

Moringa Cultivation for Green Fodder



Harvesting of Moringa green fodder crop



Chaffing and feeding of Moringa green fodder

An useful nutritious green fodder crop for animals



**National Dairy Development Board
Anand**

Introduction

"**Moringa**", is a multi-purpose shrub/tree used by human beings for their food and medicine since centuries. It is known as "Miracle tree" as its food is rich in protein, minerals and vitamins. It belongs to the family Moringaceae, genus – Moringa with 14 species. The most important species are *Moringa oleifera* and *M. stenopetala*. It is commonly known in India as sahan, muga, munga, muringakkai, muringakkaya, munnakaya, nuggakai, sajane dauta, saragavo, shevaga, drumstick, horse radish tree etc. It is traditionally cultivated as a backyard plant or in orchard and pods & leaves are used for vegetable purpose.

Moringa can produce green fodder for livestock like any other perennial multi-cut fodder crop. It is fast growing deep rooted plant tolerant to drought conditions. Moringa crop fodder comprises of soft leaves & non-woody stem. It is highly nutritious, palatable and has pleasant aroma. It has potential to produce enormous biomass and promises to be the plant of the future in ensuring year round green fodder availability for animals. It is known to be devoid of any known anti-nutritional factors and has insignificant tannin content. Compared with other conventional feedstuffs, it has a very high biological value and considerable potential for adoption as food for humans as well as a ruminant fodder resource.

Origin and nature

Moringa originated in sub-Himalayan tracts of the Indian sub-continent. It is a fast growing, evergreen, deciduous medium sized perennial tree of about 10 m to 12 m height. The bark has whitish-grey colour and is surrounded by thick cork. Young shoots have purplish or greenish-white bark. Flowers are yellowish creamy white and sweet smelling. The matured fruit is a hanging capsule of 20-45 cm size having 15 to 20 dark brown globular seeds of 1 to 1.2 cm diameter.

Nutrient composition

Moringa fodder is rich source of nutrients for dairy animals. Other than protein and minerals it is also a very good source of pro-vitamin A, vitamin B, vitamin C & E, some carotenoids and sulphur containing amino acid like cysteine & methionine. Green fodder of moringa crop harvested at 2 to 3 months' interval contains Dry Matter (16.63%), Crude Protein (15.82%), Ether Extract (2.35%), Crude Fibre (35.54%), Total Ash (7.61%), Silica (1.02%), Calcium (0.8%), Phosphorus (0.28%), Magnesium (0.51%), Potassium (1.43%), Sodium (0.24%), Copper (8.78 ppm), Zinc (18.05 ppm), Manganese (35.57 ppm) and Iron (474.25 ppm).

Propagation

Moringa can be propagated through seeds as well as stem cuttings. However, seed is the most reliable and quick method for propagation of Moringa crop. In India, public sector institutions developed few vegetable purpose varieties viz. KM 1, Dhanraj, KDM 1, PKM 1 and PKM 2 which can also be grown for fodder cultivation.

Package of cultivation practices

- For moringa cultivation black, laterite, deep sandy to sandy loam soils with soil pH 6.5 to 8.0 are ideal. Fields with more than 30 cm deep soil tilth, good percolation & drainage facility and free from infestation of perennial weeds like *Cyprus rotundus*, *Cynodon dactylon*, *Parthenium hysterophorus* are suitable for moringa cultivation.
- Moringa cultivation should not be taken in waterlogged and poorly drained soils as in rainy season, crop is completely destroyed.

- Moringa can be sown during spring and autumn seasons as it ensures good germination and proper establishment of seedlings. Moringa sowing must be avoided during rainy season to prevent seedling damages due to excess moisture and water stagnation in fields.
- Land is prepared by giving deep plough using Disc, Reversible or M.B. plough followed by 2-3 harrow or cultivator ploughings and thereafter followed by proper levelling.
- Moringa being a perennial crop, deep ploughing ensures proper root penetration in soil.
- Apply 10 tons of farm yard manure or 3 tons of vermi-compost per hectare 15 days before sowing.
- Moringa crop requires 150 kg nitrogen, 60 kg phosphorus, 40 kg potash, 30 kg sulphur and 10 kg zinc sulphate for one hectare land. Single Super Phosphate (SSP) and Ammonium Sulphate may be used for meeting phosphorus, nitrogen and sulfur requirements.
- Apply 30 kg nitrogen and full dose of other chemical fertilizers before sowing and mix well in soil. Apply remaining nitrogen in equal split doses first after 45 days of planting and subsequent 15 days after each cutting.
- Apply full dose of organic and inorganic fertilisers every year to get optimum fodder production and faster vegetative re-growth.
- Soak the seeds in water overnight. Treat the seed with *Trichoderma viride* or Carbendazim fungicide @ 5 to 10 gram/kg of seed before sowing. It hastens the germination and protects against root fungal diseases.
- Sow 100 kg/ha Moringa seed in one hectare. In a well prepared field, open shallow furrows at 30 cm spacing, sow one seed at 10 cm spacing 3-4 cm deep in soil. Cover the seed properly with soil after sowing.
- Apply Pendimethalin @ 1.25 litre/ha just after sowing as pre-emergence herbicide followed by hand weeding/hoeing at regular 25 -30 days interval during cultivation period to ensures proper weed control.
- First irrigation may be given just after sowing and second irrigation one week after sowing to ensure proper germination in field. Rest of the irrigations at 15 -20 days internal as per crop need.
- Apply bio-pesticide like neem seed kernel extract (NSKE) @ 5 % solution on crop to control insect –pest infestation like leaf eating caterpillar during spring and summer season.
- For organic fodder production of moringa, crop may be irrigated with animal shed waste water or bio-gas plant slurry. This practice will not only meet the fertilizer requirement of Moringa crop but also keep the crop free from insect-pest attack and check damages from wild animals.

Harvesting & Yield

- Crop is ready for first harvest at 85-90 days after sowing. Harvest the crop at 30 cm above ground level to ensure optimum fodder production, better regeneration & long term establishment of crop. Harvesting earlier than 85- 90 days may lead to thin & weak stem, poor regeneration and higher mortality. Subsequent cuttings can be taken at 60 days interval at 5 to 6 feet crop growth.
- After each cutting, apply 30 kg nitrogen fertiliser per hectare and irrigation is applied to crop for quick re-growth. Give light hoeing to control weeds in inter row spaces.
- Moringa gives green fodder yield of around 100-120 ton/ha/year.

Feeding

Moringa green fodder is to be chaffed in to small pieces of 2-3 cm size through manual or power chaff cutter for feeding to dairy animals. 15-20 kg chaffed green fodder of moringa can be fed daily to one animal after mixing it with dry or other cereal green fodder.

Advantages

- Drought tolerant and source of perennial fodder.
- Rich in nutrients like crude protein, minerals & vitamins.
- Propagated through seeds and vegetative means.
- Used by human beings as well as livestock.
- Higher biomass production potential

Estimated Cost of green fodder production (Rs/acre over 3 years cultivation period)

Field Operations	Bajra Napier Hybrid Grass (3 years)	Fodder Maize (9 crops over 3 years)	Perennial Moringa (3 years)	Perennial Lucerne (3 years)	Conclusion	
Tillage & Inter-cultural operations (₹)	15000	27000	15000	9000	1. Moringa is yielding higher green fodder and rich in minerals and quality amino acids while crude protein yield is competing with lucerne.	
Seed Cost (₹)	10000	18000	24000	5400		
Hand sowing by Labour (₹)	1500	4500	2000	1000		
Fertiliser and manure (₹)	30000	21500	24600	21500		
Weedicide & Insecticide (₹)	1000	10800	1500	1000		
Irrigation (₹)	27000	27000	18000	24000		
Harvesting and handling (₹)	30000	27000	18000	18000		2. Cost of Moringa green fodder is cheaper compared to lucerne.
Total Expenditure (₹)	114500	135800	103100	79900		
Green Fodder Yield (MT)	180	135	120	80		3. Moringa crop has low pest infestation, can be grown on marginal lands in almost entire India and consumed by human as well as livestock while lucerne cultivation is limited to fertile lands in western parts of the country.
Green Fodder Yield (Kg)	180000	135000	120000	80000		
Total Expenditure (Rs/ Kg of green fodder)	0.64	1.01	0.86	1.00		
Dry matter (%)	20	25	18	20		
Dry matter Yield (Kg)	36000	33750	21600	16000		
Crude Protein (%)	7.5	7	16	18.5		
Crude Protein yield (Kg)	2700	2362.5	3456	2960		
Cost of Crude Protein (₹/kg)	42.41	57.48	29.83	26.99		



Moringa variety PKM 1 orchard for seed production

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