



# **DetergANTS: are they effective against urban pest ants?**

**Senior Capstone Project**

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## Introduction

The odorous house ant, *Tapinoma sessile*, is native to the United States and also found in Canada and parts of Mexico.<sup>1</sup> Workers are dark brown or black, have a single node on the petiole, and measure 2.4 mm to 3.3 mm. When crushed, the ants give off a rotten coconut odor.<sup>2</sup> Colonies consist of multiple nests as well as multiple reproducing queens. The colonies frequently relocate their nests or fragment into groups to form new colonies. Moreover, if a nest gets too large, it breaks off from the parent colony and starts a new, independent colony in a nearby location.<sup>3</sup>

Odorous house ants are a major nuisance pest ant in the U.S. and nests are found in many different places. Typically, these ants will invade homes and scavenge for food. While indoors, odorous house ants typically nest in walls or below the floor. They prefer sweet foods, but will also scavenge for dead insects and spiders.<sup>4</sup> Outdoors, odorous house ants mainly feed on honeydew produced by hemipterans.

Common control practices include the use of baits. Baits are ingested by the workers, and are then carried back into the nest, and transferred to other colony members via trophallaxis. Once the correct type of bait is selected, preferably one for sweet-feeding ants, it should be placed in a location with heavy ant activity and replaced every so often. Residual spray insecticides can also be used, but can be harmful to the public and the environment.

## Objectives

The goal for the current study was to evaluate the efficacy of household cleaning agents against odorous house ants. Cleaning agents are frequently used by homeowners to kill and/or repel ants, but the efficacy of cleaning agents has not been previously evaluated. Relative to

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<sup>1</sup> <http://ento.psu.edu/extension/factsheets/odorous-house-ant>

<sup>2</sup> <http://www.orkin.com/ants/odorous-ant/>

<sup>3</sup> <https://www.walthamservices.com/pest-control/ants/odorous-house-ants/>

<sup>4</sup> <http://www.schoolofants.org/species/118>

traditional pesticides, cleaning agents are readily available, easy to use, cheaper, and potentially safer. The goal of the current study was to determine if: (1) cleaning agents are effective in direct spray applications, (2) cleaning agents are effective in residual spray applications, and (3) residual applications of cleaning agents have lasting effects.

### **Direct Spray**

The efficacy of 6 cleaning agents including Shout, Windex, Clorox, Formula 409, Seventh Generation, and Febreze was evaluated. Colonies of odorous house ants were collected on the campus of Purdue University and maintained under laboratory conditions on a diet of 25% sugar water and freshly killed cockroaches. In direct spray experiments, 10 worker ants were aspirated from a stock colony and placed inside a petri dish (4 cm high by 9 cm diameter). The inner side of the dish was covered with Fluon to prevent the ants from escaping. The cleaning agents were poured into a 2 oz fingertip sprayer and the solutions were applied directly to the ants. Two pumps from the sprayer were delivered for each dish so that all the ants were uniformly coated with a thin layer of the spray solution. Each pump from the sprayer delivered 130  $\mu\text{L}$  of liquid. Therefore, a total of 260  $\mu\text{L}$  of test material was applied for each dish. Each treatment was replicated 4 times. Ant mortality was recorded at 10, 20, and 30 minutes post-treatment. The experiments were completed over the course of several months (Fall 2016-Spring 2017) in the Urban Ecology Laboratory at Purdue University.

### **Residual Spray**

The same 6 cleaning agents were evaluated in residual applications. The cleaning agents were applied to ceramic tiles (10 cm by 10 cm) using a pipetter. For each tile, 475  $\mu\text{L}$  of cleaning agent was applied. The cleaning agent was then spread uniformly over the tile using a glove. The tiles were allowed to dry for 2 hours and 10 ants were aspirated from a stock colony and placed onto the tile. A Fluon coated petri dish was placed over the ants to restrict them to the treated surface and to keep them from escaping. Four replications were performed for each

cleaning agent. Ant mortality was recorded at 10, 20, and 40 minutes, then 1, 2, 4, 6, 8, and 24 hours.

### **Longevity of residual applications**

The longevity of spray applications was evaluated by allowing the treated tiles to age for 24 hours. The protocol and supplies were the same as in the residual spray application. The tiles were treated and the treatments were allowed to age under laboratory conditions for 24 hours. Ten ants were placed on each tile, covered with a petri dish, and ant mortality was recorded at 10, 20, and 40 minutes, then 1, 2, 4, 6, 8, and 24 hours.

### **Results and Discussion**

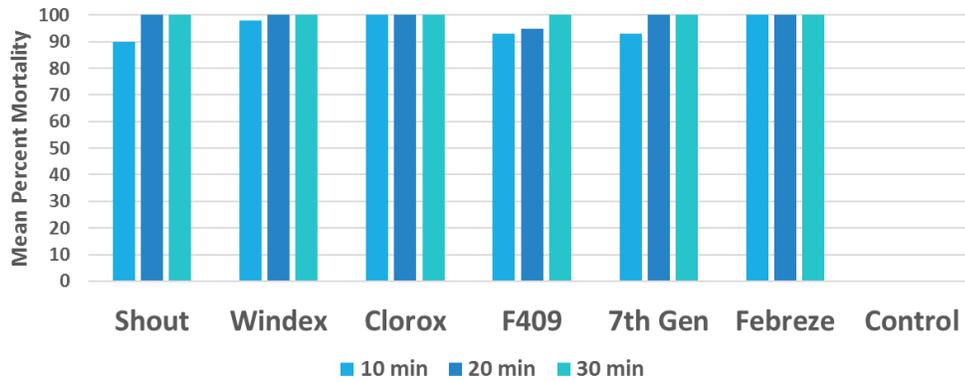
The results of this study are presented in Figures 1-3 below. All cleaning agents were highly effective in direct applications and killed 100% of the ants within 30 minutes (Figure 1).

In residual applications, the most effective agents were Shout and Clorox and killed over half the ants in 20 minutes (Figure 2). The least effective agent was Seventh Generation, as it only killed approximately 25% of the ants in 24 hours. Mortality with Windex and Febreze was delayed, but they were highly effective in 24 hours. Formula 409 took approximately 4 hours to kill more than 50% of the ants.

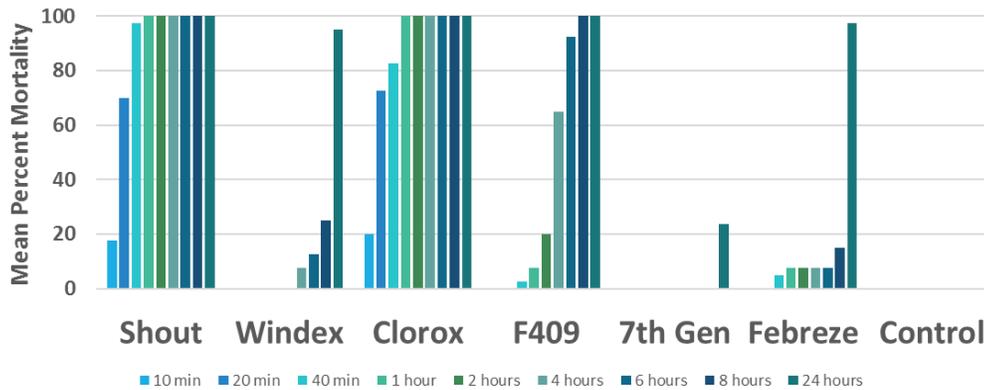
Aged residual applications were largely ineffective and mortality was substantially delayed relative to fresh applications (Figure 3). Shout and Febreze were initially slow acting, but killed approximately 75% of the ants within 24 hours. The other cleaning agents were not effective even with 24 hours of continuous exposure to the treated tiles.

In conclusion, cleaning agents are effective alternatives to traditional pesticides in certain situations. These agents are fast-acting and highly effective when applied directly, inexpensive, and environmentally-friendly. However, they may not be effective alternatives to traditional pesticides as they only yield temporary results.

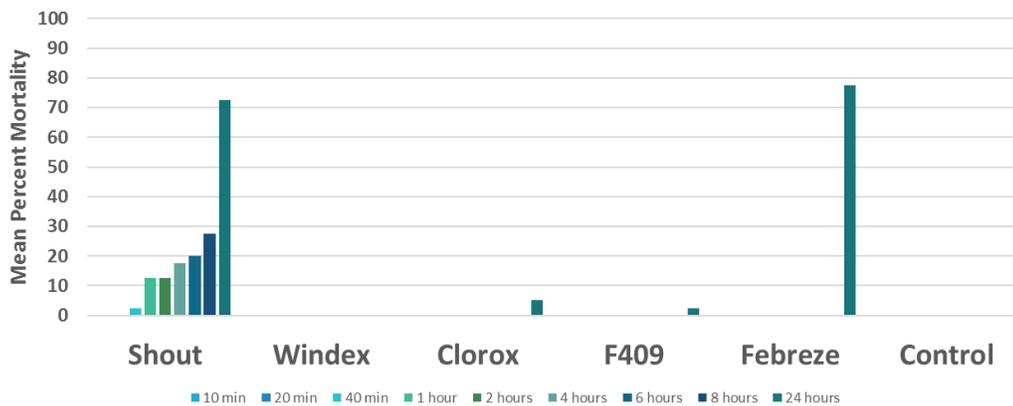
**Figure 1. Mean percent mortality in odorous house ants treated with direct applications of cleaning agents.**



**Figure 2. Mean percent mortality in odorous house ants exposed to residual applications of cleaning agents.**



**Figure 3. Mean percent mortality in odorous house ants exposed to aged residues of cleaning agents.**



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I would like to thank Dr. Buczkowski for guiding me through this entire process and teaching me how to work under laboratory and scientific conditions. I would also like to thank Dr. Neal for teaching me how to organize, analyze, and put together this finalized project.

## **References Cited**

Odorous Ants: Odorous House Ant Control & Identification. *Orkin.com*. N.p., n.d. Web.  
03 May 2017.

Odorous House Ant (Department of Entomology). *Department of Entomology (Penn State University)*. N.p., n.d. Web. 03 May 2017.

Odorous House Ants. *Waltham Pest Services*. N.p., 2017. Web.

Tapinoma sessile. *School of Ants*. N.p., n.d. Web. 03 May 2017.