A Field Evaluation of Fipronil Used for Termite Control

Researchers at Texas A&M University present research about the efficacy of exterior-only treatments as chemical barriers for the control of interior infestations of subterranean termites.

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In the past decade, three non-repellent compounds have been registered for use as liquid termiticides. These include fipronil (Termidor®), imidacloprid (Premise®), and chlorfenapyr (Phantom®). These products do not appear to disrupt termite foraging in the treated soil zone (Kard 2003). In addition, these new liquid termiticides have a delayed mode of action that may contribute to movement of the active ingredient in the colony through trophallaxis and social grooming (Kard 2003). Lab studies have shown that exposed nestmates can cause secondary mortality by fipronil transfer to unexposed nestmates in subterranean termite populations (Shelton and Grace 2003, Ibrahim et al. 2003).

Potter and Hillery (2002 and 2003) reported that exterior-only treatments had potential as an alternative to complete labeled applications with fipronil and imidacloprid for the post-construction control of interior infestations of subterranean termites. These applications could potentially result in less labor and chemical cost, and be less intrusive to the homeowner (Potter and Hillery 2003). This study was conducted to assess the efficacy of exterior-only treatments as chemical barriers for the control of interior infestations of subterranean termites in comparison to conventional "full" treatments to the interior and exterior of structures.

THE STUDY. Thirty-two privately-owned structures were randomly assigned to one of three treatment groups utilizing fipronil (Termidor SC). These included 10 structures treated at 0.06% (lowest labeled rate) fipronil on the exterior and interior according to the product label, 11 structures treated at 0.06% fipronil only on the exterior, and 11 structures treated at 0.125% (highest labeled rate) fipronil only on the exterior. Structures were located in Galveston and Harris Counties, Texas. They were all slab-on-grade construction and had clear evidence of an active, interior infestation of subterranean termites.

A licensed pest control operator who was certified for termite work in Texas treated all structures. All structures were treated around the exterior perimeter to form a continuous chemical barrier by trenching (6-inch by 6-inch) and filling techniques or sub-slab injection at a rate of 4 gallons/10 linear feet. Treatment to the interior of structures, for those structures receiving a complete labeled application, included applying fipronil at bath traps, visible cracks in the foundation, internal joints, and around any accessible plumbing penetrations.

All structures were inspected at 3, 6, 9, and 12 months post-treatment to record the presence or absence of termites. If live termites were found in any of the structures at or after the six-month inspection, a treatment was made at the point of termite entry. Termatrol® termite monitoring stations were installed in the soil at 10-foot intervals around the perimeter of each structure, 1 foot from the outside edge of treated the soil. These monitors were inspected on every scheduled inspection for termites.

Soil samples were taken both pre- and post-treatment with a soil probe that was 1-inch in diameter by 6 inches long. Pre-treatment samples were taken to assure that no fipronil was in the soil of any structure prior to initiation of the study. Post-treatment sampling was done at 1 week and 3, 6, 9, 12, and 18 months post-treatment. Soil samples were taken from each side of structures with accessible soil. All of the samples were analyzed via a gas chromatograph to determine the concentration of fipronil.

Soil bioassays identical to those used by Gold et al. (1996) were also done with live subterranean termites to determine the minimum concentrations necessary

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to inhibit termites from breaching a 2-inch column of treated soil, and to establish the concentration of fipronil necessary to kill all of the termites. Thirty subterranean termites were placed at the top of each bioassay tube and allowed to tunnel downward for five days. Fipronil was mixed into the soils at concentrations of 0.10, 0.30, 0.70, 1, 2, 3, 5, and 7 parts per million (ppm). Five different Texas soils were tested at each concentration.

RESULTS. All 10 structures receiving a 0.06% fipronil complete treatment were clear of termites by the third month inspection. All 11 of the structures receiving a 0.125% fipronil exterior-only treatment demonstrated the same results. In contrast, four (36%) out of the 11 structures receiving a 0.06% exterior-only application had active termites at or after the six-month inspection. Termites were found in three of these structures in central bath traps and, in one structure, they were foraging on a wood piling coming through the interior part of the foundation.

In all structures where any points of termite entry were associated with the exterior perimeter wall, the treatment exhibited full control of the infestation within six months. In structures where the point of entry was a site more towards the interior, and away from an exterior wall, and that site was treated (0.06% exterior/interior treatments), full control was achieved within six months. Finally, in all four of the structures where the point of entry was an interior site, and that site was not treated, full control was not achieved until the sites were treated following the six-month inspection.

The data resulting from this study showed that placement of fipronil at 0.06 or 0.125% A.I. at the point of termite entry into a structure was the determining factor for effective control of interior populations of subterranean termites when applications are made post-construction. When Termidor SC was applied according to the product label, which required a continuous barrier of fipronil be placed around the perimeter of a structure, as well as to active and potential points of termite entry, treatments were 100% effective. Thorough inspections based on knowledge of construction practices and the ability to deduce points of termite entry are critical to effective subterranean control.

According to the data presented, exterior-only applications will only control termite infestations associated with exterior perimeter walls. Any points of termite entry that are not treated should be considered as unprotected from future termite infestation. It is inevitable that there will be inaccessible points of termite entry in structures, but applying chemical to as many potential entry points as possible will protect the structure from termite infestation.

Termatrol termite monitoring stations were not effective indicators of termite infestations on the interior of structures in this study when placed around the outside perimeter of infested structures. This was evidenced by the fact that even though all 32 structures had an initial interior infestation of subterranean termites, and four structures had active termites on the interior at the three- and six-month inspections, termites were never found in any of the termite monitoring stations.

In the bioassays, the lowest concentrations of fipronil for the five soils at which there was no surviving termites after five days ranged from 1 to 3 ppm. The minimum effective concentration at which termites were unable to breach the 2-inch soil barrier ranged from 0.1 to 1.0 ppm depending on soil type. There was no fipronil in any of the soils prior to initiation of the study. The mean concentration of fipronil in the soils of the structures did not significantly decrease over the first 18 months post-treatment. Soil concentrations were consistently 20 to 60 times those necessary to control subterranean termites based on the soil bioassays. Any structures still showing active termites at the six-month inspection resulted from the fact that termite entry points were not treated, and not that the fipronil failed.

IMPLICATIONS. Although exterior-only post-construction treatments with liquid termiticides may save money and time, they will most likely result in increased number of callbacks and customer dissatisfaction. Over time, this may prove more costly and problematic than treating as thoroughly as possible from the beginning.

The overall goal of any termite treatment is to protect the structure, not just to kill termites or apply chemicals. We recommend that all detectable and accessible termite entry points be treated. Furthermore, we recommend that the highest labeled rates be used to ensure the longest residual life of all liquid termiticides used as barrier treatment.

Finally, we recommend that barrier treatments be done in conjunction with nonchemical actions to remove conducive conditions that support termite activity and survival in or near structures.

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