N O T E

# Fire Ant (Hymenoptera: Formicidae) Activity in Simulated Electric Utility Boxes Treated with $NaHCO_3$[1]

Mark A. Brinkman, Wayne A. Gardner[2] and Reid M. Ipser

Department of Entomology, University of Georgia, College of Agricultural and Environmental Sciences
Griffin Campus, 1109 Experiment Street, Griffin, GA 30223-1797 USA

J. Entomol. Sci. 39(4): 679-680 (October 2004)

**Key Words** *Solenopsis invicta,* sodium bicarbonate, electric utility cabinets

Red imported fire ants, *Solenopsis invicta* Buren, often colonize electric utility boxes, damaging equipment and posing safety problems for utility employees (MacKay et al. 1992, Environ. Entomol. 21: 866-870). In a study by Vinson and MacKay (1990, *In* R. K. Vander Meer et al. [ed.], pp. 496-503, Applied myrmecology—a world perspective, Westview), up to 75% of highway signal cabinets near Bryan and College Station, TX, had fire ant infestations. The initial attraction of fire ants to the structures may be protection from the environmental conditions (MacKay and Vinson 1990, *In* R. K. Vander Meer et al. [ed.], pp. 614-619, Applied myrmecology—a world perspective, Westview). Fire ants are not attracted to electrical fields, but workers may bridge circuits and emit alarm pheremones in response to electric shock (Slowik et al. 1996, J. Econ. Entomol. 89: 347-352). This often results in increased fire ant activity in the cabinets. Common methods of fire ant control are insecticidal baits and mound treatments, but these types of treatments are not always useful or safe. Chlorpyrifos on a corncob grit significantly reduced red imported fire ant infestations and activity in traffic signal boxes (MacKay and Vinson 1990); however, extensive use of insecticides in utility boxes would be costly, time consuming, and may compromise human safety. Additional safe and inexpensive methods of control are needed for fire ant management in structures that house electrical devices. In laboratory tests, red imported fire ants were not repelled by sodium bicarbonate ($NaHCO_3$) on surfaces, and exposure to concentrations of 18.0 mg per $cm^2$ caused relatively high levels of worker mortality (Brinkman et al. 2004, J. Entomol. Sci. 39: 188-201). The objective of this study reported herein was to determine whether $NaHCO_3$ can reduce fire ant activity in metal boxes constructed to simulate electric utility boxes. Results from this preliminary field study will aid in determining whether or not it is feasible to test $NaHCO_3$ in full-scale operational electric utility boxes.

We placed two rectangular metal boxes that were 0.23 $m^2$ in area and 10.5 cm tall

[1]Received 28 May 2004; accepted for publication 14 June 2004.
[2]To whom all inquiries should be directed (email: wgardner@griffin.uga.edu).

on concrete pads to simulate typical structures that house electrical devices (MacKay and Vinson 1990). The area under one of the boxes was treated with $NaHCO_3$ at a concentration of 18.0 mg per $cm^2$. The other box was left untreated. Distance between treated and untreated boxes at the sites ranged from 2.1 to 5.2 m. Water in a 150-mm plastic Petri dish, tuna in oil in a 35-mm Petri dish, 10% sugar water in a 35-mm Petri dish, and 100 fire ant workers were placed under each box. Boxes were then inspected for fire ant activity each day over 3 d, and the number of live fire ants in each box was recorded. Water and food were replenished each day as needed. Trials including 14 pairs of metal structures were conducted between 24 April and 01 November 2003 at various locations on the University of Georgia Griffin Campus (Griffin, Spalding Co., GA) using worker ants from five laboratory colonies. A trial was discontinued if precipitation washed away treatments, or if Argentine ant, *Linepithema humile* (Mayr), workers invaded the structures. Frequent rainfall during the summer of 2003 made it difficult to conduct the experiments for more than 3 d. Also, Argentine ants invaded both treated and untreated boxes of a pair and raided the fire ants and removed food from Petri dishes. Interestingly, only legless bodies of dead fire ant workers were found in those boxes the day after addition of fire ants to structures. Therefore, data for nine pairs of structures over 3 sampling days were available; these were analyzed using the t-test (1998, SPSS Inc., Chicago, IL).

Fire ant activity in untreated structures was much higher than that observed in treated structures each day of the experiment. Mean (±SEM) number of fire ants in untreated structures on days 1, 2, and 3 was 63.22 ± 25.85, 51.44 ± 18.49, and 56.11 ± 28.81, respectively. Mean number of fire ants in treated structures on days 1, 2, and 3 was 14.22 ± 7.85, 15.22 ± 9.26, and 9.00 ± 6.17, respectively, and was significantly ($t = 3.05$; df = 52; $P = 0.0036$) lower than the number in untreated boxes. At the end of the monitoring period, structures were not immediately removed. In at least one instance, fire ant workers carried soil into the area under an untreated box and began mound construction. We did not observe nest construction in any treated structures. There were also cases in which workers from nearby active fire ant mounds formed foraging trails to the structures and were observed removing tuna and visiting the Petri dishes with sugar water. Although not statistically different, this was more common in untreated structures, and activity in treated structures usually decreased after the first day despite replenishment of food.

Results from these metal box studies suggest that $NaHCO_3$ reduces fire ant activity in treated structures. Testing of $NaHCO_3$ in full-scale, operational electric utility boxes should be conducted. An important factor to investigate in future studies would be persistence of $NaHCO_3$ activity in cabinets. The structures used in our study did not have floors and were not sealed on the concrete. Thus, the treatments were washed away during heavy rainfall. In order for $NaHCO_3$ to be a practical long-term treatment for protection of electric utility boxes from fire ants, it must be protected from precipitation. Use of $NaHCO_3$ in electric utility boxes would be inexpensive. Our results from using 18.0 mg $NaHCO_3$ per $cm^2$ indicate that it may take less than 113 g of $NaHCO_3$ to treat the floor of a 7,871 $cm^2$ electrical utility box at a cost of $0.16.