

Evaluation of Siesta™, Siesta™ + Esteem® hopper blend, MaxForce®FC, Amdro® Fire Strike Single Mound Treatment, and Extinguish® Plus fire ant baits for the management of the red imported fire ant

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Introduction

The red imported fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae) has become an important economic problem in urban Texas, according to a 1998 study conducted by the Department of Agricultural Economics, Texas A&M University. Fire ant related costs in Dallas, Fort Worth, Austin, San Antonio, and Houston, fire ants have serious economic effects for these metro areas of Texas (Lard, Hall, and Salin 2000). Households experienced the largest costs among sectors examined with an average of \$151 per household spent annually. These costs include repairs to property and equipment, first-aid, pesticides, baits, and professional services. A full damage assessment for Texas must include additional sectors, and the estimated costs of \$581 million per year for the selected sectors underscore the impact of this pest. Treatment costs accounted for over 50% of the total cost. In Houston, the average medical treatment cost per household was \$25.46. The duration of injury for children and adults was 6.6 days and 5.6 days, respectively. The fire ant limits outdoor activities and homeowners and agricultural producers incur added costs in managing fire ants.

Managing the red imported fire ant through broadcast applications of fire ant bait products has been demonstrated to dramatically reduce the cost, insecticide use, maintain control of fire ants, and help eliminate problems caused by the fire ant (Riggs et al. 2002). Management of the fire ant on large mixed use land tracts using insecticide products is economically feasible when the economic impact of high fire ant population levels equals or exceeds the cost of control (Flanders and Drees 2004). Mixed use land tracts may include parks, camp grounds, convention centers, animal-care facilities, or a mixture of any of these. The use of these areas by large numbers of the general public can expose them to fire ants if no control measures are undertaken.

Fire ant bait products offer a means to treat large areas of managed turf to obtain a level of fire ant control and reduce the exposure of the general public to the fire ant. Fire ant bait formulations vary somewhat but most consist of de-fatted processed corn grit as a “carrier,” soaked with soybean oil as an attractant that contains the active ingredient. The broadcasting of fire ant bait products allows foraging fire ants from visible or hidden mounds access to the bait particles that they pick up and take back to their respective colonies. When foraging ants return to the colony the product is fed ant-to-ant, ant-to-larva, larva-to-ant and ant-to queen(s) so that all members of the colony are affected. This is also why most bait ingredients must be rather slow to kill ants. If ants die too fast, the active ingredient fails to reach the queen or multiple queens.

This study evaluated new fire ant baits being developed for use in fire ant infested areas from BASF Corporation, Siesta™ (metaflumizone), Siesta™ + Esteem® (pyriproxifen) hopper blend, Bayer Environmental Science, MaxForce®FC (fipronil); against the existing products

from Central Life Sciences, Amdro® Fire Strike™ Single Mound Treatment (hydramethylnon + methoprene) and Extinguish® Plus (hydramethylnon + methoprene).

Material and Methods

This study was established in an undeveloped, non-agriculture grassy field on Texas A&M University property, College Station, TX, in Brazos County. Thirty-two 0.5 acre plots were established on September 5, 2008. Pre-treatment assessments of the number of active red imported fire ant mounds were made within a 0.25 acre circle (59 ft radius) sampling area within each 0.5 acre plot. Plots were mapped using a handheld GPS unit (Trimble® Geo Explorer XT with submeter accuracy) before applying the fire ant bait products. Plots were blocked in order from the plot containing the highest to the lowest number of fire ant mounds per plot. Replications were established by dividing the array into four blocks and randomly assigning the six treatments to plots within each block and then adjusting to assure that pre-treatment mean differences between treatments in all replications or blocks were minimal. All plots were monitored prior to and periodically following treatment throughout the entire result demonstration period. The data were analyzed using separate Analysis of Variance (ANOVA) tests were conducted per sampling date, in the ANOVA model “numbers of mounds” was considered the response variable, block and treatment were considered the fixed factors. Tukey Post hoc analysis (mean separation test) were also performed on the data to determine the group(s) of treatments that differed from the untreated plots. All the statistical analyses were performed using the statistical package SPSS 14.0 (SPSS Inc.). Significant differences occurred when $P < 0.05$.

Limited rainfall occurred during and prior to the testing period. All treatments (**Table 1**) were broadcast (with the exception of the Amdro® Fire Strike single mound treatment product) with a Herd GT-77 Sure Feed Broadcaster for Fire Ants (Herd Seeder Co., Inc., Logansport, IN www.herdseeder.com) mounted to a Kawasaki Prairie 700 ATV on September 5, 2008, in the late afternoon (4:41 pm, 93°F, 42%RH, 1-2 mph SSW). The Herd GT-77 was calibrated to deliver 1.5 lb fire ant bait with a 20 ft swath. The Herd GT-77 was fitted with a Herd Seeder Co. #1 plate between the opening and below the agitator. After all the replications of each treatment were applied, the broadcaster hopper was swept clean before the next treatment. The Amdro® Fire Strike treatment evaluated in this trial was a spot treatment every 20 feet in a grid pattern with 2 tablespoons (treated 49 spots within plots) of Amdro® Fire Strike™ for a total of 1.0 lbs per plot (2.0 lb/acre label rate). On October 3, 2008 the second Siesta™ application was made (5:00 pm, 89°F, 44% RH, 1-2 mph SW) in the Siesta™ followed by (fb) Siesta™ treatment.

At 5, 14, 28 and 60 days after treatment (DAT), Sept. 9, 19, Oct. 3 and Nov. 5, 2008, respectively, each plot was monitored for fire ant foraging activity using a survey station consisting of a small slice of hot dog (0.75 inch diameter by 0.375 inch thick, Bar-S Jumbo brand) placed on the ground and marked with a small flag. Five survey stations were placed, one in each corner, of the 0.5 acre monitoring area (approximately 15 foot from each corner) and one in the center. After 45 minutes each station was checked for the number of fire ants present on the hot dog. The number of ants from 0 - 100 were recorded for each hot dog observed.

At 0, 5, 14, 28, 60 and 90 (Dec. 1, 2008) DAT, the number of active fire ant mounds within subplots of 0.25 acre circles (59 ft radius) measured in the center of each 0.5 acre plot was

counted and recorded. To determine if a mound was active, a shovel was used to disturb the mound. If no fire ants appeared after 15 seconds, the mound was considered inactive. Total active fire ant mounds in each plot were counted, and the data was recorded as the number of active fire ant mounds per 0.25 acre subplot.

Results and Discussion

Statistical analysis documented that: 1) several treatments or treatment regimes significantly impacted mean foraging ant numbers attracted to food lures within treatments, a relative indicator of ant activity, in broadcast bait treated plots compared to means in untreated plots during several post-treatment evaluation dates (**Table 2**); and, 2) several broadcast bait treatments significantly reduced mean mound numbers in subplots compared to untreated subplots (**Table 3**).

No pre-treatment ant foraging data were taken. On Sept. 9, DAT average or mean numbers of foraging ants at hot dog slice food lures were numerically lower in all broadcast-bait treatment plots (**Fig. 1**). Thereafter, there was an overall increase in foraging activity, before the second application of Siesta™ treatments (Siesta™ 1.5 lb followed by Siesta™ 1.5 lb). After the second application, mean foraging ant numbers in those plots decreased numerically below all other treatments by 60 DAT (Nov. 5).

Variations in mean fire ant mound numbers at each of the evaluation dates occurred with all treatments with the exception of MaxForce® FC, which showed a numerical, but not statistically significant, decline at 14 DAT (Sept. 9), and an increase in numbers occurring after that time (**Fig. 2**). However, with ever increasing mound numbers occurring in untreated control plots, this treatment had significantly lower mound numbers by the 12 and 18 week (Nov. 1, Dec. 1 or 60 and 90 DAT) evaluations (**Table 2**). The Amdro® Fire Strike (hydramethylnon plus methoprene) grid spot treatment, although showing some numerical reduction at 14 DAT, never significantly reduced mound numbers relative to untreated control plots means. All other broadcast bait treatment appeared to provide suppression by 14 DAT, with only the Siesta™ followed by Siesta™ (metaflumazone) treatment being significantly less than untreated control plot mean mound numbers. The treatments with the additional application of Siesta™ (1.5 lb applied twice) and the single application of the full rate hopper blend of Siesta™ + Esteem® showed the highest reduction of fire ant mounds 90 DAT (Dec. 1, 18 weeks after trial initiation), although all plot other broadcast treatment plot active ant mound number means were also significantly lower than the untreated control.

Results of this trial should help people managing red imported fire ants in their selection of the “best” product for use in their situation. Speed and length of control of fire ant foraging and/or active mound numbers, and cost per acre for treatment regimes are important factors to consider when choosing the appropriate course of action.

Literature cited

Flanders, K. L. And B. M. Drees. 2004. Management of imported fire ants in cattle production systems. ANR-1248. Alabama Cooperative Extension System, Auburn, AL. 8 pp.

Lard, Curtis F., Charles Hall, and Victoria Salin. "Economic Impact of the Red Imported Fire Ant on the Homescape, Landscape, and the Urbanscape of Selected Metroplexes of Texas," final report to Texas Fire Ant Research and Management Plan, Fire Ant Economic Research Rpt. # 99-08, Aug. 1999.

Riggs, Nathan L., Lisa Lennon, Charles L. Barr, Bastiaan M. Drees, Scott Cummings, and Curtis Lard. 2002. Community-Wide Red Imported Fire Ant Management Programs in Texas. Southwestern Entomologist. Suppl. No. 25:31-41.

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Treatment	Rate (lb Product/acre)
Untreated check	0
Siesta™ (metaflumizone)	1.5
Siesta™ (metaflumizone) + Esteem® (pyriproxyfen)	1.5 + 1.5
Siesta™ followed by a second Siesta™ application	1.5 + 1.5
Extinguish® Plus (methoprene plus hydramethylnon)	1.5
MaxForce® FC (fipronil)	1.5
Amdro® Fire Strike (methoprene plus hydramethylnon)	2.0
Grid spot application	
Siesta™ + Esteem®, half rates	0.75 + 0.75

Table 1. Red imported fire ant bait products evaluated on 0.25 acre subplots, Texas A&M University, College Station, TX, in Brazos County. All treatments broadcast applied except Amdro® Fire Strike on September 5, with a second Siesta™ treatment (1.5 lb product /acre) applied on October 3, 2008.

Treatment	Week			
	1	2	3	4
Untreated control	70.5±8.05	76.5±12.28	82.5±10.11	79±8.54
Siesta™ (1.5)	*16±9.7	53.5±17.23	51.5±17.8	54±16.95
Siesta+Esteem® (1.5+1.5)	*13.5±13.5	46.5±9.2	40±13.73	27.5±9.74
Siesta followed by Siesta (1.5 fb 1.5)	*6.5±3.94	41.5±3.3	47±15	*13.5±6.23
Extinguish® Plus (1.5)	*31.5±5.12	52.5±13.4	52.5±11.08	39.5±11.32
MaxForce® FC (1.5)	*12.5±7.08	45±10.75	54.5±11.52	55.5±14.24
Amdro® Firestrike (2)	*27.5±13.59	31±11.12	40.5±6.29	48.5±10.93
Siesta+Esteem (0.75+0.75)	*15±9.9	52±11.54	57.5±8.22	50.5±19.88
<i>P</i> -value *	0.02	0.318	0.343	0.06
<i>F</i>	4.647	1.246	1.195	2.311
MSE	359.583	682.839	717.714	1548.857
<i>df</i>	1,7	1,7	1,7	1,7

Table 2. Analysis of Variance (ANOVA) table (Mean ± Standard Error or SE) for fire ant worker foraging on food lures (hot dogs) per 0.25 acre subplot following bait product treatments applied Sept. 5, 2008, Texas A&M University, College Station, TX, in Brazos County (significant difference when $P < 0.05$, *Tukey Post hoc test, mean significantly different to untreated control).

Treatment	Week					
	0	1	2	4	12	18
Untreated control	22.75±6.0	21.75±4.1	24.75±3.4	31.5±7.89	42±3.62	40±3.93
Siesta™ (1.5)	23.25±5.7	12.5±3.6	10±3.0	17.75±5.96	22±5.59	*15.75±4.6
Siesta+Esteem® (1.5+1.5)	23.5±5.3	10.5±1.8	7.75±2.28	7.75±2.72	*7.5±1.93	*4.25±2.09
Siesta followed by Siesta (1.5 fb 1.5)	23±4.6	9.5±2.6	*2.75±0.75	12±2.94	*4.25±1.6	*2.25±1.31
Extinguish® Plus (1.5)	20.25±5.4	19.5±7.5	12.25±3.9	11±2.48	*14±2.73	*10.25±2.92
MaxForce® FC (1.5)	19±4.4	16.5±5.7	22±9.5	32±11.57	*19±6.48	*17.5±6
Amdro® Firestrike (2)	19.25±4.5	12.25±2.5	8±3.0	14.25±7.28	23.25±9.0	24.25±6.79
Siesta+Esteem (0.75+0.75)	23.25±5.3	17.5±5.0	11.25±1.43	17.75±4.27	*15±1.68	*9.75±2.32
<i>P</i> -value *	0.994	0.477	0.019	0.090	>0.000	>0.000
<i>F</i>	0.137	0.966	3.063	2.046	5.839	8.573
MSE	109.198	81.979	71.990	162.667	92.354	69.562
<i>df</i>	1,7	1,7	1,7	1,7	1,7	1,7

Table 3. Analysis of Variance (ANOVA) table (Mean ± Standard Error or SE) for relative mound density of imported fire ants per 0.25 acre subplot before and following bait product treatments applied Sept. 5, 2008, Texas A&M University, College Station, TX, in Brazos County (significant difference when $P < 0.05$, *Tukey Post hoc test, mean significantly different to untreated control).

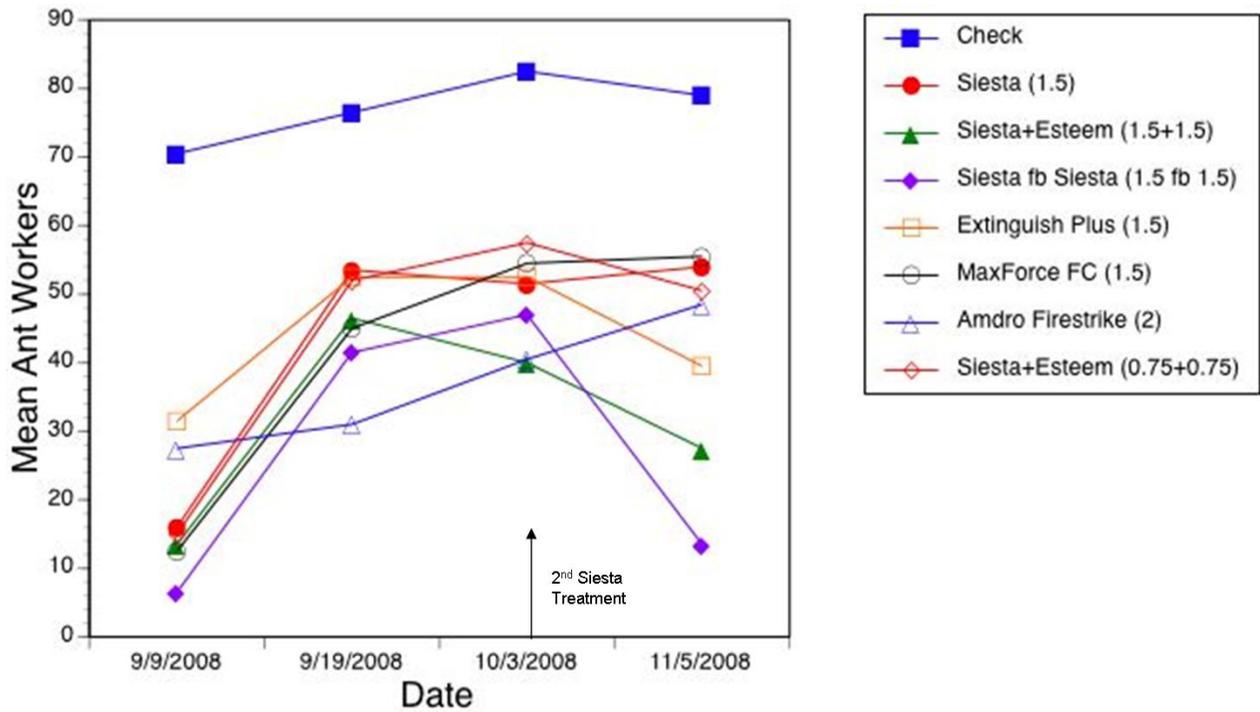


Figure 1. Mean fire ants observed on food lures (hot dog slices) before and following imported bait product applications, Texas A&M University, College Station, TX, in Brazos County. All treatments applied on September 5. Second Siesta treatment (1.5 lb product /acre) applied on October 3, 2008.

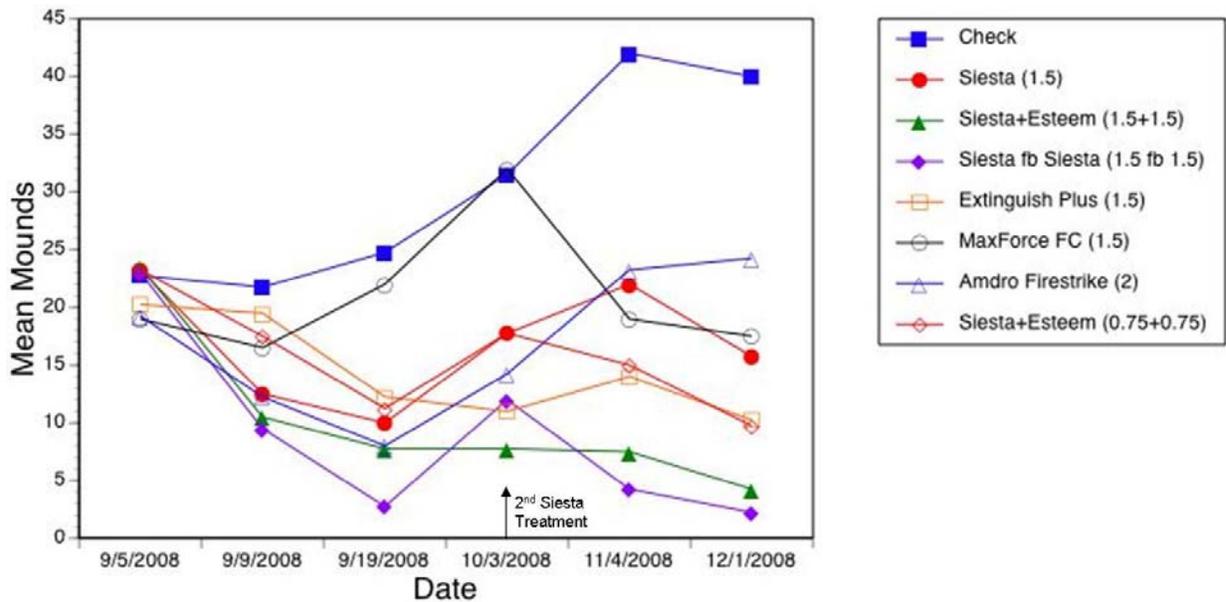


Figure 2. Mean fire ants mounds observed before and following imported fire ant bait product applications, Texas A&M University, College Station, TX, in Brazos County. All treatments applied on September 5. Second Siesta treatment (1.5 lb product /acre) applied on October 3, 2008.