Evidence of Colony Elimination of a Higher Termite, *Globitermes sulphureus* (Blattodea: Termitidae) by Bistrifluron Bait

by

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Abstract

The efficacy of bistrifluron, a benzophenylurea insecticide, against field colonies of *Globitermes sulphureus* (Haviland) was evaluated. Bistrifluron (1.0% w/w) cellulose bait pellets was used in this study. Nest dissecting was done at the end of the experiment to obtain direct evidence of colony elimination. At the early stage (≈2-mo baiting period), the worker bodies appeared whitish in color and mites (acarid) were present on the bodies. The nest wall surface started to erode. Colony elimination or suppression was achieved of at least 4-mo baiting period. Nest dissecting revealed that the carton materials were wet, highly consumed, and overgrown with fast-growing fungus. Decaying termite carcasses were scattered in the nest. Approximately 72.6 ± 31.5 g of bait matrix or equivalent to 726 ± 315 mg of bistrifluron were consumed in each colony. Only a mere 143 mg of bistrifluron was required to eliminate a colony of *G. sulphureus*.

Key words: Chitin synthesis inhibitors, baiting, *Globitermes*, colony elimination

Introduction

Preliminary studies on hexaflumuron paper-based baits (Ngee et al. 2004) reported that several termitids, for example, *Macrotermes*, *Microcerotermes*, *Microtermes*, *Nasutitermes* and *Globitermes* (Lee et al. 2007) did not respond well to the baits. The treated colony showed no visible detrimental effects, although some termites was found to feed on the baits (Ngee et al. 2004). The lack of response of termite baiting system against termitids has been an issue to termite management, especially in the tropics where termitids are readily found in- and around buildings and structures. To date, chemical spraying is the only method used to control these termitids.

The subfamily Termitinae is believably the most primitive in family Termitidae (Noirot 1969). The developmental pathway of the Termitinae resembles to rhinotermitids in some respects. The most noteworthy is that the workers have several successive instars (undergoing at least three moltings) with some notable size, morphological, pigmentation or behavioral changes (Roisin 2000). In the present study, we would expect the succession molting of worker instars in the Termitinae are considered as possible factor for the effectiveness of CSIs.

The goal of this study was to evaluate the efficacy of bistrifluron against field colonies of *G. sulphureus*. Once no termite activity was detected, we dissected the treated nests to obtain direct evidence on the colony elimination

Materials and methods

The study was conducted in the Minden campus of Universiti Sains Malaysia, Penang

located at northern peninsular Malaysia (5º 21' N, 100º 18' E). Three colonies of *G. sulphureus* with mound size ranged between 30 – 50 cm in height and 35 – 55 cm in diameter were chosen in this study.

The bait that was used in this study was 1.0% w/w bistrifluron cellulose-based bait (X-term™ Defence Against Termites by Sumitomo Chemical). A hole (11 cm in diameter and 20 cm in depth) was drilled into the nest and the bait station was installed (9 cm in diameter and 22 cm in height) directly into it. The bait cartridge (7.5 cm in diameter and 6 cm in height) containing 122.0 ± 0.3 g (dry weight) of bistrifluron cellulose bait pellets was introduced into the bait station. The bait cartridge was weighed at the pre- and post treatment.

The colonies were assessed monthly by drilling three small holes (1 cm in diameter) into the nest and checked for termite activity (termites usually appeared at the holes of less than 5 min). Once no termite activities were detected, the nests were destructively sampled. The degree of nest erosion was also categorized as followed: 1 = no visible nest surface eroded (intact); 2 = area of nest surface eroded ≤ 25%; 3 = area of nest surface eroded 25<x≤50%; 4 = area of nest surface eroded 50<x≤75%; 5 = area of nest surface eroded >75%.

Results and discussion

In all instances, worker bodies appeared marbled white in color (accumulation of uric acid in the body) and less active (slow in walking speed) after 2-mo baiting period. At 4-mo inspection, wall surface of all treated nests were found to be moderately to severely eroded due to lack of nest maintenance by workers (Fig. 1). In some instances, the nests were overgrown with vegetation. The treated colonies often contained low number of larvae, whitish-bodied workers and decaying termite carcasses. Occasionally, workers were found to be infected by mites (acarids). The carton materials inside the nest were moist and overgrown with fast-growing fungus. Most of the carton materials were highly consumed. No identifiable royal cells and nursery zones were found.

(A) (B)

Fig. 1. Nest of *G. sulphureus*. (A) Healthy nest before treatment. (B) Nest showed high degree of erosion after four months baiting.

G. sulphureus colonies were eliminated or suppressed approximately 4-mo after the bait was employed. The result corroborated the previous record of the field evaluation of chlorfluazuron

against *G. sulphureus* in Thailand (Peters and Broadbent 2005). Huang et al. (2006) reported similar time needed to suppress a colony of *Odontotermes formosanus* Shiraki using fipronil bait.

Approximately 72.6 ± 31.5 g of bait matrix or equivalent to 726 ± 315 mg of bistrifluron were consumed in each colony. Based on the total bait consumption of the colony B, a mere 143 mg of bistrifluron appears to be sufficient to eliminate a colony of *G. sulphureus* (Table 1). This result reflects that bistrifluron has greater termiticidal efficacy against termites compared to those of hexaflumuron and chlorfluazuron, as reported by Evans (2010).

Table 1. Effects of Bistrifluron bait against *G. sulphureus* and total bait consumption

Colony	The degree of nest erosion	Bait matrix consumption (g)
A	4	122.3
B	4	14.3
C	3	81.1

Conclusions

This result demonstrates that the bistrifluron cellulose pellet bait achieves colony elimination of *G. sulphureus*. Perhaps the use of bistrifluron cellulose pellet bait can also be applied to control other pest species of the subfamily Termitinae and Nasutitermitinae (e.g., *Microcerotermes sp.* and *Nasutitermes sp.*), in which, these species undergo several successive molting in worker stages.

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