Evaluation of Three New Individual Mound Treatments for Fire Ant Control

M. E. Merchant and S. A. Russell
Texas Agricultural Extension Service
October 23, 2000

Abstract: Eleven treatments were applied to plots containing fire ant mounds at Dallas Fort Worth International Airport, Texas in March, 2000. Significant differences among the treatments were found in percent control, mound ratings, and rate of new, "satellite" mound formation. Treatments resulting in the greatest reduction of fire ant mound activity included diazinon and thiamethoxam. Greater than 95 percent control was obtained by by 1 and 7 days after treatment (DAT) in diazinon- and thiamethoxam-treated (1.2 g a.i./gal rate) plots, respectively. Complete (100%) control of fire ant mounds was observed by 14 DAT in both diazinon- and thiamethoxam-treated (1.2 and 2.4 g a.i./gal rates) plots. Although thiamethoxam appeared to work more slowly than diazinon, significant reduction in mound activity was evident by 1 DAT in thiamethoxam-treated plots. No control of fire ant mounds was observed with an experimental formulation of *Beauveria bassiana* (strain ATCC 74040) numbered as TB131-1. Observations of satellite mound formation in plots suggests that water drench- and Garden-Ville Soil Conditioner-treated colonies survived and moved to other locations more often than thiamethoxam-treated mounds.

Introduction

Individual mound treatments play an important role in fire ant management. Mound treatments are selective and often faster-acting than broadcast insecticide treatments (Merchant and Drees, 2000). One desirable characteristic of fire ant mound treatments is low toxicity. This test evaluated three relatively new, lower toxicity treatments: an experimental insecticide from Novartis Crop Protection, thiamethoxam (CGA 293343), a neonicotinoid class insecticide; Garden-Ville Soil Conditioner; and an experimental formulation of the fungus *Beauveria bassiana* (TB131-1). Although not registered as an insecticide, the Garden-Ville product is sold as an organic "soil conditioner" with fire ant control properties. Standard treatments included in the comparison were Amdro® Granular Fire Ant Bait, and Evict™ diazinon concentrate.

Methods and Materials

Forty-four plots, 40 feet wide and of varying lengths, were established on property belonging to Dallas Fort Worth International Airport adjacent to Hyatt Resort at Bear Creek Golf Course. Ground cover consisted of mixed forbs and grasses, which were left un-mowed over the course of study. Soil was predominately black clay. Eleven plots were located in each of four sites separated no more than 1 km. Active mounds were flagged prior to treatment, and each plot was sized to enclose approximately 10 active mounds. Plot length varied from 28 to 293 feet-long. Block assignments were based on plot length, with the 11 shortest plots assigned to block I,

the next 11 shortest plots assigned to block II, etc. Treatments were randomly assigned to plots within blocks, according to a randomized complete block design with four replications. Mounds in each plot received one of the following treatments:

1. Control-no treatment
2. CGA 293343 - 2.4 grams active ingredient per one gallon of water, applied at the rate of one gallon per mound. Novartis Crop Protection
3. CGA 293343 - 1.2 g a.i. / gallon, applied as above
4. CGA 293343 - 0.6 g a.i. / gallon, applied as above
5. CGA 293343 - 0.3 g a.i. / gallon, applied as above
6. Evict™ (diazinon 56%) formulated at 25 ml formulation (66ppm a.i.) per gallon, applied at the rate of one gallon per mound.
7. TB131-1, *Beauveria bassiana* (ATCC 74040). One application, 0.5 fl oz/mound poured into a "thumb sized hole pressed into the mound". (0.72% active, containing min. 2.3 x 106 viable spores) Troy Biosciences, Phoenix, AZ.
8. TB131-1, *Beauveria bassiana* (ATCC 74040). Two applications, 0.5 fl oz/mound as above. Second application was made (to active mounds only) 14 days after treatment. (0.72% active, containing min. 2.3 x 106 viable spores) Troy Biosciences, Phoenix, AZ.
9. Garden-Ville Soil Conditioner (mixture of 70% compost tea extract, 30% citrus oil). 6 oz/gallon water/mound. Garden-Ville Fertilizer Co., San Antonio, TX.
10. Amdro® Fire Ant Bait. 2-5 Tbsp/mound (depended on mound size) sprinkled around the base of the mound. American Cyanamid, Princeton, NJ.
11. Control, water only (1 gallon/mound)

Pre-treatment counts were made on 17 March, 2000. Treatments were applied on March 20, 2000. Each mound was flagged and rated according to a scale modified from Lofgren & Williams (1982), where 1 = small mounds (less than 100 ants) and 5 = large mounds (>50,000 ants). Mounds containing fewer than 25 workers were considered inactive, and mounds less than 12 inches apart were considered a single colony. Mounds were counted and rated at 1, 3, 7, 14 and 28 days after treatment (DAT). New mounds discovered in plots after treatment were considered new or "satellite" mounds and were counted and rated as such. Results were analyzed using Statistical Analysis Software (SAS Institute, Cary, NC) Version 8.1. Significant differences were detected using the General Linear Models (GLM) procedure. Means were compared using Tukey's Studentized Range Test or the Ryan-Einot-Gabriel-Welsch multiple range test.

Results

Significant differences in mound activity were found on all post-treatment sample dates ($P>0.05$, GLM) (**Table 1**). Diazinon- and Garden-Ville-treated mounds had the lowest activity levels by one day after treatment (DAT); however by 3 DAT, a trend for lower percent active mounds was seen in thiamethoxam treated plots. By 7 DAT, percent active mounds were lower in all thiamethoxam-treated plots compared to Garden-Ville-treated plots. By 7 DAT ant activity was significantly lower for all thiamethoxam rates compared to control plots.

Complete control was achieved for two rates of thiamethoxam and the diazinon-treated

plots. Thiamethoxam provided slower control, but the 1.2 g a.i./gal rate matched control provided by diazinon treatments by 14 DAT. Lowest levels of control were observed in plots treated with the fungal treatment, *Beauveria bassiana*. Fire ant activity in plots treated with this product were not significantly different from the untreated controls on all dates ($P>0.05$). Lack of control may have been due to the non-conventional method of application, which called for no use of water carrier. Hydramethylnon (Amdro®) treatments provided the slowest control, being indistinguishable from control plots until 7 DAT. By 14 and 28 DAT there was no statistical difference in control between Amdro® and the best treatments.

Comparison of mound ratings among the different treatments yielded results similar to percent activity measurements (**Table 2**). By 7 DAT mound activity ratings were lowest in diazinon- and thiamethoxam-treated plots. Mound ratings in control plots and Beauveria bassiana-treated plots were significantly higher than other treatments by 7 DAT. Numbers of satellite mounds in the plots increased over the two months of the study, and satellite mound numbers varied significantly among treatments ($P=0.0028$) (**Table 3**). Because there was no significant interaction between treatment and date ($P=0.3835$), all dates were combined for analysis.

Water drench, Garden-Ville, and Amdro treated plots showed the highest rate of satellite mound formation. Plots treated with the 1.2 g a.i./gal rate of thiamethoxam had significantly fewer satellite mounds than water drench- or Garden-Ville-treated plots. These data suggest that thiamethoxam treatments may be less likely to cause treated fire ant colonies to relocate and form satellite mounds, a desireable characteristic for a mound treatment.

Garden-Ville treated plots had statistically higher numbers of satellite mounds compared to plots treated with the 1.2 g a.i./gal rate of thiamethoxam, but there was no significant difference in satellite mound numbers between Garden-Ville-treated plots and untreated (no drench) control plots in this test. Overall fire ant activity, as measured by combined original and satellite mound ratings, produced results similar to those discussed previously (**Table** 4).

There was no consistent trend toward improved fire ant control with increased application rates of thiamethoxam. Overall, the 1.2 g a.i. rate of thiamethoxam provided numerically superior control and resulted in fewer satellite mounds than the higher, 2.4 g a.i./gal, rate. On most dates, however, there were no statistically significant differences between the two higher rates of thiamethoxam. The two lower rates provided levels of control equivalent to the higher rates except for on 1 and 3 DAT.

References cited:

Lofgren, C. S. and D. F. Williams (1982). "Avermectin B1A: Highly potent inhibitor of reproduction by queens of the red imported fire ant (Hymenoptera: Formicidae)." Journal of Economic Entomology 75: 798-803.

Merchant, M. E. and B. M. Drees (2000). The Texas Two-Step Method: Do-it-yourself fire ant control for homes and neighborhoods. Texas Agricultural Extension Service publication L-5070.

Acknowledgments: The authors wish to acknowledge the Tarrant County and Dallas County Master Gardener volunteers, who contributed many man-hours of labor setting up, counting and rating fire ant mounds. We also thank the maintenance department of the DFW International Airport for their cooperation in supplying the site for the study.