Highlights and Impacts of FY '05 Projects Funded by the Texas Imported Fire Ant Research and Management Project

Project Investigator's Name: James A. Reinert

Project Title: Identification and Development of Red Imported Fire Ant Resistant Grasses for use in Pastures, Urban Lawns and Recreational Areas to Repel or Significantly Reduce RIFA Density.

Significant Accomplishment	Impact on Imported Fire Ant Management
The various species of turfgrasses used in the urban landscape have been evaluated for feeding preference by red imported fire ants. These grasses can act as sources of food (known that sugar constitutes ca. 60% of the diet) for fire ants. Differences in foraging preference are being found among the turfgrass species and among the cultivars within a grass species. St. Augustinegrass, Zoysiagrass and Bermudagrass have been evaluated, other turf species will soon be completed and then the preference among the most susceptible and most resistant cultivars for each species will be assayed. Samples of each of these grasses have been collected and processed to be evaluated for sucrose content by Dr. Vinson's lab.	The correct choice of turfgrass species and or cultivars can definitely impact the densities of RIFA that establish in the urban landscape. This was learned in the large scale LGIS study that we conducted over a two-year period. The present studies are confirming that the choice of a particular cultivar or even species of grass for the landscape can contribute significantly to RIFA management.
St. Augustinegrass: Six cultivars have been assayed for RIRA preference. Foraging ant numbers were similar for all the cultivars, but were highest on Bitter Blue > Raleigh > Floralawn > Texas Common > Delmar > Floratam. Among the cultivars, Floratam appears to exhibit a level of resistance. It has also documented resistance to other turf insects.	Among the St. Augustinegrass cultivars there is definitely a much lower level of foraging by RIFA in Floratam than in the other cultivars evaluated.
Zoysiagrass: Six cultivars (El Toro, Zeon, Palisades, Cavalier, DeAnza and Crowne) have been assayed for RIRA preference. Foraging ant numbers were very high on El Toro. Numbers recorded foraging on the other cultivars were very similar and about one half the number present on El Toro. As a group, the zoysiagrasses were more resistant than bermudagrass and St. Augustinegrass.	Among the Zoysiagrass cultivars the results show that El Toro would be a bad choice compared to the other cultivars. In fact there was ca. one half as many RIFA foraging in Cavalier, DeAnza and Crown than in El Toro.
Bermudagrass: Five cultivars (Tifway > Baby > Tifsport > GN1 > Tifton 10) have been assayed for RIRA preference. Tifway, Baby and Tifsport were each highly preferred with much higher RIFA densities than either St. Augustinegrass or Zoysiagrass. Conversely, GN1 and Tifton 10 exhibited very low levels of foragers and were the more resistant of any of the grasses evaluated so far.	The data shows that the highest foraging by RIFA occurs in several cultivars of Bermudagrass (Tifway, Baby and Tifsport), while less than one fifth as many ants were foraging Tifton 10. The data is probably the most clear-cut among the Bermudagrasses that RIFA shows a high preference for certain cultivars. The data clearly supports the 2-year study, that Tifway (probably the most widely used cultivar) is a preferred host for RIFA.
Source and Amount of Funds Leveraging Current Fire Ant Project: **Proposals have been submitted but none have been funded so far.**	

Highlights and Impacts of FY '05 Projects Funded by the Texas Imported Fire Ant Research and Management Project

Project Investigator's Name: Ken R. Helms Co-PI S. B. Vinson

Project Title: Identification and development of grasses to repel or significantly reduce red imported fire ant density in pastures, conservation lands, urban lawns, and recreation areas.

Significant Accomplishment	Impact on Imported Fire Ant Management
A). Evidence suggests that different grass communities support different densities of the red imported fire ant (IFA). There are a number of possible reasons for the difference and these reasons may be different with different grasses and situations. The system consists of different grasses that may differ in serving as a food resource, presence of repellents, insect infestation that provides protein food, insect infestation that provides carbohydrate food, presence of predators or parasites that compete or alter resources, or different environmental preferences Understanding the affect that grasses have on the IFA is important because it will tell us whether manipulating grass species occurrence can reduce IFA populations.	A). Grasses are the primary vegetation on ranches, in lawns, recreation areas, and natural grasslands. These are also areas impacted severely by the presence of the IFA. Evidence suggests that different grass species are associated with different IFA densities, suggesting it may be possible to manage IFA population size by manipulation and management of grass communities. However, we currently do not know why different grasses are associated with different IFA densities. An answer to this question is necessary in order to determine the potential benefits of grass management in reducing IFA populations. **GOAL**- Reduce or eliminate IFA through grass management.
B). There are 4 major factors that may play a role in influencing IFA densities in grasses. These are, 1. Repellency of a factor in or due to the grass, 2. Some grasses may provide resources (directly through feeding on grass). 3. Through directly providing insects as food (ants feed on grass associated insects), or 4. Indirectly through carbohydrate resources provided by certain insects). 4. None of above, but due to environment.	B). One reason that it is important to know how different grasses affect the IFA is that those affects may not be direct. For example, it is possible that different grass species have different habitat requirements and that some closely match those of the IFA while others do not. This could result in an association between grass species and IFA density. In this case, grass community management would likely have little affect on IFA abundance. **Goal**- What is the factor(s) that control IFA abundance and can we manipulate it?
C).Both carbohydrates and proteins have been shown to be important in IFA colony growth. The most likely nutritional resource that the IFA could acquire directly from grass plants are carbohydrates available in the phloem. In the experiment, all colonies were given an identical limited amount of insect prey as a source of	C). These results of the research show that grasses probably supply little if any nutritional resources directly to the IFA. The research does, however, suggest that the IFA has preferences in which grass species they associate with. Preferences for association with particular grasses may at least partially explain associations

protein, and any other effect on colony growth would be attributed to the presence of carbohydrates acquired from the different grass species. A control group did not have access to any grass. The experiment showed that different grass species did not differ in their effect on IFA colony growth. In addition, the growth of colonies with access to grasses was no different than colonies without grasses.	between different grass species and IFA abundances in the field, suggesting that management of grass community composition may be one strategy to reduce IFA abundance.
D). It remains possible that grasses affect IFA density, or directly by intrinsic repellent or attractive properties. For this The later possibility was explored during the next experiment. In this experiment, the IFA colonies had a choice of nesting in one of two containers, one with bare soil and one with one of the three grass species. The colonies were initially placed in the containers with bare soil, from which they could remain or move to the container with the grass plants. In a control group, colonies were given the choice of nesting in one of two containers that both had bare soil. Results for the first 2 days showed a significant preference for colonies to nest in containers with Bermuda grass over containers with bare soil while they did not prefer to nest in WW-B Dahl over bare soil. However, this preference disappeared after 2 days. IFA nest site location over the course of the experiment showed that the IFA hase a strong and significant preference to nest in containers with grasses over nesting in bare soil.	D). These results suggest that either Bermuda grass has an attractive property to the IFA or WW-B Dahl has a repellent property. Why this difference was short-lived and whether it occurs and affects IFA population size under field conditions requires further study. We are trying to evaluate the possibility of repellents in WW-B Dahl grass working with the Texas Tec. Grass project. However, the first samples were not very repellent.
E). We discovered that the IFA tends homoptera (Mealybugs) so we asked a question. Do colonies grow better if they have a source of carbohydrate. We fed new small colonies unlimited protein but only half had a source of carbohydrate. The colonies with carbohydrate grew larger twice as fast as the sugar restricted colonies.	E). The results suggest that a source of carbohydrate is important and the ants can not get the sugar directly (see C above), so they may depend on homoptera. This question is under study. The preliminary results suggest that homoptera are important (see also the pheromone project).
Source and Amount of Funds Leveraging Current Fire Ant Project Funding was awarded for a project closely related to this research:	

Helms, K. R. and S. B. Vinson. Effects of the invasive mealybug *Antonina graminis* on abundance of the red imported fire ant, *Solenopsis invicta*. CSREES, USDA National Research Initiative. $346,000. 2004 – 2007.

Publications:

Helms, K. R. and S. B. Vinson. 2003. Apparent facilitation of an invasive mealybug by an invasive ant. Insect Socio. 50: 403-404.

Highlights and Impacts of FY '05 Projects Funded by the Texas Imported Fire Ant Research and Management Project

Project Investigator's Name: S. B. Vinson Co-PI: Ken Helms

Project Title: Identification and development of grasses to repel or significantly reduce red imported fire ant density in pastures, conservation lands, urban lawns, and recreation areas.

Significant Accomplishment	Impact on Imported Fire Ant Management
A) Because the data suggests that mealy bugs are important and often associated with fire ants, we began studies to evaluate the role of mealy bugs and determine factors that influence mealy bugs. We have found that populations of mealy bugs are higher in association with IFAs. Also some grasses are resistant to mealy bugs and these grasses tend to be ones less preferred by the IFA. We also know that the IFA can detect and destroy parasitized aphids (Vinson, S. B., and T. A. Scarborough. 1991. Interactions between *Solenopsis invicta* (Hymenoptera: Formicidae), *Rhopalosiphum maidis* (Hymenoptera: Aphididae), and the parasitoid *Lysiphlebus testaceipes* Cresson (Hymenoptera: Aphididae). Ann. Entomol. Soc. Am. 84:158-164.). Thus, the IFA may promote the mealy bug in mealy bug susceptible grasses. This is under study.	A). If the IFA reduces mealy bug parasitoids and as a result the mealy bug population increases that provides resources for the IFA , then a mealy bug resistant grass may be a management tool. If repellents are also found then these may be added through crosses and/or selective breeding. GOAL.- Develop a IFA resistant grass based on the data from this project. Alternatively produce or protect the mealy bug parasitoids to reduce the ants access to resources..
B) We are collecting A. graminis in Brazos County to develop mealy bug rearing methods and develop methods to handle the different parasitoids. We have developed rearing containers to restrict the mealy bug crawlers and also restrict the flightless *N. sangwan* and other parasitoids	B). This will allow us in the laboratory to determine if parasitoid manipulation, resistant grasses or other factors can be used to manipulate IFA colonies. If promising we can plan field experiments, but it is best to under stand all the parameters before field studies are designed.
C). A survey for mealy bug parasitoids is underway. We have already found that at least 3 species exist.	C). Some species may be more effective against the mealy bug and thus be more effective in IFA suppression. ,
D). A study is being set up to determine if RIFA directly interferes with oviposition by some of the parasitoids such as *N. sangwani.*	D). If the IFA interferes with oviposition or they kill parasitized mealy bugs thus reducing the next parasitoid generation the results would suggest that mealy bug resistant grasses would be a better approach than biological management.

Source and Amount of Funds Leveraging Current Fire Ant Project	
See Helms report.	