



**International Journal of Research
in
Pharmaceutical and Nano Sciences**

Journal homepage: www.ijrpns.com

<https://doi.org/10.36673/IJRPNS.2023.v12.i03.A12>



**NUTRITIONAL AND MEDICINAL VALUE IMPACT OF *MORINGA OLEIFERA*: A
REVIEW**

**Navneet Kumar Verma^{*1}, Arvind Kumar Maurya¹, Ashok Kumar Yadav¹, Shubham Kumar Mishra¹,
Vinay Pratap Singh¹, Sudhanshu Yadav¹**

^{1*}Buddha Institute of Pharmacy, GIDA, Gorakhpur, Uttar Pradesh, India.

ABSTRACT

Powdered leaves of *Moringa oleifera* are useful in reducing stunting. Based on nutrigenomic and biological research, adding powdered *Moringa oleifera* leaves to supplemental foods may be beneficial to health. Molecular qualities that are anti-inflammatory, antioxidant, and anemia-preventing. Therefore, more study in these areas will be needed in the future. The moringa plant provides all of the essential elements that individuals need. They contain not only the essential nutrients but also some that aren't. Medical facilities, especially those in rural regions where malnutrition is common, should emphasize raising awareness of the nutritional and therapeutic benefits of moringa. One strategy is to brand Moringa as the "Family Tree" in order to encourage its planting in family compounds. "The purpose of this narrative review was to address undernutrition as a type of malnutrition in children, the strategies implemented in South Africa to address childhood malnutrition and its difficulties, complementary feeding practices in South Africa, particularly in KZN and the potential use of MOLP as a fortifier to increase the nutritional content of home-prepared complementary foods".

KEYWORDS

Moringa oleifera, Complementary foods, Anti-inflammatory, Antioxidant and Anti-anemia actions.

Author for Correspondence:

Navneet Kumar Verma,
Buddha Institute of Pharmacy,
GIDA, Gorakhpur, Uttar Pradesh, India.

Email: navneet_its04@rediffmail.com

INTRODUCTION

Children with stunting are shorter than they should be for their age development because stunting is a chronic nutritional deficit syndrome that affects early development and causes growth retardation¹. Both physical and cognitive development issues are brought on by stunting². If stunting is not properly treated, it would negatively affect the country's future people resources, which is a major issue for

the government. To raise public awareness and provide targeted supplemental nutrition, the Indonesian government has started to carry out nutritional initiatives. Supplemental meals are given in addition to breastfeeding in order to carry out specific nutritional intervention³. Stunting can be significantly reduced when adequate supplemental nutrients are given, as has long been known. As an additional food source, powdered *Moringa oleifera* leaves can be given⁴. In Indonesia, *moringa oleifera*, or moringa plants, are widely distributed⁵. *Moringa oleifera* is a plant that is widely grown by farmers in Indonesia and has the potential to be utilized as inexpensive supplemental food. The leaves of the *Moringa oleifera* plant have been used in many communities. For instance, a Yogyakarta study found that giving infants powdered *Moringa oleifera* increased their body mass index by an average of 13% to 14% among 30 respondents⁶. A similar outcome was obtained from the study carried out at the Piyungan Community Health Centre. Higher educated mothers tended to choose supplemental foods rich in *Moringa oleifera* powder for their infants, which increased toddler height by 0.476 to 0.594cm⁷. One of the most beneficial trees on earth, *Moringa oleifera*, may be used practically anywhere for food, medicine, and industrial use⁸. Based on studies⁹⁻¹¹, moringa leaves have seven times the vitamin C of oranges, four times the calcium of milk, four times the Vitamin A of carrots, three times the potassium of bananas, and two times the protein of yoghurt. Newborns and nursing moms are especially encouraged to eat the leaves because they are very nutritious, especially if they are from developing nations or areas where malnutrition is common. This is because both classes are likely to be impacted by nutritional deficits. While neonates are in a critical developmental stage, pregnant women and nursing mothers require a consistent supply of nutrition. Because it is used to increase women's milk production, moringa is referred to as "Mother's Best Friend"¹²⁻¹⁴. It's considered a "Natural Gift of Nature." Like other developing nations, South Africa (SA) has a high rate of undernutrition¹⁵.

Vulnerable demographic groups are impacted by this public health concern, especially young children under five. The trend in South Africa is in line with that of developing nations¹⁶. Globally, the percentage of stunted children under five was 6.7% and 22%, respectively. Similar to SA, there were 6.0% underweight children, 27.4% stunted children, 2.5% wasted children and 13.0% nutritional deficiencies in 2016¹⁷. Moreover, in the South African province of KwaZulu-Natal (KZN), stunting was found to afflict 28.5% of children under the age of five in 2017¹⁸. These results¹⁹ show that stunting is the most prevalent form of malnutrition in South African children under five. The growth in malnutrition, especially undernutrition in South Africa, has multiple causes. Major variables that persist include childhood diseases, inadequate access to water and sanitation, inadequate feeding practices for infants and young children, and food insecurity²⁰. In order to lessen malnutrition and enhance children's nutritional status, the South African government has put in place a variety of programmes and/or policies, such as those that encourage breastfeeding, growth monitoring and promotion, vitamin A supplementation, and food fortification²¹. Nevertheless, a number of issues have arisen with these services that have made it challenging for individuals to use or access them²². Access to these programmes was further curtailed by COVID-19, which also had a substantial impact on essential medical and nutritional services²². As a result, an increase in malnutrition cases is anticipated. More practical, at-home methods are required to lower malnutrition, particularly in hard-hit economic situations like the COVID-19 pandemic²³. Reducing malnutrition and improving the nutritional health of those who are most at risk, especially children, require long-term, reasonably priced solutions²³. In order to address malnutrition at the family level, more practical and long-lasting solutions are required. Improving the nutritional content of supplemental foods that are made at home is one such method. Plant species high in nutrients that are readily available, reasonably priced, and appropriate

for the area could be included as a fortifier to homemade supplemental foods. India-native *Moringa oleifera* grows throughout the world in tropical and subtropical climates^{24,25}. South Africa's soil is perfect for cultivating this kind of crop. It is therefore produced in most of the provinces of South Africa²⁶. It is widely cultivable because it rarely becomes stunted by drought and may thrive in less fertile soil^{24,25}. Numerous studies have shown that moringa leaves are rich in nutrients, including protein and vitamins, as well as bioactive compounds that improve health²⁴. The majority of South Africans, however, are not aware of the dietary and health advantages of moringa leaves²⁵. Studies have been done locally and internationally to find out how well-liked moringa is among customers. Although MOLP improves the nutritional composition of nutrient-deficient foods^{27,28}, its adverse effects on flavour, colour and aroma may reduce consumer acceptance²⁷. In South Africa, however, there is a lack of knowledge regarding the physiological and nutritional advantages of moringa leaves²⁵. Moringa has been researched both domestically and abroad to determine how well-liked it is by consumers. While adding MOLP to nutrient-deficient meals increases their nutritional value^{27,28}, its adverse effects on the food's flavour, colour, and aroma may make it less acceptable to consumers²⁷. Although moringa may grow in a variety of soil types, it prefers sandy or loamy soil that is well-drained, somewhat alkaline and It may thrive in scorching, arid deserts or damp tropical climates and it can even grow in less fertile soils and during droughts²⁹. It is present throughout all of Nigeria's geographical regions, from the semi-desert zones to the savannah. It is a vital source of nutrients for animals despite being vulnerable to wind damage^{30,31}. This tree may enhance nutrition, rural development, and food security³². It is clear that a significant portion of the populace in many developing nations, like Nigeria, is reliant on herbal remedies, which are made either independently or in mixtures to treat and prevent a variety of ailments. Herbal remedies have typically remained popular for historical and cultural reasons, even if modern

medications can coexist with such old practices³³. One plant that has shown useful for these kinds of customs is moringa, albeit many rural homes underuse it since they are unaware of its uses. The goal of this review is to raise knowledge of the health advantages of Moringa, sometimes referred to as the "Miracle Tree" or "Mother's Best Friend." The plant *Moringa oleifera* is native to the Indian subcontinent, but it has spread to all parts of the world that are tropical or subtropical³⁴. The drumstick tree, sometimes referred to as the benzolive, horseradish, or ben oil tree, is a drought-resistant, quickly-growing tree that is safe and tasty³⁵. It's sometimes called "sahajan" in casual conversation³⁶. The moringa tree, the most useful tree in the world, is used in food, medicine, and industrial, among other things. Of the 13 species of Moringa that have been identified, the Indian-born *Moringa oleifera* is one of the most researched and used for its pharmacological, phytochemical, and nutritional properties. As per Milla³⁷, ayurveda is the traditional and complementary medicine of India. It thrives in semi-arid and desert conditions and can withstand long droughts. With a lifespan of more than 20 years and the capacity to grow up to 10 metres tall quickly-reaching 4 metres in just six months-it is an especially adaptable species. Its remarkable ability to produce edible food, which comprises a variety of vegetative structures, such as leaves, pod shells, stalks, flowers, fruits, and seeds, has earned it recognition as a particularly adaptable plant³⁷. Its leaves, pods, seeds, gums, bark, and flowers are used in more than 80 nations to treat vitamin and mineral deficiencies, keep the cardiovascular system in good working order, and treat a range of chronic ailments, such as cancer, neuro-dysfunctional disorders, inflammatory diseases, and diabetes³⁸. Improve regular blood levels, boost the immune system, neutralize free radicals to reduce the risk of cancer, enrich anemic blood, and support the body's anti-inflammatory systems well³⁹. Traditional medicine has traditionally utilized moringa to treat a variety of conditions, such as cholera, blood impurities, conjunctivitis, bronchitis, anemia, anxiety, and

asthma. A bacterial infection can cause a variety of symptoms, including cough, diarrhea, eye and ear infections, fever, glandular swelling, headaches, abnormal blood pressure, hysteria, joint discomfort, acne, and respiratory illnesses. A39. Malnutrition can be effectively treated with the plant species *Moringa oleifera*, which is a member of the Moringaceae family. Moringa is a very nutrient-dense plant because of the variety of essential compounds it contains in its leaves, pods and seeds. Moringa actually claimed to contain 25 times more iron than spinach, 25 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, and 7 times more vitamin C than oranges⁴⁰. These claims were made in actuality. Because moringa is easy to grow, it is a sustainable treatment for malnutrition. In countries like Senegal and Benin, moringa is used to treat children⁴¹. Malnutrition symptoms are often present in non-breastfed children. Nursing moms are frequently administered lactogogues to increase milk supply. The phytosterol-based galactogogue serves as a precursor to hormones necessary for the development of the reproductive system. Numerous phytosterols, including campesterol, sitosterol, and stigmasterol-precursors of hormones-are found in moringa. These substances raise oestrogen levels, which encourage the development of mammary gland ducts that produce milk. Malnutrition in children under three years old is treated with it⁴². Leaf powder provides a pregnant lady with all the iron and calcium she needs in around six spoonfuls. An overview of the pharmacological properties, medicinal qualities that are valuable in the marketplace, nutritional advantages, and production of moringa is provided by this study. Comprehensive research on the application of moringa in the management of diabetes and cancer is lacking. This study aims to reduce the disparity. A kind of indigenous, medicinal Indian plant called moringa has grown in favour in countries that are tropical and subtropical. The Moringa plant is also known by the names Horseradish tree, Mulangay, Mlonge, Benzolive, Drumstick tree, Sajna, Kelor,

Saijihhan and Marango. The kingdoms that *Moringa oleifera* is classified into in science are as follows: Magnoliphyta, Magnoliphyte, Magnoliopsida class Arranged in brassicales. The Moringaceae family Species: *Moringa oleifera*; Genus: Moringa⁴³. The vegetable *Moringa oleifera* is a member of the Moringaceae family and a member of the Brassica order of plants. The Moringaceae family comprises one genus and thirteen recognized species⁴⁴. Originally from the sub-Himalayan highlands of North West India, *Moringa oleifera* is a small native tree that is now found in various regions of Africa, Arabia, South East Asia, the Pacific and Caribbean Islands, and South America. The moringa has long been used and is well known for its health benefits in these regions, where it is also a staple diet. People have dubbed it "the miracle tree" because of its incredible healing abilities for a range of illnesses, including some chronic ailments. Owing to the plant's wide range of uses, a great deal of research has been done to separate bioactive compounds from various plant parts⁴⁵. Herbal plants in medicine, or phytomedicine, are still trustworthy and commonly utilized as an alternative way in the medical field because of their inexpensive cost⁴⁶. For millennia, the Moringa plant has been utilized medicinally in many civilizations worldwide to treat conditions like skin infections, anemia, anxiety, and Cholera, bronchitis, catarrh, chest congestion, asthma, blackheads, and blood impurities are just a few other conditions that might occur⁴⁷⁻⁴⁹. Furthermore demonstrated to possess anti-inflammatory, antispasmodic, anti-hypertensive, anti-tumor, antioxidant, antipyretic, anti-ulcer, anti-epileptic, diuretic, cholesterol-lowering, renal, anti-diabetic, and hepatoprotective properties are *Moringa oleifera's* research findings^{50,51}.

MALNUTRITION IN CHILDREN: UNDERNUTRITION

A type of malnutrition known as undernutrition refers to imbalances or shortfalls in a person's daily energy and essential nutritional requirements⁵². Previous research has emphasized stunting, underweight, wasting, and other signs of childhood

malnutrition. And/or a micronutrient deficit. Severe acute malnutrition (SAM), moderate acute malnutrition (MAM) and not acutely malnourished but at risk (NAM but at risk) are further categories for undernutrition⁵².

Between 2008 and 2016, there was a 2.5% increase in stunting in South Africa, a chronic sign of malnutrition^{19,53,21}. In addition, the KZN province of South Africa had the second-highest rate of stunting (28.5%), with rural children being the most affected.

Compared to their urban peers (26%) they had a higher rate of stunting (29%). After the age of two, stunting cannot be reversed^{54,55}. Among the detrimental effects of chronic dietary deficiency are poor growth and development, as well as long-lasting physical and cognitive impairment^{56,57}. This highlights how crucial it is to have a healthy diet throughout the first 1000 days of life.

In 2016, 6% of South African children were underweight, according to the country's most recent national survey. In addition, 2.5% of children in South Africa suffer from malnutrition⁵³. Moreover, 2.5% of KZN province's population under five suffers from wasting¹⁷. The primary causes of waste are hunger, insufficient intake of appropriate quantities and quality of food, recurrent childhood diseases that affect nutritional status, or a combination of these factors^{40,46}. Reiterating the need of optimal nutrition, particularly during supplemental feeding, waste can cause childhood mortality if it is not avoided, properly detected, or treated¹⁷.

Children under five in Africa and other underdeveloped areas are at risk of protein-energy malnutrition (PEM)²¹. PEM is the term for children who eat a diet low in the protein and energy needed for normal growth and development⁵⁸. Children may experience PEM in addition to micronutrient deficiencies (such as iron, zinc, iodine, and vitamin A), which can have long-term effects on growth and development. PEM and micronutrient deficiencies exhibit early indications in babies aged 6 to 24 months⁵⁹. Viral infections and an inadequate diet can lead to PEM and micronutrient deficiencies in

children⁵⁵, highlighting the significance of good nutrition throughout infancy. Undernutrition in South Africa is caused by a number of factors, including poverty, food insecurity, a lack of access to a variety of nutrient-rich foods, poor infrastructure, a lack of funding and healthcare facilities, a lack of knowledge about proper feeding practices and an ignorance of infectious diseases^{59,60}. Undernutrition continues to be a global and South African concern despite social and economic improvement⁶¹.

To purchase food and other essentials, a large number of the poor rely on social assistance. Social assistance is not enough to give them access to a healthy, balanced diet. For instance, in South Africa, a basic 28-item food basket costs R1148.38 (\$63.25), whereas a child support allowance is R500/month (\$27.54)⁶². This illustrates how expensive nutritious meals may be for many underprivileged individuals. Inadequate consumption of essential nutrients from food can cause diseases, undernourish children, and even cause death⁶³. In South Africa, young children's nutritional status suffers from a monotonous diet²¹. A monotonous diet is low in key elements such as protein, vitamins, and minerals and largely comprises of starchy foods^{21,64}. Consequently, a diet lacking in diversity in terms of foods from various food groups may cause an inadequate intake of vital nutrients, which could result in undernutrition in children²¹. This emphasizes how crucial it is to implement measures to stop and lessen undernutrition.

STRATEGIES IN PLACE TO COMBAT CHILDHOOD MALNUTRITION AND CHALLENGES

The promotion of breastfeeding⁶⁵, growth monitoring and promotion (GMP) programmes²¹, vitamin A supplementation programmes⁶⁶ and dietary fortification⁶⁷ are a few of the strategies being used in South Africa to combat childhood undernutrition. Solid meals must be introduced to a newborn after the first six months of life, as breast milk is insufficient to provide them with the

necessary nourishment at that time. For up to two years afterward, breastfeeding is continued with complementary diets⁶⁸. It's important to note that breastfeeding rates are higher in rural than in urban settings⁶⁹. However, for a variety of reasons, mixed feeding has become standard during the first six months of life. The low breastfeeding rates in South Africa can be attributed to the country's widespread availability of infant formula⁷⁰. Working women do not receive adequate support to continue nursing⁷¹. Only 12% of countries globally provide appropriately compensated maternity leave, prompting breastfeeding women to return to work in order to earn a living⁷². As a result, nursing may be discontinued and supplementary foods offered earlier. As a result, nursing may be discontinued and replacement foods introduced sooner⁷². This is a risk factor for undernutrition because the early introduction of supplemental meals has a substantial impact on the infant's growth, development, and survival⁷³, which are examined at GMP clinic visits. GMP includes regular growth checks and as necessary, appropriate referrals. Nutrition services, for example, may be referred to if an infant is underweight. The GMP initiative may be able to ease this problem by identifying children with undernutrition early and guiding them to suitable assistance⁷⁴. GMP programmes face a number of challenges, particularly in developing countries like South Africa, such as limited access to anthropometric assessment equipment, inaccurate growth chart recording, low patient attendance at GMP healthcare facilities, and remote patients who cannot afford transportation to medical facilities. Despite regular GMP attendance, some caretakers still lack the knowledge and assistance needed to implement recommended infant and young child feeding practices⁷⁵. In South Africa, healthcare personnel face hurdles to GMP implementation, such as work overload, vaccine shortages, a lack of GMP staff training, and a paucity of health booklets that can be used to document immunizations and development patterns⁷⁶. The vitamin A supplementation scheme is a component of the GMP programme in South Africa, as it is in other

poor countries; babies receive routine vitamin A supplements during GMP clinic visits to prevent deficits that could hinder growth.

Vitamin A deficiency (VAD) is a major public health problem in low- and middle-income countries, including South Africa. VAD can cause blindness in addition to increasing the risk of childhood sickness and death from diseases such as measles and diarrheal disorders⁷⁷. Because vitamin A increases growth and fights infections, resolving VAD can raise sickness resistance and decrease mortality in children under the age of five⁷⁸. Despite the country's vitamin A supplementation plan, VAD remains a problem in South Africa, affecting 44% of children under the age of five, which is higher than the survey's 1994 findings of 33.3%⁷⁹. This emphasizes the need for low-cost, long-term treatments, such as existing undernutrition prevention campaigns and food fortification with critical nutrients. Food fortification is the process of enhancing the nutritional value of processed foods by incorporating necessary micronutrients, such as trace elements, vitamins, and minerals⁶⁷. Iron, vitamin A, vitamin B, vitamin D and other micronutrient deficits are reduced through food fortification⁸⁰. It is a food-based strategy that can be utilized to reduce micronutrient deficiencies and is affordable^{80,81}. In poorer nations, the most popular foods are employed as fortification vehicles⁸². These include rice, wheat, maize, sugar, salt, milk, oil and fats and rice and fats⁷¹.

Iron, zinc, thiamine, riboflavin, niacin, pyridoxine, vitamin A, and other minerals are added to wheat flour and maize meal in South Africa⁸³. Food fortification has been found to improve nutritional status and to prevent and/or treat micronutrient deficiencies in a specific demographic group⁸⁴. Despite the availability of fortified foods in South Africa, the majority of vulnerable groups cannot afford or access them, increasing their risk of micronutrient deficiency⁸³. This highlights the importance of easily accessible food-based treatments to support current efforts to prevent undernutrition in young children, particularly during the supplemental feeding era.

COMPLEMENTARY FEEDING PRACTICES

The first 1000 days of life, from conception to age two, are crucial for promoting good growth and preventing undernutrition⁸⁵. As mentioned earlier, infants have to be breastfed exclusively for the first six months of their lives, after which they can be given safe, nourishing supplementary meals and breast milk⁸⁶. Age-appropriate, adequate, timely (introduced neither too early nor too late), safe (hygienic practices must be followed during meal preparation, storage, and feeding) and adequate (provide sufficient energy and nutrients as per individual's requirement) are the requirements set forth by the World Health Organization for complementary feeding⁸⁶. Complementary foods should have adequate amounts of energy, macronutrients (protein, lipids, and carbs) and micronutrients (zinc, iron, calcium, folate and vitamins A, B, and C) to ensure that the recommended levels of growth and development are met⁸⁷. Feeding rarely, introducing solids too soon or too late and/or giving insufficient nutrients are examples of poor supplementary feeding practices. Babies between the ages of 6 and 24 months in South Africa rarely consume foods high in protein, which increases their risk of PEM and vitamin deficiency⁸⁸. The premature introduction of supplemental foods has been linked to inadequate nursing and feeding practices for infants⁸⁷. Food allergies, reduced breast milk consumption and an increased risk of choking have all been associated with the early introduction of solid foods. In South Africa, solid food introduction is usually initiated before six months of age⁸⁸. Children may experience delayed development and an increased risk of malnutrition, which can lead to underweight, wasting, and/or stunting^{87,89}.

USE OF MOLP AS A FORTIFICANT COULD BE FUTURE

Background

India is the native home of moringa trees. It belongs to the Moringaceae family and is the species of *Moringa* that is grown the most commonly⁹⁰. Worldwide, moringa is a popular crop because it

can withstand a variety of weather conditions, such as severe frost and prolonged drought^{26,91}. The planting of *Moringa oleifera* was initially introduced to rural populations in the Limpopo region of South Africa. Since then, a number of SA regions have seen increases in output and utilization²⁶. The macro- and micronutrient contents of the moringa plant are high²⁴. To lessen childhood malnutrition, *Moringa oleifera* could be utilized as a food source⁹⁰.

Nutritional Profile

The nutritional composition of *Moringa* leaves and leaf powder is listed in Table No.1^{92,93}. *Moringa oleifera* leaves are frequently a component of the powder known as *Moringa oleifera* leaf powder (MOLP)⁹⁴. MOLP is created by drying fresh moringa leaves⁹⁴. When dried and processed into a powder, moringa leaves lose some of their nutritious value⁹⁴. It has been shown that dry *Moringa* leaves and MOLP have higher quantities of fat, protein, and energy than fresh *Moringa* leaves. The concentration impact does not, however, eliminate the possibility that some specific nutrients may be lost during processing⁹⁴. *Moringa* contains important vitamins (A, B, and C) as well as minerals (calcium, phosphorus, and iron). This includes the SA *Moringa* ecotype²⁶. Furthermore, moringa has a high beta-carotene and vitamin E content. Seven times as many vitamins as an orange, ten times as many as a carrot, seventeen times as many as milk, nine times as many as yoghurt, and twenty-five times more than spinach are found in it²⁴. *Moringa* contains minerals that are essential for treating and preventing malnutrition and deficiencies in micronutrients. These minerals include calcium, iron, potassium, copper, and zinc. These minerals are crucial for physiological development and growth²⁴.

Moringa is a good provider of essential minerals and protein. Protein replacements derived from plants, such as *Moringa oleifera*, can be used to treat or prevent undernutrition^{25,95}. You can get vital amino acids from foods including red meat, fish, poultry, and eggs. This is problematic for the vulnerable people, who cannot afford to purchase

meat-based food sources of protein. Moringa leaves provide almost equivalent levels of the amino acids valine, lysine, isoleucine, threonine and methionine as in animal products⁹⁶.

Moringa is a good source of protein and other essential components

Undernutrition can be treated or prevented with plant-based protein substitutes such *Moringa oleifera*^{25,95}. Eat meals like eggs, chicken, fish and red meat to receive the critical amino acids you require. For the vulnerable people, who cannot afford to buy meat-based food sources of protein, this is an issue. Meat products contain relatively similar amounts of the amino acids threonine, methionine, isoleucine, lysine, and valine to those found in Moringa leaves⁹⁵. There are several ways to eat the different parts of the Moringa plant. Moringa is consumed in South Africa as leaves, seeds, and powdered leaf material that is cooked as a vegetable, added to salads and brewed as a tea²⁶. MOLP, a commercial food fortifier, is now being made from moringa leaves by processing.

Many studies, both domestically and internationally, have been conducted to determine the nutritional composition and consumer acceptance of food products that use moringa as a powder. This has advantages as well as disadvantages. the advantages and disadvantages of fortifying with moringa that were found in several studies conducted between 2014 and 2022.

Moringa's effectiveness as a supplement to prevent undernutrition in children

Numerous negative sensory characteristics have restricted moringa's reception among consumers. To create a fortified supplemental food that is excellent for substitution and has an improved nutritional composition, more study is required. Find the home-prepared supplemental foods that the target group can incorporate with MOLP before moving further. In order to increase customer adoption, more research is required to improve the appearance and flavour of foods infused with moringa. Additionally, research may examine the use of additional food ingredients to enhance the flavour and hide the hue.

Table No.1: The nutrient composition of *Moringa oleifera* fresh leaves, dry leaves, and leaf powder

S.No	Nutrients	Fresh Leaves	Dry Leaves	Leaf Powder
1	Energy (cal)	92	329	205
2	Protein (g)	6.7	29.4	27.1
3	Fat (g)	1.7	5.2	2.3
4	Carbohydrates (g)	12.5	41.2	38.2
5	Fiber (g)	0.9	12.5	19.2
6	Vitamin B1 (mg)	0.06	2.02	2.64
7	Vitamin B2 (ng)	0.05	21.3	20.5
8	Vitamin B3 (mg)	0.8	7.6	8.2
9	Vitamin C (mg)	220	15.8	17.3
10	Vitamin E (mg)	448	10.8	113
11	Calcium (mg)	440	2185	2003
12	Magnesium (mg)	42	448	368
13	Phosphorus (mg)	70	252	204
14	Potassium (mg)	259	1236	1324
15	Copper (mg)-+	0.07	0.49	0.57
16	Iron (mg)	0.85	25.6	28.3
17	Sulphur (mg)	-	-	870

All values are in 100g per plant matter

CONCLUSION

Powdered leaves of *Moringa oleifera* are useful in reducing stunting. Based on nutrigenomic and biological research, adding powdered *Moringa oleifera* leaves to supplemental foods may be beneficial to health. Molecular qualities that are anti-inflammatory, antioxidant and anemia-preventing. Therefore, more study in these areas will be needed in the future. The moringa plant provides all of the essential elements that individuals need. They contain not only the essential nutrients but also some that aren't. Medical facilities, especially those in rural regions where malnutrition is common, should emphasize raising awareness of the nutritional and therapeutic benefits of moringa. One strategy would be to use the moniker "Family Companion" to encourage the growing of moringa in family compounds". This narrative review aimed to address under nutrition as a type of malnutrition in children, the strategies implemented in South Africa to address childhood malnutrition and its difficulties, complementary feeding practices in South Africa, particularly in KZN and the potential use of MOLP as a fortifier to improve the nutritional content of home-prepared complementary foods. In South Africa, malnutrition still affects children under five, despite the government's many efforts to stop it. The main cause of childhood malnutrition in South Africa is the widespread use of subpar supplemental feeding practices. Commercial cereals and maize are common supplemental diets in South Africa. On the other hand, vulnerable individuals have access to maize that has only been partially enriched with nutrients and is deficient in other crucial components like protein. This is important for neonatal growth because, as this study has previously noted, a shortage of it can result in malnutrition, which can have disastrous effects. The nutritional content of popular home-cooked supplementary foods needs to be raised by including home-based culinary practices. Incorporating MOLP into well-known home-prepared supplementary dishes is one potential food-based strategy. The nutrient-dense herb

moringa may improve kids' nutritional health, particularly in the stage of supplemental feeding. Numerous negative sensory characteristics have restricted moringa's reception among consumers. To create a fortified supplemental food that is excellent for substitution and has an improved nutritional composition, more study is required. Prior to doing so, determine the home-prepared supplemental foods that can incorporate MOLP for the target group. In order to increase customer adoption, more research is required to improve the appearance and flavour of foods infused with moringa. Additionally, research may examine the use of additional food ingredients to enhance the flavour and hide the hue.

ACKNOWLEDGEMENT

The authors wish to express their sincere gratitude to Buddha Institute of Pharmacy, GIDA, Gorakhpur, Uttar Pradesh, India for providing necessary facilities to carry out this review work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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Please cite this article in press as: Navneet Kumar Verma et al. Nutritional and medicinal value impact of *Moringa oleifera*: A review, *International Journal of Research in Pharmaceutical and Nano Sciences*, 12(3), 2023, 83-96.