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Tree species resistant to termites

1. Introduction

Termites are extremely important creatures in decomposition and nutrient cycling in tropical ecosystems. However, they can inflict serious damage to growing trees and structures in wood. Some termite species consume mainly dead wood; others attack also seedlings and trees, thereby causing great damage in new plantings. While most mature trees overcome the attack, seedlings usually die. Any wood construction of suitable species can be attacked both indoor and outdoor. Termites are often adaptive to whatever species are available, though different termite species have a preference for particular wood types and plant species and keep away from others. Resistance is rarely total but often relative; some species are generally avoided, as long as other species are available. Termites will often shift to other species if their preferred food species is depleted.

Chemical control is practiced both in new plantations and as treatment to seasoned construction wood. However, as for most types of chemical treatment, the negative implications make the option questionable: 1) efficacy is generally of short duration and application must be repeated regularly, 2) unintentional effect on other creatures, e.g. natural enemies, may accentuate the problem in the long term, 3) the cost of treatment is often high, 4) application and disposure of waste require safety measures, which are often not available, and 5) some remedies have long term negative environmental effects.

2. A short biology of termites

Termites form a very diverse group of insects with several thousand species. They are social insects, i.e. living in large organised groups with a high degree of specialisation. They live mostly under ground. Some species form very large central colonies which in time can accumulate to conspicuous termite mounds – sometimes mistakenly called ›ant hills‹ because of their similarity to ants. Termites are crawling insects where only the fertile young ready to mate females (queens) and males can fly. After the mating flight they lose their wings and establish new colonies. Most of the alates perish. The wingless termite is typically white or light brown with a cylindrical and distinctly segmented body, 1-1½ cm long, a big, often round head with strong mouth parts and 6 thin legs. There is significant morphological difference between various specialised groups (castes); ›soldier‹ termites thus have hard shields and very strong claws while food gathering ›workers‹ have soft body, gnawing or sucking mouth parts and are usually blind. The size, crawling habit, social organisation, similarity in specialisation and subterranean life style often causes confusion with ants. However, the morphological differences are distinctive and taxonomically ants and termites are placed in different orders (Hymenoptera and Isoptera respectively). The main distinctive characters from ants are their soft segmented body and short legs. Termites have no larval stage but hatch as active 6-legged creatures. The most common termite family is Kolotermidae.

3. Physiological and other adaptations to termite resistance

Extremely hard wood does yield some mechanical resistance to attack, and termites often start feeding on the soft part. However, resistance is mostly chemical where certain smells and tastes are apparently avoided. In addition, several tree species contain compounds that interfere with the insects' cellulose digestion system, e.g. resin, oils and lignins. Hence, several pines are surprisingly not attacked by termites, despite their relative soft wood.

Termite–plant relation has presumably evolved in a traditional predator–prey manner: the prey evolves certain resistance, whilst the predator in turn evolves to overcome. Exotic species sometimes have an advantage in escaping local predations because they possess defence

Figure 1. Left: Termite workers are soft, whitish and often blind (www.timber.org.au). Right. Termite attacked wood showing characteristic tubes under which the termites hide (www.allpest.com).

mechanisms, which local predators have not overcome. The mechanism is often temporary and does not always work. For example, some eucalypts claimed to exhibit certain resistance to termites in Australia are strongly attacked in Africa.

Fast and healthy growth is usually the best preventive mechanisms as decay and initial weakness tend to become self accelerating. Once decay has started, the attack will develop, and weak sites also become vulnerable to other types of attack, e.g. bacteria and fungi, especially where termite attack causes water contact, e.g. ›broken tubes‹.

4. List of species with inert termite resistance

Tree species rich in anti-feedants such as oil, resin, tannin and lignin are often relatively resistant. However, the rule is not universal as some species with these compounds are attacked and some species with relatively little content of above anti-feedants are not. There is a certain degree of host specificity in termites, and species claimed ›resistant to termites‹ sometimes means to the prevailing species in a certain area. The list contains species, which have been observed as moderately to highly resistant to termite attack.

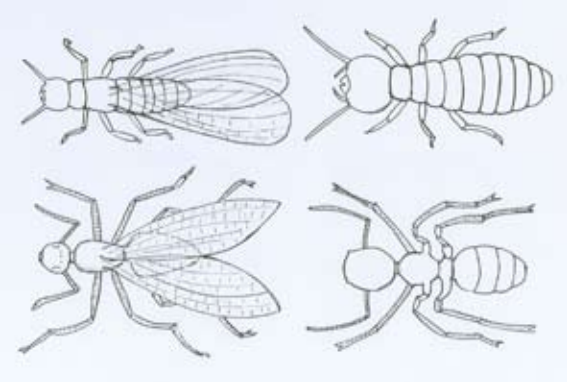

Figure 2. Termites and ants have many similarities both in terms of external morphology, feeding habits and social structures. Both groups consist of highly specialised groupings e.g. workers, soldiers and queens, and both termites and ants have winged stages (alates /swarmer). Two key caracters are the the thick and straight abdomen and straight antennas in termites (upper row), and the narrow waist and bended antennas in ants (lower row).

Acacia nilotica	*Acacia holoserica*
Acacia polyacantha	*Aegiceras corniculatum*
Afrormosia laxiflora	*Afzelia africana*
Aglaia perviridis	*Albizia lebbek*
Albizia odoratissima	*Albizia zygia*
Anacardium occidentale	*Anogeissus leiocarpus*
Artocarpus styracifolius	*Azadirachta indica*
Borassus aethiopum	*Borassus akeassii*
Boswellia dalzielli	*Brachylaena hutchinsii*
Callitris columellaris	*Callitris glaucophylla*
Calophyllum inophyllum	*Canarium australicum*
Capparis aphylla	*Cassia siamea*
Castanopsis indica	*Casuarina decaisneana*
Casuarina equisetifolia	*Catalba bignonioides*
Cedrela odorata	*Cedrus deodora*
Cinnamomum camphora	*Commiphora africana*
Cordia subcordata	*Cryptomeria japonica*
Daniellia oliveri	*Detarium senegalensis*
Diospyros ebenum	*Dodonea viscosa*
Enterolobium cyclocarpum	*Erythropleum suaveolens*
Eucalyptus camaldulensis	*Eucalyptus deglupta*
Eucalyptus microcorys	*Glericidia sepium*
Grevillea robusta	*Hardwikia mannii*
Juniperus procera	*Juniperus virginiana*
Leucaena leucocephala	*Litsea coreana*
Madhuca subquincuncialis	*Magnolia albogericea*
Magnolia dandyi	*Magnolia glauca*
Melia azedarach	*Michelia balansae*
Michelia mediocris	*Paramichelia baillonii*
Pericopsis elata	*Pinus kesiya*
Pinus merkusii	*Prosopis africana*
Pterocarpus angolensis	*Pterocarpus dalbergioides*
Santalum album	*Schinus molle*
Strychnos nux-vomica	*Syzygium cumini*
Taiwania cryptomerioides	*Tarrietia javanica*
Tectona grandis	*Vatica subglabra*
Vitex quinata	*Zanthoxylum xanthoxyloides*

5. References and selected reading

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HDRA – the organic organisation: Termite control without chemicals. *www.gardenorganic.org.uk/pdfs/international_programme/Termite.pdf*

NB: There are many internet sources available on termites.

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