



Texas Imported Fire Ant Research and Management Project

Final Progress Report - October 2001

Determination of Effects of Imported Fire Ants on Texas Livestock

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Funding Amount/2 Years: \$120,000

Summary of Work to be Done: This project will (1) determine relationships between grazing behavior in cattle and sheep and level of RIFA infestation and (2) further investigate the degree of passive transfer of immune response to RIFA in cattle.

Major accomplishments to date (Sept. 1, 1999 through Aug. 31, 2001):

1. Blood sera on feedlot cattle collected for evaluation of red imported fire ant (RIFA) specific immunoglobulin G (IgG).
2. Analysis of data to study passive immunity transfer of IgG specific to RIFA in beef cattle.
3. Development and utilization of global positioning system (GPS) collars to study cattle grazing patterns in RIFA infested pastures.

Goals achieved:

Accomplishment Area 1.

A total of 311 feedlot cattle in three separate trials were evaluated for level of RIFA specific IgG, the major immunoglobulin involved in cattle immune response. These cattle were known

to originate in the eastern portions of Texas, and their exposure to RIFA before entering the feedlot was apparent based on the immune response test we developed in the first two years of the project. Although large differences in RIFA IgG levels were seen among these cattle entering the feedlot, the level of RIFA IgG was not related to either average daily weight gain during the feedlot phase nor incidence of bovine respiratory disease.

Accomplishment Area 2.

In the spring of 2000, 30 pregnant Angus cows in the last trimester of gestation in a non-RIFA area were utilized to study passive immunity transfer of RIFA specific IgG. Cows randomly received one of three treatments, which were (1) injections of alum adjuvant (control) 14 days apart, (2) injections of 120 ng of RIFA venom with adjuvant 14 days apart, and (3) injections of 240 ng of RIFA venom with adjuvant 14 days apart. Large differences were observed across individual animals for level of RIFA specific IgG. There was an increase ($P < 0.05$) in the level of RIFA specific IgG levels in both cows and calves from the date of the initial venom injection illustrating that these cattle were producing an immune response. However, the levels of RIFA specific IgG in the cows and calves showed no differences between the three treatment groups illustrating that these dosages of RIFA venom were not large enough to prove a significant difference in immune response. In many instances the IgG values in the calves (which did not receive injections) were higher than those of the cows as was reported in the first phase of the project.

Accomplishment Area 3.

Two pastures at the McGregor Texas A&M Research Station were utilized in the summer of 2001 to study the relationship between RIFA presence and cattle grazing patterns. Within each pasture, three areas were evaluated for presence of RIFA by placing a 100-foot transect line of 10 bait cups in each area. The cups were collected after 15 minutes. These three areas represented different plant communities within each pasture (see Figure 1).

Statistical differences existed in number of ants collected in these bait areas, but there was also a very noticeable difference in amount of green, growing forage in these areas as well. Areas associated with more green forage showed higher ($P < 0.05$) RIFA counts per cup. There were also statistical differences in the amounts of times that cattle were in the six bait areas, with bait areas having the higher RIFA numbers showing reduced cattle presence. This is thought to be a reflection of the forage presence and not caused by RIFA. Figure 2 illustrates the presence of two cows (one per pasture) during one week of the trial with each color representing a different day.

Statistical analysis of cattle presence was based on the percentage of GPS data points per animal within the bait areas relative to the total GPS data points collected per animal. Two sets of cattle (mature cows and yearling steers) were used evaluated, but similar results were seen. The areas of the pastures that contained green forage were the areas where the animals overwhelmingly spent their time.

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

This project has assessed the impacts of red imported fire ants on cattle relative to feedlot performance and health, passive immunity transfer and pasture utilization through GPS/GIS technology. To date, there are no other projects that have specifically studied the impacts of imported fire ants on cattle production performance in an organized manner. Based on the overall results of this study, substantial differences in level of RIFA specific immune response exist in cattle and this immune response is transferred from cows to calves through passive immunity (in colostrum). However, differences in RIFA immune response do not appear to be significantly related to feedlot performance or incidence of bovine respiratory disease. The

relationship between presence of RIFA and grazing patterns of cattle is still not exactly determined. However, based on our evidence this relationship appears to be minor relative to forage availability. Based on both the findings of our previous two-year study and this study, the typical effects of RIFA on beef cattle production in Texas appears to be minimal in regard to typical production measures. Events where specific animals have severe allergic reactions to RIFA appear to be the most commonly seen detrimental effects of RIFA on cattle, but these are rarely seen. It is probable that RIFA are more of a nuisance to people than to grazing cattle.

Publication Citations, Paper Presentation Citations and other Citable Products:

Austin, G. P., A. D. Herring, C. J. Creager, S. P. Jackson, and D. K. Lunt. 2001. Development of a global positioning system to monitor cattle. *J. Anim. Sci.* 79(Suppl. 1):272(Abstr.).

Drake, Mackenzie. 2001. Evaluation of inheritance of passive immunity to red imported fire ant venom in beef cattle. A Professional paper in partial fulfillment for the M.Ag. Department of Animal Science & Food Technology, Texas Tech University.

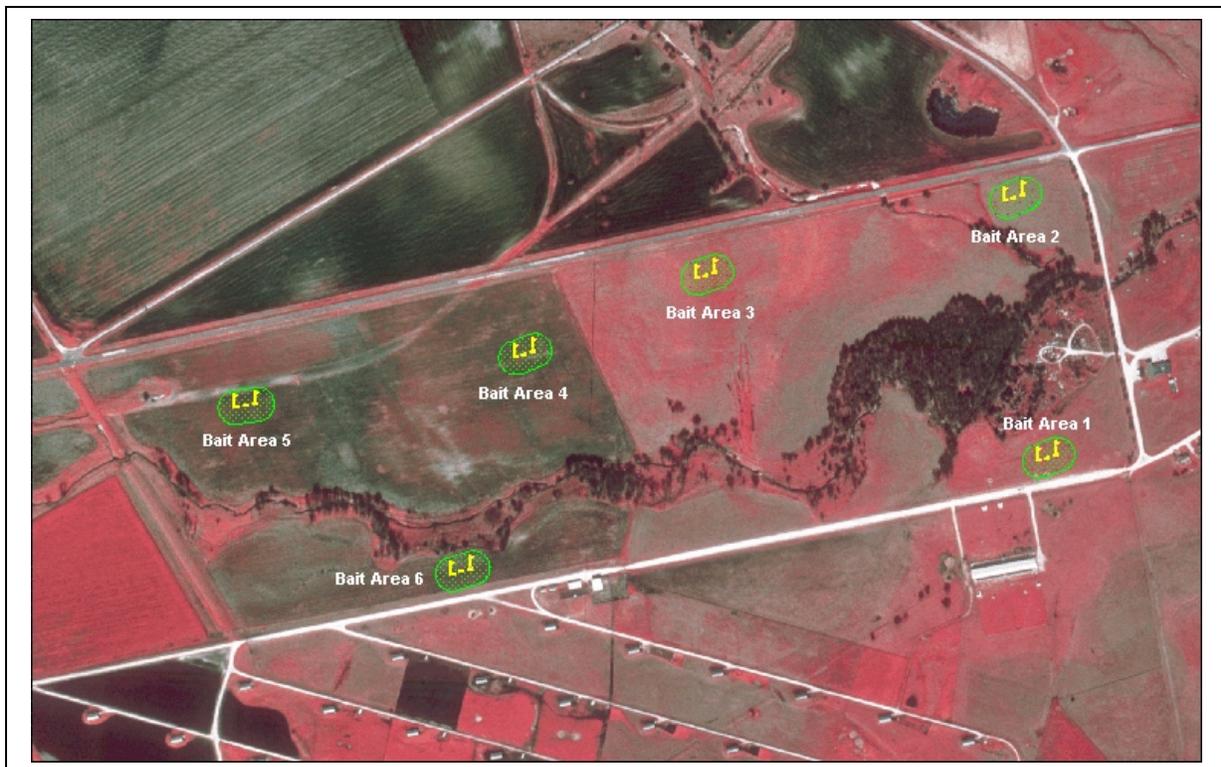


Figure 1. RIFA bait cup areas within pastures.

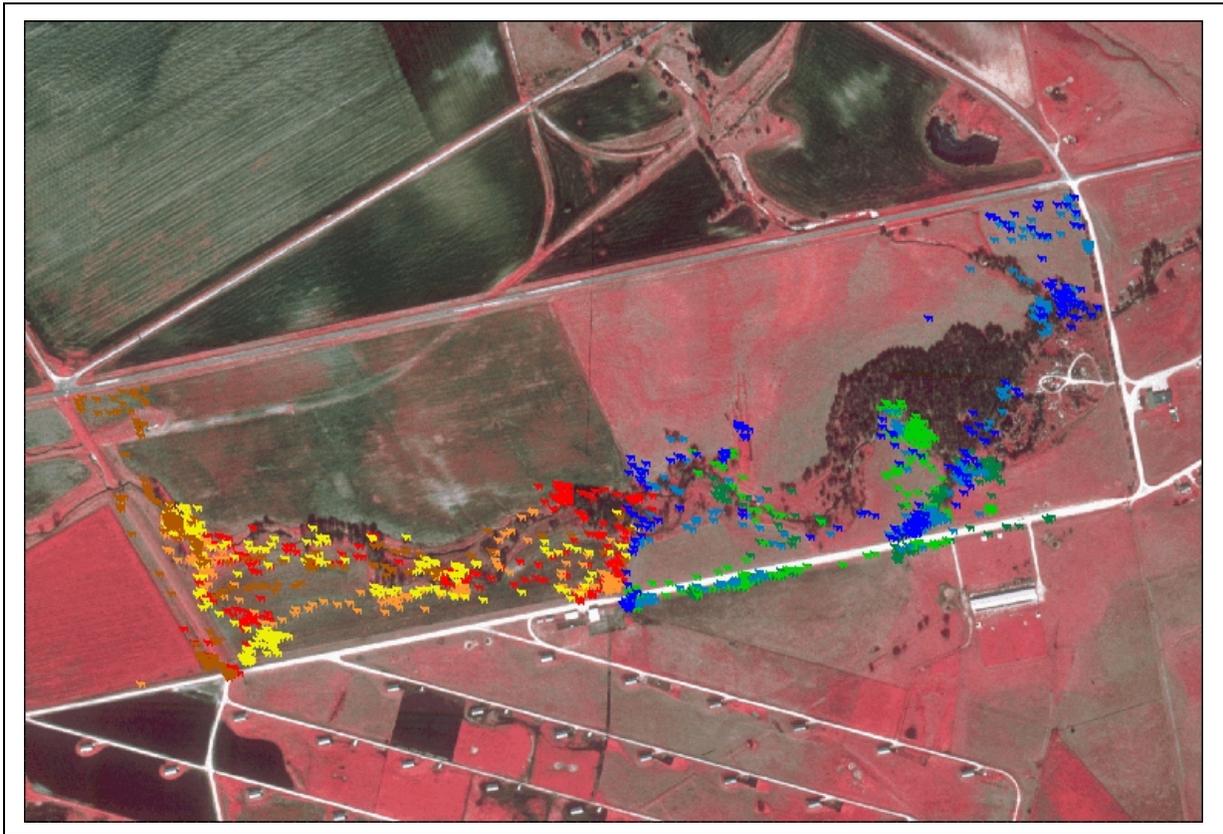


Figure 2. Presence of cattle (one per pasture) during one week of trial (each color within a pasture represents a different day).