

Nutritional Values of *Moringa oleifera*, Total Protein, Amino Acid, Vitamins, Minerals, Carbohydrates, Total Fat and Crude Fiber, under the Semi-Arid Conditions of Sudan

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Abstract

Moringa oleifera plant is used in the semiarid, tropical, and subtropical areas as food and medicinal compounds. The leave extract of Moringa, was studied by evaluating total protein, amino acid, vitamins, minerals, total fat and crude fiber under the semi-arid conditions of Sudan. HPLC and amino acid analyzer, atomic absorption spectrophotometry, Soxlet extractor, Kjeldahl methods were used in this study. It was found that, carbohydrates 9.1 g, dietary fiber 2.1 g, fat 1.7 g, protein 8.1 g also rich in vitamins such as vitamin A 80 µg, thiamine (B1) 0.103 mg, Riboflavin (B2) 0.112 mg, Niacin (B3) 1.5 pantothenic acids (B5) 0.48 mg, vitamin B6 0.129 mg folic acid (B9) 41 µg Vitamin C 8.6 mg also rich in minerals such as Calcium 99.1 mg, Iron 1.3 mg, Magnesium 35.1 mg Manganese 0.119 mg, Phosphorus 70.8 mg, Potassium 471 mg, Sodium 70 mg, Zinc 0.85 mg Also rich in essentials amino acids (ug/ml) Threonine 36.77, Valine 22.1, Methionine 2.13, Leucine 20.50, Isoleucine 31.8, Phenylalanine 36.8, Histidine 30.88, Lysine 27.67, Arginine 21.45.

Keywords: *Moringa oleifera*; Nutritional values; Carbohydrate; Protein; Fat; Crude fiber; Vitamins; Minerals; Amino acids

Introduction

Moringa family Moringaceae is native to India and northern Europe [1-3]. It grows best in dry sandy soil and tolerates poor soil. It is a sun- and heat-loving plant [4-6]. It is a source of medicinal compounds and has components of high nutritive value such as protein, amino acids, carbohydrate minerals, vitamin and organic acids [7-9]. Moringa leaves are anti-bacterial and anti-inflammatory. Leaf tea treats gastric ulcers and diarrhea. Moringa leaves are good food sources for those suffering from malnutrition due to the high protein and fiber content. Leaves treat with fevers, bronchitis, eye and ear infections, and inflammation of the mucus membrane. The iron content of the leaves is high and they are reportedly prescribed for anemia is used in the treatment of scurvy skin diseases. The leaves are the most nutritious part of the plant, being a significant source of B vitamins, vitamin C, provitamin A as beta-carotene, vitamin K, manganese, and protein, among other essential nutrients [10,11]. Moringa are now so well known that there seems to be little doubt of the substantial health benefit, to be realized by consumption of Moringa leaf powder in situations where starvation is found [12,13]. Leaves rubbed against the temple can relieve headaches [14-16].

Objective

The objective of this study was to assess the nutritional values of *Moringa oleifera*.

Materials and Methods

Experiment

The study was executed at the experimental farm of Medicinal and Aromatic Plants Research Institute at Shambat, Sudan (Latitude 1540N, Longitude 3232 and 360 m above sea level). The climate is semi-arid with low relative humidity and daily mean air temperature ranging from 25 to 40°C in summer and 15 to 21°C in winter. *Moringa oleifera* cultivated in the demonstration farms of Medicinal and Aromatic Plant Research

Institute at Shambat (Sudan). The Plant samples were identified in the department of plant taxonomy in the same institute, collected, dried and kept in carton bags for extraction.

Determination of total carbohydrate

Carbohydrates are first hydrolysed into simple sugar using dilute hydrochloric acid. In hot acidic medium glucose is dehydrated to hydroxyl furfural. This compound forms with anthrone a green colored product with an absorption maximum at 630 nm.

Determination of crude fiber

Extract 2 g of material with petroleum ether to remove fat and then boil with sulphuric acid for 30 min, filter and washed with water until washing is no longer acidic. Boil with 200 ml of sodium hydroxide solution for 20 min, filter and washed with water and 25 ml alcohol. Remove the residue and transfer to ashing dish (pre weight dish W1, Dry the residue for 2 h at 130°C cool and weigh W2. Ignite for 30 min at 600°C then cool and weigh W3.

Calculation

Determination of total fat: The classical method is based on continuous extraction performed on dried samples of food in a Soxhlet extractor [17]. The extractant used is often petroleum spirit (which is less flammable than

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diethyl ether and less likely to form peroxides), which requires completely dry analytical portions and the removal of sugar.

Determination of protein total nitrogen: Total nitrogen is measured using some version of the Kjeldahl method (which measures total organic nitrogen). In this method the organic matter is digested with hot concentrated sulphuric acid [17]. A “catalyst mixture” is added to the acid to raise its boiling point, usually containing a true catalytic agent (mercury, copper or selenium) together with potassium sulphate. All organic nitrogen is converted to ammonia, which is usually measured by titration.

Determination of essential amino acids

(16) 5 g of the test samples were macerated in 50% alcohol until all pigment was extracted and concentrated under reduced pressure at 40°C. 10 ml NaCl (10%) was added to the extract, stirred for one hour then 10 ml of trichloroacetic were added and filtrated. The precipitate was collected by centrifugation, washed and dried in desiccato 20 mg of protein were refluxed with 6 N HCl (10 ml) for 20 h and the acid removed by evaporation under reduced pressure, the residue was dissolved in 10% isopropanol for amino acids identification using the method (Eppendorf-Germany Lc 3000) Amino acid analyzer.

Determination of minerals

The preferred techniques of minerals determination are atomic absorption spectrophotometry (AAS) [17].

Determination of vitamins

The samples are saponified in alcoholic potassium hydroxide with the addition of an antioxidant as ascorbic acid, butylated hydroxytoluene (BHT) or pyrogallol. The vitamins are extracted using a suitable organic solvent. The extract is evaporated with additional BHT at a controlled temperature. Both normal-phase and reversed-phase HPLC can be used for the separation. In normal-phase separations measurement is usually by Brubacher et al. [17].

Results and Discussion

Data presented in Table 1 shows the results of *Moringa oleifera* leaf extract nutritional value per 100 g (3.5 oz), Carbohydrate 9.1 g, Dietary fiber 2.1 g, fat 1.7 and protein 8.1. These results conformity with those obtained in previous studies [8]. Table 2 shows the results of vitamin content in *Moringa oleifera* such as vitamin A 80 µg thiamine (B1) 0.103 mg, Riboflavin (B2) 0, 112 mg, Niacin (B3) 1.5 pantothenic acids (B5) 0.48 mg, vitamin B6 0.129 mg folate (B9) 41 µg Vitamin C 8.6 mg these

Carbohydrates	9.1 g
Dietary fiber	2.1 g
Fat	1.7 g
Protein	8.1 g

Table 1: Nutritional value per 100 g (3.5 oz) of *Moringa oleifera* L. leave extract.

Vitamin A equiv.	80 µg
Thiamine (B1)	0.103 mg
Riboflavin (B2)	0.112 mg
Niacin (B3)	1.5 mg
Pantothenic acid B5)	0.48 mg
Vitamin B6	0.129 mg
Folate (B9)	41 µg
Vitamin C	8.6 mg

Table 2: Vitamins content of *Moringa oleifera* L. all vitamins in 10%.

Calcium	99.1 mg
Iron	1.3 mg
Magnesium	35.1 mg
Manganese	0.119 mg
Phosphorus	70.8 mg
Potassium	471 mg
Sodium	70 mg
Zinc	0.85 mg

Table 3: Minerals content of *Moringa oleifera* L. trace metals all in 10%.

Threonine	36.77
Valine	22.1
Methionine	2.13
Leucine	20.50
Isoleucine	31.8
Phenylalanine	36.8
Histidine	30.88
Lysine	27.67
Arginine	21.45

Table 4: Essential amino acids of *Moringa oleifera* L. (ug/ml).

results were in agree with those obtained in previous studies [9]. Table 3 showed the result of minerals content in *Moringa oleifera*, such as Calcium 99.1 mg, Iron 1.3 mg Magnesium 35.1 mg Manganese 0.119 mg, Phosphorus 70.8 mg Potassium 471 mg, Sodium 70 mg, Zinc 0.85 mg these results were in conformity with those obtained in previous studies [10]. Table 4 shows the results of essentials amino acids (ug/ml) content in *Moringa oleifera* leaf extract Threonine 36.77, Valine 22.1, Methionine 2.13, Leucine 20.50, Isoleucine 31.8, Phenylalanine 36.8, Histidine 30.88, Lysine 27.67, Arginine 21.45 these results were in agree with those obtained in previous studies [10].

Conclusion

Based on the results of this study it can be concluded that *Moringa oleifera* leave extract had highly nutritive values. Eating *Moringa* food products is good for those suffering from malnutrition.

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