I J R B A T, Issue (Special-17), June 2021: 295-299 e-ISSN 2347 – 517X
A Double-Blind Peer Reviewed & Refereed Journal Original Article
INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY
© www.ijrbat.in

MORINGA OLERICA MULTI-NUTRIENT FOOD SOURCE FOR MALNUTRITION: A REVIEW ARTICLE

Satish Sampatrao Tambe
MGV'S Arts, Science and Commerce College Manmad
Email: sst.sph@gmail.com

ABSTRACT:
The Current food system – production, transportation, packing, storage, retail, loss and waste, feeds the majority of the world population and supports the live hoods of over 1 million people. However, an estimated 821 million people are currently under nourished, 151 million children's under five are stunted, 613 million women's and girl saged15 to 49 suffer from iron deficiency. To overcome to this problem Moringa is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, Moringa is said to provide 7 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, 15 times more potassium than bananas and 25 times more iron than spinach. The review explores Moringa phytochemical constitutes and its medicinal properties.

Key words: *Moringa,* malnutrition, phytochemical superfood

INTRODUCTION:

A prime impact of food insecurity is malnourishment (literally 'bad nourishment') leading to malnutrition, which refers to deficiencies, excesses, or imbalances in a person's intake of energy and/or nutrients. As defined by FAO *et.al.* (2018), undernourishment occurs when an individual's habitual food consumption is insufficient to provide the amount of dietary energy required to maintain a normal, active, healthy life. In addition to undernourishment in the sense of insufficient calories ('hunger'), undernourishment occurs in terms of nutritional deficiencies in vitamins (e.g., vitamin A) and minerals (e.g., iron, zinc, and iodine), so-called 'hidden hunger'. Hidden hunger tends to be present in countries with high levels of undernourishment (Muthayya *et.al.* 2013), but micronutrient deficiency can occur in societies with low prevalence of undernourishment. For example, in many parts of the world teenage girls suffer from iron deficiency (Whitfield *et.al.* 2015) and calcium deficiency is common in Western-style diets (Aslam and Varani 2016). Food security is related to nutrition, and conversely food insecurity is related to malnutrition. Not all malnourishment arises from food insecurity, as households may have access to healthy diets but choose to eat unhealthily, or it may arise from illness. However, in many parts of the world, poverty is linked to poor diets (FAO *et.al.* 2018). This may be through lack of resources to produce or access food in general, or healthy food, in particular, as healthier diets are more expensive than diets rich in calories but poor in nutrition (high confidence) (see meta-analysis by Darmon and Drewnowski 2015). The relationship between poverty and poor diets may also be linked to unhealthy 'food environments,' with retail outlets in a locality only providing access to foods of low nutritional quality (Gamba *et al.* 2015) – such areas are sometimes termed 'food deserts' (Battersby 2012). The Food and

Agriculture Organization of the United Nations (FAO) also plays a significant role in designing and coordinating national policies to increase adaptation and food security. The five key strategic objectives of FAO (help eliminate hunger, food insecurity and malnutrition; make agriculture, forestry and fisheries more productive and sustainable; reduce rural poverty; enable inclusive and efficient agricultural and food systems; and increase the resilience of livelihoods to climate threats) (FAO 2018)

Plantation and soil conditions

M. oleifera can be grown in any tropical and subtropical regions of the world with a temperature around 25–35 °C. It requires sandy or loamy soil with a slightly acidic to slightly alkaline pH and a net rainfall of 250–3000 mm (M.D. Thurber, 2010). The direct seeding method is followed as it has high germination rates. Since Moringa seeds are expected to germinate within 5–12 days after seeding and can be implanted at a depth of 2 cm in the soil. Moringa can also be propagated using containers. The saplings are placed in plastic bags containing sandy or loamy soil. After it grows to about 30 cm, it can be transplanted. However, utmost care has to be taken while transplanting as the tap roots are tender and tend to get affected. The tree can also be cultivated from cuttings with 1 m length and 4–5 cm in diameter, but these plants may not have a good deep root system. Such plants tend to be sensitive to drought and winds. For commercial purposes large scale intensive and semi-intensive plantation of Moringa may be followed. In commercial cultivation, spacing is important as it helps in plant management and harvest. *M. oleifera* differs in nutrient composition at different locations (M.F. Aslam, 2005). The tree grown in India has slightly different nutritional components than a tree grown in Nigeria. (Asante *et.al.*2014) studied the nutritional differences in the leaves from two ecological locations semi-deciduous and Savannah regions. It showed that the latter was less nutritious than the former and attributed this to high temperatures at the Savannah regions. At higher temperature, proteins and enzymes get denatured and this could be the cause for the difference in *nutrient* content. Soil is an important factor that defines nutrient content and strength of the plant. (Dania *et.al.*2014)

Nutritive properties of *Moringa*

Every part of *M. oleifera* is a storehouse of important nutrients and anti-nutrients. The leaves of *M. oleifera* are rich in minerals like calcium, potassium, zinc, magnesium, iron and copper (Kasolo J.N. 2010). Vitamins like beta- carotene of vitamin A, vitamin B such as folic acid, pyridoxine and nicotinic acid, vitamin C, D and E also present in *M. oleifera* (MbikayM.2012). Moringa leaves also have a low calorific value and can be used in the diet of the obese. The pods are fibrous and are valuable to treat digestive problems and thwart colon cancer (OduroI 2008). A research shows that immature pods contain around 46.78% fibre and around 20.66% protein content. Pods have 30% of amino acid content, the leaves have 44% and flowers have 31%. The immature pods and flowers showed similar amounts of palmitic, linolenic, linoleic and oleic acids (D.I. Sánchez 2010). Moringa has lot of minerals that are essential for growth and development among which, calcium is considered as one of the important minerals for human growth. While 8 ounces of milk can provide 300–400 mg, Moringa leaves can provide 1000 mg and Moringa powder can provide more than 4000 mg. Moringa powder

can be used as a substitute for iron tablets, hence as a treatment for anemia. Beef has only 2 mg of iron while Moringa leaf powder has 28 mg of iron. It has been reported that Moringa contains more iron than spinach (L.J. Fuglie, 2005). A good dietary intake of zinc is essential for proper growth of sperm cells and is also necessary for the synthesis of DNA and RNA. *M. oleifera* leaves show around 25.5–31.03 mg of zinc/kg, which is the daily requirement of zinc in the diet (J.T. Barminas , 1998).PUFAs are linoleic acid, linolenic acid and oleic acid; these PUFAs have the ability to control cholesterol. Research show that Moringa seed oil contains around 76% PUFA, making it ideal for use as a substitute for olive oil (S. Lalas, 2002). Revealed that seasons influence the nutrient content. It was shown that vitamin A was found abundantly in the hot-wet season, while vitamin C and iron were more in the cool-dry season (R. Yang, 2006). Phytochemical such as tannins, terpenoids, flavonoids, saponins, anthraquinones, alkaloids, and reducing sugar present along with anti- cancerous agents like glucosinolates, isothiocyanates, glycoside glyceroal-1-9- octadecanoate (Berkovich L 2013)The difference in results can be attributed to the fact that the location, climate and the environmental factors significantly influence nutrient content of the tree (B. Moyo, 2011).

CONCLUSIONS:

Moringa has high nutritional potential because its leaves contain a high concentration of nutrients, and phenolic constituents, mainly flavonoids and phenolic acids, which represent a good source of natural antioxidants. The World Health Organization (WHO) has been promoting the Moringa plant as an alternative to imported food supplements to treat malnutrition in poor countries. Daily consumption of Moringa in the form of juice, fresh leaves or dried leaf powder can contribute significantly to meeting the needs of nutrients and reduce the risks of malnutrition in pregnant women, lactating mothers and young children. In *Moringa* plants *is* reported to prevent malnutrition because of the high protein and micronutrient content of the leave, flowers and Pods. Several studies shows that *Moringa* has 96 nutrient and 46 antioxidant it is very rare that single plant content large quantities nutrients and antioxidants and also have a very digestible protein, iron, calcium, Vitamins so it can use as supplementary food for several poor countries. Through government, NGO should be developed wareness program for Moringa cultivation its nutrition contents in future the Moringa act as a super food of poor people.

REFERENCES:

Aslam, N.M., and J. Varani, 2016: The Western-style diet, calcium deficiency and chronic disease. J. Nutr. Food Sci., 6, 1–6, doi:10.4172/2155-9600.1000496.

B. Moyo, P. Masika, A. Hugo, V. Muchenje Nutritional characterization of Moringa (*Moringa oleifera* Lam.) leaves African J. Biotechnol., 10 (2011), pp. 12925-12933

Battersby, J., 2012: Beyond the food desert: Finding ways to speak about urban food security in South Africa. Geogr. Ann. Ser. B, Hum. Geogr., 94, 141–159, doi:10.1111/j.1468-0467.2012.00401.x

D.I. Sánchez-Machado, J.A. Núñez Gastélum, C. Reyes-Moreno, B. Ramírez-Wong, J. López-

CervantesNutritional quality of edible parts of *Moringa oleifera* Food Anal. Methods, 3 (2010), pp. 175-180

Darmon, N., and A. Drewnowski, 2015: Contribution of food prices and diet cost to socioeconomic disparities in diet quality and health: A systematic review and analysis. Nutr. Rev., 73, 643–660, doi:10.1093/nutrit/nuv02

FAO, 2018: The FAO Strategic Objectives. Food and Agriculture Organization of the United Nations, Rome, Italy,www.fao.org/3/a-mg994e.pdf.

Gamba, R.J., J. Schuchter, C. Rutt, and E.Y.W. Seto, 2015: Measuring the food environment and its effects on obesity in the United States: A systematic review of methods and results. J. Community Health, 40, 464–475, doi:10.1007/s10900-014-9958-z

I. Oduro, W.O. Ellis, D. Owusu Nutritional potential of two leafy vegetables: *Moringa oleifera* and *Ipomoea batatas* leaves Sci. Res. Essays, 3 (2008), pp. 57-60

J.N. Kasolo, G.S. Bimenya, L. Ojok, J. Ochieng , J.W. Ogwal-okeng Phytochemicals and uses of *Moringa oleifera* leaves in Ugandan rural communities J. Med. Plants Res., 4 (2010), pp. 753-757

J.T. Barminas, M. Charles, D. Emmanuel Mineral composition of non-conventional leafy vegetables Plant Foods Hum. Nutr., 53 (1998), pp. 29-36

L. Berkovich, G. Earon, I. Ron, A. Rimmon, A. Vexler, S. Lev-Ari *Moringa oleifera* aqueous leaf extract down-regulates nuclear factor-kappaB and increases cytotoxic effect of chemotherapy in pancreatic cancer cells BMC Complement. Altern. Med., 13 (2013), pp. 212-219

L.J. Fuglie The Moringa Tree: A local solution to malnutrition Church World Service in Senegal (2005)

L.J. Fuglie The Moringa Tree: A local solution to malnutrition Church World Service in Senegal (2005)

L.J. Fuglie The Moringa Tree: A local solution to malnutrition Church World Service in Senegal (2005)

M.D. Thurber, J.W. FaheyAdoption of *Moringa oleifera* to combat under-nutrition viewed through the lens of the diffusion of innovations theory Ecol. Food Sci. Nutr., 48 (2010), pp. 1-13

M.F. Aslam, R. Anwar, U. Nadeem, T.G. Rashid , A. Kazi, M. Nadeem Mineral composition of *Moringa oleifera* leaves and pods from different regions of Punjab, Pakistan Asian J. Plant Sci., 4 (2005), pp. 417-421

Moringa Leaf Powder: A nutritional analysis of powder.leaf http://www.Moringaleafpowder.co.za/analysis.html.

Muthayya, S. et al., 2013: The global hidden hunger indices and maps: An advocacy tool for action. PLoS One, 8, e67860, doi:10.1371/journal. pone.0067860.

Nutrient composition of *Moringa oleifera* leaves from two agro ecological zones in Ghana African J. Plant, 8 (2014), pp. 65-71

P.T. Olagbemide, P.C. Alikwe Proximate analysis and chemical composition of raw and defatted *Moringa oleifera* kernelAdv. Life Sci. Technol., 24 (2014), pp. 92-99

P.T. Olagbemide, P.C. Alikwe Proximate analysis and chemical composition of raw and defatted *Moringa oleifera* kernelAdv. Life Sci. Technol., 24 (2014), pp. 92-99

R. Yang, L. Chang, J. Hsu, B.B.C. Weng, C. Pal ada, M.L. Chadha, V. Levasseu Nutritional and functional properties of Moringa leaves from germplasm, to plant, to food, to healthAm. Chem. Soc. (2006), pp. 1-17

S. Lalas, J. Tsaknis Characterization of *Moringa oleifera* seed oil variety Periyakulam-1 J. Food Compos. Anal., 15 (2002), pp. 65-77

S.O. Dania, P. Akpansubi, O.O. Eghagara Comparative Effects of different fertilizer sources on the growth and nutrient content of Moringa (*Moringa oleifera*) seedling in a greenhouse trial Pharma. Clin. Res., 5 (2014), pp. 67-72

W.J. Asante, I.L. Nasare, D. Tom-Dery, K. Ochire-Boadu, K.B. Kentil

List of nutrients available in leaves, pods and seeds are shown in Table. No 1

Nutrients	Fresh leaves	Dry leaves	Leaf powder	Seed	Pods
Calories (cal)	92	329	205	–	26
Protein (g)	6.7	29.4	27.1	35.97 ± 0.19	2.5
Fat (g)	1.7	5.2	2.3	38.67 ± 0.03	0.1
Carbohydrate (g)	12.5	41.2	38.2	8.67 ± 0.12	3.7
Fibre (g)	0.9	12.5	19.2	2.87 ± 0.03	4.8
Vitamin B1 (mg)	0.06	2.02	2.64	0.05	0.05
Vitamin B2 (mg)	0.05	21.3	20.5	0.06	0.07
Vitamin B3 (mg)	0.8	7.6	8.2	0.2	0.2
Vitamin C (mg)	220	15.8	17.3	4.5 ± 0.17	120
Vitamin E (mg)	448	10.8	113	751.67 ± 4.41	–
Calcium (mg)	440	2185	2003	45	30
Magnesium (mg)	42	448	368	635 ± 8.66	24
Phosphorus (mg)	70	252	204	75	110
Potassium (mg)	259	1236	1324	–	259
Copper (mg)	0.07	0.49	0.57	5.20 ± 0.15	3.1
Iron (mg)	0.85	25.6	28.2	–	5.3
Sulphur (mg)	–	–	870	0.05	137

All values are in 100 g per plant material (L.J. Fuglie ,2005) and (P.T. Olagbemide,2014),