

THE MORINGA TREE, *MORINGA OLEIFERA*, IS CALLED MOTHER'S BEST FRIEND

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That is one way they sometimes refer to this tree in the Philippines where the leaves of the malunggay, as they call it, are cooked and fed to babies. Other names for it include horseradish tree and drumstick tree (India) and benzolive (Haiti). Moringa is one of the most successful plants in ECHO's seedbank. Moringa tree leaves, pods, and roots are eaten; flowers are loved by bees; and seeds are powdered and used to purify water from murky rivers. I believe it is one of the most exciting and versatile plants that we have in our seedbank of tropical plants.

The leaflets can be stripped from the feathery, fern-like leaves and used in any spinach recipe. Small trees can be pulled up after a few months and the taproot ground, mixed with vinegar and salt and used in place of horseradish. Very young plants can be used as a tender vegetable. After about 8 months the tree begins to flower and continues year round. The flowers can be eaten or used to make a tea. They are also good for beekeepers. The young pods can be cooked and have a taste reminiscent of asparagus. The green peas and surrounding white material can be removed from larger pods and cooked in various ways. Seeds from mature pods (which can be 2 feet long) can be browned in a skillet, mashed and placed in boiling water, which causes an excellent cooking or lubricating oil to float to the surface. The oil reportedly does not become rancid and was once sold as "ben oil." The wood is very, very soft, though the tree is a good living fencepost. It makes acceptable firewood but poor charcoal.

It is an extremely fast-growing tree. Roy Danforth in Zaire wrote, "The trees grow more rapidly than papaya, with one three month old tree reaching 8 feet. I never knew there would be such a tree." The tree in our organic garden grew to about 15 feet in 9 months, and had been cut back twice to make it branch out more. It is well to prune trees frequently when they are young or they will become lanky and difficult to harvest. Where people begin breaking off tender tips to cook when trees are about 4 or 5 feet tall, the trees become bushier.

The folks to whom we have sent the tree in Africa have been pleased at its resistance to dry weather. Rob Van Os rated its growth, yield and potential as exceptional and added that it "can be planted after the other crops, even near the end of the rains." He has introduced it into several villages already. The first plants grew so well for Gary Shepherd in Nepal that he had us arrange for sending him 1,000 of the large seeds. He reports that at five months one was 12 feet tall and most were 6 feet.

There is more good news. The edible parts are exceptionally nutritious! Frank Martin says in *Survival and Subsistence in the Tropics* that "among the leafy vegetables, one stands out as particularly good, the horseradish tree. The leaves are outstanding as a source of vitamin A and, when raw, vitamin C. They are a good source of B vitamins and among the best plant sources of minerals. The calcium content is very high for a plant. Phosphorous is low, as it should be. The content of iron is very good (it is reportedly prescribed for anemia in the Philippines). They are an excellent source of protein and a very low source of fat and carbohydrates. Thus the leaves are one of the best plant foods that can be found." In his *Edible Leaves of the Tropics* he adds that the leaves are incomparable as a source of the sulfur-containing amino acids methionine and cystine, which are often in short supply.

It responds well to mulch, water and fertilizer. It is set back when our water table stays for long at an inch or two below the surface. We planted one right in the middle of our vegetable garden for its light shade. The branches are much too brittle to support someone climbing the tree. It is not harmed by frost, but can be killed to the ground by freezes. It quickly sends out new growth from the trunk when cut, or from the ground when frozen. Living fences can be continually cut back to a few feet.

CULTIVATION. I quote Alicia Ray, who wrote a booklet on the benzolive in Haiti some time ago. "It seems to thrive in impossible places--even near the sea, in bad soil and dry areas. Seeds sprout readily in one or two weeks. Alternatively one can plant a branch and within a week or two it will have established itself. It is often cut back year after year in fence rows and is not killed. Because of this, in order to keep an abundant supply of leaves, flowers and pods within easy reach, "topping out" is useful. At least once a year one can cut the tree off 3 or 4 feet above the ground. It will readily sprout again and all the valuable products will remain within safe, easy reach."

Scott Josiah writes that the Pan American Development Foundation in Haiti planted many kilometers of moringa as a living hedgerow on the contour of steep slopes, with mixed results. "In some cases, the growth has been excellent, nearly comparable to that of *Leucaena leucocephala*. However, *M. oleifera* has generally been a moderate performer, and seems rather sensitive to droughty sites and/or limited rainfall."

Beth Mayhood with Grace Mountain Mission wanted to establish a model vegetable garden on a small piece of land. "It was windswept and sunbaked with no natural barriers or trees in the area. Soils were poor and very alkaline. The salt content was also high. We started in January to prepare large quantities of compost. In April holes were dug in the poor soil and filled with compost. Benzolive trees planted in seedbeds germinated in 3-4 days. In 9 weeks they were transplanted in between the garden beds, around the edge of the 200 x 250 ft area and in a double row about 5 ft apart in the middle. The trees protected against the prevailing winds." I saw slides of this spot later. It was impressive.

The light shade of the tree is a considerable help to most vegetables.

I cannot emphasize enough how important it is to use pruning of some sort. If left to itself the tree becomes quite tall and lanky. This method of cutting it back to 4 feet each year sounds good. One method I tried with some success was to cut each branch back a foot after it had grown 2 feet until it was a multibranching shrub. Alternatively, normal harvesting can have the same effect if begun while the tree is young. Beth Mayhood wrote, "We liked them so much we began picking the growing tips to boil as a spinach several times a week. This picking of the growing tips caused the tree to branch. Our constantly pruned trees became thick-limbed and many-branched."

I am told that when grown for its roots, the seeds are sometimes planted in a row like vegetables.

COOKING THE LEAVES. Alicia Ray writes, "Of all parts of the tree, it is the leaves that are most extensively used. The growing tips and young leaves are best. [Ed: However, we sometimes pull the leaflets off in our hands and cook them without regard to age.] Unlike other kinds of edible leaves, benzolive leaves do not become bitter as they grow older, only tougher. When you prepare the leaves, always remove them from the woody stems which do not soften. [Ed: We did not know this the first time we served them. It was like having wire in the dish.]

"The leaves can be used any way you would use spinach. One easy way to cook them is this: Steam 2 cups freshly picked leaves for just a few minutes in one cup water, seasoned with an onion, butter and salt. Vary or add other seasonings according to your taste. In India, the leaves are used in vegetable curries, for seasoning and in pickles. Let your imagination be your guide."

Ross Haliburton in Pakistan wrote, "We planted moringa seeds in April and, with hand watering, they have grown well. The tender leaves from six plants have been regularly used like spinach since July. A group of Afghan refugee men (chiefs and nurserymen caring for small nurseries in the refugee villages) visited us. When they saw the moringa trees they immediately asked for seed. We believe this tree has potential as a green vegetable in refugee villages, where there is a general lack of greens, especially through the summer."

Dr. Warwick Kerr wrote from Brazil that while he was the president of the State University of Maranhao, he organized a group of students and professors to carry out an extension project. They planted 25,000 moringa seedlings (all descendants from one small packet we sent him in an envelope a few years ago). "I like the moringa omelet that my wife prepares almost every morning. Collect a bowl of leaves, wash and fry for five minutes with sliced onions, garlic and salt. While this is cooling,

minced tomato and onion are lightly fried then mixed with the fried moringa. Half a cup of this mix, two eggs and a spoon of any bullion soup mix are stirred and then cooked. It is delicious!" [He added that the chaya cuttings we sent made it fine and he has now distributed many plants in the community. "My wife is cooking it at least once a week and prepares it in many ways. This was the most sensational introduction: 8 small stalks in a regular airmail envelope!"]

Ronald Watts in Zimbabwe sent a copy of a letter to the editor that he wrote concerning moringa. It was published in "Productive Farming" magazine. "...I noticed several villages growing trees that I was unfamiliar with. They turned out to be *Moringa oleifera*. What was remarkable is that they were being grown for their leaves. One homestead had over 30 of these trees growing in a circle. In 36 years of wandering around Africa this was the first time I had seen trees grown in a traditional village purely for their leaves. The farmers said that the leaves were in high demand from their neighbors particularly in times of famine. Fresh leaves appear towards the end of the dry season when green food is in short supply. This tree would seem to have immense potential for improving human diets particularly in the hot and dry areas of Zambia and Zimbabwe. ...[Moringa] would seem to have great potential for feeding livestock. Several Zambian farmers who have tried *leucaena* for this purpose have been disappointed because it is extremely susceptible to termite damage. Moringa has the advantage that it is less susceptible and can be grown from cuttings. A 2-meter cutting means that from the day of planting the top of the tree should be out of reach of goats." Ronald says that though palatable to termites, moringa seems to be able to resist the challenge, particularly when grown from cuttings.

We have printed many success stories with the moringa tree. But cultures differ. Mr. C. N. Okonkwo in Nigeria ran into problems with acceptance. "All the seeds germinated and some are providing pods. Unfortunately I have not been able to convince any of the farmers to eat the leaves, except myself. The reasons are three: (a) the leaves have no eye appeal, (b) the leaves have a foul smell, (c) the growing tips have no commercial value. I am not disputing the claims regarding moringa. But in a community where so many broad-leaved vegetables thrive abundantly and some fetch good money, it is not hard to see why farmers look at this scanty small-leaved tree with some doubt."

COOKING THE PODS. Alicia Ray writes, "When young, horseradish tree pods are edible whole, with a delicate flavor like asparagus. They can be used from the time they emerge from the flower cluster until they become too woody to snap easily. The largest ones usable in this way will probably be 12 to 15 inches long and 1/4 inch in diameter. At this state they can be prepared in many ways. Here are three:

1. Cut the pods into one inch lengths. Add onion, butter and salt. Boil for ten minutes or until tender.
2. Steam the pods without seasonings, then marinade in a mixture of oil, vinegar, salt, pepper, garlic and parsley.
3. An acceptable "mock asparagus" soup can be made by boiling the cut pods until tender, easoned with onion. Add milk, thicken and season to taste.

Even if the pods pass the stage where they snap easily they can still be used. You can cut them into three inch lengths, boil until tender (about 15 minutes), and eat as you would artichokes. Or you can scrape the pods to remove the woody outer fibers before cooking."

COOKING THE PEAS. Alicia Ray writes that the seeds, or "peas," can "be used from the time they begin to form until they begin to turn yellow and their shells begin to harden. Only experience can tell you at what stage to harvest the pods for their peas.

"To open the pod, take it in both hands and twist. With your thumbnail slit open the pod along the line that appears. Remove the peas with their soft winged shells intact and as much soft white flesh as you can by scraping the inside of the pod with the side of a spoon. Place the peas and flesh in a strainer and wash well to remove the sticky, bitter film that coats them. (Or better still, blanch them for a few minutes, then pour off the water before boiling again in fresh water.) Now they are ready to use in any recipe you would use for green peas. They can be boiled as they are, seasoned with onion, butter and salt, much the same as the leaves and young pods. They can be cooked with rice as you would any bean.

"In India the peas are prepared using this recipe:

12-15 horseradish tree pods	1 medium onion, diced
4 cups grated coconut	2 bouillon cubes
2 inches ginger root	4 T. oil or bacon grease
1 clove garlic	2 eggs, hard boiled
salt, pepper to taste	

"Blanch both peas and pods' flesh, drain. Remove milk from 2 1/2 cups grated coconut by squeezing water through it two or three times. Crush ginger root and garlic, save half for later. Mix peas, flesh, coconut milk, ginger and garlic together with onion, bouillon cubes, oil, salt and pepper. Bring to a boil and cook until the peas are soft, about 20 minutes. Fry remaining coconut until brown. Fry remaining half of crushed ginger root and garlic in 2 T. oil. Dice eggs. Add coconut, ginger, garlic and eggs to first mixture, heat through. Serves 6.

THE DRY SEEDS. The dry seeds are apparently not used for human food, perhaps because the bitter coating has hardened. They are used for their oil, which is about 28% by weight. The oil can be removed by an oil press. I have heard reports that the residual cake is not safe to feed to animals, but I have not seen the results of any studies. Write to me if you have details. If an oil press is not available, seeds can be roasted or browned on a skillet, ground, then added to boiling water. The oil floats to the surface. Alicia Ray says that roasting is, however, not necessary.

Randy Creswell in Mali wrote, "The Khassonkes in Mali have been growing moringa trees for their leaves as far back as anyone's knowledge seems to go. Besides leaves, we have found good profit in a high quality edible oil readily pressable from the seeds. We are planting 1500 moringa seedlings."

THE FLOWERS. A visitor who had spent time in the Pacific area told me recently that the flowers are eaten there. Unfortunately, I do not recall details. Perhaps our readers can help. Alicia Ray says they are used in Haiti for a cold remedy. Water is boiled, then a cluster of flowers is placed to steep in it for about 5 minutes. Add a little sugar and drink as needed. It is very effective!

THE ROOTS. The tree is uprooted and the roots grated like horseradish. Alicia Ray says to one cup grated root add 1/2 cup white vinegar and 1/4 t. salt. "Chill for one hour. This sauce can be stored for a long time in the refrigerator." The following caution quotes from a recent review by Dr. Julia Morton in *Economic Botany*.

"The root, best known in India and the Far East, is extremely pungent. When the plant is only 60 cm tall, it can be pulled up, its root scraped, ground up and vinegar and salt added to make a popular condiment much like true horseradish. ...The root bark must be completely removed since it contains two alkaloids allied to ephedrine -- benzylamine (moringine), which is not physiologically active, and the toxic moringinine which acts on the sympathetic nerve endings as well as on the cardiac and smooth muscles all over the body. Also present is the potent antibiotic and fungicide, pterygospermin. The alkaloid, spirachin (a nerve paralyzant) has been found in the roots.... Even when free of bark, the condiment, in excess, may be harmful." (The key words are "in excess" --the body can detoxify small amounts of a great many things.)

USE AS AN ANTIBIOTIC. A study at University of San Carlos in Guatemala is summarized. Herbal applications are commonly used to treat skin infections in developing countries, although few investigations are conducted to validate scientifically their popular use. A previous study had showed that moringa seeds are effective against skin infecting bacteria *Staphylococcus aureus* and *Pseudomonas aeruginosa* in vitro (i. e. in a test tube). This study showed that mice infected with *S. aureus* recovered as quickly with a specially prepared aqueous extract of moringa seed as with the antibiotic neomycin.

This study proves only the effectiveness of moringa as they prepared it. That preparation could be done in any country, but not with just household utensils. It was prepared by infusing 10 g powdered moringa seeds in 100 ml of 45 deg.C water for 2 hours. The part that is a bit more complicated is reducing the 100 ml down to 10 ml by placing it in a rotavaporator. This is a very common piece of laboratory equipment which continually rotates a flask containing the liquid. An aspirator attached to a faucet produces a modest vacuum when the water is turned on. A rubber tube from the aspirator is connected to the rotavaporator, reducing the pressure and causing the water to evaporate rather quickly without boiling it. The ointment was prepared by placing 10% of the extract in vaseline. (We can send a copy of the article to medical personnel.)

Are you in a situation where there is a shortage of antibiotics? This ointment could be prepared for use in the local community wherever there is electricity and running water. Simpler methods, better suited to preparation as needed in the home, might also be effective. I hope someone will devise and test such preparations.

ECHO can provide trial-sized quantities of *Moringa oleifera* from the trees on our farm. For those seeking other potential sources we can recommend the following:

Christas Cactus, 529 W. Pima, Coolidge, AZ 85228, USA; phone 602/723-4185.
Greenleaf Seeds, P.O. Box 98, Conway, MA 01341, USA; phone 413/628-4750 (No telephone orders).
Of the Jungle, P.O. Box 1801, Sebastapol, CA 95473, USA.

Peace Seeds, 2385 S.E. Thompson Street, Corvallis, OR 97333, USA; phone 503/752-0421.
Peter B. Dow & Co., P.O. Box 696, Gisborne 3800, NEW ZEALAND; fax (079) 78 844.
Ellison Horticultural Ltd., P.O. Box 365, Nowra, N.S.W. 2541, AUSTRALIA; phone 6144-214255.
Kumar International, Ajitmal 206121, Etawah, Uttar Pradesh, INDIA.
Samuel Ratnam, Inland & Foreign Trading Co., Block 79A, Indus Road #04-418, SINGAPORE
169589; phone 2722711; fax 2716118.

Tom Post in Belize mentioned that his moringas are growing so well he now needs recipes. The Philippine book *Learn to Eat Malunggay* has 18 pages of recipes; write to ECHO for a photocopy.

Refer to Chapter 11 on Human Health for information on using moringa in water clarification.

If moringa does not already grow in your region, you may request a trial packet of the marble-sized seed. It grows wild in many places (such as Haiti and the Dominican Republic) where people do not know it is edible. The moringa is one of God's abundant resources for the struggle against world hunger.