Subterranean Termite Pests and their Control in the Urban Environment in Malaysia

by

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ABSTRACT

Subterranean termite control accounted for 50% of the total business turnover of the Malaysian pest control industry in 2000, of which US$8-10 million were spent. About 70% of termite treatments were done on residential premises, 20% on industrial buildings and 10% on commercial buildings. The most important species are *Coptotermes travians*, *C. curvignathus*, *C. havilandi*, *C. kalshoveni* and *C. sepangensis*. *C. curvignathus* which usually attack houses built in areas where rubber trees (*Hevea brasilliensis*) were previously planted, while *C. travians* is mainly found in urban buildings. Other subterranean and mound-building species that are found around living premises, urban gardens and parklands, but usually do not attack structures include *Macrotermes gilvus*, *Macrotermes carbonarius*, *Globitermes sulphureus*, *Microtermes pakistanicus*, *Microcerotermes* spp. and *Odontotermes* spp. Control of subterranean termites in Malaysia currently relies heavily on pre- and post-construction soil treatments. Dusting is also commonly done in buildings. The ban in 1998 on chlordane usage as a soil termiticide, has caused pest control operators to opt for organophosphate and pyrethroid insecticides. Field evaluations of hexaflumuron baits against various *Coptotermes* species in natural habitats and in buildings showed very promising results. The activity of all baited termite colonies diminished within 70 days of bait application with the total amount of hexaflumuron consumed being less than 1.5 g. The potential of baiting and challenges to termite control in Malaysia are discussed.

INTRODUCTION

Termites are an important group of insects in Malaysia. They are pests in the urban, agricultural and forest environment (Dhanarajan 1969; Tho 1992). The study of termites in Malaysia was pioneered by Haviland (1898), followed by Bugnion (1913) who compiled a list of Indo-Malayan termites, and John (1925) on termites of Ceylon, Peninsular Malaysia, Sumatra and Java. Most of the early studies concentrated on

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basic information on termite taxonomy and biology. The introduction of rubber trees (*Hevea brasilliensis*) by the British, followed by mass planting of this crop, indirectly initiated the study of termites as a pest in Malaysia. In the early 1900s, when termites had become a serious pest of the rubber tree, a number of studies and observation on these pests were made (Bailey 1901, Corey 1902, Ridley 1909, Togwood 1909, Baker 1910, Beeley 1934). Many subsequent studies dealt with termite taxonomy, and control of termites in agriculture and forestry. However, limited studies have been reported on termites attacking residential structures and buildings.

There has been a steady increase in the termite control business in Malaysia over the last 10 years. The cost of termite control and related services, which was estimated at US$5 million in 1995 (Yap & Lee 1996), increased to US$8-10 million in 2000 (C.Y. Lee, unpublished). Proportionally, termite control and related services contributed to 40% of the total business turnover of the pest control industry in 1995 (Yap & Lee 1996), and increased to 50% in 2000. Despite the importance of termites in Malaysia, there has been a dearth of information about termite pests, especially those attacking structures and buildings. In depth research on termite species in the urban environment in Malaysia is urgently required.

Subterranean Termite Pests in Malaysia

About 180 species of termites has been found in Malaysia, covering a total of 42 genera (Tho 1992). However, less than 10% of them are important pest species in the human environment. In the urban and suburban environment, four species of *Coptotermes* are of great importance to the pest control industry, namely *C. travians*, *C. curvignathus*, *C. havilandi* and *C. kalshoveni* (Sajap & Wahab 1997; C.Y. Lee, unpublished). The first two are the most aggressive species, readily attacking urban structures and buildings. Another species, *C. sepangensis* is usually found infesting suburban and rural structures. A preliminary study conducted in 1998 on the various premises (n = 32) serviced by pest control companies, indicated that 53% of the infestation in structures and buildings in central Peninsular Malaysia are due to *C. travians*, 28% by *C. curvignathus* and the remaining by the other three *Coptotermes* spp. and other species. *C. curvignathus* is also a serious pest in rubber and oil palm plantations.

In addition to the *Coptotermes* species, several other termite pests are also readily found along the perimeters of buildings and structures, in urban gardens and in parklands. These include *M. gilvus*, *M. carbonarius*, *G. sulphureus*, *M. pakistanicus*, *Odontotermes* spp. and *Microcerotermes* *crassus*. Among these species, *M. gilvus*, *M. carbonarius* and *G. sulphureus* are mound-builders, while *M. pakistanicus* may sometimes be found in mounds of *M. gilvus* and *M. carbonarius*. On the other hand, *M. crassus* is an arboreal nest builder. Most of them attacked small wooden structures (eg. ladders, park benches, etc) and trees around the houses. There have been a few isolated cases of *M. gilvus* and *G. sulphureus* attacking residential wooden structures. *M. gilvus* and *G. sulphureus* are pests of rubber and oil palm plantations, while *M. pakistanicus* is an important pest in tea plantations.

Common Locations of Infestations

Termite infestation is a major problem to residential premises in Malaysia. This is clearly reflected in the fact that 65% of the pest control services provided for termite control were carried out in residential premises, compared to 20% in the industrial sectors (eg. manufacturing plants, factories, warehouses, etc), 10% in commercial buildings (office complexes, shopping malls, etc) and 5% for other locations. One of the major reasons could be due to the use of ex-rubber and oil palm plantations for residential housing projects. Many of these plantations were cleared during the period when commodity prices for rubber and oil-palm were not satisfactory. Most of the time, the trunks of the trees were chopped down, but the roots were left in the soil. This would have sustained the food source of the *Coptotermes* sp. until the houses were completed.

Table 1 shows the common locations of infestation of subterranean termites within buildings/structures in Malaysia. The data is based on information provided by 10 major pest control companies through their services over the period of two years (July 1998 – June 2000). A total of 124 structures/buildings were inspected. Door and window frames and parquet floors were found to be most prone to termite attack within the

Table 1. Common locations of infestation of subterranean termites within buildings/structures in Malaysia[1] (n = 124)

Location	% of total infestation found
Door/window frame	35
Parquet floor	30
Baseboard/skirting area	5
Built-in wall cabinet	5
Roof/ceiling	10
Bathroom area	10
Others	5

[1]Results based on information provided by 10 major pest control companies in Malaysia.

structures. These are also the locations where most householders would first detect the presence of termite infestation in their house. Another location which is common to termite attack is the wood frame around the bathroom door where moisture is abundant.

Termite Control

Like most Southeast Asian countries, control strategies against subterranean termites in the urban environment in Malaysia rely heavily on the use of soil insecticides (Chung & Lee 1999). Basically, the usage of soil insecticides can be divided into pre- and post-construction treatments. A total of 48% of the total pest control business was done at pre-construction of the buildings, while the remaining was at the post-construction. Most of the post-construction treatment utilized dusting, trenching and corrective soil treatment. A survey on 10 major pest control companies in the country indicated that 50% of the total post-construction treatment jobs comprise dusting and corrective soil treatment, followed by 30% using dusting only, and 20% using dusting and trenching. Arsenic trioxide is still heavily used for dusting, despite being an unregistered item in Malaysia. Since the banning of chlordane usage in 1998, chlorpyrifos-based products have dominated the termiticide market (80%). Other insecticides used include cypermethrin (5%), chlordane (remaining stock) and other pyrethroids (15%). For chlorpyrifos usage, the generic compound produced by manufacturers in China is very popular among the pest control operators due to its low cost.

Baiting by pest control operators against subterranean termites using hexaflumuron baits started in October 2000 in Malaysia. It is gaining popularity among the middle to upper class residential house owners in the central Peninsular Malaysia region, although its usage is still very limited. So far, good results have been registered against *Coptotermes* spp. colony suppression or even elimination is usually achieved within 70 days upon baiting. To date, one report on the performance of hexaflumuron baits against *C. curvignathus* has been published (Sajap *et al.* 2000). Four colonies evaluated in this study were eliminated within 25–44 days post-baiting with 137.5–395 mg of hexaflumuron consumed. The greater effectiveness of these baits in Malaysia against *Coptotermes* spp. compared to *Coptotermes formosanus* in other parts of the world may be due to several factors, including differences in species response to the active compound and higher feeding rate under tropical conditions (Lee *et al.* 1999; Sajap *et al.* 2000). Importantly, most tropical termite species have small foraging territories and population sizes, compared to the temperate or subtropical species. For example, *C. curvignathus* has a population size between 1.6-1.7x10^5 and foraging territory of 15–50m^2 (Sajap *et al.* 2000), compared to *C. formosanus* which has a larger population size (1.0–6.8 x10^6) and foraging territory (160–3500m^2) (Su & Scheffrahn 1988; Su 1994). On the other hand, *C. travians* has a bigger population size (3.2–13x10^6) and foraging territories (125–384m^2) (C.Y. Lee 2002), compared to *C. curvignathus*.

The author also found good efficacy when hexaflumuron baits were evaluated recently against several species of *Coptotermes* in Malaysia. Colony elimination was achieved between 49–62 days when the baits were assessed against three field populations of *C. travians*, with total consumption of 0.92–1.45g of bait active. When tested against two field populations of *Coptotermes havilandi*, a total of 0.89–1.47g of hexaflumuron were consumed before termite activities diminished within 60 days. Two other *Coptotermes* spp. namely one population each of *C. kalshoveni* and *C. sepangensis* were also tested with hexaflumuron baits. Both populations were eliminated within 45 days using 0.45 and 0.72g of hexaflumuron, respectively (C.Y. Lee, unpublished).

Challenges to Termite Control in Malaysia

There are several major challenges to termite control in Malaysia. First, although current building legislation encourages building or housing developers to do pre-construction treatment, it is not compulsory. It is also not mandatory for them to engage professional services from pest control operators to conduct the treatment. Thus in order to save cost, many housing developers resort to untrained workers to carry out the treatment.

Secondly, there is also a serious need to have more trained pest control operators. At present, pest control operators are not required to be licensed to perform their services. This means that none of the operators are required to undergo any examination or test to check their competency to conduct pest control operations. Several cases of mistreatment due to pest control operators lacking appropriate knowledge have happened in the past. These included: conducting corrective soil treatment for wood borer infestation; residual spraying on the baseboard for termite control; and pouring cement slab onto the freshly treated soil without a protective or plastic cover.

Interestingly, the incidence of *Macrotermes gilvus* infesting residential premises which had been previously treated for *Coptotermes* spp. using hexaflumuron baits has been observed recently. *M. gilvus* was found in the house as early as two months later after the suppression or elimination of the *Coptotermes* spp. This observation concurs with the earlier report by Su *et al.* (1995) who found that *Reticulitermes flavipes* had invaded homes which had previously been baited for *C. formosanus*. They suggested that, with the elimination of *C. formosanus*, *R. flavipes* was able to reclaim its former territory. However, compared to *R. flavipes* which can be successfully baited, it is very challenging to bait *M. gilvus* due to its poor response to paper-based bait matrix, and its sensitivity to disturbance as is inevitable during inspection of baits.

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