Comparison of Amdro®, Spectracide® Fire Ant Bait and Diazinon Using Broadcast and Individual Mound Treatment Applications

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Two products used to control red imported fire ants (*Solenopsis invicta* Buren) are the faster-acting Amdro® Fire Ant Bait (0.73% hydramethylnon) and slower-acting insect growth regulator (IGR) baits such as Spectracide® (0.05% pyriproxyfen). Despite research showing time and cost savings of broadcast baits, granular formulations of contact insecticides, such as diazinon and chlorpyrifos, were still widely used for routine suppression of fire ants in home lawns. Chlorpyrifos was recently banned from sale for home use with diazinon to follow in 2003. Other contact insecticides will undoubtedly take their place, but there are a number of reasons that bait products should be used instead. This test was designed to provide a head-to-head comparison of the two types of bait products and diazinon granules when applied as both broadcast and as individual mound treatments over a single fire ant season. The test is designed to simulate normal use in a home lawn to determine effectiveness and cost.

Objectives:

1) Compare the speed and effectiveness of control of bait and contact insecticide products against fire ants.
2) Compare product costs and labor required to make such treatments.

Material and Methods

The test was located at the Cameron Airpark, the municipal airport of Cameron, Milam County, Texas. The site is regularly mowed with no cattle present. Soil type varies considerably from black clay to reddish clay to sandy loam. Fire ant densities vary considerably, but are likely of the multiple-queen form.

Plot size was 1/8 acre (75' x 75') with a minimum12 ft. untreated area on all sides. The number of active mounds in the entire area of each plot was counted on June 6, 2000. Pre-counts were arrayed from lowest to highest and divided into 4 equal groups (replications). Treatments were assigned within replications so that the number of active mounds for each treatment (sum of all four replications) were as equal as possible (Barr and Best, 2002). Treatments were applied, June 7, 2000.

Table 1. Treatments included. Cameron Airpark, Milam Co. Texas, 2000.

Treatment	Rate	Application
Amdro®	1.5 lbs. per acre	Broadcast
Amdro®	5 tablespoons per mound	Individual mound treatment
Spectracide® Bait	1 lb. per 4,400 square feet	Broadcast
Spectracide® Bait	4 tablespoons per mound	Individual mound treatment

Spectracide® granular	2 lb/1000 square feet	Broadcast
Spectracide® granular	1/3 cup per mound	Individual mound treatment
untreated	N/A	N/A

Mounds in all individual mound treatment (IMT) plots were first located and flagged, then treated. The diazinon was applied using a measuring cup for IMTs then watered in with one gallon of water per mound out of a sprinkler can. Diazinon was applied with a Red Devil® push spreader for broadcast plots then watered in with approximately 90 gallons of water per plot using a gas-powered high-volume pump. Baits were applied using a tablespoon for IMTs and a Cyclone 1C1 hand spreader for broadcast.

Evaluations were conducted on June 6 (pre), 10 and 15 and July 6 using the minimal disturbance technique. A mound was considered active if ant response was similar to that of the untreated mounds upon disturbance. Results analyzed using SAS analysis of variance with means separated by Tukey's studentized (HSD) range test.

Results and Discussion

As shown in **Table 2** and **Figure 1**, diazinon resulted in significantly ($P < 0.05$) faster suppression of mounds at 3 days post-treatment, both as an individual mound treatment (IMT) and when broadcast and lightly irrigated. Amdro treatments were the next to result in significant ($P < 0.05$) reductions at the 7 day count. By the one month count both Amdro and diazinon were significantly lower ($P < 0.05$) than the untreated plots. However, untreated plot numbers were 86% lower than pre-count due to the hot, dry weather and further evaluations were postponed until rains fell. During this period, Cameron City maintenance personnel mowed over all but one plot marker. Even after considerable precipitation fell in the fall of 2000, the site had few mounds reappear and the test was abandoned. Between the inaccuracy of reconstructing these small plots and the general lack of mounds, it was decided to abandon the test.

Table 2. Results of red imported fire ant mound counts - 0.125-acre plots, 4 replications. Cameron, TX. Treated June 7, 2000.

	Mean number of active mounds			
Treatment	Pre-count	Day 3	Day 7	One month
untreated	26.75 a	21.00 ab	24.50 a	3.75 a
Amdro b'cast	26.50 a	12.50 bc	6.00 c	0.00 b
Amdro IMT	26.50 a	11.75 bc	4.75 c	0.25 b
Spect Bait b'cast	27.50 a	19.25 ab	14.25 abc	1.00 ab
Spect Bait IMT	26.50 a	22.25 a	21.50 ab	3.50 ab
diazinon b'cast	25.75 a	6.25 c	3.00 c	0.00 b
diazinon IMT	26.50 a	5.00 c	6.75 bc	1.25 ab

F	19.24	11.77	5.41	3.61
P	0.0001	0.0001	0.0012	0.0098
R^2	0.9058	0.8548	0.7301	0.6437
MSD	6.1097	9.5163	15.093	3.5813

Means in the same column with the same letter are not significantly different. Means separated by Tukey's studentized range (HSD) test, $P < 0.05$. df = 21.

Table 3 illustrates the enormous labor differences between individual mound treatments and broadcast treatments. As shown by the more conservative Tukey's test, diazinon (or any granular product requiring irrigation) required three to five *times* as long to treat as the other IMTs largely because of the irrigation required. The Spectracide IMT took longer than the Amdro IMT because the product was being shaken out of one-pound bottles into measuring cups, while the Amdro was poured out of a 25 lb bag into a large container for easy scooping - an unintentional illustration of how a few seconds difference per mound adds up to a considerable amount of time when treating an area. As a group, the IMT plots required at least three times longer to treat than broadcast treatments because of the time needed to locate mounds for mound treatments. This difference is shown statistically by the less rigorous Duncan's multiple range test.

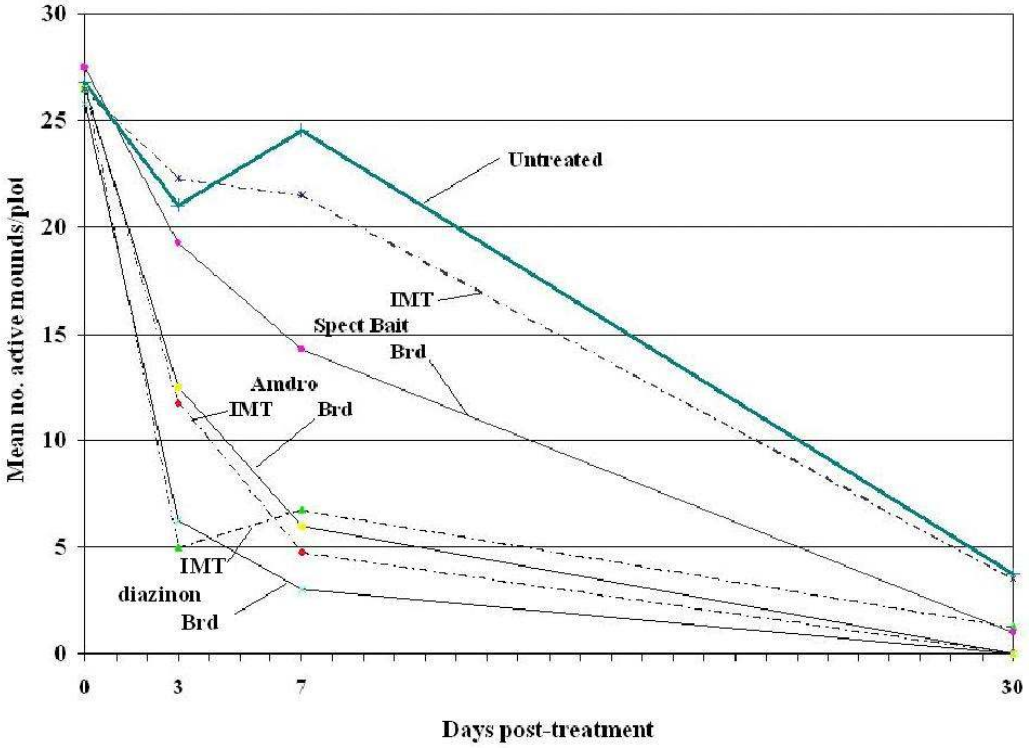

Figure 1.

Summary of efficacy data, Cameron, Texas - 1999

In this test, there was little difference in speed of control between an IMT and broadcast treatment of each single product. This is more the exception than the rule and was probably caused by environmental factors. Contact insecticides, applied either way, generally control colonies within a few days, as seen here. Insect growth regulator baits generally show no differences between broadcast and IMT treatments, also as shown here, but they usually take much longer to work, on the order of 2 - 3 months in the summer. Amdro IMTs, however, generally control colonies in about a week while broadcasting usually takes 2 - 4 weeks. The differences between Amdro application methods are probably due to the heat, high natural ant mortality rate and lack of mound rebuilding.

This test illustrates the speed and effectiveness of broadcast versus individual mound insecticide applications. The amount of time needed to treat an area with IMTs makes the practice prohibitive in almost any type of commercial setting or on any area larger than a few thousand square feet. The IMTs also used as much or more product than their companion broadcast applications, adding further to their cost. Despite the speed and ease of broadcast treatments, this test still supports the idea of contact insecticides and IMTs in *certain situations.* Even when baits work far faster than normal, as occurred here, the contact insecticides worked faster. If speed of control is a critical factor, contact insecticides are the preferred choice, but as a broadcast - mound treatments are still too labor intensive. In cases where there are very few mounds (usually fewer than 20 per acre) individual mound treatments are less expensive than broadcast applications - unless labor is included - in which case, the cost of the time it take to just survey the

area for mounds will exceed the cost of a bait application.

Table 3. Treatment time analysis for 1/8-acre plots. Average 26.5 active imported fire ant mounds per plot (212 per acre).

Treatment	Mean treatment time (min.)	Tukey's HSD test	Duncan mult. range test
diazinon IMT	50:15	a	a
Spect Bait IMT	13:53	b	b
Amdro IMT	10:08	b	bc
diazinon b'cast*	3:04	b	c
Spect Bait b'cast	2:50	b	c
Amdro b'cast	2:35	b	c
F-value	32.34		
P	0.0001		
R^2	0.9452		
MSE	95941.04		

Means in the same column with the same letter are not significantly different. Means separated by Tukey's studentized range (HSD) test and Duncan's Multiple Range Test, $P < 0.05$. Time analyzed as seconds, then converted to minutes for easier comprehension. df = 15.
* Does not include area irrigation time.

As shown in **Figure 1**, Amdro gave virtually the same control as diazinon within a week, regardless of the method by which it was applied. Though somewhat fast for Amdro, this speed is not unheard of. Speed of control is relative to what customers expect. If control is expected within a day or two, a contact insecticide is the only solution. However, if a consumer can be satisfied with noticeably "sick" mounds in a few days and elimination of activity within a week or two, then broadcast Amdro is the easiest, least expensive and most environmentally safe choice. Insect growth regulator baits are simply too slow as a curative treatment in most situations, performing better as a preventive in the long term, as a hopper blend, or as a follow up to an initial Amdro treatment to knock-down the existing ant population.