



A COMPILATION ON **Moringa oleifera**



MORINGA OLEIFERA FOR PEDIATRIC POPULATION

MORINGA OLEIFERA: A GLIMPSE

The plants have always been vital for mankind irrespective of the era and area globally since the beginning of life. They are essential due to their evident propitious role in nutritional, social, cultural, religious, and environmental aspects.¹ In addition, they are sources of bioactive compound that comprises of antitumor, antioxidant, anti-obesity, and antimicrobial molecules. Owing to their vast potential, they are being applied in dietary supplements as well as traditional treatments for many diseases worldwide.² Among these, the widely cultivated *Moringa oleifera* also known as *Moringa pterygosperma Gaertn*, belongs to monogeneric family, the Moringaceae, native to the Sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan has high medicinal value. This rapidly-growing edible tree (also known as the horseradish tree, drumstick tree, benzolive tree, kelor, marango, mlonge, moonga, mulangay, nébéday, saijhan, sajna or Ben oil tree) is increasingly being used for nutritional supplementation.^{3,4} Different parts of this plant such as the leaves, roots, seeds, bark, fruit, flowers and immature pods are being used for the treatment of

different ailments in the indigenous system of medicine.⁵ Since many years, World Health Organization has supported the use of *Moringa* as an alternative food for management of malnutrition.¹ Phytochemical analyses have shown that its leaves are particularly rich in potassium, calcium, phosphorous, iron, vitamins A and D, essential amino acids, and antioxidants like β -carotene, vitamin C, and flavonoids. Higher content of *Moringa oleifera* is also shown in figure 1.⁶ Peculiar components of *Moringa* preparations that exhibit hypotensive, anticancer, and antibacterial potential are illustrated in figure 2.³

CONSTITUENTS IN MORINGA OLEIFERA

Although the benefits of *Moringa oleifera* are diverse, its nutritional benefits are its chief advantage because of the presence of various macro- and micronutrients and essential amino acids.⁷ It has been suggested that its leaves are known to have anti-oxidant properties and thereby can treat hallucinations, dry tumors, hiccup and asthma.⁵ There is undisputed evidence that *Moringa oleifera* leaves in the form of both fresh and powdered form, are rich in

Figure 1: Higher content of *Moringa oleifera*

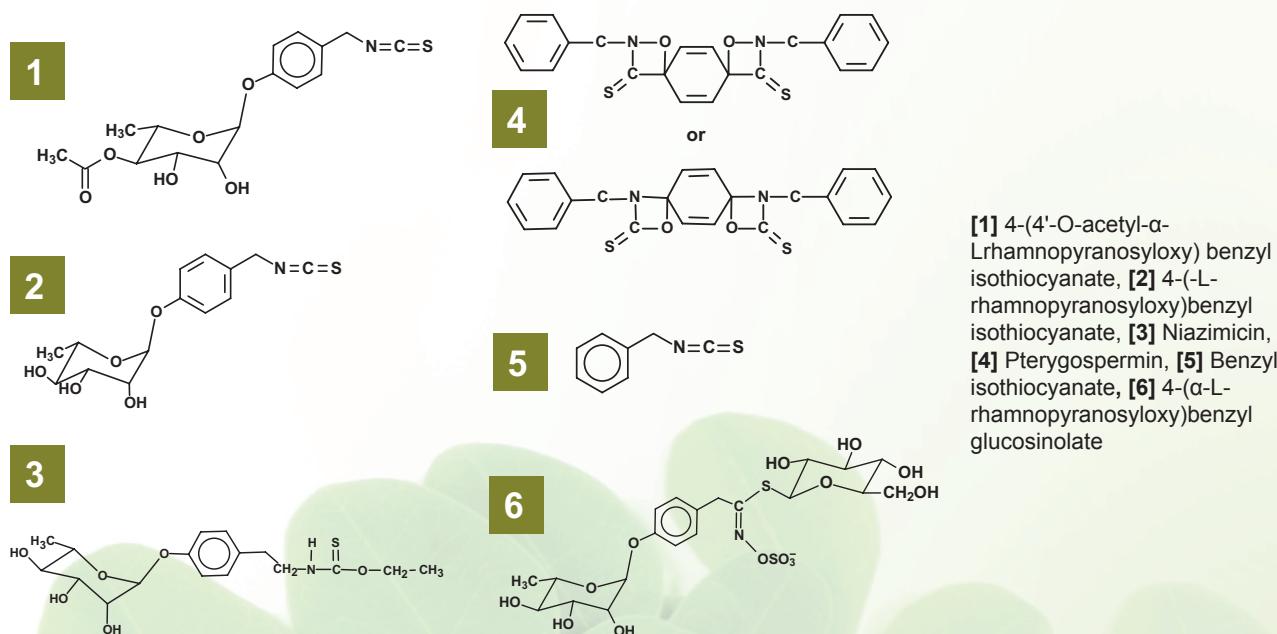


Moringa oleifera



Adapted from: Reference 6

Figure 2: Structures of phytochemicals from *Moringa oleifera*



Adapted from: Reference 3

nutritional supplement as depicted in table 1.⁷ Evidence based observation suggest that not only *Moringa oleifera* is the most nutrient-rich plant yet discovered, it has shown its superiority over other foodstuffs.¹ Table 2¹ summarizes its comparative nutritional value with that of other foods.

Moreover, studies have supported that it is one of the richest natural sources of β -carotene or provitamin A and thus, has a promising role in developing countries like India. Additionally, β -carotene and lutein (carotenoids) from *Moringa oleifera* have been reported to have high bioavailability.⁷ This has been substantiated by a study⁸ revealing relatively high bioaccessibility of beta-carotene and lutein from its leaves, suggestive of its potential in improving vitamin A nutrition in individuals with its deficiency, especially in degenerative disorders.⁸ Similarly, the bioavailability of thiamine and riboflavin are also high.⁷ Thus, establishing its good pharmacokinetic profile.

Health benefits of constituents of *Moringa oleifera*

Moringa oleifera tree is known as “miracle tree” in traditional medicine as it affects beneficially at almost all parts of the human body.⁵ Mounting evidences suggest that it exhibits various biological activities such as anti-atherosclerotic, immune-boosting, anti-cardiovascular diseases, antiviral, antioxidant, antimicrobial, anti-inflammatory properties and tumor-suppressive effects.² Besides, it also possesses analgesic, antipyretic, anti-asthmatic, hepatoprotective, antihypertensive, diuretic and cholesterol lowering activity. In addition, its antispasmodic, antiulcer, and antihelmintic effects are also evident.⁹ The investigators have suggested that every part of the plant has specific medicinal use.

The leaves are chiefly utilized in the management of hallucinations, dry tumors, hiccups and asthma whereas the root and bark are used to cure disorders of heart, eyes along with inflammation, dyspepsia and splenomegaly. Moreover, the flowers have anti-inflammatory effects and can cure muscular diseases. Seed oil from Moringa plants can be used for treatment of leprosy ulcers.⁵ A plethora of studies have highlighted the significance of chief pharmaceutical components of Moringa, which are listed in table 3.⁹

In addition, its constituents like vitamins are essential and play a vital role in the development of a child. Vitamin C, a crucial micronutrient has significance in boosting immune system as vitamin C helps in combating a host of illnesses including colds and flu. Similarly, Moringa is rich in vitamin A, which acts as a protective agent against ophthalmic, and dermatologic diseases. Furthermore, calcium also has a crucial role especially in pediatric patients as it helps in the formation of strong bones and teeth. In addition, this micronutrient can be utilized in ameliorating osteoporosis. Other important components include potassium, which is essential for the functioning of the brain and nerves. In spite of these constituents, Moringa leaves are rich in proteins (amino acids) which are the known as the basic building blocks of the body.¹ Various essential amino acids that are present in *Moringa oleifera* according to World health organization (WHO) reference pattern,¹⁰ along with their significance, are listed in table 4.¹¹⁻¹⁸

Therefore, taking into account various therapeutic benefits of *Moringa oleifera* and its extracts, it can be considered as an optimum agent in the treatment of various disorders in children, which is further elaborated in following section.

Table 1: Nutrient composition of Moringa oleifera leaves and Recommended Daily Allowance by Food and Nutrition Board, Institute of Medicine, National Academy of Sciences Dietary

	Moringa oleifera leaves (value/100g edible portion)	Recommended Daily Allowance for healthy children age 1-8 years old
Calories	92 cal	
Macronutrients		
Protein	6.70 g	13-19g/day
Fat	1.70 g	30-40 g/day
Carbohydrates	12.5 g	130 g/day
Micronutrients		
Vitamin C	220 mg	15-25 mg/day
Calcium	440 mg	500-800 mg/day*
Fiber	900 mg	19000-25000 mg/day*
Potassium	260 mg	3000-3800 mg/day*
Carotene (Vitamin A)	6.78 mg	300-400 mg/day
Thiamin (B1)	0.06 mg	0.5-0.6 mg/day
Riboflavin (B2)	0.05 mg	0.5-0.6 mg/day
Niacin (B3)	0.8 mg	6-8 mg/day
Copper	0.07 mg	340-440 mg/day
Iron	0.85 mg	7-10 mg/day
Magnesium	42 mg	80-130 mg/day
Phosphorus	70 mg	460-500 mg/day
Zinc	0.16 mg	3-5 mg/day
Essential Amino Acids		
Histidine	149.8 mg	8 mg/g protein
Isoleucine	299.6 mg	25 mg/g protein
Leucine	492.2 mg	55 mg/g protein
Lysine	342.4 mg	51 mg/g protein
Methionine + Cysteine	117.7 mg	25 mg/g protein
Phenylalanine	310.3 mg	47 mg/g protein
Tyrosine		
Threonine	117.7 mg	27 mg/g protein
Tryptophan	107 mg	7 mg/g protein
Valine	374.5 mg	32 mg/g protein

Adapted from: Reference 7

*Adequate Intake for an individual

POTENTIAL APPLICATIONS OF MORINGA OLEIFERA IN PEDIATRIC POPULATION

Moringa oleifera: The immune booster and fatigue fighter

The immune system in host has been developed to protect the host from pathogen mediated stimuli. The immune system functions by eliminating toxic or allergic substances from the body. Additionally, the immune system also possesses the ability to distinguish from self and non-self in order to evoke response to foreign pathogens, toxins, or allergens. Both innate and adaptive immune responses are activated in hosts to eliminate the emerging threat. It is important to note that environment is full of pathogenic and toxic material that continuously challenge the host immune system. Thus, immune system is a complex arrangement employing

Table 2: Comparative nutritional value of Moringa oleifera with that of other foods

Contents	Moringa fresh leaves	Other foods
Vitamin A	6,780 mg	Carrot: 1,890 mg
Vitamin C	220 mg	Orange: 30 mg
Calcium	440 mg	Cow milk: 120 mg
Potassium	259 mg	Banana: 88 mg
Protein	6600 mg	Cow milk: 3200 mg

Adapted from: Reference 1

Table 3: Chief pharmaceutical components of Moringa oleifera and its significance

Components	Significant activities
Quercetin and kaempferol	Antioxidant, hepatoprotective
Pterygospermin	Antibacterial and fungicidal
Alkaloid Moringine	Antiasthmatic
4-(4'-O-acetyl-a-L-rhamnopyranosyloxy) benzyl isothiocyanate, 4-(a-Lrhamnopyranosyloxy) benzyl isothiocyanate, niaziminic, benzyl isothiocyanate, and 4-(a-Lrhamnopyranosyloxy) benzyl glucosinolate, Antholine and Spirochin	Antibacterial
B-sitosterol	Cholesterol lowering
Nitrile, mustard oil glycosides and thiocarbamate glycosides	Hypotensive
Niaziminic	Anticancer
Dark chocolate polyphenols and other polyphenols	Hypoglycemia
4- (alpha- L-rhamnosyloxybenzyl)-omethyl thiocarbamate, niazinin A, niazinin B, niaziminic	Spasmolytic, hypotensive and bradycardiac

Adapted from: Reference 9

various mechanisms to protect the host from damage.¹⁹ Studies have shown that an average child develops around four to eight infections every year, which varies in accordance to presence or absence of risk factors that predispose the patients to develop infections (Table 5).²⁰

In this regard, there is an emerging need of immune modulation, which is the modulation of immune reactions to help in suppression of unnecessary reactions developing due to autoimmunity, and allergies, and also to invoke protective responses against organisms that are responsible for these reactions. Immune modulators are agents that alter immune responses directly or indirectly and avert the risk of developing diseases. These agents primarily work by modulating cell-mediated immunity and indirectly by humoral immunity. The immune modulators enhance the functions of innate immunity and activity of T-lymphocytes. Of note, there is dearth

Table 4: Essential amino acids present in *Moringa oleifera* according to World health organization (WHO) reference pattern, along with their beneficial role

Amino acids	Beneficial role
Lysine	Increases absorption of calcium from the small intestine, required for growth and tissue repair
Histidine	Immunomodulatory as well as antioxidant activity, also needed for growth and tissue repair
Threonine	Assists metabolism and helps prevent fat from building up in the liver, also useful in indigestion and intestinal disorders. In addition, Iso helps in anxiety disorders
Valine	Helps to promote muscle coordination and emotional calm
Methionine	Required for growth and tissue repair, lowers cholesterol, reduces the fat stores in the liver thereby protects kidneys. In addition, may have antioxidant property
Isoleucine	Helps in wound healing, detoxification of nitrogenous wastes, enhances immune function. Also necessary for hemoglobin formation
Leucine	Vital for protein synthesis and regulation of blood-sugar levels; promotes growth and repair of muscle and bone tissue
Phenylalanine	Helps the brain's nerve cells communicate by producing norepinephrine. In addition, reduces hunger pangs, improves memory, and works as antidepressants

Adapted from: References 9,11-18

of immune modulating agents, which in parts may be attributed to low effectiveness, side-effects like central obesity, osteoporosis, hyperglycemia, risk of opportunistic infections and in-ability to discriminate between self and non-self. Complementary medicine provides information on existence of few organic preparations, capable of regulating the immune system. Consistent with this observation, *Moringa oleifera* has been considered to promote immune functions. It has been commonly used for treatment of immune-system mediated disorders. Adewale and colleagues²¹ conducted a study to assess the immunomodulatory potential of *Moringa oleifera* in experimental models. A total of 24 subjects were divided into 4 groups and administered distilled water, 250, 500 and 1000 mg of *Moringa oleifera* extract once-daily for 56 days, respectively. The outcomes of the study:

- The serum concentration of interleukin-2 increased whereas serum concentration of interleukin-6 and tumor necrosis factor- α decreased
- The concentration of erythrocyte parameters, neutrophils and monocytes decreased
- Total leukocyte and lymphocyte count also modulated.

The phytochemical analysis of *Moringa oleifera* extract showed the presence of alkaloids, flavonoids, phenols, saponins, tannins, oxalate, cyanogenic glycosides, cardenolides, triterpenes and

Table 5: Risk factors that increase the propensity to develop infections in children

Day-care attendance
School-aged sibling
Second-hand smoke

Adapted from: Reference 20

anthraquinones. The extract also contained minerals responsible for immunomodulation including selenium, copper, zinc, manganese and magnesium. The immunomodulatory activity may be attributed to alkaloid content of the extract. Additionally, saponins and uric acid also invoke immune system.

The relevant findings of the study including its activity on various factors involved in immune responses are suggestive of beneficial effects of *Moringa oleifera* extracts in infective and degenerative immune disorders.

In another clinical trial²² the immunomodulatory effect of *Moringa oleifera* was assessed in experimental subjects. The cellular immune responses were evaluated with neutrophil adhesion test, carbon clearance assay and cyclophosphamide induced neutropenia. Alongside, humoral immune responses were evaluated with subject lethality test, serum immunoglobulin estimates and indirect hemagglutination assay. The use of *Moringa oleifera* extract remarkably increased the serum levels of immunoglobulins and averted the risk of infections induced mortality. Additionally, the extract also helped in increasing circulating antibody titer, adhesion potential of neutrophils and phagocytic index. The study results thus affirmed that *Moringa oleifera* extract is useful for stimulating both cellular and humoral immunity even at low doses.

Fatigue

Fatigue is a common physical symptom in pediatric patients. It is a state of significant tiredness, lack of energy and feeling of exhaustion. It is believed that fatigue is experienced four or more times per week by nearly one-third of adolescents. Fatigue is a significant concern owing to its consequences related to chronic illness on several aspects of functioning. Fatigue also exerts negative impact on health-related quality of life among patients with disease conditions.²³

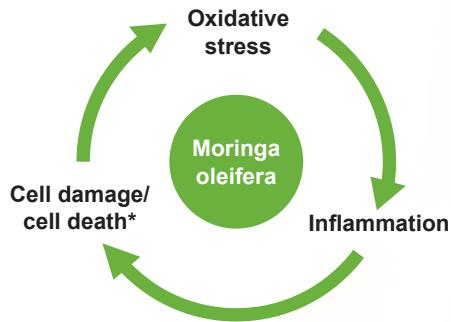
Fatigue is considered to be comorbid in children with respiratory tract infections. Digestive system disorders also cause fatigue. Alongside, an improper diet for a long duration also accounts for a factor in chronic fatigue. Fatigue may also be indicative of underlying pathologic condition, thus, recognizing the need for therapeutic interventions to respond to fatigue.²⁴

It is documented in literature that Moringa has several beneficial nutrients, thus it may be useful of treatment of severe fatigue, which is common in children and also has significant impact on quality of life of patients.²⁵

Therapeutic potential in allergic conditions such as asthma

In allergic conditions inflammation has an important pathophysiological role.²⁶ Also, allergic asthma, which is complex

Figure 3: Oxidative stress mediated cell damage/death



*Increased generation of reactive oxygen species due to protein, lipid and DNA damage.

Adapted from: Reference 1,34

disorder has an obligatory involvement of inflammation in the disease process.²⁷ Scientific studies have shown that *Moringa oleifera* has potent anti-inflammatory and anti-asthmatic and anti-allergic activity (table 6).²⁸⁻³² It has also been used as decoction in sore throat and hoarseness.³³

Antioxidative potential to prevent oxidative damage

Reactive oxygen species such as superoxide anions, hydrogen peroxide and hydroxyl radicals are all involved in different biochemical and disease processes. An attuned balance is often maintained to prevent oxidant mediated damage. Oxidative stress develops due to an imbalance between pro-oxidants and antioxidants. Under normal conditions body neutralizes excessive free radicals; however, when oxidative stress occurs, systems capacity to eliminate reactive species is compromised. This results in alteration in intracellular and extracellular homeostasis that contributes to cause cell damage and death thorough various mediating mechanisms. It is important to note that oxidative stress is responsible for causation of several disorders such as neurodegenerative disorders, cancer, malaria, chronic fatigue syndrome, asthma, and atherosclerosis. Oxidative stress in asthma initiates or worsens the existing inflammation and thus severe asthma (figure 3).^{1,34}

Increased exposure to environmental pollutants, UV light, and smoke also increases the free radical load of the body. Oxidant mediated tissue damage has a pathognomonic role in several disorders. Free radicals cause damage to membranes, enzymes and DNA. In this context, antioxidants are agents that protect the tissues and cells against damage. Several micronutrients function as antioxidants alongside, antioxidants may improve immune potential of an individual. Certain nutraceuticals contain antioxidants that counter-regulate the potential harmful free radicals.^{35,36}

It is known that *Moringa oleifera* extracts have considerable nutritional benefits. Additionally, *Moringa oleifera* is considered as an important source of antioxidants that may have favorable impact on health. A study evaluated the antioxidant activity of *Moringa*

oleifera from flowers, seeds, rachis, leaf tissue, leaf rachis and stem. The results showed that extracts of *Moringa oleifera* contained significant amount of antioxidants.³⁷ Sreelatha and colleagues conducted a study to assess the antioxidant potential of Moringa extract. The relevant results highlighted strong antioxidant potential in context of considerable scavenging effects on free radicals and inhibition of lipid per oxidation. The findings support antioxidant activity of *Moringa oleifera* and its putative role in prevention of oxidative damage.³⁸ Similarly, another study estimated the free radical scavenging potency and antioxidative activity of *Moringa oleifera* from various regions. The study results reflected high amount of antioxidant activity in two Indian samples. The main bioactive phenolic compounds were flavonoids including quercetin and kaempferol.³⁹

Storehouse of vitamins to increase immune potential

Vitamins are essential for immune functioning. They are required in trace amounts and are not synthesized by the organisms to meet the demands of the body. Vitamins find their elaborate role in numerous physiological processes and work as hormones, antioxidants and regulators of tissue growth and differentiation. A well-demarcated role of vitamins has been observed in maintenance of immune functions including innate and adaptive immune responses. Vitamin C, E and some members of B-complex vitamins have relatively non-specific role in immune modulation. Vitamin A and D have specific influence on immune responses.⁴⁰

Moringa oleifera is believed to have numerous useful vitamins. Studies have estimated that *Moringa oleifera* may have as high as 11,300–23,000 IU of vitamin A. Vitamin A has a demarcated role in many physiological processes including maintenance of normal vision, immune competence, epithelial tissue and brain functions. It also contains high levels of carotenoids (6.6-6.8 mg/100 g). Vitamin C, which has antioxidant potential and is essential for maintenance of various body functions, is also found in abundance in Moringa. Vitamin C is found in Moringa to the extent that it contains more vitamin C in comparison to an orange. Vitamin E, another vitamin with antioxidative activity is also present in high quantities in *Moringa oleifera* extract.⁴¹ A trial assessed the levels of betacarotene in *Moringa oleifera* plant extract. Experimental models were fed with vitamin A deficient diets. Subjects were subsequently administered vitamin A rich sources such as Vitamin A acetate, and Moringa extracts from drumstick leaves and dehydrated drumstick. The study results showed Moringa extract as a good source of vitamin A capable of overcoming vitamin A deficiency.⁴²

Role of *Moringa oleifera* in managing protein and micronutrient malnutrition

Moringa oleifera is considered a very significant plant due to its medicinal and nutritional purposes.⁴³ The plant was found to contain many essential nutrients such as fats, proteins, beta-carotene, vitamin C, iron, potassium, and other nutrients.² Proteins contribute to a majority of the nutrient pool of Moringa leaves, accounting for nearly 40% share. Moreover, this plant is believed to have the highest protein ratio than any other plant.⁴⁴ Moringa

Table 6: Potential role of *Moringa oleifera* in asthma

Study	Aim	Intervention	Significant findings	Conclusion
Agarwal et al ²⁸	Study aimed to evaluate the efficacy of <i>Moringa oleifera</i> for the management of bronchial asthma	<i>Moringa oleifera</i> extract Patients with mild-to-moderate asthma	<ul style="list-style-type: none"> The erythrocyte sedimentation rate reduced significantly Considerable improvement was noticed in asthma symptom score and severity of asthma attacks <i>Moringa oleifera</i> improved forced vital capacity, forced expiratory volume in one second and peak expiratory flow 	<i>Moringa oleifera</i> shows promising prospects as therapeutic regimen in patients with bronchial asthma
Mahajan et al ²⁹	Study was directed to observed the impact of Moringa extract on prevention of immune mediated responses in experimental asthma models	Ethanol extract of <i>Moringa oleifera</i> Four groups: Group 1- control; group 2- TDI control/ vehicle; group 3- dexamethasone; and group 4- <i>Moringa oleifera</i> extract	<ul style="list-style-type: none"> Asthmatic symptoms and airway abnormalities were absent in group 3 and 4 Levels of neutrophils and eosinophils also decreased appreciably in group 3 and 4 TNF-alpha, IL-4 and IL-6 levels were reduced in <i>Moringa oleifera</i> group Protective effect was observed for <i>Moringa oleifera</i> extract 	<i>Moringa oleifera</i> extract may be beneficial in chemically stimulated immune-mediated inflammatory actions that are typical of asthma
Mehta et al ³⁰	Study authors investigated effect of <i>Moringa oleifera</i> extract on different bronchial asthma experimental models	<i>Moringa oleifera</i> extract	<ul style="list-style-type: none"> <i>Moringa oleifera</i> exerted bronchodilating and spasmolytic effects. <i>Moringa oleifera</i> also protected against mast cell mediated degranulation. It also acted against respiratory pathogens. 	The anti-asthmatic properties of <i>M. oleifera</i> extracts may be attributed to its bronchodilator, anti-inflammatory, mast cell stabilization and antimicrobial properties.
Goyal et al ³¹	Study was orchestrated to evaluate antiasthmatic mechanism of action of <i>Moringa oleifera</i> extract in experimental models	<i>Moringa oleifera</i> extract	<ul style="list-style-type: none"> Remarkable reduction was observed in the eosinophil and monocyte counts and histamine release 	<i>Moringa oleifera</i> induced inhibition of the immediate hypersensitive reaction, histamine release, and the infiltration of various inflammatory cells and constituted as the potential antiasthmatic mechanisms through which Moringa acts
Mahajan et al ³²	Study evaluated efficacy of <i>Moringa oleifera</i> extract for ameliorating airway inflammation in experimental subjects	<i>Moringa oleifera</i> extract	<ul style="list-style-type: none"> The tidal volume was decreased in experimental subjects administered <i>Moringa oleifera</i>. The respiration rate and the total and differential cell counts in blood and bronchoalveolar lavage fluid were increased appreciably as compared to controls. <i>Moringa oleifera</i> rendered protection against bronchoconstriction and controlled airway inflammation 	<i>Moringa oleifera</i> controlled airway inflammation and exhibited anti-asthmatic properties by regulating Th1/Th2 cytokine balance.

Adapted from: References 28-32

has been regarded useful for nutritional supplementation. Even international agencies like World Health Organization have suggested potential use of moringa for malnutrition due to its nutritional properties.⁴⁵

The approximate concentration of proteins evaluated from the dry matter of *M. oleifera* comes out to be 377.5 ± 1.9 g/kg, which is much higher than that in legumes considered important for human

nutrition (149-220 g/kg). Several studies have revealed that high protein value provides adequate levels of essential amino acids, appropriate availability for intestinal absorption, and proficient rumen degradability of nitrogen, when compared to soybean meal.⁴⁶ The extract from this tree contains all 9 essential amino acids in variable proportions.⁴⁴ A study was conducted to examine the amino acid composition of *Moringa oleifera* using HP 6890 gas

chromatography. Out of 17 amino acids separated from the extract, highest concentrations of glutamate were observed (13.53, 14.76, 15.14 g/100g protein in roots, seeds, and leaves, respectively). The levels of amino acids obtained were comparable with the World Health Organization's reference pattern for essential amino acids. The findings of the study therefore suggested that *M. oleifera* is a rich source of proteins, both for humans and livestock and greater levels of arginine makes it an excellent source of fortification of cereal weaning food.¹⁰ Furthermore, the quality of protein established in the leaves of Moringa is equivalent to that of milk and eggs. In light of the mentioned benefits, extracts from the trees have been used to counter the malnutrition, especially among infants and nursing mothers.³ When supplemented to a child's standard diet, 25 g of the leaf extract completes the daily requirement of calcium and vitamin A, about half the protein and potassium, and about three quarters of the iron.⁴⁶

A study was performed to examine the effects of extract of Moringa on the nutritional status of malnourished children. The study group comprised 110 children, who were randomly categorized in to group I and group II. The subjects were given standard nutritional care diet, but those in group I were administered 10 g of Moringa extract more per day. Children in group I demonstrated a greater average weight gain of 8.9 ± 4.3 g/kg/day, in contrast to children in group II (5.7 ± 2.72 g/kg/day), with a rapid recovery rate. An average stay of 36 ± 16.54 days was observed in group I, against 57 ± 19.20 days in group II. Therefore, it can be summarized that supplementation of Moringa extract appears promising in terms of efficacy and tolerability in enhancing the nutritional status of severely malnourished children.⁴⁷

CONCLUSION

Moringa oleifera is a medicinal plant extract with diverse nutritional benefits. It is a store house of macronutrients, micronutrients and essential amino-acids. *Moringa oleifera* has several advantageous properties such as immune-boosting, antioxidant, anti-inflammatory, anti-microbial, anti-atherosclerotic and tumour suppressive, owing to which it may be used in the management of several disorders. Studies have shown it to be beneficial in pediatric patients in various conditions related to immunity, fatigue, oxidative stress, allergy and malnutrition.

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Gluten free	Safe for Celiac disease patients
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Advantages of MOGA®

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- Dosage**
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