



Texas Imported Fire Ant Research and Management Project

Final Progress Report - October 2001

Control of the red imported fire ant in hay shipments

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Summary of Work to be Done: To develop a technique for eliminating fire ants from large, round hay bales.

Major accomplishments to date:

The Texas Administrative Code (Title 4, Part 1, Chapter 19, Subchapter J, Rule §19.102) does not permit baled hay to be shipped from quarantine counties to nonquarantine counties or to other states due to infestation of the red imported fire ant (<http://lamb.sos.state.tx.us/tac/>). Currently there is no effective method for treating infested hay. During the first summer, we conducted preliminary trials to eradicate red imported fire ants from one-ton circular bales of coastal hay. Our study site is located approximately 60 miles east of San Antonio, Texas, in Karnes County. We bought coastal hay from “Yaa-Yaa” Hay Co. L.L.C. and conducted our experiment on Southwind Ranch, (owned by “Yaa-Yaa” Hay).

We used #2 grade, (fair) coastal hay. A total of eight bales were used, (four controls and four treatments). All bails were infected with a colony of the polygyne form of the red imported fire ant. The ants were contained in a PVC tube approximately 25-cm long and 5-cm in diameter. The tube was sealed at one end with a PVC cap. Moistened paper towels were inserted into the tubes and a colony of red imported fire ants was added, (all colonies contained brood, alates, majors and minors, and fertile queens). The tubes were inserted at the lower portion of the bales. All eight bails were then covered with industrial strength polyethylene plastic (6-mm strength,

black) and sealed with duck tape. A 24-hour settling period for the ants was provided before the injection of anhydrous ammonia. The treatment bales received a single injection of 35.75 liters of anhydrous ammonia per bale. We wore protective wear and respirators while working with the anhydrous ammonia. The injection holes were immediately sealed after treatment.

The bales were then monitored for the next 48-hours. During this period, grass surrounding the treatment bails turned yellow and gradually died as a result of the treatment by anhydrous ammonia. At the end of the 48-hour period, we uncovered all the bales and checked for the presence ants. We found that all the controls contained living ants, most of which migrated to the bottom of the bale. Queens were identified in two of the control bales. Only one of the control bales contained ants in the original container, where one of the queens was located.

Living ants were discovered in three of the four treated bales of hay, and appeared to act normally, and to be in approximately the same numbers that were introduced into the bale. We could not find dead or live ants in the first treated bale, we are assuming that migration of the plastic occurred before treatment. The remaining treatment bales contained brood, alates, majors and minors, and most contained queens. We put on our respirators because of the noxious smell of anhydrous ammonia that predominated around the bales. The anhydrous ammonia gave the hay a yellow color, (as if wet) which would not appeal to buyers. It appeared to dissipate after several hours.

During the last half of May of the second summer, we conducted trials to eradicate red imported fire ants from one-ton circular bales of coastal hay. The study site used to conduct our preliminary trials last year shut down after the 2000 fall harvest. The 2000 summer drought was cited as the main reason for shutting down. We located a new study site approximately 40 miles southeast of San Antonio, Texas, in Wilson County. Boening Bros. Inc. in Floresville, TX provided us with the study site, coastal hay, and anhydrous ammonia.

We used No. 2 grade, (fair) coastal hay. A total of eight bales were used, (four controls and four treatments). All bails were infected with a colony of the polygyne form of the red imported fire ant. The ants were contained in a PVC tube approximately 25-cm long and 5-cm in diameter. Two 2-mm wide slits were made along the length of each tube (20-cm long) and were temporarily sealed with duct tape. These slits provided the ants with greater access to the hay and reduced the chance that tubes could act as shelters for the ants from the anhydrous ammonia. The tube was sealed at one end with a PVC cap. Moistened paper towels and dead grasshoppers were inserted in the tubes and a colony of red imported fire ants was added, (all colonies contained brood, alates, majors and minors, and fertile queens). The tubes were inserted at the lower portion of the bales. All eight bails were then covered with industrial strength polyethylene plastic (6-mm strength, black) and sealed with duck tape. A 24-hour settling period for the ants was provided for two control bales and two treatment bales before the injection of anhydrous ammonia. The other two control and two treatment bales were given a 48-hour settling period before the injection of anhydrous ammonia. The treatment bales received a single injection of 35.75 liters of anhydrous ammonia per bale. We wore protective wear and respirators while working with the anhydrous ammonia. The injection holes were immediately sealed after treatment.

The bales were then monitored for the next 24/48-hours. At the end of the 24/48-hour period, we uncovered the all bales of hay and checked for the presence ants. We found that all the controls contained living ants, most of which remained near the tube. Queens were identified in all of the control bales.

Living ants were discovered in one of the four treated bales of hay. We found dead ants (brood, alates, majors and minors, and queens) in the first, third, and fourth treated bales. The first treatment bale was inspected 24 hours after treatment and the third and fourth treatment bales were inspected 48 hours after treatment. The second treatment bale contained both dead and alive brood, alates, and majors and minors. We feel that ants survived in the second treatment bale because we were unable to complete the full application of the anhydrous ammonia. We estimate that the second treatment bale received approximately 20.41 liters of anhydrous ammonia.

Goals achieved/Milestones/Highlights:

The preliminary experiment did not successfully eliminate the ants. The experiment was repeated the second year, using more realistic conditions, and the ants were eliminated in three of the four treatment bales

Relevance to the Texas Imported Fire Ant Research Ant Management Project:

Several points that we can offer to the Texas Department of Agriculture is that the red imported fire ant does not appear to be collected during the cutting of the hay or the baling of the hay. Over time however, red imported fire ants will migrate to round bales and build a mound on the south facing side of the bale. We're unclear as to why this occurs (it could be that this aids in temperature regulation of the mound or protects the mound from the wind). It also appears that when bales of hay are being stored in the field or along the field (in rows) and a red imported fire ant nest is present given time the nest forms a mound at the base of the bale. It can be torn from the rest of the mound when being loaded for shipment to a buyer and transported to a new location. If a queen is present it can become established. Anhydrous ammonia is a dangerous chemical, which involves a high health risk when applying in the above manner. Anhydrous ammonia is normally injected into the ground to increase the nitrogen content available for the hay. More importantly this application forces agriculture pests such as grub worms and fire ants from coastal hay fields (even though this is not the purpose of applying the anhydrous ammonia). Regular subsurface applications of anhydrous ammonia could play a two-fold role for hay producers. While enriching the soil's nitrogen content an added benefit is that it could force fire ants from coastal hay fields.

Publications submitted/published; presentations/posters presented at national technical meetings/conferences:

Mackay, William P. 2000. A review of the New World ants of the subgenus *Myrafant* (genus *Leptothorax*). *Sociobiology* 36: 265-444.

Mackay, William P., A. Van Pelt, and Isidra Moreno. 2000. Malfunction of electrical equipment caused by *Solenopsis aurea* Wheeler (Hymenoptera: Formicidae). *Pan-Pac. Entomol.* 77:126.

Proceedings Articles:

Mackay, William P., Daniel I. Padilla, Veronica Treviso, Mario Chavez, Nick B. Hogue, Isidra Moreno, Cynthia Morales, Mary A. Mackay, Linda Mackay, A. Enger, Audrey Hernando, and Hilda Taylor. 2000. The current status of the red imported fire ant control program in El Paso, Texas. *Proceedings of the 2000 Imported Fire Ant Conference*, pp 67- 70.

Padilla, Daniel, Nick B. Hogue, and William P. Mackay. 2000. Preliminary results of intranidal insecticidal bait treatments on the red imported fire ant, *Solenopsis invicta* (Hymenoptera: Formicidae). *Proceedings of the 2000 Imported Fire Ant Conference*, pp. 91 – 96.

Presentations:

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Chavez, Mario, Veronica Treviso, Cindy Morales, Isidra Moreno, Cynthia Altamirano, Daniel Padilla and William Mackay. 1999. The nest density of *Solenopsis krockowi* (Hymenoptera: Formicidae). Fifth Symposium on Resources of the Chihuahuan Desert Region: U.S. and Mexico, Sul Ross State University, Alpine, Texas, October 7-8, 1999.

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Morales, Cynthia, Eliza Vigil, Veronica Treviso, Mario Chavez, Daniel Padilla, Gus Enger, Grace Proctor, and William P. Mackay. 1999. *Solenopsis krockowi* as a potential predator of *Solenopsis invicta* queens in the laboratory. Fifth Symposium on Resources of the Chihuahuan Desert Region: U.S. and Mexico, Sul Ross State University, Alpine, Texas, October 7-8, 1999.

Moreno, Isidra, Heather Jimenez, Daniel I. Padilla, Hilda S. Taylor, and William P. Mackay. 1999. The current status of the red imported fire ant, *Solenopsis invicta* in west Texas (Hymenoptera: Formicidae). Fifth Symposium on Resources of the Chihuahuan Desert Region: U.S. and Mexico, Sul Ross State University, Alpine, Texas, October 7-8, 1999.

Padilla, Daniel, Nicholas B. Hogue, William P. Mackay, and Sandra Poole. 1999. Evaluation of intranidal insecticidal baits on the red imported fire ant, *Solenopsis invicta* (Hymenoptera: Formicidae). Fifth Symposium on Resources of the Chihuahuan Desert Region: U.S. and Mexico, Sul Ross State University, Alpine, Texas, October 7-8, 1999.

Padilla, Daniel, Nick B. Hogue, and William P. Mackay. 2000. Preliminary results of intranidal insecticidal bait treatments on the red imported fire ant, *Solenopsis invicta* (Hymenoptera: Formicidae). 2000 Imported Fire Ant Conference, The University of Tennessee, April 5-7, 2000.