

Different Ratios of s-Methoprene and Hydramethylnon Baits as Hopper Blends for the Suppression of Red Imported Fire Ants

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Broadcast baits used to control red imported fire ants (*Solenopsis invicta* Buren) have the advantages of being relatively inexpensive and easy to use, but are slow acting compared to most individual mound treatments. One of the fast-acting baits is Amdro[®] (0.73% hydramethylnon) with maximum control as a broadcast expected within about a month. Most other baits, such as Logic[®] (1.0% fenoxycarb), Extinguish[™] (0.5% s-methoprene) and Distance[®] (0.5% pyriproxyfen) are considered slow-acting because of their insect growth regulator (IGR) activity. They rarely eliminate colonies faster than about 3 months in the summer and may take 5 or more months when applied in the fall. Despite their slow activity, these IGR baits generally provide longer control than Amdro and coverage does not have to be as thorough. Amdro begins to lose effectiveness if it is applied below 1 lb/acre or if spots are missed during application. The IGR baits can be applied at reduced rates and in some cases as a skip swath application with results similar to full-rate, full-coverage treatments (Drees et al. 1993).

In the early 1990's, we received reports that some pest control professionals were mixing Amdro and Logic in their spreaders (a hopper blend) and getting the speed of Amdro plus the long duration of Logic. A number of tests supported this observation not only with Amdro plus Logic, but Amdro plus any IGR bait (Barr and Best, 1999). As promising as hopper blends appeared, they still involved buying and mixing two products manufactured by two companies and such mixing was not mentioned on either label. In the late 1990's Wellmark International brought Extinguish to the market and American Cyanamid was taken over by BASF. Retail marketing was then taken over by Ambrands. Wellmark and Ambrands are both owned by Central Garden and Pet. So, finally, two ingredients of a hopper blend were under the same corporate roof and serious investigation began into labeling and/or marketing the blend of the two products.

All previous tests of an Amdro hopper blend used a 50:50 ratio of Amdro to the IGR product. There was little information on whether different ratios of hydramethylnon blended with s-methoprene affected performance. Another formulation concern was whether the two active ingredients could be combined on a single granule (with the potential of a new product) or needed to remain on separately formulated granules. This trial addressed both issues by comparing four ratios of hydramethylnon and s-methoprene formulated both on separate granules then mixed and also when combined on a single granule. Amdro, Extinguish and a field-mixed 50:50 ratio of the two were used as standards.

Objective: Test the effectiveness of different ratios and formulations of hydramethylnon and s-methoprene broadcast baits for the control of fire ants.

Materials and Methods

The test was located at the Wharton Municipal Airport in Wharton County, Texas, about 50 miles south of Houston in combination with the test "High Volume Broadcast Application of

Hydramethylnon

for the Control of Fire Ants” (p.25). The site was mowed regularly and was free of livestock and human disturbance. Soil was a black clay that produced well-defined fire ant mounds.

Plots were designed to take advantage of runway lights as plot edge markers, thus minimizing the chances of having markings destroyed by mowers. Runway lights were spaced at 190 feet, so to give a 40 foot untreated buffer between plots, plot dimensions were 170 X 65 feet (11,050 ft², 0.25 acre), running lengthwise adjacent to the pavement. Over half the mounds were found in the 10 foot strip between the runway/taxiways and marking lights, so the sample area consisted of a swath 170 X 45 feet (7,650 ft², 0.18 acre), adjacent to the pavement. Plots contained a minimum of 10 active mounds at the pre-count. Counts were arrayed from highest to lowest, divided into four equal groups (replications) and treatments were assigned within replications so that the total number of mounds for each treatment was as equal as possible.

Plots were established and pre-counted on May 9, 2001. Treatments were made between midnight and 5:00 a.m., May 17, 2001 using a hand-held Earth-Way Model 2700 “belly bumper” spreader at 1.5 lbs/acre. Applications were made at night to take advantage of better ant foraging conditions. Weather at the time of treatment was, 72°F with a breeze. Considerable dew was present on the grass during much of the application period. Ants were foraging actively.

Evaluations were conducted on 21, 24 and 31 May, 7, 21 and 28 June, 12 July, 9 August, 5 September and 15 November (3 days, 1, 2, 3, 5, 6, 8, 12 and 26 weeks respectively.) The scheduled 4 week evaluation was postponed due to torrential rains from tropical storm Allison. Evaluations were conducted using the minimal disturbance technique in which mounds were disturbed with a pointed tool handle. If a number of ants came to the surface in a defensive manner, the mound was considered active. Mounds were also rated on a scale of 1- 4 with 1 being a mound with only a few ants and 4 being an unaffected mound with worker brood present. A rating of 3 represented a fully active mound, but without visible worker brood. Appropriate data (see previous report) were analyzed using SAS ANOVA with means separated by Tukey’s studentized range (HSD) test, $P < 0.05$. Model included treatment and replication effects.

Table 1. Hydramethylnon:s-methoprene formulations used in the field trial at Wharton Airport, 2001.

Treatments - Ratio of hydramethylnon to s-methoprene	Formulation
100+100	mixed granules
75+25	mixed granules
50+50	mixed granules
25+75	mixed granules
(100:100)	single granule
(25:75)	single granule
(50:50)	single granule
(25:75)	single granule

Amdro® Fire Ant Bait (0.73% hydramethylnon)	single product
Extinguish™ Fire Ant Bait (0.55 s-methoprene)	single product
untreated	N/A

Results and Discussion

As shown in **Table 2**, all treatments performed well and similarly. All significantly ($P \leq 0.05$) reduced active mound numbers compared to untreated plots, there were no significant differences between the different formulations and ratios and even numerical differences were small. At various points through the trial no active mounds were found in all four replications of various treatments. Extinguish performed as expected with full control taking two months, compared to two or three weeks for treatments containing Amdro. There do not appear to be any consistent differences between two-granule and single-granule products, either. Mound rating data are presented in **Table 3** and reflect similar findings.

Table 2. Mean number of active red imported fire ant mounds per 0.18 acre sample area, 4 replications. Wharton Airport, treated May 17, 2001.

Treatment*	Pre	Week 1	Week 2	Week 3	Week 5	Week 6	Week 8	Week 12	Week 16	Week 26
untreated	14.00 a	9.00 a	7.00 a	5.25 a	5.50 a	4.75 a	3.00 a	2.50 a	4.25 a	18.00 a
100+100	14.25 a	3.50 b	1.00 c	1.00 b	0.50 bc	0.25 b	0.00 b	0.25 b	1.75 ab	7.25 a
75+25	14.00 a	3.00 b	0.75 c	0.50 b	0.50 bc	0.75 b	0.50 b	0.25 b	1.50 ab	8.50 a
50+50	14.25 a	2.50 b	2.25 bc	0.50 b	0.50 bc	0.00 b	0.50 b	0.00 b	2.50 ab	10.00 a
25+75	14.25 a	3.25 b	1.75 bc	0.00 b	0.00 c	0.25 b	0.25 b	0.25 b	0.75 b	8.00 a
(100:100)	13.75 a	4.00 ab	1.25 bc	0.50 b	0.00 c	0.75 b	0.50 b	0.50 b	1.75 ab	10.00 a
(75:25)	14.00 a	3.00 b	2.50 bc	1.00 b	0.50 bc	0.00 b	0.00 b	0.50 b	2.25 ab	13.25 a
(50:50)	14.25 a	6.50 ab	1.50 bc	1.25 b	1.25 bc	0.50 b	1.00 b	0.75 ab	2.75 ab	15.25 a
(25:75)	14.25 a	5.50 ab	2.25 bc	0.50 b	0.75 bc	0.25 b	0.25 b	0.00 b	2.00 ab	14.00 a
Amdro	14.50 a	2.75 b	1.25 b	0.75 b	1.00 b	0.25 b	0.50 b	0.25 b	1.75 ab	5.25 b
Extinguish	15.00 a	7.50 ab	5.50 ab	4.50 b	3.50 ab	1.50 b	0.00 b	0.00 b	1.50 ab	10.25 a
F	0.15**	3.36	5.07	10.49	6.02	10.85	3.87	3.04	1.71	1.68
P	0.99.82	0.0030	0.0001	0.0001	0.0001	0.0001	0.0011	0.0058	0.1099	0.1165
R ²	0.8374	0.5928	0.6870	0.8197	0.7228	0.8246	0.6267	0.5685	0.4258	0.4220
MSD	4.086	5.3325	4.025	2.3558	3.0698	1.8408	1.8728	1.7929	3.3807	14.146

Means followed by different letters in the same column are significantly different ($P \leq 0.05$) using SAS analysis of

variance procedures. Means separated using Tukey's studentized range (HSD) test. $df = 30$

* Ratio of hydramethylnon to s-methoprene; "+" indicates blended granules; "(:)" indicates both active ingredients applied to the same granule.

** F and P values are for treatment effects only. Replication $P = 0.0001$ due to stratification of mound densities.

One often-stated advantage of hopper blends is that the IGR portion results in a longer period of suppression than Amdro alone. That observation was not borne out in this test as all plots were becoming re-infested by the 26 week evaluation date. A possible explanation is that it is believed that the duration of control provided by IGRs, particularly methoprene, is due to the continued existence of worker ants in colonies that are no longer able to reproduce workers. These long-lived ants continue to "protect" an area from re-invasion by preying on newly-mated queens and possibly resisting other colony movement. Therefore, in order to have this "protection" there must be at least a few ants. Between the treatments and the hot, dry summer, most plots dropped to only one and, in several cases, *no* active mounds at some point. With no ants present, the plots were left open to re-invasion.

Nevertheless, we still feel that the IGR portion of a hopper blend provides a "safety net" for Amdro (Barr and Best, 2001), which has suffered occasional control reductions in hot, dry weather in some of our work. It is also thought that IGRs allow for incomplete or reduced rate coverage as demonstrated in several skip swath tests, whereas Amdro alone has shown reduced effectiveness when the area is not thoroughly covered.

Table 3. Mean activity rating (1-4, sum of ratings per plot) of red active imported fire ant mounds per 0.18 acre sample area, 4 replications. Wharton Airport, treated May 17, 2001.

Treatment	Week 1	Week 2	Week 3	Week 6	Week 8	Week 12	Week 16	Week 26
untreated	29.75 a	25.25 a	19.00 a	17.25 a	10.00 a	7.25 a	16.50 a	72.00 a
100+100	5.00 bc	2.25 c	3.00 a	0.75 b	0.00 b	1.00 b	6.75 ab	64.00 a
75+25	7.50 bc	1.00 c	1.50 b	2.50 b	1.75 b	1.00 b	5.00 b	33.50 a
50+50	3.75 c	5.25 bc	1.00 b	0.00 b	1.50 b	0.00 b	9.50 ab	40.00 a
25+75	7.50 bc	4.75 bc	0.00 b	0.75 b	0.75 b	0.75 b	3.00 b	32.00 a
(100:100)	7.75 bc	3.75 c	1.00 b	1.75 b	1.75 b	1.50 b	5.75 b	40.00 a
(75:25)	4.75 bc	5.25 bc	2.75 b	0.00 b	0.00 b	1.00 b	5.25 b	52.75 a
(50:50)	13.00 bc	4.25 bc	2.75 b	0.75 b	2.75 b	2.75 ab	9.00 ab	60.75 a
(25:75)	14.50 bc	5.25 bc	1.00 b	0.25 b	0.75 b	0.00 b	7.75 ab	56.00 a
Amdro	5.75 bc	3.75 c	1.75 b	1.00 b	1.50 b	0.75 b	3.50 b	21.00 a
Extinguish	19.25 ab	17.75 ab	12.50 a	3.25 b	0.00 b	0.00 b	6.00 b	40.75 a
F	5.28	5.78	10.65	18.03	4.52	2.99	3.20	1.15
P	0.0001	0.0001	0.0001	0.0001	0.0003	0.0065	0.0042	0.3627
R ²	0.6958	0.7146	0.8220	0.8868	0.6620	0.5643	0.5808	0.3318
MSD	15.079	13.605	7.9975	5.1606	5.7554	5.3076	10.314	81.296

Means followed by different letters in the same column are significantly different ($P \leq 0.05$) using SAS analysis of variance procedures. Means separated using Tukey's studentized range (HSD) test. $df = 30$

Note: Ratings were not taken during pre-counts due to time and labor shortage, but ratings can be assumed to be "4" for virtually all mounds. Rating data were not taken at Week 5.

* Ratio of hydramethylnon to s-methoprene; “+” indicates blended granules; “(:)” indicates both active ingredients applied to the same granule.

Literature Cited

- Barr C. L. and Rody L. Best. 1999. Evaluation of Skip-Swath and Hopper Blend Applications of Extinguish™ for Red Imported Fire Ant Control. 1997-2000 Result Demo. Handbook, Tx. Ag. Exten. Serv., Bryan, Texas
- Drees B.M., C. L. Barr and M. E. Heimer. 1993. Skip-swath application of Amdro® and Logic® broadcast baits for the suppression of the red imported fire ant. 1993-1994 Result Demo. Handbook. Tx. Ag. Exten. Serv, Bryan, Texas.