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

Rasha Khalid Abbas1,2*, Fatma S Elsharbasy3,4 and Abdalfatah Abdalla Fadilemula2

1Department of Biochemistry, Faculty of Applied and Industrial Science University of Bahri Sudan
2Department of Chemistry, Faculty of Science and Arts in Mukhwa, University of Albahe, Saudi Arabia
3Department of Chemistry of Natural and Microbial Products, National Research Center, Egypt
4Department of Chemistry, Faculty of Science and Humanity studies, Sattam bin Abdul Aziz University, Saudi Arabia

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 (μg/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 is grow 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 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 rubered against the temple can relieve headache [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 fufural. This compound forms with anthrone agree 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 are no longer acidic. Boil with 200 ml of sodium hydroxide solution for 20 min, filter and washed 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 weight W3.

Calculation

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

**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 g 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 results were in accordance 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 essential 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 agreement 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.

**Acknowledgement**

The authors would like to express their deepest thanks to the laboratories of biochemistry and food technology college of agriculture Khartoum University Sudan for their help in analyzing the samples.

**References**

5. 5-Ted Radovich (2010) Farm and forestry production and marketing profile for Moringa. Specialty crops for pacific island agroforestry.


