LABORATORY AND FIELD EVALUATION OF SODIUM ARSENATE BAIT STATIONS FOR RED IMPORTED FIRE ANT CONTROL

Bastiaan M. Drees, Extension Entomologist
Charles L. Barr and Robert Cavazos, Research Assistant
S. Bradleigh Vinson, Professor
Department of Entomology, Texas A&M University System

Sodium arsenate (Fatsco® Ant Poison) and related compounds such as arsenic trioxide (Grant's Kills Ants®) have been formulated as containerized bait stations for use indoors to eliminate house-infesting ants. Some of these products have been marketed for the control of the red imported fire ant (RIFA), *Solenopsis invicta* (Buren). These tests were conducted to evaluate the effectiveness of these bait stations for eliminating laboratory and field RIFA colonies.

Materials and Methods

Laboratory trial: Eight field-collected standardized RIFA colonies were established and maintained under laboratory conditions and feeding schedule. On 29 March, 1989, four of these colonies were exposed to cotton balls (20mm diameter) saturated in the 3 percent sodium arsenic Fatsco Ant Poison solution. One sodium arsenate saturated cotton ball was placed in each 55mm diameter ant cup provided by Fatsco as a tamper proof bait station. Four other cotton balls were saturated with distilled water and placed in bait station to serve as controls. The ant colonies were exposed simultaneously. The number of worker ants, number of queens (dealate females) and the presence and type of brood (reproductive or worker) was determined prior to and following exposure of the colonies to the bait stations. The number of ants per colony for each post-treatment evaluation was subjected to analysis of variance using the Least Significant Difference test (P # 0.05).

On 13 April, 1989, this trial was repeated. However, the cotton balls in the bait stations were re-treated (with 2 droppers full of solution) every 2 to 3 days until 1 May, 1989, using a total of two 2 fl oz bottles of Fatsco or 1 fl oz per colony during the test period. Data and analysis was performed as described above.

Field trial: On 5 July, 1989, 30 RIFA mounds were located, marked with plot flags and numbered consecutively in 0.25 of a 0.25-acre circular plot (0.063-acre) established at the A&M Riverside Campus. A Fatsco Ant Poison cup, containing a cotton ball, was placed near each mound. In an adjoining 0.063-acre quarter circle and left as a control. On 6 July, 5 ml of Fatsco Ant Poison were added to each cup. The cups were recharged tree more times, approximately every four days with additional 5 ml doses. Each mound received a cumulative dose of 20 ml of Fatsco Ant Poison during the three week treatment period.

Mound evaluations were conducted weekly with each mound receiving a "+" or "-" indicating whether ants came to the surface with light mound disturbance. Evaluations were conducted at approximately 10:00 a.m. The final evaluation was conducted by digging the mound, observing brood presence and giving the mound an index value (Banks, 1986). New mounds in the two plots were also documented to determine charges in mound density. For analysis, the 30 sequentially-numbered mound sets in the treated and untreated plots were subdivided into 6 subsets of 5 mounds. The number of active RIFA mound within each subset was determined for each evaluation date, used to calculate plot means and subjected to analysis using the Students t test (P # 0.05). This procedure was also used to analyze resulting mound index values.

Results and Discussion

Laboratory trial: Prior to exposure to Fatsco ant bait (29 March, 1989), the eight laboratory colonies used for these trials were similar in vigor and reproductive status:

		No. workers		**Reproductive Worker**	
Treatment	**Colony**	**(1000's)**	**No. Queens**	**brood**	**brood**
Fatsco Ant Poison	18	40	1	-	+
(Sodium arsenate)	27	40	45	-	+
	26	40	25	-	+
	16	40	25	-	+
Untreated	20	50	60	-	+
	24	40	40	-	+
	19	40	15	-	+
	23	40	15	-	+

One week following treatment (6 April), there was no difference in the estimated number of RIFA per colony or reproductive status. However, there was a notable difference in the amount of food consumed by the ant colonies exposed to the Fatsco Formulation. Consumption estimated to be 50% less.

By April 17, the first evaluation of the 13 April to 1 May treatment regime, colonies that had received the Fatsco Ant poison had slightly fewer ants. However, consistent differences in estimated ant numbers did not occur until 8 May (**Table 1**). From that point, Fatsco-treated

colonies declined through the course of the treatment period, but was never entirely eliminated. Larvae in treated colonies were reduced both in number and in size, as only very small darker cream-colored larvae were detected. No loss in the number of queen ants was noted. On the 13 June evaluation, over 1 month following the last Fatsco Ant Poison treatment was determined to suppress colony size and development, but was not determined to effectively eliminate colonies during a reasonable treatment schedule.

Field trial: Results of the field trial were similar to those produced in the laboratory. The number of active mounds during the monitoring period were numerically decreased, but statistically they were decreased only on 4 and 25 August (**Table 2**), representing 16 and 41 percent reduction in active mounds respectively. Overall mound rating by the end of the monitoring period were suppressed due to hot, dry conditions. However, on 30 August, mean (± S.D.) mound index values were significantly suppressed in the plot containing 30 treated mounds: 10.3 ± 8.4 vs. 14.1 ± 8.4 (N = 28 vs 27; D.F. =53; t = -1.7055, P = 0.0470), a reduction of 27 percent index value. Eight new mounds were detected in the untreated (control) plot, while only occurred in the treatment plot, resulting in a total mound density of 464 vs 560 mounds per acre in the treated vs untreated plots.

The Fatsco Ant Poison was Found to be difficult to dispense safely with the cups provided. In liquid form, the sodium arsenate formulation can spill easily either when dispensing the solution or after the material has been placed in the cups. A safer application method should be developed to avoid accidental contamination to the user and the environment. Once the material had dried in the cup, then cotton ball was hardened and adhered tightly to the green vessel. Instructions for disposal of contaminated materials were not provided.

Results of these trials are similar to those obtained form test using arsenic trioxide bail stations. In that test, conducted 26 September 1988, three standard laboratory colonies were exposed to the bait stations and evaluated relative to 3 untreated colonies. The test was monitored until 17 October, 21 days following initial exposure. No elimination of worker brood or queen ants was documented, and no reduction in colony vigor was observed.

The arsenic (or arsenate) compounds tested for RIFA control failed to eliminate colonies. Apparently, the number of ants associated with a RIFA colony decreased the ability of these slow acting stomach poisons to reach and affect the queen ants. Although some worker ants may have been eliminated, sufficient numbers of worker (nurse) ants survived to care for the queen(s) and (diminished) brood.

Boric acid baits, registered for indoor ant control, are not know to effectively eliminate RIFA colonies. However, another bait, Raid® Max Ant Bait, containing sulfonamide (N-ethyl perfluorochlansulfonamide, 0.5%) and registered for control of ants indoors (black carpenter ants, Argentine ants, cornfield ants and pharaoh ants), has eliminated RIFA colonies in a similar (non-replicated) laboratory test. Amdro® (hydramethylnon) is also known to be an other hydramethylnon formulations (Combat® and Maxforce® bait stations) are registered for the control of other ant species indoors. These products may show promise for indoor RIFA control using a bait-station approach. However, in the absence of an effective bait registered for indoor

RIFA control , current management tactics are restricted to surface treatments (emulsifiable concentrate, liquid, wettable powder, dust or granule formulations) to eliminate foraging working ants or fumigants (aerosols formulations) and injectable (dust, aerosols, sprays) materials to treat colonies detected inside wall voids or other structures (Drees and Vinson 1989, Owens 1983).

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Banks, W.A. 1986. Control of imported fire ants with new insect growth regulator and fluorocarbon baits. Proc. 1986 Imported Fire Ant Conference (M. E. Mispagel, ed.). Univ. Ga, Athens, GA pp. 76-82.

Drees, B. M. and S. B. Vinson. 1989. Fire ants and their control. B-1536. Texas Agriculture Extension Service. Texas A&M University System, College Station, Texas. 12 pp.

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Table 1. Estimated of red imported fire ants and presence of worker brood per colony during a Fatsco Ant Poison (3% sodium arsenate) treatment period conducted from 13 April through 1 May, 1989, during which colonies received a total of 1 fl oz solution dispensed over 2 to 3 day intervals relative to untreated colonies.

	----April----		----------May----------				June
Treatment	**17**	**24**	**1**	**8**	**15**	**22**	**13**
	No. ants (thousands)/colony						
sodium arsenate	30*	22	22	18*	14*	11*	8*
untreated	45	22	22	34	30	31	23
	Worker brood						
Sodium arsenate	++++	few+	few+	++++	-+++	++++	-+++
untreated	++++	++++	++++	++++	++++	++++	++++

* Means significantly different (P#0.05) according to the Student, s t test.

Table 2. Active red imported fire ant mounds in 6 sets of 5 mounds following a 5 to 26 July 1989 treatment program in which mounds received weekly 5 ml doses (20 ml total) of sodium arsenate (Fatsco Ant Poison), relative to sets of untreated mounds, Brazos County, Texas.

Treatment	**4 Aug.**	**10 Aug.**	**21 Aug.**	**25 Aug.**	**30 Aug.**
	Active fire ant mounds/5				
untreated	5.0±0.0*	4.0±1.3	4.2±1.0	3.7±1.0*	3.8±0.9
sodium arsenate	4.2±0.8*	3.2±1.7	3.0±1.7	2.2±1.7*	3.1±1.7
t	-2.7116	-09552	-1.4725	-1.8495	-0.8617
P	0.0109*	0.1810	0.0858	0.0486*	0.2045
D.F. = 10					

* indicates significant difference in means in columns using the Student's t test (P # 0.05).