



## Technical Note #5

# Neem

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Neem leaves Source: ECHO Staff

This technical note was published in the early 80's when there were relatively few sources of information on, or seed for, the neem tree. In recent years much progress has been made in each of these areas. The information contained in this technical note is still quite valuable. A good source of additional information is the National Academy of Sciences publication [Neem: A tree for Solving Global Problems](#).

The following recommendations are based on our own experience, scientific publications, two conferences on neem and personal communication. We would like to give some brief and practical information; for details and scientific background we refer to the selected literature in the appendix. Please note that we cannot accept any liability for the practicability and effectiveness of the recommended measures.

## INTRODUCTION

Neem (*Azadirachta indica*) probably originated in India or Burma, where its medical and insecticidal properties are well known. Furthermore, neem oil is used on a small industrial scale for soap production. At the beginning of this century the neem tree was introduced to many other tropical countries, especially in Africa. Here, many of its properties are still unknown and it is mostly used for firewood and as a shade tree.

Recalling the insecticidal properties of neem, researchers began programs in the early sixties to identify the active principles and to screen insect species against which they can work. The results to date indicate that there are several active compounds, which are mostly concentrated in the seeds. Some of them inhibit larval development and reduce female fertility in various insect species by blocking insect hormones. Others act as repellents or antifeedants. The compounds are most effective against insects of the following families: Coleoptera (beetles and their larvae), Lepidoptera (caterpillars = larvae of butterflies and moths), Orthoptera (nymphs and adults of grasshoppers and locusts). Results against some bugs, leafhoppers and whiteflies have also been good.



Figure 1. Neem fruit.  
Source: Tim Motis

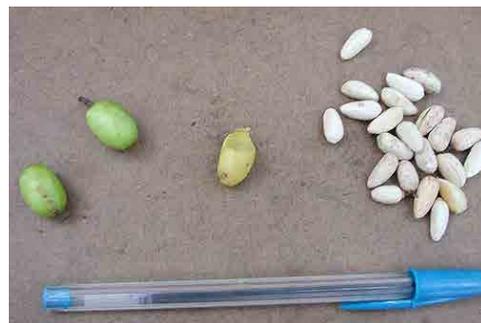
## HARVEST AND PROCESSING

In many areas seeds are easy to collect from the ground because birds or fruit bats eat the juicy and sweet fruits and spit out the kernels (Figure 1). Where this does not occur, the harvested ripe fruits need to be pulped. If water is available the risk of infection by fungi can be reduced by washing the grains after collecting them. For further

processing use oil or water extracts. For storage the kernels should be well dried by spreading them on hard ground in the shade. To avoid moulding, kernels should always be stored in a well-aerated container such as a jute sack. Never store them in a plastic bag. Moulding can be due to fungi which produce aflatoxin, a substance which is highly toxic to human beings even in low concentrations. To prepare seeds for planting dry them carefully, if possible in the shade, because temperatures above 45°C will reduce germination. Storage for more than one month will also decrease the rate of germination. For immediate sowing kernels do not have to be dried.

## OIL PRODUCTION

To press neem oil by hand, the kernels have to be decorticated (Figure 2). To do this, take stones or a big mortar (as used for "fufu" in West Africa) to crush the kernels. Then remove the shells by winnowing, as is traditionally done with cereals. The decorticated kernels must now be ground in a mill or pounded in a mortar. The powder thus obtained should be moistened with a little bit of water (attention: do not add too much) until it sticks together and an almost solid ball can be formed. Knead this paste for several minutes until oil collects on the surface; then press it firmly. Oil will come out in drops. Alternate the kneading and pressing. In this way half the oil in the kernels, which could be 100-150 ml/kg, can be gained. Do not be discouraged if you do not succeed at first. Try it again, your results will improve with experience.



**Figure 2.** Neem kernels. unprocessed (left) and decorticated (right). Source: Tim Motis

If you use an expeller oil press you do not need to decorticate the neem seeds.

In many regions there are existing traditional methods of oil production with other oil seeds (peanuts, sesame, etc.). Test these with neem seeds and continue to use them if they are suitable; they will be better accepted than newly introduced methods. Heating of oil will not affect its insecticidal purpose.

## PRACTICAL USES

- The neem tree is fast growing and drought resistant. Therefore it is widely used to reforest semiarid areas.
- Neem seeds contain up to 45% oil, which can be used for soap production or as fuel for lamps.
- Neem seed cake (residues of oil extraction), when used for soil amendment or added to urea or ammonia containing fertilizer, not only enriches the soil with organic matter but also lowers nitrogen losses by inhibiting nitrification. In addition, some nematocidal properties have been reported.
- Neem oil at a concentration of 2-4 ml/kg can protect stored beans against the bruchid (*Callosobruchus maculatus*), which is a serious storage pest worldwide. Protection lasts for at least a period of six months. Good results against pests of stored cereals (wheat, maize, sorghum) were also obtained.
- Water extracts of powdered neem kernels can protect plants against damage done by several insect species.
- A tea prepared of leaves is used traditionally to reduce fever caused by malaria, etc. This tea is extremely bitter.

### *Using neem oil to protect beans against storage pests*

Take 2-4 ml of oil/kg of threshed beans. Because only a small amount of oil is needed, the beans and the oil have to be thoroughly mixed. This is best done in a big pot or something similar, and the beans are treated portion by portion.

Neem oil has a bitter taste. Nevertheless people did not report any bitterness or difference in taste after they ate meals with neem oil treated cowpeas. But if you want to avoid any chance of influence in taste, soak the beans for about 5 minutes in hot water before further preparation. No recommendation can yet be given for the use of neem oil with stored cereals. Results reported so far have been conflicting and were less promising as with beans. If you would like to test it yourself, treat the cereal in the same manner as beans.

### *Water extract for plant protection*

Start the extract preparation one day before application. For 1 L of water, take 25 g of ground neem kernels (decorticated seeds) or 50 g of ground neem seeds (not decorticated) and let the mixture stand overnight (for grinding or pounding respectively see "Oil Preparation"). Then filter the extract through fine gauze, a fine meshed sieve or tissue to remove the bigger particles. The extract can now be applied with a knapsack sprayer or a handpump sprayer. You do not need any emulsion or wetting supporting substance.

The active compounds of neem are decomposed rapidly, especially under tropical conditions. Therefore crops which are attacked consistently have to be treated weekly; in the case of a serious locust or grasshopper attack it is better to treat biweekly. If crops have to be watered (vegetables), irrigate the soil directly. Water running over the leaves may wash off the extract.

The author himself obtained good results in field trials conducted in Togo against the main pests of cabbage (caterpillars), most of the main pests of eggplant (caterpillars, plant hoppers, except spider mites), the main pests of solanaceous vegetables (caterpillars) and important pests of courgette (larvae of leaf eating beetles, whiteflies). Always remember that neem will not act against every pest and that the best results will be shown by insect species belonging to the families mentioned [earlier](#) in this technical note.

## ADDITIONAL USES FOR NEEM (FROM PAST EDN ISSUES)

### *Mosquito repellent from neem*

Dr. V. P. Sharma, of the National Institute of Malaria Research in New Delhi, says the repellent is particularly effective against the *Anopheles* mosquito which spreads malaria. When the preparation is applied to the body, mosquitoes are effectively repelled. Low-cost neem oil is mixed with coconut oil in concentrations of 1-2%. This information is taken from *Neem News*, vol 1, p. 4, published by the Neem Association, 1780 Oakhurst Ave., Winter Park, FL 32789, USA. The non-profit association is organized to promote communication between neem scientists, growers and producers; promote its various uses and seek other uses; promote research to develop superior varieties of neem and to develop new uses.

### *Control of scabies*

Dr. S. X. Charles at the Medical and Cancer Research and Treatment Center in India sent us the results of a study of 814 people treated with neem and turmeric. (Scabies, also called seven year itch, is especially common in children. It causes very itchy little bumps that can appear all over the body, but are most common between fingers, on wrists, the waist and genitals. It is caused by little animals similar to tiny ticks or chiggers, which tunnel under the skin.)

Scabies is treated with a scrub bath, boiling the fomites (clothes and bed linens), and application of a paste made by grinding "Fresh neem leaves and turmeric in the proportion of 4:1 by weight. The measurement that is taught to mothers is a handful of neem leaves and a piece of turmeric  $\frac{1}{2}$  the length of the index finger. This paste is rubbed all over the body and left to dry. The procedure is repeated daily until the patient is cured. (Boiling clothes and scrub bath is carried out daily before application of the paste.)

"Paste rubbed on the face has not caused any skin reaction or other toxic symptoms. Because of the bitter taste, chances of children swallowing it was remote, and even if swallowed [is not toxic]." "Of the 824 cases, 98% showed complete cure within 3-15 days of treatment. Those cases (95.8%) with localized lesions showed cure in 3-5 days. When lesions were all over the body and there was secondary infection, treatment needed for a cure was 6-15 days. Failure of treatment was only 2%. The reasons for failure were irregular application of paste and not doing the preliminary treatment of scrub bath and boiling of fomites to prevent reinfection."

### *Control of nematodes*

"There is evidence that leachates from the litter of certain trees and shrubs [water that has soaked through the litter] have nematocidal properties, e.g. *Azadirachta indica* (neem), *Ricinus communis* (castor bean) and *Leucaena leucocephala*." Farmers in Sao Luis put 1 kg of neem leaves/square meter in the soil (25 cm deep) before planting carrots in order to control soil nematodes.

### *Neem leaf tea to control termites*

We seldom hear of any natural control that works with termites. Don Mansfield in Mali sent the following. "A Norwegian missionary here in Mali told me how to control termite damage to trees with neem leaf tea (*Azadirachta indica*). A barrel or bucket is filled with green neem leaves. They cover the leaves with water and after 4 days use the liquid against termites. I don't know whether it kills them or just keeps them away. The missionaries swear it really works.

"It has been a great success for me. Most of the time when I've used it, it has been setting for at least 2 weeks. When I see where the termites are starting up a tree or pole, I knock them and their clay off. Then I take a paint brush and paint the whole area where the termites had been on with the tea. I make sure that plenty runs down around the base. Twice I have had to

do it a second time after about a week, but all the other times I have only done it once and the termites have not come back. It has been 5 or 6 months since I treated a couple mango trees, which have not been bothered since."

### *More uses of neem as an insecticide*

R. N. Mall in Pakistan writes, "We learned during the Health Education Program that in some villages the seeds are crushed and the oil is being used against head lice, which is quite effective." Dick Lockman, also in Pakistan, says that they use the dried leaves for moth protection of woolen clothing in storage. A few leaves in the pockets and scattered among the items prevent moth damage.

The following three paragraphs are abstracted from an article in the magazine Baobab, #5, 1990. They in turn learned it from "The Farming World" of BBC World Service.

For the past 20 years, Professor Ahmed Sadiq has been working with the use of neem in pest control. Recently CARE started trials in collaboration with him. The seeds have about twice the potency of leaves, but seeds are only available for 3-4 months each year. So they are working with leaves. Leaves are dried in the shade, because the ultra-violet from the sun will break down the active ingredient. When the leaves are dry, they are crushed to a powder in a mortar and pestle. They can then be used directly for dusting crops or as a powder in stored foods. The powder can also be mixed with water and sprayed on crops.

Most farmers like to see pests drop dead right away. Neem does not have this sort of effect, with a few exceptions. Its main effect is as a repellent. If insects do eat the treated plant, the neem has a hormonal and growth-regulator effect. Local farmers have used it only one year. Those who treated okra with it said grasshoppers avoided treated plants.

Farmers who treated watermelon seeds with neem powder said that rats that normally eat the seeds did not eat the treated seeds. Neem is not usually thought of for rodent control, but it has a flavor which perhaps the rats did not like.

### *Neem seed as a feed ingredient*

Four Nigerian scientists have shown that the ground seeds can replace up to 28% of the corn and cotton seed meal in a rabbit ration. (33-7; from "The Journal of Applied Rabbit Research," vol. 13, pp. 125+126, 1990.)

Fresh neem fruits were soaked for one day, after which the pulp was removed manually and discarded. The seeds were washed, dried several days, then ground. The greatest daily gain was with 10% neem seed meal. The authors speculate that the foul-smelling odor of neem seed meal and bitter taste account for a lesser amount of feed eaten with the highest level of neem.

Note that in these experiments the entire seed was ground. Many farmers might prefer to extract the oil first. This would presumably remove some of the bitter tasting substances. The extracted meal would contain a higher percent of protein, but less energy. Without the oil, the extracted neem seed would presumably more closely resemble the cotton seed meal (meals have had the oil removed) than corn. I would speculate that it could replace cotton seed meal or even soybean meal.

## **Production related topics (from past EDN issues)**

### *Salt tolerance of neem*

Neem (*Azadirachta indica*) seedlings have been grown successfully in Pakistan on sandy soil using irrigation water with approximately 10,000 ppm salt. (Pure sea water is 35,000 ppm.) A neem plantation has been established near Mecca in Saudi Arabia to provide shade for Muslim pilgrims. Water with approximately 2500 ppm salt was used for irrigation.

### *Neem and bees*

Dave Morneau in the Central Plateau of Haiti asked us about the Haitian beekeepers' belief that neem (*Azadirachta indica*) or chinaberry (*Melia azedarach*) blossom nectar is harmful to honeybees, since leaves and seeds are widely used to control insects. We checked ECHO's library and found no written evidence to support this concern.

*Neem: A Tree for Solving Global Problems* reports that neem is benign to most beneficial insects, and "[insects] that feed on nectar or other insects rarely contact significant concentrations of neem products." The authors cite a study which found that "only after repeated spraying of highly concentrated neem products onto plants in flower were worker bees at all affected.

Under these extreme conditions, the workers carried contaminated pollen or nectar to the hives and fed it to the brood. Small hives then showed insect-growth-regulating effects; however, medium-sized and large bee populations were unaffected."

### *Devastating disease of neem trees in West Africa*

We are suddenly hearing from many in our network about this disaster. Mike Bengé with USAID phoned to alert us to the problem and to say that they were sending a team to investigate. Steve Maranz in Niger writes that the neem disease has now reached all the way to Senegal. [ED: *That's as far west as one can go in Africa.*] "It should be noted that to the villagers here, none of the products and services rendered by neem compare to its value as a shade tree. When there is nothing in the bare landscape between you and the blazing sun, the thick shade of a neem is heavenly. So much more the loss, then, when a 20 year old neem tree dies." On a related note, Steve writes, "I saw that our cowpeas were infested with beetles (I assume the bruchid beetles one reads about). I asked our field technician if he had ever used neem oil to control these pests. His answer was interesting. He said he knew it was effective, but would rather lose half his cowpeas than have to taste neem in his food. This is from someone who eats kola nuts every day, which are as bitter as quinine."

## References

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