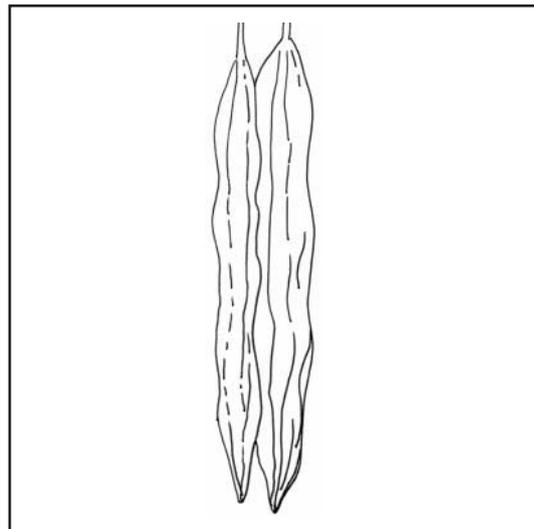
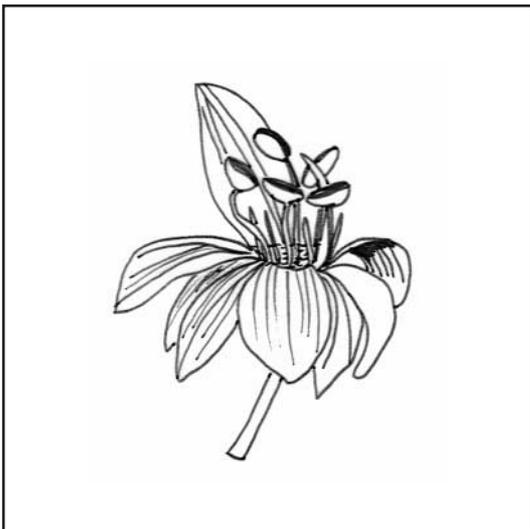
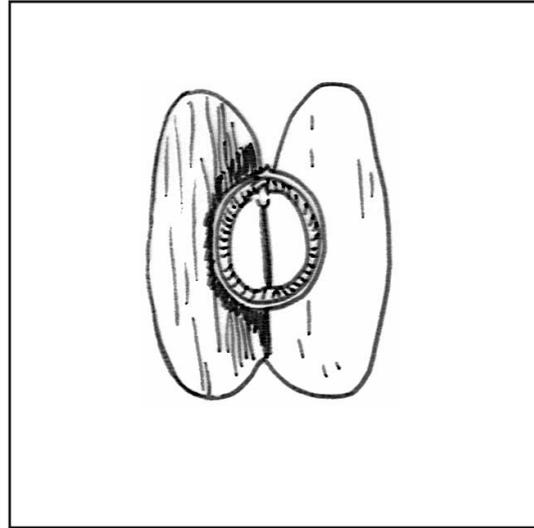
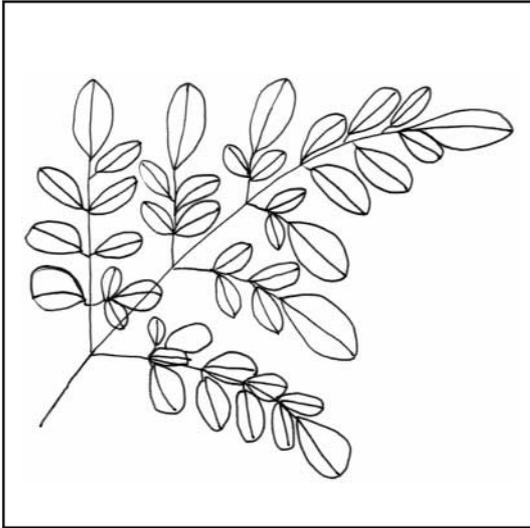


Moringa oleifera

A multi-purpose tree



produced by
HDRA - the organic organisation

What is *Moringa oleifera*?

Moringa oleifera, known as Moringa, is native to north India but is now found throughout the tropics. Moringa is also known as horseradish tree, drumstick tree and mother's best friend. It grows fast and reaches up to 12m. The bark is grey and thick and looks like cork, peeling in patches.

It loses its leaves from December to January and new growth starts in February to March. Moringa produces cream coloured flowers when it is 8 months old and the flowering season begins in January and continues through to March. The fruit ripens from April to June and the pods are triangular in cross section, 30 to 50cm long and contain oily, black, winged seeds.



How does Moringa grow?

Rainfall and altitude

Moringa requires an annual rainfall of between 250 and 3000mm. It is drought resistant, though in drought conditions it may lose its leaves. This does not mean it is dead and it should recover when the rains arrive. It grows best at altitudes up to 600m but it will grow at altitudes of 1000m.

Temperature

It will survive in a temperature range of 25°C to 40°C but has been known to tolerate temperatures of 48°C and light frosts.

Soil

Moringa prefers neutral to slightly acidic soils and grows best in well-drained loam to clay-loam. It tolerates clay soils but does not grow well if waterlogged.

The uses of *Moringa oleifera*?

All of the parts of the tree can be used in a variety of ways. Moringa is full of nutrients and vitamins and is good in your food as well as in the food of your animals. Moringa helps to clean dirty water and is a useful source of medicines. It provides lots of leafy material that is useful when using alley cropping systems. There are many other uses and these will all be described in this booklet:

- Human food
- Animal fodder
- Water purification
- Natural medicines
- Fertiliser
- Living fence
- Alley cropping
- Natural pesticide
- Domestic cleaning agent
- Fuelwood and other uses

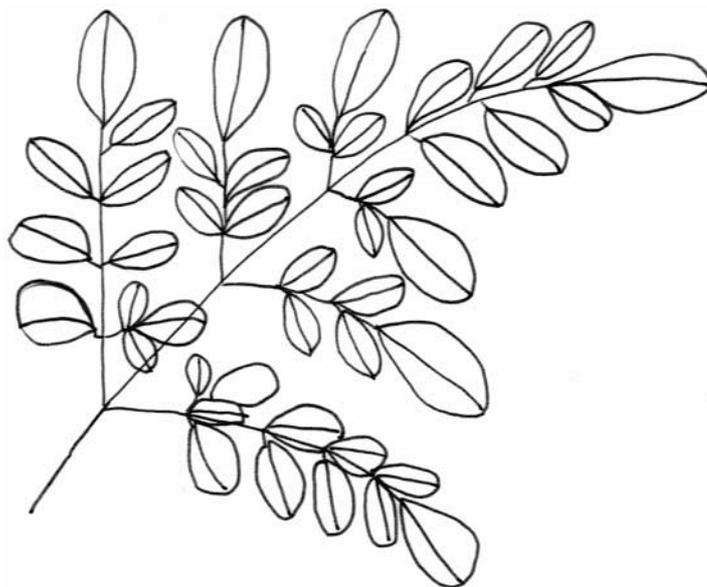
Human food

All Moringa food products have a very high nutritional value. You can eat the leaves, especially young shoots, young pods, flowers, roots, and in some species even the bark. Leaves are low in fats and carbohydrates and rich in minerals, iron and vitamin B.

It is particularly useful as a human food because the leaves appear towards the end of the dry season when few other sources of green leafy vegetables are available.

Fresh leaves

Of all the products of the tree the leaves are used the most. They become tougher as they get older so it is best to pick the growing tips and young leaves. Remove the leaves from the woody stem, as this will not soften during cooking. The leaves can be used in the same way as spinach. An easy way of cooking them is to steam 2 cups of freshly picked leaves for a few minutes in one cup of water, seasoned with an onion, butter and salt or other seasonings according to taste.



Dried leaves

A leaf powder can be produced by drying the leaves and crushing or pounding them. You can sift the powder to remove leaf stems. This powder can then be added to sauces at the same time as other condiments or vegetables are added.

Flowers

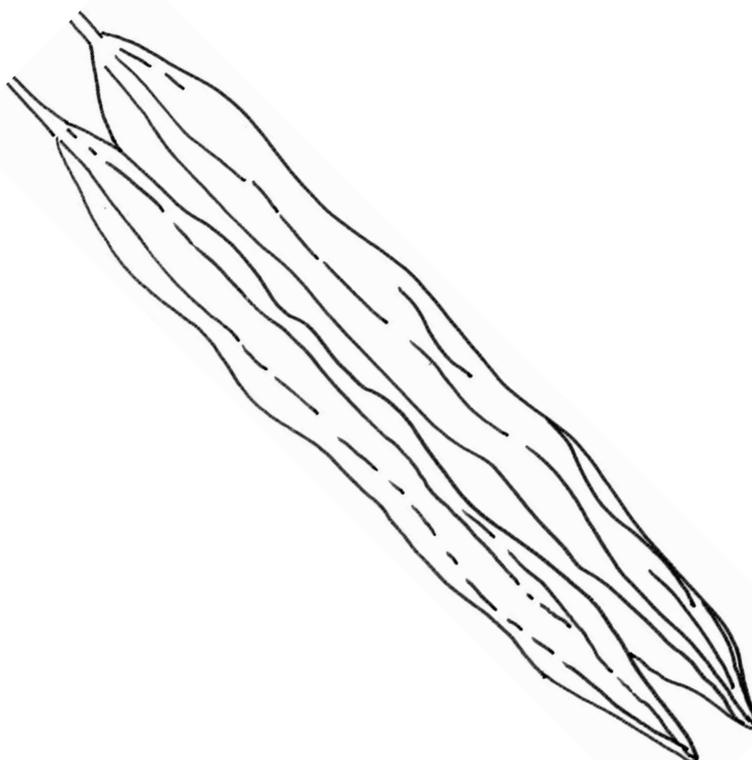
The flowers can be cooked and mixed with other foods or fried in batter. They can also be placed in hot water for five minutes to make a kind of tea. They are also a good source of nectar for honey producing bees.



Pods

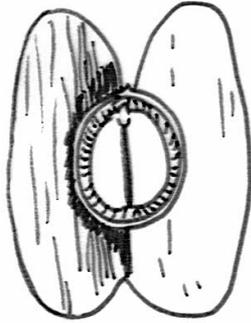
The pods can be eaten from when they first appear to when they become too woody to snap easily (up to 30cm long). They are cooked like other green beans and have a similar flavour to asparagus. Beware as some bitter varieties are poisonous if too many are eaten.

Even the pods that have become too woody can be boiled until they are tender. They are opened and the white flesh is scraped out and returned to the boiling water. This can be used in soups and stews.



Seeds

The seeds are often referred to as peas and can be used from the time they appear until they turn yellow and their shells begin to harden. Experience will help decide when the best time to harvest the pods for their peas.



To cook, remove from the pod with their soft winged shells intact and as much white flesh that can be scraped out from the pod. Put the peas and flesh into a strainer and wash them to remove the sticky, bitter film that covers them, or boil them for a few minutes then drain and boil again in fresh water. They can then be used as any other green pea.

When the seeds are mature, their coating hardens and becomes bitter. This can be pressed for oil extraction. If a press is not available the seeds can be browned or roasted, ground, added to boiling water and the oil floats to the surface. The seeds contain 35% oil and this is used for cooking purposes. The oil does not turn rancid and also burns without smoke.

Roots

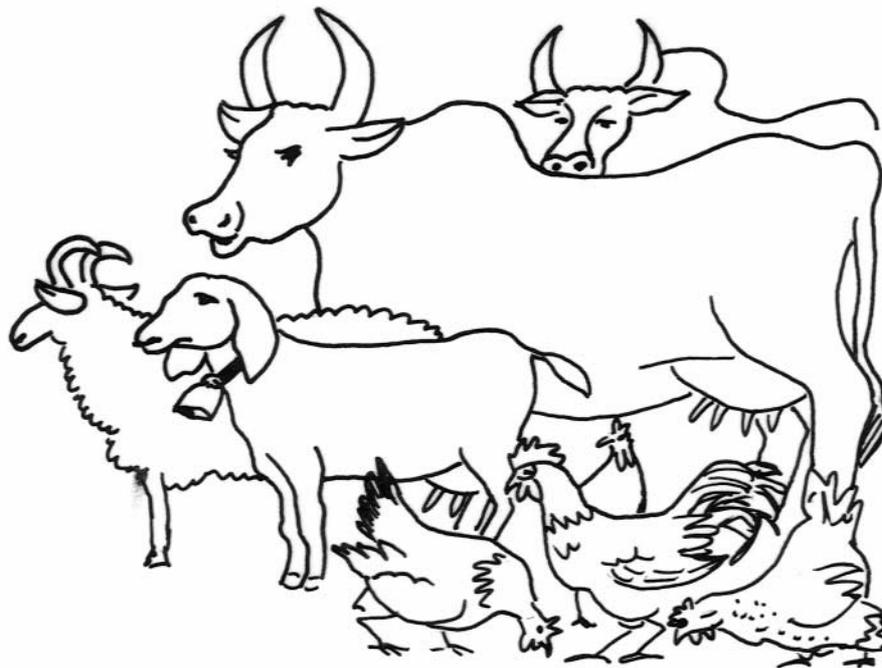
A sauce similar to horseradish sauce can be made from the roots when the seedling is only 60cm tall. The root bark should be completely removed as it contains harmful substances, then the root is ground up and vinegar and salt are added. However, it should not be eaten in excess. It is best to store the sauce in a refrigerator.

Gum

The gum that is found in the bark can be used to season food.

Animal fodder

Cattle, sheep, pigs, goats and poultry browse the bark, leaves and young shoots of Moringa. The best diet for pigs is 70% Moringa, 10% Leucaena and 20% other leaves. It is possible for their diet to be 100% Moringa but it should be no more than 30% Leucaena. The pork from pigs fed on this diet is lean. If trees are intended for animal fodder it is useful to prune them to 4m high, but if they are not they should be pruned to 6m so harvesting for human consumption can be easily carried out.



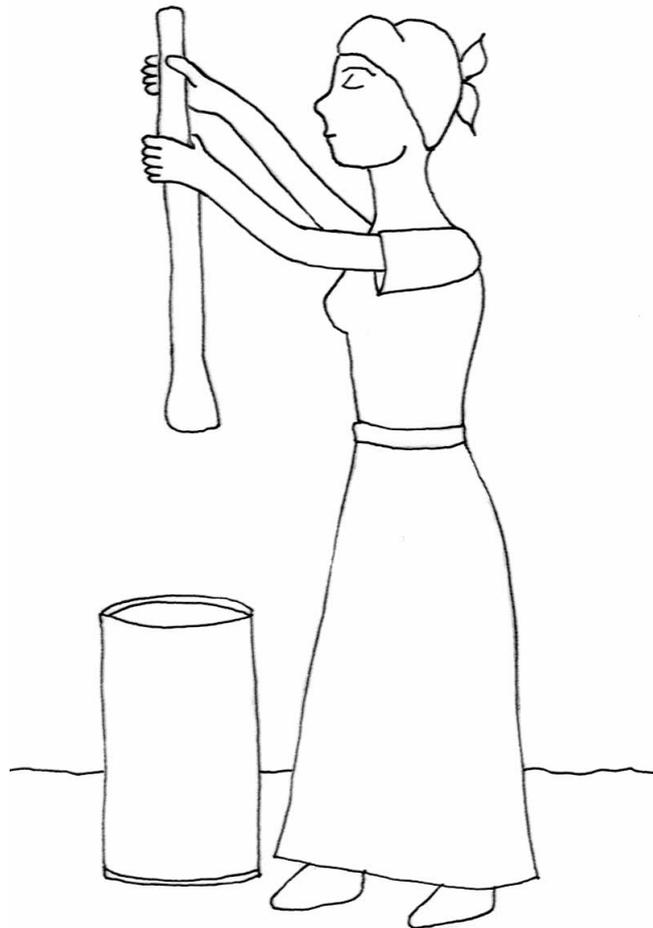
Livestock diets are improved by the addition of Moringa products

Water purifying

Seed powder can be used as a quick and simple method for cleaning dirty river water. The powder joins with the solids in the water and sinks to the bottom. This treatment also removes 90-99% of bacteria contained in water. Using Moringa to purify water replaces chemicals such as aluminium sulphate, which are dangerous to people and the environment, and are expensive.

Twenty litres of water can be treated in the following way:

1. Remove the wings and brown seed coat and discard any seed kernels that have dark spots or any other signs of damage.
2. Pound the kernels to a fine powder.



Making Moringa seed powder to purify water

3. Add 2 grams (2 small spoons) of powder to one cup of clean water, pour into a bottle and shake for 5 minutes.
4. Filter the solution through a clean cloth into the bucket of dirty water that is to be treated.
5. Stir the water quickly for 2 minutes and slowly for 10 to 15 minutes (do not use metal implements).
6. Leave the bucket undisturbed for one hour or until the water becomes clear and the impurities have sunk to the bottom.
7. Filter the water through a clean cloth
8. Boil the water before drinking.

Water from varying sources will need different amounts of powder because of the impurities present will not be the same. Experiments with a jar will help in working out the correct amount needed.

Both the seeds and the seed powder can be stored but the solution made in stage 3 should not be stored. It should be freshly made every time water is to be purified.

Honey and sugar cane juice can also be cleared of impurities using the powder.

Moringa stenopetala seeds have better water purifying properties than *Moringa oleifera*.

Natural medicines

Around the world every part of the Moringa tree has been used effectively against varying ailments. Some of the remedies are described here but there is no guarantee they will work for every case!

Leaves

- Leaves rubbed against the temple can relieve headaches.
- To stop bleeding from a shallow cut, apply a poultice of fresh leaves.
- There is an anti-bacterial and anti-inflammatory effect when applied to wounds or insect bites.
- Extracts can be used against bacterial or fungal skin complaints.
- Leaf tea treats gastric ulcers and diarrhoea.
- Eating Moringa food products is good for those suffering from malnutrition due to the high protein and fibre content.

Flowers

- Flower juice improves the quality and flow of mothers' milk when breast feeding.
- Flower juice is useful for urinary problems as it encourages urination.

Pods

- If eaten raw, pods act as a de-wormer and treat liver and spleen problems and pains of the joints.
- Due to high protein and fibre content they can play a useful part in treating malnutrition and diarrhoea.

Seeds

- Used for their antibiotic and anti-inflammatory properties to treat arthritis, rheumatism, gout, cramp, sexually transmitted diseases and boils. The seeds are roasted, pounded, mixed with coconut oil and applied to the problem area. Seed oil can be used for the same ailments.
- Roasted seeds and oil can encourage urination.
- They can also be used as a relaxant for epilepsy.

Roots, bark and gum

The roots and the bark have all of the properties described above but are more concentrated. Therefore much more care should be taken if using them as medicines.

Fertiliser

The seed cake, which is produced by pressing the seeds to extract oil, cannot be eaten as it contains harmful substances. However, it contains high levels of protein and makes a good fertiliser for use in agriculture.

Living fence

Planted as a living fence, Moringa provides wind protection and shade. It grows very quickly and if cuttings are planted close together they will form a fence that livestock cannot get through in just 3 months.

Alley cropping

Moringa has a large tap root and few lateral roots so it will not compete for nutrients with the crops. It will also add to the nutrients available as it produces many protein rich leaves. They grow very quickly but do not provide too much shade due to the structure of their leaves. They are also very good at reclaiming marginal land.

Natural pesticide

By digging Moringa leaves into the soil before planting, damping off disease (*Pythium debaryanum*) can be prevented among seedlings.

Domestic cleaning agent

Crushed leaves are used to clean cooking utensils or even walls.

Fuelwood and other uses

The wood is light and is a good fuel for cooking. However, it is not suitable for building. The bark can be beaten into a fibre that can be used to make rope or mats and the wood produces a blue dye. Chippings of wood can be used to make a good quality paper. The tree also produces viscose resin that is used in the textile industry.

How to propagate Moringa

Growing from seed

Seeds can be planted as soon as they are mature but should only be kept for up to 3 months in natural conditions. Before sowing, soak the seeds in water for one day then plant the seeds 2cm apart and 1cm deep. Water lightly and they will germinate in 15 days. When the seedlings reach 30cm in height they should be thinned to 10cm apart and when they reach 60 to 90cm tall they can be planted out, but they will be very fragile.

Growing from cuttings

Cuttings of healthy branches with hard wood, 45cm to 1.5m long and 10cm wide, should be taken in the rainy season. Trim any green wood without damaging the bark of the hardwood and leave the cutting ends in a shady place for 3 days to dry. Plant the cutting directly in the soil or in polybags containing 3 parts soil and 2 parts sand. One third of the cutting's length should be placed in the soil (i.e. if the cutting is 1.5m long, plant it 50cm deep). The soil should be moist but not over watered. Cuttings planted in polybags will take a long time to develop roots and may be planted out after 2 or 3 months.

Production rates

Within 3 years of planting one tree will produce 300 to 400 pods every year and a mature tree can produce up to 1000 pods. Frequent pruning of the growth tips will maintain and increase leaf growth and the height can be controlled to make harvesting easier.

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Miracle Trees

Further information on Moringa, multi-purpose trees, tree planting, agroforestry and methods of organic farming can be obtained from HDRA.

The Tropical Advisory Service
HDRA - the organic organisation
Ryton Organic Gardens
Coventry CV8 3LG
UK

Tel: +44 (0)24 7630 3517

Fax: +44 (0)24 76623 9229

Email: ove-enquiry@hdra.org.uk

Web site: <http://www.hdra.org.uk>

The aims of HDRA are to carry out scientific research into, collate and disseminate information about, and promote interest in organic gardening, farming and food in the UK and overseas. For more than a decade, HDRA's international programme has been involved in the support and extension of sustainable farming practices; supporting research on aspects of tropical organic agriculture, providing advice and literature on appropriate organic techniques and providing tree seeds and technical information to organisations involved in tree planting and research.

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