



FY 2006-2007 Report on Progress

(September 1, 2006 – August 31, 2007)

Texas Imported Fire Ant Research And Management Project

Title of project:

Develop products to initiate wing muscle degeneration in alate virgin females leading to IFA management (and also initial egg laying).

Principal investigator(s) and contact information:

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Dr. Toghara Azizi,

Current address unavailable, No longer working in the Department of Entomology.

Lay Summary of Major Accomplishments:

The objectives of this study were compromised by nature as we were unable to get the material in sufficient number to run the experiments and the samples were infected with *Thelohania solenopsae*. Although this study was compromised we observed an opportunity to increase our knowledge of the disease. *T. solenopsae* was discovered in the USA in 1998, but our data based on archived ant samples shows that *T. solenopsae* was here in Brazos Co as early as 1984, our earliest archived samples. We also show that the level or severity of the disease in colonies has increased, as well as, the percent of colonies infected in this area. We also have data to indicate that males may be capable of transmitting the disease, but more research is needed and is underway.

Technical Description of Progress on Individual Objectives:

We proposed 4 objectives. The first was to use our established wing muscle cell apoptosis (WMCA) bioassay to isolate and identify the component(s) of the male seminal fluid that initiate flight muscle histolysis. **Hypothesis:** a male produced chemical initiates that wing muscle degeneration. In the spring of 2006 we initiated some studies by separating the seminal fluid from the sperm. This fluid contained water soluble compounds that had no effect on apoptosis. The other sample contained sperm and oil soluble compounds and by implanting this material into alate females (could not be squirted into the female system as too viscous) we did get some wing muscle apoptosis. We initiated a study to look at the oil soluble materials, but during these studies we encountered a number of *Thelohania solenopsae* infected males with a few spores that appeared in the testis. We also found that alate females would not dealate when separated. This was not typical of alate females (based on 40 years of experience with the IFA by lead investigator). Thus, we became concerned about the validity of using diseased insects in our experiments. Secondly we had a serious drought in 2006 that reduced the major mating flights and instead sporadic and unpredictable flights that prevented the collection of large numbers of flying males and females. In 2007 the opposite has been true, too much water.

Thus, We initiated a study to determine if there were spores in the testes of males by 3 methods. We found spores in testis squashes, but concern about contamination due to a possible fat body cell left on the testis suggested we try EM sectioning. Again we saw a few spores, but it was difficult to determine where in the testis these spores were located. We were in the middle of the third

method of looking at the spermatheca after a mating flight to see if spores are in the spermatheca of non infected just delated or infected dealated females when my funds for the project were gone and Dr. T. Azizi had to search for a new job.

Because we had a difficult time finding non-infected colonies we also decided since we had the methods and archived ant samples to see if we could look through these samples to get an idea when *Thelohania solenopsae* entered Brazos county. *T. solenopsae* was discovered in the USA in 1998. Our data shows that it was here as early as 1984, our earliest archived samples. This work was completed before Dr Azizi left and is written up for publication.

As a result of the *T. solenopsae* infection and poor mating flights the other three objectives #2, 3, and 4 were not addressed. We believe we made good use of the time, personnel and funds to take advantage of an opportunity in light of the road-blocks put on this project by nature. It is my hope to complete the infected male study and return to the apoptosis and mating study in the near future.

Objectives not addresses, but still valuable in pursuing.

2. To use the WMCA bioassay to drive the isolation and purification of a hemolymph wing muscle histolysis factor reported by Davis and co-workers in 1989.

Hypothesis: That there is a factor in the hemolymph that may play a role in muscle degeneration.

3. Determine if the previously identified gene (queen fire ant putative CPI) is a regulator of apoptosis. We will use RNA interference (RNAi) method to examine the functional role(s) of putative fire ant queen CPI in the initiation of apoptosis in the fire ant flight muscle.

Hypothesis: That the CPI is yet another factor in the sequence that initiates wing muscle degeneration.

4. To determine, using our "mature alate bioassay" the conditions and factor that initiates the initial egg laying that occurs following a mating flight.

Hypothesis: That the initial and early egg laying that occurs following a mating flight is initiated by factors associated with the biology of the mating flight.

Relevance to Achieving the Overarching Goals of the Texas Imported Fire Ant Research and Management Project (see RFP guidelines):

Identifying genes and development of biological control agents fits under the category of elucidation of the biology of fire ant leading to new management methodologies and biological control.

Manuscripts Published/In Press/Submitted:

Azizi, T., J. S. Johnson and S. B. Vinson. 2007. A gene involved in postmating flight muscle degeneration in Red Imported Fire Ant (Hymenoptera: Formicidae) queens. *Ann. Entomol. Soc. Am.* 100:270-274.

Azizi, T., J. S. Johnson and S. B. Vinson. (Submitted). Initiation of flight muscle apoptosis and wing casting in the Red Imported Fire Ant, *Solenopsis invicta*. *Physiological Entomology*.

Invited and Submitted Presentations/Posters Presented at Scientific/Technical Meetings/Conferences:

Invited Symposia: "A new appreciation for symbiotic microorganisms and the wide variety of roles they play in insects may open doors to insect management. In Symposia "Simbiontes e seu papel no controle biologico". 9th Simpósio de Controle biológico. 15-19 May Recife, Brazil, 2005.

Invited Conference presentation: Vinson, S. B., Walker Hale, Toghara Aziz and Karen Snowden. Is there potential for the use of *Thelohania solenopsae* for the management of the Imported Fire ant, *Solenopsis invicta*? International Pacific Invasive Ant Conference. Kailua-Kona, HI. May 23-25, 2007

Hale, M. W. and S. B. Vinson. 2005. The host/parasite relationship between a microsporidian parasite *Thelohania solenopsae* and *Solenopsis invicta*. Annual Red Imported Fire Ant Conference, March

22-24, Gulfport MS.

Hale, W. and S. B. Vinson. Utility of calcoflur M2R and Sytox dual staining for assessment of Microsporida *Thelohania solenopsae* invading *Solenopsis invicta*. (**Poster**). Ento. Soc. Am. Meeting, Ft. Lauderdale , FL.Nov., 6-9.

Vinson, S. B., T. Azizi and K. Snowden. 2006. The historical occurrence of *Thelohania solenopsae* in red imported fire ant (*Solenopsis invicta*) colonies in the Brazos valley region of Texas. Annual Red Imported Fire Ant Conference, March 28-30, Mobile AL.

Azizi, T and S. B. Vinson 2006. Identification of gene(s) involved in the early events concerning flight muscle degeneration in the red imported fire ant (*Solenopsis invicta*). (**Poster**). Annual Red Imported Fire Ant Conference, March 28-30, Mobile AL.

PI Signatures:

Signature

Date

If this report is prepared by someone other than the Principal Investigator, please provide name and contact information:

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