Purdue University
Department of Entomology
Undergraduate Capstone
Project Summary

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Project Title:

Susceptibility of Urban Pest Ants to Selected Residual Insecticides

Project Summary:

The primary objective of this project was to determine the susceptibility of nine urban pest ant species to residues of three liquid spray insecticides commonly used for ant control. The relationship between the worker size and speed of kill was be calculated in order to determine if there is any correlation. I also determined whether species or worker sizes affected the speed of kill. My hypothesis was that as the weight of the ant increases, the LT50 will also increase. In other words, there will be a positive and significant correlation between ant weight and the time needed to kill the ant.

Nine common pest ants were selected to be used in this experiment. The ant species included were pavement ant, odorous house ant, acrobat ant, pharaoh ant, cornfield ant, thief ant, black carpenter ant, field ant, and argentine ant. This allowed for a wide variety of worker sizes, with thief being the smallest and black carpenter being the largest. The ants were collected outside at pre-marked locations, and were then taken back to the lab to be established as lab colonies. Three liquid insecticide sprays were used, which included Talstar, Phantom, and Termidor.

Ceramic floor tiles and sand were used to represent two common substrates. The tiles used in the experiment were 12 in. by 12 in., and each insecticide was applied by using a small spray bottle. Four plastic rings measuring five inches in diameter were coated with Fluon and then placed on top of each tile. A total of eight rings, on two tiles, were used for each ant species. The sand substrate was poured into large plastic trays measuring 12 in. by 15 in. at a depth of half of an inch. The sand was then treated with the insecticides, with one insecticide application per tray. Holes were melted onto the bottoms of Fluon coated petri dishes and placed upside down on top of the sand. The holes allow for an ant insertion area. Again, eight petri dishes were used for each ant species. With nine ant species, two substrates, and three insecticides, a grand total of 54 trials were tested.

To test the mortality, each ant species was put through a continuous exposure of each insecticide. The mortality was recorded in time intervals after the first death. After all the ants were dead, the average mortality was calculated from all eight trials. The average mortality was then converted to average percent mortality, which in turn was plotted over time for each species. The graphed results of the tile and sand trials were compared for each of the three insecticides. Talstar on sand showed significantly faster mortality rates than talstar on tile. This was the case for phantom also, but on termidor, the mortality rates were generally the same. Talstar killed the ants the fastest, followed by termidor, and then phantom.

For the final part of the experiment, a regression analysis was performed. LT 50s for each of the ant species were needed, and were calculated using SAS (2001). The regression of the LT 50 values and time was analyzed. Both substrates on tile showed no significance, while the sand trials on phantom and termidor were proven to be significant. Reasons to why there would be significance on sand for phantom and termidor but not tile remains unknown.

In conclusion to the initial experiment, little to no relationship was shown between the LT 50 and the worker weight when exposed to the insecticides. Slight correlations exist, but then disappear when the substrate is changed from tile to sand, and vice versa. A future study to branch from this experiment could be to test for the reasons why there are varied results in the relationships of LT 50 and worker weight. Varying biological pathways or behavior could easily contribute to the mixed results.