

**Scientific Data  
and Resources**

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## History of Moringa

*Moringa oleifera* is the best known of the thirteen species of the genus Moringaceae. Moringa was highly valued in the ancient world. The Romans, Greeks and Egyptians extracted edible oil from the seeds and used it for perfume and skin lotion.

In the 19th century, plantations of Moringa in the West Indies exported the oil to Europe for perfumes and lubricants for machinery. People in the Indian sub-continent have long used Moringa pods for food. The edible leaves are eaten throughout West Africa and in parts of Asia.<sup>5</sup>

## Identification

**Species:** *Moringa oleifera*

**Family:** Moringaceae

**Range:** Native to the Indian sub-continent, and naturalized in tropical and sub-tropical areas around the world<sup>9</sup>

**Characteristics:** Deciduous tree or shrub, fast-growing, drought-resistant, average height of 12 meters at maturity<sup>5</sup>

## Varieties

Twelve other Moringa species are known as well:<sup>5</sup>

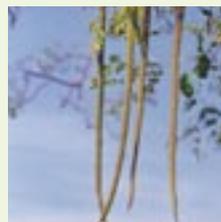
- M. arborea*
- M. borziana*
- M. concanensis*
- M. drouhardii*
- M. hildebrandtii*
- M. longituba*
- M. ovalifolia*
- M. peregrina*
- M. pygmaea*
- M. rivaie*
- M. ruspoliana*
- M. stenopetala*

## All parts are useful

Every part of the Moringa tree is said to have beneficial properties that can serve humanity. People in societies around the world have made use of these properties. While the focus of this book is on the leaves, other parts of the tree are also worthy of further study.



**Leaves:**  
Nutrition  
Medicine



**Pods:**  
Nutrition  
Medicine



**Flowers:**  
Medicine



**Seeds:**  
Water purification  
Medicine  
Cooking oil  
Cosmetics  
Lubricant



**Bark:**  
Medicine  
**Gum:**  
Medicine



**Roots:**  
Medicine

## Nutritional Value of Moringa Leaves

Nutritional analyses indicate that Moringa leaves contain a wealth of essential, disease-preventing nutrients. They even contain all of the essential amino acids, which is unusual for a plant source. Since the dried leaves are concentrated, they contain higher amounts of many of these nutrients, except vitamin C.

Nutritional contents of vegetable matter can vary depending on varieties, seasons, climate, and soil conditions. Thus, different analyses produce different figures. For example, some studies show potassium content of Moringa leaves as lower and iron content as higher than what is shown here.

The information used in this book for fresh Moringa leaves comes from Gopalan, et al., based mostly on analysis done at the National Institute of Nutrition in Hyderabad, India.<sup>1</sup> Information on dried Moringa leaves comes from Fuglie, based mostly on analysis sponsored by Church World Service and the Department of Engineering at the University of Leicester and performed by Campden & Chorleywood Food Research Association in Gloucestershire, UK.<sup>5</sup>

Vitamin A is obtained from vegetables in the form of its precursor, carotene. The intestines only absorb a fraction of the carotene in foods. Thus, there are differing views on how to calculate the amount of carotene that is absorbed and converted to vitamin A. For vitamin A content, Gopalan et al. and Fuglie simply give the figures for carotene or beta-carotene. The most commonly accepted conversion factor of carotene to vitamin A (retinol) is 6:1.

## Amino Acid Content of Moringa Leaves\*

All values are per 100 grams of edible portion.

	Fresh Leaves <sup>1</sup>	Dried Leaves <sup>5</sup>
Arginine	406.6 mg	1,325 mg
Histidine	149.8 mg	613 mg
Isoleucine	299.6 mg	825 mg
Leucine	492.2 mg	1,950 mg
Lysine	342.4 mg	1,325 mg
Methionine	117.7 mg	350 mg
Phenylalanine	310.3 mg	1,388 mg
Threonine	117.7 mg	1,188 mg
Tryptophan	107 mg	425 mg
Valine	374.5 mg	1,063 mg

\*While Gopalan, et al. expressed amino acid content per g N (nitrogen), these figures have been converted to mg per 100g leaves for clarity.

### **Vitamin and Mineral Content of Moringa Leaves**

All values are per 100 grams of edible portion.

	<b>Fresh Leaves<sup>1</sup></b>	<b>Dried Leaves<sup>5</sup></b>
Carotene (Vit. A)*	6.78 mg	18.9 mg
Thiamin (B1)	0.06 mg	2.64 mg
Riboflavin (B2)	0.05 mg	20.5 mg
Niacin (B3)	0.8 mg	8.2 mg
Vitamin C	220 mg	17.3 mg
Calcium	440 mg	2,003 mg
Calories	92 cal	205 cal
Carbohydrates	12.5 g	38.2 g
Copper	0.07 mg	0.57 mg
Fat	1.70 g	2.3 g
Fiber	0.90 g	19.2 g
Iron	0.85 mg	28.2 mg
Magnesium	42 mg	368 mg
Phosphorus	70 mg	204 mg
Potassium	259 mg	1,324 mg
Protein	6.70 g	27.1g
Zinc	0.16 mg	3.29 mg

\*Figures shown for vitamin A are carotene content for fresh leaves and beta-carotene content for dried leaves.<sup>1, 5</sup>

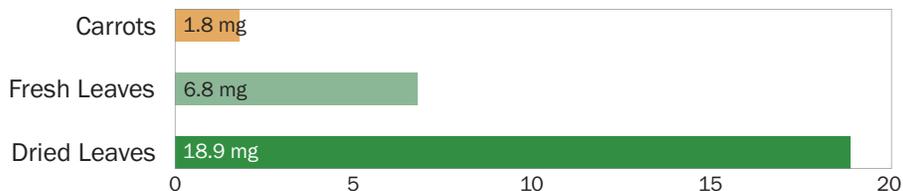
### Moringa Leaves Compared to Common foods

The following graphs show a comparison of the nutritional content of fresh Moringa leaves and dried Moringa leaves compared to common foods, gram for gram.

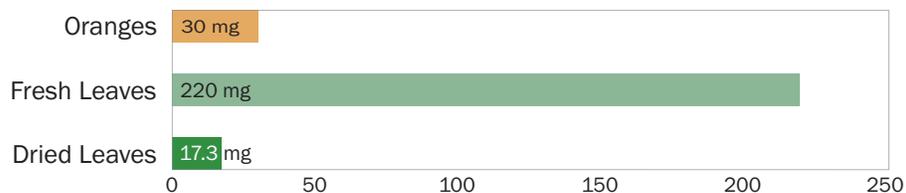
Again, nutritional contents of these common foods can also vary depending on varieties, seasons, location, climate, and soil conditions. For example, some studies show higher iron content for spinach and higher potassium content for bananas. The data for fresh Moringa leaves and common foods come from Gopalan, et al.<sup>1</sup> Data for dried Moringa leaves come from Fuglie.<sup>5</sup>

All values are per 100 grams of edible portion.

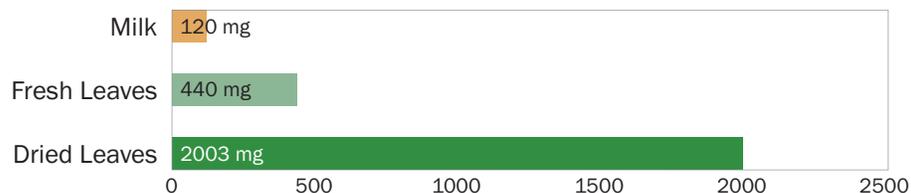
#### Vitamin A



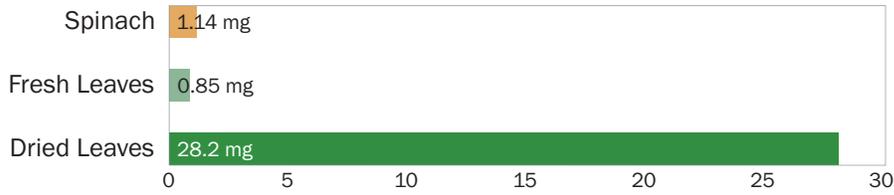
#### Vitamin C



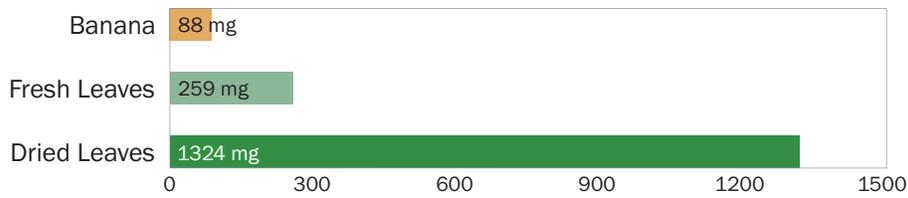
#### Calcium



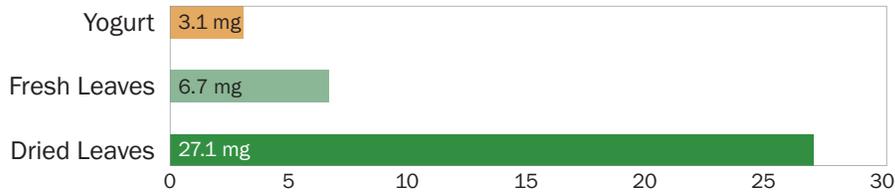
### Iron



### Potassium



### Protein



#### Fresh Leaves

Gram for gram, fresh leaves contain about:

- 4 times** the Vitamin A of Carrots
- 7 times** the Vitamin C of Oranges
- 4 times** the Calcium of Milk
- 3 times** the Potassium of Bananas
- 3/4** the Iron of Spinach
- 2 times** the Protein of Yogurt



#### Dried Leaves

Gram for gram, dried leaves contain about:

- 10 times** the Vitamin A of Carrots
- 1/2** the Vitamin C of Oranges
- 17 times** the Calcium of Milk
- 15 times** the Potassium of Bananas
- 25 times** the Iron of Spinach
- 9 times** the Protein of Yogurt



### Case Study: Moringa Leaf Powder Treating Malnutrition

In 1997-98, Alternative Action for African Development (AGADA) and Church World Service tested the ability of Moringa leaf powder to prevent or cure malnutrition in pregnant or breast-feeding women and their children in southwestern Senegal.<sup>5, 19</sup> Malnutrition was a major problem in this area, with more than 600 malnourished infants treated every year. During the test, doctors, nurses, and midwives were trained in preparing and using Moringa leaf powder for treating malnutrition. Village women were also trained in the preparation and use of Moringa leaf powder in foods.

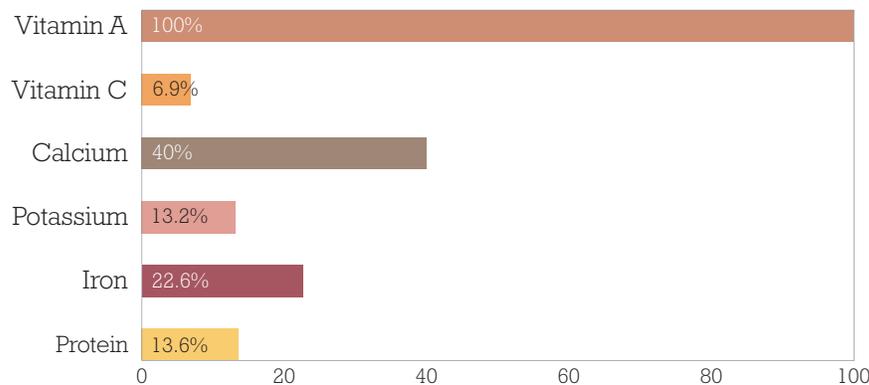
This test found the following effects to be common among subjects taking Moringa leaf powder:

- ❑ Children maintained or increased their weight and improved overall health.
- ❑ Pregnant women recovered from anemia and had babies with higher birth weights.
- ❑ Breast-feeding women increased their production of milk.

The following graphs show RDA values of major nutrients in dosages suggested by this test:

#### For a Child Aged 1-3 Years

RDA% per tbsp. (8g) Moringa Leaf Powder<sup>5</sup>



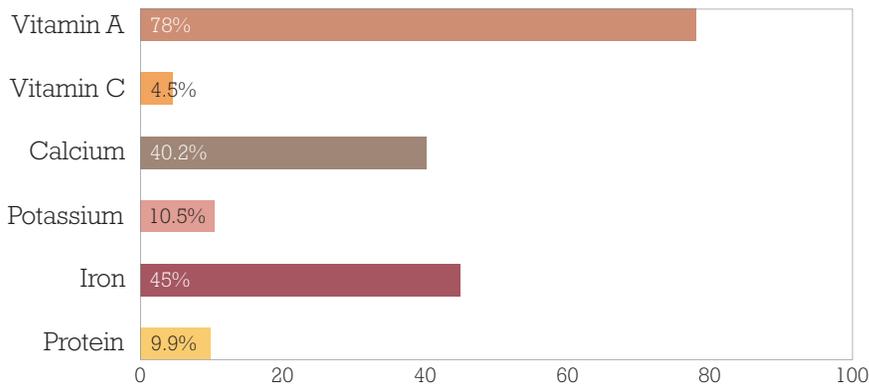
#### Suggested Dosage:

Children: 1 to 3 tablespoons a day, depending on nutritional needs

1 tbsp. provides 100% RDA of Vitamin A.

#### For Breast-Feeding Women

RDA% per 3 tbsp. (24g) Moringa Leaf Powder<sup>5</sup>



#### Suggested Dosage:

Pregnant or nursing women: 2 to 3 tablespoons a day, depending on hemoglobin levels

3 tbsp. provides 78% RDA of Vitamin A.

Absorption of nutrients may vary depending on individual diets and health conditions. Moringa leaves, with their high iron and protein content, are not appropriate for initial treatment of the severely malnourished.

## Claims of Traditional Medicine

For centuries, people in many countries have used Moringa leaves as traditional medicine for common ailments. Clinical studies have begun to suggest that at least some of these claims are valid. With such great medicinal value being suggested by traditional medicine, further clinical testing is very much needed at this time. If studies conclude that even some of the claims are correct, these leaves could become an invaluable resource for people in areas where other forms of treatment are scarce.

Guatemala	skin infections, sores
India	anemia, anxiety, asthma, blackheads, blood impurities, bronchitis, catarrh, chest congestion, cholera, conjunctivitis, cough, diarrhea, eye and ear infections, fever, glandular swelling, headaches, abnormal blood pressure, hysteria, pain in joints, pimples, psoriasis, respiratory disorders, scurvy, semen deficiency, sore throat, sprain, tuberculosis
Malaysia	intestinal worms
Nicaragua	headache, skin infections, sores
Philippines	anemia, glandular swelling, lactation
Puerto Rico	intestinal worms
Senegal	diabetes, pregnancy, skin infections, sores
Venezuela	intestinal worms
Other countries	colitis, diarrhea, dropsy, dysentery, gonorrhoea, jaundice, malaria, stomach ulcers, tumor, urinary disorders, wounds