

EVALUATION OF EXPERIMENTAL LOGIC® (FENOXYCARB) FORMULATIONS WITH REDUCED AMOUNTS OF THE ACTIVE INGREDIENT

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Bait-formulated products containing fenoxycarb (Logic® and Award®) for suppressing the red imported fire ant, *Solenopsis invicta* Buren, are registered for use as broadcast and individual mound treatments. When applied as a broadcast application, 1.0 to 1.5 lbs. of the formulated materials per acre are to be applied using special broadcast application equipment. These products are currently formulated as baits containing 1.0 percent active fenoxycarb. The trials reported here were evaluations of lower rates (0.50 and 0.25 percent) fenoxycarb formulations.

Materials and Methods

Trial 1. This trial was initiated, 29 July 1991, on the J.B. Evans Turf Farm in Algoa, Texas. The site was an abandoned turf farm and adjacent abandoned field. The fields were overgrown St. Augustine grass and had been recently mowed. There was a considerable amount of litter on the surface of the turf area.

The experimental design consisted of three replications (blocks), with four treatment plots each. Treatments were randomized within each block. Each treatment plot consisted of a square, 150 feet on a side, or 0.51 acres. Counts of active fire ant mounds were made within a 0.25 acre circular subplot inside each half-acre plot, using a string 58 feet long anchored in the plot center. Ant mounds were considered active if ants ran up to the mound surface within 5 to 10 seconds of light disturbance with a shovel handle (minimal disturbance method). Counts were made either before noon or after 5:00 pm. to maximize ant response. In addition, on 3 Sept. treatment plots were monitored to determine if the fenoxycarb treatments had affected the ant mounds. Four plots, one from each treatment, were evaluated by opening each mound and looking for the presence of worker brood (larvae and pupae).

The following treatments were included: 1) untreated control; 2) fenoxycarb bait 1% (Logic® Fire Ant Bait); 3) fenoxycarb bait 0.5%; and 4) fenoxycarb bait 0.25%. All baits were applied, 30-31 July, at a rate of 1.5 lbs per acre using a Cyclone® Model 1C1 hand seeder operated from the tailgate of a moving truck. Plots were monitored for ant mound activity 8 weeks, 3, 7, 12 and 18 months following application of treatments. Resulting ant mound counts per plot were analyzed using analysis of variance (ANOVA) and means were separated using Tukey's Studentized Range test ($P \leq 0.05$).

Trial 2. This trial was located on the back side of the earthen dam impounding Lake Somerville. The area is federally owned and managed by the U.S. Army Corps of Engineers. Access is tightly restricted to maintenance and monitoring personnel only. The area is gently sloping with small water diversion terraces through the middle. Vegetation is primarily native grass. Mowing is done, at most, three times per year. Mowing had just been completed at the onset of the trial. The total area available for the test was approximately 400 feet wide and 4,000 feet long.

Plots were established, 22 Aug. 1991 in adjoining columns, two plots wide and 8 long. Due to a severe decrease in ant mound numbers, a second block of four adjoining plots was laid out at the opposite end of the dam where mound numbers were more consistent. The 20 plots allowed for four replications (blocks) of the four treatments to be assigned randomly within each block. Two additional sets of two plots were established for untreated control and 1 percent fenoxycarb treatments. The plots were identical in size to those in Trial 1 and treatments, applied 26 Aug. 1991 (4:00 to 8:00 pm), were also identical. Fire ant mound density was monitored as in Trial 1. Active ant mounds were monitored in each plot 8 weeks, 3, 12 and 18 months following treatment.

Results were analyzed as those of Trial 1, and results from both trials were analyzed as one. Finally, a linear regression analysis was conducted on the percent reduction in active ant mounds (calculated from pre-treatment levels) at 7 and 12 months after treatment, using results from both trials.

Results and Discussion

Trial 1. The 1 percent fenoxycarb bait (Logic®) application was made the evening of 30 July. The remaining treatments were applied 31 July before 11:45 a.m. According to the owner, a brief, heavy thunderstorm occurred at approximately 4:30 p.m. Since the bait formulation, composed of defatted corn grit, is effectively dissolved by moisture, the low rate bait particles had less than 5 hours to be collected by foraging ants. This concern prompted the establishment of the second trial. On 3 Sept., no worker brood was noted in the fenoxycarb treatment plots while large numbers were present in the untreated control plot mounds. This finding indicated that the rain that fell shortly following treatment did not affect the ants' retrieval of the product.

All treatments significantly reduced the number of active fire ant mounds beginning 3 months after treatment (Table 1). Curiously, the 1 percent fenoxycarb formulation was slower to suppress ants than the other two formulations, and did not produce a significant level of suppression after 18 months. Statistically, the 0.5 and 0.25 percent formulations performed equally well in this trial. Maximum suppression of active ant mounds from fenoxycarb bait occurred 7 months following treatment (85 to 98 percent reduction relative to untreated plots on that date).

Trial 2. One plot (replicate I, below) at Somerville maintained unusually high ant mound numbers. This area apparently contained a source of water such as a seep since Johnson grass grew heavily there. Analysis using this plot was attempted, but the decision was made to substitute data from one of the other two 1.0 percent fenoxycarb bait treated plots (Plot VI) for analysis of data from

the evaluation of the three formulations.

	Replicate					
	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>
pre-count	108	49	58	41	10	7
2 weeks	77	31	37	32	15	8
6 weeks	37	17	14	30	14	7
3 months	42	8	13	9	11	6
7 months	55	0	1	3	10	8
1 year	3	0	2	2	4	2
18 months	35	2	23	26	12	11

In this trial, significant reductions from fenoxycarb bait treatments did not occur until 7 months after application (Table 1), when percent suppression ranged from 77.0 to 91.4 relative to untreated plots on that date. Significant levels of suppression lasted for one year. By 18 months after treatment, active mound numbers had increased. All treatments performed equally well, statistically.

Analysis of data from both trials, again, documents that the fenoxycarb formulations performed equally well from seven months to a year after treatments (Table 2). The 1.0 percent fenoxycarb bait (Logic®) suppressed active ant mounds more quickly (by 3 months).

Linear regression analysis suggests that there may be an influence of initial mound density on the level of active ant mound suppression resulting from a 1% fenoxycarb bait (Logic®) application, particularly after 1 year of treatment (Table 3). In particular, efficacy seems to be lower when applied to plots with low densities of fire ant mounds. Omitting Plot I data from Trial 2 greatly changes the equation for the line, particularly at seven months after treatment. Although the results of this analysis are preliminary, additional data points from other trials may render results definitive. Implications of the pre-treatment ant mound density effect on product performance justify, to some extent, excluding data from Trial 1 plot I data in the analysis presented here. Furthermore, these results support the technique of arraying pre-treatment ant mound counts in plots from low to high density and assigning blocks according to these density increments. This method has been used on all subsequent studies.

Table 1. Numbers of active red imported fire ant mounds before and after treatment with a broadcast application of 1.5 lbs. per acre fenoxycarb (Logic®) bait formulations, 1991.

Trial 1. J.B. Evans Turf Farm Site, Alvin (Galveston Co., Texas), 30-31 July 1991

Mean number of active fire ant mounds, 3 replications*

<u>Treatment</u>	<u>Pre-count</u>	<u>8 wks.</u>	<u>3 mos.</u>	<u>7 mos.</u>	<u>1 yr.</u>	<u>18mos.</u>
untreated control	41.33a	30.67a	25.33a.	35.33a	11.67a	34.00a
1% fenoxycarb (Logic®)	33.67a	8.67a	5.00ab	0.67b	3.67a	
	22.67ab					
0.5% fenoxycarb bait	30.67a	12.67a	3.00b	5.33b	2.00a	15.33b
0.25% fenoxycarb bait	35.00a	18.33a	1.67b	1.00b	3.67a	12.67b
MSE	273.500	79.833	61.667	39.500	15.250	48.250
F	0.22	3.45	6.09	21.02	3.72	5.66
P	0.8789	0.0716	0.0104	0.0004	0.0609	0.0223
MSD	43.244	23.364	20.451	16.434	10.211	18.163

* Means followed by the same letter are not significantly different using analysis of variance (PROC ANOVA) and the Tukey's Studentized Range Test ($P \leq 0.05$; d.f. = 8; Range = 4.529)(PC SAS)

Trial 2. Somerville Dam Site (Burlason County, Texas), 26 Aug. 1991

Mean number of active mounds, 4 replications**

<u>Treatment</u>	<u>Pre-</u>	<u>2 wks.</u>	<u>6 wks.</u>	<u>3 mo.</u>	<u>7 mo.</u>	<u>1 yr.</u>	<u>18 mos.</u>
untreated control	24.00b	22.75c	18.00a	21.25a	34.75a	22.25a	33.00a
1.00% fenoxycarb	38.75ab	27.00bc	17.00a	9.00a	3.00b	1.50b	15.50a
0.50% fenoxycarb	64.75a	46.50ab	22.25a	18.75a	4.25b	1.75b	12.50a
0.25% fenoxycarb	62.50a	51.50a	20.75a	19.25a	8.00b	2.75b	18.75a
MSE	217.708	99.229	87.625	72.688	187.167	84.605	169.563
F	7.05	8.11	0.27	1.65	4.80	4.86	1.94
P	0.0055	0.0032	0.8471	0.2294	0.0202	0.0194	0.1766
MSD	30.975	20.912	19.651	17.898	28.717	19.31	27.336

** Means followed by the same letter are not significantly different using analysis of variance (PROC ANOVA) and the Tukey's Studentized Range Test ($P \leq 0.05$; d.f. = 12; Range = 4.199)(PC SAS)

Table 2. Numbers of active red imported fire ant mounds before and after treatment with a broadcast application of 1.5 lbs. per acre fenoxycarb (Logic®) bait formulations, Trials 1 and 2, Galveston and Burleson Counties, Texas, 1991-1993.

Mean number of active mounds, 7 replications*

<u>Treatment</u>	<u>Pre-count</u>	<u>3 mos.**</u>	<u>7 mos.</u>	<u>1 year</u>	<u>18 mos.</u>
untreated control	31.43a	23.00a	35.00a	17.71a	33.43a
1.0% fenoxycarb bait	36.57a	7.29b	4.00b	2.43b	18.57ab
0.5% fenoxycarb bait	50.14a	11.43ab	3.29b	1.86b	13.71b
0.25% fenoxycarb bait	50.71a	12.29ab	5.00b	3.14b	16.14b
MSE	330.6380	82.4678	115.1408	57.2318	112.0589
<i>F</i>	2.29	4.29	10.95	5.45	3.71
<i>P</i>	.0907	.0097	.0001	.0031	.0100
MSD	26.897	13.433	15.872	11.190	15.658

* Means followed by the same letter are not significantly different using analysis of variance (PROC GLM) and the Tukey's Studentized Range Test ($P \leq 0.05$; d.f. = 23; Range = 3.914)(PC SAS). Sites were not significantly different unless noted.

** Sites statistically different for this post-treatment date:

site	$F = 5.75$
	$P = .0250$
treatment	$F = 3.81$
	$P = .0237$

Table 3. Linear regression analysis of percent reduction of red imported fire ant mounds from the application of 1 percent fenoxycarb bait (Logic®) at seven and twelve months after treatment versus the initial ant mound density, Burleson and Galveston Counties, Texas, 1991-1993.

Model: $Y = MX + B$

where Y=percent reduction; X=initial density; M=slope; and B=Y intercept

At seven months, all plots: $Y = 0.638X + 36.293$

$F = 1.743$ $P = 0.2283$

At seven months, Plot I omitted: $Y = 2.358X - 13.903$

$F = 60.411$ $P = 0.0002$

At 1 year, all plots: $Y = 0.317X + 74.113$

$F = 7.560$ $P = 0.0285$

At 1 year, Plot I omitted: $Y = 0.661X + 64.096$

$F = 24.300$ $P = 0.0026$
