



Moringa seeds (right) and kernels (left)



Water treatment procedure using *Moringa oleifera* seeds - continued

- Water from varying sources will need different amounts of powder because the impurities present will not be the same. 50 -150 mg of ground *Moringa* seeds treats one liter of water, depending on how clear the water is. Experimenting with a jar will help in working out the correct amount of seeds and stirring times so as to find out what works for you. A general rule of thumb according to Lowell Fuglie is that powder from one *Moringa* kernel to two liters if water is a good amount when water is slightly turbid, and to one liter when water is very turbid.
- Both the seeds and the seed powder can be stored but the paste (solution made in stage 4) needs to be fresh for purifying the water. It should be freshly made every time water is to be purified.

Water treatment procedure using *Moringa oleifera* seeds



- Allow the *Moringa* seeds pods to dry naturally on the tree before harvesting.
- Remove the seed wings and husks (brown seed coat), leaving a whitish kernel. Discard any seed kernels that have dark spots or any other signs of damage.
- Crush or pound the seed kernels to a fine powder with a stone or mortar.
- Mix the powder (e.g. 2g or 2 small spoons) to one cup of clean water, pour into a bottle and shake for 5 minutes.
- Filter the mixture through a clean cloth into a bucket of dirty water that is to be treated.
- Stir the water quickly for 2 minutes and slowly for 10-15 minutes (do not use metal implements). During this slow mixing, the fine particles and bacteria begin to clump together and sink and settle to the bottom of the bucket.
- Cover the bucket and leave it undisturbed for an hour or until the water becomes clear and the impurities have sunk to the bottom.
- The clean water may be siphoned, or poured off the top of the container or filtered through a clean cloth. The process removes 90-99% of the bacteria and impurities that cause turbidity.
- For drinking water though, the water needs to be purified further by boiling, using a simple sand filter or placing in the direct sun in a clear bottle for 2 hours (solarizing).

Moringa oleifera *the Miracle tree*



Moringa plant parts and their benefits

Tree part	Uses or benefits
Leaves	Nutritional, medicinal, biomass, plant growth hormone, forage
Flowers	Nutritional, medicinal, honey
Pods	Nutritional, medicinal
Bark	Medicinal, rope making, gum for turning hides
Roots	Medicinal
Gum	Medicinal
Wood	Paper, animal feed, medicinal, alcohol production
Seeds	Water treatment, food, cosmetics, cooking oil, lubricant

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Multivitamins in Moringa (Incredible, isn't it?)



SPACING:

For intensive Moringa production, plant the tree every 3m in rows 3m apart. To ensure sufficient sunlight and airflow, it is also recommended to plant the trees in an east-west direction. When the trees are part of an alley-cropping system, there should be 10m between the rows. The area between trees should be kept free of weeds. Trees are often spaced in a line one meter or less apart in order to create living fence posts. Trees are also planted to provide support for climbing crops such as pole beans, although only mature trees should be used for this purpose since the vine growth can choke off the young tree. Moringa trees can be planted in gardens; the tree's root system does not compete with other crops for surface nutrients and the light shade provided by the tree will be beneficial to those vegetables which are less tolerant to direct sunlight. From the second year onwards, Moringa can be inter-cropped with maize, sunflower and other field crops. Sunflower is particularly recommended for helping to control weed growth. However, Moringa trees are reported to be highly competitive with eggplant and sweet corn and can reduce their yields by up to 50%.

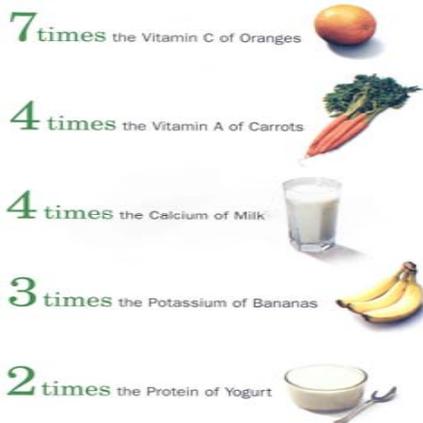
PINCHING THE TERMINAL TIPS:

When the seedlings reach a height of 60cm in the main field, pinch (trim) the terminal growing tip 10cm from the top. Secondary branches will begin appearing on the main stem below the cut about a week later. When they reach a length of 20cm, cut these back to 10cm. Use a sharp blade and make a slanting cut. Tertiary branches will appear, and these are also to be pinched in the same manner. This pinching, done four times before the flowers appear (when the tree is about three months old), will encourage the tree to become bushy and produce many pods within easy reach. Pinching helps the tree develop a strong production frame for maximizing the yield. **If the pinching is not done, the tree has a tendency to shoot up vertically and grow tall, like a mast, with sparse flowers and few fruits found only at the very top.**

WATERING:

Moringa trees do not need much watering. In very dry conditions, water regularly for the first two months and afterwards only when the tree is obviously suffering. Moringa trees will flower and produce pods whenever there is sufficient water available. If rainfall is continuous throughout the year, Moringa trees will have a nearly continuous yield. In arid conditions, flowering can be induced through irrigation.

Gram-for-gram comparison of nutritional information



To encourage rapid germination, one of three pre-seeding treatments can be employed:

1. Soak the seeds in water overnight before planting.
2. Crack the shells before planting.
3. Remove shells and plant kernels only.

IN THE FIELD:

If planting a large plot it is recommended to first plough the land. Prior to planting a seed or seedling, dig a planting pit about 50cm in depth and the same in width. This planting hole serves to loosen the soil and helps to retain moisture in the root zone, enabling the seedlings' roots to develop rapidly. Compost or manure at the rate of 5kg per pit can be mixed with the fresh topsoil around the pit and used to fill the pit. Avoid using the soil taken out of the pit for this purpose: fresh topsoil contains beneficial microbes that can promote more effective root growth. The day before out-planting, water the filled pits or wait until a good rain before out-planting seedlings. Fill in the hole before transplanting the seedling. In areas of heavy rainfall, the soil can be shaped in the form of a mound to encourage drainage. Do not water heavily for the first few days. If the seedlings fall over, tie them to stick 40cm high for support.

DIRECT SEEDING:

If water is available for irrigation (i.e., in a backyard garden), trees can be seeded directly and grown anytime during the year. Prepare a planting pit first, water, and then fill in the pit with topsoil mixed with compost or manure before planting seeds. In a large field, trees can be seeded directly at the beginning of the wet season.

GROWING FROM CUTTINGS:

Use hard wood, not green wood, for cuttings. Cuttings should be 45cm to 1.5m long and 10cm thick. Cuttings can be planted directly or planted in sacks in the nursery. When planting directly, plant the cuttings in light, sandy soil. Plant one-third of the length in the ground (i.e., if the cutting is 1.5m long, plant it 50cm deep). Do not over water; if the soil is too heavy or wet, the roots may rot. When the cuttings are planted in the nursery, the root system is slow to develop. Add phosphorus to the soil if possible to encourage root development. Cuttings planted in a nursery can be out-planted after 2 or 3 months.

Nutritious Moringa Cultivation



Moringa oleifera is believed to be native to sub-Himalayan tracts of northern India but is now found worldwide in the tropics and sub-tropics. It grows best in direct sunlight under 500m altitude. It tolerates a wide range of soil conditions, but prefers a neutral to slightly acidic (pH 6.3-7.0), well-drained sandy or loamy soil. Minimum annual rainfall requirements are estimated at 250mm with maximum at over 3,000mm, but in waterlogged soil the roots have a tendency to rot. (In areas with heavy rainfall, trees can be planted on small hills to encourage water run-off). Presence of a long taproot makes it resistant to periods of drought. Trees can be easily grown from seed or from cuttings. Temperature ranges are 25-35°C but the tree will tolerate up to 48 degrees in the shade and it can survive a light frost. Moringa seeds have no dormancy period, so they can be planted as soon as they are mature and they will retain the ability to germinate for up to one year. Moringa trees will flower and fruit annually and in some regions twice annually. During its first year, a Moringa tree will grow up to five meters in height and produce flowers and fruit. Left alone, the tree can eventually reach 12 meters in height with a trunk 30cm wide; however, the tree can be annually cut back to one meter from the ground. The tree will quickly recover and produce leaves and pods within easy reach. Within three years a tree will yield 400-600 pods annually and a mature tree can produce up to 1,600 pods.

IN THE NURSERY:

Use poly bags with dimensions of about 18cm in height and 12cm in diameter. The soil mixture for the sacks should be light, i.e. 3 parts soil to 1 part sand. Plant 2 or 3 seeds in each sack, 1-2cm deep. Keep moist but not too wet. Germination will occur within 5 to 12 days, depending on the age of the seed and pre-treatment method used. Remove extra seedlings, leaving one in each sack. Seedlings can be out-planted when they are 60-90cm high. When out-planting, cut a hole in the bottom of the sack big enough to allow the roots to emerge. Be sure to retain the soil around the roots of the seedling.

Prepared by:
Dr H M Kwaambwa
Polytechnic of Namibia
School of Health and Applied Sciences
P/B 13388, Windhoek, Namibia
Tel: +264 61 2072583 Fax: +264 61 2072945
Email: hkwaambwa@polytechnic.edu.na