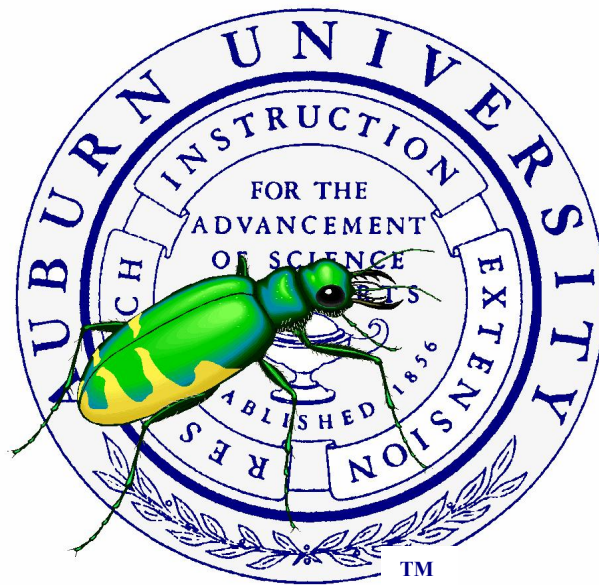


**ALABAMA FIRE ANT  
MANAGEMENT PROGRAM  
PROGRESS REPORT  
FY 2000\***



**THE DEPARTMENT  
OF  
ENTOMOLOGY AND PLANT PATHOLOGY  
AT  
AUBURN UNIVERSITY**

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## **Alabama Fire Ant Management Program**

### *Introduction*

The Alabama Fire Ant Management Program, based at Auburn University, is charged with conducting both research and educational programs on imported fire ants. This year, colleagues at Alabama A&M joined the project. Our goal is to develop long-term management programs that will make the fire ant easier to live with and to transfer this information to Alabama residents, and others, in a timely manner.

Unfortunately, the biology of the fire ant does not allow the development of an eradication program, such as was successful with the boll weevil. Research studies are designed to develop strategies to reduce populations of fire ants and to maintain these populations at an acceptable level. Educational programs include information on the biology of the fire ant that is needed to properly design a control strategy for a local area.

Our basic biology projects provide insight into the growth, development and spread of the fire ant. Ecological studies will determine the impact of fire ant management on other insects and related organisms in pastures and crops. Two study sites, established in 1997 in cooperation with local Cooperative Extension agents, are used to demonstrate how to get maximum fire ant control with minimum input. A third site was turned over to the local school district once school personnel were trained to use the integrated pest management tactics developed at the site. Three biological control agents have been released in Talladega, Houston, and Macon counties in conjunction with the USDA and the Alabama Cooperative Extension System. The decapitating fly appears to be well established in Macon and Talladega counties, and has spread over five miles from the release site in Macon county. The release in Houston county was made in September 2000.

Our educational programs are intended to increase the public's general knowledge about imported fire ants. Various media resources are used to inform the public of our program. Presentations are made at various professional meetings, such as the Alabama Turfgrass Association, and to local groups. Several Extension publications are available from county Extension offices. In October, Alabama Fire Ant Management Program personnel staff a booth at the Alabama National Fair in Montgomery. Faculty, staff and students are available to answer questions about fire ants and to distribute fire ant educational materials for both children and adults. Data from research projects are presented each year at professional meetings and results are published in professional journals.

Graduate students are involved on several of the projects. Matt Aubuchon used GPS/GIS technology in the analysis of his ecological study located on a farm in Chambers Co. His maps and presentation were awarded the National Geographic Society Student Award by the British Cartographic Society during their annual symposium in Oxford, England. He is the first student from the United States to receive this award.

This program is funded by the Alabama State Legislature, through the Alabama Department of Agriculture and Industries. A progress report is included for each project conducted in 2000. In addition, proposals for projects that were funded for the fiscal year 2001 are included.

**Alabama Fire Ant Management Program**  
***Personnel and Cooperators –FY2000***

**Advisory Committee**

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Greg Myrick - Talladega  
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Kyle Miller – BASF  
Robert Cartwright – Syngenta

Sincere apologies from the editors to anyone inadvertently omitted from this list.

## **Educational Materials**

**The following publications have been prepared as part of the educational activities of the Alabama Fire Ant Management Program 1997-2000**

### **Alabama Fire Ant Management Program Publication**

1999. The hidden truth about red imported fire ants. Youth activity book reproduced with permission from an Arkansas Cooperative Extension Service publication created by Donna Shanklin and Brian Richardson using Alabama Fire Ant Management Program funds.

### **Extension & Experiment Station Publications**

- Aubuchon, M., G. Mullen, and M. Perdue. 2000. Keeping the mounds down. Highlights of Agric. Res., Ala. Agric. Exp. Stn., 47(3): 3-4.
- Cobb, P., and F. Oi. 1998. Imported fire ants in lawn, turf and structures. Ala. Coop. Ext. Sys. Circular ANR-175.
- Drees, B. M., et al. 2000. Managing imported fire ants in urban areas. Regional publication. Texas A&M Bulletin 6043.
- Drees, B. M., et al. 1999. Managing imported fire ants in agriculture. Regional publication. Texas A&M Bulletin 6076.
- Eubanks, M.D. 2000. Can bad bugs do good? The ecology of fire ants in Alabama agricultural crops. Highlights of Agric. Res., Ala. Agric. Exp. Stn., 46(1): 3-4.
- Flanders, K. L., F. Graham, D. Shanklin, and B. Richardson. 2000. The hidden truth about red imported fire ants. Youth activity book reproduced by permission. Ala. Coop. Ext. Sys. Circular ANR-1185.
- Flanders, K. L., S. Porter, and D. Oi. 2000. Biological control of imported fire ants. Ala. Coop. Ext. Sys. Circular ANR-1149.
- Flanders, K. L., L. Weatherly, and L. Craft. 1999. Getting the most out of your fire ant bait. Ala. Coop. Ext. Sys. Circular ANR-1161.
- Flanders, K. L. 1999. New fire ant bait products. Ala. Coop. Ext. Sys. Timely Info. Sheet.
- Flanders, K. L. 1999. Stop chasing those fire ants around! Ala. Coop. Ext. Sys. Timely Info. Sheet.
- Roberson, J. R. (ed.). 1999. Getting the bugs out. 1999. Annual Report. Ala. Agric. Exp. Stn., Auburn University.
- Shelton, T.G., J.T. Vogt and A.G. Appel. 1999. Dangerous liaisons? Native termites inhabiting red imported fire ant mounds. Highlights of Agric. Res., Ala. Agric. Exp. Stn., 46(2):5-6.

### **Video**

2000. Fire ant control made easy. Ala. Coop. Ext. Sys.

## **Demonstrations, Training & Outreach**

**The Alabama Fire Ant Management Program has a commitment  
to provide timely information about fire ants to the people of Alabama.  
1999-2000**

### **Television & Radio**

- Dorough, H. 2000. Television News Spot on phorid release. Birmingham AL ABC affiliate, week of 9/13/00.
- Flanders, K. L., and F. Graham. 1999. ALFA prepared a news release on fire ants at our lab. The release was aired locally during the nightly news on WSFA and WRBL. Others may have used the release. 1999.
- Graham, F. 2000. Biological control of fire ants in Alabama. Auburn 2000 Media Day, Auburn, AL. (6/16/00).
- Graham, F. 2000. Radio show (Pat Dye) talk on fire ants. (1/3/00).
- Graham, F. 2000. For The Record, Alabama Public Television. (9/19/00).
- Graham, F. 2000. Television News Spot on phorid release. Columbus, GA ABC affiliate. week of 9/18/00.
- Graham, F. 2000. Television News Spot on phorid release. Columbus, GA CBS affiliate. week of 9/18/00.
- Television News Spot on phorid release. Dothan AL. week of 9/13/00.
- One radio program appearance. 1999

### **Extension & Experiment Station Presentations**

- Eubanks, M. D. 2000. Presentation to Alabama Soybean Commission on Fire Ants, February.
- Eubanks, M. D. 1999. Presentation to Talladega County Farmers, Fire Ants in Soybeans, May.
- Eubanks, M. D. 1999. Presentation to Calhoun County Farmer's Association, Fire Ants in Soybeans, May.
- Eubanks, M. D. 1999. Presentation to Alabama Soybean Commission on Fire Ants, April.
- Flanders, K., F. Graham, K. Creel, K. Ward and R. Ward. 2000. Information about SARE trainer grant "We can do something about fire ants". In-service training workshop session (4), Scottsboro, AL. (4/5/00).
- Flanders, K. L. 2000. Tips for using fire ant baits. In-service training workshop session (4), Scottsboro, AL. (4/5/00).
- Flanders, K. L. 2000. Controlling fire ants around fish ponds. In-service training workshop session (4), Scottsboro, AL. (4/5/00).
- Flanders, K. L. 2000. County meeting, Cullman Co., March.
- Flanders, K. L. 2000. Field Day, Black Belt Regional Extension Center, Marion Junction, April.

- Flanders, K. L. 2000. Monthly Meeting, Lee Co. Nursery Association, May.  
 Flanders, K. L. 2000. County Meeting, Lawrence Co., June.
- Flanders, K. L. 1999. Fire ant biology and management, Houston Co.
- Flanders, K. L. 1999. Biological control of fire ants. AL Pesticide Dealer Training Meeting, Montgomery, AL.
- Flanders, K. L. 1999. Biological control of fire ants. AL Pesticide Dealer Training Meeting, Headland, AL.
- Flanders, K. L. 1999. Fire ant control. Pesticide Safety and Plant Maintenance Workshop, Tuscaloosa, AL.
- Flanders, K. L. 1999. Learning to live with fire ants. Alabama Cattleman's Assoc. Meeting and Trade Show, Montgomery, AL.
- Graham, F. 2000. Fire ants-biology and management. 39<sup>th</sup> Annual Turfgrass Conference and Trade Show, Alabama Turfgrass Association, Birmingham, AL.
- Graham, F. 2000. Fire ant management in turf. Small Cemetery and Funeral Management Conference, New Orleans, LA. (8/10/00).
- Graham, F. 2000. Fire ant biology and management. National Association of County Agricultural Agents, Jackson MS. (8/8/00).
- Graham, F. 2000. Fire ant management tips. Turfgrass Field Day, Auburn, AL. (7/21/00).
- Graham, F. and R. Anderson. 2000. Careers in entomology - what does an entomologist do? Montgomery Zoo Day Camp, Montgomery, AL. (6/13/00).
- Graham, F. 2000. Overview of the Alabama fire ant management project. In-service training presentation, Scottsboro, AL. (4/5/00).
- Graham, F. 2000. Dealing with fire ants inside houses. In-service training presentation, Scottsboro, AL. (4/5/00).
- Graham, F. 2000. How to make a fire ant mound cast. In-service training workshop session (4), Scottsboro, AL. (4/5/00).
- Graham, F. 2000. Fire ant management around home greenhouses. East Ala. Orchid Society, Auburn, AL. (2/4/00).
- Graham, F. 1999. Learn about fire ants! Lee Scott Academy (14), Auburn, AL.
- McLean, K. and F. Graham, 2000. The science of fire ants. Teacher training workshop (5), Auburn University, AL. (6/20-6/22/00).
- Alabama National Fair. 1999. Alabama Fire Ant Management Program Booth, Montgomery, AL. October.
- Fire Ant Management Program Display 2000. Comer Hall, Auburn University Campus. Feb.-Jul.
- Fire Ant Management Program Display. 2000. Funches Hall, Auburn University Campus. Jan-Dec.

**Magazine & Newspaper Articles**

- Flanders, K. L. 2000. Update on Fire Ant Biological Control. Alabama Cattleman, March.
- Flanders, K. L. 2000. Mobile Register interview, June.
- Fighting fire ants. Debbie Ingram Smith, Dothan Eagle, 9/13/00, made AP wire top 10.

The fire ant may have met its match. AP wire release, Tuscaloosa News, week of 9/13/00.

Brain-eating flies join fire ant war. AP wire release, Columbus Ledger-Enquirer, week of 9/13/00.

Tiny flies enlisted in battle against fire ants. AP wire release, LaGrange Daily News, 9/14/00.

Flanders, K. L. 1999. Scientists enlist old foe to fight fire ants in South. AFC Farming News, p. 18, November. (article prepared by Jim Langcuster).

Flanders, K. L. 1999. Fire ant bait most effective control tool. Southeast Farm Press, p.2, April.

Flanders, K. L. 1999. Fire ant bait control. AFC Farming News, p. 9, April.

Flanders, K. L. 1999. Forage bites: Are fire ants costing you money? Alabama Cattleman, p, 41, April.

Flanders, K. L. 1999. Forage bites: Tips for making fire ants easier to live with. Alabama Cattleman, p, 43-44, January.

Flanders, K. L. 1999. Least labor intensive fire ant bait most effective control tool. Southeast Farm Press, p. 27, April.

Flanders, K. L. 1999. Fire ant bait best for control. AFC Farming News, p.9, April.

Flanders, K. L. 1999. Scientists enlist old foe to fight fire ants in South. AFC Farming News, p. 18, November. (article prepared by Jim Langcuster).

Fire ant management a top priority in Alabama. AU media release, Pickens County Herald, Dec. 8, 1999.

Small scale biological war. Frank Sikora, Birmingham News, Feb. 23, 1999.

Fire in the hole. Charles Croft, Mobile Register, May 15, 1999.

Trial by fire ant, Clinton Colmenares, Montgomery Advertiser, Jan. 8, 1999.

Information to county agents for local articles. 1999.

### **Field Demonstrations**

Fire ant management, K. Flanders, Auburn University, and R. Hudson and R. Murphy, Houston Co., J. Jones, Henry Co., E. Crowder, Dale Co., and J. R. Weeks, Auburn University. Tested new fire ant bait products for control of fire ants in Houston Co.

Fire ant management, F. Graham and K. Flanders, Auburn University, L. Craft, Montgomery Co., S. Huber, Baldwin Co., L. Weatherly, Tuscaloosa Co., and F. Wood, Marshall Co. Farm-wide fire ant management demonstrations were evaluated at two livestock operations, three broiler operations, two cemeteries, and a school.

Biological control of fire ants, F. Graham and K. Flanders, Auburn University, H. Dorrough, Talladega Co., R. Hudson, Houston Co., and Sanford Porter, USDA ARS. Released the decapitating fly, *Pseudacteon tricuspis*, in pastures in Macon Co. and Houston Co. and the decapitating fly *P. curvatis* in Talladega Co.

Biological control of fire ants, F. Graham and K. Flanders, Auburn University, E.V. Smith Experiment Station. Inoculated fire ant mounds with the microsporidian pathogen *Thelohania solenopsae*.





**Phorid Fly Release in Dothan, AL – Summer 2000**

## Fire Ant Management Program Booth Alabama National Fair - October 1999





**In-Service Training  
Scottsboro, AL  
April 2000**



## Research & Publications

Research conducted by the Alabama Fire Ant Management Program has been published in referred journal and presented at professional meetings 1997-2000

### Articles in Refereed Journals

- Eubanks M. D. In Review. Estimates of the direct and indirect effects of red imported fire ants on biological control. (submitted to Biological Control May 2000).
- Eubanks, M. D., S. A. Blackwell, C. J. Parrish, and Z. D. DeLamar. In Prep. Intraguild predation of biological control agents by red imported fire ants in cotton. (For Environmental Entomology, scheduled for early September submittal).
- Shelton, T. G., J. T. Vogt, A. G. Appel and F. M. Oi. 1999. Observations of *Reticulitermes* spp. in *Solenopsis invicta* mounds (Isoptera: Rhinotermitidae, Hymenoptera: Formicidae). Sociobio. 33: 265-275.
- Vogt, J. T., A. G. Appel and M. S. West. 2000. Flight energetics and dispersal capability of the fire ant, *Solenopsis invicta* Buren J. Insect Physiol. 46: 697-707.
- Vogt, J. T. and A. G. Appel. 2000. Discontinuous gas exchange in the fire ant *Solenopsis invicta* Buren: caste differences and temperature effects. J. Insect Physiol. 46: 403-416.
- Vogt, J. T. and A. G. Appel. 2000. Metabolic costs of spontaneous movement in the red imported fire ant, *Solenopsis invicta* (Hymenoptera: Formicidae). Sociobio. 35: 89-98.
- Vogt, J. T. and A. G. Appel. 1999. Standard metabolic rate in the red imported fire ant, *Solenopsis invicta* Buren: effects of temperature, mass, and caste. J. Insect Physiol. 45: 655-666.

### Published Abstracts

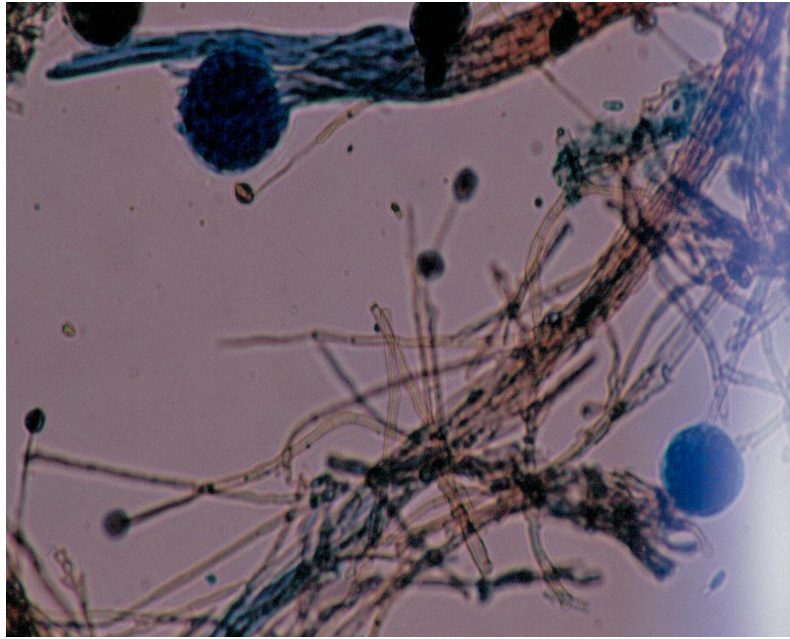
- Shelton, T. G., J. T. Vogt, A. G. Appel and F. M. Oi. 1998. *Solenopsis invicta* Buren mounds as *Reticulitermes* spp. habitats. Proc. Nat'l. Conf. Urban Entomol., San Diego, CA.
- Vogt, J. T. and A. G. Appel. 1998. Red imported fire ant (*Solenopsis invicta* Buren) flight energetics. Proc. Nat'l. Conf. Urban Entomol., San Diego, CA.

### Papers presented at professional meetings

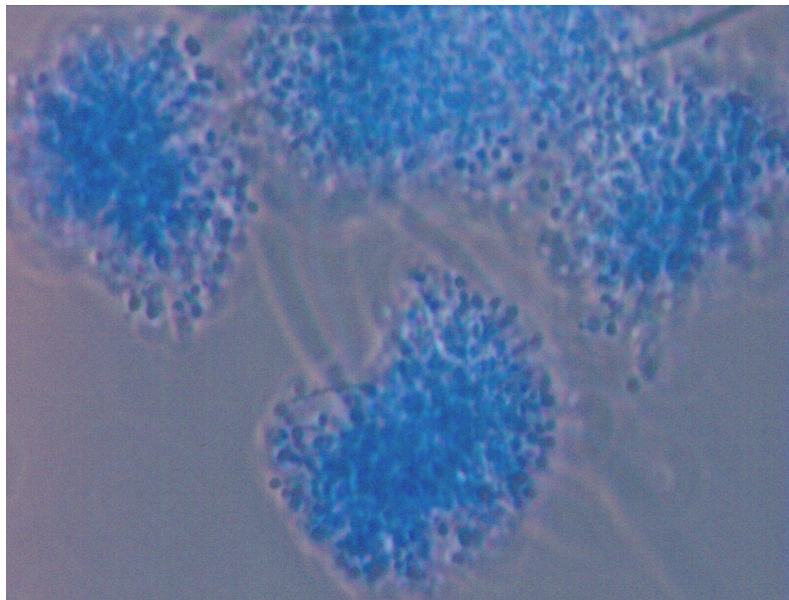
- Appel, A. G. 2000. Importance of respiratory water loss in alate red imported fire ants. Entomological Society of America, Montreal, Canada.
- Aubuchon, M. D. and G. R. Mullen. 2000. Efficacy of broadcast and perimeter applications of S-methoprene for the control of the red imported fire ant. Southeastern Branch, Entomological Society of America, Mobile, Alabama.

- Aubuchon, M. D. and G. R. Mullen. 2000. Efficacy of broadcast and perimeter applications of S-methoprene for the control of the red imported fire ant. Imported Fire Ant Conference, Chattanooga, TN.
- Aubuchon, M. D. and G. R. Mullen. 2000. Efficacy of broadcast and perimeter applications of S-methoprene for the control of the red imported fire ant. Annual Graduate Student Research Forum, Auburn University, AL.
- Aubuchon, M. D., G. R. Mullen, and M. D. Perdue. 1999. Efficacy of broadcast and perimeter applications of S-methoprene for the control of the red imported fire ant. Entomological Society of America. 1999. Atlanta, GA. [poster]
- Blackwell, S., M. D. Eubanks, C. Parrish and Z. DeLamar. 2000. The impact of red imported fire ants on cotton pests. Entomological Society of America, Montreal, Canada.
- Blackwell, S., and M. D. Eubanks. 1999. Managing fire ants in agricultural crops: Does the removal of ants benefit pests? Entomological Society of America, Atlanta, GA.
- DeLamar, Z., M. D. Eubanks, S. Blackwell, and C. Parrish. 2000. Do red imported fire ants suppress soybean pests? Entomological Society of America, Montreal, Canada
- Eubanks, M. D. 2000. Pervasive invasives and complex trophic interactions: The impact of red imported fire ants on biological control. Department of Entomology, Virginia Tech University, Blacksburg, VA.
- Eubanks, M. D. 2000. Managing fire ants in agricultural crops: does the removal of ants benefit pests? Southeastern Branch, Entomological Society of America, Mobile, AL.
- Eubanks, M. D., S. Blackwell, C. Parrish, and Z. DeLamar. 2000. Pervasive invasives and complex trophic interactions: Fire ants and biological control. Entomological Society of America, Montreal, Canada.
- Flanders, K. L. and J. LaPrade. 2000. Economic impact of fire ants in Alabama cattle operations. Imported Fire Ant Conference, Chattanooga, TN. (poster).
- Flanders, K., A. Appel, G. Mullen, N. Liu, and L. Graham. 1999. The Alabama fire ant management project. Imported Fire Ant Conference, Charleston, SC. (poster).
- Flanders, K. L., D. H. Oi, F. M. Oi, and P. P. Cobb. 1998. Evaluation of integrated pest management methods for red imported fire ants in Alabama. Entomological Society of America, Las Vegas, NV. (poster).
- Liu, N. and X. Yue. 1999. Role of cytochrome P450 in red imported fire ants. Imported fire ant conference, Charleston, SC.
- Porter, S. D., L. A. Nogueira de Sa, K. Flanders, and L. Thompson. 1999. Field releases of the decapitating fly, *Pseudacteon tricuspis*. Imported fire ant conference, Charleston, SC.
- Shelton, T. G., A. G. Appel, F. M. Oi., and J. T. Vogt. 1998. Observations of *Reticulitermes* spp. inhabiting *Solenopsis invicta* mounds in Alabama. Entomological Society of America, Las Vegas, NV. (poster).
- Vogt, J. T. and A. G. Appel. 1999. An examination of the flight capability of *Solenopsis invicta* Buren alates. Imported Fire Ant Conference, Charleston, SC.

- Vogt, J. T. and A. G. Appel. 1999. The energetic cost of flight in *Solenopsis invicta* Buren, the red imported fire ant. Southeastern Branch, Entomological Society of America, Destin, FL.
- Vogt, J. T. and A. G. Appel. 1997. Discontinuous gas exchange in the red imported fire ant. Southeastern Branch, Entomological Society of America, Ashville, NC.
- Vogt, J. T. and A. G. Appel. 1997. Flight of red imported fire ant alates (*Solenopsis invicta* Buren): physiological aspects and energetics. Entomological Society of America, Nashville, TN.



**Entomopathogenic Fire Ant Fungal Isolates:**  
*Hirsutella jonesii*, also referred to as *Synnematium jonesii*,  
(above) and *Beauveria bassiana*, (below)



**FY 2000  
PROGRESS REPORTS**



## **Development and Dissemination of Materials that Increase Public Knowledge of Fire Ant Biology and Management**

**Principal Investigators:** Kathy Flanders, Lawrence Graham, Arthur Appel, and Kathy McLean

**Objective:** Develop and disseminate training materials on fire ant biology and management in Alabama.

**Exhibit at the Alabama National Fair, October, 2000:**

An exhibit was prepared for the Alabama National Fair by Lawrence Graham with the assistance of Terri Rodriguez, Research Information, College of Agriculture, Auburn University. The exhibit included informational posters, live fire ants, live decapitating flies, and plaster casts of fire ant tunnel systems. This exhibit was extremely popular. More than 6,000 fire ant coloring books, and more than 1,000 copies each of five fire ant fact sheets were distributed. Most of the children were fascinated, rather than repelled by the fire ants (see photographs in Demonstration, Training, & Outreach section). This gave us a chance to explain the basics of fire ant biology to the children, and both the basics of fire ant biology and management to their parents. The booth was staffed for the duration of the fair by participants of the Alabama Fire Ant Management Project.

**Fire ant videotape:**

The fire ant videotape will be ready for distribution in September 2000. This video is the first of six educational aids that will be developed for trainers to use in their programming, in conjunction with a SARE Professional Development Program Grant. The videotape was designed by a team of county agents from the Alabama Cooperative Extension System (ACES). It was then scripted, filmed, and produced by Mario Lightfoote (ACES Communications Department) and Kathy Flanders. Footage from an Arkansas Cooperative Extension Service video was incorporated into the program. That videotape had been developed from federal funds, for use by stakeholders in the Southeast. Four hundred copies of the new videotape will be distributed to county extension agents, state legislators, and other educators.

### **The Science of Fire Ants, June 2000:**

This program was designed to increase the knowledge base about imported fire ants to middle school science teachers of Alabama. Middle school science teacher workshops were conducted at Auburn University in June. Drs. McLean and Graham assisted by graduate students, research assistants and students workers modeled hands on science with fire ants to 85 Alabama teachers and 15 undergraduate education majors. Applied science projects were set up for the teachers. The projects were designed for the teachers to use in their classrooms, increasing their students' knowledge about fire ants. Projects included charting the ants' life cycle through morphological observations of all stages of fire ant growth and development; determining preferred food sources utilizing various baits; and identifying pest ants using INTERNET keys. The fire ant science projects demonstrate the scientific hypothesis procedure and require data collection, data analysis and summary of results. The teachers were each given a package of the science project materials to take back to their classroom for their use. The package included an ant farm, magnified observation chambers, test tubes and handouts describing experiments demonstrated.

We have increased the general public's knowledge about fire ants by reaching 85 current teachers located in 31 different counties across the state. The teachers in turn teach the students in K through 12<sup>th</sup> grade. The workshops trained 85 teachers who will teach science to approximately 4700 students in Alabama next year. The workshop evaluation is summarized and attached. Teachers rated their interest in attending the workshop as a 2.75 on a scale of 1-5. After the workshop, they rated the workshop as a 4.5 indicating that the science was well presented and they will be able to incorporate the projects into their science classes next year.

**Regional publication for reference purposes:**

The regional publication "Managing Imported Fire Ants in Urban Areas," was published in September 2000. This publication was prepared by the Texas Fire Ant Management Program with input from fire ant workers throughout the Southeast. The final draft was reviewed by personnel from the Alabama Fire Ant Management Project.

**County agent in-service training, April, 2000:**

This program was designed to increase the imported fire ant knowledge base of county Extension agents. The seven hour training session was held in Scottsboro, AL on April 5, 2000. It was attended by 34 county agents and 11 stakeholders, representing 27 counties. The stakeholders included city or school employees, homeowners, a retired county agent, and military personnel.

Kathy Flanders coordinated the workshop. Sixteen fire ant experts (see attached program) were invited to speak at the training session, in order to provide the participants with the most up-to-date and accurate information possible. The workshop included information on fire ant biology and management, as well as hands on demonstrations on working with decapitating flies, surveying for multiple queen colonies, applying individual mound treatments, calibrating bait spreaders, setting up a fire ant control demonstration, making a mound cast, and identifying pest ants. The participants were given an extensive collection of reference materials to take home.

Testing before and after the training session showed that the county agents learned a great deal about fire ants. Mean pre-test score was 69%, and mean post-test score was 83%. The participants were able to return to their jobs, and use what they had learned to help the general public. Participants rated the workshop as a 4.8 out of 5.0, indicating the training session accomplished its goal of providing useful information on fire ant biology and management.

In the coming months, we will build on this training session by developing educational materials that can be used by county agents to train others about fire ants. The educational materials will include a video tape, a slide set, a mound model, and a fire ant poster. The educational materials will be funded by a SARE Professional Development Program grant, matched by the Alabama Fire Ant Management Program (see attached program description). Each educational aid will be developed by a team of county agents, led by a principal

investigator. A review panel consisting of fire ant experts and stakeholders will be asked to evaluate each visual aid to make sure that it is factual, relevant, and appropriate for its audience.

**Fire Ant Coloring Book:**

The coloring book (printed in FY 1999) has been extremely popular. A poll of county Extension agents showed a demand for over 10,000 copies. Therefore, Dr. Graham worked with the communications department at the Alabama Cooperative Extension System to produce a black and white version of the coloring book. This book is now available for distribution.

**Outcomes:**

Improved knowledge of fire ant biology and management strategies by the public and increased visibility of Alabama Fire Ant Management Program.

**Evaluation of Integrated Pest Management Methods for Red Imported Fire Ants in Alabama**

**Principal Investigators:** Fudd Graham, Kathy Flanders, Dept. Entomology, & Plant Pathology Auburn University, Henry Dorough, Rickey Hudson, Alabama Cooperative Extension System, and Ken Ward, Alabama A&M University

**Objective 1:** *Demonstrate the efficacy and efficiency of targeted broadcast baiting and mound treatments in urban landscapes and rural agricultural operations/home sites.*

Study sites have been established since 1997 to demonstrate that a bait-based approach targeting ants in priority areas can extend suppression of fire ant populations. This strategy requires maintaining low levels of fire ants to kill invading fire ant queens attempting to establish new colonies. This approach saves money on labor and material costs by reducing the treated area. These sites are two hobby cattle farms in Montgomery Co. and two cemeteries in Baldwin Co. The studies are conducted in cooperation with Extension agents Larry Craft and Shannon Huber. Applications of fire ant baits (Amdro on the cattle ranch and Award on the cemetery) have resulted in a marked reduction in fire ant mounds, but a more demanding criterion for control will be to see how long these

reductions last. The treated cemetery site in Baldwin Co. has seen a large reduction in numbers of large and medium size fire ant mounds, but a large number of small mounds were present in June during the pretreatment counts. However, numbers of other ant mounds have increased over 600% since the project was initiated in 1997. Fire ants have been successfully removed around the headquarters of the Keener farm in Montgomery Co., but fire ant populations at the homestead area of the Harris farm still remain high. Bait application strategies were changed this summer at the Harris farm and will be evaluated in the fall.

**Objective 2:** *Release and evaluate the effectiveness of two fire ant biological control agents: a phorid fly and a microsporidian.*

The first population of the decapitating fly, *Pseudacteon tricuspis*, was released in 1998 in a pasture in Talladega County, in cooperation with county Extension Agent Henry Dorough and with Dr. Sanford Porter of the USDA-ARS. No captures of *P. tricuspis* have been made in Talladega Co. to date. A new population of *Pseudacteon curvatus* was released in Talladega Co. in the same pasture in May 2000, with Dr. Porter's assistance. The release was performed over a period of two weeks. The site was monitored twice a week until hot temperatures and dry weather reduced fire ant foraging and activity. In August, *P. curvatus* was collected from this site.

In May 1999, *P. tricuspis* were released in Macon Co and were recovered in large numbers during the fall. The *P. tricuspis* site in Macon Co. was monitored approximately weekly this spring and summer until hot temperatures and dry weather reduced fire ant foraging and activity. *P. tricuspis* were finally captured at the site in late July during several days of rain and cooler temperatures. These captures were made

outside the release area, indicating that the flies were not only surviving the winter cold, but were spreading. In September, *P. tricuspis* were captured over five miles from the release site.

A new release of *P. tricuspis* was made in September at a farm in Houston County, in cooperation with Rickey Hudson and other interested county extension personnel. Flies were sighted in Houston Co. in late October.

Extension agents in Talladega and Houston counties are responsible for day to day monitoring of these sites, but several visits by project personnel are required each year to monitor the sites and collect data. Pitfall traps and baits are set out twice per year at each site to monitor ant populations for comparison to base data. Temperature data are collected on each visit to each site.

The microsporidian, *Thelohania solenopsae*, was released in 1998 in Macon Co. in a pasture infested with the red imported fire ant. Pitfall traps and bait stations are collected at the site during the spring, summer and fall. Mound number and population estimates are monitored bimonthly. Fire ant workers are collected during these monitoring trips and returned to the laboratory. These workers are examined for presence of the of *T. solenopsae* spores. No infected workers have been confirmed to date. Spores were thought to have been found Aug. 1999, but have not been collected since. No vegetative stages were found in the brood at this time.

A new release of *T. solenopsae* was made in Madison Co. in August in a pasture infested with colonies of fire ants that are hybrids of the red imported fire ant and the black imported fire ant. Current research has shown that the hybrids may be more susceptible to the pathogen than the red imported fire ant. This release was made by Ken

and Rufina Ward with the Department of Plant and Soil Science at Alabama A&M University. Auburn personnel assisted with the initial site preparation, data collection, and care and transportation of the brood prior to release. Auburn personnel will assist with population monitoring, data collection and spore identification as needed.

## **Implementation of a Fire Ant Management Program in the Tuscaloosa School System**

**Principal Investigators:** Lloyd Weatherly, Lawrence Graham, and Kathy Flanders.

**Objective:** Transfer the Tuscaloosa school fire ant management demonstration over to the stakeholders.

**Progress:** During the past three years, we have developed a site specific fire ant management program for three Tuscaloosa schools. The strategy of mapping fire ant mounds to determine priority areas for treatment with a fire ant bait has worked well. After the second year of the program, fire ant mounds were reduced by 90%. The school principals are very pleased with the results. They have received fewer complaints about fire ants, and have not had to spend so much time or money on fire ant control. This year, we turned the management of the fire ants over to the school system employees.

In May 2000 the principal investigators trained the custodians from the three demonstration schools. We explained the purpose of the project, the principles of fire ant mapping, and demonstrated the use of the equipment that can be used to apply fire ant bait.

The following materials used to apply fire ant baits were purchased, and are kept at the Tuscaloosa County Extension Office:

hand-cranked gravity flow seeders (small and medium sized)

backpack blower

supplies for calibrating bait applicators

Maintenance people will be able to borrow the equipment as needed. This year, fire ant bait was provided by Novartis.

The severe drought delayed the actual mapping of fire ant colonies, as the proportion of ant colonies that made visible mounds was reduced. Sites were mapped in July, and Award fire ant bait was applied to problem areas identified by mapping. In October, we will visit the site and evaluate the level of fire ant control and the degree of acceptance of the program by stakeholders.

**Outcomes:**

Improved knowledge of fire ant biology and management by maintenance personnel.

Maintenance of excellent level of fire ant control at the sites.

Increase interest extending the fire ant management concepts to other school yards and public landscapes in Tuscaloosa Co.

**Desiccation Tolerance and Water Budgets of Red Imported  
Fire Ant Alates**

**Principal investigator:** Arthur G. Appel

**Objectives:**

- 1) Determine the tolerance of alate red imported fire ants to various rates of desiccation.
- 2) Quantify cuticular and respiratory water loss in alate red imported fire ants.
- 3) Construct water budgets for alate red imported fire ants.



**Progress:**

Newly collected alate red imported fire ants, *Solenopsis invicta* Buren, were dried at 30°C and 0% relative humidity to determine their rate of desiccation, water content, and sensitivity to water loss. Female alates lose water at nearly half the rate of male alates. In addition, female alates weigh more than twice as much as male alates (15.93 versus 7.28 mg), but contain about 20% less water and 30% more fat. Alates were also dried in moving air at various humidities. Both female and male alates are immobilized after losing about 35% of their total body water. Water loss and immobilization is more rapid at lower humidities and higher air speeds. Because of their lower rate of desiccation, female alates can survive desiccating conditions nearly 25% longer than male alates.

When walking or resting, alate red imported fire ants intermittently release CO<sub>2</sub> from their respiratory system. This phenomenon is known as the discontinuous gas exchange cycle or DGC. Depending on temperature, bursts of CO<sub>2</sub> are released once every 1 to 15 minutes. Because gases in the insect respiratory system, as in our lungs, are saturated with water vapor, water is lost each time CO<sub>2</sub> is released. Using real-time flow-through respirometry and an infrared water detector, both CO<sub>2</sub> and water vapor release patterns were recorded from individual ants at several temperatures. Unlike practically every other arthropod for which DGC has been described, respiratory water loss in alate red imported fire ants represents a significant proportion of total water loss. Respiratory water loss ranges from about 20% of total water loss at 20°C to nearly 40% of total water loss at 30°C. These results demonstrate the importance of the DGC to alate fire ant water balance and the need for newly mated queens to find cool, moist nesting sites.

A laminar flow wind tunnel has been constructed to test the ability of alates to fly after various periods of desiccation. Male alates can not fly after approximately 10-20% of their total body water is lost. Female alates, however, retain the ability to fly until they lose 35-40% of their total body water. Alates that were desiccated more rapidly (at higher temperatures and lower relative humidities) lost the ability to fly at lower percentage of total body water lost than alates that were desiccated more slowly.

Preliminary water budgets for female and male alate have been estimated for several temperatures. Cuticular water loss represents 60 to 80% of total water loss at 15 and 30°C, respectively. Metabolic water production was estimated from CO<sub>2</sub> production and O<sub>2</sub> consumption data and can represent up to 10% of total losses. After flight, neither female nor male alates eat and female alates do not drink.

Our previous study we found that alate red imported fire ants contain enough energy to fly <5 km in the absence of wind. The results of this study better reflects the range in natural environmental conditions and problems encountered by alates and will allow better estimates of the ability of alate red imported ant to disperse via flight.

#### **Articles in Refereed Journals:**

- Vogt, J. T., **A. G. Appel** and M. S. West. 2000. Flight energetics and dispersal capability of the fire ant, *Solenopsis invicta* Buren J. Insect Physiol. 46: 697-707.
- Vogt, J. T. and **A. G. Appel**. 2000. Discontinuous gas exchange in the fire ant *Solenopsis invicta* Buren: caste differences and temperature effects. J. Insect Physiol. 46: 403-416.
- Vogt, J. T. and **A. G. Appel**. 2000. Metabolic costs of spontaneous movement in the red imported fire ant, *Solenopsis invicta* (Hymenoptera: Formicidae). Sociobiology 35: 89-98.
- Vogt, J. T. and **A. G. Appel**. 1999. Standard metabolic rate in the red imported fire ant, *Solenopsis invicta* Buren: effects of temperature, mass, and caste. J. Insect Physiol. 45: 655-666.

Shelton, T. G., J. T. Vogt, **A. G. Appel** and F. M. Oi. 1999. Observations of *Reticulitermes* spp. in *Solenopsis invicta* mounds (Isoptera: Rhinotermitidae, Hymenoptera: Formicidae). *Sociobiology* 33: 265-275.

**Non-refereed Journals and Extension Publications:**

Shelton, T. G., J. T. Vogt and **A. G. Appel**. 1999. Dangerous liaisons? Native termites inhabiting red imported fire ant mounds. *Highlights of Agricultural Research. Alabama Ag. Exp. Stn.* 46(2): 5-6.

**Papers presented at or submitted for professional meetings:**

- Appel, A. G.** 2000. Importance of respiratory water loss in alate red imported fire ants. Entomological Society of America, Montreal, Canada.
- Vogt, J. T. and **A. G. Appel**. 1999. An examination of the flight capability of *Solenopsis invicta* Buren alates. Imported fire ant conference, Charleston, SC.
- Flanders, K., **A. Appel**, G. Mullen, N. Liu, and L. Graham. 1999. The Alabama fire ant management project. Imported fire ant conference, Charleston, SC. (poster)
- Vogt, J. T. and **A. G. Appel**. 1999. The energetic cost of flight in *Solenopsis invicta* Buren, the red imported fire ant. Southeastern Branch, Entomological Society of America, Destin, FL.

## Fungal Antagonists Associated with Imported Fire Ants in Alabama

**Principal Investigators:** Kathy S. McLean

The objectives of this research are to identify naturally occurring fungi associated with fire ants in Alabama and to screen potential fungal isolates for possible microbial insecticide activity.

Dr. Graham and his technical assistants collected ants from ant hills across the state of Alabama. Ants were kept in colonies in the lab and were collected as they died naturally. Initially dead ants were scanned utilizing dissecting microscope to observe any fungal spores attached to the ants' exoskeleton. Fifty ants from each ant hill were placed on nutrient mediums utilizing aseptic techniques to culture fungal isolates. All fungal specimens isolated were identified, recorded, and collected for pathogenicity tests. Unknown isolates were subcultures for later identification.

To date, fifty-six ant hills have been aseptically plated and fungal cultures collected. Thirty different genera of fungi have been isolated from the fire ants (Table 1). Of those genera isolated, approximately 10% are considered insect pathogens. *Synnematium jonesii* is one of the insect pathogens that appears to be a good candidate for biological control testing (see picture in Research and Publications section). Several genera of fungi isolated from the Alabama fire ants have never been isolated from fire ants previously. A bacterium was also isolated and identified as *Bacillus lentimorbus*, a known insect pathogen. We are in the process of collecting isolates of all the genera of

fungi associated with fire ants in Alabama. These fungal isolates could potentially be microbial insecticides that will be screened for efficacy of fire ant control.

**Table 1. Genera of fungi isolated from imported red fire ants in Alabama**

*Acremoniella sp.*  
*Alternaria alternata*  
*Alternaria tenuissima*  
*Aspergillus fumigatus group*  
*Aspergillus flavus group*  
*Arthrinium phaeospermum*  
*Chaetomium cupreum*  
*Chaetomium aureum*  
*Cladosporium cladosporioides*  
*Cladosporium sp.*  
*Curvularia lunatus*  
*Cochliobolus sativus*  
*Coniella fragariae*  
*Drechslera spp.*  
*Epicoccum purpurascens*  
*Fusarium semitectum*  
*Fusarium oxysporum*  
*Geotrichum candidum*  
*Nigrospora sphaerica*  
*Paecilomyces farinosus*  
*Penicillium spp.*  
*Phoma spp.*  
*Rhizopus stolonifer*  
*Sardaria fimicola*  
*Stigmella sp.*  
*Synnematium jonesii*  
*Thermomyces langinosus*  
*Thielavia terricola*  
*Tricoderma vardiiae*  
*Tricholosporum beigelii*

## **Developing Integrated Pest Management Options for Fire Ant Control in No-Till Soybeans**

**Principal Investigator:** Micky D. Eubanks

We conducted an on-farm study in Talladega County to test the effectiveness of Extinguish and develop recommendations regarding its use. Full-strength Extinguish treatments (1 lb/acre) reduced the number of large mounds at the Wilson farm by approximately 60%, but did not reduce the density of large mounds at the Stockdale farm. It is not clear why the full-strength Extinguish treatments were reasonably effective at the Wilson farm but not at the Stockdale farm. Bright sunshine can deactivate the active ingredient of Extinguish under some conditions. Treatments were applied in the early afternoon at both sites on moderately sunny days, however, the amount of sunlight penetrating the soybean canopy was probably different at the two farms. Plants at the Wilson farm were already approximately 1 ft tall with a leaf canopy that shaded the soil surface, whereas plants at the Stockdale farm were less than 6 inches tall and did not shade the soil surface. It is possible that increased light levels at the Stockdale farm reduced the efficacy of Extinguish. It is also possible that increased densities of thatch or dead plant material interfered with the efficacy of Extinguish. We noted a general trend that the density of insects on the ground, particularly fire ants, were positively correlated with the density of thatch (dead plant material left from previous plantings; primarily brown wheat stems at both farms). It should also be noted that even the best results we observed (a 60% reduction in mounds) do not approach the efficacy of Extinguish reported in other studies. For example, Extinguish reduced the density of large mounds

by over 90% on some plots during a study conducted last summer in Alabama pastures (Matt Aubuchon, per. com.). Half-pound per acre (half-strength) applications of Extinguish were ineffective at reducing the density of large fire ant mounds. Mound densities were actually slightly higher on plots treated with a half-pound of Extinguish at the Stockdale farm and were only 13% lower than control plots at the Wilson farm.

### **Impact of Fire Ants on Biological Control:**

Red imported fire ants are usually considered pests. Fire ants, however, can be beneficial. They are voracious predators and are abundant in southeastern agroecosystems. There is, however, controversy regarding the beneficial impacts of fire ants because they also attack beneficial insects. I documented the impact of fire ants on insect pests and beneficial arthropods in cotton and soybean fields. Densities of *S. invicta* were negatively associated with all 17 herbivore taxa sampled in cotton and 13 of the 16 herbivore taxa sampled in soybean. These data suggest that red imported fire ants are important predators of the major insect pests of these two crops. The abundance of fire ants, however, was negatively correlated with the densities of 22 of 24 natural enemy taxa found in cotton and 14 of 16 natural enemy taxa found in soybean. Their impact on any given pest species must be evaluated in terms of their suppression of other natural enemies.

### **Publications:**

- Eubanks, M. D. 2000. Can bad bugs do good? The ecology of fire ants in Alabama agricultural crops. *Highlights of Agricultural Research*, 46(1):3-4.
- Eubanks, M. D. In Review. Estimates of the direct and indirect effects of red imported fire ants on biological control. (submitted to *Biological Control* May 2000).
- Eubanks, M. D., S. A. Blackwell, C. J. Parrish, and Z. D. DeLamar. In Prep. Intraguild predation of biological control agents by red imported fire ants in cotton. (For *Environmental Entomology*, scheduled for early September submittal).

**Presentations:**

- Eubanks, M. D., S. Blackwell, C. Parrish, and Z. DeLamar. 2000. Pervasive invasives and complex trophic interactions: Fire ants and biological control. Annual Meeting, Entomological Society of America, Montreal, Canada.
- Blackwell, S. M. D. Eubanks, C. Parrish and Z. DeLamar. 2000. The impact of red imported fire ants on cotton pests. Annual Meeting, Entomological Society of America. Montreal, Canada.
- DeLamar, Z., M. D. Eubanks, S. Blackwell, and C. Parrish. 2000. Do red imported fire ants suppress soybean pests? Annual Meeting, Entomological Society of America, Montreal, Canada.
- Eubanks, M. D. 2000. Pervasive invasives and complex trophic interactions: The impact of red imported fire ants on biological control. Department of Entomology, Virginia Tech University, Blacksburg, VA.
- Eubanks, M. D. 2000. Managing fire ants in agricultural crops: Does the removal of ants benefit pests? Southeastern Branch Meeting, Entomological Society of America, Mobile, AL.
- Blackwell, S. and M. D. Eubanks. 1999. Managing fire ants in agricultural crops: Does the removal of ants benefit pests? Annual Meeting, Entomological Society of America, Atlanta, GA.

Presentation to Alabama Soybean Commission on Fire Ants, February 2000.  
Alabama Fire Ant Program, 1999 Alabama State Fair, Montgomery, AL, October 1999.

**Identifying Differentially Expressed Genes between Queens and Workers  
of the Imported Fire Ant, *Solenopsis Invicta*.**

**Principal Investigator:** Dr. Nannan Liu

The red imported fire ant, *Solenopsis invicta* Buren, arrived in Mobile, Alabama from South America during the 1930's and has spread into much of the southeastern United States. Approximately 270 million acres currently are infested. One of the major limitations in the control of fire ants is the lack of understanding of the molecular basis involved in the development, reproduction, and the defense system of these pests.



Many insects show polyphenisms, or alternative morphologies, which are based on differential gene expression rather than genetic polymorphism (Evans and Wheeler 1998). Queens and workers are alternative forms of the adult female fire ant and represent one of the best-known examples of insect polyphenism. These alternative forms enable fire ants in different castes to perform different and mutually beneficial roles. Fire ant queens produce pheromones that regulate development, reproduction, and caste determination (Vargo 1998). Workers are completely sterile, lacking functional reproductive organs. They do not produce pheromones, but develop enhanced defensive and sensory organs. These substantial physiological differences between queen and worker fire ants may reflect the differential expression of genes present in both castes. Thus identification, characterization, and isolation of the gene(s) involved in the regulation of pheromone production in fire ant queens and the regulation of the defense system in fire ant workers may provide useful information for developing the novel strategies to control imported fire ants.

In this study, we used differential display to compare mRNA populations in both queens and workers. With this information, we can analyze genes that are differentially expressed between both castes. It is reasonable to believe that these differentially expressed genes may play a role in the regulation of pheromone production in fire ant queens and/or in the regulation of the defense system in workers.

Total RNAs were extracted from workers and queens. Two 3'-oligo-dT primers and eight 5'-random primers were designed for the experiments. cDNAs were amplified by RT-PCR using <sup>35</sup>S labeled random primer pairs (16 primer pairs were used). The denatured RT-PCR products were separated by electrophoresis on polyacrylamide gels.

The gels were exposed to X-Ray film. By comprising the signal intensity of radioactivity, we found that most cDNA bands were equally detected in RNA samples from both queens and workers. However, several cDNA bands were apparently unique to samples from queens and some cDNA bands were detected solely in samples from workers. Twelve cDNA fragments from queens and 7 cDNA from workers were isolated from the gels, amplified by PCR using same primer pairs, and cloned into the PCR<sup>Tm</sup> 2.1 vectors. We have manually sequenced the 12 cDNA fragments from queens and compared sequences with the gene database of GenBank using a Blast search. Six of the twelve cDNA fragments showed amino acid sequences that matched protein sequences in the GenBank database. The amino acid sequences of these six cDNA fragments were similar to: 1) a family of insect storage proteins, 2) an important family of transcription factors (apparently involved in multiple signaling pathways important in developmental and metabolic processes throughout the eukaryotes), 3) an oxidoreductase enzyme family (the major metabolic enzymes in eukaryotes), 4) cytochrome c oxidase (metabolic enzyme), 5) an insect retroviral protein (encodes a transposable element, gypsy from *Drosophila melanogaster*), and 6) a human voltage-gated calcium channel. The other cDNA fragments from the sample of queens did not match any existing amino acid sequences from the GenBank database, either because the fragments were too short or because they might be unique sequences that have not been published. Although we have found several genes (partial) that are differentially expressed between queens and workers of the fire ants, the full length of the genes needs to be characterized and the function of the genes needs to be investigated.

Nucleic acid (DNA) array technique is an alternative strategy we have used to identify genes involved in the regulation of pheromone production in fire ant queens and in the regulation of the defense system in workers. DNA array is a powerful and versatile technology that allows complex mixtures of RNA and DNA to be compared in a parallel and quantitative fashion. DNA arrays can be used for many different purposes, most prominently to measure levels of gene expression (mRNA abundance) for tens of thousands of genes simultaneously. DNA arrays work by hybridization of labelled RNA or cDNA molecules attached at specific locations on a surface. Recently, we have successfully constructed a fire ant cDNA library (cDNA pool) using a cDNA library construction kit (Strategy). With this fire ant cDNA library, we are carrying out the DNA array experiments by isolating tens of thousands of fire ant cDNAs from the library and hybridizing them with labelled RNAs from both queens and workers.

## **Characterization of Arthropod Communities in Fire Ant Managed Areas in Alabama**

**Principal Investigators:** Gary R. Mullen and Matthew D. Aubuchon

Data from field studies conducted in Alabama in 1999 were analyzed to determine the effectiveness of a commercial bait formulation of methoprene, an insect-growth regulator, for control of the imported fire ant in pastures grazed by cattle. The bait was applied as broadcast and perimeter treatments in 1-acre test plots on farms in Lee and Chambers County. The results indicated significant reduction of fire ants with broadcast

applications at the rate of 1 lb bait/acre, with highest mortality at 4 months following treatment. Perimeter applications of methoprene bait at ¼ lb bait/acre did not provide effective control.

In conjunction with these field tests of methoprene baits for control of fire ants, the impact of methoprene on non-target organisms in treatment areas has been investigated. The focus has been the associated arthropod community, including other ant species, ground-dwelling insects, and both soil-inhabiting and litter-inhabiting mites found in grazed pastures. Non-target insects and mites were sampled prior to treatment and at 1, 3, 6, 9, 12, and 15 weeks after treatment to determine the effect of methoprene on their populations. Sampling was conducted using pitfall traps for surface-dwelling arthropods and Berlese samples for extraction of soil- and litter-inhabiting organisms. A total of 1,008 pitfall samples and 1,008 Berlese samples were collected. Identification of arthropods taken at 3, 9, and 15 weeks post-treatment in plots with broadcast applications of methoprene were used for preliminary evaluations of methoprene on non-target species.

Four other species of ants were found living in association with the red imported fire ant in the test plots: the thief ant (*Solenopsis molesta*), *Ponera trigona*, *Forelius foetida*, and *Paratrechina vividula*. In addition, species representing 9 orders and 28 families of insects were recovered as follows: Collembola (3 families), Orthoptera (2), Homoptera (1), Hemiptera (3), Coleoptera (12), Siphonaptera (1), Diptera (3), and Hymenoptera (3). Identification and analysis of the mite fauna has not been completed and will require slide-mounting for microscopic examination. General fauna included dung beetles (Scarabaeidae), ant-mimicking beetles (Anthicidae), braconid wasps

(Braconidae), cat fleas (Pulicidae), grasshoppers (Acrididae), and wolf spiders (Lycosidae).

Fire ants were the most abundant arthropods in the pitfall traps before, during, and after treatment. Although the methoprene treatments did significantly reduce fire-ant activity and abundance in treatment plots, the proportion of fire ants to coexisting ants and other insects remained high in both the treatment plots and the untreated controls. At the same time, populations of the non-target species remained at consistently low levels throughout the sampling period. Preliminary statistical analyses indicate that non-target arthropods were not significantly affected by the methoprene applications and, in general, did not increase in abundance even after fire ant activity was greatly reduced in a given area. Contrary to literature reports that fire ants significantly reduce species diversity and abundance of other arthropods, these field tests did not reveal a significant, adverse effect of the red imported fire ant on other arthropod species occurring at low-abundance levels. Nor did methoprene applied at the rate of 1 lb/acre appear to have an adverse impact on other, non-target arthropods coexisting at relatively low population levels in fire ant-infested pastures.

Further analyses and quantification of data on the associated arthropod community of non-target organisms is in progress. This will provide additional information on possible effects of methoprene-bait treatments for fire ants on the species diversity of the arthropod community associated with managed pastures.

The following four presentations have been made in relation to this fire ant work during the past year.

**Presentations:**

- Aubuchon, M. D., G. R. Mullen, and M. D. Perdue. 1999. Efficacy of broadcast and perimeter applications of S-methoprene for control of the red imported fire ant. Entomological Society of America, Atlanta, GA. (poster).
- Aubuchon, M. D. and G. R. Mullen. 2000. Efficacy of broadcast and perimeter applications of S-methoprene for the control of the red imported fire ant. Southeastern Branch, Entomological Society of America, Mobile, AL.
- Aubuchon, M. D. and G. R. Mullen. 2000. Efficacy of broadcast and perimeter applications of S-methoprene for the control of the red imported fire ant. Imported Fire Ant Conference, Chattanooga, TN.
- Aubuchon, M. D. and G. R. Mullen. 2000. Efficacy of broadcast and perimeter applications of S-methoprene for control of the red imported fire ant. Annual Graduate Student Research Forum, Auburn University, Auburn, AL.

## **Coordination and Support for the Alabama Fire Ant Management Program**

**Principal Investigators:** Michael Williams and Lawrence Graham.

**Objectives:**

- 1) Provide general support assistance in the coordination and implementation of fire ant projects.
- 2) Conduct project outreach efforts to improve the public's knowledge of fire ants, and to promote the efforts of the Alabama Fire Ant Management Program.
- 3) Pay for on-going expenses of the fire ant program.

**Progress:**

Over \$12 million are spent each year by Alabamians for fire ant control. Fire ants are difficult to live with because of their painful bites and stings. In addition, fire ant mounds are unsightly and can damage equipment. While it may never be possible to eradicate fire ants, we can develop ways to reduce their impact.

The goal of the Alabama Fire Ant Management Project is to make fire ants easier to live with by finding new ways to manage fire ants and make them less intrusive in our lives. The project involves a strong educational program and a coordinated, aggressive research program.

A fire ant program steering committee, consisting of Drs. Williams (chair), Arthur Appel, Kathy Flanders, and Lawrence Graham evaluates projects each year and makes decisions on projects for the following year. Dr. Graham, Research Fellow, coordinates program outreach and assists in the implementation of individual fire ant projects.

Principal investigators Graham and Williams attended the 2000 Imported Fire Ant Conference in Chattanooga, Tennessee. A new computer was purchased that can efficiently run necessary GIS software. A digital camera was also purchased and used to document activities of the Alabama Fire Ant Management Program.