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Evaluating the Exterra™ Termite Interception and Baiting System in Australia

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Abstract

The Exterra™ Termite Interception and Baiting System (Ensystex Inc., Fayetteville, NC) was evaluated in a field experiment near Townsville, Australia. Cellulose-acetate powder containing either 0.05% weight/weight (w/w) or 0.25% w/w chlorfluazuron (Requiem™) was tested for its efficacy in eradicating colonies of the mound-building subterranean termite *Coptotermes acinaciformis* (Froggatt). Thirteen mounds were used. There was no evidence of repellence, but there was little feeding on replenished bait. Five colonies were eradicated by 0.05% w/w chlorfluazuron and five colonies by 0.25% w/w chlorfluazuron: another colony was moribund and eradication appeared imminent. Colony decline was first suspected some 12 weeks after bait application. Colony eradication was confirmed, by destructive sampling, about five weeks later. Indicators used to monitor colony health were reliable. A suite of urban trials, demonstrating the effectiveness of Exterra Requiem Termite Bait in controlling a wide range of subterranean termite species throughout mainland Australia, is presented and discussed.

Key words: subterranean termites, *Coptotermes acinaciformis*, bait technology, chitin synthesis inhibitor, chlorfluazuron, Exterra, Australia

Introduction

The economically important subterranean termite *Coptotermes acinaciformis* (Froggatt) builds mounds in northern Australia. These mounds provide an opportunity to test the effectiveness of bait toxicants, under field conditions (Peters and Fitzgerald 1999). The use of mounds avoids the need to use multiple mark-release schemes (see Su *et al.* 1991) to verify the effects of the bait toxicant on the termite colonies. Problems with multiple mark-release schemes are discussed by Evans *et al*. (1998, 1999) and by Evans (2001).

Ensystex Inc. (Fayetteville, North Carolina, USA) has developed the Exterra Termite Interception and Baiting System, which utilizes a toxicant incorporated into an edible bait matrix. The toxicant used in the USA is diflubenzuron (a Chitin Synthesis Inhibitor) and the bait matrix is a cellulose-acetate compound. Both the system and bait toxicant required testing under Australian conditions against an economically important species of termite to facilitate registration in Australia by the National Registration Authority for Agricultural and Veterinary Chemicals (NRA) (Australian Standard AS 3660.3 2000): chlorfluazuron was the intended bait toxicant. We evaluated the susceptibility of the bait matrix to *C. acinaciformis* and the efficacy of chlorfluazuron in eradicating colonies of this mound-building subterranean termite. Results from a suite of urban trials, conducted throughout mainland Australia under experimental permit, are also presented and discussed.

Materials and Methods

Field Trial: The work was conducted about 45 km north-west of Townsville, North Queensland, where *C. acinaciformis* occurs commonly in mounds. Thirteen active *C. acinaciformis* mounds (Mounds 1-13) were used. At each mound a trench (about 50 × 100 × 1000 mm long) was dug radially to the mound. One end of the trench was extended into the outer crust of the mound until live termites were encountered. Radiata pine *Pinus radiata* D.Don material (a cut "stud", 35 × 70 × 1000 mm long) was placed in each trench with one end inserted into the mound. Two or five Quarterra Stations (depending on the treatment) were then placed into the ground along each stud. The Quarterra Extended Inspection Interval Station is a round plastic bait station consisting of inter-locking halves with horizontal slots, to allow the entry of termites, and a lockable plastic lid. Inside the Station are a series of vertical slots which house the wooden interceptors (pieces of untreated wood) used to facilitate contact between the termites and the moist bait matrix. Each Station holds about 500g of bait matrix. Station 1 was proximal, and Station 5 was distal, to the mound. Once the devices were in place the trenches were backfilled with soil to the level of the Station lid.

Ensystex Australasia supplied the bait matrix (cellulose-acetate powder with chlorfluazuron) and control matrix. Approximately 400g of moist bait matrix was added to each Station. Three treatments were applied. Bait matrix was applied to five Stations on each of Mounds 1-5 (0.05% weight/weight [w/w] chlorfluazuron) and Mounds 6-10 (0.25% w/w chlorfluazuron). Control matrix was applied to Station 1 and bait matrix (0.25% w/w chlorfluazuron) was applied to Station 2 on each of Mounds 11-13. Mounds were inspected on four occasions (6, 9, 12 and 17 weeks) after the initial treatment, and an estimate made of the quantity of bait matrix eaten at each Station. Bait matrix was generally replenished at Mounds 1-10 during the first inspection. Bait matrix was not replenished at Mounds 11-13.

A 400-mm-long pine dowel was placed into a conduit in each mound and used as a "dip-stick" to measure colony health. The presence of termites, faecal mottling and feeding on the dowel was used to indicate an active colony. Commencing at the third inspection, a small section of the mound was separated from the main structure and the presence of live termites noted. The section was replaced and repairs noted at the next inspection. Colonies showing decline were destructively sampled during the fourth inspection using a pick and shovel and a search made for live termites in the mound.

Urban Trials: Over 150 urban trials were conducted throughout Australia as remedial treatments, on a range of termite species, to evaluate the effectiveness of the Exterra™ Termite Interception and Baiting System using 0.05% and 0.1% w/w chlorfluazuron. A range of high profile sites with termite infestations was included in the urban trials. These were sites where control had not been achieved despite many attempts using a variety of different traditional methods over many years.

Results and Discussion

Field Trial: The following observations were made during the four inspections:

- Termites "muddied" the inside of most stations.
- Bait matrix consumption was greatest in Station 1 (400g) and least in Station 5 (0-80g), with some variation between mounds.
- Ants, principally *Iridomyrmex purpureus* (F. Smith) group and *Papyrius nitidus* (Mayr) group, were present in seven stations, especially where bait matrix consumption was least.
- Replenished bait matrix was generally not consumed.

- At the third inspection termites and feeding were absent from dowels inserted into Mounds 1-7, 9, 11 and 12, suggesting these 10 colonies were in decline. Termites were also absent when small sections of these mounds were removed and in some of the stations the ant activity had increased.
- At the final inspection, eleven colonies (Mounds 1-9, 11 and 12) were identified as in decline, or possibly eradicated. These mounds were destructively sampled and live *C. acinaciformis* was found only in Mound 12.
- Mounds 2, 7-9 and 11 were occupied by *Microcerotermes* sp. and ants occupied the other five mounds.
- Ten colonies were confirmed dead due to the effects of the bait toxicant, while the colony in Mound 12 was moribund and eradication appeared imminent.
- Mounds 10 and 13 were inspected but not destructively sampled because the termites had repaired the incisions made during the previous inspection and termites were active in the mound and on the monitoring dowel.

Why the colony in Mound 10 did not succumb to the effects of the toxicant is unclear. Peters and Fitzgerald (1999) reported a similar anomaly when working with hexaflumuron. Evans (2001) notes that removal of bait does not always equate to consumption, as shown by Duncan (1997) for *Hodotermes* in South Africa. The presence of many ants at Mound 13, Station 2 may have precluded termites from entering the Station and consuming the bait matrix. The results of the 4-month experiment indicate that 440g of 0.05% w/w chlorfluazuron and 80g of 0.25% w/w chlorfluazuron caused colony eradication. The bait matrix was readily consumed, with no evidence of repellence, supporting work by Rojas and Morales-Ramos (2001). Replenished bait matrix was seldom consumed and was unnecessary for colony eradication. Indicators used to monitor colony health were reliable.

Urban Trials: Termite species and corresponding number of buildings successfully treated with the Exterra™ Termite Interception and Baiting System throughout Australia are presented in Table 1. Presumed colony eradication was achieved at all sites. In about 15% of these urban sites the nest of the colony was located and eradication was confirmed by destructive sampling, the use of temperature probes or borescopic investigation. The average consumption of Exterra Requiem Termite Bait was about 1000g per colony with one colony of *Schedorhinotermes* sp. consuming 2900g of bait matrix. Using a formulation with 0.1% w/w chlorfluazuron, colony eradication during summer months was less than 50 days, and for all trials was less than 63 days.

Table 1: Termite species and corresponding number of buildings successfully treated with the Exterra™ Termite Interception and Baiting System throughout Australia

TERMITE SPECIES	NUMBER of BUILDINGS
Coptotermes acinaciformis (Froggatt)	85+
C. a. raffrayi Wasmann	5+
C. frenchi Hill	21+
C. michaelseni Silvestri	10+
Nasutitermes exitiosus (Hill)	6+
N. walkeri (Hill)	3+
Schedorhinotermes spp.	17+
Heterotermes ferox (Froggatt)	5+
Total	***152+***

Some interesting aspects of termite behaviour were observed during the urban trials. For example, moister bait matrix was more successful during summer months and the rate of bait removal was greatest when large amounts of bait matrix were provided, as demonstrated by Waller and La Fage (1987). Shortly before colony eradication, thousands of soldier termites were often found aggregated in the baited stations. On some occasions nymphs and alates were also found (see Lenz and Evans, 2002). The bait matrix was seen incorporated into the walls of the royal chamber of the nest (see Evans, 2001). On other occasions, termites produced large amounts of 'muddy' material external to the aboveground stations, with worker and soldier termites observed outside of this material. Further timber damage was rarely noted after termites commenced feeding on the Exterra Requiem Termite Bait.

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