

Spinosad Bait Rate and Formulation Study Cameron Airpark - 1999

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Spinosad, a bacterially-derived nerve toxicant formulated on conventional ant bait, has been found to be effective in controlling red imported fire ants, *Solenopsis invicta* Buren, when applied as a broadcast treatment. A previous test in Central Texas indicated that the product worked quickly and effectively when applied in the fall, with some rate response to increased rates (Barr and Best 1999). Other tests across the country, however, indicate that control is inconsistent, and may depend on colony size and season of application. This trial, which was repeated by other researchers in other states, tested three different concentrations of spinosad, 0.15%, 0.075% and 0.015%, each broadcast at three different application rates, 1.0, 2.0, and 3.0 pounds per acre.

Objective: Test the effectiveness of the active ingredient spinosad at various concentrations and application rates to control fire ants as a broadcast applied bait.

Materials and methods

The test was located at the Cameron Airpark, Milam County, Texas. Soil at the site varied from heavy black clay to reddish, sandy loam. Many small mounds were concentrated near the runway. To take advantage of this distribution, runway lights that served as permanent plot centers, and the dimensions of the property, plot size was 185 x 120 feet (approx. 1/2-acre). A 20-foot buffer was left on all sides of the plots. Ant mounds were counted in a 1/4-acre semi-circle (83-foot radius) with the straight edge against one side of each plot. Pre-counts were taken on 2 June 1999. Mound totals per plot were arrayed from highest to lowest and divided into four equal groups (replications). Treatments were then assigned within each replication so that the number of active mounds was as equal as possible between treatments (sum of all four replications).

Table 1. Treatments included. Cameron Airpark, Milam Co. Texas, 1999

Treatment name	Formulation	Application Rate
High-1	spinosad, 0.15%	1 lb./acre
High-2	spinosad, 0.15%	2 lbs./acre
High-3	spinosad, 0.15%	3 lbs./acre
Med-1	spinosad, 0.075%	1 lb./acre
Med-2	spinosad, 0.075%	2 lbs./acre
Med-3	spinosad, 0.075%	3 lbs./acre
Low-1	spinosad, 0.015%	1 lb./acre
Low-2	spinosad, 0.015%	2 lbs./acre
Low-3	spinosad, 0.015%	3 lbs./acre
Amdro [®]	hydramethylnon, 0.73%	1.5 lbs./acre

untreated	N/A	N/A
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Treatments were applied on 4 June 1999. Weather was partly cloudy 80° - 90°F with a moderate southeast breeze. Soil was moist and ants were actively foraging. A Red Ball electric spreader mounted on a John Deere ‘Gator utility vehicle was used to apply the baits.

Post-treatment counts were conducted on 21 June and 12-13 July 1999. Mound activity for these evaluations and the pre-count was determined using the minimal disturbance technique. Results were analyzed using PC SAS analysis of variance procedures with means separated using Tukey’s studentized range (HSD) test, $P < 0.05$.

Results and Discussion

Results for the different formulations and rates of spinosad were extremely inconsistent and followed no logical pattern. For both post-treatment evaluations, the minimum significant difference was larger than most of the mean values, an indication of high variability. Indeed, some plots had very good control, while others of the same rate and formulation had very poor control. For example, the 0.15% rate of spinosad at 1.0 lb./acre had plot values of 18, 11, 10 and 0. In other words, 100% control to 13% control compared to the untreated mean.

Table 1. Mean number of active red imported fire ant mounds: 0.25 ac. sampling area, 4 replications. Cameron, TX, treated June 4, 1999.

Treatment	Mean number of active mounds		
	Pre-count	2 weeks	5 Weeks
untreated	34.75 a	41.50 a	20.75 a
spinosad High-1	34.75 a	20.00 ab	7.75 ab
spinosad High-2	34.75 a	18.25 ab	11.00 ab
spinosad High-3	34.50 a	9.50 b	11.50 ab
spinosad Med-1	34.75 a	22.25 ab	17.75 ab
spinosad Med-2	34.50 a	22.25 ab	13.75 ab
spinosad Med-3	34.50 a	15.75 ab	17.50 ab
spinosad Low-1	34.75 a	18.75 ab	12.75 ab
spinosad Low-2	34.50 a	15.50 ab	13.50 ab
spinosad Low-3	34.50 a	12.50 ab	10.75 ab
hydramethylnon	34.75 a	5.50 b	3.75 b
<i>F</i>	0.00*	1.95	2.82
<i>P</i>	1.000	0.0644	0.0094
R^2	0.8908	0.4580	0.5496
MSD	12.752	29.985	15.806

Means in the same column with the same letter are not significantly different. Means separated by Tukey's studentized range (HSD) test, $P < 0.05$. $df = 30$.

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

The reasons for such erratic performance most likely have something to do with the speed of action of spinosad itself. The threshold of activity for spinosad is very narrow. In other words, an insect either consumes a fatal dose with almost immediate signs of intoxication or a non-lethal dose showing no effects at all (Dow Agro pers. comm.). It is surmised that when a foraging ant encounters a bait particle, it will consume some oil before returning with the particle to the colony. In the time it takes to return, the ant will begin to exhibit toxicity symptoms. This is recognized by the colony and the returning worker is not allowed back in, thus keeping the active ingredient out, as well. Studies by the USDA Gulfport lab show that laboratory colonies of fire ants will stop consuming all baits within a few hours once exposed to spinosad bait. (Dow Agro. pers. comm.)

Previous tests with spinosad broadcast and mound treatment bait showed good control (Barr and Best 1999; Barr 1999), but these tests were conducted in the fall after a hot, dry summer. Colonies were small and on the rebound with more moderate temperatures and sufficient moisture. One could make the assumption that they were "hungry" and rapidly gathering any food available. This trial, on the other hand, was conducted in the late spring with adequate moisture conditions and healthier colonies. More food resources were likely available, so the colony could be potentially be more selective about which were accepted.

Literature Cited

Barr CL. 1999. Efficacy of Spinosad Bait for the Control of Individual Fire Ant Colonies. Result Demo. Handbook 1997-1999. Tex. Ag. Extension Serv. Bryan, TX. Also <http://fireant.tamu.edu>

Barr, CL and RL Best. 1999. Rate Test of Spinosad-based Broadcast Bait for the Suppression of Red Imported Fire Ants in Large Plots. Result Demo. Handbook 1997-1999. Tex. Ag. Extension Serv. Bryan, TX. Also <http://fireant.tamu.edu>