

Evaluation of amino acids as an individual mound treatment for red imported fire ants, *Solenopsis invicta* Buren (Hymenoptera: Formicidae)

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Red imported fire ants, *Solenopsis invicta* Buren, are aggressive, nuisance insects that sting. This makes controlling this pest insect a high priority (Drees et al. 2002). Treating individual fire ant mounds is the fastest way to kill fire ant colonies. There are numerous products on the market labeled to decrease fire ant populations from fire ant baits to mound drenches. All across Texas, there is a growing interest in using naturally derived insecticides for controlling all insects, including red imported fire ants. These products are termed “organic” (Drees and Lennon 1998). This trial was established to determine the efficacy of individual mound treatments using amino acids (Rain Plus™ Phase III Organic Acid with Protein Pack, Tempe, Arizona) as an organic mound drench treatment and using rhyolite as an individual mound treatment. Amino acids are commonly used to enhance the nutrients of the soil, but have also been noticed to hinder fire ant colonization within the treated soil. Rhyolite is an igneous rock, similar in composition to granite and is thought to have repellent effects within the soil due to its jagged edges.

Materials and Methods

On March 18, 2009, twenty plots were established at the Frito Lay Corporation, 7701 Legacy Drive, Plano, TX (Figure 1). We began measuring plots at 11:00am with temperatures at 77° F. Flags were inserted into the ground to mark the beginning and end of each plot. Within each plot, 5 active fire ant mounds were flagged. Red imported fire ant mounds were counted within each plot by disturbing suspected mound sites with a stick to determine activity. Mounds were considered active if many (dozens of) worker ants were observed exiting the mound within 15 seconds.

The width and length varied between the plots. Areas of the plots were arrayed from smallest to largest and then divided into 4 blocks containing 4 treatment plots each. This allowed the total area of the plots for all the treatment plots to be roughly equal, so colony migration into and out of the plot areas was similar for all treatments. Within each block, treatments were assigned to plots at random in order to minimize pre-treatment differences in total plot length (Table 1).

The treatments included:

- 1) Amino Acids (Rain Plus™ Phase III Organic Acid with Protein Pack)- 100 ml/ gallon water per mound
- 2) Rhyolite (Mineral Air Rhyolite, 1501 LBJ Freeway, Dallas, TX) - 64 ounces per mound
- 3) Combination of Amino Acids (Rain Plus™ Phase III Organic Acid with Protein Pack)- 100 ml/ gallon water per mound and Rhyolite- 64 ounces per mound
- 4) Water Control
- 5) Untreated Control

Treatments were applied beginning at 1:00pm on March 19, 2009 with temperatures at 75° F (Figures 2 and 3). Evaluation of mound activity was conducted at 3, 7, 14, 21, and 28 days post treatment. For the evaluation process, red imported fire ant mounds were determined to be active within each plot by disturbing suspected mound sites with a stick to determine activity. Mounds were considered active if many (dozens of) worker ants were observed exiting the mound within 15 seconds. Data were analyzed using Analysis of Variance (ANOVA) test with means separated using Duncan's Multiple Range Test at $P \leq 0.05$ (SPSS for Windows, Lead Technologies, Version 13.0).

The average daytime temperature throughout the study was 85°F with a total of 6 inches of rain.

Results and Discussion

At 3 days, there were no significant differences in fire ant mound activity between the treatments and the control (Table 2). At 7 days post treatment, the number of active mounds in the combination of amino acids and rhyolite treated plots were significantly less than the other treatments and the controls. At 14 and 21 days, the number of active mounds in the combination of amino acids and rhyolite and rhyolite treated plots were significantly less than the other treatment and the controls. At 28 days, all of the treatments had significantly less active fire ant mounds compared to the controls.

Overall, the combination of amino acids and rhyolite had numerically less active fire ant mounds compared to the other treatments. Further tests should be conducted to confirm this study.

Table 1. Treatment block assignments based upon plot area.

Treatment	Plot Number	Plot Area (ft²)
Amino Acids	1, 4, 7, 17	728, 1024, 2176, 1404
Rhyolite	5, 11, 12, 14	1092, 2755, 935, 828
Amino Acids and Rhyolite	8, 13, 18, 20	2100, 540, 513, 2706
Dry Control	3, 6, 9, 15	392, 1462, 2871, 900
Water Control	2, 10, 16, 19	1620, 690, 3060, 351

Table 2. Number of active red imported fire ant mounds in the individual mound test observed at Frito Lay Corporation, 7701 Legacy Drive, Plano, TX.

Treatments	3 Days	7 Days	14 Days	21 Days	28 Days
Amino Acids	4.50a	4.00b	3.75b	3.50c	2.50b
Rhyolite	4.75a	4.50b	2.50a	2.50b	3.25c
Amino Acids and Rhyolite	4.50a	2.50a	2.75a	1.50a	1.50a
Dry Control	5.00a	5.00b	4.00b	4.00c	4.00d
Water Control	5.00a	4.25b	4.25b	4.25c	4.25d

^aMeans followed by the same letter within the same column were not significantly different using Analysis of Variance (ANOVA) and means separated using Duncan's Multiple Range Test at $p \leq 0.05$ (SPSS, Windows 11.5).

Figure 1. Testing site for the individual fire ant mound trial on 8 acres at the Frito Lay Corporation, Plano, TX.



Figure 2. Treating individual fire ant mounds with amino acids at the Frito Lay Corporation, 7701 Legacy Drive, Plano, TX.



Figure 3. Treating individual fire ant mounds with rhyolite at the Frito Lay Corporation, 7701 Legacy Drive, Plano, TX.



Literature Cited

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Evaluation of ARINIX® Permethrin Impregnated Nylon Plastic Strips in Preventing Fire Ant Invasion in RainBird Par + ES Irrigation Boxes at Bear Creek Golf World, Houston, Texas

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Golf is a major industry in the State of Texas. The World Golf Foundation (2008) reported that as of 2006, the state of Texas had over 900 golf courses which produced a \$7.4 billion economic impact and supported almost 100,000 jobs. Harris County is home to about 100 golf courses with a total estimated size of 19,800 acres (Camerino, 2007). Golf course maintenance is a high input agronomic system that requires a careful balance between visual aesthetics, turfgrass health, playability and budgetary constraints. The golf courses managed by Harris County Texas AgriLife Extension Service program attendees in 2009 had an average annual fertilizer and pesticide budget of \$141,250.00 (Jo and Camerino, 2009).

Maintaining acceptable conditions is challenging because of a variety of insect pests. A significant insect pest that impacts aesthetics, turfgrass health, and playability is the red imported fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae). According to Lard et.al. (1999), in the five major metro areas in Texas, Austin, Dallas, Ft. Worth, Houston, and San Antonio, \$581 million was spent in 1998 on fire ant control and management. This figure includes expenditures by households, golf courses, cities, and schools.

Lard et.al. (1999) determined that golf courses in these five metro areas spent an estimated \$30 million on fire ant control, equipment replacement, repair, and medical expenses directly related to fire ant infestation. An infestation can cause a great deal of damage, requiring large sums of money for system replacement or repair. The most costly expenditure, by far, for golf courses was electrical equipment replacement. This amounted to \$25.3 million, or approximately 85% of their total annual fire ant related expenditures. Much of this cost (\$25.1 million) was for the replacement of irrigation systems that were infested by fire ants. Fire ants and other ant species have an affinity for electrical equipment switching mechanisms involving electrical currents like those used in automated irrigation systems. Of this total, Houston spent \$3.5 million with the majority of the damage (67%) being to electrical equipment (Lard et.al. 1999).

Bear Creek Golf World (16001 Clay Road, Houston, TX 77084) is a 450 acre facility located on the west side of Houston, TX that offers 54 holes of golf. The facility was the first daily fee course in the area not run by a municipality. Daily fee golf courses, such as Bear Creek Golf World, operate on a very restrictive budget compared to private and semi-private golf facilities. Budgetary constraints and turfgrass health are of more importance to managers of these facilities, while lower standards of aesthetics and playability are tolerated by consumers. At Bear Creek Golf World, fire ant control is on an as needed basis. An annual area-wide fire ant suppression program is not economically feasible at this facility. This golf facility has a perpetual problem with fire ants infesting its irrigation control box pedestals spread throughout the three 18-hole courses. According to the superintendent, if fire ants could be managed in a way that eliminated damage to susceptible electrical landscape utility devices,