

Preface

I have always been enchanted by trees. I looked at them, studied them, and climbed them. I hugged them shamelessly, I envied those trees. I talked to them often; and photographed them thousands of times. Some of my photographs have names such as: "The Never Enough Trees" and, indeed, the trees were never enough to me. Admittedly, this might sound rather eccentric, especially when you know I am, after all, a "cold-blooded" scientist. The extraordinary thing in this whole story is one good day, life suddenly prompted me to write a book about . . . a tree, or, to be more precise, an **extraordinary tree**. Well, this surprise found me ripe. **I believe my whole life I was unknowingly preparing myself to write This Book**. But maybe I should not call it a "surprise", rather an expected order of things: there must have been so much love for trees, so much passion for Nature within my heart, that **life compelled me to express myself in this project**.

It is my hope that I will be able to match life's expectations and bring you the unbelievable, beautiful story of one of our greatest trees, Moringa. A tree rich in the most precious nutrients that has wisely chosen to grow where it is most needed - in **arid, drought plagued areas** of our world. Moringa, a resilient tree, **inherently resistant to many diseases**, can also help our body heal itself from some of its diseases. It's a tree that can amazingly grow 5-6 meters (yards) in a year, despite minimum rainfall. Moringa is a tree that brings hope to malnourished children while drying the tears of their mothers. No wonder it is surrounded by legends and praise, awe and respect.

Moringa bears a variety of suggestive names around the world such as: **"Miracle Tree", "Mother's Best Friend", and "Never Die"**. It has been more than overwhelming to learn about the many uses of Moringa, and, during this process, I came to love and talk about her as a close friend. Don't be surprised to notice my affection here and there, while reading this short book about a great being.

After a comprehensive introduction, this book is organized in chapters explaining the main beneficial nutrients and compounds found in Moringa. The subsequent chapters show how Moringa can improve our general health. My wish is that anybody who reads this book may understand the extraordinary value of this plant for humanity. The mission was difficult;

Moringa has hundreds of substances such as vitamins, enzymes, amino acids, fats, minerals, specific phytochemicals (plant-derived), each with clear importance and numerous applications in healing and nutrition. I tried to remain objective and impartial, although it is hard not to be excited and fascinated by Moringa. In comparable amounts (gram per gram), Moringa contains more vitamin C than oranges, three times the iron of spinach, and four times the calcium found in milk. Combine these with significant amounts of proteins and oils, a great taste, and the presence of beneficial antioxidant (antiaging) and anti-inflammatory substances and you will come to understand why they call her a Miracle Tree.

MONICA G. MARCU

PHARM.D PH.D.

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Moringa is famous and beloved in many parts of the world, while her fame is spreading and igniting exciting research projects in agriculture, forestry, botany, food and drug industries, health and cosmetics. Churches and charities, peace corps, and other humanitarian organizations such as Educational Concerns for Hunger Organization, or ECHO, Trees for Life - based in Wichita, Kansas - an organization that plants food-bearing trees in developing countries are interested in Moringa for obvious reasons. Church World Service (the U.S. National Council of Churches' global service and witness

ministry) has recently organized the first-ever international conference on the Moringa tree, as an indigenous resource for fighting hunger and malnutrition. Participants from **27 countries**, including **12 African nations**, representatives from private industry, ministry officials, researchers, secular and ecumenical non-governmental organizations were counted among the attendees.

The International Eye Foundation (based in Maryland, USA) is promoting Moringa for the prevention of childhood blindness (due to malnutrition) in poor countries. Indeed, Moringa, through her richness in vitamins, saves precious eyesight in the most vulnerable victims, children with vitamin A deficiency.

Newspapers and scientific journals mention Moringa more and more often. Until recently, this tree wasn't really known in the West, except to botanists. Today, Moringa - the very plant that desperate mothers from tropical countries use to save their malnourished children, is also featured as the exciting ingredient of a fancy skin rejuvenating cream. Researchers from Austria to Australia, Nicaragua and India, study Moringa's properties and growth. The National Science Foundation and National Geographic Society, together with other organizations, have started to finance the gathering of a collection of all Moringa species to gather more information about her many healthful properties.

MORINGA. THE MEDICINAL PLANT

As briefly mentioned when introducing Moringa, the plant is being used around the world by many cultures for a variety of ailments. It is time now to explore and explain in more detail some of the known and lesser-known facts about her medicinal properties, active compounds, and their effects on humans and animals. Let me start with a short introduction on ***medicinal plants and their importance in human health.***

Herbal (plant) medicine is the most ancient form of healthcare known to humankind. Plants as medicines are mentioned in *historic documents dating back many thousands of years.* Furthermore, many cultures, like Amazonian Indian tribes, with no written languages, depended on oral communication to convey information and traditions, which were also rich in plant stories. Since prehistoric times and continuing to our modern days, people from all over the world have grown or collected plants for the prevention and treatment of diseases. Moringa oleifera is one of the best examples. People have long known that botanical medicine provided a complete, safe system of healing and prevention of diseases.

The **World Health Organization** (WHO) estimates that nearly 80% of the world population is dependent on traditional medicine for primary healthcare. This is due to the fact that plants are the only available, trusted medicine or the only affordable solution. As a result, plants continue to save millions of lives every year. Of the many plants used around the world, some have been carefully studied and used for the production of valuable drugs that can be found in pharmacies. Remarkably, of the hundreds of plant derived pharmaceutical medicines, about ***75% are used in modern medicine in ways correlating directly with their traditional uses by various native cultures!***

In other words, modern science has validated most of the traditional (should I say empirical? Probably not) therapies involving plants. This remains valid for **Moringa's precious medicinal properties**, as we shall further explore.

How is Herbal Medicine Working? How is Moringa Working?

Plants produce and contain thousands of chemical compounds that benefit the plant itself. They **protect the plant from herbivores or damaging ultraviolet light**, attract pollinators or prevent competitive germination. Below are some examples of plant chemicals with biological activity in animals:

Powerful alkaloids (alkaline reaction in water, contain nitrogen in their molecule) with specific actions on animal physiology. **Caffeine** (from coffee beans) and **morphine** (from poppy) are well known **alkaloids**. Moringa root bark, but not the rest of the plant, contains specific alkaloids such as **moringinine**, which increase heart and blood vessel tonus.

Antioxidant compounds (please, refer to the chapter "Antioxidants in Moringa") reduce the cellular damage inflicted by normal metabolism and living processes in plants, animals, and humans. Most plant antioxidants are also anti-inflammatory and cancer-preventive, thus delaying aging of tissues, and degenerative diseases (age-related ailments).

Examples of antioxidants are the compounds called flavonoids (color pigments found in many plants). To date, Moringa is known to contain a number of powerful antioxidant flavonoids such as quercetin and kaempferol. Many vitamins in Moringa qualify as potent antioxidants as well: vitamins A (as betacarotene), C and E. (Please review "Antioxidants in Moringa.")

Dietary plants are the main source of antioxidant antiaging substances for humans!

Vitamins are complex substances vitally important for metabolic and many other physiological reactions. Some of the vitamins (specifically, vitamins A, C, E) are also potent antioxidants. Vitamins may be considered nutrients but they are also viewed as "medicines" when they bring the health back into balance, normalize and regulate the abnormal biologic processes, which lead to diseases. Moringa is a powerful vitamin factory; some of those present in the various parts of the plant include vitamin C, beta-carotene (a precursor of vitamin A), vitamin E, vitamin K, and many of the B complex group of vitamins. These are reviewed extensively in the chapter "Moringa, the Nutritive Plant".

*** Antibiotics, antimicrobial and antihelminthic (i.e., against parasites, worms)**

substances. Some of the most powerful antibiotics have been isolated from plants, but plants can also be used in their whole form to fight infections and parasite infestations. This extraordinary effect of plants is especially important whenever the local population cannot afford expensive medicines from pharmacies. Moringa has long been known to have powerful antibiotic effects and was used by various populations around the globe against infections.

Modern science has confirmed and described at least some of the **antibiotic** substances in Moringa. **For example, pterygospermin**, a substance from her flowers and roots, has excellent **antimicrobial and fungicidal properties**. But that may not be all; Moringa seeds and leaves might contain antibiotic substances, yet to be discovered. Why do I believe that? Because this plant, especially the **leaf juice**, was traditionally used and is used to **treat many skin infections**.

Natural hormones, enzymes, minerals, and various phytochemicals (plant-derived substances) with numerous pharmacological activities in animals and humans. These are too numerous to mention, and they go beyond the purpose of this book to talk about their effects on health. Suffice it to say that plants, generally, are an inexhaustible, fantastically useful and creative source of beneficial substances that can be used in many ways to improve human lives, at all levels.

Niaziminin, another Moringa phytochemical, was shown to have potent anticancer activity in animal studies. Interestingly, long before research validated the idea, people traditionally have used Moringa against abdominal and other tumors (cancerous growths).

Hypotensive (lower blood pressure) principles niazinin, niazimicin, and niaziminin A and B were also obtained from fresh leaves. These compounds belong to the family of mustard-oil glycosides (very rare in nature).

One of the most exciting phytochemicals found in Moringa is **beta-sitosterol**. It has a chemical structure very similar to that of cholesterol, and it acts to reduce the excess of cholesterol in the human blood. Although beta-sitosterol is not well absorbed by the body after ingestion, when consumed with cholesterol (found in animal fats) it **effectively blocks cholesterol's absorption**. This ultimately leads to a lower serum cholesterol level. But beta-sitosterol has many other beneficial effects for humans. Please review the chapter "Moringa, the Nutritive Plant" or more exciting details.

Moringa is rich in beneficial substances, hence her numerous pharmacological and nutritive activities. Her **leaves** are used for **stabilizing blood pressure and blood sugar**, plus **reducing high levels of cholesterol in the blood**. The **Pods** are used to treat **inflammations of the joints**; the **roots** for **rheumatism**; the **seeds** have antispasmodic **properties**; the **bark** can be chewed to stimulate digestion; the flowers can heal various inflammations, and so on. For a short summary of traditional, medicinal applications of Moringa, see Table 1.

IMPORTANT: It is worth mentioning that more often than not, it is impossible to point to a single, specific pharmacological effect of any particular phytochemical from a whole plant. Whole plants or their parts include a wide variety of active compounds that may **act synergistically** (complement and empower each other) or annihilate each other's unpleasant effects. The result of such **multiple interactions** between **plant components**, on one hand, and plant components and animal organisms (cells, tissues, organs) on the other hand, is **expectedly complex**. Humans (and animals!) have tried various plants and noticed their effects on overall health. These are, after all, time-tested medicines. *Had they not helped healing, people would have discarded them and searched for other, more efficient plant medicines.* In other words, if various cultures, in separate and distant parts of the world, have **continued using Moringa as a medicinal plant, there must be very reliable beneficial effects.**

Table 1 explores some of the best-described healing properties of Moringa's seeds, leaves, and pods around the globe, from local traditional medicine. I wish to remind you that these **medicinal applications**, found and **time-tested** mostly in tropical and sub-tropical regions, were made by people suffering from diseases generally different from those diseases of people in the developed world. Their **main health concerns** were various **infections and parasites, malnourishment, and skin inflammations**. High cholesterol, heart disease, cancers, and Alzheimer's disease were not on their priority list! But, as already mentioned and to be further explored, Moringa has plenty of healthy surprises for people with a wide variety of habits and problems.

A diet rich in plants such as Moringa can significantly improve human health by:

- * Reducing **cholesterol** levels and triglycerides ("bad" fats in the serum).
- * Controlling **blood sugar** and helping normal sugar and energy balance.
- * Offering **vitamins and minerals** vital for maintaining normal physiology.

- Offering powerful **antiaging and anti-inflammatory** natural substances, many with anticancer properties.

LEAVES	FLOWERS	PODS	SEEDS
general tonic	general tonic		tonic
anti-inflammatory	anti-inflammatory	anti-inflammatory	anti-inflammatory
anti-cancer	anti-cancer	anti-cancer	
diuretic	diuretic		treats bladder problems
antibacterial	antibacterial		antibacterial
antihelminthic	antihelminthic	antihelminthic	
reduce fever	antifebrile		reduce fever
reduce headache			
laxative			laxative
anti-anemic			treat scurvy ²
increase milk production			
anti-diarrheal			
antihypertensive			
anti-diabetic			
hepatoprotector			
relaxant sedative			

Note: Roots and bark are also used in a variety of ways for healing.

MORINGA, THE NUTRITIVE PLANT

A more palatable subject, I hope, although nutrition and diet are pervasive buzz words that complicate our lives. Why? Because there is so much information (sometimes contradictory) and talk about food and nutrients, so many articles and shows everywhere you turn, that the subject leaves many people confused. It is not my wish to add more confusion to an otherwise important subject. Therefore I will explore Moringa's nutrients and benefits, while explaining briefly their role in human physiology.

What could Moringa bring to the Westerners' table?

Concentrated vitamins, minerals, all necessary protein constituents, beneficial fats, antioxidant, antiaging and anti-inflammatory substances, all in a readily absorbable (usable) form and **easy to digest an energy food**. Tasty, but with very little sugar and salt.

First we saw the extraordinary benefits and nutritional value of Moringa for people living in less fortunate or impoverished areas which are **prone to drought**. The leaves, seeds and pods of Moringa provide many nutrients which can be eaten fresh or dried in a variety of recipes. According to Optima of Africa, Ltd. (optimaworld.com, a group that has been working with this tree in Tanzania), **25 grams** (less than an ounce) daily of Moringa Leaf Powder - **will give a child the following recommended daily allowances: protein 2%, calcium 125%, magnesium 60%, potassium 41%, iron 71%, vitamin A 272%, vitamin C 22%.** The same benefits apply to adults and senior citizens, but only the percentages change. Obviously, Moringa is **beneficial for people of all ages**.

It might seem hard to believe, but, despite the high frequency of obesity in our Western culture, **many from the Western world suffer from serious nutritive deficiencies**. They stem from poor eating habits (junk food, overcooking, mixing foods in an appropriate way, etc.), insufficient consumption of fresh fruits, vegetables and seeds, foods lacking valuable nutrients due to soil depletion caused by intense, monoculture, **chemically-laden** methods of agriculture, or by **overprocessing** of foods.

Many people, unknowingly, have **poor gastro-intestinal absorption of nutrients**, which usually increases in seriousness with age. Many others lack the time to learn about healthy nutrition, while some are not educated enough to understand its importance. Still others simply don't care, and stick with their junk food until their first (or last) heart attack.

Multivitamins (with minerals) seem to be an easy and handy solution, but beware: many vitamin brands offer pills and products that cannot be truly dissolved and absorbed efficiently by the body. They may also be contaminated with various industrial substances (for example, solvents, heavy metals, etc.). Generally, vitamins and most nutrients are **best absorbed** and used by the body when they come from **natural sources** (plants, animals) and are present in naturally occurring, complex combinations. This is because we humans ARE part of the natural world. We evolved together with our food for millions of years. Our digestive, metabolic, and immune systems have been accustomed to dealing with plants as a whole. We are designed to best absorb vitamins from nature's complex foods. So eat your veggies, whenever possible!

Summary of the Main Nutrients in Moringa oleifera

Most often leaves and pods of young shrubs or adult plants are used for cooking. Sometimes leaf powder (very concentrated in nutrients) may be obtained for the convenience of handling and transportation. There are already a number of studies that have analyzed and measured the rich variety of nutritive substances from Moringa. It is not my intention to overburden you with numbers and percentages--so I put together the following simplified Table 2 on page 30.

There are plenty of foods and treats on the market, each with more or less nutritive and caloric value. We try to make sense of them and choose the best, but what is "best"? For some, it is the taste, for others the vitamins, for many, the lack of cholesterol or sugar, or salt (**strange, isn't it? - to value food for what it lacks.**) There are thousands of books and opinions on food. Some get rich on the backs of others who, after reading those books, are still groping in the darkness of **low calorie and low cholesterol, tasteless "health" bars.**

Although, personally, I have been through medical schools and educational institutions in several countries, I can say my best and most reliable teacher is **Nature!** I take time to observe what Nature does, what animals that are like me eat or do; how healthy or sick they get, and what their secrets are for agility, energy, and longevity. I am not the only one. **Ancient, wise civilizations did the same for thousands of years, observing and following Nature, in all details.**

To make a long story short, I do what other omnivores like me do: eat a variety of fresh, non-cooked plants, mostly greens (lettuce, parsley, cabbage, spinach, and others), other colorful plants and fruits, seeds, nuts, mushrooms, and from time to time, some grains, eggs and lean meat (although I could live very well without meat). Since all these omnivores move a lot to collect those plants (think of the bear), I also **move a lot.** I think that is all you need to know about a healthy diet. Nature keeps things clear, simple and free of charge.

Coming back to Moringa - a green, most amazing and nutritious plant, I will describe the **importance of her complex content in her characteristic**, concentrated form (leaves or leaf powder and pods). Table 2 presents a brief summary of the main nutrients and other important components in Moringa for those who hate numbers and percentages.

Sometimes numbers are truly important since they enable us to compare nutritive values. So, for the sake of convincing the skeptics, let's look at some numbers, below.

Attention vegetarians and parents: In terms of protein value, the Moringa leaves are about **40% protein**, with all of the **9 essential amino acids** present in various amounts. (Essential amino acids are

those that the human body cannot synthesize, therefore they must be supplied by the diet.) Moringa is considered to have the **highest protein ratio of any plant so far studied on earth!**

Attention lactose-intolerant friends: Calcium is a vital macroelement for human health. A cup (8 ounces) of milk or yogurt could supply 300-400 mg (about half of the daily necessary amount), while 8 ounces of **Moringa leaves** contain **1,000 mg calcium**. Moringa **leaf powder** of the same weight (8 ounces) contains over **4,000 mg calcium**.

Attention **anemic friends**: Moringa is very **high in iron**. Three ounces (about 100 g) contain 7 mg of iron, while the leaf powder has 28 mg. One of the richest iron sources, roast beef, has only 2 mg iron proportionally per three ounces.

Attention everybody: **Vitamin C**, one of the most disputed, talked about and supplemented vitamins, is found in Moringa in large quantities. **100 g of Moringa leaves** contain more than **200 mg vitamin C**, while 100 g of **orange juice** has only about **40 mg**. The daily allowance . . . well, this is a long story that deserves more space, so we will meet again with this subject at the "Vitamin C" subchapter.

I know what you're thinking. All this sounds good, but who is going to replace the beef, oranges and yogurt with some leaves?

The answer is simple: the numbers and comparisons above were given for the purpose of evaluation and better appreciation of the extraordinary Moringa richness. I do not suggest you replace all of your favorites with "just" leaves. But, since most of us are concerned with calories while trying to nourish ourselves with nutrients and vitamins, ***Moringa can become a unique "super-food" in our arsenal.*** It is unique because, even in small amounts, it can supply daily a wide gamut of vital nutrients with few calories. It would take really large amounts and many types of foods - and calories - to bring all the nutrients, vitamins and minerals, antioxidants and antiaging substances we should eat every day. Why not add a concentrated super-food like Moringa? **One plant has it all. . . even great taste!**

For variety and simplicity in choices, parents concerned about their children's health should take a closer look at Moringa as a regular meal. Instead of supplying oranges for vitamin C, milk for calcium, meat for iron and proteins, greens for magnesium, bananas for potassium, apples and pears for fiber, parents could use **Moringa as a "Jack-of-All-Trades"** regular snack.

Remember, VARIETY still remains the key for a healthy diet! I mean plant variety.

There are various sources for cooking and enjoying fresh Moringa leaves, pods or leaf powder. Please consult the references at the end of this book.

The Main Nutritive Groups and Valuable Dietary Compounds in Moringa

1. **Protein** constituents or amino acids (the building blocks of proteins). There are 20 amino acids necessary, and found in human proteins, of which 9 are essential. ALL 9 are found in Moringa.
2. **Carbohydrates** (several of the "good" type, including fibers; about 3-13 % in pods and leaves).
3. **Minerals** as macroelements such as calcium, magnesium, potassium, phosphorus, sulfur.
4. **Minerals** as necessary microelements: iron, zinc, copper, manganese.
5. **Fats**, as vegetable oils: fatty acids, beneficial omega-6 oils and liposoluble vitamins.

6. **Vitamins**, many of which with antioxidant properties: vitamin C, E, F, K, provitamin A(beta-carotene), complex of vitamins B - B1, B2, B3, choline, others.
7. **Chlorophyll**, the green pigment of plants (includes magnesium in its molecule).
8. Other **plant pigments**, some with antioxidant properties: lutein, carotenoids.
9. **Plant hormones** with antiaging properties in humans: cytokinins such as zeatin.
10. Plant specific (**phytochemicals**) antioxidants: quercetin, kaempferol and others.
11. Plant specific **sterols**: beta-sitosterol. And many others beyond the scope of this book.

Amino Acids in Moringa

Plants are an important source of proteins, but most plants actually supply the units making up the proteins - the amino acids. As you know, proteins together with lipids and carbohydrates are the three basic groups of biochemical substances of which plant and animal organisms are made. Again, amino acids are the building blocks or monomers of the proteins (which are long chains of amino acids linked together).

How Much Protein Do We Need?

Nutrition experts recommend that proteins (or amino acids) should account for 10-15 % of the calories in a balanced diet, although requirements for protein are affected by age, health, weight, and other factors. Generally, a normal adult requires approximately 0.36 grams of protein per pound of body weight, or 0.8 grams per kg weight. That makes a total of 50-80 grams daily. Athletes have higher amino acid (protein) requirements, and babies need much more protein per body weight than do adults.

Proteins are digested by the gastro-intestinal system and then cut into smaller, simpler units (aminoacids) that can be absorbed through the walls of the intestines and used by the body. After absorption, the liver and various tissues will make their own, specifically needed proteins. Thousands and thousands of complicated proteins make up the structure of cell walls, and the soluble particles in blood or less soluble structures of bone and skin. Proteins interact with each other and specifically recognize each other in order to perform ALL our physiological functions. Life can be seen as a complicated and beautiful "dance of proteins"! Since proteins and other nitrogen-containing substances are continuously degraded and rebuilt, they must be replaced by a continuous supply of amino acids from the diet.

Since proteins are cut into the smaller units and resynthesized afterwards, amino acids are the best material supply for making proteins in animals/humans. By eating amino acids instead of long chains of proteins (as found in most animal-derived foods), the human body can save energy, time and... allergies. **Many allergies are due to animal proteins.** Therefore, by eliminating those proteins from one's diet, allergies can be treated or controlled efficiently. (Some allergies can also be due to plant proteins.) Since some babies are allergic to animal proteins or even soy proteins, they should be provided with amino acids, which are much smaller molecules, easier to absorb, and do not usually trigger allergies.

There are **20 amino acids** present in the human body's structures. (Actually, in nature there are more amino acids.) Of those, 9 are known to be ESSENTIAL; they have to be supplied by the diet since the human body cannot synthesize them, as it does with the other in amino acids. Few foods, like Moringa, are known to contain all essential amino acids, hence, the importance of a complex, rich diet. The **9**

essential amino acids are: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, **tryptophan** and valine. Histidine is considered essential for children and babies, not for adults. Strict vegetarians should ensure that their diet contains sufficient amounts of all these amino acids.

Moringa is one of the very few plants that contain all the essential amino acids, although two of them, lysine and tryptophan, are poorly represented in most plants. Moringa's essential amino acids presence and digestibility scores are more than adequate when measured against the standards of **WHO**, Food and **Agricultural Organization** (FAO) and **United Nations Organization** (UNO) for small children, the most at-risk population group when it comes to proteins in food.

Compared to **soy beans**, one of the best known and **most valuable plant sources of proteins**, Moringa's leaves fare great. The two plants have similar protein quality and quantity. **Food scientists once believed that soy proteins were the only plant-based proteins with a quality equal to that of meat, milk and eggs**, but now they have **added Moringa** to this very short list.

With all due respect to soy and its fans, I have to remind you that soy might be a wonderful source of proteins but it is **not famous for its content of vitamin C, iron, calcium, and other nutrients**.

Moringa IS! Also, many babies are intolerant (allergic) to soy's protein.

Sometimes these babies are **lactose-intolerant** as well, so they cannot drink milk or use it as a source of protein. Since there are no reports of any Moringa-triggered allergies, and since it is safely used as a food for numerous healthy and sick children, **Moringa can become a principal source of amino acids in baby nutrition, replacing soy!**

Another recent concern related to soy is that a large proportion of the soy cultivated in USA today is **genetically modified (GM)** but not labeled as such. The European Union, Japan and other countries often reject GM plants or require strict labeling of the foods containing GM products. Soy is present in a large variety of products, from baby food to supplements, in soy protein isolate or flour. *Most believe that there is no safe way to identify and differentiate GM soy from non-GM soy in USA or Canada.* While the debate about GM plants is very hot and understandably so, I do not intend to discuss this here. Suffice it to say that GM plants contain foreign proteins, sometimes derived from insects that may induce allergies and other health problems in some people. GM plants also pose a serious threat for the environment and common plants or agricultural heritage. Their long-term effects on human health have not been studied yet, but GM plants have been highly promoted and sold unlabeled on North American food market shelves. Therefore, to **vegetarians** and everybody concerned about their plant protein sources, such as soy, **Moringa's amino acids should be a first-line supply**, together with her other wonderful nutritive qualities!

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Table 3 compares the essential amino acids composition in Moringa and soy proteins. Don't miss this eye-opening table!

Essential Amino Acid	Soy Protein mg/g protein	FAO/WHO 2-5 year old child Reference Pattern mg/g protein	<i>Moringa oleifera</i> Extracted Leaves mg/g protein
Histidine	26	19	31
Isoleucine	49	28	51
Leucine	82	66	98
Lysine	63	58	66
Methionine + Cystine	26	25	21
Phenylalanine + Tyrosine	90	63	105
Threonine	38	34	50
Tryptophan	13	11	21
Valine	50	35	63

FATS IN MORINGA

Moringa seeds contain between 30-42% oil, with 13% saturated fats and 82% unsaturated fatty acids (those considered very beneficial in the diet). The leaves and pods, surprisingly, also contain 1-2% fats. Since Moringa is a **food champion** and seems to gather **all the best nutrients** for us, don't be surprised to find out that it also provides some of the absolutely essential fats or Essential Fatty Acids (EFA's), and other "good" fats as oils. (As in the case of essential amino acids, the EFA's cannot be naturally synthesized by the human body therefore they must be obtained from the diet.) Moringa oleifera (oleifera is the Latin term for "oil-containing") surely deserves her name.

The Good, the Bad and the ...**Oleic Acid**.

Don't eat too much fat! A fatty diet is unhealthy, right? WRONG!

Fats of the good sort, as we shall further explore, are absolutely vital for health. All cells, especially the membranes surrounding the cells, contain large amounts of fats (including cholesterol), and our brains are composed mostly of fat. Can't keep a brain without fat! Most of the body's biology (including **heart function**, blood pressure, fertility, inflammation and immunity-resistance to various infections and even **cancer**) depends on the presence of optimal fats. Damaged cells are replaced with new ones on a daily basis; in this process, fats are absolutely necessary as they make up a good proportion of the cell membranes.

A low-fat diet will make you very ill in the long run; it induces heart problems, stunts growth, harms the liver, kidneys, endocrine glands (that secrete our hormones) and the immune system (that protects us against infections and cancer).

Not all fats are equal, though. While animal sources contain mostly saturated fats (more hydrogen in their chemical structure) - or "bad" fats, many plant-derived fats are high in unsaturated, beneficial oils. The more unsaturated a fat is, the more liquid (oily).

What about the amount of fats in the diet?

Detailed research has shown that the total amount of fat in the diet (high or low) isn't really linked with disease, but what really matters is the type of fat in the diet. The secret is to substitute good, vegetable fats for bad fats.

Saturated fats increase the occurrence of chronic diseases, inflammations, heart problems, strokes, atherosclerosis and others.

Unsaturated fats protect against many diseases, including cancer, nourish the body and fight inflammation, depression and infections.

A particularly harmful group of fats are the man synthesized hydrogenated (trans) fats that can be found in everything today, such as biscuits and candies, margarine and vegetable shortening, fast foods and in most commercially baked goods.

What About Cholesterol in Food?

Although it is important to limit the amount of cholesterol in the diet, dietary cholesterol isn't the main enemy. High cholesterol in the bloodstream may significantly increase the risk for heart disease and strokes.

But the cholesterol in the blood is mostly (75%) made in the liver, while only a quarter is derived from what is absorbed from food. Again, the biggest influence on blood cholesterol level is the ratio and type of fats in the diet. (For more information about cholesterol and why Moringa could help, please review the chapter "Beta-sitosterol in Moringa".)

One of the best types of fats is **oleic acid**, a **monounsaturated oil** which is actually present in Moringa in high quantities. About **73%** of the Moringa oil is oleic acid, while in most beneficial plant oils, it only contributes up to 40%! Just for instance, olive oil (one of the best, most healthy types of fats) is about 75% oleic acid. While sunflower is about 20%, and canola about 55% oleic acid. Similar to olive oil, Moringa has only 13% saturated fats,

You must have heard about **oleic acid**, **the main ingredient in olive oil** - one of the best known secrets of the healthy Mediterranean diet, which is linked to lower rates of cardiovascular disease and certain types of cancer. The Mediterranean diet is actually rich in fats, but we are really talking about the good oleic acid.

Science has clearly established the link between **reduced incidence of cardiovascular disease** and **olive oil (oleic acid)** and it is believed that this is due to its ability to lower cholesterol levels. (High cholesterol levels are a main risk factor for cardiovascular disease.) Risk factors of heart disease, stroke and high blood pressure. are also positively affected by oleic acid. Some scientists have recommended the daily use of olive oil to lower the need for antihypertensive drugs! **Oleic acid** also reduces atherosclerosis (hardening of the arteries). European studies have found significantly lower breast cancer incidence among women with a high intake of monounsaturated fats, mainly in the form of olive

oil. As of this date, science has yet to study the benefits of Moringa oil, but that date will surely come in the not too distant future.

However, since Moringa oil is so similar to olive oil, one could expect similar beneficial properties.

Another **exciting property of oleic acid is related to its ability to regulate the blood glucose levels.** Glucose is the common type of sugar in the blood. Research studies have shown that olive oil can markedly lower blood glucose levels. Even diabetics who switch from a high carbohydrate/low fat diet to a high fat (**50% of calories coming from fat**) diet, with **most of that fat as olive oil**, can lower their blood sugar levels so much that they **require less insulin injections.** Insulin is the pancreatic hormone regulating, among others, the blood glucose levels. Some diabetics do not produce enough insulin anymore, others have become "**insulin resistant**" - meaning that their cells do not recognize and do not react anymore to the body's own insulin. Both groups require constant treatment and careful diet habits. Even in the case of insulin resistance, oleic acid may help to prevent or delay the onset of the diabetes by preventing insulin resistance. Many overweight people are candidates for diabetes with insulin resistance. For them and for anybody else, it is worth taking a good look at oleic acid and [replacing the saturated fats with plant oils rich in oleic acid.](#)

Similar to olive oil, Moringa oil also contains 1-2 % EFA's such as the omega 3 and omega 6. EFA's favorably affect atherosclerosis, coronary heart disease, inflammatory disease, depression and even behavioral disorders (temper tantrums, learning, and hyperactivity in children).

An inadequacy of essential fatty acids is one of the main, widespread nutritional deficiencies among Americans and, generally, other modern societies consuming a refined or over-processed diet. This is a serious health risk, especially for children, since fatty acids are crucial for proper growth. The brain development of growing fetuses and newborns depends absolutely on the presence of EFA.

ATTENTION PARENTS OF HYPERACTIVE CHILDREN: Recent studies have shown that hyperactive children have much lower levels of essential fatty acids! Take a look at the labels of the cookies, cereals, peanut butter and other foods - replace foods containing hydrogenated or trans fats, and introduce instead plenty of good, fresh fats: raw nuts, extra virgin olive oil, flax, fish and.. .Moringa!

SUMMARY

Moringa oil fat composition is very similar to that of olive oil, one of the most studied, most beneficial types of fat.

The main (**73 %**) fat in Moringa - **oleic acid** - is an unsaturated fat linked to reduced incidence of heart disease, neurological disease, atherosclerosis, infections, and various cancers.

Moringa leaves and seeds also contain beneficial essential fatty acids (EFA's).

The type of fat is more important than the amount of fat in the diet.

BETA-SITOSTEROL IN MORINGA

Hold on, this is not a scene from "Invasion of the Body Snatchers", but rather a real biological "**warfare**" between two similar substances of the sterol family: **betasitosterol and cholesterol.** A sterol is a complex chemical related to steroid hormones but which also relates to alcohols. The sterols are naturally occurring substances in plants and animals and have many functions.

Cholesterol is mainly found in animals. It plays essential roles in the formation of cell membranes, synthesis of hormones and vitamin D; therefore its presence is vital for health. Too high levels in the

blood (actually in the serum) are dangerous, though. High cholesterol levels are a main risk factor for cardiovascular disease. Beta-sitosterol is a specific plant sterol, from the family of phytosterols. As mentioned before, it has a chemical structure that is **very similar to cholesterol** - the much-maligned serum fat that we all try to keep under control.

Beta-sitosterol has been shown to **reduce blood cholesterol levels!** This is due to their **competition for absorption in the intestines**: since the two sterols are similar, beta-sitosterol **"tricks"** the intestines and inhibits the absorption of food cholesterol. In other words, although beta-sitosterol is not well absorbed by the body, when consumed with animal fat cholesterol, it efficiently blocks cholesterol absorption. Consequently, lower serum cholesterol levels can result.

Beta-sitosterol also improves other blood lipids besides cholesterol levels, and brings them to a more normal range. Here you have it - maybe you could enjoy your steak WITH Moringa after all! Maybe, but don't take this to an excess of steak, of course. Remember, the liver itself also produces cholesterol. (Please review "Fats in Moringa" for facts on fats and how Moringa's oleic acid can help.)

Moringa is very rich in beta-sitosterol and related substances, and this is another excellent reason to include it in your diet. If you remember from the chapter on fats, Moringa contains another factor against high cholesterol - **oleic acid**. In any case, you might need extra beta-sitosterol. It is believed that the **average American diet lacks this component**, since it generally includes few veggies.

Plant sterols like beta-sitosterol are also proven to be very beneficial in preventing and treating **prostate problems like prostate enlargement** due to aging. Plant sterols improve many of the prostate-related symptoms. Even more, beta-sitosterol acts against some forms of cancer. It has been found to **reduce the growth of prostate and colon cancer cells**.

Among other medical benefits of beta-sitosterol:

- * It boosts the immune defense.
- * It has anti-inflammatory properties.
- * It helps normalize the blood sugar and supports the pancreas (which produces insulin - the hormone controlling blood sugar).
- * It helps to heal ulcers.
- * It can alleviate cramps.

The list could go on, but I think you get the idea - Moringa has many weapons against high cholesterol and its potential harmful effects.

FINAL THOUGHTS AND CONCLUSIONS

Although it is hard to say good bye to my friend, Moringa, I have to. Actually, Moringa will stay with me forever, as she remains with so many other people, as well. For the purpose of this book, though, I have to finish somewhere. I know some will read the beginning and the end first, in order to decide if they are truly interested in the whole book. In any case, closing remarks are always important - many readers will only remember those over the long run.

Before summarizing the many wonders of Moringa, I would like to expand more and explain why a **plant-based diet** is so important in the **prevention of serious, chronic diseases**, against which, we have poor weapons (read treatments). I am not going to throw too many numbers and statistics at you, I have done it already; besides, you can find the cited articles in the references if you need more details.

My call is for **sound thinking** and, above all, inspiration from **Nature**, which is the greatest, most successful, oldest scientist of all. The most compassionate physician, as well!

We humans ARE part of Nature, there is no other "external" environment, we are the environment. As such, we should function according to the basic rules of Nature for proper physical and mental health. Since we were meant to eat mostly plants, as omnivorous creatures, the best way to remain functional and healthy is to continue ingesting mostly plants, especially non cooked plants. **Have you ever seen an obese wild monkey** or a depressed bear (except for those in cages...)?

What about hypertension, cancer or atherosclerosis in our closest omnivorous cousins? No, for as long as they have the choice, our wild relatives will choose the right food. They will eat the food that keeps their legs agile, eyes sharp, and their bodies cancer-free.

The only situation in which wild animals get cancer is when they are exposed to human-created pollution. (Funny, I think, how we create the pollution that sickens us with asthma and cancer, then we struggle in so many other ways to fight these diseases, instead of addressing the cause and cleaning our internal and external environments.)

Some might argue that animals feed while humans "eat". In other words we have transformed the basic ingestion of nutrients into a social, sophisticated event; we seek the pleasure and satisfaction (taste) above all.

I personally think it is the lack of basic nutrition education that leaves some ignorant or indifferent to their true organic needs. The other main reason is the total dissociation from Nature, or our own roots and who we really are. **The consequences are many and sad, among these - a plethora of chronic diseases and physical weaknesses.**

In the case of cancer, for instance, it is clear now that most types of **cancer can be prevented or delayed by a healthy life style, especially a diet rich in vitamins and antioxidants.** Healthy life style also means natural or "normal" - as normal as it used to be when we enjoyed clean food, water and air, and were forced to move a lot. Did you know that there are thousands and thousands of scientific studies and publications about what can inhibit and how cancer can be prevented by various plants or plant-derived substances? By contrast, there is **not a single study showing that animal-based food can prevent cancers**, on the contrary! Even baked foods (such as bread) and grilled meat have proven to contain cancer-promoting substances. I do not mean to scare you, but rather to draw your attention to a crucial aspect of our diet and how is it connected to our poor state of health, from poor eye sight to cancer and heart disease.

If I have to choose the single most important group of substances that are really needed but are not well represented in the Western diet, I would select the **antioxidants from plants.** Or, better, I would say, eat a lot of non-cooked plants! Green or colorful, canned or not, fresh better than cooked (although sometimes cooking preserves certain antioxidants), organic if possible, or whatever you can afford, just get back to your roots and eat what you were designed to eat for, the best physical and mental state. **You would be surprised to**

notice the positive changes and the energy you will draw from plants. If you are still skeptical, I say this to you; "no matter what your dietary education or habits are, if you really eat properly, when you get up from the table you should feel light, energized and clear-minded." In the long run, you should:

* **rarely suffer from colds, constipation, migraines.**

* **have fewer wrinkles and joint pains, no need for eye glasses.**

* **definitely have no heartburn, high cholesterol or hypertension, to name just a few health troubles.**

If you suffer from any of these, your diet is not what it is supposed to be.

I still cannot understand those who continue to eat a specific type of food no matter what clear signs of stomach distress they might get afterwards. The pill against heartburn will not stop the erosion of the gastric mucosa following a stupidly chosen meal. Even more, remember - plant-derived foods will not distress your stomach, they will protect the gastric mucosa (unless it is already ruined by previous poor eating habits). The distress most likely comes from the animal - based foods you eat.

I, for one, if science and Nature would prove that by eating stones one could prevent cancer, I would definitely stick with the stones. I have seen enough suffering., fortunately, Nature provided a much tastier alternative - the **PLANTS** - so I stick with them. Statistically, did you know that one in three Americans might get cancer today? These statistics look even worse for the future: in 30-50 years, one in two Americans will probably have cancer! What about in 100 years? I do not know, but what I know is that humans are not guaranteed perpetual survival. On the contrary, we are just one of many other animal species and, according to science, **more than 90 % of species that have ever lived on earth have already vanished.** I also know that, the further we stray from our natural eating habits, the weaker and more prone to diseases we become. Draw your own Conclusions and act accordingly.

I briefly expose these serious health threats and their link to Western diet, for a better appreciation of plant derived food and - the role Moringa could play in it. You can continue to eat what you ate before, or you could ponder better alternatives. I personally trust plants to keep me healthy and energetic, the way I trust Nature to show me the path of wisdom in everything. After all, Nature has experimented on a large scale, and successfully created a myriad of opportunities and solutions for hundreds of millions of years! Among them - **the Miracle Tree - Moringa.** We humans have played and experimented with food for just a few thousand years or so (while junk food is much younger, of course). We started to invent and synthesize medicines less than 100 years ago...

This rather short book introduces you to Moringa oleifera, an unusually beneficial tree, in so many ways. **My wish is that, upon reading it, you can understand her nutritional and medicinal value, and begin to appreciate Earth's amazing, still largely unknown green heritage.** I have collected and put together information about Moringa's world-spread fame,

extraordinary medicinal and nutritive qualities, and why her introduction into our diet could be so valuable. I mean human and animal diet. I hope to have covered the most significant data and selected the most interesting facts, although I cannot claim to have covered all, or satisfied everybody. Please keep in mind that Moringa is studied and grown in many parts of the world, within various climates and conditions; therefore, the biological data and nutritive contents can vary widely from place to place.

Besides this book, there are other valuable resources on Moringa out there, many web sites and related articles, cooking recipes, seed sources and others. Please review the "[References and Resources of Information on Moringa](#)". The book "[Moringa, Nature's Medicine Cabinet](#)" by S. Holst includes many cooking recipes using various parts of the plant.

Unfortunately, it is very **difficult to find fresh Moringa on our Western markets**, but one can find canned or frozen pods in gourmet stores and some Asian markets. I plan to keep growing this wonderful plant for a continuous supply in my own house, although today we now have it readily available in a tasty Moringa product ([Zija International](#)).

Let me remind you again why this plant could be so valuable for each and every one of us, from East or West:

Moringa oleifera is extremely [rich in vital nutrients](#), and, as a bonus, can grow very fast even in dry areas of the world, where food is scarce. Since ancient times, she was used as a medicinal plant, known to heal and ease a wide [number of diseases: from various inflammations to cancer, from parasitic diseases to diabetes](#). In more recent times, Moringa has gained notoriety as a nutrition power plant that can feed the needy and, in fact, save lives. And [eyes...](#) from blindness due to lack of vital nutrients such as vitamin A in the diet. Moringa leaves or leaf powder can be used successfully as a complex food to nourish small children, pregnant or nursing women, and, of course, anybody else. In terms of nutrients, the leaves contain all the essential amino acids, present in harmonious combinations and significant amounts, readily bioavailable.

[Moringa can be, from this point of view, better than or at least as good as soy beans and soy protein.](#)

Moringa seeds are rich in an excellent oil, very similar in quality and composition to olive oil, one of the healthiest, most studied fatty foods. The replacement of animal fats in the diet with vegetal fats such as olive or related oils has been clearly linked with beneficial health effects and reduction in cardiovascular diseases and cancers. The list of Moringa's nutrients goes on:

essential minerals such as calcium, potassium, iron, and selenium, are present in Moringa, often more abundantly than in most plant sources we know of so far.

Iron is much higher in Moringa than in spinach, for instance. [Vitamins C, B 1, B2, E, and pro-vitamin A](#) are also present in significant quantities that make oranges or carrots pale by comparison. In addition, Moringa contains numerous phytochemicals (specific plant-derived chemicals) that act as antioxidants or antiaging substances, stimulating rejuvenation of skin and mucosa, or energizing and detoxifying the body.

These beneficial substances are hormones (zeatin), others and plant pigments (flavonoids) such as rutin and quercetin, to name just a few. All these naturally

occurring nutrients and medicines of Moringa are known to be best absorbed and active in the body if derived from natural sources (such as plants), and are present in complex combinations. Many of these beneficial substances act synergistically, enhancing each other's properties.

Not less exciting are Moringa's medicinal properties, as described in the chapter dedicated to the medicinal uses of this plant around the world. What is more interesting is that science continues to validate the ancient traditional therapeutic uses of Moringa.

Recently, novel derivatives of thiocarbamates and nitrites which stimulate insulin release in animals have been found in Moringa. These compounds and their action explain the **anti-diabetic properties** of the Miracle Tree. The list with valuable, recent medicinal discoveries related to Moringa goes on and on. One would need hundreds of pages to mention all the discoveries and describe their content.

Now that you understand better the value of this plant to us, you might consider as justified all those suggestive, affectionate names people gave Moringa: ***"Miracle Tree," "Mother's Best Friend," and "Never Die." I could not think of a better name...***