

**RED IMPORTED FIRE ANT MANAGEMENT  
APPLIED RESEARCH/RESULT DEMONSTRATIONS  
1995-1997**

---

| <b>PAGE</b> | <b>CONTENTS</b>  |
|-------------|--|
| 1           | Evaluation of currently registered and experimental broadcast-applied bait-formulated insecticides for suppression of the red imported fire ant - Bastiaan M. Drees and Charles L. Barr                      |
| 7           | Evaluation of a new insect growth regulator, pyriproxyfen and other broadcast-applied bait products and product mixtures for suppression of the red imported fire ant -Bastiaan M. Drees and Charles L. Barr |
| 10          | Evaluation of fenoxycarb (Award™) formulations and fertilizer blends for suppression of the red imported fire ant - Bastiaan M. Drees and Charles L. Barr  |
| 13          | Evaluation of Amdro® Insecticide Bait (hydramethylnon) production quality between production plants - Charles L. Barr  |
| 17          | Evaluation of Combat® (hydramethylnon) ant bait and treatment patterns - Bastiaan M. Drees, Charles L. Barr and S. Bradleigh Vinson  |
| 28          | Evaluation of 15% granular acephate (Velocity®) as a dry individual red imported fire ant mound treatment - C. L. Barr   |
| 30          | Evaluation of bifenthrin (Talstar®)formulations as individual fire ant mound treatments - Charles L. Barr and Bastiaan M. Drees  |
| 33          | Carbaryl (Sevin®) dust and liquid formulation individual fire ant mound treatment efficacy trial - Charles L. Barr and Lyle Zoeller  |
| 37          | Evaluation of lindane (Gamma-Mean®) as an fire ant mound injection treatment - Charles L. Barr and Bastiaan M. Drees   |
| 40          | Evaluation of Works Well short-chained aliphatic hydrocarbons as a red imported fire ant mound treatment - Charles L. Barr and Bastiaan M. Drees   |
| 45          | Laboratory and field evaluation of sorghum seed treatments to prevent damage by the red imported fire ant - Bastiaan M. Drees  |

---

---

The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Texas Agricultural Extension Service or the Texas Agricultural Experiment Station is implied.

---

Support for Texas A&M University fire ant programs reported herein was provided by:

American Cyanamid Corporation  
Ciba-Geigy Corporation/ Novartis  
F.M.C. Corporation  
Oregon-California Chemicals, Inc.  
Prentiss Incorporated  
Sandoz Agro, Inc.  
Solaris  
Texas Industries, Inc.  
Valent U.S.A.  
M. W. Hardwick

Educational programs conducted by the Texas Agricultural Extension Service serve people of all ages regardless of socioeconomic level, race, color, sex, religion, disability or national origin.

---

The Texas A&M University System, U.S. Department of Agriculture, and the County Commissioners Courts of Texas cooperating

# **EVALUATION OF CURRENTLY REGISTERED AND EXPERIMENTAL BROADCAST-APPLIED BAIT-FORMULATED INSECTICIDES FOR SUPPRESSION OF THE RED IMPORTED FIRE ANT**

Bastiaan M. Drees, Professor and Extension Entomologist and  
Charles L. Barr, Extension Associate

This test is the most comprehensive side-by-side comparison of broadcast baits yet conducted by our Applied Fire Ant Research Program. Results will be used to help determine which baits are most appropriate for use in a given situation based on speed of mound activity elimination, total active mound reduction and duration of suppression. In order to compare the speed and effectiveness of the available, or potentially available, fire ant baits, products from several companies were combined into a single large-scale field test. Additionally, an experimental compound from American Cyanamid (AC 303,630, a pyrrole insecticide/miticide) was tested for effectiveness at four different formulation rates, plus a blank.

## **Materials and Methods**

Plots were established, 29 and 30 August 1996, in an approximately 40 acre field in the western part of Brazos County, Texas. Pre-treatment fire ant mound number were obtained, 2 and 3 September, by counting all active ant mounds within a 0.25 acre circle in the center of each 0.5 acre square plot. A mound was considered active if a sufficient number of ants rose to the surface within 15 seconds of light disturbance given the weather conditions at the time (the minimum disturbance method). Pre-count data were arrayed from lowest to highest then grouped into four blocks of 10 plots each. Treatments were assigned within groups so that the total number of mounds for each treatment was as equal as possible across all blocks.

The terrain of the experimental site was extremely rough due to the great number of large, grass-covered fire ant mounds. The roughness made it impossible to drive any type of vehicle fast enough or at a steady enough speed to accurately apply baits with the precision needed for this test. Hand application with a "belly-bumper" seeder was also impractical due to size of the test and need for even, complete coverage. Consequently, a gasoline-powered Solo® backpack mist sprayer was modified to apply fire ant baits. Modifications were very simple and the treatments appeared to go out easily and quite evenly with a minimum of skips. All products were applied at a rate of 1.5 pounds per acre. Treatments were applied late in the day to avoid the possibilities of photodegradation, loss of material due to heat melting the carrier, and afternoon thundershowers.

The following treatments were applied:

10 September, 4:30-7:00 p.m.

1. Amdro®/Siege® (hydramethylnon)
  2. Logic®/Award® (fenoxycarb)
  3. V71639 (pyriproxyfen)
  4. Affirm®/Ascend® (abamectin)
  5. AC 303,630 blank
- Untreated Control

12 September, 4:00-7:00 p.m.

6. AC 303,630 .001% (a pyrrole)
7. AC 303,630 .0025%
8. AC 303,630 .005%
9. AC 303,630 .0075%

Post-treatment counts were conducted 18 - 19 September, 30 September - 1 October, and 11 October. A rating scale was used to help determine mound activity reduction. Upon disturbance mounds were rated as follows: 3 = over 1,000 ants; 2 = 100 - 1,000 ants; 1 = less than 100 ants. Thereafter (21 March 1997), plots other than those treated with AC 303,630 were monitored for number of active mounds, but mounds were not individually rated for activity.

Evaluators attempted to compensate for differences in temperature and time of day when assigning ratings. Statistical analyses were conducted using PC SAS Analysis of Variance (ANOVA) and means were separated using Tukey's studentized range test ( $P \leq 0.05$ ). Both number of mounds and total rating [(number of mounds X rating)] for each plot were analyzed.

## Results and Discussion

Application of hydramethylnon (Amdro® Insecticide Bait/Siege®) bait resulted in 75 percent active mound reduction in one week, with an 84 percent reduction in one month (**Table 1**). This speed of activity for hydramethylnon bait is unprecedented in our experience. It is likely that climate conditions played a major part in such a rapid reduction. This area of Texas had been under severe drought conditions for several months resulting in an almost complete lack of fire ant mound building activity and, it was observed, significant decreases in colony size. The area then received over 10 inches of rainfall in August alone, accompanied by below normal high temperatures. These favorable conditions resulted in vigorous mound building activity, a flush of brood production, and a likely increase in foraging activity. Therefore, small, weakened colonies probably picked up a large proportion of all the baits. Since hydramethylnon is known to be toxic to both queens and workers, there was a sufficient amount picked up to kill a proportionally greater number of workers in these smaller colonies than would normally occur in large colonies. The result was a very rapid elimination of ant mound activity in hydramethylnon bait treated plots.

The remaining registered, commercially-available treatments appeared to be progressing as expected, given the characteristics of their active ingredients. Abamectin (Affirm™/Ascend®) bait produced no statistically significant reduction of mound activity at one week, though it did have a numerical

reduction. By two weeks post-treatment, it was statistically lower than the untreated check and by four weeks, abamectin bait had reduced mound numbers by over 60 percent relative to pre-count levels. Fenoxycarb (Logic®/Award®) and the experimental insect growth regulator (IGR) pyriproxyfen (V71639) bait began to show numerical reductions by week four, though no statistical differences had been found by that time. Observations indicate a lack of worker brood in plots of all three treatments so a continued decline was to be expected. Speed of ant mound activity reduction from IGR-type (juvenoid) insecticides (fenoxycarb and pyriproxyfen) is partially determined by prevailing weather conditions, which had been very dry and warm since the one-week evaluation.

None of the pyrrole AC 303,630 formulations showed significant or consistent numerical reduction in mound activity versus either pre-counts, the blank treatment, or untreated control plots. Observations indicate large amounts of worker brood present in the mounds of these plots. Activity ratings had actually increased in some of these plots versus those from the one and two-week evaluations. It appeared that this bait formulation was either ineffective or unattractive to the ants and would result in little or no reduction in mound numbers or activity. Monitoring activities in plots treated with AC 303,630 were abandoned in 1997.

By 6 months after treatment (20 March 1997), all chemical treatment plots monitored contained significantly fewer active ant mounds than did untreated plots. However, the active fire ant mounds in the hydramethylnon (Amdro®/Siege®) bait treated plots were of the same average size and rating (3) as mounds in untreated plots. To a lesser extent, and with more variability, mounds in the abamectin (Affirm™/Ascend®) bait treated plots also had some well-developed colonies. On the other hand, mounds in the insect growth regulator treatment (IGR) plots (Logic®/Award® and V71639) were very small (rating 1 to 2), and had very little evidence of freshly excavated dirt on top of the colony site. In short, they were hardly noticeable, but still present.

Evaluations were continued for one year for the remaining products. By mid-March (6 months) during an unusually cool, wet spring, mound activity still appeared to be declining. All treatments were significantly different from untreated plots and statistically similar to each other. The May evaluation showed roughly 75 percent reduction of ant mound numbers versus untreated plots for the IGR (Logic®/Award® and V71639) bait products. All were similar statistically and significantly less than both untreated plots and hydramethylnon bait treated plots. Active mound numbers in hydramethylnon bait treated plots were on the rise.

The final, one-year post-treatment evaluation was conducted in late August 1997 during a very dry, hot summer. Mound numbers in untreated plots were about 30 percent less than in May. Fenoxycarb (Logic®/Award®) bait treatments produced its maximum suppression at this point. Abamectin (Ascend®/Affirm™) and pyriproxyfen (V71639) baits appeared to be either holding steady at their maximum suppression level or beginning a re-infestation trend. Hydramethylnon (Amdro®/Siege®) bait treated plots still had significantly lower ant mounds than untreated plots, but had three times the number of mounds recorded at its point of maximum suppression at 4-weeks post-treatment in October 1996.

In conclusion, it appears that hydramethylnon (Amdro®/Siege®) bait worked unusually fast and somewhat more poorly than is usually encountered initially. At one year it was up to only 38 percent reduction in ant mound numbers versus those in untreated plots. Fenoxycarb (Logic®/Award®) bait was very slow to reach maximum suppression, but provided the best control of all the products at one year post-treatment, about 74 percent reduction in ant mound numbers versus those in untreated plots. Abamectin (Ascend®/Affirm™) bait had a rapid drop in numbers initially, followed by a bounce-back. It then followed the decline of pyriproxyfen (V71639) bait almost exactly. Pyriproxyfen bait lacked the initial drop of hydramethylnon and abamectin baits. It appears that both these compounds reach maximum suppression within about 6 months, intermediate to hydramethylnon and fenoxycarb. They showed roughly 58 percent reduction in mound numbers versus untreated at one year.

The results of this test emphasize the need for planning when treating an area with bait. On one hand, hydramethylnon bait can show impressive activity within a month, but ants may re-infest to unacceptable levels within six or eight months. Fenoxycarb bait, on the other hand, may not provide acceptable control for four to six months, particularly if weather conditions are favorable for ant survival. The two other compounds (abamectin and pyriproxyfen) appear to fall somewhere in between, but their suppression patterns are not as well understood due to a lack of data compared to the other commercially-available bait products.

If spring control of fire ants is desired, an hydramethylnon bait application in the late fall may be the best choice to ensure maximum suppression at that time. The severity of winters in Texas is very unpredictable, so relying on them for ant mortality is guesswork, at best. Had the winter of 1996-97 been dry or very cold, fenoxycarb bait would probably have performed better by spring. Texas summers, however, are notoriously reliable for being long, hot, and dry with high ant mortality. Fenoxycarb bait may best be applied in the spring for maximum control in the fall since high natural mortality is a virtual certainty. A summer or early fall application of fenoxycarb may also be effective for both fall and spring control since it still allows a period of high mortality and prevents reproduction during the mild fall months.

**Table 1.** Mean number and rating\* of red imported fire ant mounds per 1/4 acre subplot before and following broadcast application of currently registered and experimental bait-formulated fire ant insecticides applied 10 and 12 September 1996, Brazos Co., Texas.

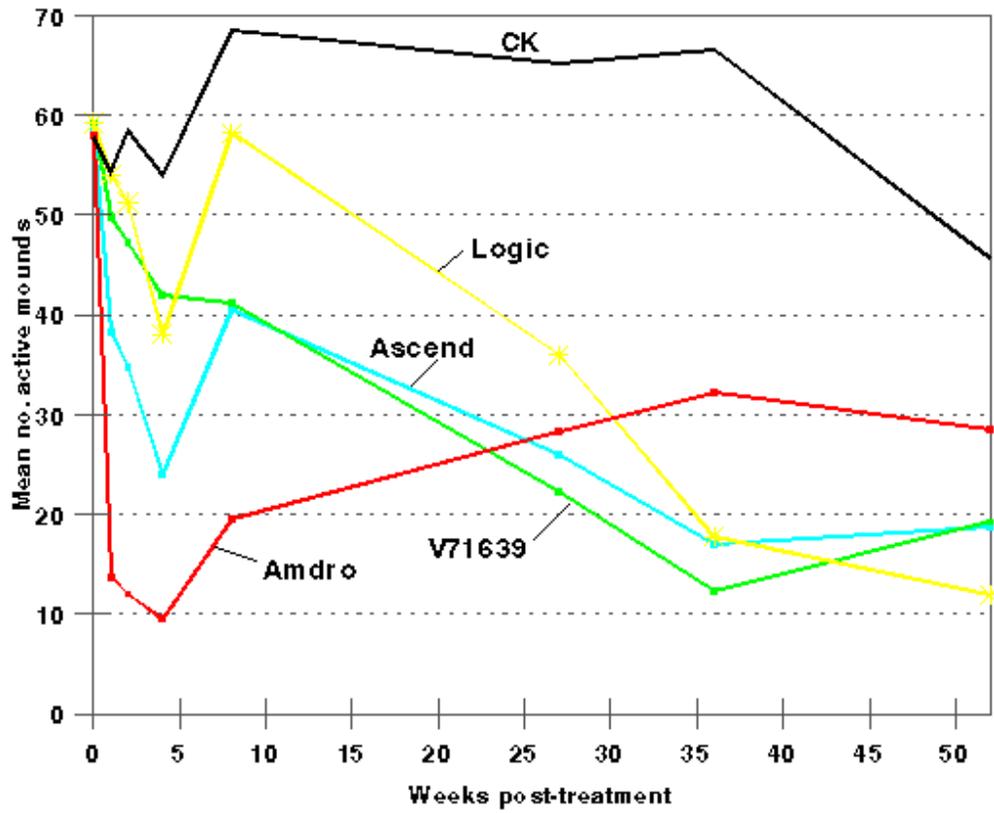
| Product           | Mean no. ant mounds per 1/4 acre** |        |        |         |         |         |         |
|-------------------|------------------------------------|--------|--------|---------|---------|---------|---------|
|                   | pre-count                          | 1 week |        | 2 weeks |         | 4 weeks |         |
|                   |                                    | count  | rating | count   | rating  | count   | rating  |
| Amdro®/Seige®     | 58.0a                              | 13.8b  | 24.3b  | 12.0c   | 27.8c   | 9.5c    | 23.5c   |
| Affirm®/Ascend®   | 58.5a                              | 38.3a  | 96.0a  | 34.8b   | 82.3bc  | 24.0bc  | 56.8bc  |
| V71639            | 59.3a                              | 49.8a  | 131.5a | 47.3ab  | 130.3ab | 42.0ab  | 105.3ab |
| Logic®/Award®     | 59.3a                              | 54.0a  | 152.0a | 51.3ab  | 143.8ab | 38.0ab  | 97.0abc |
| Untreated Control | 57.8a                              | 54.3a  | 157.5a | 58.5a   | 173.3a  | 54.0a   | 158.8a  |
| AC 303,630 .001%  | 58.0a                              | 49.3a  | 142.0a | 62.8a   | 183.3a  | 58.5a   | 169.5a  |
| AC 303,630 .0025% | 58.0a                              | 48.8a  | 134.3a | 49.0ab  | 144.0ab | 58.0a   | 170.5a  |
| AC 303,630 .005%  | 58.0a                              | 47.0a  | 130.0a | 43.3ab  | 126.0ab | 53.3a   | 154.8a  |
| AC 303,630 .0075% | 58.0a                              | 45.5a  | 126.0a | 53.8ab  | 155.5a  | 54.8a   | 155.0a  |
| AC 303,630 blank  | 59.3a                              | 47.0a  | 132.5a | 59.8a   | 172.3a  | 53.3a   | 154.3a  |
| <i>F</i>          | 14.54                              | 8.40   | 9.20   | 11.23   | 11.69   | 8.51    | 8.80    |
| <i>P</i>          | 0.0001                             | 0.0001 | 0.0001 | 0.0001  | 0.0001  | 0.0001  | 0.0001  |
| Min. Sig. Diff.   | 12.029                             | 22.234 | 65.202 | 21.949  | 67.524  | 25.698  | 78.134  |
| d.f. =            | 27                                 |        |        |         |         |         |         |
| Critical value =  | 4.864                              |        |        |         |         |         |         |

| Product           | count  | Mean no. ant mounds per 1/4 acre** |                |                |                 |  |
|-------------------|--------|------------------------------------|----------------|----------------|-----------------|--|
|                   |        | 8 weeks<br>rating                  | 6 mo.<br>count | 8 mo.<br>count | 12 mo.<br>count |  |
| Amdro®/Seige®     | 19.5c  | 52.3d                              | 28.3b          | 32.3b          | 28.5b           |  |
| Affirm®/Ascend®   | 40.5b  | 83.5cd                             | 26.0b          | 17.0c          | 18.8c           |  |
| V71639            | 41.3b  | 80.5cd                             | 22.3b          | 12.3c          | 19.3c           |  |
| Logic®/Award®     | 58.3ab | 129.0bc                            | 36.0b          | 17.8c          | 12.0c           |  |
| Untreated Control | 68.5a  | 203.3a                             | 65.3a          | 66.5a          | 45.8a           |  |
| AC 303,630 .001%  | 62.0a  | 182.0 ab                           | --             | --             | --              |  |
| AC 303,630 .0025% | 66.3a  | 197.3a                             | --             | --             | --              |  |
| AC 303,630 .005%  | 61.3a  | 171.5ab--                          | --             | --             | --              |  |
| AC 303,630 .0075% | 73.3a  | 213.3a                             | --             | --             | --              |  |
| AC 303,630 blank  | 66.0a  | 188.8ab--                          | --             | --             | --              |  |
| <i>F</i>          | 16.88  | 18.56                              | 10.83          | 33.78          | 16.46           |  |
| <i>P</i>          | 0.0001 | 0.0001                             | 0.0002         | 0.0001         | 0.0001          |  |
| MSD               | 18.774 | 60.599                             | 18.153         | 13.465         | 12.002          |  |
| d.f. =            | 27     | 27                                 | 12             | 12             | 12              |  |

\* Upon disturbance mounds were rated as follows: 3 = over 1,000 ants; 2 = 100 - 1,000 ants; 1 = less than 100 ants.

\*\*Means followed by the same letters are not significantly different using analysis of variance (ANOVA) and means separated using Tukey's studentized range test ( $P \leq 0.05$ ). Both number of mounds and total rating [Ó(number of mounds X rating)] for each plot were analyzed.

**Figure 1.** Performance profile of currently registered and experimental bait-formulated fire ant insecticides applied 10 and 12 September 1996, Brazos Co., Texas.



**EVALUATION OF A NEW INSECT GROWTH REGULATOR,  
PYRIPROXYFEN (V-71639), AND OTHER BROADCAST-APPLIED BAIT  
PRODUCTS AND PRODUCT MIXTURES  
FOR SUPPRESSION OF THE RED IMPORTED FIRE ANT**

Bastiaan M. Drees, Professor and Extension Entomologist and  
Charles L. Barr, Extension Associate

Previous work has shown that the combination of bait formulations containing a "juvenoid"-type insect growth regulator (*e.g.*, fenoxycarb) plus a metabolic inhibitor (*e.g.* hydramethylnon) suppressed active red imported fire ant mound numbers more quickly than the insect growth regulator (IGR) and for longer than the metabolic inhibitor alone (Drees *et al.* 1993, 1995). This trial was conducted to determine if a similar effect could be achieved. A potential new insect growth regulator formulation containing 0.5 % pyriproxyfen, V-71639, from Valent U.S.A. was also evaluated.

**Materials and Methods**

Thirty two 1 acre rectangular plots were established on land behind the earthen dam behind Granger Lake in Williamson County, Texas. Prior to treatment, the number of active red imported fire ant mounds in each 1/3 acre subplot sampling area was counted. Plots were arrayed in order from highest to lowest active fire ant mound numbers and divided in to four blocks (replicates) of eight plots each. The following treatments were assigned at random to each of the blocks:

| <u>Treatments</u>                           | <u>Rate(s)</u>       | <u>Plots</u> |
|---|----------------------|--------------|
| 1. Exp.*                                    | --                   | --           |
| 2. Exp.*                                    | --                   | --           |
| 3. Exp.*                                    | --                   | --           |
| 4. Amdro® <sup>1</sup> /Award® <sup>2</sup> | 0.75 + 0.75 lb/acre) | 19,21,22,32  |
| 5. Nylar™ <sup>3</sup>                      | 1.5 lb/acre)         | 12,15,27,30  |
| 6. untreated control                        | --                   | 2,8,9,24     |
| 7. Award®                                   | 1.5 lb/acre          | 3,13,23,29   |
| 8. Exp.*                                    | --                   | --           |

---

\*Information regarding these treatments can not be released until the interval of the Proprietary Agreement between the private organization and the Texas Agricultural Extension Service has elapsed.

<sup>1</sup> Amdro® Granular Insecticide 24567-41 12/92 (Unopened jugs); American Cyanamid

<sup>2</sup> Award® Brand of Logic Fire Ant Bait; CGA119L2A 032; Ciba-Geigy Corp.

<sup>3</sup> V-71639 0.5% BA 3.624 kg. Batch VS-1813-97; 5/10/95; GLP#NA; SR#:V01996 (2481); Lot #:V050495 JNF Ext. 5/4/0; Valent U.S.A.

Treatments were applied, 11 July 1995 on a clear, hot day (Treated 10:00 am - 1:09 pm & 4:01 - 7:30 pm. Max temp, 4:50 = 102.4 degrees F.) using a tractor mounted Herd® Model GT-77 seeder using 10 swaths/plot (7-9 paces apart; 10 min./plot).

## Results and Discussion

No significant differences in mean number of red imported fire ant mounds occurred prior to treatment (Table 1). Metabolic inhibitors or mixtures with these compounds (Amdro® + Award®) produced significant reductions of active ant mounds within 3 weeks after application. "Juvenoid" insect growth regulators or IGRs (pyriproxyfen, fenoxycarb) did not produce significant reductions in mound numbers relative to untreated check plots until 8 weeks (pyriproxyfen) or 12 weeks (fenoxycarb) after treatment. The mixture of metabolic inhibitor plus "juvenoid" IGR treatments suppressed them for the 6 month duration of this trial. These results confirm earlier studies of an enhanced product performance "profile" realized with the application of these product mixtures. This trial was terminated after only 6 months of treatment because of poor weather conditions. No rain was received in this test location from May through late August, reducing ant mounding activity to almost undetectable levels.

---

Drees, B. M., C. L. Barr, M. E. Heimer and R. Leps. 1995. Reducing treatment costs for fire ant suppression in Texas cattle production systems. *in* Proceedings of the Fifth International Pest Ant Symposia and the 1995 Annual Imported Fire Ant Conference (ed. S. B. Vinson and B. M. Drees), San Antonio, Texas. pp.146-154.

Drees, B. M., C. L. Barr and M. E. Heimer. 1993 Skip-swath application of Amdro® Logic® broadcast baits for the suppression of the red imported fire ant *in* Proceedings of the 1993 Imported Fire Ant Conference (ed. J. P. Ellis) Charleston, South Carolina.

**ACKNOWLEDGEMENTS:** We wish to thank Eugene Marak, Foreman, Precinct 4, Williamson Co., for providing the tractor used to apply treatments in this trial. Ronald Leps, County Extension Agent, Agriculture, collaborated in applying treatments in this trial.

**Table 1.** Number of active red imported fire ant mounds before and following application of bait-formulated insecticides, Granger Lake, Williamson County, Texas, treated 11 July 1995.

| <u>Treatments</u>            | <b>Mean number of active mounds*</b> |                |                 |                  |                |
|------------------------------|--------------------------------------|----------------|-----------------|------------------|----------------|
|                              | <u>Precount</u>                      | <u>3 weeks</u> | <u>8 - week</u> | <u>12 - week</u> | <u>6 month</u> |
| untreated control            | 29.5                                 | 25.0a          | 9.75 a          | 12.75 a          | 43.50 a        |
| <b>Metabolic inhibitors:</b> |                                      |                |                 |                  |                |
| Exp.                         | --                                   | --             | --              | --               | --             |
| <b>"Juvenoid" IGRs:</b>      |                                      |                |                 |                  |                |
| Exp.                         |                                      |                |                 |                  |                |
| pyriproxyfen (V-71639)       | 27.5                                 | 15.5abc        | 1.25 bc         | 2.00 c           | 4.00 b         |
| fenoxycarb (Award®)          |                                      |                |                 |                  |                |
| 1.5 lb/acre                  | 29.3                                 | 17.3abc        | 7.25 a          | 1.50 c           | 3.25 b         |
| <b>Mixtures:</b>             |                                      |                |                 |                  |                |
| Exp.                         | --                                   | --             | --              | --               | --             |
| hydramethylnon               |                                      |                |                 |                  |                |
| (Amdro®/Award®)              | 28.3                                 | 4.8bc          | 0.00 c          | 1.75 c           | 4.50 b         |
| 0.75 + 0.75 lb/acre          |                                      |                |                 |                  |                |
| <i>F</i> =                   | NS                                   | 5.44           | 8.31            | 4.16             | 6.76           |
| <i>P</i> =                   | NS                                   | 0.0005         | 0.0001          | 0.0029           | 0.0001         |
| MSD =                        | NS                                   | 14.747         | 5.7202          | 9.009            | 26.956         |
| d.f. = 21                    |                                      |                |                 |                  |                |
| Critical value. = 4.743      |                                      |                |                 |                  |                |

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

**EVALUATION OF FENOXYCARB (AWARD™) FORMULATIONS  
AND FERTILIZER BLENDS FOR SUPPRESSION OF  
THE RED IMPORTED FIRE ANT**

Bastiaan M. Drees, Professor and Extension Entomologist, and  
Charles L. Barr, Extension Associate

Development of a fire ant bait product that can be applied as a formulation with fertilizer could result in a labor savings in applying these inputs to maintain ornamental turfgrass in areas such as golf courses. Conventionally formulated fire ant bait loses attractiveness to foraging ants when blended with fertilizers. Blending formulations Award™ (fenoxycarb) Brand of Logic® Fire Ant Bait with encapsulated fertilizer has shown some promise in successfully suppressing fire ants. This trial was conducted to further evaluate a new formulation of Award and several Award-fertilizer blends.

**Materials and Methods**

The trial was located on the B. H. Look Ranch in Waller County, Texas. Plots consist of 1 acre squares, with a 30 foot buffer between plots. The sampling area consisted of a circle, 105 feet in radius for a total area of 0.795 acres. The circle was divided into quadrants, each with an approximate area of 0.20 acres, for sub-plot analysis.

Prior to treatment, the number of active fire ant mounds within each subplot quadrant was documented. Treatments were applied on 9 August 1995 using a tractor-mounted Herd GT-77 seeder for the bait-only plots and a tractor-mounted broadcast-type fertilizer spreader for the fertilizer blends:

| <u>Treatment</u>   | <u>Rate</u>       |
|--|-------------------|
| 1. untreated control   | ---               |
| 2. Award™  | 1.5 lbs per acre  |
| 3. CGA 114597 IGR-A  | 1.5 lbs. per acre |
| 4. "Product 1" - Orange fertilizer;<br>35-0-0 Tri-Kote + CGA   | 100 lbs. per acre |
| 5. "Product 2" - Orange fertilizer;<br>35-0-0 Tri-Kote + Award | 100 lbs. per acre |
| 6. "Product 3" - Green fertilizer;<br>35-0-11 Polyon + Award   | 100 lbs. per acre |
| 7. "Product 4" - Green fertilizer;<br>35-0-11 Polyon + CGA     | 100 lbs. per acre |

The first evaluation was conducted on 13 October 1995 by digging each mound with a shovel, giving it a rating of 1-5 and indicating the presence of brood according to the USDA rating system (Harlan, *et al.* 1981; Lofgren and Williams 1982). Two months after treatment, a post-treatment evaluation was conducted using the same method. Results were analyzed using PC SAS Analysis of Variance (ANOVA,  $P \leq 0.05$ ) and Tukey's Studentized Range test for mean separation.

## Results and Discussion

Two months following application of fenoxycarb baits and bait plus fertilizer blend treatments, no significant differences in number of fire ant mounds per sub-plot area were found between treatments (**Table 1**). However, there were significant differences between mound ratings, with CGA 114597 IGR-A and "Product 1" (Tri-Kote) treatments differing from those in untreated control subplots. Award<sup>TM</sup> performed numerically better than "Products 2, 3 and 4" but did not perform significantly different other treatments. Due to the plot design of this trial, with subplots occurring within larger treatment plots, there were numerical pre-treatment differences resulting in a higher variability (shown by raw data provided in Table 1) which influenced our ability to separate, statistically, means in this two-month post-treatment evaluation.

This trial was scheduled to be continued and to receive a second application of baits in the spring. However, due to dry weather this field began to be used for grazing livestock. Thus, the trial was abandoned in the spring.

---

Harlan, D. P., W. A. Banks, H. L. Collins and C. E. Stringer. 1981. Large area tests of AC-217,300 bait for control of imported fire ants in Alabama, Louisiana, and Texas. *Southwest Entomol.* 6:150-157.

Lofgren, C. S. and D. F. Williams. 1982. Avermectin B<sub>1a</sub>: A highly potent inhibitor of reproduction by queens of the red imported fire ant. *J. Econ. Entomol.* 75: 798-803.

**Table 1.** Number of active red imported fire ant mounds and mean mound rating (Harlan, *et al.* 1981; Lofgren and Williams 1982) per 0.20 acre sub-plot and treatment mean before and two months after broadcast application of fenoxycarb bait-formulations and bait plus encapsulated fertilizer blends, B. H. Look Ranch, Waller Co., Texas, applied Oct. 9, 1995.

| <b>Number of active mounds per 0.20 acre sub-plot / treatment mean*</b> |                    |                     |
|---|--------------------|---------------------|
| <u>Treatment</u>  | <u>Pre-count</u>   | <u>Two months</u>   |
| Untreated control   | 34,20,18,12 / 24.0 | 12,10,11,7 / 10.00  |
| Award <sup>TM</sup>   | 45,33,32,29 / 31.3 | 21,11,14,11 / 14.25 |
| CGA 114597 IGR-A  | 33,32,29,28 / 31.3 | 13,16,4,12 / 11.25  |
| "Product 1"***  | 35,18,18,10 / 23.7 | 11,10,6,2 / 7.25    |
| "Product 2"***  | 28,25,21,13 / 24.7 | 9,11,10,10 / 10.00  |
| "Product 3"***  | 25,21,14,13 / 20.0 | 25,11,4,6 / 11.50   |
| "Product 4"***  | 24,20,20,11 / 21.7 | 16,13,11,7 / 11.75  |

| <b>Mound ratings after two months</b> |                              |                |
|---------------------------------------|------------------------------|----------------|
| <u>Treatment</u>                      | <u>Rating total per plot</u> | <u>Mean***</u> |
| Untreated control                     | 134,132,176,142              | 146.0 a        |
| Award <sup>TM</sup>                   | 62,39,35,37                  | 43.25 ab       |
| CGA 114597 IGR-A                      | 50,45,10,36                  | 35.25 b        |
| "Product 1"***                        | 45,14,68,6                   | 33.25 b        |
| "Product 2"***                        | 94,135,60,171                | 115.0 ab       |
| "Product 3"***                        | 238,106,39,16                | 99.75 ab       |
| "Product 4"***                        | 125,106,86,37                | 88.50 ab       |

|                         |        |
|-------------------------|--------|
| <i>F</i>                | 3.50   |
| <i>P</i>                | 0.0147 |
| d.f. = 21; MSD = 107.93 |        |

\* No statistically significant ( $P \leq 0.05$ ) differences were found.

\*\* "Product 1" - Orange fertilizer, 35-0-0 Tri-Kote + CGA, 100 lbs. per acre; "Product 2" - Orange fertilizer, 35-0-0 Tri-Kote + Award, 100 lbs. per acre; "Product 3" - Green fertilizer, 35-0-11 Polyon + Award, 100 lbs. per acre; "Product 4" - Green fertilizer, 35-0-11 Polyon + CGA, 100 lbs. per acre.

\*\*\* Means followed by the same letter are not significantly different ( $P \leq 0.05$ ) using PC SAS ANOVA and Tukey's Studentized Range test for mean separation.

## Evaluation of Amdro® (Hydramethylnon) Quality Between Production Plants

Charles L. Barr, Extension Associate

In 1996, the American Cyanamid Co. relocated the manufacturing plant for the fire ant bait product Amdro® Insecticide Bait (0.73% hydramethylnon). To verify the effectiveness of product lots produced at the new location, samples were tested in the field versus product produced at the old plant and an untreated control.

A second purpose of the test was to evaluate the practicality of an alternative plot sampling method more suitable for one-man set-up and evaluation than traditional methods best evaluated with at least two people. The new method utilizes the counting of mounds within concentric rings within a circular sampling area versus the traditional method of counting mounds within the area of a complete circular sampling area within a treated square area. The traditional method involves zig-zagging across circular plots while attempting to scan wedge-shaped areas. Experience has shown that plot centers are scanned repeatedly while slices along the outer edges may get missed or only viewed from a distance. Walking along a fixed radius and scanning a fixed distance to either side is essentially a circular transect and should provide much more consistent and thorough visual coverage.

It was also hoped that the use of concentric circle sub-plots would help reduce variability in mound counts across patchy fire ant infestations as opposed to traditional methods where circular plots are divided into quarters or halves. Again, experience has shown that fire ants tend to concentrate mounds along linear features such as levees, tire tracks and drainage ways. As an example, if a water diversion levee with high ant mound numbers crosses one side of a plot circle, only one or two quarter-circle sub-plots would encounter it. Potentially, all concentric circle sub-plots would cross the levee at least once, thus reducing variability.

### Materials and Methods

The site of this trial was located on an ungrazed pasture about 3 miles south of Montgomery, Montgomery County, Texas. Four adjoining one-acre non-replicated square plots were established using a surveyor's transit and a 300-foot measuring tape. Corners were marked with wire flags and each plot was marked at its center with a 3-foot piece of 3/8" reinforcing rod.

Treatments were as follows:

| <u>Treatment</u> | <u>Lot#</u>   |
|------------------|---------------|
| Untreated        | -             |
| Amdro®           | 513003E       |
| Lot A            | AC-10861-65-2 |
| Lot B            | AC-10861-65-2 |

Amdro® was supplied by the manufacturer, American Cyanamid, during the summer of 1996 in retail one-pound plastic bottles to be used as part of another trial. Approximately 5 pounds each of Lot A and B were supplied in two five-gallon plastic jugs in October 1996 for use in this test.

The trial was established and treatments applied, 19 November 1996. The weather during application was partly cloudy, 75 to 78°F, light breeze and moderate to dry soil moisture. Application was made using a Solo® engine-powered backpack mist blower modified to apply bait products. Baits were applied at 1.5 lbs. per acre.

Evaluations were conducted by counting the number of active fire ant mounds within each of four ten-foot wide concentric circles between 60-70-80-90-100 foot radii of the center stake. Evaluations were conducted prior to treatment and at 2, 8 weeks and five months thereafter.

Sub-plot data were analyzed two different ways. The first method was to consider each set of four rings of similar size as a replication. In this manner, the area evaluated for each replication would be similar. The second method was to divide the number of active mounds counted within each ring by the area of that ring to obtain a mound per square foot value (mound density). These densities were then ranked within each plot (treatment) from highest to lowest. The highest density ring of each plot was then considered to be “Rep 1”, the next highest “Rep 2” and so on. Designations remained the same for all evaluations. All results were analyzed using PC SAS analysis of variance procedures. Means were separated using Tukey’s studentized range test ( $P \leq 0.05$ ).

## Results and Discussion

Both sub-plot analysis methods yielded similar results by the end of the test (**Tables 1 & 2**). All treatments had significantly lower active ant mound counts than the untreated control and statistically similar counts between treatments. All treatments produced numerically lower counts by two weeks post-treatment versus the untreated control. The four week evaluation produced some variation in results between treatments and between data conversion methods. These results indicate that formulations of hydramethylnon bait from the new manufacturing facility produce similar reductions in mound numbers as existing stocks of Amdro®.

The corresponding ring method of sub-plot replication grouping was certainly the easier to calculate of the two and the end results were the same. The density-calculated method, however, reduced variability between replications and produced more statistical separations. This method is similar in its grouping of true replications to the “railroad track” method used for individual mound treatment tests. In a test where replicated plots are treated and evaluated, rather than multiple sub-plot evaluations within non-replicated plots, the corresponding ring method would not be possible since only one ring of the same size would be evaluated in each plot. Therefore, the density-grouped method appears to be superior for plot assignment and statistical analysis purposes.

From a practical standpoint, evaluating concentric rings (circular transects) appears to be much more time-efficient than evaluating entire circles. It took an average of 4:05 minutes to evaluate the outer rings of three of the plots, an area of 0.137 acres each. If that figure is extrapolated to 0.25 acres, the size of a typical circular evaluation area, it should take 7:27 minutes to cover the same amount of ground. Similar results were obtained for the other three sets of concentric rings. Evaluation of one 0.25-acre circular plot in this test took 8:38 minutes. Typically, it takes 10-12 minutes (five to six per hour) to evaluate 0.25 acre circles in a normal test.

**Table 1.** Red imported fire ant mound numbers in concentric circular subplot areas within a circular sampling area before and after application of Amdro® (0.78% hydramethylnon) bait lots, Montgomery County, Texas, applied 19 November, 1996.

---

| <u>Treatment</u> | <u>Ring (ft. radius)</u> | <u>Active mounds per sub-plot</u> |               |               |                |
|------------------|--------------------------|-----------------------------------|---------------|---------------|----------------|
|                  |                          | <u>Pre-count</u>                  | <u>Week 2</u> | <u>Week 4</u> | <u>Month 5</u> |
| Untreated        | 90-100                   | 16                                | 15            | 12            | 11             |
|                  | 80-90                    | 16                                | 14            | 12            | 9              |
|                  | 70-80                    | 7                                 | 5             | 6             | 3              |
|                  | 60-70                    | 14                                | 10            | 9             | 8              |
| Amdro®           | 90-100                   | 16                                | 12            | 8             | 5              |
|                  | 80-90                    | 9                                 | 9             | 5             | 2              |
|                  | 70-80                    | 15                                | 8             | 7             | 2              |
|                  | 60-70                    | 8                                 | 5             | 4             | 0              |
| Lot A            | 90-100                   | 18                                | 13            | 11            | 4              |
|                  | 80-90                    | 9                                 | 4             | 5             | 2              |
|                  | 70-80                    | 12                                | 9             | 8             | 3              |
|                  | 60-70                    | 12                                | 8             | 5             | 4              |
| Lot B            | 90-100                   | 8                                 | 9             | 3             | 4              |
|                  | 80-90                    | 11                                | 6             | 3             | 2              |
|                  | 70-80                    | 17                                | 7             | 2             | 3              |
|                  | 60-70                    | 9                                 | 5             | 2             | 3              |

---

**Table 2.** Statistical analysis of red imported fire ant numbers using two methods of analyzing data from concentric ring subplot area data from a circular sampling plot before and after application of Amdro® (0.78% hydramethylnon) bait lots, Montgomery County, Texas, applied 19 November, 1996.

*Corresponding ring (equal area) replications*

| <u>Treatment</u>    | Mean* number of active mounds |               |               |                |
|---------------------|-------------------------------|---------------|---------------|----------------|
|                     | <u>Pre-count</u>              | <u>Week 2</u> | <u>Week 4</u> | <u>Month 5</u> |
| Untreated           | 13.25 a                       | 11.00 a       | 9.75 a        | 7.75 a         |
| Amdro®              | 12.00 a                       | 8.50 a        | 6.00 ab       | 2.25 b         |
| Lot A               | 12.75 a                       | 8.50 a        | 7.25 a        | 3.25 b         |
| Lot B               | 11.25 a                       | 6.75 a        | 2.50 b        | 3.00 b         |
| <i>F</i>            | 0.40                          | 2.47          | 6.16          | 4.94           |
| <i>P</i>            | 0.8605                        | 0.1078        | 0.0082        | 0.0167         |
| MSD                 | 9.3673                        | 5.958         | 4.2429        | 4.0008         |
| d.f. = 9            |                               |               |               |                |
| Crit. Value = 4.415 |                               |               |               |                |

*Density-grouped replications*

| <u>Treatment</u>    | Mean* mounds per square foot x 1,000 |               |               |                |
|---------------------|--------------------------------------|---------------|---------------|----------------|
|                     | <u>Pre-count</u>                     | <u>Week 2</u> | <u>Week 4</u> | <u>Month 5</u> |
| Untreated           | 2.5350 a                             | 2.0775 a      | 1.860 a       | 1.4675 a       |
| Amdro®              | 2.0775 a                             | 1.6150 a      | 1.155 b       | 0.4075 b       |
| Lot A               | 2.4525 a                             | 1.6350 a      | 1.385 ab      | 0.6325 b       |
| Lot B               | 2.2300 a                             | 1.2950 a      | 0.475 c       | 0.5800 b       |
| <i>F</i>            | 7.27                                 | 1.64          | 9.48          | 4.44           |
| <i>P</i>            | 0.0047                               | 0.2415        | 0.0018        | 0.0231         |
| MSD                 | 0.8133                               | 1.0863        | 0.6331        | 0.7535         |
| d.f. = 9            |                                      |               |               |                |
| Crit. Value = 4.415 |                                      |               |               |                |

\* Means in columns followed by the same letters are not significantly different using PC SAS ANOVA and Tukey's studentized range test for mean separation ( $P \leq 0.05$ ).

## EVALUATION OF COMBAT® (HYDRAMETHYLNON) ANT BAIT AND TREATMENT PATTERNS

Bastiaan M. Drees, Professor and Extension Entomologist,  
Charles L. Barr, Extension Associate, and  
S. Bradleigh Vinson, Professor, Department of Entomology,  
The Texas A&M University System

Combat® and MaxForce® granular ant baits containing hydramethylnon on particles composed of ground up silkworm caterpillars differ from conventional Amdro® and Seige® formulations. Conventional ant bait formulations contain an active ingredient formulated in soybean oil used to coat defatted, processed corn grit particles. This difference can make the Combat/MaxForce formulations attractive to a different spectrum of ant and insect species and make broadcast application using conventional equipment (e.g. Cyclone®, Herd® or Ortho® Whirlybird®) seeders difficult. This trial was conducted to evaluate Combat granular ant bait as a treatment to suppress the red imported fire ant, *Solenopsis invicta* Buren, when applied as a broadcast application and various patterns of spot applications. Spot treatments of a conventional ant bait formulation of fenoxycarb, Award®, was used for comparison.

The product, Combat® Outdoor Ant Killing Granules (1% hydramethylnon) distributed by Combat Insect Control Systems, is labeled for controlling fire ants, Argentine ants, carpenter ants, pharaoh ants, pavement ants, honey ants, acrobat ants, odorous house ants and thief ants when applied as spot treatments of 1 oz quantities of granules every 20 feet around the perimeter of the home or structure, or 1 oz. around each ant hill. Additional solid formulations in plastic encased outdoor and indoor bait stations are sold as Combat® Outdoor Ant Killing Stations (registered for fire ant, Argentine ants, black carpenter ants, cornfield ants, little black ants, odorous house ants and pavement ants) and Combat® Superbait® (registered for pharaoh ants, fire ants, carpenter ants, Argentine ants, crazy ants, thief ants, odorous house ants, acrobat ants and pavement ants). MaxForce® Professional Insect Control® Ant Killer Granular Bait (1% hydramethylnon) and Ant Killer Bait Stations (for indoor and outdoor use) distributed by MaxForce are similarly registered for the professional pest control operator market. However, the granular bait is to be applied outdoors, only, by lightly sprinkling 4 to 8 oz MaxForce Ant Killer Granular Bait evenly in a band approximately 1 to 2 feet wide adjacent to the foundation of the average sized home (200 to 400 linear feet). It may also be applied at a broadcast rate of 1 oz. per 1,800 sq. ft. or to individual fire ant mounds at 2 Tbsp. (1 oz.) around each hill.

### Materials and Methods

Forty plots, 100 by 100 ft., were established in a native pasture in Brazos Co., Texas. This field

was heavily infested with suspected monogyne and polygyne red imported fire ant colonies. Each plot contained a 35 ft. radius circular treatment area (thus, 40 ft. buffer areas between treatment circles) in the center in which the number of active red imported fire ant mounds were monitored by measuring their distance (to the nearest 1 ft. increment) from the plot center. Prior to treatment, plots were arrayed from highest to lowest number of mounds per circular subplot area. Five blocks (replications) of eight treatments each were established so that each treatment had a plot in each block. Treatment plots were assigned within each replicate block largely at random, but adjusted to reduce pre-treatment mean differences and variability between and among treatments. Eight treatments were initiated on 12 September 1996 as follows (Note: Combat® hydramethylnon granular bait treatment rates were calculated on applying 1.5 pounds per acre to the 70 by 70 ft. square or area-equivalent 39.5 ft radius circular plot, for a total of 76.61 grams maximum per plot):

1. Untreated control
2. Combat® hydramethylnon bait applied as a *broadcast* application, applying 76.61 g evenly across the 35 ft. radius circle. Applications were made with a Solo® backpack-style, engine-powered mist blower. Bait was placed in a coffee can attached to the end of the blower hose and the unit's Venturi-action feed tube used to vacuum the bait into the airstream.
3. Combat® hydramethylnon bait applied in a *grid pattern* of spot treatments, with 76.61 g placed in 11.7 g. spots every 20 ft around the 35 ft. radius perimeter, plus 5 spots every 20 ft. along a 16 ft. radius inner circle and a single spot in the center.
4. Combat® hydramethylnon bait applied as a *border* spot treatment, with 76.61 g placed in 11.7 g. spots every 20 ft around the 35 ft radius perimeter.
5. Combat® hydramethylnon bait applied as a *single center* spot, with 76.61 g scattered in an approximately 3 ft. radius spot in the plot center.
6. Combat® hydramethylnon bait applied as a *replenished* center spot, with 25.5 g applied three times at two-week intervals.
7. Award® fenoxycarb bait applied as a *single center* spot, with 76.61 g scattered in an approximately 3 ft. radius spot in the plot center.
8. Award® fenoxycarb bait as a *replenished* center spot, with 25.5 g applied at weekly intervals three times.

At time of treatment (9:30 am to 4:00 pm, 12 Sept. 1996), temperatures ranged from 70 to 80 degrees F. There was a light breeze and skies were partly cloudy with a persistent haze. Ants were observed picking up the bait within minutes of application throughout the day.

Plots were monitored for active ant mounds and mound locations from the plot center periodically (1 week, 2 weeks, 1 month and 2 months) after initiating treatments. Resulting active mound numbers per plot data were analyzed using analysis of variance (ANOVA) and means were separated using Tukey's studentized range test ( $P \leq 0.05$ ). The distance of each active ant mound from the plot center was recorded for all plots. The plot circle was then divided into 35 concentric circles (rings) of 1 ft. radius each and the area of each ring calculated. The number of active ant mounds at each radius was divided by the area of the corresponding ring to give a mound per

square foot density value. Densities were then analyzed and graphed using both linear regression and moving average techniques.

## Results and Discussion

The mean number of active red imported fire ant mounds were significantly reduced in plots treated with the broadcast and grid pattern spot treatment of Combat® hydramethylnon bait applied at 1.5 lbs. per acre one week through one month following application relative to untreated plots (**Table 1**). The broadcast treatment producing the highest numerical level of suppression. Other spot treatment patterns of hydramethylnon bait produced less dramatic results, with maximum suppression achieved two weeks following initiation of treatment(s). Rains occurring between the 2 week and 1 month monitoring dates resulted in an increase in active ant mound numbers in all plots. Award® fenoxycarb bait applications did not produce consistent, significantly reduced mound numbers in treated plots within the time interval of these monitoring dates. These plots and the untreated control plots will continue to be monitored for 6 to 12 months.

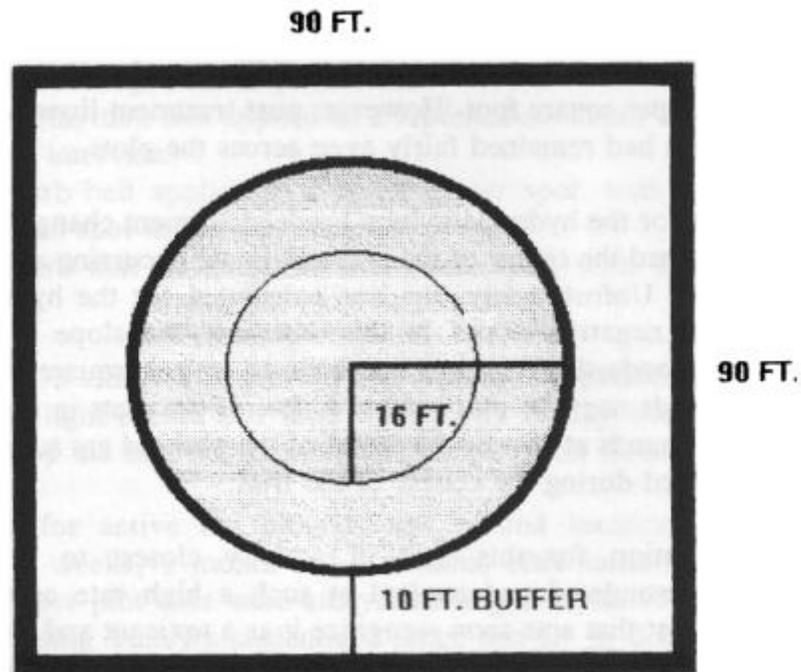
Linear regression analysis of fire ant mound distance from the plot centers were somewhat problematic since sets of plots for two treatments (fenoxycarb center and replenished center spot treatments) had distributions of mounds that were higher toward the plot centers before treatments were initiated (**Figure 1**). However, other treatment plot mound distributions were roughly equal across plots, producing lines with no or almost no slope. At the point in time when the hydramethylnon treatment produced the maximum level of ant mound suppression (**Figure 2**), slopes and levels of most lines had changed, with hydramethylnon broadcast and grid treatments being suppressed from between 0.02 to 0.03 mounds per square foot (pre-count level) to 0.0 to 0.01 mounds per square foot. However, post-treatment lines had little slope, indicating ant mound distribution had remained fairly even across the plots.

In contrast, the slope for the hydramethylnon border treatment changed as expected, with more mounds occurring toward the center of the plot and fewer occurring around the perimeter of the circular plot (Fig. 2). Unfortunately, the line calculated for the hydramethylnon center spot treatment also had a negative slope. In this instance, the slope is possibly an artifact of converting data to standardize mound numbers to a per square foot value which over-compensates for mounds near the plot center. A few of the plots in the hydramethylnon center treatment contained mounds at or near the center of the plot and ant activity in these mounds was somehow not eliminated during the course of the trial.

One possible explanation for this lack of activity closest to a spot treatment is that hydramethylnon as formulated and applied at such a high rate acts as a rather fast-acting toxicant, perhaps so fast that ants soon recognize it as a toxicant and avoid recruiting additional workers to the product - a phenomenon recognized as a response by ant colonies to other fast-acting toxicants (e.g., chlorpyrifos treated seeds). This idea is supported by comparing the effects of the

broadcast versus grid treatments (Table 1). In a broadcast treatment, scattered bait particles are collected by random foraging worker ants and may deliver the highest possible amount of this ingredient to a colony before its toxic effects are noticed. Spot treatments that rely on recruitment of worker ants bait for delivery to colonies may actually reduce total toxicant delivery due to learned avoidance.

In **Figures 3 through 10**, the average number of mounds per square ft. found within 3 ft. to either side of each 1 ft. increment from the plots' center are plotted. Using this method, the first three data points from the center have fewer than data from 6 concentric 1 ft. concentric rings from which means are otherwise calculated. This quirk of calculating and plotting moving average lines can result in higher variability (higher or lower) for plot center values. Otherwise, this method reduces variability and creates "smoother" lines from converted data. This method was used to depict the effects of each treatment plotted over time. Two month data were not included. **Figure 3** illustrates the rather stable nature of fire ant mound numbers and distribution in untreated control plots; **Figure 4** best depicts overall and uniform suppression of mound numbers following the broadcast application of Combat® hydramethylnon bait; and, **Figure 6** best depicts the suppression of active ant mound numbers within roughly 10 feet of the perimeter of the plots (although the rise in mound numbers at the center of the plot is unexplainable and/or an artifact of the data conversion and moving average plotting method).

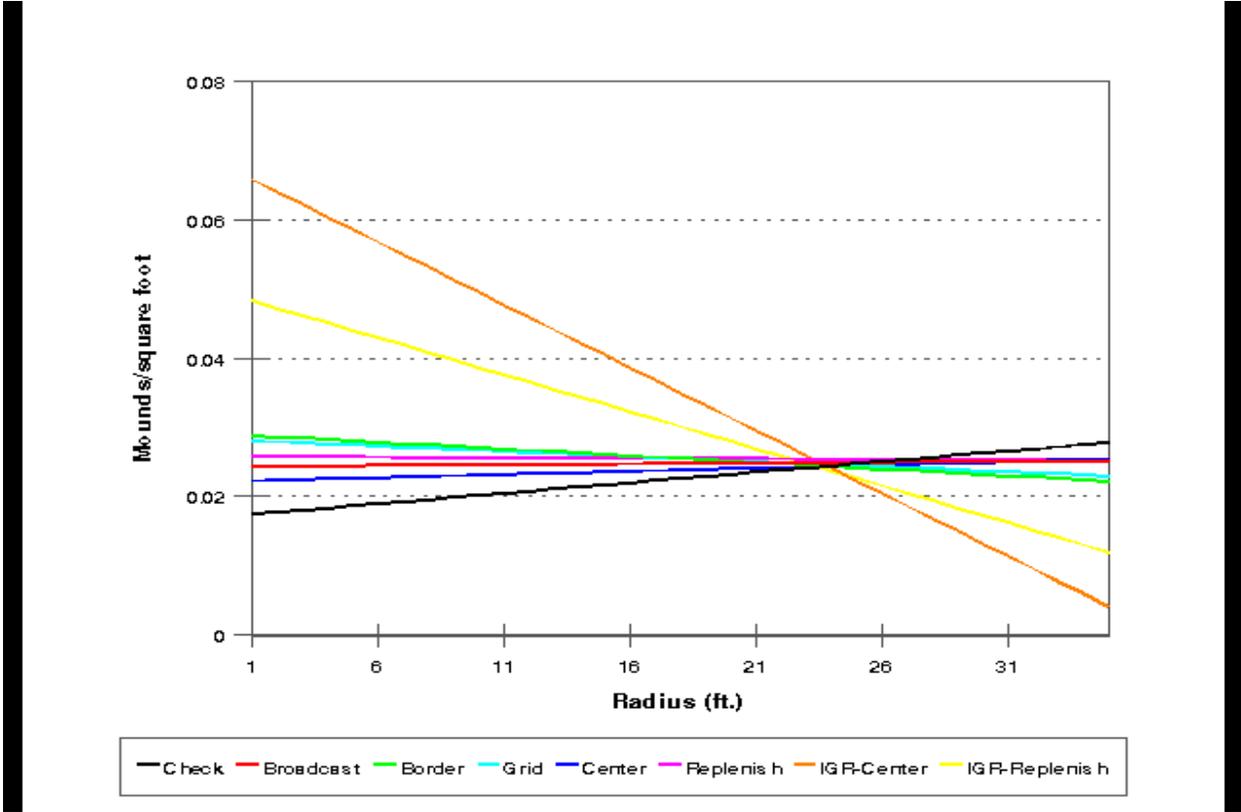


**Table 1.** Number of active red imported fire ant mounds before and following application of 1.5 lbs. per acre Combat® hydramethylnon or Award® fenoxycarb ant bait formulations in various patterns to 35 ft radius circular plots, initiated 12 September 1996, Brazos Co., Texas.

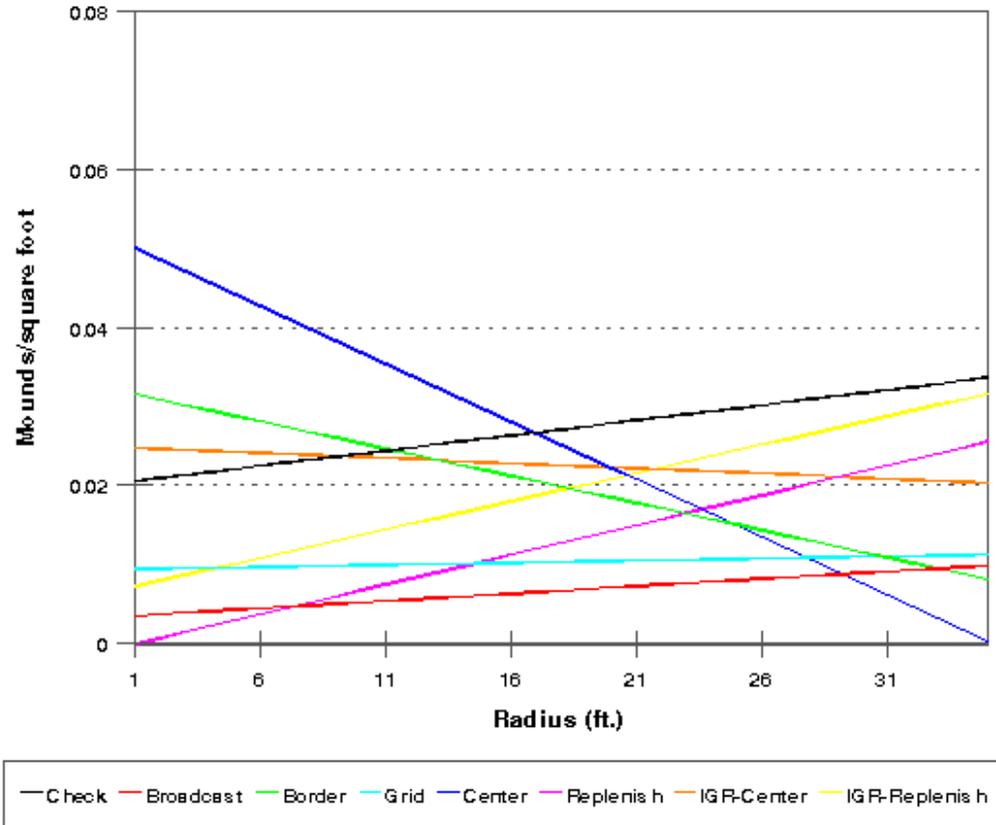
| <u>Treatment</u>               | Mean no. Ant mounds/35 ft. radius circular plot* |               |                |              |              |
|--------------------------------|--|---------------|----------------|--------------|--------------|
|                                | <u>Pre-treatment</u>                             | <u>1 week</u> | <u>2 weeks</u> | <u>1 mo.</u> | <u>2 mo.</u> |
| untreated control              | 18.4a  | 21.2a         | 22.6a          | 23.0a        | 26.8a        |
| Combat® hydramethylnon         |  |               |                |              |              |
| <i>broadcast</i> application   | 19.2a  | 8.6c          | 6.0e           | 11.2c        | 11.8b        |
| <i>grid pattern</i> of spots   | 19.0a  | 11.2bc        | 8.2de          | 13.4c        | 16.8ab       |
| <i>border spot</i> treatment   | 18.6a  | 14.6abc       | 12.2cd         | 16.8abc      | 19.2ab       |
| <i>single center spot</i>      | 18.8a  | 14.6abc       | 12.8bcd        | 15.8abc      | 23.8a        |
| <i>replenished center spot</i> | 19.2a  | 17.0ab        | 13.2bcd        | 22.6a        | 23.0ab       |
| Award® fenoxycarb              |  |               |                |              |              |
| <i>single center spot</i>      | 18.8a  | 19.6a         | 16.8bc         | 24.0a        | 22.4ab       |
| <i>replenished center spot</i> | 18.4a  | 19.8a         | 18.2ab         | 22.2a        | 25.0a        |
| <i>F</i>                       | 22.45  | 7.70          | 14.02          | 6.22         | 3.07         |
| <i>P</i>                       | 0.0001   | 0.0001        | 0.0001         | 0.0001       | 0.0081       |
| <i>MSD</i>                     | 5.5228   | 8.1526        | 5.7445         | 8.8473       | 11.855       |
| d.f. = 28                      |  |               |                |              |              |
| Crit. val. = 4.625             |  |               |                |              |              |

\* Means of five replicate plots in columns followed by the same letter are not significantly different using analysis of variance (ANOVA) and means were separated using Tukey's studentized range test ( $P \leq 0.05$ ).

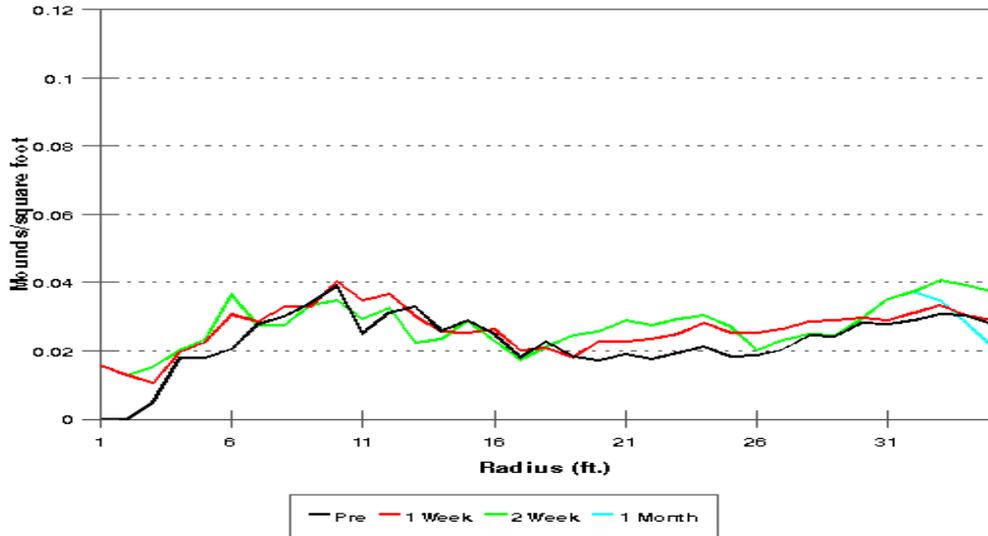
**Figure 1.** Linear regression of pre-treatment red imported fire ant mound distribution across 35 ft. radius circular treatment plots, Brazos Co., Texas, September 1996.



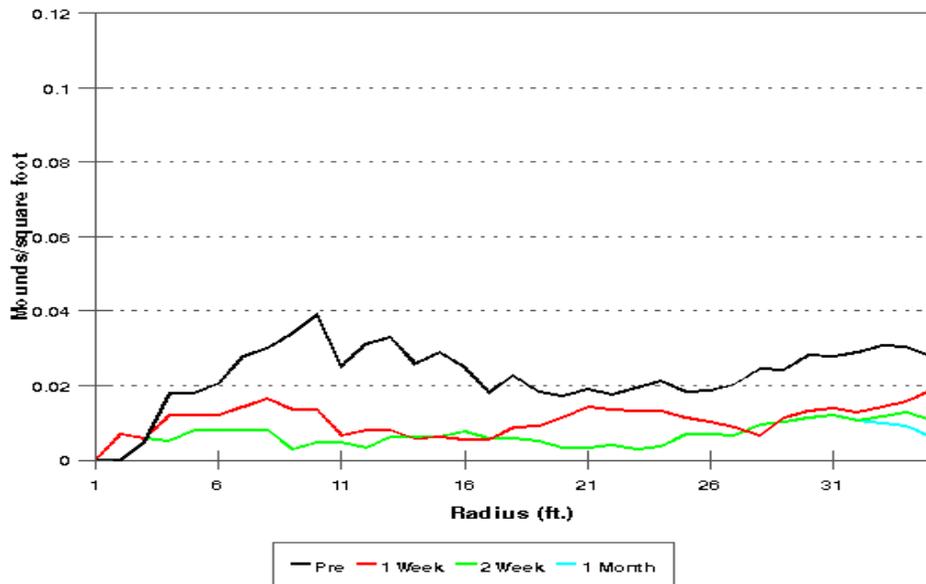
**Figure 2.** Linear regression of post-treatment red imported fire ant mound distribution across 35 ft. radius circular treatment plots two weeks following application of 1.5 lbs. per acre Combat® hydramethylnon or Award® fenoxycarb ant bait formulations in various patterns to 35 ft radius circular plots, initiated 12 September 1996, Brazos Co., Texas.



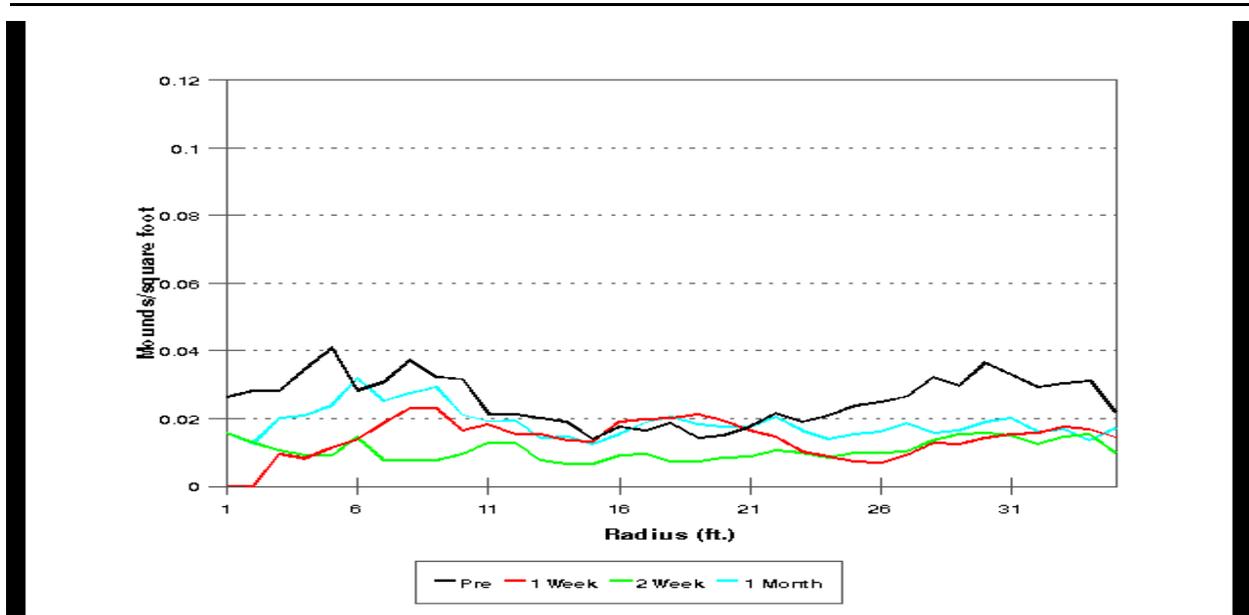
**Figure 3.** Moving average (3ft. on each size of each 1 ft. increment) of red imported fire ant mounds across 35 ft. radius circular *untreated control* plots in a trial initiated 12 September 1996, Brazos Co., Texas.



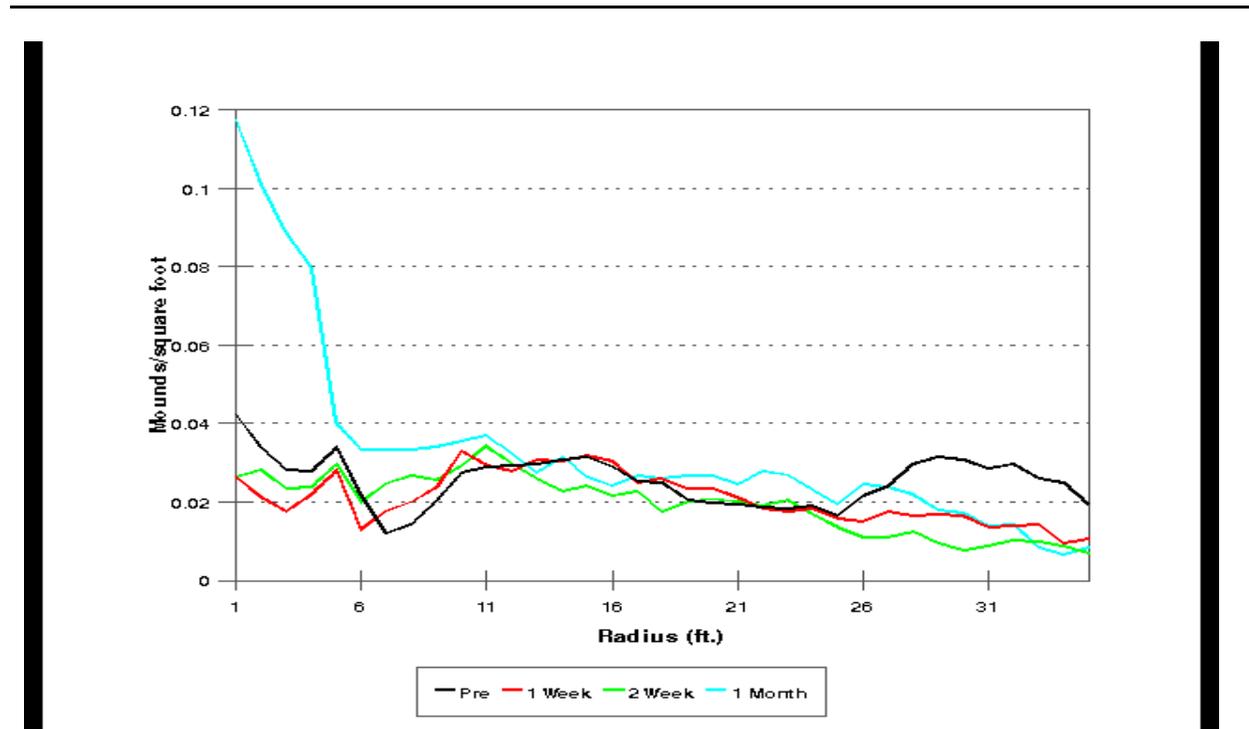
**Figure 4.** Moving average (3ft. on each size of each 1 ft. increment) of red imported fire ant mounds across 35 ft. radius circular plots receiving a *broadcast application* of 1.5 lbs. per acre of 1% granular hydramethylnon bait applied 12 September 1996, Brazos Co., Texas.



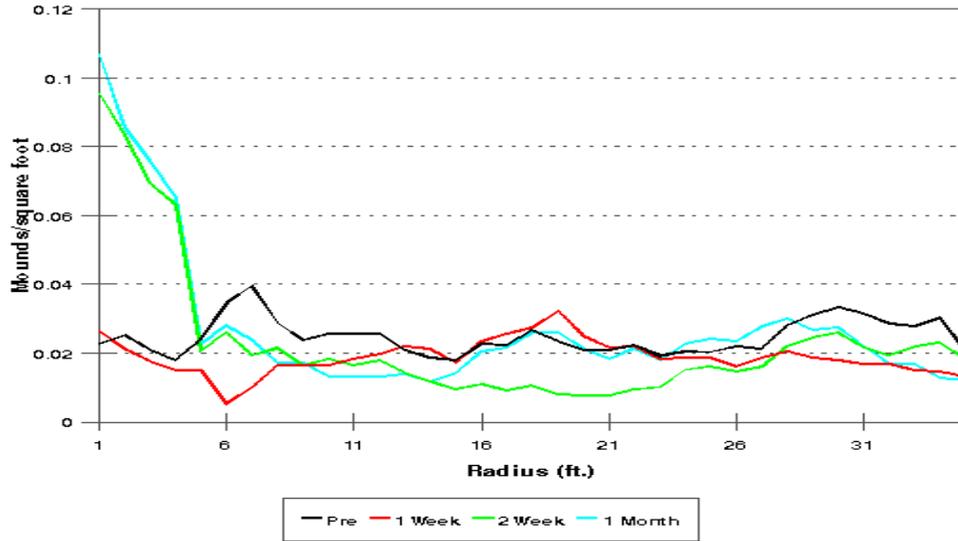
**Figure 5.** Moving average (3ft. on each size of each 1 ft. increment) of red imported fire ant mounds across 35 ft. radius circular plots receiving a *grid pattern of spot treatments* of 1.5 lbs. per acre of 1% granular hydramethylnon bait applied 12 September 1996, Brazos Co., Texas.



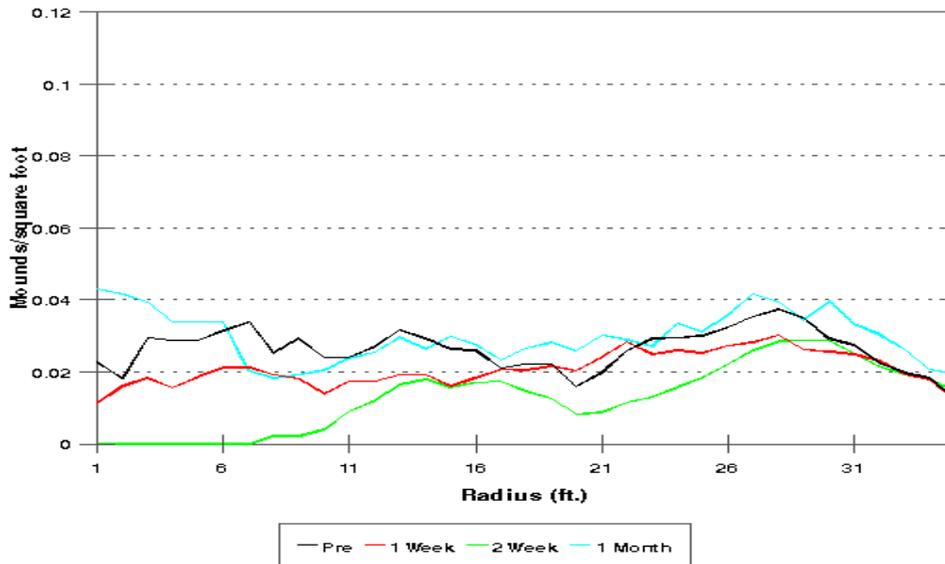
**Figure 6.** Moving average (3ft. on each size of each 1 ft. increment) of red imported fire ant mounds across 35 ft. radius circular plots receiving a *border spot application treatment* of 1.5 lbs. per acre of 1% granular hydramethylnon bait applied 12 September 1996, Brazos Co., Texas.



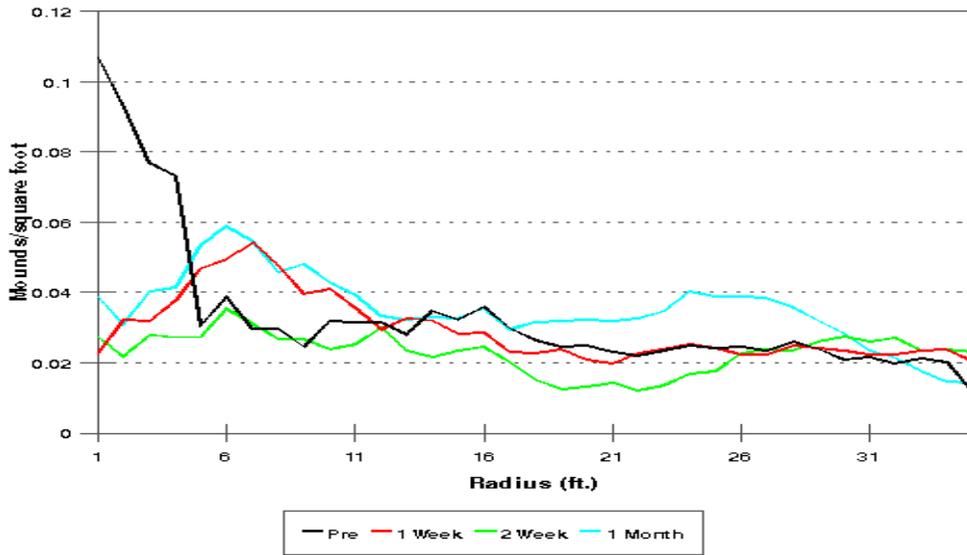
**Figure 7.** Moving average (3ft. on each size of each 1 ft. increment) of red imported fire ant mounds across 35 ft. radius circular plots receiving a *single center spot application* of 1.5 lbs. per acre of 1% granular hydramethylnon bait applied 12 September 1996, Brazos Co., Texas.



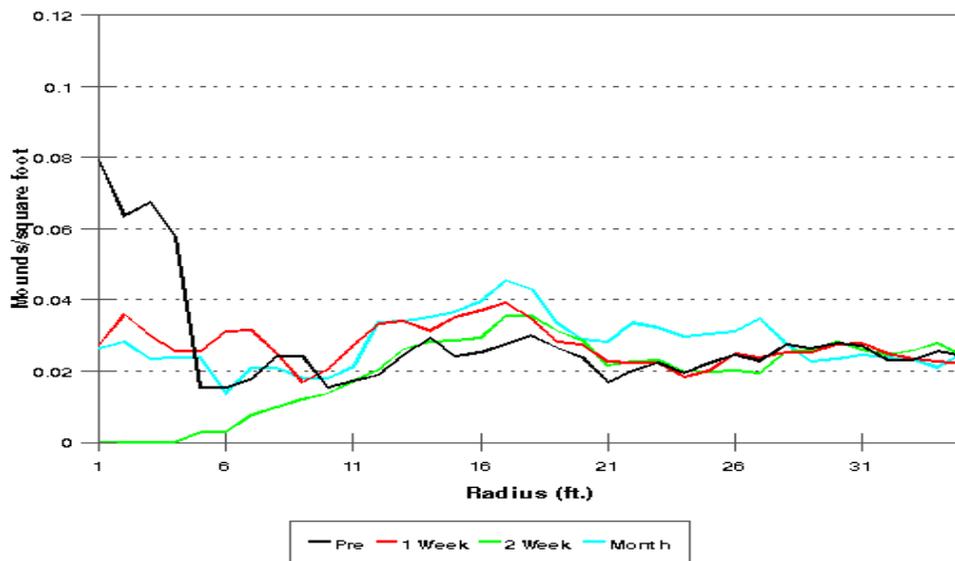
**Figure 8.** Moving average (3ft. on each size of each 1 ft. increment) of red imported fire ant mounds across 35 ft. radius circular plots receiving a *center spot application replenished weekly* (totalling 1.5 lbs. per acre) of 1% granular hydramethylnon bait, initiated 12 September 1996, Brazos Co., Texas.



**Figure 9.** Moving average (3ft. on each size of each 1 ft. increment) of red imported fire ant mounds across 35 ft. radius circular plots receiving a *single center spot application* of 1.5 lbs. per acre of fenoxycarb bait (Award®) applied 12 September 1996, Brazos Co., Texas.



**Figure 10.** Moving average (3ft. on each size of each 1 ft. increment) of red imported fire ant mounds across 35 ft. radius circular plots receiving a *center spot application replenished weekly* (totalling 1.5 lbs. per acre) of fenoxycarb bait (Award®), initiated 12 September 1996, Brazos Co., Texas.



**EVALUATION OF 15% GRANULAR ACEPHATE (VELOCITY®)  
AS A DRY INDIVIDUAL RED IMPORTED FIRE ANT MOUND TREATMENT**

Charles L. Barr, Extension Associate

Velocity® (Valent U.S.A. Corp.) is a 15% granular acephate formulation that is similar to Orthene® Turf, Tree and Ornamental (TT&O) Spray or Ortho® Ant-Stop™ Ant Killer Dust (75% acephate dust) in method of application and mode of activity. It is marketed as a low-dust and low-odor alternative. This trial was conducted to evaluate this new formulation compared to four other treatments including Orthene® TT&O, a granular bifenthrin product (Talstar® T&O 0.2G) and control treatments.

**Materials and Methods**

Test plots were established by marking all active mounds with survey flags contained within a strip 30 feet wide and indeterminate length along an abandoned runway on the Texas A&M Riverside Campus, Brazos Co., Texas. Mound activity was determined using the minimal disturbance technique. Once ten mounds were marked, flag color was changed for the next ten and so on. Flags were then placed along one edge of the strip and numbered sequentially to divide the groups of ten mounds into plots. Plot width was then measured using a measuring wheel. These widths were arrayed from lowest to highest and divided into four equal groups to represent four replications. Treatments were randomly assigned within replications. The following treatments were applied on 7 October:

| <u>Name</u>        | <u>Product</u>                            | <u>Rate</u> | <u>Application Method</u>               |
|--------------------|---|-------------|---|
| acephate 15%G      | Velocity®                                 | 2 tsp       | dry per mound                           |
| bifenthrin 0.2G.   | Talstar® T&O                              | 2 tsp       | dry per mound followed with 1 gal water |
| acephate 75%D      | Orthene® TT&O/<br>Ortho® Ant-Killer™ Dust | 2 tsp       | dry per mound                           |
| untreated control  | none                                      | --          | --                                      |
| water-only control | water                                     | 1 gal       | drench per mound                        |

Weather during application was partly cloudy with a temperatures ranging from approximately 80 to 90 degrees F. Soil was moderately moist. Treated mound evaluations were conducted 10, 15 and 23 October and 6 November 1996 using the minimal disturbance technique. The plots were surveyed for "satellite" mounds 9 October. Results were analyzed using PC SAS PROC Analysis of Variance (ANOVA), with means separated by Tukey's studentized range test ( $P \leq 0.05$ ).

## Results and Discussion

All treatments resulted in significant active ant mound reductions in treatment plots throughout the trial compared to both water-only and untreated control treatment plot mound number. There were no significant differences in the number of "new", satellite mounds occurring in plots between treatments. Total active mound numbers (treated mounds + "new" mounds) were significantly lower for all treatments versus controls at 7 days. At one month, all treatments were significantly different from the untreated control, but not from the water-drench control. Due to the rather small size of the treated mounds, it is not surprising that water-drenched mounds were more likely to be relocated than untreated ones.

**Table 1.** Number of active red imported fire ant mounds of ten per treatment plot, replicated four times, before and periodically after application of insecticide treatments applied, 7 October 1996, Brazos Co., Texas.

| <u>Treatment</u>  | Mean number of active mounds |             |            |              |              |                     |            |            |  |
|-------------------|------------------------------|-------------|------------|--------------|--------------|---------------------|------------|------------|--|
|                   | ----- 3 day -----            |             |            | 7 day        | 14 day       | ----- 1 month ----- |            |            |  |
|                   | <u>count</u>                 | <u>sats</u> | <u>tot</u> | <u>count</u> | <u>count</u> | <u>count</u>        | <u>sat</u> | <u>tot</u> |  |
| Pinpoint          | 0.75 b                       | 2.25 a      | 3.00 b     | 0.25 b       | 0.00 b       | 0.25 b              | 3.25 a     | 3.50 b     |  |
| Tals T&O          | 0.25 b                       | 1.25 a      | 1.50 b     | 0.25 b       | 0.00 b       | 0.00 b              | 4.00 a     | 4.00 b     |  |
| Orthene (std.)    | 0.25 b                       | 1.00 a      | 1.25 b     | 0.00 b       | 0.50 b       | 0.00 b              | 3.00 a     | 3.00 b     |  |
| CK Drench         | 7.50 a                       | 1.00 a      | 8.50 a     | 6.50 a       | 6.50 a       | 3.25 a              | 2.75 a     | 6.00 ab    |  |
| CK Dry            | 8.25 a                       | 1.50 a      | 8.25 a     | 9.75 a       | 5.75 a       | 4.75 a              | 4.00 a     | 8.75 a     |  |
| <i>F</i>          | 22.58                        | 0.57        | 10.47      | 25.84        | 25.84        | 9.09                | 1.55       | 8.63       |  |
| <i>P</i>          | 0.0001                       | 0.7663      | .00003     | 0.0001       | 0.0001       | 0.0006              | 0.2411     | 0.0007     |  |
| MSD               | 2.973                        | 4.016       | 4.2911     | 2.8135       | 3.7826       | 2.3728              | 4.2911     | 3.5636     |  |
| d.f.=12           |                              |             |            |              |              |                     |            |            |  |
| Crit. Val.= 4.508 |                              |             |            |              |              |                     |            |            |  |

\* Means followed by the same letter are not significantly different ( $P \leq 0.05$ ) using PC SAS ANOVA and Tukey's Studentized Range test for mean separation.

**EVALUATION OF BIFENTHRIN (TALSTAR®) FORMULATIONS  
AS INDIVIDUAL FIRE ANT MOUND TREATMENTS**

Charles L. Barr, Extension Associate, and  
Bastiaan M. Drees, Professor and Extension Entomologist

This is the second trial conducted to evaluate bifenthrin formulations as individual mound drenches to control the red imported fire ant. Previously, a trial was conducted by these authors in 1993 to evaluate the effects of bifenthrin formulations applied as a broadcast application to a turf farm. This trial was conducted to gather information on the effects of bifenthrin formulations (liquid and granular) applied as individual mound treatments.

**Materials and Methods**

Plots, containing ten fire ant mounds each, were established by marking all active mounds with survey flags contained within a strip 30 feet wide and indeterminate length along an abandoned runway on the Texas A&M Riverside Campus, Brazos County, Texas. Mound activity was determined using the minimal disturbance method. Once a set of ten mounds were marked in a plot, flag color was changed for the next plot and so on. Flags were then placed along one edge of the strip and numbered sequentially to divide the groups of ten mounds into plots. Plot length was then measured using a measuring wheel. These lengths were arrayed from lowest to highest and divided into four equal groups (blocks) to represent four replications. Treatments were randomly assigned within replications (blocks).

The following treatments were applied on 7 October:

| <u>Name</u>                   | <u>Product</u>              | <u>Rate</u>        | <u>Application Method</u>   |
|-------------------------------|-----------------------------|--------------------|-----------------------------|
| <b>bifenthrin treatments:</b> |                             |                    |                             |
| 0.05g-Low                     | bifenthrin, 0.05G granular  | 26.13 g. (1/4 cup) | dry/mound with 1 gal. water |
| 0.05G-High                    | bifenthrin, 0.05G granular  | 52.26 g. (1/2 cup) | dry/mound with 1 gal. water |
| 0.2G-Low                      | Talstar® granular, 0.2G     | 6.53 g. (1 tsp.)   | dry/mound with 1 gal. water |
| 0.2G-High                     | Talstar® granular, 0.2G     | 32.65 g. (5 tsp.)  | dry/mound with 1 gal. water |
| Talstar-Low                   | Talstar® Flowable 14.19 ml. | in 1 gal. drench   |                             |
| Talstar-High                  | Talstar® Flowable 22.70 ml. | in 1 gal. drench   |                             |
| <b>"standard treatment":</b>  |                             |                    |                             |
| Orthene                       | Orthene® TT&O (75% WP)      | 2 tsp.             | dry per mound               |
| <b>control treatments:</b>    |                             |                    |                             |
| CK-Dry                        | none                        | ---                | ---                         |
| CK-Drench                     | water                       | 1 gal.             | drench per mound            |

Weather during application was partly cloudy with a temperatures ranging from approximately 80 to 90EF. Soil was moderately moist. Post-treatment evaluations were conducted 10, 15, and 23 October and 6 November using the minimal disturbance technique. The plots were surveyed for

"satellite" mounds, 9 October and 6 November. Results were analyzed using PC SAS PROC Analysis of Variance (ANOVA), with means separated by Tukey's studentized range test ( $P \leq 0.05$ ).

## Results and Discussion

All bifenthrin treatments produced significant reductions in active fire ant mound numbers per plot compared to both untreated and water-drenched only control ant mounds throughout the test (**Table 1**). No significant differences in "new", satellite mound formation were documented between treatments. The total number of active mounds in treatment plots (treated mounds + satellite mounds) were significantly fewer at 7 days in all plots that received bifenthrin treatments as compared to numbers of mounds in both control plots. However, there were no significant differences in mound numbers per plot between any treatments one month after treatment. However, the 7.25 "new", satellite mounds documented in plots receiving the 0.2 G bifenthrin treatments suggests, perhaps, that low concentrations of this product may aggravate colony movement rather than eliminating ant colonies. Data from all bifenthrin treatments were both statistically and numerically similar to those from the Orthene® TT&O (acephate, 75% dust) "standard treatment" on all evaluation dates.

The one or two mounds remaining active for a week or two in most of the bifenthrin treatments had been, in fact, treated since granular residue could be seen on the surface. The Talstar® ant mound drench treatments, on the other hand, resulted in 100% activity elimination within 3 days. It is sometimes difficult to distribute granular material evenly across a mound, particularly when little material is used, such as only 1 teaspoon of the 0.2G product. Another difficulty with granular materials is the possibility of washing the product off instead of into a mound with the post-treatment drench. Though neither of these occurrences were noted during treatment and 98% control is quite good, the mix-and-pour drench still performed a little better and was less time consuming and labor intensive to apply.

**Table 1.** Number of active red imported fire ant mounds or ten and "new" (satellite) mounds within treatment plots following application of individual mound treatments, Brazos County, Texas, applied Oct. 7, 1995.

| <u>Treatment</u>       | Mean number of active mounds* |              |            |              |              |              |                    |            |
|------------------------|-------------------------------|--------------|------------|--------------|--------------|--------------|--------------------|------------|
|                        | ----- 3 days -----            |              |            | 7 days       |              |              | ----- 1 month----- |            |
|                        | <u>count</u>                  | <u>"new"</u> | <u>tot</u> | <u>count</u> | <u>count</u> | <u>count</u> | <u>"new"</u>       | <u>tot</u> |
| bifenthrin treatments: |                               |              |            |              |              |              |                    |            |
| 0.05G High             | 0.25 b                        | 2.00 a       | 2.25 b     | 0.00 c       | 0.50 b       | 0.00 b       | 2.75 a             | 2.75 a     |
| 0.05G Low              | 0.50 b                        | 1.75 a       | 2.25 b     | 0.25 c       | 0.00 b       | 0.00 b       | 4.75 a             | 4.75 a     |
| 0.2G High              | 0.75 b                        | 3.00 a       | 3.75 b     | 0.25 c       | 0.00 b       | 0.00 b       | 3.00 a             | 3.00 a     |
| 0.2G Low               | 0.75 b                        | 1.50 a       | 2.25 b     | 0.25 c       | 1.00 b       | 0.00 b       | 7.25 a             | 7.25 a     |
| Talstar High           | 0.00 b                        | 1.25 a       | 1.25 b     | 0.00 c       | 0.00 b       | 0.00 b       | 3.50 a             | 3.50 a     |
| Talstar Low            | 0.00 b                        | 0.75 a       | 0.75 b     | 0.00 c       | 0.00 b       | 0.00 b       | 2.00 a             | 2.00 a     |
| "standard treatment":  |                               |              |            |              |              |              |                    |            |
| Orthene (std.)         | 0.25 b                        | 1.00 a       | 1.25 b     | 0.00 c       | 0.50 b       | 0.00 b       | 3.00 a             | 3.00 a     |
| control treatments:    |                               |              |            |              |              |              |                    |            |
| CK Drench              | 7.50 a                        | 1.00 a       | 8.50 a     | 6.50 b       | 6.50 a       | 3.25 a       | 2.75 a             | 6.00 a     |
| CK Dry                 | 8.25 a                        | 1.50 a       | 9.75 a     | 8.75 a       | 5.75 a       | 4.75 a       | 4.00 a             | 8.75 a     |
| <i>F</i>               | 31.42                         | 1.11         | 10.14      | 39.49        | 10.45        | 15.70        | 1.84               | 3.15       |
| <i>P</i> .             | 0.0001                        | 0.3979       | 0.0001     | 0.0001       | 0.0001       | 0.0001       | 0.1020             | 0.0091     |
| MSD                    | 2.453                         | 3.6402       | 4.3544     | 2.2062       | 3.3554       | 1.8895       | 7.7812             | 7.5261     |
| d.f.=24                |                               |              |            |              |              |              |                    |            |
| Crit. Val.=4.807       |                               |              |            |              |              |              |                    |            |

\* Means followed by the same letter are not significantly different ( $P \leq 0.05$ ) using PC SAS ANOVA and Tukey's Studentized Range test for mean separation.

# CARBARYL (SEVIN®) DUST AND LIQUID FORMULATION INDIVIDUAL FIRE ANT MOUND TREATMENT EFFICACY TRIAL

Charles L. Barr, Extension Associate and  
Lyle Zoeller, County Extension Agent, Coryell County, Texas

The number of conventionally-formulated products currently labeled for use against red imported fire ants (*Solenopsis invicta* Buren) in grazed and hayed pastures has dwindled to only three or four. Carbaryl (Sevin®), a carbamate insecticide, has long been registered for the control of many pests in many different crop and non-crop areas, including control of the red imported fire ant. This test was designed to test the effectiveness of two Sevin formulations in eliminating fire ant colonies: Rhone-Poulenc Sevin XLR®, applied as a drench; and Hi-Yield® 10% Sevin dust, applied as a dry dust with no irrigation. Hi-Yield 10% Sevin is not labeled for use in pastures though it is labeled for various other insects in home gardens and yards. Several other brands of Sevin products available to homeowners, including Ortho® and Green Charm® brands, are not labeled for fire ant individual mound treatments, so specific label directions must be followed carefully. Amdro® Insecticide Bait (hydramethylnon), broadcast applied, was also included in the test as a “standard” since it is labeled for pasture use.

## Materials and Methods

The test site was located north-east of Gatesville, Coryell County, Texas on a gently sloping hillside composed of heavy, clay, Blackland soil with scattered flint rocks. Grass on the site was regularly cut and baled for hay. Test plots were marked on 8 July 1997 with treatments applied between about 1:30 and 3:00 that afternoon.

Test plots consisted of 12, 75 ft. X 75 ft. squares arranged in three rows of four plots each. Within a 30 ft. radius sampling area in each plot, all active fire ant mounds were counted and marked with wire flags. A mound was considered active if a number of ants rose to the surface in a defensive manner within 10 -20 seconds of disturbance. The number of active mounds in each plot was counted and arrayed from highest to lowest. The plots were then divided into three sets of four plots each (replicates) beginning with the four highest and ending with the four plots with the fewest number of active mounds. Treatments were then assigned within replicates so that the total number of active mounds for each treatment was as equal as possible. Treatments were as follows:

| <u>Treatment</u> | <u>Rate</u>               | <u>Application</u>                      |
|------------------|---------------------------|---|
| Untreated (CK)   | -                         | -                                       |
| Sevin XLR        | 1.5 qts/100 gallons       | approx 1 gal. per mound                 |
| Sevin 10% dust   | 2 TB (approx 1 oz.)/mound | dusted across mound without disturbance |
| Amdro            | 1.5 lbs./ acre            | broadcast                               |

The Sevin XLR was applied by mixing 1.5 pts. in 50 gallons of water in a tank in the back of a pickup truck. A 12 V pump drew the solution from the tank and discharged it through a garden hose at approximately 30 p.s.i.. Mounds were treated according to label directions by spraying material around each mound out to a 2 ft. radius then saturating the mound itself with at least one quart of solution per six inches of mound diameter. The Sevin 10% dust was applied by dusting each mound with two level tablespoons of material with light disturbance of the mound, according to label directions. Amdro was broadcast by means of a Solo® gas-powered backpack blower at a rate of 1.5 lbs. per acre, or approximately 0.20 lbs./plot. Weather during treatment application was partly cloudy, 85-90EF, with a strong breeze. Soil was moderately moist to dry and ants were active.

Evaluations were conducted by disturbing all flagged mounds and recording those that exhibited ant activity. The 30-foot radius sample area was also surveyed for new or “satellite” mounds at several sampling dates. Mound-marking flags were removed prior to the final evaluation so that plots could be mowed and new mounds located more easily. Evaluations were made on 11, 15, and 25 July and 5 August.

## **Results and Discussion**

Only marked and treated (flagged) mounds were evaluated for the three day post-treatment evaluation (**Table 1**). Flagged mounds were evaluated and the sample areas surveyed for new mounds at both one and two weeks. Since flags were removed for mowing, only the sample area was surveyed at four weeks.

Results indicate that both Sevin® XLR and Sevin® 10% dust yielded 100% elimination of ant activity in treated mounds within three days of application. Amdro® broadcast treatments also provided statistically significant ( $P < 0.05$ ) control versus untreated plots at three days post-treatment, though there were considerably more active mounds, numerically, than the Sevin treatments. By one week, only one Amdro-treated marked mound remained active of all pesticide-treated mounds. This degree of activity elimination is extremely fast for an Amdro broadcast application. Normally, Amdro takes a minimum of two weeks, usually about four, to achieve such results.

When both marked and non-marked mounds are included in the analyses, however, the three chemical treatments are significantly different from the untreated plots only for the three-day and one week evaluations. Despite great numerical differences at two weeks, all treatments are statistically similar due to the high degree of variability in mound counts. By week four, the total number of active mounds became relatively similar for all treatments.

The main purpose of this trial was to compare the two products currently labeled for pasture use and widely available - Amdro® and Sevin® - in a side-by-side comparison. In the past, Orthene® TT&O (Valent U.S.A. Corp.) has, until recently, been the "standard" individual fire ant mound

treatment product labeled for pasture use. It's main advantages over other products was that it could be applied as a dry dust, requiring only a teaspoon and protective clothing for application, and low cost. Other drench and broadcast-type products require considerably more time and/or equipment for application. Orthene costs only \$0.17 - \$0.35 per mound for a very effective treatment. Orthene TT&O labels produced after 1996 no longer include pastureland as a registered use site, however.

Sevin® XLR costs \$24.44 per gallon which would make 267 gallons of solution at a rate of 1.5 quarts per 100 gallons. At one gallon solution per mound, the per mound cost comes to \$0.092. However, at one quart per six inches of mound diameter, the product cost could be cut by more than half in some areas. It took approximately one hour to mix and apply Sevin XLR to 47 mounds in this test. At minimum wage, the additional labor cost would be approximately \$0.105 per mound for a total of \$0.20 per mound.

Sevin 10% cost \$4.58 for a four-pound bag. At one ounce (dry) per mound, the cost comes to \$0.072 per mound. It took less than half an hour to treat the 50 mounds in this test, so the minimum-wage labor rate would be, at most, \$0.05 per mound, for a total cost of about \$0.13 per mound.

The Sevin dust also has the advantage of easy, dry application. One of the most common complaints heard about fire ant individual mound treatments is that "the ants just move over after you treat." There is always a concern that dry-applied products will result in mound relocation, rather than elimination. Though not conclusive at this time, test results showed more non-marked mounds in 10 percent Sevin-treated plots, a possible indication of mound relocation. The test site received no rain over the course of the test and high temperatures were in the mid-90's every day. It is strongly suspected that the drought suppressed ant mound building activity and that an accurate representation of the pesticides' effectiveness cannot be obtained until significant rainfall occurs and/or temperatures moderate. Therefore, the test will continue to be monitored.

## **Acknowledgements**

We wish to extend our deepest thanks to Mr. John Hendricks and his son, Mr. Samuel Hendricks, for their invaluable help in obtaining access to the test site, laying out the test, applying treatments, and assisting in evaluations.

**Table 1.** Number of active red imported fire ants before (Init.) and periodically following application of insecticides, applied 8 July 1997, Coryell County, Texas.

---

| <u>Treatment</u> | <u>Init</u> | Mean* no. active fire ant mounds/75 by 75 ft. plot |   |        |  |        |                                   |
|------------------|-------------|--|---|--------|--|--------|-----------------------------------|
|                  |             | <u>3 day</u><br><u>marked</u>                      | <u>one week</u><br><u>marked</u> <u>total</u> |        | <u>two weeks</u><br><u>marked</u> <u>total</u> |        | <u>four weeks</u><br><u>total</u> |
| CK               | 15.7 a      | 15.0 a   | 14.7 a  | 15.3 a | 10.0 a   | 11.0 a | 6.3 a                             |
| Sevin XLR        | 15.7 a      | 0.0 b  | 0.0 b   | 1.0 b  | 0.0 b  | 1.0 a  | 3.7 a                             |
| Sevin 10%        | 16.7 a      | 0.0 b  | 0.0 b   | 1.0 b  | 0.0 b  | 1.3 a  | 4.3 a                             |
| Amdro            | 16.0 a      | 4.3 b  | 0.3 b   | 0.7 b  | 0.7 b  | 1.0 a  | 2.0 a                             |

---

|          |        |        |        |        |        |        |        |
|----------|--------|--------|--------|--------|--------|--------|--------|
| <i>F</i> | 8.54   | 22.29  | 14.98  | 10.51  | 6.31   | 3.92   | 2.44   |
| <i>P</i> | 0.0106 | 0.0008 | 0.0025 | 0.0063 | 0.0221 | 0.0633 | 0.1545 |
| MSD      | 9.69   | 5.71   | 7.24   | 8.62   | 7.70   | 10.22  | 6.46   |

df. = 6  
crit. value = 4.896

\* Means followed by different letters are statistically different ( $P < 0.05$ ) using PC SAS analysis of variance procedures and Tukey's studentized range test.

# EVALUATION OF LINDANE (GAMMA-MEAN® L. O.) AS AN INDIVIDUAL RED IMPORTED FIRE ANT MOUND INJECTION TREATMENT

Charles L. Barr, Extension Associate and  
Bastiaan M. Drees, Professor and Extension Entomologist

Gamma-Mean® L. O. (lindane 40%) was evaluated for effectiveness as an individual mound treatment to eliminate red imported fire ant activity. This treatment was compared to a "standard" treatment (Diazinon 5G) and a water, only injection.

## Materials and Methods

Plots were established on the Texas A&M University Riverside Campus, 25 September 1996, in a 30 foot wide strip between an abandoned airport runway and a fence line. Active fire ant mounds were located and marked with wire surveyor's flags. Moving along the line of plots, ten mounds were marked with the same color flag, constituting a single plot. The next group of ten mounds were marked with a different color and so on until twelve sets of ten mounds had been marked. The length of each plot was measured and arrayed from lowest to highest before being assigned to one of four blocks or replicates containing three treatment plots apiece. Treatments were assigned at random within replications so that the average plot length for each replication would be roughly equal for each treatment.

The following treatments were used:

| <u>Treatment</u>                    | <u>Volume (concentration)</u>                     | <u>Method</u>  |
|-------------------------------------|---|--|
| Gamma-Mean® L. O.<br>lindane 40%    | 2 gallons per mound<br>(1.5 qt. lindane/100 gal.) | Mound injection  |
| Diazinon 5G<br>diazinon 5 % granule | 1/3 cup granules per mound                        | Granules applied dry to mound,<br>followed by a 1 gallon<br>water/mound irrigation |
| Water                               | 2 gallons per mound                               | Mound injection  |

Gamma-Mean® L. O. was mixed in a large plastic container at the label rate of 1.5 qt per 100 gallons or 9.6 oz. pr 20 gallons. Water used for the Gamma-Mean treatment was buffered to pH 7.0 " 0.2 using Nutra-Buffer® 1200 agricultural buffer. The solution was drawn from the container by means of a 12V diaphragm pump delivering 2.8 gallons per minute at 30 p.s.i.. The injection apparatus consisted of 3/8" galvanized pipe, crimped, welded and sharpened at the end. Two holes were drilled and recessed on either side of the tip to emit sufficient solution and prevent clogging. The unit was calibrated to deliver two gallons of solution in approximately 40 seconds.

Treatments were applied the afternoon of 25 September 1996 (Weather conditions: temperature= 89-94EF, mostly sunny, wind SSE 5-10 mph). Injections were made by inserting the probe into the center of a mound until firm resistance was met, usually 6- 10 inches deep. The shut-off valve was then opened and a stopwatch started. The probe was left in one spot until the solution bubbled up and began to puddle. If a mound was large enough, the probe was re-inserted several times. If necessary, efforts were made to knock down any built up mound structure with a stream of solution. The valve was shut off after 40 seconds. The water-only control treatment was applied in a similar manner.

The diazinon standard treatment was applied by sprinkling 1/3 cup of Diazinon 5G on and around a two foot radius of each mound in a plot. The mounds were then irrigated with one gallon of water using a plastic watering bucket with a breaker nozzle.

Evaluations were conducted 30 September, and 3, 15, 23 October or 5, 8, 20, and 28 days, respectively. The uneven spacing of the evaluations was due to cool, cloudy weather that resulted in very low ant activity. Ant mounds were evaluated using the minimal disturbance method, whereby each mound was lightly disturbing them with a pointed tool handle. If more than 20 ants emerged within about 15 seconds, the mound was considered to contain an active ant colony. Plots were surveyed for "new" (satellite mounds or immigrant colonies) mounds occurring within the plots or 3 and 23 October by counting all active, unmarked mounds within each plot. Results were analyzed using PC SAS Analysis of Variance (ANOVA) and Tukey's studentized range test for mean separation ( $P \leq 0.05$ ).

## Results and Discussion

Results (**Table 1**) indicate that Gamma-Mean L. O. (lindane) injection performed similarly to the diazinon "standard" treatment on all evaluation dates. Both treatments had significantly fewer mounds than the water injection control plots throughout the monitoring period. Diazinon-treated plots contained no treated mounds remaining active after treatment while Gamma-Mean® L. O. treated plots contained one or two. An unusually large number of water-injected mounds became inactive, compared to what is usually seen for untreated or water-drenched mounds. This observation indicates that the injection process itself is highly disruptive to fire ant colonies and often causes them to move. The "new", satellite mound counts support the idea that colonies in water-injected treatment plots simply relocated, since the number of ant mounds was significantly higher than those from chemical treatment plots on the first evaluation date and numerically higher on the last. Total mound counts (marked + "new") showed significant differences between the water-injected treatment and both insecticide treatments on both evaluation dates, suggesting that colonies in insecticide treated plots were, indeed, eliminated.

Results indicate that Gamma-Mean® L. O. injected at the rate of two gallons per mound is as effective at the elimination of ant activity as Diazinon 5G applied according to label directions. Furthermore, Gamma-Mean significantly reduced the number of active mounds compared to a water-injection control.

**Table 1.** Mean number of active red imported fire ant mounds following an individual 2 gallon mound injection of lindane (Gamma-Mean) or water (untreated control) or granular diazinon granular treatment watered in after application, Brazos County, Texas, treated 25 September 1996.

| <u>Treatment</u> | Mean number* active fire ant mounds/10, new or plot |               |              |              |                |                |              |              |
|------------------|---|---------------|--------------|--------------|----------------|----------------|--------------|--------------|
|                  | <u>5 days</u>                                       | <u>8 days</u> |              |              | <u>20 days</u> | <u>28 days</u> |              |              |
|                  | <u>per 10</u>                                       | <u>per 10</u> | <u>"new"</u> | <u>total</u> | <u>per 10</u>  | <u>per 10</u>  | <u>"new"</u> | <u>total</u> |
| Gamma-Mean®      | 0.50b   | 0.25b         | 1.50a        | 1.75b        | 0.25b          | 0.25b          | 2.25a        | 2.50b        |
| Diazinon 5G      | 0.00b   | 0.00b         | 2.00b        | 2.00b        | 0.00b          | 0.00b          | 0.25a        | 0.25b        |
| Water            | 6.00a   | 4.75a         | 5.25b        | 10.0a        | 3.75a          |                | 4.75a        | 3.50a        |
|                  |   |               |              |              |                |                | 8.25a        |              |
| <i>F</i>         | 36.27   | 73.50         | 9.48         | 73.74        | 45.21          | 16.60          | 2.65         | 25.01        |
| <i>P</i>         | 0.0001  | 0.0001        | 0.0061       | 0.0001       | 0.0001         | 0.0010         | 0.1244       | 0.0002       |
| Min. Sig. Dif.   | 2.1826  | 1.2312        | 2.6117       | 2.1577       | 1.2312         | 2.5909         | 3.9758       | 3.2573       |
| d.f. =           | 9   |               |              |              |                |                |              |              |
| Crit. Value =    | 3.948   |               |              |              |                |                |              |              |

\* Means in columns followed by the same letters are not significantly different using PC SAS ANOVA and Tukey's studentized range test for mean separation ( $P \leq 0.05$ ). Means represent either 1) number of mounds per ten originally treated within a plot; 2) number of "new" (satellite or immigrant) ant colonies occurring in treatment plots; or 3) total number of mounds occurring within treatment plots.

## EVALUATION OF WORKS WELL SHORT-CHAINED ALIPHATIC HYDROCARBONS AS A RED IMPORTED FIRE ANT MOUND TREATMENT

Charles L. Barr, Extension Associate, and  
Bastiaan M. Drees, Professor and Extension Entomologist

Works Well®, a 100% volatile (flash point of 135°F) liquid mixture of short-chain aliphatic petroleum hydrocarbons, was initially evaluated in 1995. The product provided 60-80% control of individually treated red imported fire ant, *Solenopsis invicta* Buren, mounds over the course of the one month test. The number of active mounds were statistically similar to those of a standard treatment, Orthene® Turf, Tree and Ornamental Spray (acephate 75% dust), and significantly lower than those in untreated control plots.

Results were forwarded by the manufacturer to the Environmental Protection Agency (EPA) as part of the registration process. The EPA responded with three specific experimental protocols to address efficacy concerns: 1) the effect of high ambient temperatures, 2) the effect of sandy versus clay soil type and, 3) the effects of disturbance (in addition to disturbance caused by treatment) at time of treatment. The result of negotiations with the manufacturer was a protocol for a single test designed to “address” all three concerns. The test was conducted in relatively hot, dry conditions on a site with sandy soil and mounds were probed before treatment. It must be emphasized that, all three factors differed from the first test. With different treatment conditions, results obtained from the two trials can not be directly compared.

### Materials and Methods

The 1997 trial was conducted in an area below the earthen dam of Lake Conroe, Montgomery County, Texas. The soil on the test site was a deep, moderately coarse sand or loamy sand. The test site was mowed to a height of 3.5 inches during the last week of May. The test was established on 3 June in the following manner: Two strips, 40 feet wide and approximately 200 feet long each, were measured and marked using six-foot long pieces of 3/8-inch diameter reinforcing rod at all corners. The strips were surveyed for active fire ant mounds and mound activity assessed using the minimal disturbance technique. Beginning at one end of a strip, 10 active mounds were marked with red surveyor’s flags. The next 10 mounds were marked with orange flags and so on, alternating colors, until 12 sets of 10 mounds (plots) had been marked. The length of each plot was then measured, arrayed lowest to highest and divided into four blocks of three plots each (replications). Treatments were assigned within blocks so that the total lengths for each treatment were approximately the same. Treatments included the following:

- 1) Untreated Control
- 2) Works Well liquid formulation - amount applied according to mound size
- 3) Spectracide® Dursban®, 6% chlorpyrifos, 2 oz. concentrate in one gallon water per mound.

Treatments were applied 5 June, beginning at approximately 10:30 a.m. The weather was partly cloudy and humid, with a slight breeze. Temperature at the end of the test was approximately 85

degrees F and the soil was dry to slightly moist.

Dr. Warren Hardwick, manufacturer of the Works Well formulation, was present for the test and applied all the Works Well treatments personally. Dr. Hardwick located the site of greatest ant activity in each mound and probed to a depth where resistance was met using a pointed metal rod approximately 3/8-inch in diameter. The material was applied directly from a half-gallon metal can with a single-hole squirt cap. He applied the desired amount of Works Well into the hole then sprayed a band of fluid around the perimeter of the mound and on top of the mound. The time of each application was recorded on a stopwatch. After all mounds were treated, the remaining fluid in each can was measured in a graduated cylinder and subtracted from the stated full volume. In this way, the amount applied per mound could be calculated later. Standard chlorpyrifos drenches were applied during the same time period using a plastic sprinkler can with a breaker nozzle. Before applications began, the plots were re-surveyed for any moved or missed mounds. These mounds were marked with blue flags and treated with the appropriate chemical after marked-mound treatments. For the remainder of the trial, these "blue flagged" ant mounds were ignored.

The first evaluations was conducted on 6 June at 9:00 a.m.. Weather conditions were similar to those of the treatment date. Each marked mound was disturbed with a pointed tool handle until ants rose to the surface in a defensive action ("active") or failed to appear after 10 - 20 seconds ("inactive"). Dr. Hardwick was present for all evaluations and agreed with the evaluator's assessment of mound activity at the time. The number of active mounds was recorded for each plot. During the first evaluation, active mounds in Works Well formulation treated and standard-treated plots were marked with large, yellow flags for later re-treatment. All plots were surveyed and any new active unmarked ("satellite") mounds were also marked with large, yellow flags.

The second evaluation was conducted on 9 June, beginning at 8:00 a.m. The weather was overcast, with sprinkling rain, temperature 70-75 degrees F. Evaluations were conducted in a similar manner. Active Works Well formulation-treated mounds were re-treated by Dr. Hardwick at this time and the application times recorded. Active unmarked new, "satellite" mounds were also treated. No chlorpyrifos-treated mounds were active, so only unmarked ones were treated.

The one-week post-treatment evaluation was conducted 12 June 1997, beginning at 9:00 a.m. The weather was partly cloudy, temperature 75 - 80 degrees F and the soil was slightly moist. Minimal disturbance evaluations were conducted on all originally flagged mounds and given "active" or "non-active" ratings. The plots were also surveyed for new, "satellite" mound formation. Flags were removed from previously marked satellite mounds if they showed no activity.

The final, two-week evaluation was conducted on 19 June. Marked mounds were evaluated using the method of mound activity rating as defined by Harlan *et al.* (1981) and modified by Lofgren and Williams (1982). Plots were also surveyed again for new, "satellite" mound formation. Conditions at the time of evaluation (beginning 9:00 a.m.) were partly cloudy, 80 - 85 degrees F, with high humidity and calm winds. The soil was moist. Dr. Hardwick was present for all

evaluations. Resulting active mound data were analyzed using analysis of variance (PC-SAS ANOVA) ( $P \leq 0.05$ ) and means separated using Tukey's Studentized Range test.

## Results and Discussion

Works Well Application Volume. The application volume for the initial application of Works Well formulation was 80.63 " 26.80 ml. (St. Dev.) per mound (2.84 oz. " 0.94 oz.). The marked mound density of Works Well formulation-treated plots was 335 mounds per acre. If "blue flagged" mounds are included, the density rises to 469 mounds per acre. This area is considered to be infested by the multiple queen (polygyne) form of the red imported fire ant. If one were to extrapolate per acre treatment volume requirement from these small plot treatments, the application rate would have been 7.43 " 2.46 gallons formulation/acre of the Works Well formulation. Moreover, had all mounds (including "blue-flagged" mounds) had been treated with the calculated rate, the total volume per acre would rise to 8.79 " 3.44 gallons/acre. Re-treatments on the 19 still-active mounds were made with considerably more volume: 153.16 " 41.06 ml. (St. Dev.) per mound (5.39 oz. " 1.45 oz.). Had this rate been used for the initial treatment of marked mounds the per acre rate would have been 14.11 " 3.79 gallons/acre, and for all mounds, the rate would have risen to nearly 20 gallons per acre. In contrast, 56.2 fl. oz. chlorpyrifos active ingredient per acre would have been required (calculated from the 6% chlorpyrifos solution contained in Spectracide Dursban Indoor & Outdoor Insect Control product). At a retail cost of \$11.00 per quart, the cost of treating all mounds in an acre of land at this level of infestation would have been \$322 (or \$0.69 per mound) with this chlorpyrifos product. According to the manufacturer, the Works Well formulation is anticipated to cost \$12.00/0.5 gallon and an approximate treatment cost of \$0.30/mound.

Efficacy. Application of the Works Well formulation to individual mounds resulted in significant ( $P < 0.05$ ) elimination of ant activity as compared to those mounds receiving no treatment at all evaluation dates (**Table 1**). However, Works Well formulation-treated mounds were significantly more active than those receiving a standard chlorpyrifos drench treatment at one, four and seven days post-treatment. In one EPA report to the manufacturer, a requirement for 90% control was mentioned as the required level of efficacy to claim "control" of treated fire ant mounds. The following table lists "Percent control" for each post-treatment evaluation date in this test as calculated from pre-treatment levels of treated active mounds.

| <u>Treatment</u>       | Percent control (% inactive mounds of 40 treated) |                |               |                |
|------------------------|---|----------------|---------------|----------------|
|                        | <u>1 day</u>                                      | <u>4 days*</u> | <u>7 days</u> | <u>14 days</u> |
| Untreated control      | 0.0   | 5.0            | 17.5          | 22.5           |
| Works Well formulation | 22.5  | 52.5           | 77.5          | 100.0          |
| Standard               | 97.5  | 100.0          | 100.0         | 100.0          |

\* all active mounds retreated

At 14 days after the initiation of the treatment regime, 100 percent of the mounds in Works Well treated plots showed no ant activity. Also, plots also contained no more new, "satellite" mounds than those found in the chlorpyrifos-treated standard plots. Only at that time, however, did the mean total number of both treated and new, "satellite" mounds combined in Works Well formulation-treated plots differ significantly from that of untreated control plots (see "Total" columns, **Table 1**).

Mound activity ratings as defined by Harlan *et al.* (1981) and modified by Lofgren and Williams (1982) at day 14 showed complete, 100 percent *index of control* of mounds treated with both the Works Well formulation and the chlorpyrifos standard.

Although almost immediate elimination of ant activity in Works Well formulation-treated mounds was anticipated by the formulator, data indicate a slower decline. Factors that could explain these documented results include soil type, mound structure and temperature. It is suspected that the combination of higher temperatures and/or sandy, porous soil was responsible for the slower-than-expected results. Some of the ant mounds in treated plots were constructed at the base of clump grasses. These were observed to be more difficult to treat effectively with the Works Well formulation, as expected, and were re-treated as instructed on the product's experimental label..

---

Harlan, D. P., W. A. Banks, H. L. Collins and C. E. Stringer. 1981. Large area tests of AC-217,300 bait for control of imported fire ants in Alabama, Louisiana, and Texas. *Southwest Entomol.* 6:150-157.

Lofgren, C. S. and D. F. Williams. 1982. Avermectin B<sub>1a</sub>: A highly potent inhibitor of reproduction by queens of the red imported fire ant. *J. Econ. Entomol.* 75: 798-803.

**Table 1.** Efficacy of individual red imported fire ant mound treatments, Lake Conroe Dam, Montgomery County, Texas, treated, 5 June 1997.

| <u>Treatment</u>        | Mean no. active mounds* |            |              |               |            |              |
|-------------------------|-------------------------|------------|--------------|---------------|------------|--------------|
|                         | 1-day-----              |            |              | 4-days-----   |            |              |
|                         | <u>Marked</u>           | <u>New</u> | <u>Total</u> | <u>Marked</u> | <u>New</u> | <u>Total</u> |
| Untreated control       | 10.0a                   | 1.0a       | 11.0a        | 9.5a          | 0.8a       | 10.3a        |
| Works Well formulation  | 8.3b                    | 2.5a       | 10.8a        | 4.8b          | 2.3a       | 7.0a         |
| Chlorpyrifos "standard" | 0.3c                    | 0.8a       | 1.0b         | 0.0c          | 1.3a       | 1.3b         |
| <i>F</i>                | 104.24                  | 1.08       | 17.97        | 32.56         | 0.72       | 5.96         |
| <i>P</i>                | 0.0001                  | 0.455      | 0.002        | 0.0003        | 0.633      | 0.025        |
| MSD                     | 1.4004                  | 3.334      | 3.740        | 2.3153        | 2.8945     | 5.302        |
| Crit. value = 4.339     |                         |            |              |               |            |              |
| d.f. = 6                |                         |            |              |               |            |              |

Continued:

| <u>Treatment</u>        | 7-days-----   |            |              | 14-days-----  |            |              |
|-------------------------|---------------|------------|--------------|---------------|------------|--------------|
|                         | <u>Marked</u> | <u>New</u> | <u>Total</u> | <u>Marked</u> | <u>New</u> | <u>Total</u> |
| Untreated control       | 8.3a          | 1.8a       | 10.0a        | 7.8a          | 1.8a       | 9.5a         |
| Works Well formulation  | 2.3b          | 1.0a       | 3.3a         | 0.0b          | 1.0a       | 1.0b         |
| Chlorpyrifos "standard" | 0.0c          | 1.5a       | 1.5b         | 0.0b          | 1.3a       | 1.3b         |
| <i>F</i>                | 30.69         | 2.12       | 15.95        | 61.29         | 1.45       | 24.18        |
| <i>P</i>                | 0.0003        | 0.193      | 0.002        | 0.0001        | 0.330      | 0.001        |
| MSD                     | 2.1392        | 2.315      | 3.254        | 1.5761        | 1.947      | 2.730        |
| Crit. value = 4.339     |               |            |              |               |            |              |
| d.f. = 6                |               |            |              |               |            |              |

\* Means in columns followed by the same letter are not significantly different using analysis of variance (PC SAS - ANOVA) ( $P \leq 0.05$ ) and means separated using Tukey's Studentized Range test.

## LABORATORY AND FIELD EVALUATION OF SORGHUM SEED TREATMENTS TO PREVENT DAMAGE BY THE RED IMPORTED FIRE ANT

Bastiaan M. Drees, Professor and Extension Entomologist

Drees *et al.* (1992) described methods of evaluating seed-protecting insecticides from predation by the red imported fire ant, *Solenopsis invicta* Buren. The trials reported here were conducted in the laboratory and in the field to determine the effectiveness of sorghum seeds treated with lindane (Gammasan® and experimental formulations) and imidacloprid (Gaucho®).

### Materials and Methods

In trials conducted under laboratory conditions, temperature ranged from 69 to 75 degrees F. In each of these trials the following nine treatments, or subsets thereof, were included and are generally referred to by treatment number:

| <u>Treatment</u>          | <u>Rate</u>       | <u>Sorghum variety</u> |
|---------------------------|-------------------|------------------------|
| 1. lindane (Gammasan®)    | 5.4 fl. oz./Cwt.  | unspecified            |
| 2. lindane WE0303012C     | 1.33 "            | unspecified            |
| 3. lindane WE0303012C     | 2.67 "            | unspecified            |
| 4. lindane WE303012C      | 5.34 "            | unspecified            |
| 5. lindane WE0201047C     | 3.6 oz./Cwt.      | unspecified            |
| 6. lindane WE0201047C     | 5.4 "             | unspecified            |
| 7. untreated control      | ---               | unspecified            |
| 8. imidacloprid (Gaucho®) | Gustovson treated | Pioneer 8500 95511 A1  |
| 9. untreated control      | ---               | Pioneer 8500 95511 A1  |

---

Trial 1. Four colonies of red imported fire ants were collected in 5-gallon plastic buckets and maintained in the laboratory. On 23 October 1995, test containers were constructed that were composed of sealed plastic Petri dishes with 1/8 inch diameter holes melted into the sides. Each dish contained a piece of dry filter paper and ten dry sorghum seeds. All nine treatments were included in this trial, one set of treated seeds was placed in each test container. Petri dish sets of treatments were placed in the four fire ant colonies, constituting four replications. In addition, 25 seeds of each treatment were placed in petri dishes containing wet filter paper to determine percent germination. Seeds were inspected 48 hrs. after exposure of dry treated seeds to ant foraging. Ant-exposed seeds were inspected for damage and moistened seeds inspected for percent germination. This trial was repeated from 25 through 28 October using 48 hr. water-soaked sorghum seeds as described above, although only six seeds were placed in each test container.

Trial 2. Six fire ant colonies were collected from the field and removed from the soil by slowly floating them in water, 10 November 1995. Colonies were maintained on water, only. On 13 Nov., ten dry sorghum seeds of each of the nine treatments were enclosed in plastic screen mesh packets ("tea bags"). Each of four colonies received one set of treatment seed packets, constituting four replications. The remaining two colonies served as untreated controls. Packets were removed from ant colonies, on 17 Nov. (4 days exposure) and each seed was inspected for ant damage.

Trial 3. An additional six colonies collected, 9 November 1995, were maintained in 5-gallon plastic buckets with water, only. On 16 November, one colony was provided 48 hr. water-soaked (germinated) sorghum seeds from Treatments 7 and 9 (untreated sorghum seeds) in plastic mesh packets buried in the soil. These seeds were inspected 24 hours later for ant-related damage. Thereafter, on 17 November, three colonies were provided packets containing ten 48 hr. water-soaked (germinated) seeds of each of the nine treatments. Seeds were inspected 20 November for ant-related damage.

Trial 4. Four fire ant colonies were marked in a vegetation-free field, 4 December 1995. Around each mound, 10 seeds of each of nine treatments were planted in furrows radiating away from each mound (four replicates), ending less than 10 inches from each mound's edge. On 14 and 19 December, these plots were examined for seedling plants. Results were analyzed using Analysis of Variance ( $P \leq 0.05$ ) and means separated using Tukey's Studentized Range Test.

Trial 5. Five fire ant colonies were collected from the field in 5-gallon plastic buckets and allowed to adjust in the laboratory. On 27 March 1996, each colony received a metal screen sleeve containing ten untreated sorghum seeds (Treatment 9) and another sleeve containing ten imidacloprid (Gaucho<sup>®</sup>, Treatment 8) treated seeds imbedded in soil in an 8 by 8 by 2 inch aluminum pie pan (a paired treatment comparison replicated five times). Each pie pan was watered with 250 mls. water to germinate the seeds. This pair of sleeves was allowed to remain in each colony bucket until 1 April when sleeves were removed and seeds were evaluated for fire ant injury.

Trial 6. On 11 May 1996, ten fire ant colonies were established in 5-gallon buckets in the laboratory (65% relative humidity and 72.4 degrees F). Gustovson lindane seed Treatments 1, 2, 3, and 7 were evaluated in four of the colonies, while Treatments 4, 5, 6, and 7 were evaluated in a separate set of four colonies. Ten 24-hr. water-soaked germinated seeds of each treatment were placed in separate 1 by 4 inch folded screen sleeves and placed randomly in the soil within a single colony bucket (a within colony four-treatment comparison replicated four times). The soil surface was then covered with a layer of potting soil (Baccto<sup>®</sup>) and watered with 1 cup water. Sleeves containing seeds were removed, 16 May 1996, and seeds were evaluated for ant injury. Results were analyzed using Analysis of Variance ( $P \leq 0.05$ ) and means separated using Tukey's Studentized Range Test.

## Results and Discussion

Trial 1. Although numerous dead ants were observed within each Petri dish, no ant related damage to seeds was found in this trial. The colonies used in this trial were assumed to lack vigor and were discarded. Percent germination ranged from 84 to 100 percent (Treatment 1 = 22/25; 2 = 21/25; 3 = 23/25; 4 = 25/25; 5 = 25/25; 6 = 24/25; 7 = 24/25; 8 = 24/25; 9 = 23/25).

Trial 2. The four fire ant colonies receiving treated seeds declined dramatically. After one day of exposure, piles of dead ants were numerous and the ants did not respond to the stimulus of "blowing" into the colony trays. After three days, these colonies failed to recruit workers to honey water or frozen crickets as compared to untreated colonies. Apparently the majority of forager ants were eliminated from these colonies. Many ants remained in Petri dishes partially filled with moistened plaster and with holes melted in the tops which housed the queens, brood (eggs, larvae and pupae) and nurse ants. However, no damage to sorghum seeds was produced, even to untreated seeds (Treatments 7 and 9). Evidently, the insecticide treated seeds were overwhelming to colony vigor and foraging activity.

Trial 3. Untreated seeds exposed to an ant colony for 24 hrs. were damaged (Treatment 7 - 2/10 seeds damaged; Treatment 9 - 8/10 seeds damaged). After three days exposure to ant colonies in soil, none of the lindane treated 48 hr. water-soaked (germinated) seeds (Treatments 1 - 6) were found to be damaged; one seed out of three sets of ten Gaucho® treated seeds was damaged; three untreated sets of ten seeds had 5, 1, and 0 damaged seeds per 10 seed set for Treatment 7 and 4, 4, 0 damaged seeds per set for Treatment 9. These results were the first in this series of trials to suggest that seed treatments provided protection from fire ant foraging relative to untreated seeds.

Trial 4. On 14 December, seedling plants were just beginning to emerge in the field. By 19 December seedlings were approximately 1 inch tall. Differences between treated seeds are presented in **Table 1**. Lindane Treatment 3 had significantly more germinated seedlings than lindane Treatment 5.

Because of the difficulty of separating differences in ant injury to seeds in trials between all nine treatments, trials were conducted using smaller subsets of treatments.

Trial 5. After 5 days of exposure to fire ant foraging, more untreated sorghum seeds had been damaged than were imidacloprid-treated seeds:

| <u>Treatment</u>            | Replication (damaged/total sorghum seeds) |          |          |          |          |
|-----------------------------|---|----------|----------|----------|----------|
|                             | <u>1</u>                                  | <u>2</u> | <u>3</u> | <u>4</u> | <u>5</u> |
| untreated seeds:            | 7/9                                       | 4/10     | 6/10     | 5/10     | 1/10     |
| imidacloprid-treated seeds: | 0/10                                      | 2/10     | 2/10     | 3/9      | 2/10     |

These results provide supportive documentation that imidacloprid seed treatment effectively protected seeds from predation by fire ants under these laboratory conditions.

Trial 6. Although most colonies involved in the two sets of treatment evaluations consumed untreated seeds, some did not. Consequently, high variability in Set #1 prevented statistical separation of means between treatments (**Table 2**). However, in Set #2, ants damaged significantly more untreated sorghum seed than treated seeds. These efforts failed to document differences between lindane seed treatments but did document, for the most part, that these treatments effectively protected seeds from predation by fire ants under these laboratory conditions.

---

Drees, B. M., R. Cavazos, L. A. Berger and S. B. Vinson. 1992. Impact of seed-protecting insecticides on sorghum and corn seed feeding by red imported fire ants (Hymenoptera: Formicidae). *J. Econ. Entomol.* 85(3):993-997.

**Table 1.** Number of sorghum seedlings emerged, 19 December 1995, around red imported fire ant mounds, Brazos Co. Texas.

| <u>Treatment</u>     | <u>Mound 1</u> | <u>Mound 2</u> | <u>Mound 3</u> | <u>Mound 4</u> | <u>Means*</u> |
|----------------------|----------------|----------------|----------------|----------------|---------------|
| 1. lindane           | 6              | 2              | 4              | 2              | 3.5ab         |
| 2. lindane           | 8              | 7              | 7              | 5              | 6.8ab         |
| 3. lindane           | 6              | 6              | 8              | 10             | 7.5a          |
| 4. lindane           | 5              | 10             | 4              | 4              | 5.8ab         |
| 5. lindane           | 2              | 1              | 2              | 2              | 1.8b          |
| 6. lindane           | 4              | 7              | 0              | 2              | 3.3ab         |
| 7. untreated control | 3              | 3              | 7              | 0              | 3.3ab         |
| 8. imidacloprid      | 7              | 6              | 7              | 1              | 5.3ab         |
| 9. untreated control | 2              | 0              | 6              | 0              | 2.0ab         |

\* Means followed by the same letter are not significantly different using analysis of Variance ( $P \leq 0.05$ ) and means separated using Tukey's Studentized Range Test ( $F = 2.77$ ;  $P = 0.0174$ ;  $MSE = 5.289352$ ;  $MSD = 5.5276$ ; d.f. = 24; crit. val. = 4.807).

**Table 2.** Number of fire ant damaged sorghum seeds following 5 days of exposure to fire ant predation in laboratory colonies (four colonies per treatment set), 1996.

| <u>Treatment</u>                          | <u>Number of damaged seeds/total seeds recovered</u> |          |          |          |          | <u>Mean*</u> |          |
|---|--|----------|----------|----------|----------|--------------|----------|
|   | <u>Colony no.</u>                                    | <u>1</u> | <u>2</u> | <u>3</u> | <u>4</u> |              | <u>5</u> |
| Set #1                                    |  |          |          |          |          |              |          |
| 1. lindane (Gammasan®)                    |  | 0/10     | 0/9      | 0/10     | 0/10     | 5/8          | 1.0a     |
| 2. tefluthrin (Raze)                      |  | 0/10     | 0/9      | 0/10     | 0/10     | 0/9          | 0.0a     |
| 3. tefluthrin (Raze)                      |  | 0/9      | 0/9      | 0/9      | 0/9      | 0/10         | 0.2a     |
| 7. untreated control                      |  | 2/6      | 0/7      | 8/9      | 0/10     | 0/0          | 4.0a     |
| Set # 2                                   |  |          |          |          |          |              |          |
| 4. tefluthrin (Raze)                      |  | 0/10     | 0/9      | 0/10     | 0/10     | 0/8          | 0.6b     |
| 5. lindane + diazinon<br>(Agrox Premiere) |  | 0/10     | 3/9      | 0/9      | 0/10     | 0/8          | 0.0b     |
| 6. lindane + diazinon<br>(Agrox Premiere) |  | 0/10     | 0/10     | 0/8      | 0/10     | 0/9          | 0.0b     |
| 7. untreated control                      |  | 5/9      | 2/3      | 3/8      | 0/0      | 0/0          | 3.8a     |

\* No significant differences between Set #1 treatments. For Set #2, mMeans followed by the same letter are not significantly different using analysis of Variance ( $P \leq 0.05$ ) and means separated using Tukey's Studentized Range Test ( $F = 18.97$ ;  $P = 0.0001$ ;  $MSE = 0.875$ ;  $MSD = 1.6926$ ; d.f. = 16; Crit. Val. = 4.046).