

# The Neem Tree

**This page provides some background information about the role of the neem tree in the fight against malaria and poverty.**

*"Poverty is not necessarily the want of money or cash in hand. In a wider sense it is the lack of option, whether it is the none-availability of fertilizer for crop cultivation or pesticides for crop protection, medical remedies for family welfare, safe contraceptives for regulating family size, fuel or firewood for cooking, timber for furniture or dwelling, or the availability of appropriate technology for restoring wastelands, or absence of income generation and employment opportunities. In all these respects, Neem could be a 'panacea', particularly in rural areas."*

Dr. Saxena, Chairman of the Neem Foundation [Neem Foundation, 1997-2]

## Description of the Neem Tree (*Azadirachta indica*)

The neem tree, *Azadirachta indica*, is a tropical evergreen with a wide adaptability. Native to India and Burma, it has been transplanted to Africa, the Middle East, South America and Australia. It is especially suited to semi-arid conditions and thrives even in the poorest soil with rainfalls as little as 18 inches (450 mm) per year and temperatures up to 50° C (120° F). It may grow up to 50 feet (15 m) tall and live for 200 years.



Young Neem Trees in the Surroundings of Tamale (Ghana)

Its blossoms are small, white flowers with a very sweet, jasmine-like scent. Its edible fruit — loved by children in Africa — is about 3/4 of an inch (2 cm) long, with white kernels. A neem tree generally begins bearing fruits at three to five years of age, and can produce up to 50 kg (110 lbs.) of fruit annually when mature. The pinnate leaves have a very bitter taste and a garlic-like smell. (See the picture of a leaf.)

Due to its medical and insecticidal properties, the neem tree has been widely used in the traditional medicine and agriculture of India. Apart from *Azadirachta indica* there are two other known species of neem: *Azadirachta siamensis* and *Azadirachta excelsa*. [MotherNature, 1999; Neem Company-3]

### ***Azadirachta siamensis***

*Azadirachta siamensis* grows in Thailand, where the seeds and young leaves of the so-called "sweet" neem are used as additions to many spices. The leaves are about twice as large as in *Azadirachta indica* and less bitter. The seeds are also considerably larger and the kernels are rather of an emerald green than white. The medical uses of *Azadirachta siamensis* in Thailand are similar to those of *Azadirachta indica* in India. [Neem Company-4]

### ***Azadirachta excelsa***

*Azadirachta excelsa* grows in remote areas of Malaysia and the Philippine islands. It grows up to 160 feet (50 m) tall and is found deep in the mostly inaccessible rainforests. Because of its scarcity *Azadirachta excelsa*, like *Azadirachta siamensis*, is not used extensively for commercial products but plays a role in some indigenous medicines such as anti-malarials. [Neem Company-4]

## **History of Neem**

On the Indian sub-continent, the neem tree has been used for more than 4,500 years. The earliest documentation of neem mentions the fruit, seeds, oil, leaves, roots and bark for their advantageous medicinal properties. In the first millennium BC the neem tree was called the "Sarva Roga Nivarini" (= one that could cure all ailments and ills). The Indian physicians CHARAKA (2nd century AD) and SUSRUTA (4th century AD), whose books provided the foundation of the Indian system of natural treatment, the Ayurveda, also mention the tree and its medical use.

With the advent of Europeans on the Indian subcontinent, the religious practices around the neem tree were stigmatised as heathen practice and over time most practical uses were abandoned. However, at the beginning of this century the neem tree was still highly esteemed by Indian emigrants and they took it along to the places where they settled. Thus, the neem tree was introduced in places like Australia, East and sub-Saharan Africa, South East Asia, and South America. In Indian agriculture, neem cake (the remains from the oil production out of neem seeds) was in use as a fertilizer and pesticide in sugar cane fields up to the 1930s.

With the end of the colonial era, interest in the neem tree was on the rise again. Pioneering work in the possible commercial use of Neem oil and cake had been done by the Indian Institute of Science in Bangalore as early as the 1920s. Recalling the insecticidal properties of neem, researchers began programs in the early sixties to identify the active principles and screen them against major crop pests.

Several active ingredients were isolated from various parts of the tree, among them meliantriol and azadirachtin.

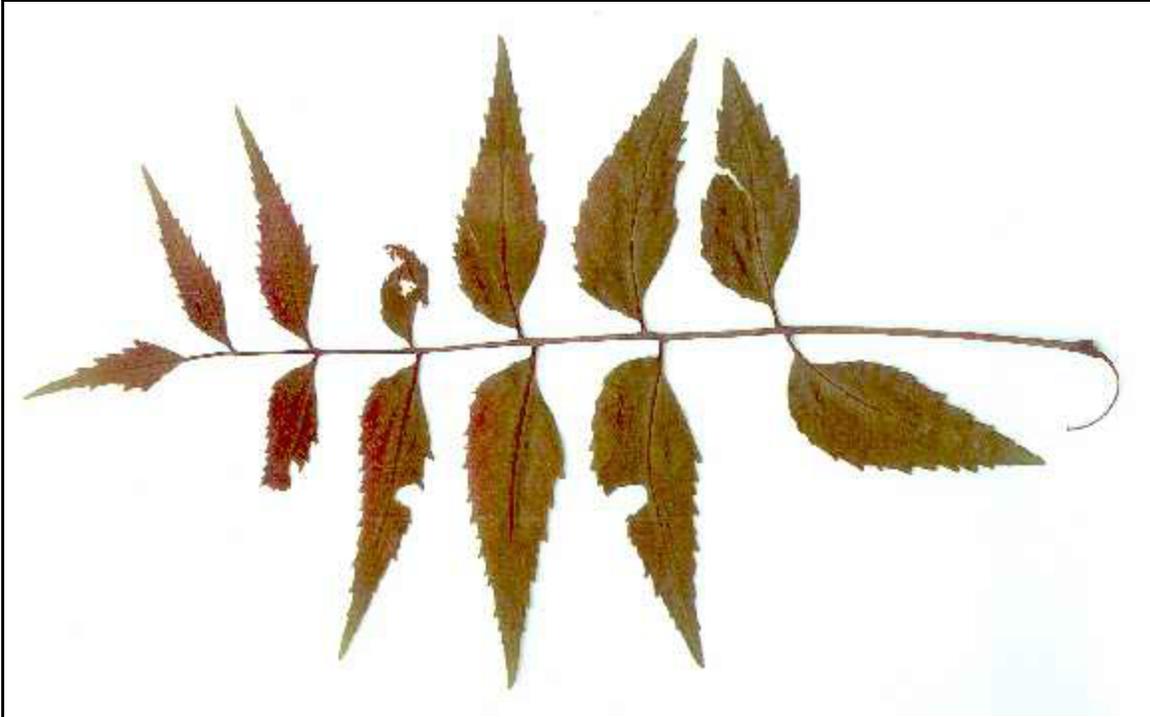
In the last two decades research on neem has been intensified and many of the trees agricultural and medical properties were rediscovered. Today, neem plays a major role in the rural industry of India and projects for the commercial use of neem have been successfully introduced in such places as Kenya. [MotherNature, 1999; Neem Company-5; Neem Foundation, 1997-2; Neem Foundation, 1997-3]



A Closer Look at the Neem Tree

## Active Ingredients

The neem tree contains more than 100 bio-active ingredients and it is rich in proteins. Its bitter taste is due to an array of complex compounds called "limonoids". The most important bio-active principal is azadirachtin (repellent); other compounds are gedunin (anti-malarial), nimbin (anti-inflammatory, anti-pyretic), nimbidin (antibacterial), nimbidol (anti-malarial, anti-pyretic), quercetin (anti-malarial), salannun (repellent), and sodium nimbinatate (spermicide). Young neem leaves contain 60% water, 23% carbohydrates, 7% proteins, more than 3% minerals, and 1% fat. [MotherNature, 1999; Neem Company-2; Neem Foundation, 1997-1; Neem Foundation, 1997-3; Neem Foundation, 1997-4; VillagePharmacy]



Single Leaf of a Neem Tree

## Producing Neem Extracts and Oils

Neem seeds contain up to 45% of a brown and bitter oil, which is also known as Oil of Margosa. It has many therapeutic uses but can also serve as fuel for lamps or for soap production. Neem seed cake (residues of oil extraction) can be used as fertilizer.

In many areas the neem seeds are easy to collect from the ground because bird or fruit bats eat the juicy and sweet fruits and spit out the kernels. If this is not the case the harvested ripe fruits need to be pulped. If water is available, the kernels should be washed to minimize the risk of fungal infection. For further processing and storage, the kernels should be dried well. This is best done by spreading them on the ground in the sun. To avoid moulding, the kernels should never be stored in a plastic bag.

### Seeds for planting

If kernels are sowed immediately, they do not need any treatment. However, seeds for later planting must be carefully dried in the shade. Temperatures above 45° C or storage for more than one month will reduce germination.

To press neem oil by hand, the kernels have to be crushed first in a big mortar, like the one used for "fufu". — As neem seed are very bitter, a separate mortar should be used. — Then the shells have to be removed by winnowing as is done with cereals. Now the kernels can be ground in a mill or pounded in a mortar. The resulting powder should be moistened with a little bit of water (not too much) until it sticks together and an almost solid ball can be formed. This dough should be kneaded for several minutes until oil collects on the surface. If this is the case, the oil can be pressed out in drops by firmly

pressing the dough. By alternatingly kneading and pressing half of the oil in the kernels can be obtained which can amount to 100 - 150 ml per kg.

If an oil press is available, the work can be simplified and the resulting amount of oil increased. Heating of the oil will not affect its insecticidal purpose. [Neem Company-5;† Neem Foundation, 1997-1]

### **Neem oil production in brief**

- A) Preparation 1. Gather the fruits and pulp them to† remove the flesh†
2. Wash the kernels if possible to avoid fungal infection†
3. Dry the kernels in the sun as done with rice or fish† B) Oil pressing 4. Crush the kernels in a fufu mortar (because of the bitter taste, use a separate mortar)†
5. Remove the shells of the kernels by winnowing, as done with cereals†
6. Grind the kernels in a mortar until a powder is obtained†
7. Moisten the powder with a little water and form a dough-ball†
8. Knead the ball until oil collects on the surface†
9. Press the oil out.†
- 10 Repeat steps 8 and 9 until you obtain about a third to half a small bottle of oil per kg of crushed kernels†

## **How the Neem's Products are Used**

All parts of the neem tree have their value as well in agriculture as in human and animal health. Some of the usage of neem are shortly described here.

### **Use of Neem in Malaria**

Neem has been used in the treatment of malaria for centuries. It has been taken as an infusion of bark, leaves or roots boiled in water or as dispersion of neem seed powder. Recent experiment have shown that several of Neem's components are effective against malaria parasites. Irocin A, a substance found in neem leaves, is toxic for resistant strains of malaria. Studies showed a 100 percent mortality in 72 hours at a ratio of 1:20,000 in vitro. Gedunin and quercetin, to other compounds found in neem leaves, are at least as effective against malaria as quinine and chloroquine.

Because the anti-malarial effects of neem appear to be greater in the body than on the petri dish, there has been some speculation that stimulation of the immune system is a major factor in neem's effectiveness against malaria. In addition to its anti-malarial activity, neem also lowers the fever and increases the appetite. Thus, strengthening the body and speeding recovery. [icipe, 1998-2, S. 187; Neem Foundation, 1997-1; VillagePharmacy]

### **Malaria Prevention**

Drinking neem teas or chewing a couple of leaves every day reduces the possibility of contracting malaria. Extracts obtained by a water and acetone combination are even more effective than plain neem tea. [Neem Company-1]†

### **Malaria Treatment**

Boil 30 g of neem leaves in 3 liters of water for 20 minutes and take one glass of this leaf extract three times a day for one week. (This treatment has been successfully used in the Wamirithu Herbal Clinic in Kenya. Patients were cured completely within one week.) [Neem Company-3]

## **Use of Neem as Insect Repellent**

Neem oil has been found to be an effective mosquito repellent. Studies have shown that one neem compound is a more effective insect repellent than DEET, a chemical widely used in commercial mosquito repellents. Also neem oil treated mosquito nets are becoming popular. Apart from mosquitoes neem also repels a great variety of other insects which are main storage pests. [icipe, 1998-2, S. 187; Neem Foundation, 1997-1; VillagePharmacy]

### **Home made mosquito repellent from neem**

To use neem as a mosquito repellent, mix 1 to 2 parts of neem oil with 98 to 99 parts of coconut oil. Applied to the body, the mixture repels mosquitos for up to 12 hours and is especially effective against the malaria type.†

Kerosene lamps containing 0.01-1% of neem oil, also reduce mosquito biting activity. [Neem Company-5]†

## **Use of Neem as Insecticide**

Neem derivatives neutralise nearly 500 pests worldwide, including insects, mites, ticks, and nematodes, by affecting their behaviour and physiology. Neem does not normally kill pests right away, rather it repels them and affects their growth. As neem products are cheap and non-toxic to higher animals and most beneficial insects, it is well-suited for pest control in rural areas. [icipe, 1998, S. 24; icipe, 1998-2, S. 93]

The most commonly used products in pest control are extracts from seeds or leaves. The seeds have about twice the potency of the leaves, but they are only available for 3-4 months each year. Leaves have to be dried in the shade, because the sunlight will break down some active ingredients. The powder obtained from crushed leaves can be used directly for dusting crops or as powder in stored foods. It can also be mixed with water and sprayed on crops. If the kernels are used they should be soaked in water overnight. The extract can be filtered and applied by a hand-pump sprayer. As the active compounds of neem decompose rapidly, crops under attack have to be treated weekly. [Neem Company-5]

## **Water Extract for Plant Protection**

### ***A) First Day***

1. Prepare the mixture: 25 g of peeled and grounded neem kernels or 50 g of grounded neem seeds per liter of water.†
2. Let the mixture stay overnight.

### ***B) Second Day***

3. Filter the extract through a fine gauze, meshed sieve or tissue to remove bigger particles.†
4. Apply the extract with a knapsack or hand-pump sprayer weekly. [Neem Company-5]†

## **Other Uses of Neem**

Apart from its use against malaria, neem plays a traditional role in the treatment of urinary disorders, skin disease, diabetes, fungi infections and viral diseases. Neem twigs contain antiseptic ingredients which provide dental hygiene and has been used for this purpose by people from rural areas in India and parts of Africa. The practice has inspired use of the neem bark in extracts in commercial toothpaste and mouthwashes. In India, scientist are researching neem's use as a contraceptive. Neem is also of ecological importance: In Africa the tree is used as a shade tree and as a source of fuelwood. In the Sahel countries, neem as been used for halting the spread of the Sahara desert. It is also a preferred tree along avenues, in markets and near homesteads, because of the shade it provides. The relatively hard and heavy wood of neem is not only durable, but also termite resistant. In many developing countries the wood is used in making fence post, poles for house construction, and furniture. [icipe, 1998-2, S. 100; MotherNature, 1999; Neem Foundation, 1997-1; Neem Foundation, 1997-4]

## **Links**

The Neem Foundation: <http://www.neemfoundation.org>

The Neem Company:† <http://www.neemcompany.com>

The Village Pharmacy: <http://www.aijsc.com/neemtree.htm>

MotherNature: <http://www.mothenature.com/articles/neem/article1.stm>

Comments, suggestions or corrections, especially from Ghanaians, people from the teaching field or in malaria research to [mattgig@crosswinds.net](mailto:mattgig@crosswinds.net) are most welcome.

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