

# *Moringa (Moringa oleifera Lam.)- A Natural Boon for Mankind*

**R. Balakumbahan<sup>1</sup>, V. Sivakumar<sup>2\*</sup>, G. Thiyagarajan<sup>3</sup> and D. Vidya<sup>4</sup>**

<sup>1</sup>Horticultural Research Station, Tamil Nadu Agricultural University,  
Thadiyankudisai, Tamil Nadu (624 212), India

<sup>2</sup>Coconut Research Station, Tamil Nadu Agricultural University,  
Aliyarnagar, Tamil Nadu (642 101), India

<sup>3</sup>Forest College & Research Institute, Tamil Nadu Agricultural University, Mettupalayam, Tamil  
Nadu (641 301), India

<sup>4</sup>Department of Fruit Science, Tamil Nadu Agricultural University, Coimbatore,  
Tamil Nadu (641003), India,

**Corresponding Author**

V. Sivakumar

Email: shivafruitscience@gmail.com

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## **ABSTRACT**

Moringa is one of the traditional vegetable crops of Southern parts of India which possess richness in nutrients and nutraceutical properties. Leaf production of Moringa is gaining importance among the farming community since its international demand is in growing trend. Integrated nutrient management i.e., combined use of inorganic fertilizers along with microbes could be helpful to increase the crop yield. Microorganisms facilitate fixation, solubilization and mobilization of nutrients to crops. Use of microorganisms will also reduce the residual toxicity of inorganic fertilizers in the end produce.

## **INTRODUCTION**

**M**oringa is a deciduous, fast-growing plant, widely distributed along tropical and sub-tropical climate regions. The family Moringaceae contains thirteen species widely distributed in

India and Africa. Among the thirteen species, *Moringa oleifera* Lam. is the widely cultivated species originated from India and known in over 200 local languages due to its multifunctional

uses (Morton, 1991) and widely distributed in India, Egypt, Philippines, Sri Lanka, Thailand, Malaysia, Burma, Pakistan, Singapore, West Indies, Cuba, Jamaica and Nigeria. It is also known by several synonyms as Mother's Best Friend', 'Horse Radish tree', 'Miracle tree' and murungai (in Tamil). Moringa is widely used as vegetable and grown commercially for its edible pods and leaves. It is a multipurpose tree, where the leaves, flowers and fruits are used for culinary and medicinal purposes. The roots are a good substitute for horse radish. The edible leaves are eaten throughout West Africa and in parts of Asia.

Nutritional properties of Moringa leaf Moringa leaves are rich in iron, calcium, protein, vitamins (A, C and E), dietary fibre, and other mineral like Phosphorous and Potassium important for human health. Besides the nutrients it also a good source of antioxidants like falvanoids and phenolics property and medicinal properties too. Nutritional composition of moringa leaves helps to overcome the malnutrition in children all over the world. The dried leaves of moringa are one of the raw materials in pharmaceutical, confectionaries, animal feed and nutraceuticals industries. Details of the nutrient content of moringa leaf is as given in the table (Lockett *et.al.*, 2000).

Nutritive value of moringa leaf (per 100 g of leaf)		
	Fresh leaf	Dry leaf
Beta –Carotene	6.78mg	18.9 mg
Vitamin –B1	0.06 mg	2.64 mg
Vitamin –B2	0.05 mg	20.5 mg
Vitamin –B3	0.8 mg	8.2 mg
Vitamin - C	220 mg g	17.3 m
Calcium	440 mg	2,003 mg
Energy	92 cal	205 cal
Carbohydrates	12.5 g	38.2 g
Copper	0.07 mg	0.57 mg
Fat	1.70 g	2.3 g
Dietary Fiber	0.90 g	19.2 g
Iron	0.85 mg	28.2 mg
Magnesium	2 mg	368 mg
Phosphorous g	70 mg	204 m
Potassium	259 mg	1,324 mg
Protein	6.70 g	27.1 g

### Cultivation details

Moringa is being cultivated commercially for its immature pod as vegetable and many types of moringa viz., Yazhpanam Moringa, Chavakacheri Moringa, Nattu Moringa, Karumbu moringa, and kodikaal moringa are available for cultivation. All these are perennial type of moringa and cultivated in many part of Tamil Nadu in a commercial way. Besides, two short duration annual varieties viz., PKM-1 and PKM -2 have been released from Horticultural College and Research Institute (TNAU), Periyakulam for commercial cultivation and are very popular globally. For leaf production annual Moringa Var. PKM 1 is most suitable because of its high leaf biomass production capability.

### Soil and climate

Moringa is a tropical drought hardy vegetable crop prefers a dry arid climate for its cultivation. Frost and water stagnation conditions are detrimental for its cultivation. Performance of moringa is good at a Temperature of 25-35 o C and it tolerate temperature up to 40 o C. It can be cultivated an altitude of 600 m above MSL. For leaf production well drained loamy or sandy loamy soil with a pH range of 6.0-7.0 is ideal. Heavy clayey and calcareous soils should be avoided.

### Field preparation

For moringa leaf cultivation the field should be ploughed three to four times. 20-25 tonnes of farmyard manure or 3-5 tonnes of vermicompost can be incorporated prior to the last ploughing. Along with the organic manures bio fertilizers viz., Azospirillum, Phosphorus Solubilizing Bacteria (PSB), Potassium solubilizing bacteria (KSB) and AM fungi @ 2.0 Kg each can be incorporated. Apart from this 50 kg neem cake per acre also to be added Different methods of planting based on the spacing are followed for moringa leaf production.

### Raised bed method

This method of planting is suitable for closure spacing of 40 cm x 20 cm / 30 cm x 30 cm. Raised beds of 20 cm height, 160 cm width and convenient length are prepared for seed sowing 15 -020 cm apart from both the edges of raised beds.

### Ridges and furrows method

This method is suitable for sowing the seeds at a spacing of 60 cm x 60 cm, 1.0 m x 60 cm and 1.0 m x 1.0 m. Ridges and furrows of 15- 20 cm height are formed as per the spacing. Treated seed are sown in the middle of the ridges at a depth of not more than 5cm and the field should be irrigated immediately after sowing.

### Channel method

This method is suitable for wider spacing of 1.5 m between the rows. Irrigation channels of 15 cm depth and 30 cm width are formed at 1.5 m between two channels and the seeds are sown in the channels as per the spacing (40 cm, 60 cm, 75 cm and 1.0m).

### Propagation and seed treatment and sowing

For leaf production Annual moringa is propagated through seeds and seed rate is as follows.

Row Spacing (m)	Plant Pacing (m)	Number of plants per acre	Seed rate (kg/Acre)
0.4	0.2	50000	17.0
0.6	0.6	11111	4.0
1.0	1.0	4000	1.5
1.0	0.5	8000	3.0
1.5	0.5	5333	2.0
1.5	1.5	1778	0.8

Treat the seeds with *Pseudomonas* @10 g/kg or *Trichoderma viride* @4 g/ kg of seeds just before sowing of seeds. The best season for sowing of seeds is June – July and February – March. Direct sowing of seed on the prepared beds as per the planting method can be done.

The depth of seed sowing should not exceed 1- 2 inches. Very shallow sowing of seeds is to be avoided. Alternatively moringa seedlings produced in poly bag nursery or portray nursery can also be transplanted as per the spacing. 35-40 days old seedlings with ball of earth can be transplanted in the prepared raised beds and irrigated immediately.

### Irrigation management

Though moringa is a drought hardy plant, it responds well for irrigation. Especially in the case of leaf production maintenance of optimum soil moisture pays well. Irrigation should be done immediately after sowing of seeds / transplanting of seedlings. Seeds take 8-9 days for germination; proper soil moisture should be assured during this period for uniform germination

and seedling growth. Drip irrigation is always best for proper irrigation in moringa leaf production. Based on the climatic condition irrigation interval can be adjusted to once in 4 to 7 days.

### Fertilizer management

20-25 tonnes of farm yard Manure or 3-5 tonnes of Vermicompost along with basal dose of 60 kg N, 30 kg P and 60 kg K per hectare is applied for leaf production. Further 120 kg of N is applied in two to three equal splits to encourage more biomass production and optimum fertilizer usage (Jaison, M. 2016). Use of water soluble fertilizer and supply of nutrients through fertigation in 5-6 equal splits will yield more leaf biomass than soil application. This schedule is

repeated every year. Application of biofertilizers viz., *Azospirillum*, Phosphobacteria, AM Fungi

@ 2 kg /ha /year also enhance the crop growth. This can be applied along with 10-15 tonnes of FYM every year. Liquid microbial inoculants viz., *Azospirillum* (*Azospirillum brasilense*), Phosphate Solubilizing Bacteria (*Bacillus megaterium*), Potassium Solubilizing Bacteria

(*Bacillus mucilagenosus*) @ 125 ml per hectare can be applied through fertigation in four times

in a year for better nutrient use efficiency and higher leaf yield. Other inter cultural operations Weeds become major competitor for seedling growth in the initial stages, so keep the field weed free during initial seedling growth period. Application pre emergence weedicides also useful to maintain the land weed freely. Growing green manure crops like dhaincha / sun hemp / horse gram in between the rows helps to control the weeds and in-situ incorporation of the green manure enrich the soil organic matter and crop growth also be enhanced. Pinching of growing tips 15 days after germination is done to promote more number of lateral shoots. Earthing up of soil around the plant base is done 3-4 times in an year. Raking of inter space once

**Harvest**

Plants are ready to harvest 70-80 days after sowing. Leaves are harvested 45 cm above soil. Further harvest is commenced once in 40 -45 days interval. Harvested leaves are to be transferred to well aerated partly shaded place for drying. Since, moisture content is more in fresh moringa leaf intermittent stirring / harrowing should be done for proper drying.

**Yield**

25- 30 tonnes of fresh leaf per hectare per year can be obtained as yield. The dry recovery of moringa leaf is 17-18 percent.

**Plant Protection**

Prophylactic spray of neem based products viz., neem seed kernel extract 4 % or any neem based products repel the insect pests and helps to obtain residue free produce.

**CONCLUSION**

Moringa leaf is a source of nutrient pack demanded internationally. To meet the international standards, integrated nutrient

management is an efficient method to combat the residual toxicity in the end produce by limiting the use of inorganic fertilizers’.

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