



Texas Imported Fire Ant Research and Management Project

Final Progress Report - October 2001

Genetics Program: Use of molecular markers to define the population structure of the genus *Solenopsis* in the United States and to determine the molecular basis of male sterility.

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Relevance/Implication of project:

It is essential that the target of the management program is known, yet we do not know whether we have 2, 3, or more populations of imported fire ants. We do know that there are at least two different populations and a hybrid form between them. The occurrence of several species and possible hybrids, if placed under severe selective pressure, could rapidly adapt or shift in response to our management methods resulting in no real progress. Such shifts are even more likely the more complex the population structure. This can be particularly important in the use of virulent forms of biologicals or an effective augmentation approach to management where the population can be subjected to very high selection pressures over a short period and where specificity is often very important. Further, it will be important to be able to track the source of re-infestations or even determine the source of new ones if real progress is to be made in management.

Summary of work proposed to be done:

Determine if there is a difference in the mitochondrial DNA sequences between the monogyne and polygyne IFA population in Texas. We focused on either confirming that the monogyne and polygyne populations in central Texas are distinct using select mtDNA sequences and microsatellite loci of confirmed locally collected monogyne and polygyne colonies.

Results

We have some data that supports a difference, but we have not pulled the information together. This is due in part that a larger effort in the next project.

Determine the population structure of the fire ant in the United States as a second step in developing a sound IFA management tactic.

In addition to knowing if the monogyne and polygyne ants are of different stock, is the need to be able to define the IFA population. This is not as simple as it might seem. For example, we have both the red and the black Imported Fire Ants in the US. Further, these are known to hybridize, as do the native species. Thus, we presently have a possible minimum of four different imported populations, and there may be more definable populations. Using several microsatellite loci along with mtDNA sequence information, we have initiated an examination of the IFA population throughout the Southeast United States that will provide a map of the current population variation.

Results

We have collected a number of samples from a number of sites across the current infestation. We have examined differences in microsatellite repeats and in several mitochondrial genes. This data is being written up for publication.

Determine the mechanism that controls the sex of the fire ant. Fire ant males are haploid, developing from unfertilized eggs.

Our present evidence suggests that the male condition is due to a single loci that consists of multiple alleles. The heterozygous condition, alleles differ results in a female. But sterile diploid males are sometimes produced and this is presumed due to a homozygous condition at the sex locus. We proposed to take advantage of this inherent weakness and locate and determine the factors that controls sex determination.

Results

We have developed techniques to determine the haplo-diplo condition of individual ants and use the same ant for microsatellites and determining the sterility condition of each individual. All of these are techniques that will be needed to examine the sterile condition.