

FIELD EFFICACY OF IMIDACLOPRID AGAINST *Coptotermes gestroi* (ISOPTERA: RHINOTERMITIDAE) and *Globitermes sulphureus* (ISOPTERA:TERMITIDAE) IN SEBERANG PERAI AND BALIK PULAU, PENANG, MALAYSIA

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ABSTRACT

The field study on population estimation and foraging activity of *Coptotermes gestroi* (Isoptera: Rhinotermitidae) in Mengkuang, Seberang Prai and *Globitermes sulphureus* (Isoptera: Termitidae) in Sungai Pinang, Balik Pulau were monitored using pine wood consumption. The treatment of Premise® 200SC (18% w/w imidacloprid) was carried out to see the efficiency of this product in a Malaysian climate. Two sites of different species of termite infestation (*C. gestroi* and *G. sulphureus*) were chosen for the efficiency study. The estimate population of *C. gestroi* was 7.22×10^5 with the feeding territory was 40m². The population of *G. sulphureus* which was estimated 3.38×10^5 with the feeding territory of 96m². Both sites were treated with Premise 200SC at the dilution rate of 25ml Premise 200SC into 10L water. From the study, Premise® 200SC was proven to cause termite activity to cease within 6 weeks after treatment and no sign of active termite was detected either indoor or outdoor after this report was written.

ABSTRAK

Kajian lapangan terhadap anggaran populasi dan perilaku mencari makanan oleh anai-anai *Coptotermes gestroi* (Isoptera: Rhinotermitidae) di Mengkuang, Seberang Prai dan anai-anai *Globitermes sulphureus* (Isoptera: Termitidae) in Sungai Pinang, Balik Pulau, Pulau Pinang dipantau dengan menggunakan aktiviti pemakanan kayu pine. Rawatan dilakukan dengan menggunakan of Premise® 200SC (18% w/w imidacloprid) untuk melihat keberkesanan produk ini di iklim Malaysia. Dua lokasi kajian dengan dua species anai-anai yang berbeza (*C. gestroi* and *G. sulphureus*) dipilih untuk melihat keberkesanan rawatan ini. Anggaran populasi *C. gestroi* adalah 7.22×10^5 dengan keluasan mencari makanan 40m². Manakaka anggaran populasi *G. sulphureus* adalah 3.38×10^5 dengan keluasan mencari makanan 96m². Kedua-dua lokasi dirawat dengan menggunakan Premise 200SC pada nisbah bancuhan 25ml Premise 200SC dalam 10L air. Daripada kajian ini didapati bahawa aktiviti anai-anai. Berjaya dikawal dalam tempoh 6 minggu dan tiada tanda kehadiran anai-anai dikesan didalam mahupun didalam rumah selepas kertas kerja ini ditulis.

Key words: *Coptotermes gestroi*, *Globitermes sulphureus*, imidacloprid, slow acting termiticide

INTRODUCTION

Termites are social insects and in Peninsular Malaysia, about 175 species termites had been

reported by Tho (1992). Sajap and Wahab (1997) reported five main subterranean termite species causing big economic damages to structure and crops are *C. gestroi*, *C. havilandi*, *C. kalshoveni*, *C. curvignathus* and *C. sepangensis*. The main nest of those species is difficult to determine

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because they are not mound builder termite. Other genera such as *Globitermes*, *Macrotermes* and *Schedorhinotermes* are also important pest although rarely attacking building (Abdul Hafiz *et al.*, 2007).

In Malaysia, conventional treatment consists of direct chemical spraying to the active termites and support by drilling, drenching and injecting chemical along and underneath infested building. Since the banning of organochlorine and some of organophosphate (e.g. chlopyrifos) for anti-termite treatment, new chemical group of termiticide and baiting concept are available alternatives to the pest control industry.

According to Lee *et al.* (1999), the basic principle of subterranean termite control is to establish an impenetrable chemical between the termite colonies and the timber structures within the property. These conventional treatments with repellent termiticide usually use a large volume of chemicals in order to fully saturate the soil under and around a structure.

Imidacloprid (Premise® 200SC) is a non-repellent termiticide. The product creates a Treated Zone® in the soil where the presence of the chemical is undetectable by the insect. Termites get affected when they passed through the zone and the chemical can be transferred among the colony through grooming and feeding activity (Thorne and Breisch, 2001; Shelton and Grace, 2003; Tomalski and Vargo, 2004). It has also been reported that the effect of the chemical can be reached far beyond the treatment area (Osbrink and Lax, 2003).

In this study, Premise 200SC (18.7% w/w imidacloprid) was tested against *C. gestroi* and *G. sulphureus* in two different location in Penang.

MATERIALS AND METHODS

Study site

The study site was located in Penang at two different palces. For The *Globitermes sulphureus*, the study site was located at Sungai Pinang, Balik Pulau; it is a single unit wooden malay traditional house. The study site for *Coptotermes gestroi* was located at a single unit bungalow house in Mengkuang, Seberang Prai, Penang.

Termite Sampling

A total of fifty pine wood survey stakes (*Pinus caribaea*) was installed for every 5 to 10 feet around the infested houses. Once the termite is detected by the survey stakes, more pine wood stakes put in to underground monitoring stations (UMS). An UMS is a plastic container (20 cm

diameter by 19 cm height) and supplied with a bundle of nine pinewood stakes (size of each stake is 2.5cm x 2.5cm x 15cm). A hole is made at the bottom of the container.

Wooded Stake Consumption

Wooden stakes in the UMS were collected every 2 weeks from the study sites and replaced with the new bundles. Stakes were washed under running water and left dried in the oven for 48 hours at 80°C before weight was recorded. The amounts of wood eaten were monitored before and after being treated with Premise 200SC.

Foraging studies

Mark- Release - Recapture (MRR) programme was carried out to estimate the foraging territory and the population size. For each termite collection, the mean body weight of the termite workers was determined by weighing five groups of 10 individuals each. The number of collected workers were determined by the total weight of collected workers and the mean worker weight. Termite workers collected from a station with a heavy activity (active feeding activity) were stained with 0.1% (wt/wt) Nile Blue A by a no choice feeding of stained filter paper (Whatman No. 1, 9.0 cm diameter) for 5 days. The stained termites were released into one of the underground monitoring stations. The total number of stained termites released depends on the total number of termites recaptured from the active monitoring station and it varied for every study sites. The monitoring stations at each site were checked and the bait from the monitoring stations was collected 7 days after the release so as to record the stained termites recaptured from the monitoring stations for that cycle. The foraging territory of a colony was defined as the area encompassed by the stations containing termites during the single Mark- Release - Recapture (MRR) programme. Lincoln's Index formula was used to estimate the foraging populations of *C. gestroi* and *G. sulphureus* (Su *et al.* 1991; Ngee & Lee 2002).

Treatment

Twenty five milliliter (ml) of Premise 200SC was added with 10 liter of water as the dilution used for the treatment. Five liter mixture of the dosage was injected for every drilled holes at 50 cm a part. For the trial on *C. gestroi* in Mengkuang, the treatment was carried out only to the internal perimeter of the house, while for the trial on *G. sulphureus* in Sungai Pinang, treatment was carried out only to external perimeter of the house.

Table 1. Number of marked released termite (n'), number of termites captured (n'') and number of marked termites among those recaptured (N2) during a single mark-recapture programme for *C. gestroi* and *G. sulphureus* colony in Mengkuang and Seberang Prai

Location/species	n'	N2	n''	Population
Mengkuang (<i>C. gestroi</i>)	12524	8924	155	7.22×10^5
Sungai Pinang (<i>G. sulphureus</i>)	2407	19496	139	3.38×10^5

RESULT AND DISCUSSION

The foraging population estimation was using Index Lincoln formula;

$$N = n'/n'' \times N2$$

Where :

- n' = Number of marked termites released again to the field
- n'' = Number of recaptured termite (with blue dye)
- N2 = Number of termites captured (from the second round)

The number of marked termites released, termite recaptured and marked termites among recaptured termites in single mark – recapture – release (MRR) procedure are shown in Table 1 and Table 2. Seven days after release, the initially marked termites were recaptured from the interconnected UMS. Before treatment, it was estimated that about 7.22×10^5 foraging populations of *C. gestroi* (Table 1) within the foraging territory of 40 m². Mean food consumption of the colony by the foraging populations ranged from 153.9g to 32.3g per station (Fig. 1).

Meanwhile for *G. sulphureus*, it was estimated that about 3.38×10^5 foraging populations of *G.*

sulphureus (Table 1) within the foraging territory of 96m². Mean food consumption of the colony by the foraging populations ranged from 4.9g to 76.9g per station (Fig. 2).

Population Activity

The mean wood consumption for *C. gestroi* was taken from average of 3 active UMS since the trial was conducted. The inconsistency feeding pattern shows that the colony ceased their activity in the UMS may due to the termite activity in the UMS. Nevertheless, after treatment in week 13, the population observed was still active with mean wood consumption of about 25g. Five weeks later, with internal perimeter treatment only around the house, no termite was detected in any of the UMS planted around the building or inside the house.

The mean wood consumed by *G. sulphureus* was taken from average of 6 active UMS. The feeding activity was increasing from 25g to 55g within 14 weeks. And after the treatment was carried out in week 14, the wood consumption by the termites decreased to nil within 6 weeks later. The termite activity could not be found either in any of UMS or inside the house.

This preliminary study of Premise 200SC against *C. gestroi* and *G. sulphureus* in Penang, Malaysia, shows that this non-repellent termiticide can be used successfully to control termite

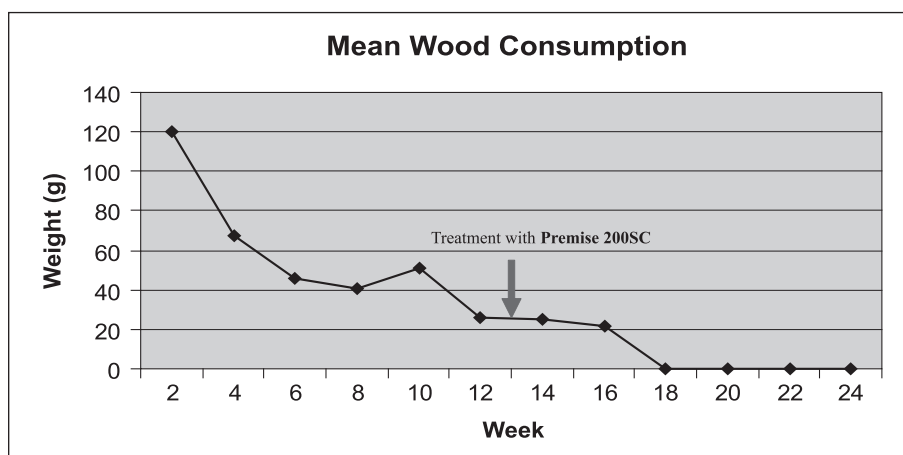


Fig. 1. Mean wood consumed by *C. gestroi* before and after treatment of Premise 200SC along the perimeter of the house in Mengkuang, Penang.

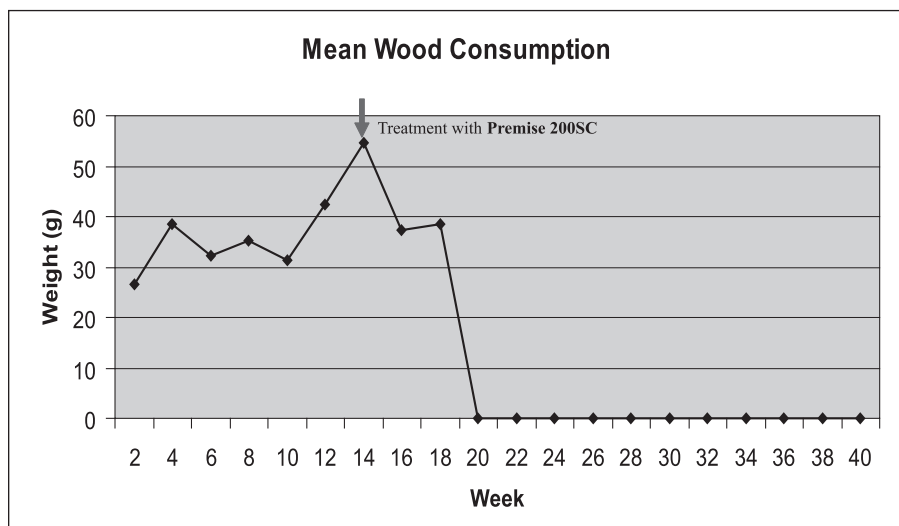


Fig. 2. Mean wood consumed activity of *G. sulphureus* before and after treatment of Premise 200SC along the perimeter of the house in Sungai Pinang, Penang

infesting building. Conventional treatment which consist of direct spraying application and drilling and injecting of the non-repellent chemical of Premise 200SC, was proven still effective to control termite infestation. Result shows that there was no termite activity in all bait stations placed surrounding the infested houses after 5 to 6 weeks of treatment. This is probably the transfer effect of imidacloprid which occurred among the colony (Abdul Hafiz and Abu Hassan, 2006; Abdul Hafiz *et al*, 2007; Obsrink and Lax, 2003; Vargo and Parman 2004). Termites hit the non-repellent zone or Treated Zone of imidacloprid and passed it to other termites in the colony either by grooming or tropholaxis. The product took sometime to show cease in the feeding activity by both *C. gestroi* and *G. sulphureus*. This probably due to the study is still on going to see the effect of the product that may have contaminated the whole colony and may probably eliminated the colony.

CONCLUSION

The results demonstrate that Premise 200SC (18.7% w/w imidacloprid) can be successfully used to control termites only with internal or external perimeter treatment for both *C. gestroi* and *G. sulphureus*. Nevertheless, proper monitoring and application by the applicator are important to deliver the result. The non-repellent action of imidacloprid and the unique properties of the formulation of Premise 200SC are able to control termites activity not only indoor but also outdoor. Vargo and Parman (2004) reported that active

ingredient of Premise 200SC can be transferred among the colony through grooming from exposed to unexposed termites. They also reported it also can be transferred through ingesting regurgitated liquids. This study will be continued to see the efficacy of the chemical after treating into the soil for a long period

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