The Neem Tree

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What is neem?

The neem tree (*Azadirachta indica*) is native to tropical South East Asia. It is fast growing, can survive drought and poor soil and keeps its leaves all year round. It is a tall tree, up to 30 metres high, with leafy spreading branches. Many white flowers which smell of honey appear for the first time when the tree is 2 to 3 years old, and the tree bears fruit after 3 to 5 years. The ripe fruit are about 2 centimetres (cm) long and oval shaped. Inside the fruit there is a light-coloured seed about 1.5 cm long.

How does neem grow?

Rainfall and altitude

Neem trees can be grown in areas which have between 400 millimetres (mm) and 1500mm of rain each year. It performs best at an altitude of less than 1,500 metres.

Temperature

Neem trees will survive very hot temperatures, up to 44°C and as low as 4°C. Some people report neem trees surviving light frost.

The seeds of neem do not live long and are usually planted as soon as possible after the fruit ripens and usually within three months. To help the seeds live longer the fruit pulp should be removed by hand and the seeds dried in the shade to a level of 15 to 20% moisture content. If the seeds have been properly air dried they should survive for up to twelve months in a refrigerator at 4°C.

How can neem be used?

Although it has many uses, the most important use for neem products is to fight against crop pests and diseases. Worldwide approximately one third of crops in the field and in storage are lost to pests each year. The worst affected are maize and rice in Africa and Asia. The main focus of this booklet is to describe how neem can be used to help combat and overcome these problems.

How do neem extracts control pests?

Neem extracts contain a natural chemical called azadirachtin. The substance is found in all parts of the tree. The leaves are used effectively, though the chemical is much more concentrated in the fruit, especially in the seeds.

Neem extracts do not usually kill insect pests immediately. They change the feeding or life cycle of the insect until it is no longer able to live or have young. This might mean that the neem extract takes a long time to work if the pest attack is severe. Other insects will avoid a plant treated with neem extracts.

When neem products are exposed to light they begin to lose their ability to control pests. For this reason the commercial neem based insecticide, Margosan-O, that is sold in the USA, contains a sunscreen. Neem based pesticides are suitable for use in developing countries because the useful chemicals can be easily removed from the neem without the use of expensive and complicated equipment.

The uses of neem

There are many different ways to use the extracts of the neem tree. Some of the most common methods are described in this section.

Neem leaves for grain storage

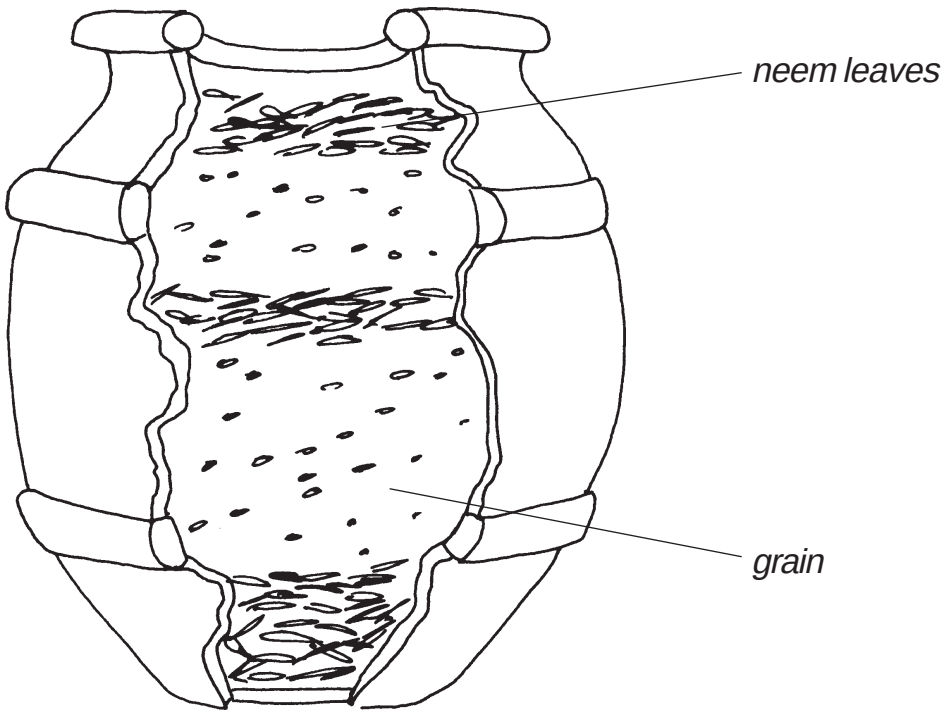
When neem is used in grain storage, pests can be kept away from the grain for a whole year; but if the grain is already infected with pests the protection will not work.

Method one

1. Place a 1.5 cm layer of fresh neem leaves, is placed in the bottom of a storage container.

2. Place a layer of sun dried grain (up to 30cm) is placed on top of this followed by another layer of neem leaves.

These layers can be repeated until the container is full, finishing with a good layer of leaves.



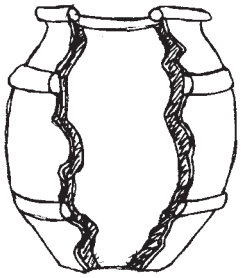
A grain container showing how neem leaves are applied between the layers of grain

Method two

1. Dry neem leaves in the sun so that the leaves stay green.

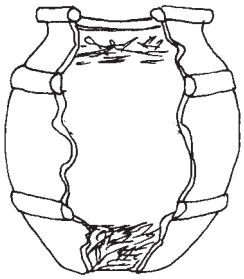
2. Grind them into a powder.

3. Mix the powder with clay and water.



4. Plaster the inside walls of the storage container with the mixture and allow to dry.

5. Place a layer of neem leaves, which have been dried in the shade, on the bottom of the container.



6. Fill the container with grain.

7. Place a layer of dried neem leaves on top and close the storage container.

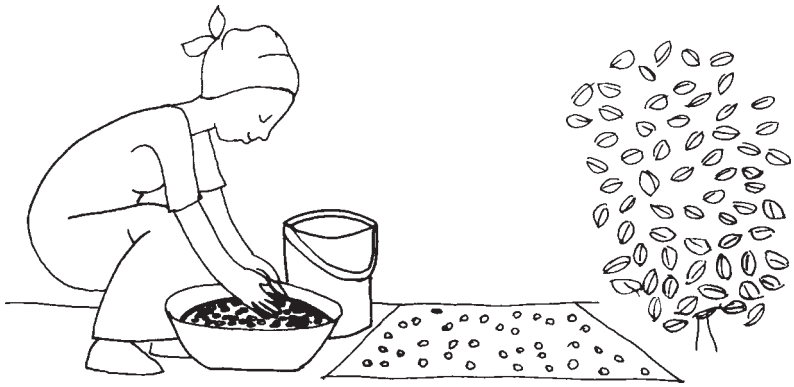
Method three

If grain is being stored in sacks, neem leaf powder can be mixed directly with the grain. Mix 1 or 2 kilograms (kg) of powder to 100 kg of grain.

Crushed neem

Preparing crushed neem seed

1. The ripe fruit pulp should be removed from the seed as soon as possible after harvest, otherwise the seeds may become covered in mould. In some areas birds or fruit bats eat the pulp if the seeds are left outside and uncovered.



2. The seeds should then be laid out in a thin layer in the sun to dry out for a few days.

3. The dried seeds should be stored in containers with plenty of air to stop mould growing, such as baskets or sacks.

4. The shells have to be removed using stones or a big mortar. The loose shells can then be removed by winnowing in the same way as with cereals.

5. The kernels are then ground in a mill or in a mortar.

Crushed neem seed to control stem borers on young plants

1. A small amount of crushed neem seed powder should be mixed with the same amount of dry clay or sawdust.

2. The mixture is sprinkled over young plants or placed in the funnel of young maize and sorghum plants.

3. Rain will gradually dissolve the active chemicals in the neem seed.

4. This treatment may need to be repeated every 8 to 10 days until the plants flower.

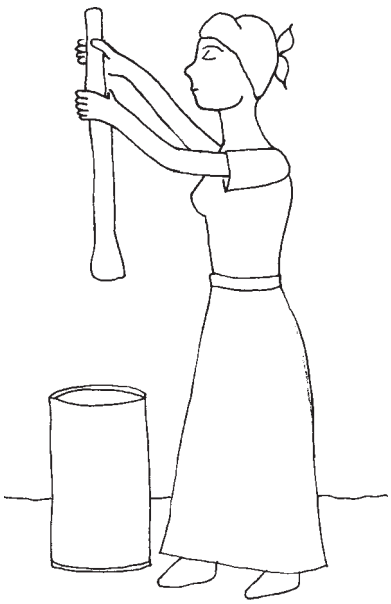
Neem powder is sprinkled in the funnel of young maize plants

Neem oil from neem seed

You should be able to extract 100 to 150 milligrams of oil for every 1 kilogram of neem seed.

Extracting neem oil

1. To press neem oil by hand, the kernels of the neem seed should be crushed in a mill or pound in a mortar.



2. Add a small amount of water until the mixture forms a firm paste that can be kneaded.

3. Knead the paste until oil drops form on the surface.

4. Press firmly to extract the oil.

5. The kneading and pressing should be continued in turn until the maximum amount of oil is removed. (The oil content of the seed kernel is about 45%).

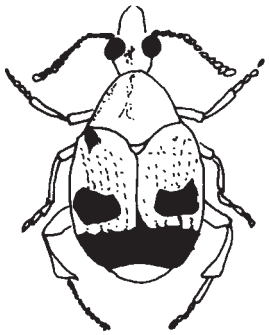
In some areas there are traditional ways of removing oil from other seeds such as sesame or groundnut. It is a good idea to try these methods with neem. Heating the oil will not affect the ability of neem to control insects.

Controlling Bruchid beetles in stored beans with neem oil

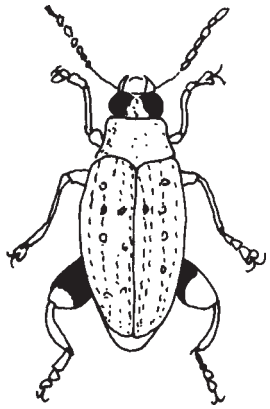
Neem oil is used to control Bruchid beetles which are small beetles whose larvae eat into stored beans and other legumes.

Mix 2 to 3ml of neem oil for every 1kg of beans or seeds before storing.

The oil has a bitter taste but it is not reported to change the taste of stored beans for humans to eat.



Cowpea Bruchid



Groundnut Bruchid

Control of soil-borne pests

The neem cake which is left after the oil is extracted from the seed, is also useful for controlling several pests which live in the soil, particularly nematodes.

Neem water

Preparing neem water

1. Grind 500 grams (g) of neem seed kernels in a mill or pound in a mortar.

2. Mix crushed neem seed with 10 litres of water. It is necessary to use a lot of water because the active ingredients do not dissolve easily. Stir the mixture well.

3. Leave to stand for at least 5 hours in a shady area.

4. Spray the neem water directly onto vegetables using a sprayer or straw brush.

5. Once applied the effect of the neem lasts for 3 to 6 days.

Neem water can be stored and will remain effective for 3 to 6 days if it is kept in the dark.

If crops have to be watered, water should go directly on the soil because water running over the leaves of sprayed plants may wash off the neem water extract.

It has been estimated that 20 to 30kg of neem seed (an average yield from 2 trees), prepared as neem water can treat one hectare of crop.

Neem water as a spray to control cutworms

Water based neem spray is most effective against pests such as cutworms. During the day the caterpillars stay on the ground and feed on plant roots. At night they eat young stems. Plants most affected include many vegetables and other affected plants include maize, tobacco and coffee.

Neem water should be sprayed at the point where the young plants emerge from the ground.

Neem water taken up by plants

Some plants will take up neem extract through their roots and into the leaves and other parts of the plant. The water based neem extract described above may be tried. Only some plant species take up the active ingredients; for example beans take up azadirachtin, but potatoes do not. Insects which feed on the parts of these plants where the azadirachtin is carried around in the plant, can be controlled in this way.

What pests can neem extract be used against?

Neem extracts are better at controlling some pests than others. Cold pressed neem oil and seed cake can both be used for pest control. The leaves can also be used to control pests, but there is less of the useful chemicals than in the seed.

Good control

Neem extract is usually most effective against beetle larvae, butterfly and moth caterpillars as their development into actual beetles is impaired. Examples of these are Mexican bean beetle larvae, Colorado potato beetle larvae and diamondback moth.

Neem is very effective against grasshoppers, leaf miners and leaf hoppers, for example variegated grasshoppers, green rice leafhopper and cotton jassid. When neem is taken up by the plant it will usually affect leaf hoppers and plant hoppers because they feed from the inner part of the plant which carries the azadirachtin around inside the plant. Grasshoppers will stop eating almost immediately after neem extract is applied but caterpillars may not stop eating for 2 or 3 days.

Controlling locusts with neem is very effective. neem spray makes them slow, flightless and solitary as opposed to a swarming mass.

Neem provides good control for various flies. The horn fly breeds in animal dung. If neem is fed to animals the flies are repelled by the smell and taste of neem in the dung. The same is true for fruit flies. Neem water sprayed under fruit trees, where fruit flies usually breed and larvae develop, stops the growth of the larvae into flies.

Some control

Neem is fairly good at controlling adult beetles, aphids, white flies and armyworms. These are less likely to settle and lay their eggs for some time after spraying. Beetles that feed on plant material as adults, such as the brown leaf beetle, may sometimes avoid plants treated with neem extracts. Beetles and weevils avoid grain or other crops which are stored in containers which have been treated with neem. Aphids avoid plants which are sprayed regularly.

When neem extracts are taken up by the plant it will not control aphids in the same way as it does hoppers because aphids feed on the outer layer of the plant which contains very little of the neem extract.

Poor control

Neem gives only poor control of mealybugs and scale insects, adult bugs, fruit maggots and spider mites.

Why use neem for pest control?

Pests are often controlled with man made chemicals which have many harmful effects.

- Artificial chemicals kill useful insects which eat crop pests.
- Artificial chemicals can be very bad for the health of people who use them and people who eat food with small amounts of chemicals in the skin, the leaves or on the surface.
- Artificial chemicals can stay in the environment and in the bodies of animals causing problems for many years.
- Artificial products are very simple chemicals and insect pests can very quickly, over a few breeding cycles, become resistant to them and can no longer be controlled.
- Artificial chemicals are often expensive and unaffordable.

  Neem, however, has properties which are very effective against many pests and diseases, and it is not harmful to the environment.
- Neem contains several active chemicals which work in different ways. As a result of this, pests are unlikely to become resistant to neem. The most well known natural chemical in neem is azadirachtin.
- Neem is easy to prepare and use, and is environmentally safe and not harmful to man and animals.
- Neem does not usually affect beneficial insects, for example those that eat crop pests. This is because neem extracts must be eaten to take effect. Insects that feed on plant tissue are likely to be affected but those that feed on nectar or other insects are unlikely to eat enough neem extract to be affected. Beneficial insects include bees, parasitic wasps, spiders and ladybirds.

Other uses of neem

Almost any part of the neem tree is useful and some of the additional benefits it provides are described below:

- Extracts from the neem tree are also used as mosquito repellents, fertilisers, diabetic food and animal feed.
- Neem leaves and the neem cake which is left over when oil has been removed from seeds can improve soil structure and add to the plant nutrient base.
- Neem leaves can be used to make soil less acid.
- The wood of the neem tree is strong and resistant to termite damage. It is also good for firewood and for making charcoal.
- The neem tree is good for shade and is often planted on roadsides.
- Neem extracts are used to treat many health problems. People bathe in neem water to relieve heat rashes and boils. Neem oil is used against stomach ulcers and rheumatism. Neem bark contains a strong antiseptic and neem is used to make soap and toothpaste. Neem twigs are used to clean teeth.

Reference list

‘**Neem: A Tree for Solving Global Problems**,’ (1992) National Research Council, National Academy of Sciences, 2101 Constitution Avenue NW, Washington, DC 20418, USA

‘**Neem a Natural Insecticide**,’ 34pp. Brochure available from GTZ, Dag - Hammarskjold - Weg 1 - 5, 65760 Eschborn, Germany

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‘**Developing Countries Farm Radio Network**,’ 1990. Package 16, Item 7. Neem trees provide safe no-cost control of many insects. From DCFRN, 40 Dundas Street West, Box 12, Suite 22B, Toronto, Ontario, Canada, M5G 2C2

‘**Rural Production and Use of Plant Preparations for Crop and Postharvest Production**’ available from GTZ, Postfach 5180, 6236 Eschborn 1, Bundesrepublik, Germany

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Further information on neem and on organic farming can be obtained from HDRA. Other publications include booklets covering composting, green manures, weed control and the neem tree, as well as single information sheets about crop pests and diseases and their control, natural pesticides and green manures. Please write to:

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