EVALUATIONS OF AMDRO® (HYDRAMETHYLNON) FORMULATIONS AND LOGIC® (FENOXYCARB) FOR RED IMPORTED FIRE ANT CONTROL

Bastiaan M. Drees, Professor and Extension Entomologist
Charles L. Barr, Extension Associate
Michael E. Heifer, County Extension Agent-Agriculture
Johnnie W. Casper, County Extension Agent-Agriculture
Rocky S. Vinson, County Extension Agent-Agriculture

Use of bait-formulated insecticides is one method of red imported fire ant (RIFA) *(Solenopsis invicta* Buren) suppression. Products like Amdro® (hydramethylnon), Logic® (fenoxycarb) and Affirm® (abemectrin) are applied either as treatments around individual mounds or as broadcast applications. Successful control is attained when several conditions are met: ants are actively foraging (when soil temperatures exceed 65 to 70EF), 2) fresh product is used, and 3) the ground is dry at the time of application and for the 24-hour period following application.

Bait particles are formulated as soybean oil coated corn grits. The oil contains the active ingredient. Attractiveness of the bait is reduced if 1) too much active ingredient or other repellent chemicals are added to the soybean oil and/or 2) the soybean oil becomes rancid (oxidizes) over time or after exposure to air. If the bait is unattractive, control failure will occur. Furthermore, if the active ingredients decompose (through time- or temperature-mediated chemical decomposition or photo degradation), the material will also become less effective for control.

This research was conducted to examine several aspects of bait attractiveness and efficacy of controlling RIFA, particularly when applied as individual mound treatments. Products and formulation tested included Amdro (fresh product produced in 1990), old Amdro (Amdro A, B, and C), and for comparison, Logic® (fenoxycarb) "insect growth regulator," and Orthene® Fire Ant Killer or 75W (acephate).

Materials and Methods

Field trial of Amdro formulations: On June 11, 1990, 8 circular plots, 60 feet in radius, were surveyed for RIFA mound activity. All mounds were marked with Kerr® canning jar lids and numbered sequentially. Mound activity was determined by light disturbance on the mound. The rating scale below was used to document the level of ant activity within each mound:

0 = Fewer than 10 ants, very slow reaction to disturbance
1 = 10 to 100 ants, slow reaction to disturbance
2 = 100 to 1000 ants, and/or vigorous reaction to disturbance
3 = more than 1000 ants, very vigorous response to disturbance

The following day, all marked mound within each plot were treated as indicated below:

Plot	Active Ingredient	Formulation	Rate /mound	No. Mounds treated
1	hydramethylnon	Amdro “A”	5 Tbsp	37
2	“	Amdro “89"	“	50
3	“	Amdro “B”	“	39
4	acephate	Orthene 75W	3 Tsp.	47
5	fenoxycarb	Logic	3 Tbsp.	32
6	hydramethylnon	Amdro “90"	5 Tbsp	51
7	“	Amdro “C”	“	36
8	untreated	none	none	34

Post-treatment evaluations were made after one-week (20 June 1990), two-weeks (27 June), four-weeks (9 July), and eight-weeks (1 August). Evaluations were made in the evening after ant activity had resumed.

Analyses of data were performed in two ways: 1) the mean mound rating were calculated for the first sequentially numbered 30 mounds within each plot and separated using ANOVA and the least significant difference (LSD) test at P#0.05; 2) the number of active mounds with in each quadrant of each plot (1/16 acre) were determined for each evaluation date and these values were used to determine the mean of active mounds per unit area per evaluation. These data were statistically analyzed as above.

Bait preference test: In the laboratory RIFA colonies were maintained in 5 gallon plastic buckets and fed a standardized diet regime, several trails were conducted to determine the attractiveness of several formulations of Amdro:

1) Amdro 90 versus Amdro A versus Amdro B versus Amdro C: Six colonies received pre-weighed 0.5 to 0.56g samples of each formulation in weighing dishes. After an exposure period of 50 minutes, the samples were weighed again and the amount of bait removed was determined. These values were used to calculate the mean weight of bait removed per formulation, and date were analyzed using ANOVA and the LSD test ($P \leq 0.05$).

2) Amdro Lot 90 versus Lot 89: This trail was conducted similarly to trial 1 except for a 55 minute exposure time and analysis using the Students t test ($P \# 0.05$).

3) Logic Lot 90 versus Lot 89: This trail, using "fresh" Logic from a just-opened bag produce in 1990 versus Logic form and opened bag stored in the laboratory since 1989, was conducted similarly to trial 2 except for a 1 hour and 40 minute exposure time.

4) Fresh Amdro versus Amdro exposed to air in a tray for 1 week versus Amdro exposed for 3 weeks: Quantities of Amdro were removed from fresh (1990) Amdro container stored in a laboratory freezer 3 weeks and 1 week before the trial was conducted and placed on a laboratory shelf in a tray to "age" the bait by exposing it to air. The trial was conducted and analyzed as trial 1 with an exposure period of 1 hour and 35 minutes.

Logic lot field test: To determine if properly stored Logic Fire Ant Bait lost effectiveness after storage in a opened, but tightly sealed 3 lb. plastic container, a trial was established on Milberger Turf Farm in Wharton County. On June 22, 1990, three, one acre treatment blocks established on a non-productive section of the farm. Prior to and following (5 Oct.) treatment, fire ant mounds were monitored for activity using the minimal disturbance technique. Ant mounds in each block were counted using a 105 foot string, pivoting in the center of the one-acre block. Active mounds were counted for each quarter of the circle. Treatments and rates were as follows: 1) 1989 batch Logic at 1 ½ lbs per acre; 2) 1990 batch Logic at 1 ½ lbs per acre and 3) untreated control. The Logic was applied by means of a wheeled, broadcast fertilizer spreader. Results were analyzed using ANOVA and the Least Significant Difference (LSD) test ($\underline{P} \# 0.05$).

Results and Discussion

Field trial of Amdro formulations: Extreme heat and high humidity were persistent for the duration of the experiment. Daily heat indexes were 105-110EF. Soil moisture condition were very poor (dry) until after the first evaluation. Some rainfall occurred during this period resulting in the increased activity noted in the ratings, particularly in the control plot.

RIFA were attracted t the bait formulations almost immediately upon application. No residual granules ere noted the following week. At that time, large numbers of dead ants in "bone piles" were noted near the Amdro-treated mounds. No such accumulations were seen in the Orthene, Logic or control plots.

Table 1 and **Table 2** indicate that all formulations of Amdro and Orthene performed similarly, eliminating all ant activity with the first week of treatment. In plot 7, treated with Amdro C, activity in a few treated mounds resumed 4 and 8 weeks following treatment, and several new mounds were detected in the plot. These mounds were a result of either control failure, or migration into the plot from untreated areas. This determination cannot be made with the available data. Logic-treated colonies declined more slowly, requiring 4 weeks before statistically-equivalent suppression to other treatments was achieved and 8 weeks before total elimination of mound activity was realized.

Bait preference tests: Results of these trials are discussed separately below. Overall, there was a trend towards older bait being less attractive to foraging worker ants than fresh material. Differences were small and nonsignificant in trials comparing the attractiveness of fresh product to bait lots from unopened year-old containers or opened and re-sealed containers stored under laboratory conditions for a year. However, exposure of the fresh bait to air prior to exposure to ants resulted in significant decreases in attractiveness within a week.

1) Amdro 90 versus Amdro A versus Amdro B versus Amdro C: Statistically, all formulations tested were found to be equally attractive. Numerically, Amdro C seemed to be consumed more rapidly than others, although in field tests, this formulation performed numerically poorer than other treatments.

Treatment	**Average Percent Consumed**	**Mean bait weight removed[a]/**
Amdro 90	65.16%	0.3396 a
Amdro A	49.84%	0.2581 a
Amdro B	57.64%	0.3017 a
Amdro C	70.98%	0.3691 a

[a]/ Means are not significantly different according to ANOVA and least significant difference (LSD = 0.152) test (P #0.05).

2) Amdro Lot 90 versus Lot 89: Although statistically similar, numerically more fresh bait was removed within the exposure period.

Treatment	**Average percent consumed**	**Mean bait weight removed[a]/**
Amdro 90	43.13%	0.22±0.15 (SD)
Amdro 89	41.90%	0.21±0.17

[a]/ Means are not statistically different according to the Students t test (t = 0.1007; d f = P# 0.05).

3) Logic Lot 90 versus Lot 89: As in trail 2, no statistical differences were documented, but the trend for older bait to be less attractive was consistent in this trial. Variability of quantity of bait consumed between colonies prevented statistical differences from being documented.

Treatment	Average percent consumed	Mean bait weight removed [a]/
Logic 90	44.64%	0.23±0.17 (SD)
Logic 89	29.79%	0.15±0.09

[a]/ Means are not statistically different according to the Students t test (t = 1.0231; d f = P# 0.17).

4) Fresh Amdro versus Amdro exposed to air in a tray for 1 week versus Amdro exposed for 3 weeks: Air-exposed or oxidized, rancid bait was less attractive to foraging worker ants than fresh bait.

Treatment	Average percent consumed	Mean bait weight removed [a]/
fresh	71.54%	0.3733 a.
1 week	49.51%	0.2394 .b
3 week	43.30%	0.2223 .b

[a]/ Means followed by the same letter are not significantly different according to ANOVA and least significant difference (LSD=0.082) test (P #0.05).

Logic lot field test: No differences in performance were detected between lots of Logic:

No. active fire ant mounds per quadrant			
Treatment	**Pre-count (22 Sept.)**	**Post-count (5 Oct.)**	**Percent reduction**
89 Logic	10.0a	2.8b	92
90 Logic	4.8b	0.5b	90
Untreated	5.5b	8.5a	

Table 1. Mean red imported fire ant mound rating[a]/ prior to and following treatment of 30 individual marked mounds within 0.25-acre circular plots, Montgomery, County, Texas 1990.

	Mean mound rating[a]/				
	11 June	**20 June**	**27 June**	**9 July**	**1 Aug.**
Treatment	**Pre-count**	**1-week**	**2-week**	**4-week**	**8-week**
Amdro A	1.2667 abc	0.0000 ..c	0.0000 ..c	0.0000 .b	0.0000 .b
Amdro 89	1.3333 abc	0.0000 ..c	0.0000 ..c	0.0000 .b	0.0000 .b
Amdro B	1.3000 abc	0.0000 ..c	0.0000 ..c	0.0000 .b	0.0000 .b
Orthene	1.5000 abc	0.0000 ..c	0.0000 ..c	0.0000 .b	0.0000 .b
Logic	1.4667 abc	0.7333 .b.	0.8000 .b.	0.0333 .b	0.0000 .b
Amdro 90	1.2000 ..c	0.0000 ..c	0.0000 ..c	0.0000 .b	0.0000 .b
Amdro C	1.5667 a..	0.0000 ..c	0.0000 ..c	0.1667 .b	0.1333 .b
Untreated	1.5667 ab.	1.2333 a..	1.6333 a..	1.1333 a.	0.8333 a.
LSD 5%	0.303	0.359	0.287	0.322	0.230

[a]/ Mound rating are: 0 = fewer than 10 ants, very slow reaction to disturbance, 1=10 to 100 ants, slow reaction to disturbance, 2 = 100 to 1000ants, and/or vigorous reaction to disturbance, and 3 = more than 1000 ants, very vigorous response to disturbance. Means followed by the same letter(s) are not significantly different according to ANOVA and the least significant difference (LSD) test ($\underline{P}$ # 0.05).

Table 2. Mean number of active red imported fire ants per 0.13-acre quadrant of a 0.25-acre circular plot, Montgomery County, Texas, 1990.

	Mean mound rating[a]/				
	11 June	**20 June**	**27 June**	**9 July**	**1 Aug.**
Treatment	**Pre-count**	**1-week**	**2 week**	**4-week**	**8-week**
Amdro A	9.2500 a	0.0000 .b	0.0000 .b	0.5000 .b	0.0000 .b
Amdro 89	12.5000 a	0.0000 .b	0.0000 .b	0.0000 .b	0.0000 .b
Amdro B	9.7500 a	0.0000 .b	0.0000 .b	0.5000 .b	0.0000 .b
Orthene	11.5000 a	0.0000 .b	0.0000 .b	0.0000 .b	0.0000 .b
Logic	8.0000 a	5.5000 a.	4.7500 a.	0.2500 .b	0.0000 .b
Amdro 90	12.7500 a	0.0000 .b	0.0000 .b	0.0000 .b	0.0000 .b
Amdro C	9.0000 a	0.0000 .b	0.0000 .b	1.5.000 .b	0.5000 .b
Untreated	8.5000 a	8.0000 a.	7.2500 a.	7.0000 a.	5.2500 a.
LSD 5%	5.613	3.161	2.999	3.383	2.668

[a]/ Means follow by the same letter(s) are not significantly different according to ANOVA and the least significant difference LSD test (P # 0.05).