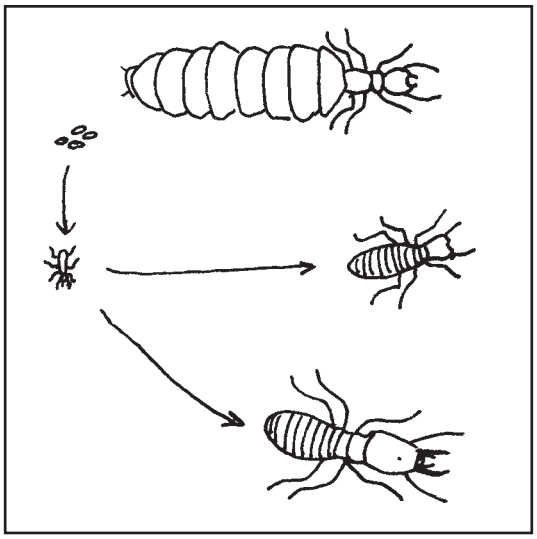
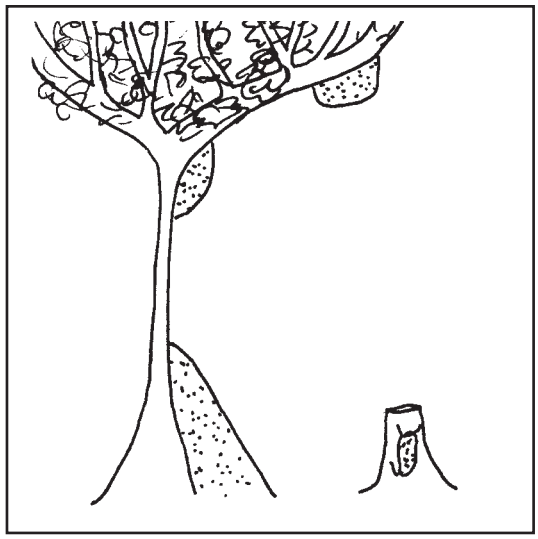
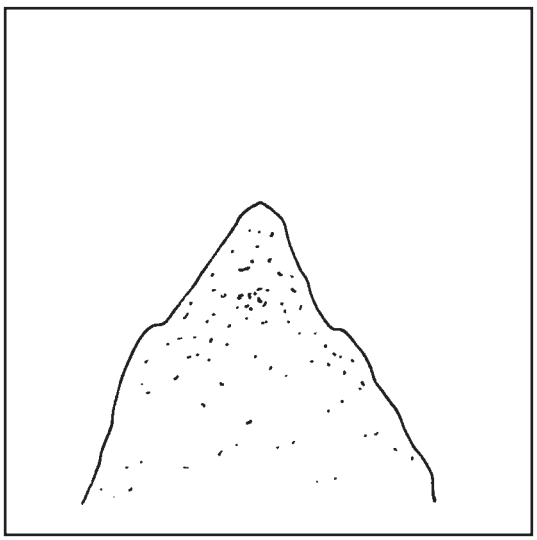
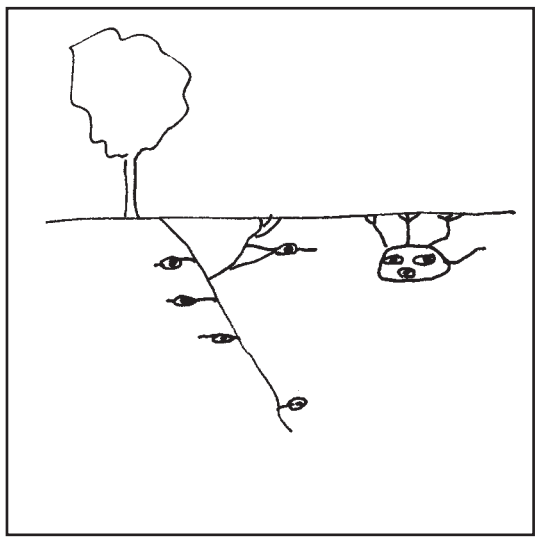
Termite Control without Chemicals









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Termites: what are they?

Termites are a group of insects (*Isoptera*) consisting of 2,500 species of which 300 are considered pests. Termites are one of the most damaging pests in the tropics and can cause considerable problems in agriculture, forestry and housing.

There are several families and sub-families. Some have nests underground, others in wood, for example hollow trees, and some build mounds.

Before control methods can be adopted a basic identification of the pest species or family is needed. This can be done by observing pest behaviour and the damage pattern on the tree or crop.

The most troublesome type of termites in agriculture are the fungus-growing termites. They feed on dead organic material such as crop residues, mulches and soil organic matter (humus). However when this type of food is not available they will eat live plant material including crops such as groundnuts, millets and maize.

Harvester termites are found in dry and semi-desert areas. They build underground nests which can be difficult to locate. They collect live green plant material and cause damage to living grasses, crops and seedlings. They will attack weak plants that are wilting or damaged.

Benefits provided by termites?

Although usually considered pests, termites can also provide many benefits. Therefore before control measures are used an assessment should be made of the following benefits against the loss of termites from the ecosystem.

Benefits include:

- Aeration of the soil due to termite burrowing activities.
- The breakdown and release of organic matter as termites eat and digest soil.
- Improved soil fertility when termite mounds, which are rich in minerals, are crushed down and incorporated into the soil.
- A source of minerals for cattle who lick the mounds.
- A source of protein rich food for many organisms including ants, guinea fowl and other mammals including humans.

Chemical control

The generally accepted method of termite control over the years has been chemical pesticides. However chemicals are expensive and have many harmful effects.

Safety for people

Artificial pesticides can quickly find their way into food chains and water courses. This creates health hazards for humans. There is also much concern for people using chemical pesticides. The products may be misused because the instructions are not written in the language understood by the person using them. This has led to many accidents and deaths.

Safety for the environment

There are a number of harmful effects that chemical pesticides can have on the environment.

- Artificial pesticide can kill useful insects which eat pests. Just one spray can upset the balance between pests and the useful predators which eat them.
- Artificial chemicals can stay in the environment and in the bodies of animals causing problems for many years.
- Pests become resistant to pesticides so more powerful chemicals are needed.

Cost

Using natural pest and disease control is often cheaper than applying chemical pesticides because products and materials which are already in the home and around the farm are most often used.

Organic control methods

There are a number of alternatives to using chemical pesticides for termite control. These methods work within the natural system and help promote natural pest control mechanisms.

- Organic control methods do not pollute the environment and are not harmful to beneficial insects and animals, or to the people using them.
- Organic methods aim to use locally available materials and do not rely on importing expensive materials from elsewhere.
- Organic methods are cheap and easy to use.
- Organic methods preserve genetic diversity within the farming system which helps provide resistance to termite pests.
- Organic methods **regulate** termite numbers rather than eliminate them so that the benefits provided by termites are not lost.

The level of control depends on the knowledge of pest species, the tree or crop species, climatic conditions and other environmental factors such as soil type and local vegetation cover. Methods of control are more effective if used in conjunction with each other, with maximum use of local knowledge and resources.

Termite control methods are described in this booklet. Some of them come from individual research studies and have not been widely tested.

Adding organic material to the soil

Fungus-growing termites prefer to eat dead plant material. Their attacks are thought to be related to soils with low organic matter content. This is because such soils do not contain enough food for termites to live and they resort to feeding on living plant material. Adding compost or well-rotted manure to the soil and sowing green manures helps to increase the organic matter in the soil.

Digging compost into the soil to increase organic matter content

Encouraging predators

Termites have many predators because they provide a source of protein. Insects that eat termites include spiders, beetles, flies, wasps and especially ants. Other predators including frogs, reptiles, birds and mammals such as aardvarks, pangolins, bats, monkeys and humans. Encouraging this kind of wildlife will help to reduce the number of termites. Bushes and trees are a home for many of these useful creatures. These areas of natural habitat can be left around fields where crops are grown. If these areas are destroyed then there is an imbalance between the populations of predator and pest.

Substitute food sources

Damage from termites which feed on dead plant material can be reduced by adding organic material to the soil. The farmer should avoid having bare, dry soil around crops.

However, there is also a short term solution which involves providing termites with an alternative source of food. This can be done by using mulch around the base of plants. Mulching with items such as hay, manure, wood shavings, wood ash or threshed maize cobs has been shown (in South Africa and Uganda), to dramatically decrease termite attacks. Termites are attracted to the mulch rather than the crop. Vetiver grass leaf mulch has been shown to prevent termite attack around the base of trees.

However, offering substitute food may also attract termites to the area and increase the overall damage done to trees and crops. Each case is likely to be different and dependent on termite species and tree/crop species.

Crop rotation

Planting the same crop on the same land year after year reduces soil fertility and structure. Crops growing in such conditions will be weaker and susceptible to termites. Crop rotation can play an important role in reducing termite attack.

Crop rotation means that crops are grown on a different piece of land each year. This can prevent pest and disease build up and also help the soil to recover nutrients.

Healthy plants for transplanting

- Plants which are suffering from disease or lack of water are generally more susceptible to termites than healthy plants. It is therefore important that plants are kept healthy and watered.

- In dry areas it is recommended that seeds should be sown at the beginning of the wet season to give the plants a chance to establish themselves and remain healthy in the field.

- Only healthy plants should be transplanted into the field. Great care should be taken during transplanting and pruning (leaves and roots) as termites may enter plants through scar tissues.

- If there is a bag around the root of a tree seedling, it is recommended that it should not be completely removed when transplanting as it can act as a barrier against termites. However it is important that the bag does not prevent the plant/roots from growing. It should still allow the plants roots to grow into the soil. Banana fibre pots are very ineffective as termites will eat them.

- Adding organic composts and manure to the planting area is recommended as this will produce healthier trees and crops. Whereas, inorganic fertilisers encourage fast growing soft tissue which is more likely to be attacked by termites.

Magnets

Placing strongbar magnets in the soil next to a new termite mound can prevent a mound from growing. This disturbs those species of termite which build their mounds in a north-south direction along magnetic lines.

Breaking up mounds and queen removal

On deep cracking soils, the regular disturbance through cracking prevents termites from building extensive mounds. On other soils artificial breaking up of mounds and galleries can have the same effect. Repeated digging and ploughing of the soil may reduce termite damage. Manual and explosive destruction of nests followed by the removal of the queen is also effective.

Physical barriers

Building barriers around buildings and nurseries can prevent attack from subterranean species. Barriers should be partially above and below ground and should be composed of a material that is impenetrable to termites such as basalt, sand or crushed volcanic cinders. Particle size of the material is critical, they should not be too large for the termites to carry away, and not so small that termites can pack the particles to create a continuous passage through which they can move.

Plants with termite resistance

Crops

There is little knowledge about crop resistance to termite attack. However, in general indigenous crops are more resistant to termites than exotic crops. For instance, in Africa, sorghum and millet are more resistant to termites than maize and cowpea, and bambara nuts are not attacked while groundnuts suffer serious damage. Annual crops are attacked towards harvest time while perennial crops are attacked most destructively during dry seasons or in early stages of growth. It may be advisable to establish small plantations in the field prior to larger scale plantations in order to discover if the crop or tree is resistant to local termites in local conditions.

Trees

The degree of resistance depends on the tree species, the origin of the tree seed, the age and condition of the tree, the termite species and where the tree is growing (region/country). However as with crops, indigenous species are more resistant than exotics. The following table gives a number of trees and shrubs that have shown to be termite resistant.

Trees and shrubs with termite resistance

Species	Common name	Termite resistant part	Comments
Acacia polyacantha	hook thorn		More resistant that most Acacias due to high number of resins
Afrormosia laxiflora		Wood/pulp	
Albizia odoratissima	tes shade tree	Wood/pulp	
Albizia zygia			Termite durable but not resistant
Azadirachta indica	neem, nim		
Borassus aethiopum	African fan palm		The fibrous wood is highly resistant
Brachylaena hutchinsii	muhugu oil tree		Highly resistant, almost impenetrable to termites
Capparis aphylla		Wood/pulp	Termite resistant shrub
Catalpa bignonioides	common catawpa		Resistant to Reticulitermes flavipes
Cedrus deodora	himalayan cedar	Wood/pulp	
Daniellia oliveri		Gum/resin	
Detarium senegalense		Wood/pulp	Oral poison
Dodonaea viscosa	purple hop bush	Wood/pulp	Termite resistant shrub
Erythropleum suaveolens		Wood/pulp	Oral poison
Eucalyptus microcorys			More resistant than other Eucalyptus
Grevillea robusta	silky oak, silver oak		Termite tolerant in Tanzania
Juniperus procera	E. African pencil cedar		Highly resistant
Melia azedarach	white cedar	Wood/pulp, leaves, seeds, oil	Oral poison
Strychnos nux-vomica		Leaves	Oral poison
Zanthoxylum xanthoxyloides		Wood/pulp	

There are many other species with termicidal properties including: *Acacia catechu (*catechu, khair*), Acacia mearnsii (*black wattle*), Acacia melanoxylon (*Australian blackwood*), Albizia saman (*saman*), Afzelia cuanzensis (*pod mahogany*), Balanites aegyptiaca (*desert date*), Bridelia micrantha (*mitserie*), Cassia brewsteeri (*Brewsters cassia), *Casuarina cunninghammiana* (river she-oak), *Eucalyptus camaldulensis* (red gum), *Gliricidia sepium* (mother of cocoa), *Grevillea glauca* (East African mahogany), *Leucaena leucocephala* (ipil ipil).

Plant preparations

Plant parts and plant extracts can be used effectively. These can be removed from the plant and used as a natural insecticide by grinding up the relevant parts, placing in boiling water, stirring and leaving to soak. The mixture is then sprayed onto the pest infested crop. Alternatively the plant part, such as toxic fruit juices, pulps or shavings can be applied directly.

Grinding up plant parts to make a natural preparation for termite control

Plants with termite control properties

Species	Common name	Termite control property	Parts used
Acacia nilotica	Egyptian thorn	Anti-insect	Wood/pulp
Agave americana	American aloe	Repellent, insecticidal	Whole plant
Allium sativum	garlic	Anti-feedant, bacterial, fungicidal, repellent	Bulbs
Anacardium occidentale	cashew	Anti-insect, repellent	Seeds, oil
Argemone mexicana	Mexican poppy	Insecticidal, repellent	Whole plant
Azadirachta indica	neem, nim	Termiticidal, anti-feedant	Leaves, seeds
Bidens pilosa	blackjack	Anti-feedant, insecticidal, repellent	Whole plant, mature seeds
Boswellia dalzielli		Repellent	Gum/resin
Calatropis gigantea		Anti-insect	Leaves, sap/latex/juice
Calatropis procera		Termiticidal	Latex
Carya ovata	shagbark hickory	Termiticidal	Bark
Camellia sinensis	tea	Anti-feedant, insectidical	Leaves and fruit
Carica papaya	pawpaw	Insecticidal	Fruit, fresh leaves and roots
Cassia siamea	yellow cassia, kassof tree	Repellent	Used as a leaf mulch
Cedrela odorata	West Indian cedar	Termiticidal	Wood
Chemopodium ambrosioides	wormseed	Anti-feedant, insecticidal, repellant	Whole plant
Cleistanthus collinus		Repellent	Bark
Commiphora africana		Termiticidal	Gum/resin
Consolida regalis	blue cloud	Termiticidal	Seeds
Diospyros ebenum	ebony	Anti-insect	Roots
Hardwickia mannii		Termiticidal	Stem/branches
Hyptis spicigera	labiatae	Repellent	Aerial parts
Juniperus virginiana	eastern red cedar	Anti-insect	
Leucaena leucocephala	ipil ipil	Repellent	Used as a leaf mulch
Melia azedarach	chinaberry, persian lilac	Anti-feedant, contact poison, repellant	Bark, branches, leaves, fruit, oil
Mesna ferrea		Anti-insect	
Ocimum basilicum	sweet basil	Insecticidal, repellent	Whole plant
Ocimum canum	wild basil	Insecticidal, repellent	Whole plant
Ocimum urticifolium	basil		Water-based extracts
Pinus strobus		Termiticidal	Bark
Prosopis africana		Anti-insect	Roots
Quassia indica		Termiticidal	Leaves
Quercus prinus	chestnut oak	Termiticidal	Bark
Samadera indica		Termiticidal	Leaves
Santalum album	sandalwood	Anti-insect	
Sassafras albidium		Termiticidal	Bark
Semecarpus anacardium		Anti-insect	Seeds
Swartzia madagascariensis		Repellent	Fruit
Tagetes minuta	Mexican marigold		Water-based extracts
Tectona grandis	teak	Repellent	Wood/pulp

Reference list

'Organic Termite Control' (1994) P Forshaw. HDRA undergraduate report.

'**Natural Pest and Disease Control**' (undated) H Elwell and A Mass, published by the Natural Farming Network, PO Box 8515, Causeway, Harare, Zimbabwe.

'**Natural Pest and Disease Control'** (1996) Gaby Stoll, published by Magraf Verlag, PO Box 105 97985 Weikersheim, Germany

Notes

Further information on termite control 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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The aims of HDRA - the organic organisation are to carry out scientific research into, collate and disseminate information about, and promote interest in organic gardening, farming and food in the UK and overseas. For more than a decade, HDRA's international programme has been involved in the support and extension of sustainable farming practices; supporting research on aspects of tropical organic agriculture, providing advice and literature on appropriate organic techniques and providing tree seeds and technical information to organisations involved in tree planting and research.

We gratefully acknowledge the generous support of the Charlton Community Development Trust in the production of this booklet.

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