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SHORT COMMUNICATION

PRELIMINARY FIELD EFFICACY OF IMIDACLOPRID ON *GLOBITERMES SULPHUREUS* (ISOPTERA: TERMITIDAE) (SUBTERRANEAN TERMITE) IN PENANG

[1]Abdul Hafiz Ab. Majid, [1] Abu Hassan Ahmad*, [2]Rashid M Z A and [1]Che Salmah Md. Rawi

[1]Medical Entomology Laboratory, Vector Control Research Unit, School of Biological Sciences, Universiti Sains Malaysia, 11800 USM Pulau Pinang, Malaysia
[2]Bayer CropScience (M) Sdn. Bhd. 12th Floor Wisma Damansara, Jalan Semantan, 50490 Kuala Lumpur, Malaysia

Abstrak: Anggaran populasi *Globitermes sulphureus* (Isoptera: Termitidae), aktiviti mencari makanan dan kawalan menggunakan racun anai-anai tindak balas perlahan, Premise® 200SC yang mengandungi 18.3% w/w imidacloprid dikaji. Terdapat enam buah stesen pemantauan bawah tanah di tapak kajian ini di Sungai Pinang, Balik Pulau, (Penang), Malaysia. Anggaran populasi anai-anai ialah sebanyak 3.38 x 10^5 dengan menggunakan kaedah Indeks Lincoln dan luas kawasan pencarian makanan ialah 96 m^2. Premise® 200SC diaplikasi dengan kaedah menggerudi lubang pada nisbah 1:400 Premise® 200SC dan air. Sebanyak 5 liter campuran Premise® 200SC dan air ditembak masuk ke dalam setiap lubang pada jarak 45 cm setiap lubang. Hasil kajian rawatan luaran yang dijalankan menunjukkan bahawa aktiviti anai-anai berjaya dihapuskan enam minggu selepas rawatan. Tiada aktiviti anai-anai dijumpai sama ada di dalam mahupun luaran rumah sehingga laporan ini diterbitkan.

Abstract: Population estimation of *Globitermes sulphureus* (Isoptera: Termitidae), foraging activity and control by using a slow acting termiticide, Premise® 200SC containing 18.3% w/w imidacloprid was studied. Six underground monitoring stations were established in this site in Sungai Pinang, Balik Pulau, Penang, Malaysia. The termite population was estimated to be 3.38×10^5, by the Lincoln Index and the feeding territory was 96 m^2. Premise® 200SC was applied by rodding at the ratio 1:400 of Premise® 200SC and water at 5 liters solution per hole of 45 cm apart. From this external treatment study, Premise® 200SC caused the termite activity to cease about six weeks after the treatment. Termite activity was not detected either indoor or outdoor until this report is published.

Keywords: *Globitermes sulphureus*, Imidacloprid, Slow Acting Termiticide

*Corresponding author: aahassan@usm.my

There are 175 species of termites in peninsular Malaysia and they are all social insects (Tho 1992). In Malaysia five species of termites that are of economic importance which cause damages to structures and crops (Sajap & Wahab 1997). The five species of termites are *Coptotermes gestroi*, *C. havilandi*, *C. kalshoveni*, *C. curvignathus* and *C. sepanggiensis.* All these species are subterranean termites which do not build mounds. Other genera such as *Globitermes*, *Macrotermes* and *Schedorhinotermes* are also important pests. Alternative termiticides have to be looked for after the banning of organochlorinated termiticides. Imidacloprid is a non repellent termiticide which provides a treated zone in the soil whereby termites are affected when they pass through the treated soil. It also can produce a transfer effect among the members of a termite colony. Previous research showed that the active ingredient of Premise®, imidacloprid, is transferred between individual termites (Thorne & Breisch 2001; Shelton & Grace 2003; Tomalski & Vargo 2004) and this effect can be far reaching beyond the treatment area (Obsrink & Lax 2003). This trial was conducted to see whether Premise 200SC can work only as external treatment under tropical condition.

A house infested badly with *Globitermes sulphureus* (subterranean termite) Balik Pulau, Pulau Pinang was chosen for the trail. Stakes of *Pinus carribae* (pine) billet were placed around the perimeter of the house at interval of 2–3 m apart. The stakes were checked monthly for the presence of termite activity including the food up-take.

Positive survey stakes that were infested by termites were replaced by underground monitoring stations which consist of a plastic container (18 cm high × 14 cm diameter) with a hole of 10 cm diameter with nine pine billets (2.5 cm height × 2.5 cm width × 15 cm length). The monitoring stations were checked every two weeks. Wood consumed by the termites was recorded from each monitoring station before and after the termiticide application biweekly. There were six underground monitoring stations along the perimeter of the house. The termite population was estimated using a single mark recapture (Lincoln Index). A known number of workers were forced-fed on filter paper dyed with Nile Blue A (1% w/w) for five days under laboratory condition (Su *et al.* 1991; Ngee & Lee 2002). Colored termites were released into the same monitoring station where they were collected. Seven days later, termites were collected from the monitoring stations. Colored termites were separated and counted. This activity also was used to map the foraging territory of the colony.

In this trial, Premise® 200SC was tested against *G. sulphureus* at the dilution rate of 1 liter of Premise® 200SC to 400 liters of water. Application rate is by injecting 5 liters of solution per hole at the distance of 45 cm apart at the perimeter of the house only. For the indoor treatment, the solution was sprayed to the active mud tubes gently.

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

Where

N	=	termites foraging population
n'	=	number of marked termites released again to the field
n''	=	number of marked individuals among captured termites
N2	=	number of termites captured

From the mark released recaptured study, the blue dye was found in all monitoring stations that were placed surrounding the study site. This means that the foraging termites are coming from the same colony. From the calculated data, the population of *G. sulphureus* before the treatment was estimated at 337,603 termites (Table 1) with the foraging territory of 96 m^2. Mean food consumption of the foraging termites ranged from 4.9 g to 76.9 g per station.

On the week 14, the house was treated for residual treatment and solution injection for external only with Premise® 200SC. On the week 20 (42 days after the treatment), feeding activity ceased in all the six monitoring stations (Fig.1). Termite was not found indoor and all the mud trails were dry and empty.

Table 1: Number of marked termites released (n'), number of marked individuals among captured termites (n'') and number of termites captured (N2) during a single mark-recapture program for *G. sulphureus* colony in Sungai Pinang, Balik Pulau, Penang.

G. sulphureus	n'	N2	n''	Population
Sungai Pinang	2,407	19,496	139	337,603

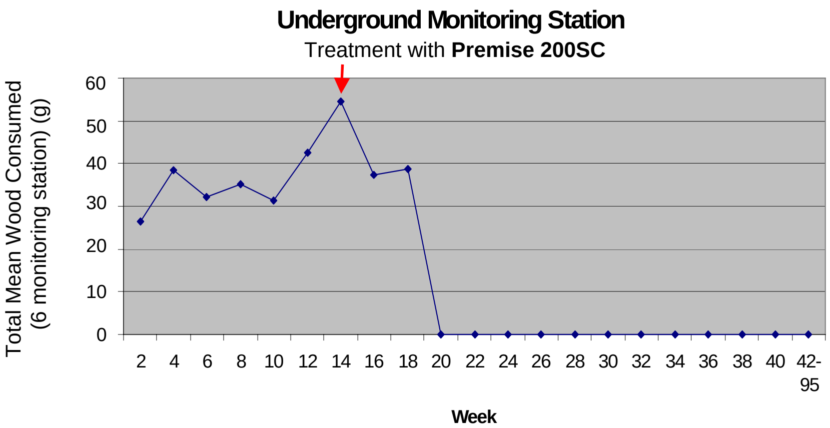

Figure 1: Mean feeding activity of *G. sulphureus* before and after treatment of Premise® 200SC along the perimeter of the house in Sungai Pinang, Balik Pulau, Penang.

It is well known that termites will become disoriented once contacted Premise Treated Zone (Gurbel & Abu Hassan 2006). According to Gurbel and Abu Hassan (2006), low concentrations of imidacloprid in the laboratory helped *C. gestroi* to survive for longer period of time. Thus, this aids imidacloprid to reach the colony and be transferred to the untreated termites by means of contact or grooming. This will affect their feeding behavior, grooming activity and interaction within the population. Therefore, probably the slow activity of imidacloprid enables the active ingredient to be transferred among the foraging colony until to the main nest. In addition, according to Abdul Hafiz and Abu Hassan (2006), the maximum foraging distance of *C. gestroi* to transfer imidacloprid from the treated underground monitoring station to untreated monitoring station was 10 meters. This "Transfer Effect" of imidacloprid has been described by Obsrink and Lax (2003), and Vargo and Parman (2004).

This trial has proven that Premise® 200SC has stopped the feeding activity in the monitoring station and in the house. A termite mound belongs to *G. sulphureus* was found dead below the house perimeter. The active ingredient, imidacloprid may have been infested the nest through the food brought by the foraging termites and caused the death of the colony (Table 2). Meanwhile research by Vargo and Parman (2004), Gurbel and Abu Hassan (2006), and Abdul Hafiz and Abu Hassan (2006), showed that Premise can be transferred among the colony through grooming from exposed to unexposed termites.

Table 2: Total wood consumed (gram/station) for termites colony *Globitermes sulphureus*.

		Total of wood consumed (gram/week/month/station)					
Month	Week	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Aug 04	2	12.1	20.5	36.9	40.3	24.4	24.3
Sep 04	4	23.2	49	36.9	49.9	44.5	27.6
	6	22.3	20	45.3	31.3	50.9	23.2
Oct 04	8	4.9	39.1	39.8	54.6	44.7	28.1
	10	37	35.3	26.5	16.5	30.1	42.4
Nov 04	12	57.9	55.4	43.5	0	29.3	68.4
Dec 04	14	● 42.8	● 76.9	● 61.8	● 16.9	● 86.2	● 43.1
	16	46.3	47.2	49.7	0	43	37.9
Jan 05	18	23.5	57.4	37.5	0	46.8	43.6
	20	0	0	0	0	0	0
	22	0	0	0	0	0	0
Feb 05	24	0	0	0	0	0	0
	26	0	0	0	0	0	0
Mar 05–Jun 06	27–95	0	0	0	0	0	0

● Treatment with Premise® 200SC

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