and *Moringa oleifera*), washed with distilled water, ethanol and acetone.

Sample	***A.digitata***	***M. oleifera***
washed with distilled water	23.4%	29.8%
washed with the acetone	20.6%	21.7%
washed with ethanol	22.8%	26.0%

Table 2 shows the percentage of protein concentrate washed by distilled water in *A. digitata* was 23.4% which was lower than *Moringa oleifera* which was 29.8%. The percentage of protein concentrate washed by acetone was found in *Moringa oleifera* as 21.7% which was higher than that of *A.digitata* 20.65%, and the concentrate washed by ethanol was found as 26.0% in *Moringa oleifera* leaf which was higher than that of *A.digitata* 22.8%. This study confirmed that protein concentrates washed by distilled water gave the highest percentage than ethanol and acetone.

Table 3. Percentage (%) of minerals in the leaves powder

Sample	**Na**	**K**	**Ca**	**Mg**	**Fe**
M .oleifera	0.47125	0.92375	3.000	6.97625	0.01320
A .digitata	0.3720	0.92386	2.375	5.88875	0.01534

From the table 3, it was clear that the *M.oleifera* contain the highest percentage of Na (0.47125) which was higher than *A.digitata* (0.372), also we found that K percentage of both samples was similar 0.923. In case of calcium the percentage was 3.00 and 2.375 in *M. oleifera* and *A. digitata* samples, respectively. The percentage of the magnesium was found as 6.97625 and 5.88875 in *M.oleifera* and *A.digitata* samples, respectively. While iron was found as 0.01320 and 0.01534 in *M.oleifera* and *A.digitata* samples, respectively.

CONCLUSION

The leaves of the *A. digitata*, and *M. olefira,* trees are a staple for many populations in Africa. Young leaves are widely used, as salad or cooked like spinach, and frequently dried, often powdered and used for sauces over porridges, thick gruels of grains, or boiled rice. They appear to be a good source of protein and as a significant source of Fe, Ca, K, Mg, Mn, and Na.

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