

# A potential attractant for the western drywood termite, *Incisitermes minor*

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## Introduction

The western drywood termite, *Incisitermes minor* (Hagen), is a wood-destroying pest capable of causing significant economic damage [1]. Unlike subterranean termites, they forage and nest inside a single piece of wood, with only reproductives leaving the nest for dispersal. The drywood termite establishes extensive galleries where aggregations of individuals perform nest duties such as feeding, tunnel construction, and brood care. Termites respond to pheromones deposited by other individuals, reinforcing aggregation sites [2].

Aggregation behavior can decrease the effectiveness of localized treatment. The most effective method is drilling into the termite gallery and injecting insecticides. Localized treatments do show high efficacy when the infested wood is accessible, exposed, and detection equipment can be used. However, due to *I. minor*'s aggregation behavior within the extensive nest galleries, the injected insecticides might not contact all individuals of the colony. If left untreated, the remaining individuals can cause the infestation to rebound [3 & 4].

This study investigates a compound for its use as an attractant for the western drywood termite. The attractant must be able to draw individuals to the treated area, overcoming the "natural" aggregation sites. When co-injected with insecticidal compounds, this type of attractant can be used to increase the efficacy of localized treatment by exposing more termites to the insecticide.

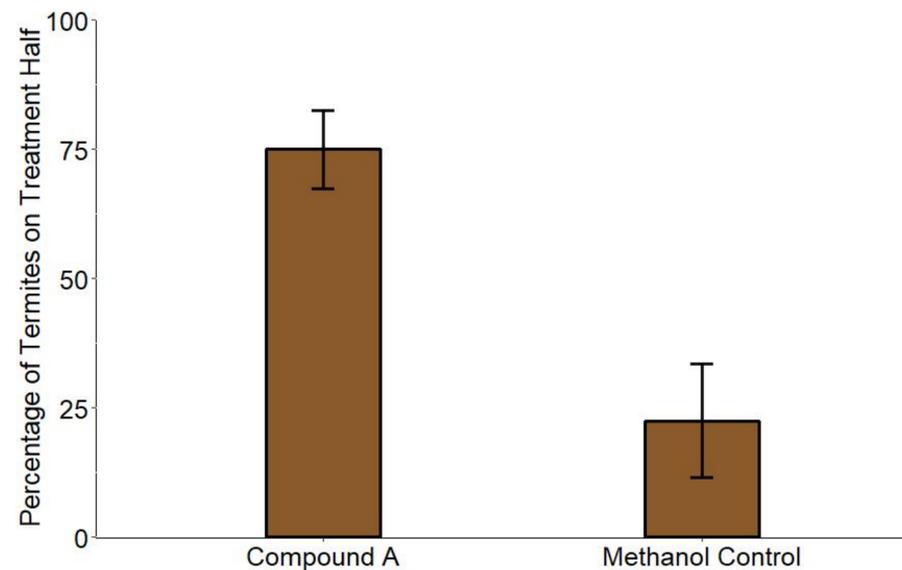
## Methods

The compound used for this study was made into solution with methanol as the solvent. The concentration used in this study had shown effectiveness as an attractant in previous preliminary trials.

The compound was tested in a wooden arena made of Douglas-fir. The wooden arena consisted of two pieces 25 x 3.81 x 8.9 cm. A 20 x 1.3, 0.6 cm deep channel lay in one piece simulating a termite gallery. A piece of acrylic covered the channel for termite confinement and ease of observation. The other piece of wood was placed on top of the acrylic.

For 24 hours 20 termites were confined to one half of the channel using a cotton ball in order to establish an "initial aggregation zone". The assumption was that termites would deposit pheromones on that side, stimulating a natural aggregation [5]. After the creation of the initial aggregation zone, 100 uL of either a treatment or control solution (methanol) was applied at the end of the channel opposite to the initial aggregation zone. The treated half was considered the "treatment zone". Three minutes was allowed for solvent evaporation. The cotton ball was removed to allow the subjects freedom of movement within the channel. After another 24 hours the number of termites on the treatment half of the channel were counted. Eight replications for both the treatment and control were performed. The arena was left in complete darkness for the trial except for a red LED light during counting.

Data were analyzed using RStudio version 3.5.1. A two-sample Mann-Whitney U test was used to determine if the number of termites on the treatment zone was different between the attractant treatment and solvent-only control groups.



**Fig. 1.** Mean percentage of termites found on the treatment side of channel after 24 hours. Error bars are standard error of the mean.



**Fig. 2.** Natural gallery of *Incisitermes minor*. Note that all individuals are in the upper section of the gallery.



**Fig. 3.** Bottom half of wooden arena with channel. Example initial aggregation zone (a) and treatment zone (b).

## Results

The control group found 22.5% of termites on the treatment half (n=8, Fig. 1), showing that a majority of termites stayed on the initial aggregation site when the other end of the channel was treated with clean methanol. In stark contrast, the presence of compound A at the other end of the channel was effective in attracting the termites away from the initial aggregation site, significantly increasing the number of termites found on the treatment half of the channel (p=0.0114). The percentage of termites found on the treatment half of the channel was 75% for the treatment group (n=8, Fig. 1).

## Discussion / Future Direction

The western drywood termite prefers to aggregate at certain sites, even when allowed freedom of movement throughout the channel (Fig. 1 & Fig. 2). These sites, where individuals form groups which participate in foraging, gallery construction, and brood care, may be analogous to termite aggregations found in field infestations. While this behavior can decrease the efficacy of localized-treatment, this study shows it is possible to draw termites away from their aggregation sites with the use of an attractant (Fig. 1).

An attractant might take advantage of how the drywood termite orientates itself towards a preferred food source. This would be especially effective since the discovery of a suitable resource is followed by the recruitment of nestmates to the feeding site, which would result in the injected insecticide contacting more individuals. Even though the drywood termite is a one-piece nester, feeding and nesting in the same piece of wood, there is evidence of feeding preference. *Incisitermes minor* prefers to construct its galleries in the sapwood of wood [2 & 6]. An evaluation of the compositional differences between sapwood and heartwood of commonly infested wood types by *I. minor*, such as Douglas-fir, may yield a chemical compound suitable for attractant use.

The co-injection of an attractant with insecticide may increase the overall efficacy of drywood termite localized treatment by contacting more individuals of the colony when compared to insecticide-only treatments. Further study will investigate the active range for compound A, test other potential attractants, as well as the effect of an attractant on overall control efficacy when incorporated in insecticidal products.

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## Acknowledgments

We would like to thank everyone in the Choe lab and the California Department of Pesticide Regulation for providing the funding for this research. Thank you to the Carl Strom / Western Exterminator Company for this scholarship opportunity.