

Research Article



Moringa oleifera LAM. as Medicinal and Food Plant to Fight Against Malnutrition in India

Shadab Ali¹, Amar Singh Kashyap^{2*}, Anuradha Singh¹, Mona Nagpal², Dinesh Kumar Sharma³, Roma Katyal⁴

1 Department of Biochemistry, School of Basic & Applied Sciences, Galgotias University, Greater Noida, Uttar Pradesh, India.

2 Department of Botany, Multanimal Modi (P.G.) College, Modinagar, (Ch. Charan Singh University, Meerut), Uttar Pradesh, India.

3. Division of Environmental Sciences, IARI, PUSA, New Delhi, India.

4. Department of Botany, Dyal Singh College, University of Delhi, New Delhi, India.

*Corresponding author's E-mail: dramarskashyap@gmail.com

Received: 12-05-2022; Revised: 26-07-2022; Accepted: 03-08-2022; Published on: 15-08-2022.

ABSTRACT

Moringa is an indigenous plant which belongs to Family-Moringaceae, scientifically, known as *Moringa oleifera* Lam. It is distributed all over India. The plant is the store house of enormous nutrients. The Fresh leaves juice contains Vit-A, Vit-C, Vit-B complex, Calcium, minerals, Carotenoids and essential amino acids. The tree is also known as miracle plant. The plant is used as a good source of food, i.e., root, stem, leaves, flower, fruits and seeds. The fresh leaves are the rich source of food which has high nutritive values, i.e., 100 g high calories, vitamin C-0.5 mg, 229 mg phosphorus, calcium 285 mg, and many other important minerals viz. Iron (0.007 mg) Manganese (27 mg), Copper (0.029 mg), Potassium (366 mg), Vitamins B-Complex, Vitamins-A, and Vit-C. This indigenous plant is a ray of hope for farmer and it can boost up the health. The tree can be grown by seeds as well by stem cuttings. The high yield is obtained by purpose full agriculture of *Moringa*. It is a miracle plant which can helps to fight malnutrition.

Keywords: *Moringa oleifera*, Food Plant, Vitamins, Calories, malnutrition, cultivation.

QUICK RESPONSE CODE →

DOI:
10.47583/ijpsrr.2022.v75i02.020



DOI link: <http://dx.doi.org/10.47583/ijpsrr.2022.v75i02.020>

INTRODUCTION

The demand for complete food in future will be a great challenge for us people. There should be search more and more alternative food resources will be met from our nature. The cheap resources of the balanced diet for the human are a big problem. The indigenous source of food would be better and safe for all of us. Their domestication and agricultural practice may introduce into the new food crops¹. *Moringa* is one of the greatest boons of nature for the man. This is the nature plant of India. It has been consumed traditionally since long time. Now, there is a demand to re-introduce it into our compulsory food list².

In Our country a serious discussion on malnutrition is still awaited as we are globally on a low ranking. Malnutrition takes a huge number of lives per year. According to UNICEF, India's performance is very poor and it needs to do more efforts³. The mortality rate of infants and young children has increased⁴. In 2017, the Ministry of Health and Family Welfare had launched the National Health Policy, 2017. NITI Ayog released the National Nutrition Strategy in 2019⁵. The worst effect of malnutrition on children caused ≥ 30% stunted, more than 7 million wasting and suffered

with many diseases. Most of the children of underweight resided in the rural areas of M.P., Rajasthan and U.P. comprising 23% percentage of the children. About 50% children are anemic while among the adults 23% women and 20% men are in this list. Every government of our country takes initiatives to eradicate malnutrition and poverty. The governments took all steps what were guided by WHO as Mid-Day Meal Scheme, National Food Security Mission, Integrated Child development Services (ICDS), the National Health Mission, the Janani Suraksha Yojana, the Matritva Sahyog Yojana etc. seek to improve the nutrition status in the country. All these efforts are imposed to eradicate the malnutrition issues^{6,7,8}. *Moringa* is the most important plant which is extremely good source of nutrients. This plant has been already well known in our society⁹. Now it is the need to popularize this plant. *Moringa* is also known as Sehjan, scientifically it is *Moringa oeilifera* Lamm. belongs to Moringinaceae Order – Brassicales, in dicotyledonous angiosperms. It is the tree of Indian origin (Fig. 1,2,3). It has vast environmental adaptations. Commonly it is known as drum stick, Horse radish tree, Ben oil tree, sondna, etc.

AIMS AND PROSPECTIVES

Moringa oleifera Lam. is the tree to the explored and popularized in the community. It is the boon for human race due to its rich source of food contents. The present study solely based on the security of alternative food resources in present scenario. We have to plan for food security, clothes, shelter and dignity. The dignity is also a part of human right it is possible after only-



- Health security according to WHO Health standards for every one
- Fight against the malnutrition in children and other citizens
- Chief resources of food and saving the capital money

Literature Review

Moringa oleifera Lam. is the miracle plant for nutrition therefore a lot of studies have been done on different aspects were also done as food, fodder and medicine^{5,10,11,12}. Many more workers examined the efficacy of food from seed^{1,13,14}. The chemical composition of protein supplement of animal protein was experimented by Bridgemohan et. al., in 2014¹⁵. Malnutrition in children data collection and work was done in a vast scientific community^{16,17}. A protocol was developed by the scientists of ICAR, ICCARI Goa^{2,18}. Both the Global and regional data were collected by UNICEF, WHO & World bank. These are monitoring agencies. The survey was based on the Children Malnutrition. A country level survey data was concentrated on the age wise health information including malnutrition, stunting, wasting, mentally and physically weakness^{3,4}. Some work was also done by the Ministry of Health and Family welfare, Govt. of India⁹.

Study Area

Western Uttar Pradesh the area is highly populated and agricultural economically sound. There is good agriculture area and the farmers are well developed and highly equipped. A huge waste land is also found in this area. Aligarh barren area is so vast, road side, river side, railway track side and other government unplanned land is also useless. such type of land can be utilized by the propagation of *Moringa* plantation. It has the favorable environmental conditions for *Moringa* adaptation. This area covers only 13 % forest area which need more and more plantation. The local community relies on the market base agro resources. The complete source of food the milk production is above normal but supply and quality is not sure. The Milk may be either synthetic or adulterated. The availability of nutritive and reliable food is a great challenge².

MATERIAL AND METHODS

The present work is mainly based on the survey and communication with local inhabitants. The survey based on set questionnaire. Literature survey was from libraries and internet. The specimens and their photographs were kept in the herbarium and album. Taxonomical investigations and their identifications authenticity was from BSI (*Botanical Survey of India*), Dehradun, Uttarakhand. Furthermore, organoleptic study, plant morphological, plant anatomy and biochemical tests were taken in the lab, Department of Botany, M.M. (P.G.) College, Modinagar.

Agriculture Practices

At present *Moringa* is under great vigilance of scientific and academic world. Mostly wildily cultivated bio-resources found but now the agro-practices are under hit and trials. It is cultivable either by seed or by cuttings.

Nursery

Varieties, i.e., Rohit-1, Coimbatore 2, PKM-1, PKM-2, which were produced by ICAR, Regional Lab. It is grown in the poor soil, hot and humid. Well drained sandy or loamy soil, pH 6.2 to 7.0 is adaptable. Climate for flowering is hot humid. Temperature required is 25-30°C. Seeds are shown with the prepared soil beds. The poly bags of 18 cm height and 12 cm diameter. Light sand and soil mixture should be in 1: 3 ratios. Even organic manure should be mixed. 2-3 seeds are kept in 1- 2 cm deep in well prepared and moist bags. The seeds will take time to germinate between 5-12 days. But is also depend on the seeds age, quality, plants age, and surrounding environment. Direct seed sowing in the field is another way of propagation.

Land Preparation

The land is prepared for the direct seed propagation. Well ploughed the land, dig the planting pits about 50cm in deepened aerated soil. Never remove the top soil it should be filled in holes before seedling transplanting. Make a mound for seedlings. Heavy water should avoid in starting but after seedlings come out the support given to the plant to stand straight. Propagation by cuttings, we should use the hard wood twig of 45 cm to 1.5 m long and 10 cm thick. It planted directly or in sacks in the ground (1/3 of the length). A sufficient amount of phosphorus should be added in the soil so that the roots may get soon. The plants will be developed within 2 or 3 months.

Spacing

During the plantation the spacing between two plants should keep- 10 cm X 10 cm to 20 cm X 20 cm or 50 cm X 100 cm. For the leaf production 2.5 m X 2.5 M or 3 m X 3 m or seed production. Spacing is essential for air flow and sufficient light. Irrigation is not needed but sprinkled the water regularly in first three months. The Soil and pH testing will be helpful to grow the plant. These are grown in rich flooded planes on river bottom meadow. The plants are grown in the favorable condition. The seeds may be germinated in the raining seasons naturally in the *Moringa* tree area.

Harvesting

When the pods are ripened and one centimeter in diameter is picked. About 50- 55 tons of pods per hectare will be obtained. The pods are used as vegetables. Let the pods are allowed to dry, the seeds are utilized for oil purpose^{13,18}.



Yield

The first yield starts within 6 to 8 months after plantation. It gives high yield up to 10 years two to three seasons may get for 10 years.



(a)



(b)

Figure 1: (a) *Moringa* plant in a propagated dig and (b) its flowers

Taxonomical Description

Moringa is a perennial tree plant. Its root is tap type even secondary roots are fleshy. The stem has soft wood. Leaves are green, yellow dark green and compound. Flowers are pedicellate, white creamy, zygomorphic and complete. Fruits are up to 10 to 16 inches, pod like, green delicat in early but woody hard at maturity. Seeds are many in each pod having caruncle like structure, contain 40% oil.

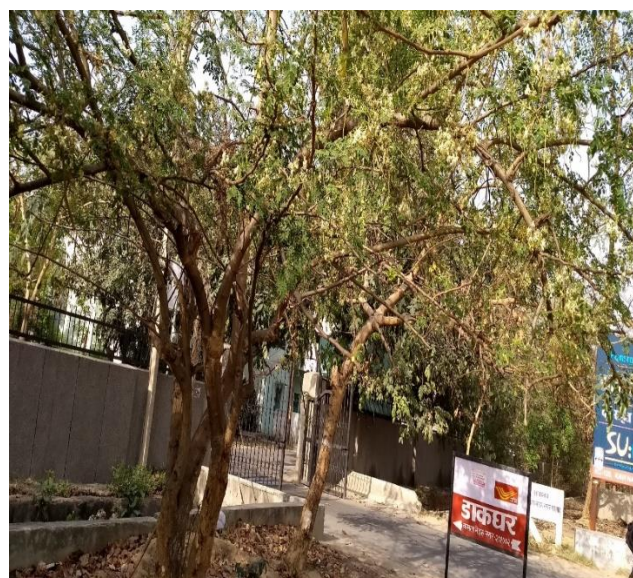


Figure 2. *Moringa oleifera* Lam. in a Colony Road side

Uses of Moringa

Moringa is an Indian Origin tree plant. *Moringa* is widely distributed in our country. *Moringa* is a good source of food, every part of plant is useful e.g. Leaves, roots, stem, flowers, fruits, and seeds. It's uses are mentioned here-

TRADITIONAL FOOD: At every home some special recipes are prepared from the *Moringa* plant products by using gum, fruits, leaves, bark, flowers etc. *Moringa* is used as main ingredient for making *laddu* and *sandha* for the jachha (young baby's feeding mother). The Gum of *Moringa* is mixed with saunth, dakhni mirch (black piper), saunth (ginger), chironji, bura/khand, cow ghee, almonds and cashew used. This mixture is known as sandha, it is given to jachcha as food. This product is also recommended for vision, joint and knee pains².

VEGETABLE: As the south Indians use *Moringa* fruit/pod in sambhar, in the same manner North Indians people also use the plants parts at different occasions viz flowers and young leaves for bhujia preparation. Pods, tree bark, roots parts are used to prepare the pickles, parantha, laddu, etc¹¹.

AS FODDER: In the rural areas the *Moringa* leaves are fed to the milk producing cattle like, cows, buffaloes, goats etc. It helps to produce high quality and more yield.

AS WATER PURIFIER: In the interior villages, somewhere the water quality is very low. It is contaminated by many additives. The additives are removed by adding the *Moringa* seeds and leaves powder.

AS SUPER FOOD: In Comparison to different food plant resources the *Moringa* is the only plant which has equal to many more food resources contents. It contains > 8X Protein than Yoghurt, > 15X Potassium than banana, > 10X Vitamin-A than Carrot, > 12X Iron than Spinach, > 16X Calcium than Milk and > 7X Vitamin-C than Orange (Table-1). There are 92 Nutrients, 46 antioxidants, 36 anti-

inflammatories, 18 amino acids and 9 essential amino acids are found^{5,14,19}.

Table 1: *Moringa oleifera* Lam. is a good source of diet. It has 306 Kcal/128Kj in 100 gm leaves soup which has following major nutrients²⁰:

S. N.	Vitamins		S. N.	Other contents	
1	Vit-A	1510 ug	9.	Proteins	25.0 gm
2	Vit-E	810 mg	10	Carbohydrate	26.0 gm
3	Vit-K	1190 ug	11	Sugar	26.0 gm
4	Vit-C	23.0 ug	12	Fat	06.0 gm
5	Vit-B1	0.80 mg	13	Fibers	24.0 gm
6	Vit-B2	01.10 mg	14	Antioxidants	+++
7	Vit-B6	01.00 mg	15	Carotenes	+++
8	Vit-12	02.00 ug	16	Salt	0.17 gm

The cow milk is a well-known complete food. It has almost all necessary food elements which is recommended to all young children and mother. The milk availability to all is too hard to think. So, the nature has provided a beautiful example of all contents of food, the *Moringa* (Table-2).

Table 2: Comparison between Indian *Moringa oleifera* Lam (100 gm leaf powder soup) and Cow Milk (1 Cup = 240 ml)

S. N.	<i>Moringa oleifera</i> Lam. (100 gm) ¹⁵		Cow Milk (1 cup= 240 ml) ²⁰	
1.	Vit-A	1510 ug	Vit-A	134 ug
2.	Vit-E	810 mg	Vit-E	0.07 gm
3.	Vit-K	1190 ug	Vit-K	0.50 ug
4.	Vit-C	23.0 ug	Vit-C	0.50um
5.	Vit-B1	0.80 mg	Vit-B1	0.095 gm
6.	Vit- B2	01.10 mg	Vit- B2	0.451 mg
7	Vit-B6	01.00 mg	Vit-B6	0.093 mg
8	Vit-12	02.00 ug	Vit-12	1.12 um
9	Proteins	25.00 gm	Proteins	0.17 gm
10	Carbohydrate	26.00 gm	Carbohydrate	0.17 gm
11	Sugar	26.00 gm	Sugar	0.17 gm
12	Fat	02.00 ug	Fat	0.17 gm
13	Fibers	0.17 gm	Fibers	NA
14	Salts	02.00 gm	Salts	0.17 gm
15	Antioxidants	+++	Antioxidants	NA
16	Carotenes	+++	Carotenes	NA
17	Ca	1985 mg	Ca	285 mg
18	Fe	45.00 mg	Fe	0.07 mg
19	P	61.20 mg	P	229 mg
20	Na	86.20 mg	K	0.50 mg



Figure 3. *Moringa* tree in wild condition with fruiting and flowering

ULCER TREATMENT: Its seeds oil is so nutritive and act against the ulcer as well wounds.

CANCER: The high amount of Vitamins-C and phosphorus promotes the drugs where are used in Chemotherapy to target the cell which require the nutrients without having the normal cells, the lung and ovarian cancer effetely can be treated.

EYE AILMENT: Vitamins A, C, E, Copper & Zinc helps to prevent & reduce the eye muscular degeneration or Stargardt's disease can be prevented.

BONE TREATMENT: Manganese with Vitamins D, Zn, Cu, and Ca helps to prevent the bone loss in older age. The deficiency of Manganese increases the chance of bone related ailments and it helps in bone metabolism, Osteoporosis also treated.

ANEMIA: The Iron treats Anemia. Fe is present in high amount in *Moringa*. The low amount of Fe cause low amount of oxygen to the cells, result is low level of energy, poor immunity and slow brain functions but here huge amount of iron helps to trap high amount of oxygen.

MIGRAIN: B₂ (Riboflavin), 400 mg dose helps to treat, cure the headache and migraine attack. It will be helpful from the leaf's parts.

DIGESTION: Phosphorus act as phospholipids which is a component of biological membrane e.g., nucleic acid and nucleotides helps to balance the pH level in body. Phosphorus reduces the water retention, diarrhea bloating. Product the heavily growth bacteria.

OTHER AILMENTS: Hair treatment, Skin Problems, Anti-ageing, Aphrodisiac etc.

RESULTS AND DISCUSSION

Moringa is a food plant, it has a huge food value estimated by Bridgemohan et. al., in 2014, Mathew et. al., in 2000 and Thayer in 2006^{15,12,11}. It was characterized by Leone et. al., in 2016¹³. Compaore et. al., in 2011, Saa et. al., in 2019 and Ijarotimi et. al., in 2003 estimated the nutritive characters and complimentary flours for nutritional values of *Moringa* seeds^{1,5,14}. Anonymous in 2019 did the work on *Moringa* leaf powder²¹. There would be more challenges for health problems. Kashyap et. al., in 2009 worked on *Moringa* for food, fodder and medicinal utility². Ramabulana, et. al., in 2016 did the work on *Moringa* effect against radiations¹⁰. Anonymous in 2019 worked on agro-practices of *Moringa* to guide the farmers²¹. Anonymous in 2018, 2011 and 1991 gave the WHO standard on health information and NSSO reporting to uplift the health standards^{6,7,8}. Many Scientists and agencies to manage surveys and collect the data on Malnutrition and different aspect hence the *Moringa oleifera* Lam. is the best plant for human food.

Future Plan

We can set the standard parameters for an alternative food list which could be in easy reach. Scrutinizing the new herbs and food resources to add in food list can solve our problem. There would be available chief source of food and balanced diet to all citizens. No one would die due to malnutrition. There is a very shameful situation that a huge number of populations live under below poverty line and have insufficient food! We must have plan to eradicate the problem of poverty and malnutrition. We have just an idea to propagate more and more *Moringa* trees on waste and wild land. Try to Familiarize among farmers and common people. It can help not only to fight against malnutrition as well as poverty.

Recommendation

It should be a common practice among all. It should be available very cheap and easily to everyone. It is a recommendable source. The farmers and traders also having a good opportunity to boost up their economy.

CONCLUSION

Moringa is a miracle plant and a boon given by the nature. It has valuable supplements of food. It is also medicinally valuable herb which helps to cure many diseases. It should be grown with modern agro-technical methods everywhere.

REFERENCES

1. Compaore WR, P.A. Nikiem PA, Bassole HIN, Savadog A, Mouecoucou J, Hounhouigan DJ and Traore SA, Chemical Composition and Antioxidative Properties of Seeds of *Moringa oleifera* and Pulps of *Parkia biglobosa* and *Adansonia digitata* Commonly used in Food Fortification in Burkina Faso, Current Research Journal of Biological Sciences, 2011; 3(1): 64-72.
2. Kashyap AS, Bhartiya A and Kumar S, *Moringa*: To supply food fodder and drug, Jr Ind. Horticulture, 2009; 54 (1):51 & 54(ISSN-0019-4875)
3. Anonymous, UNICEF Report on Malnutrition, March 2019; pp 1-25: <https://data.unicef.org/topic/nutrition/malnutrition/>
4. Anonymous, UNICEF, progress for children Beyond Averages: Learning from the MDGs, New York, 2015
5. Saa RW, Fombang EN, Ndjantau EB, Njitang NY, Treatment and uses of *Moringa oleifera* seeds in human nutrition: A review. Food Sci. Nutr., 2019; 7(6): 1911-1919.
6. Anonymous, National Sample Survey Organization (NSSO). Socioeconomics profile of the aged persons NSSO 42nd round (July 1986-june 1987) New Delhi, 1991; 24(2):S-194.
7. Anonymous, Annual report to the people on Health, Ministry of Health and Family Welfare, Govt. of India, 2011.
8. Anonymous, Measuring quality of life World Health Organization, 2018: Available on <http://www.who.int/healthinfo/survey/whogol-qualityoflife/en/accessedon 02-012020>
9. Goel PK, Garg SK, Singh JV, Bhatnagar M, Chopra H, Bajpaye SK, Unmet needs of the elderly in a rural population of Meerut, Indian Journal of Continuity Med., 1999; 28: 54-65.
10. Ramabulana T, Mavunda RD, Steencamp PA, Piaster IA, Dubery IA, Madala NE, *Moringa oleifera* against photo-oxidative damages imposed by gamma radiation, Jr of Phytochemistry & Photobiology. B: Biology, 2016;156:79-86.
11. Thayer S, The foragers harvest A guide to identifying, harvesting and preparing Edible wild plant plants, Forager's Harvest Ogema, WI, 2006.
12. Mathew PJ, Ramesh M & Kumar M, Ethnobotanical studies on wild leafy vegetables used by two tribal groups of Attappady Palakkad (Paper Presented) In National Seminar on Plant Biodiversity Systematics conversation and Ethnobotany 2000 November 9-11. Siliguri, West Bengal.
13. Leone A, Spda A, Battezzati A, Schiraldi A, Anstil J, and Bertoli S, *Moringa oleifera* seeds and oil: Character and use for human health, Intern. Jr of Mol. Sci, 2016; (17): 1-14: www.mdpi.com/journal/ijms
14. Ijarotimi OS, Adeoti OA, & Ariyo O, Comparative study on nutrient composition, phytochemical, and functional characteristics of raw, germinated, and fermented *Moringa oleifera* seed flour, Food Science and Nutrition, 2003; 1(6): 452-463. [PMC free article] [PubMed]



15. Bridgemohan P, Bridgemohan R & Mohamed M, Chemical composition of a high protein animal supplement from *Moringa oleifera*, African Journal of Food Science and Technology, 2014; 5(5): 125-128. [Google Scholar]
16. <https://www.prsindia.org/theprsblog/malnutrition-india-national-nutrition-strategy-explained> dated: 01/26/2021
17. <http://asci.india.com/pdf/report> on LMIS. 5.01,2020.
18. Anonymous, Agro-practices for valuable plants, ICCAR, e-portal team ICAR ICCARI, Ela old Goa, 2019: <http://agrifarming.in/tag/drp-irrigation>.
19. Kashyap AS, Lungru as an important future food plant to fight against malnutrition in India, Shrinkhala Ek Sodhparak Vaicharik Patrika, a Peer Rev Inter. Nat. Refereed Journal, July 2020; 7(10): E-06 (ISSN No. (P)2321-290X, E 2349-980X.
20. USD 2019. A report *Moringa* nutrients. (Dated 26.01.2021)
21. Anonymous, 2019. www.moringaleafpowder.co.za/analysis.html dated: 01/26/2021

Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

For any question relates to this article, please reach us at: globalresearchonline@rediffmail.com
New manuscripts for publication can be submitted at: submit@globalresearchonline.net and submit_ijpsrr@rediffmail.com

