

**EFFECTS OF SPOT TREATMENTS OF LOGIC®
(FENOXYCARB) ON POLYGYNOUS RED IMPORTED FIRE ANTS:
AN INDICATION OF RESOURCE SHARING?**

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Food exchange between adjacent nests of the red imported fire ant, *Solenopsis invicta* Buren was elucidated by Summerlin et al. (1975) using dye-impregnated soybean oil. Bhatkar and Vinson, (1987, 1987a, 1989) demonstrated foraging pattern differences between monogyn and polygyn red imported fire ants by marking foraging ants with a non-toxic paint, finding that worker ants moved freely between mounds of the polygynous form.

Logic® Fire Ants Bait contains the active ingredient, fenoxycarb, which acts as an insect growth regulator. Ingestion of fenoxycarb by the brood redirects larval development toward production of winged reproductive castes, only. Queen ant ovaries are also affected (Glancey 1987) and egg production is severely reduced or eliminated. In the absence of worker ants are not replaced. This process can take up to several months. During this period, affected colonies can be detected because of the absence of worker brood and prevalence of reproductive brood (large larvae and pupae with wing pads).

Individual spot Logic applications were used to determine whether or not, and to what extent, neighboring red imported fire ant mounds were affected by the treatment.

Materials and Methods

Native pasture at the edge of an abandoned pecan orchard in Burleson County was used to establish test plots. Logic® Fire Ant Bait (fenoxycarb) applied either to 1) the top of individual fire ant mounds or 2) placed randomly in the pasture at a rate of 3 tablespoons per spot on 21 September 1990. Treatment spots and mounds were established along transect lines and were separated by a minimum of 70 ft. Treatments were replicated six times and marked with plot flags. An additional set of six spots were marked to serve as an untreated check. These plots were randomly selected from an area adjacent to the treatment plots but at least 150 feet away from any flag. The entire area appeared uniform in terrain, soil type, and vegetation. Adequate moisture was present throughout the test period with temperatures varying greatly, but staying well above 70°F.

Five weeks following treatment, all active mounds within a 30 ft. radius were mapped and inspected for presence of worker and reproductive brood. The total number of fire ant mounds and mounds affected by the Logic treatment, as indicated by the lack of worker brood and the presence of reproductive brood, was determined within 0-5, 5-10, 10-15, 15-20, 20-25 and 25-30

ft. radius from the location of the spot application for each treatment. These values were converted to percent affected mounds and these values were correlated to the distance from treatment location.

Results

Average mound density was 24.78 mounds per plot or 381 mound per acre, indicating the prevalence of the polygynous form of the red imported fire ant. Significant negative correlations ($P \# 0.01$) between the number of Logic-affected mound and the distance from the spot application (**Table 1**). Linear regression equations [Y , percent affected mounds = (Y intercept) + (slope) X , distance from treatment spot] were:

$$\text{Treated central mound: } Y = 93.7 + -3.66X \quad (r = -0.8993)$$

$$\text{Random treatment: } Y = 105.10 + -4.13X \quad (r = -0.8706)$$

Relationships between treatment location and affected mounds were very similar, regardless of placement of bait on mounds or randomly within an infested area (Fig. 1). A calculated range, for the distance from the spot application to where 50 percent of the mounds were affected by the treatment was 11.9 to 13.4 ft. for bait placed on the mound versus randomly, respectively. The maximum treatment spot to affected mound distance was 23 ft.

Discussion

Clearly, more than a single fire ant mound was affected by the spot applications of Logic ®. In areas infested by the polygyn form, these mounds may represent a single colony comprised of numerous mounds. Results of this study, however, cannot be used to conclusively argue that food exchange occurred between individuals from adjacent mounds. Conceivably, foraging workers from adjacent mound or colonies shared a single resource (a spot application of bait) over time, although fire ant baits readily decompose in the environment. Regardless, results support the finding of previous studies (Summerlin et al. 1975, Bhatkar, A.P. and S. B. Vinson, 1987, and 1989).

Other aspects of these results may have implications research methodology and fire ant management. The distance between bait treatment location and affected mounds reported here would conceivable differ with varying densities of fire ants within the study area and the dose. However, during evaluations of individual mound or broadcast bait applications, the researcher must be aware of the possibility of the exchange and/or sharing of the toxicant-laden bait between neighboring colonies. In establishing broadcast application plots, buffer zones of at least 60 ft. between treatments may be necessary to completely eliminate the possibility of treatments affecting adjacent plots.

In fire ant management, the food exchange and/or resource sharing of a toxicant bait can be beneficial in a number of ways. The knowledge that bait application in restricted small spaces,

such as home lawns can affect mounds in neighboring areas for roughly 20 feet from the edge of the treatment can be beneficial and help justify the urban use of slow-acting pesticides such as Logic. Furthermore, documented resource sharing between mounds could help justify the use of bait station for fire ant management. And finally, resource sharing among the polygyn form would make them more capable of transmitting natural enemy agents, particularly pathogens, from mound to mound and perhaps between colonies.

Literature Cited

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Table 1. Number of red imported fire ant mounds affected by a spot treatment of Logic® (fenoxycarb) Fire Ant Bait five weeks following application (21 Sept.), Burleson County, Texas, 1990.

**No. of Mounds with reproductive brood only/total mounds
(percent in parentheses)**

Radius	Treated mound	Random treatment	Untreated
0-5	5/6 (83)	1/1 (100)	0/11 (0.0)
6-10	10/14 (71)	6/6 (100)	0/17 (0.0)
11-15	4/26 (15)	3/24 (12.5)	0/41 (0.0)
16-20	2/45 (4)	0/18 (0.0)	0/36 (0.0)
21-25	1/38 (3)	1/23 (4.3)	0/34 (0.0)
25-30	0/44 (0)	0/31 (0.0)	0/31 (0.0)
r		-0.90*	-0.87*

* Indicates significant correlation df = 11, Corr. Coef. = 0.708, P=0.01

Fig. 1. Composite plot maps from 6 replicates of 3 treatments: 1) spot applications of Logic® to central locations, and 3) untreated. Open circles represent active unaffected red imported fire ant mounds while black dots indicate affected mounds containing reproductive brood, only. Burlason County, Texas, 1991.

