PROGRESS REPORT FY 2008

THE ALABAMA FIRE ANT MANAGEMENT PROGRAM

...MAKING FIRE ANTS EASIER TO LIVE WITH.

AUBURN UNIVERSITY

ENTOMOLOGY AND PLANT PATHOLOGY

EDITED BY L.C. "FUDD" GRAHAM AND KELLY RIDLEY

Table of Contents

FISCAL YEAR 2008 IN REVIEW

~The Alabama Fire Ant Management Program~

...making fire ants easier to live with.

Department of Entomology & Plant Pathology Auburn University Auburn, AL

INTRODUCTION

Fire Ants! In Alabama, they present a constant problem for stakeholders. **The Alabama Fire Ant Management Program is dedicated to bringing research-based fire ant management practices to the public and helping them live with these invasive pests.**


Courtesy Pat Cabb

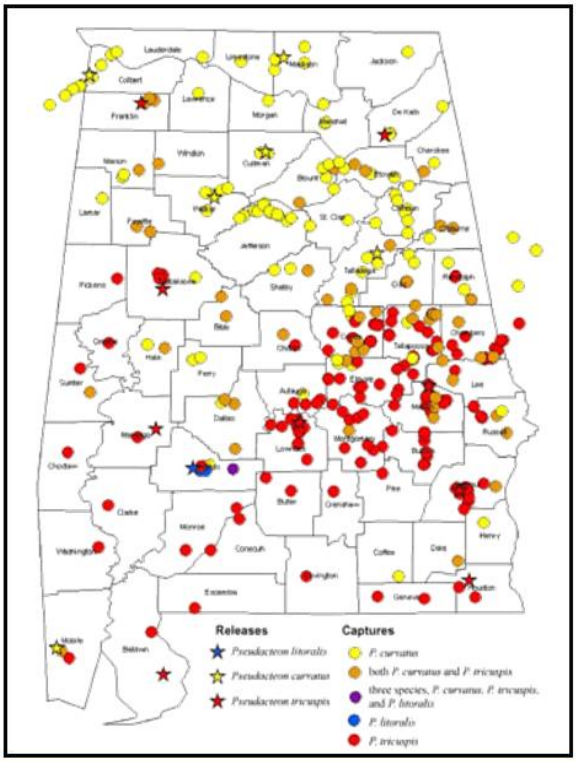
Imported Fire Ants, as the name suggests, were brought here inadvertently through the Port of Mobile from South America in the early 1900's. Since their arrival they have spread rapidly to cover the entire Southeast, much of Texas, and parts of California. Since this invasive species will never be eradicated, our program was put in place to help manage fire ant populations. We do this by informing the public, working with biological control agents (phorid flies), and researching various aspects of fire ant biology and management.

By learning more about the fire ant and maintaining a working relationship with other fire ant researchers, the program continues to make large strides in fire ant management.

BY THE NUMBERS:

- Additional Funding Leveraged: $271,952
- Publications, etc: 113
- Trainings Performed: 32

BIOLOGICAL CONTROL UPDATE: PHORID FLIES FOUND IN EVERY COUNTY IN ALABAMA



In 2008, the Alabama Fire Ant Management Program set out to survey the phorid fly locations throughout the state, and to do this we traveled to every county to find this natural enemy of the fire ant. After a long summer of searching **we can now tell ALL Alabama stakeholders that they have these nearly invisible insects helping them with fire ant control.**

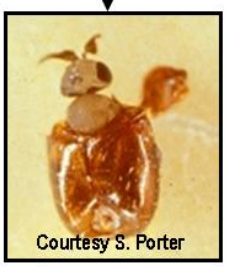
Also in 2008, we recovered the phorid fly, *P. tricuspus* in Franklin and Baldwin Counties, the first capture since their releases. In Wilcox County we again recovered *P. litoralis*, and documented its spread outward from the release site by 8 miles. **Wilcox County is the only location in the U.S. to have this phorid species established.**

We are also proud to say that **we released a 4th species of phorid fly, *P. obtusus*, into Alabama in 2008** at a farm in Lee County. In 2009, we plan to continue phorid monitoring across the state to determine how far each species has spread.

HOW DO PHORID FLIES WORK?

1. Flies are attracted by a mound disturbance and insert an egg into a fire ant.

2. The fly larva migrates to the fire ant's head, a substance dissolves the connection at the base of its head causing the ant's head to fall off.


Courtesy S. Porter

3. The developing larva eats the contents of the fire ant's head and in 1-2 weeks the adult fly emerges, to continue the lifecycle.

eXTENSION EXPANDS IN 2008

eXtension logo
Courtesy eXtension.org

The fire ant eXtension site found at: eXtension.org/fire+ants is an all-in-one, one-stop fire ant resource site. In 2008, several new applications were added, such as: The Fire Ant Decision Module, Youth Module, and a new online publication. **Visit the eXtension site today to create your own custom fire ant control method!**

Alabama Fire Ant Management Program Personnel and Cooperators

Auburn University Department of Entomology & Plant Pathology

Advisory Committee

Arthur G. Appel, Ph.D. – Department Chair
Kathy L. Flanders, Ph.D.
L. C. "Fudd" Graham, Ph.D.
Michael L. Williams, Ph.D.
Beth Guertal, Ph.D. – Department of Agronomy & Soils

Researchers

Micky D. Eubanks, Ph.D.
Henry Y. Fadamiro, Ph.D.
David W. Held, Ph.D.
Xing Ping Hu, Ph.D.
Nannan Liu, Ph.D.
Li Chen, Ph.D.
Samual Addison Barden
Wei Ding
Marla Eva
Vicky Bertagnolli-Heller
Krystal Waltman-McDuff
Alicia K. Phillips
Kelly Ridley
Marla Tanley
Xin Yue

Alabama Cooperative Extension System

Danny Cain
Dani Carrol
Doug Chapman
Valerie Conner
Patrick Cook
Willie Datcher
Henry D. Dorough
Rachel Dykes
Chip East
Gary Gray
Shane Harris
Taylor Hatchett
Chazz Hesselein
Jimmy Jones
Ken Kelley
David Koon
Willie Lampley
Charlie Mason
Charles Pinkston
Tim Reed
R. Stan Roark
Wayne Robinson
Donna Shanklin
Kent Stanford
Gerald Thompson
Roger Vines
Mac Washington
Eddie Wheeler
Anthony Wiggins
Stan Windham

Tuskegee Cooperative Extension System

George Hunter – Lowndes Co.

Alabama Agricultural Experiment Station

Sand Mountain Research and Extension Center
Tony Dawkins – Station Superintendent

Alabama A & M
Department of Plant & Soil Science

Ken Ward, Ph.D.
Rufina Ward, Ph.D.

Alabama Fire Ant Management Program Personnel and Cooperators

ALABAMA DEPARTMENT OF AGRICULTURE & INDUSTRIES

U.S. FISH AND WILDLIFE SERVICE

USDA-ARS
Sanford D. Porter, Ph.D.
Robert K. Vander Meer, Ph.D.
David Oi, Ph.D.
Steven Valles, Ph.D.
Juan Briano, Ph.D.

USDA-APHIS
Anne-Marie Callcott
Ron Weeks, Ph.D.

FLORIDA DEPARTMENT OF AGRICULTURE & CONSUMER SERVICES
Amy Croft

LOCAL COOPERATORS

Baldwin Co.	Mark Kaiser	Marengo Co.	Lynn Crocker
Barbour Co.	Lee Fenn	Mobile Co.	Bruce Porter, USFWS
Cullman Co.	Mr. & Mrs. F.D. Alexander	Talladega Co.	Mike Duke
	St. Bernard Abbey Farm		Greg Streett
Franklin Co.	Bob Rogers	Tuscaloosa Co.	Munny Sokol Park
Houston Co.	Joe Carothers	Walker Co.	Dorman Grace
	John McDaniel	Wilcox Co.	Jack Biddle
Lee Co.	Phil and Daria Story	Fayetteville, AL	Farmlinks Golf Course
Macon Co.	Tim and Susan Gaasch	Sylacauga , AL	Merkel Field Sylacauga
	Tony & Diane Silva		

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VALENT Professional Products — Jeffery Smith

DuPont The miracles of science — Todd Himelberger

Wellmark — Doug Van Gundy

Herd Seeder Co. Inc. — David Herd

Sincere apologies to anyone inadvertently omitted from this list.

Trade names are used only to give specific information. The Alabama Fire Ant Management Program and the Alabama Cooperative Extension System do not endorse or guarantee any product and do not recommend one product instead of another that might be similar.

Funding Leveraged By the Fire Ant Program:

- Fadamiro, H.Y. (PI). May 1, 2008-April 30, 2010. Isolation, Identification and Biological Activity of Novel Chemical Compounds Mediating Attraction of Parasitic Phorid Flies to Invasive Fire Ants. Auburn University Biogrants Program, $20,000.

- Flanders, K. L. and B. M. Drees. Jan. 2008. Support for leaders of the Imported Fire Ant eXtension CoP. CSREES eXtension, $15,000.

- Graham, F. 2008. Field evaluation of metaflumizone. BASF, $4,000.

- Graham, F. 2007-. School IPM PCO Training. ADAI, $42,000.

- Hu, X. Field evaluation of bait products. Gift from industries, $3,500.

- Merchant, M., J. Hurley and B. Bennett. 2007-2009. Multistate Evaluation of School IPM Cost Calculator and Training Model. SRIPM. Subcontract to Graham, F., $14,020.

- Oi, F., R. Baldwin, J. Hurley, M. Merchant and F. Graham. 2007-2009. Marketing IPM as Green School Technology. National EIPM Grant, $78,432.

- Oi, F. and F. Graham. 2007-2009. Urban IPM. eXtension Grant, $40,000.

- Oi, F., R. Baldwin, J. Hurley, M. Merchant and F. Graham. 2008-2009. Marketing IPM as Green School Technology. National EIPM Renewal Grant, $55,000.

Total Funding Leveraged: $271,952

PUBLICATIONS: **(* denotes graduate student)**

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*Chen, L. and H.Y. Fadamiro. Re-investigation of venom chemistry of *Solenopsis* fire ants. I. Identification of novel alkaloids in *S. richteri*. Toxicon. In press.

*Chen, L. and H.Y. Fadamiro. Re-investigation of venom chemistry of *Solenopsis* fire ants. II. Identification of novel alkaloids in *S. invicta*. Toxicon. In press.

Dorough, Henry, L. C. 'Fudd' Graham, V. Bertagnolli-Heller and K. Ridley. Bulk blending fire ant baits with fertilizer: An economic alternative, Proceedings of the 2008 Imported Fire Ant Conference, Charleston, South Carolina, March 24-26, 2008. In press.

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Graham, L. C. 'Fudd', S. D. Porter, J. A. Briano, V. Bertagnolli-Heller and K. Ridley. Phorid flies in Alabama: *Pseudacteon litoralis* added to the list. Proceedings of the 2008 Imported Fire Ant Conference, Charleston, South Carolina, March 24-26, 2008. In press.

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Fadamiro, H.Y., X. He and L. Chen. Aggression in imported fire ants: an explanation for shifts in their spatial distributions in southern United States?. Ecological Entomology. In review.

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Fadamiro, H.Y. and L. Chen* 2008. Semiochemical-mediated fire ant-phorid fly interactions: GC-EAD response of *Pseudacteon tricuspis* to *Solenopsis* fire ants. Proceedings of the XXIII International Congress of Entomology, Durban, South Africa.

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Scientific Presentations:

Abraham, C.M. and D.W. Held. 2008. *Pentas lanceolata* as a nectar source for *Larra bicolor* and its effect on parasitism of *Scapteriscus* mole crickets. SEB-ESA, 3 Mar, Jacksonville, FL.

Abraham, C.M. and D.W. Held. 2008. *Pentas lanceolata* as a nectar source for *Larra bicolor* and its effect on parasitism of *Scapteriscus* mole crickets. ESA national meeting, Nov. 17, Reno, NV.

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Held, D.W. 2008. Can we manage mole crickets without fipronil? Annual meeting of the AL Turf Assoc., 29 Oct., Auburn.

Held, D.W. 2008. Research update. Annual meeting of the AL Turf Assoc., 29 Oct., Auburn.

Held, D.W. 2008. Did recent hurricanes hasten the movement of invasive species? SEB-ESA, 4 Mar, Jacksonville, FL. (Invited).

Hesselein, C. 2008. Counting is easy, evaluating is hard. 2008 Imported Fire Ant Conference, Charleston, South Carolina, March 24-26, 2008.

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Hu, X.P. April 2008. Sting and poison bugs you may not be aware of. Alagasco Empolyee monthly meeting.

Morgan, M. V., P. Nester, B. Drees and K. Loftin. How to get involved in eXtension without signing your life away. 2008 Imported Fire Ant Conference, Charleston, South Carolina, March 24-26, 2008.

Publications in Preparation:

Abraham, C.M. and D.W. Held. 2009. Seasonal and diel activity of *Larra bicolor* ectoparasite of mole crickets. Annals of the ESA (in prep).

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Professional Meeting Exhibits:

Flanders, K. L. Fire Ant eXtension booth at the 2008 Imported Fire Ant and Invasive Ant Conference in Charleston, S.C. March 24-26, 2008.

Flanders, K. L. Fire Ant eXtension booth at the 2007 Annual Meeting of the Entomological Society of America, in San Diego, California, December 2007.

Outreach Activities, Presentations, Teaching, and Teaching Materials:

Adrian, A., K. Flanders and V. Morgan. Ask the Expert. How can you contribute? Web Conference for Alabama Cooperative Extension System Employees, February 5, 2008 and February 15, 2008.

Adrian A., K. Flanders and V. Morgan. What is eXtension? What are the benefits to you and your clients? Why do you need an ID? Web Conference for Alabama Cooperative Extension System Employees, January 29, 2008 and February 4, 2008.

Dorough, H. Practical Fire Ant Management Approaches, at the East Alabama Fire Ant Field Day, April 18, 2008.

Dorough, H. Pastures and Hayfields, Field Demonstration at the East Alabama Fire Ant Field Day, April 18, 2008.

Flanders, K. Imported Fire Ant eXtension, Seminar for the Entomology and Plant Pathology Department, Auburn University, September 2008.

Flanders, K. and W. "Chip" East, Fire Ant Management in Christmas Trees, Annual Meeting of the 2008 Southern Christmas Tree Association, September 2008.

Flanders, K. Free Seminar, Fire Ant Control, "The Most Economical Method of Controlling Fire Ants", Lauderdale County Extension Office, July 23, 2008.

Flanders, K. Presentation to Home Grounds Horticulture agents, Lee County, AL, August 29, 2008.
Flanders, K. Effective Management Strategies for Imported Fire Ants, Auburn Landscape, Greenhouse & Nursery School, August 13, 2008.
Flanders, K. Fire Ant Control Product Materials and www.eXtension.org, at the East Alabama Fire Ant Field Day, April 18, 2008.
Flanders, K. Extension Agent Training. Field Demonstration at the East Alabama Fire Ant Field Day, April 18, 2008.
Flanders, K. and R. Duncan. Imported Fire Ant eXtension Training for Extension Agents, Clemson University Breeze Web conference, April 14. 21. and 28, 2008.
Flanders, K. Effective Management Strategies for Imported Fire Ant Control, Gulf States Horticultural Expo, Inc., January 17, 2008.
Flanders, K. Fire Ants & You, Chambers County Farm City Tour, 6 sessions, Nov. 2007.
Futral, T., C. East and D. Carroll. Athletic Fields, School Grounds, Commercial Turf and Plant Nurseries, Field Demonstration at the East Alabama Fire Ant Field Day, April 18, 2008.
Graham, F. Fire Ant Management, Ft. Rucker Army Base, April 1, 2009, Enterprise, AL.
Graham, F. Fire Ant Management in Pastures: Heading in the Right Direction, North Alabama Cattleman's Association, April 10, 2009, Hartsell, AL.
Graham, F. Biological Control of Fire Ants, East Alabama Fire Ant Field Day, Camp Hill, AL, April 18, 2009.
Graham, F. Fire Ant Presentations to School Groups, Cleburne County Farm Day, May 1, 2009, Heflin, AL.
Graham, F. and K. Ridley. Fire Ant Display, Insectival, Oxbow Meadows, July, 13, 2009, Columbus, GA.
Graham, F. Presentations to Producers and Homeowners on Fire Ant Management (3), Chilton County Farm, Home and Wildlife Expo, Aug 2, 2009, Chilton Regional Research and Extension Center, Clanton, AL.
Graham, F. and K. Ridley. Fire Ant Management in Pastures: Heading in the Right Direction, Cattleman's Field Day, Pine View Farms, Aug 20, 2009, Elba, AL.
Graham, F., K. Ridley and S. Harris. Fire Ant Biology, How to Work a Booth at the Fair, Phorid Biology, Master Gardener Volunteers for Alabama National Fair, Sep 25, 2009, Montgomery, AL.
Graham, F., K. Ridley, R. Dykes and J. Jones. Fire Ant Biology, How to Work a Booth at the Fair, Phorid Biology, Master Gardener Volunteers for National Peanut Festival, Oct 28, 2009, Dothan, AL.
Graham, F. Imported Fire Ant Management, Annual Alabama Turfgrass Association Conference and Tradeshow, Oct 29, 2009, Ag Heritage Park, Auburn University, AL.
Gregg, T. "Farmers, Fire Ants, and the Environment," Annual Regional Poultry Workshop, Gadsden, October 11, 2007.
Harris, S. Fire Ant Biology, at the East Alabama Fire Ant Field Day, April 18, 2008.
Harris, S., S. Roark and F. Graham. Home Lawns and Gardens; Pest Control Operators, Field Demonstration at the East Alabama Fire Ant Field Day, April 18, 2008.
Hu, X. P. 2008. Disturb or not disturb, will it make difference in home-yard fire ant control? Pest control workshop, July 25.
Imported Fire Ants eXtension, brought to you by the Imported Fire Ant Community of Practice (K. Flanders, B. Drees, co-leaders). 2008. www.extension.org/fire+ants
Robinson, W. "Fire Ant Management in Horse Pastures," Lamar Co., October 20, 2007.

Mass Media:

Southern View with Leslie Bailey, The Pre-Mother's Day Show, Air date May 10, 2008, reported on the Fire Ant Field Day at the Lyman Ward Military Academy.

Press Releases:

Graham, F, and Maggie Lawrence. Fire Ant Management, Backyard Wisdom Radio Show, April 11, 2009.
Lawrence, M. and K. Flanders. Fire Ant Foes in the News, http://www.extension.org/pages/Fire_Ant_Foes_in_the_News
Lawrence, M. and K. Flanders. April 18 Alabama Workshop To Address Fire Ant Problems, http://www.extension.org/pages/April_18_Alabama_Workshop_To_Address_Fire_Ant_Problems

Lawrence, M. and K. Flanders. Fire Ant Home Remedies Becoming Urban Myths, http://www.extension.org/pages/Fire_Ant_Home_Remedies_Becoming_Urban_Myths

Demonstrations and Field Trials:

Graham, F. and K. Ridley. Horse field fire ant control. Fall 2008. AU Equestrian Center, Auburn, AL.

Graham, F. and K. Ridley. Park fire ant control. Spring and Fall 2008. AU Ag Heritage Park, Auburn, AL.

Graham, F. and K. Ridley. Intramural field fire ant control. Fall 2008. AU Intramural Field, Auburn, AL.

Graham, F. and K. Ridley. Field Evaluation of Metaflumizone. Farmlinks Research and Demonstration Golf Course, Fayetteville, AL. Summer 2008.

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Hu, X.P. 2008. Individual fire ant mound treatment with bait: disturbing or no disturbing? Plant Science, AU July 2008.

Evaluation of Integrated Pest Management Methods for Red Imported Fire Ants

L. C. 'Fudd' Graham[1], Kathy Flanders[1], Kelly Ridley[1], Rufina Ward[2], Ken Ward[2], Henry Dorough[3], Chazz Hesselein[3], Tim Reed[3], and Tony Dawkins[4]

[1]Department of Entomology & Plant Pathology, Auburn University
[2]Alabama A&M University
[3]Alabama Cooperative Extension System
[4]Alabama Agricultural Experiment Station

Phorid Flies in Alabama:

Thanks to support from the Alabama Legislature and the Alabama Department of Agriculture and Industries, we have completed the 12th year of the phorid fly program in Alabama. **Four species of phorid fly have been released in 17 counties as of September 2008 (Fig 1.) through cooperation of the Department of Entomology and Plant Pathology of Auburn University, the Alabama Cooperative Extension System, the Department of Plant and Soil Science of Alabama A&M, Tuskegee University, the Alabama Agricultural Experiment Station, USDA-ARS, USDA-APHIS, Master Gardeners and landowners across the state of Alabama.**

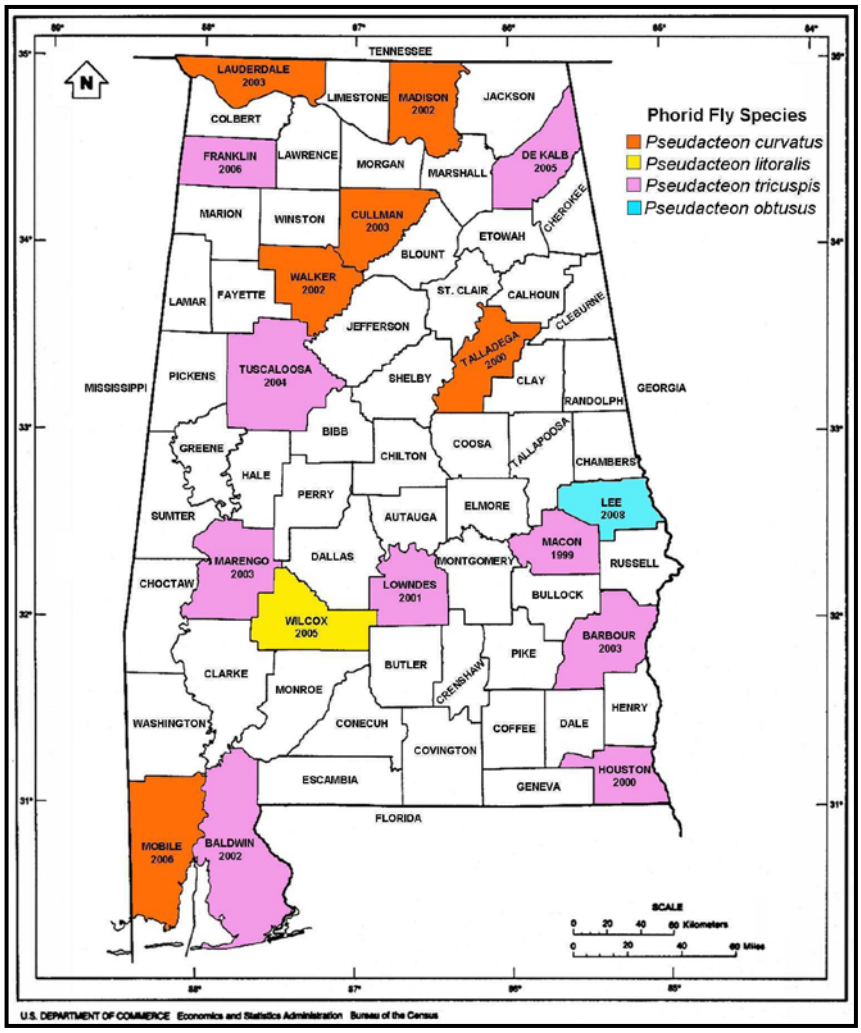


Figure 1: Counties where phorid flies were initially released

Pseudacteon tricuspis, which attacks medium-size fire ant workers, has been released in nine counties. *Pseudacteon curvatus*, which attacks small fire ant workers, has been released in six counties. *Pseudacteon litoralis*, which attacks large workers, was released in Wilcox County in 2005. In 2006, only one fly was recovered at the release site, but in 2007, *P. litoralis* was recovered at the site and 400 yards out from the site. In 2008, *P. litoralis* was collected eight miles from the site. **This is the only site in the United States where *P. litoralis* has been recovered in the field and we now consider *P. litoralis* to be established (Fig 2).** *P. litoralis* has been released at one site in Louisiana and three sites in Florida, but has never been recovered in the field from sites in these states.

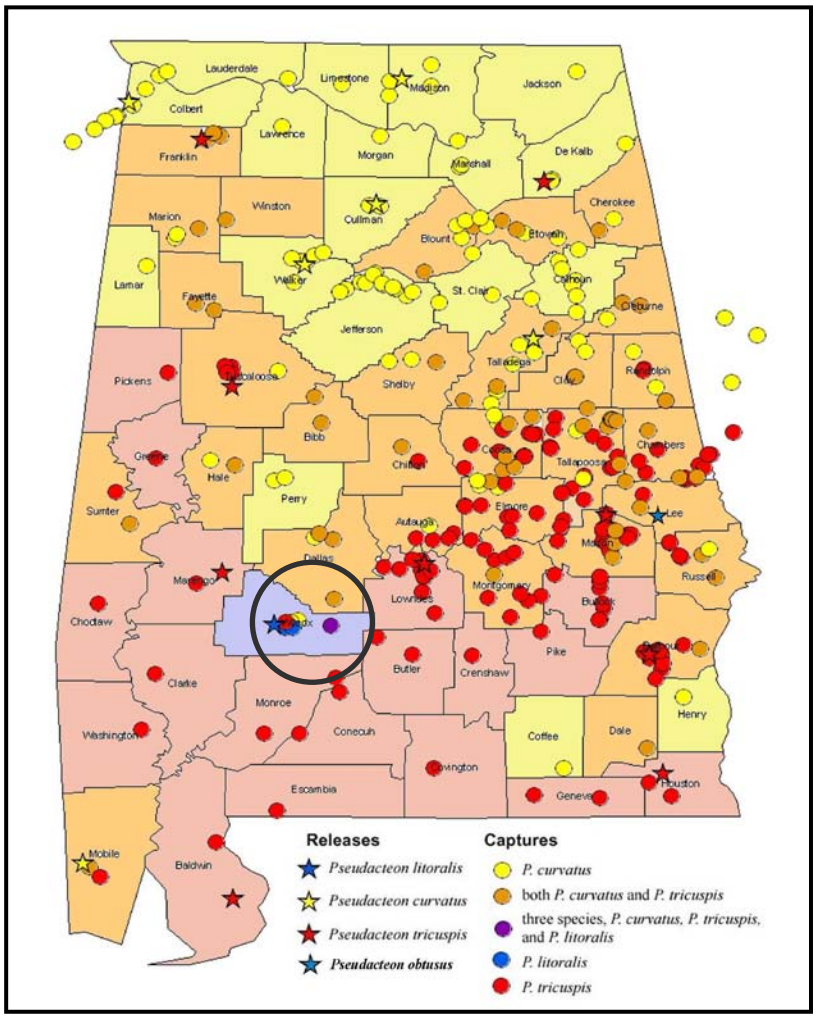


Figure 2: Phorid fly captures in Alabama; the circled area has three species coexisting in one location.

In September of 2008, a fourth species of phorid fly, *Pseudacteon obtusus*, was released in Lee County (see light-blue star in Fig. 2). The other three species of fly established tend to attack fire ants at mound disturbances. *P. obtusus* attacks the largest fire ants and prefers trailing and solitary ants.

Alabama was the first state with two species of phorid fly established and we are now the third state with three species of phorid fly established (Florida and Texas have *P. obtusus* established in addition to *P.*

tricuspis and *P. curvatus*). This is a cooperative program with the USDA-ARS and USDA-APHIS. The USDA provides phorid flies for release and the data is shared with the USDA.

Phorid flies were sampled extensively across the state during FY08. We now know that there is at least one species of phorid fly in every county in Alabama (Fig. 2). This data was shared with the USDA-ARS and USDA-APHIS, as per agreement, for a regional publication on phorid establishment and spread. Researchers at the USDA were attempting to estimate phorid movement in the Southeast when the data was received. **Although not as complete as we would like, our sampling program is more robust than most states and shows that phorid movement from release sites is progressing more rapidly than expected. Due to our extensive sampling of phorid flies in 2008, the estimates of phorid spread for all states were revised for the new publication and the revisions were based on data collected in Alabama by The Alabama Fire Ant Management Program.**

Data is collected yearly on mound numbers (population size) and individual mound size by researchers from Auburn University and Alabama A&M at all release sites that are still accessible. This data is stored and will be combined to determine effects of phorid flies on fire ant populations in Alabama.

Fire Ant Bait Application Technology:

For years, researchers have advised against mixing fire ant bait with fertilizer for a one trip application in a pasture or field. Recent research has suggested that this bulk mix of fertilizer and fire ant bait can be successful. A replicated experiment was conducted on the farm of Greg Streett in Talladega County with Regional Extension Agent Henry Dorough. Valent and Wellmark provided fire ant bait and the Talladega County Co-op provided the fertilizer for the trial. Growth regulator fire ant baits Esteem® and Extinguish® were bulk mixed with fertilizer at the co-op and were taken directly to the field for application. Esteem® was applied as a standard. All plots received bait at a rate of 1.5 pounds of product per acre. Fire ant bait mixed with fertilizer and applied immediately after mixing was just as effective as bait alone after three months, but the bait alone worked faster (Fig 3). The three bait treatments were still effective in March 2008.

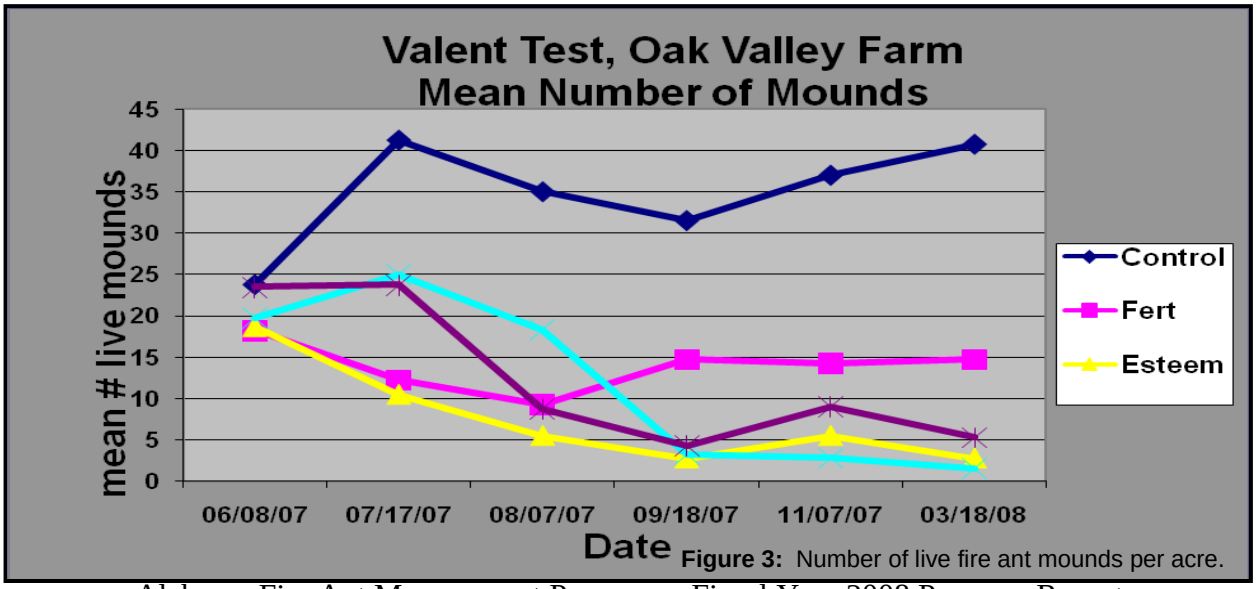


Figure 3: Number of live fire ant mounds per acre.

A FY08 study to determine the effect of application of fire ant bait mixed with fertilizer was cancelled after the study in FY07 was validated by similar studies in Louisiana and Texas. All three studies were reported at the 2008 Imported Fire Ant Conference and negated the need for a repeat in Alabama since all showed adequate fire ant control with the bait-fertilizer mixture.

Figure 4: Spreading Esteem/Fertilizer mix.

Figure 5: Spreading Esteem

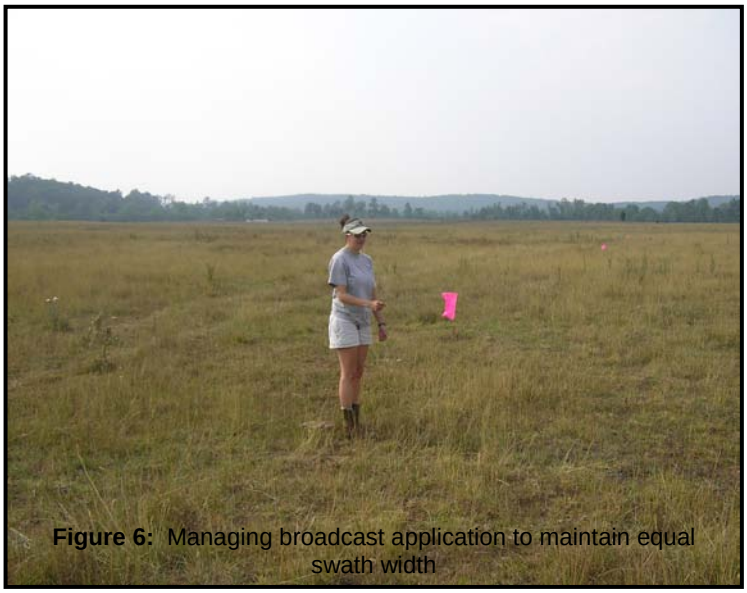


Figure 6: Managing broadcast application to maintain equal swath width

Figure 7: Counting fire ant mounds in plot.

In 2008, a Vicon Maquinas® Pendulum Action Fertilizer Spreader Model PS303 with a fine seed kit was purchased at cost to try as a new bait spreader. Preliminary tests indicate the spreader with fine seed kit installed can apply fire ant bait at recommended rates, but needs to be calibrated on several pieces of equipment to determine its utility and ease of calibration. The advantage of this spreader is that it can hold more bait and will be useful when large acreages need to be treated.

FarmLinks Golf Club (Fig. 8) is a one-of-a-kind research and demonstration golf facility located in Fayetteville, AL. In cooperation with BASF, one of the course partners, a fire ant insecticide trial was conducted at the facility with an experimental insecticidal bait requiring efficacy data for registration. Five treatments (including an industry standard and an untreated control) were replicated four times in a randomized-complete block design. The test was laid out the last week of May and pretreatment counts were taken on June 3. Treatments were applied on June 9. Data was collected Jun 13, 19 and 26, Jul 10, Aug 19 and Nov 20.

Figure 8: FarmLinks, Fayetteville, AL.

DEMONSTRATIONS AND EDUCATIONAL PROGRAMS:

An Extinguish Plus® fire ant bait demonstration was conducted for a Cattleman's Field Day at Pine View Farms in Elba, AL. Extinguish Plus® was spread at a rate of 1.5 lb / acre on July 22. Treated areas on the property (Fig.9) are shaded gray in the map of the whole farm on the left. The light blue area on both maps was left untreated as a control. Mounds were counted in the two areas shown in the map below (enlarged from the box on the map of the farm).

The bait application began at 3:30 p.m. and continued until 7:40 p.m. Temperatures were in the mid-90's and were too hot during the middle of the day for ants to forage for the bait. Fire ant bait applied during the heat of the day will dry out and degrade before soil temperatures cool down enough for ants to emerge from mounds to forage.

The chance of rain on July 22 was only 30%, but the farm received 0.3 inches of rain approximately one hour after bait application ended and drastically reduced control.

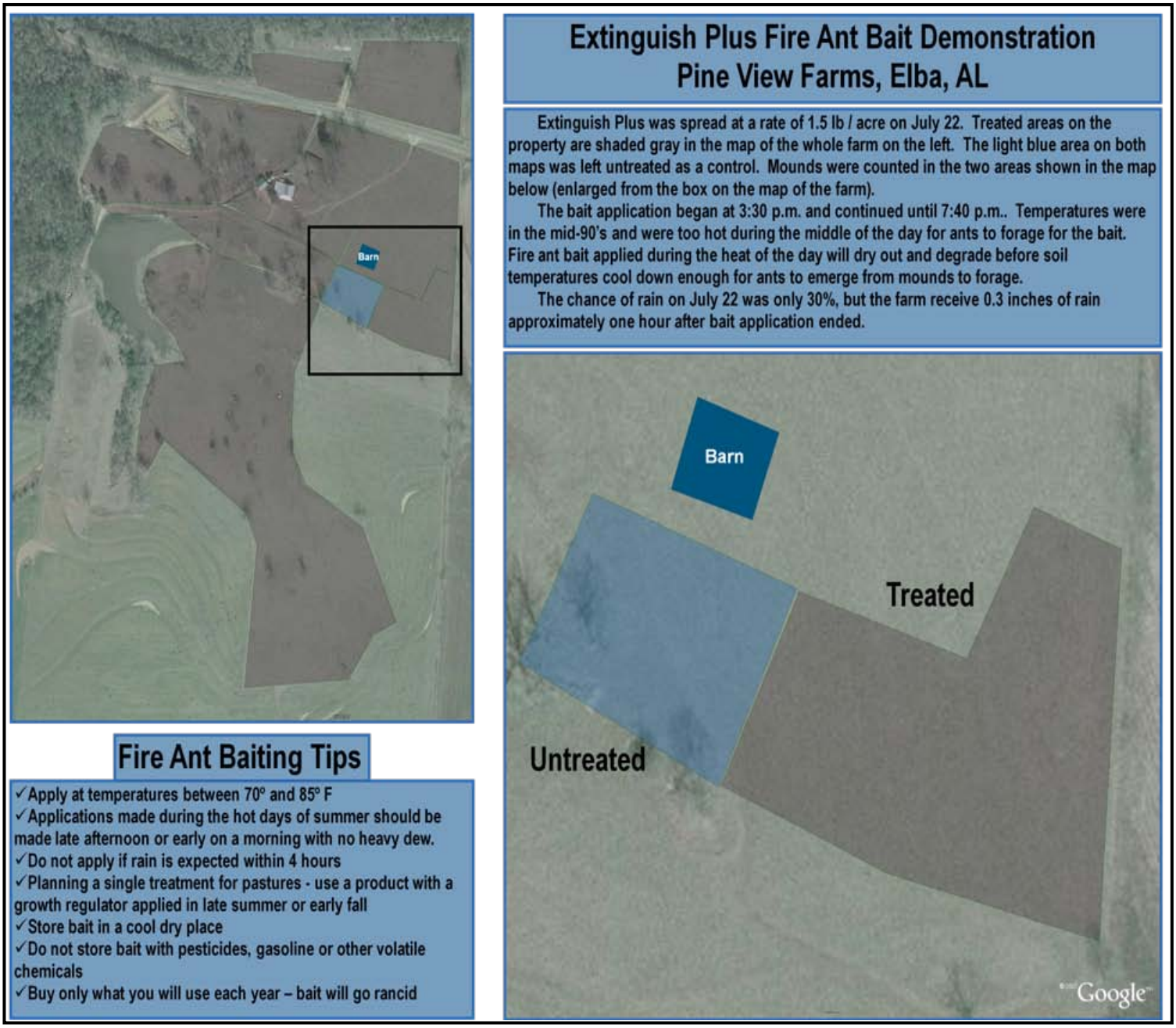


Figure 9: Poster presented at the Cattleman's Field Day at Pine View Farms, Elba, AL.

The Alabama Fire Ant Management Program was invited to Ft. Rucker Army Base on April 1 to conduct a training on fire ant management for base personnel and the contracted pest management personnel, Shaw Infrastructure, Inc. (Fig 10). Local Extension Agents Stan Windham, County Extension Coordinator, Rachel Dykes, Regional Extension Agent, David Koon, Regional Extension Agent I, and Neil Kelly, Regional Extension Agent I, assisted with the training and made contact with base personnel to serve as local resources. At the end of the training, Shaw Infrastructure presented the group a plaque expressing appreciation for our help (Fig 11).

Figure 10: David Koon, Regional Extension Agent III, discussing bait spreading with Ft. Rucker personnel.

Figure 11: David Koon, Rachel Dykes, Stan Windham, Fudd Graham, and Neil Kelly receive plaque.

Another fire ant presentation was given at the Cleburne County Farm Day (Fig. 12). Participants were educated about fire ant biology and control techniques.

Figure 12: Cleburne County Farm Day - Presentations to School Groups on Fire Ants.

GETTING THE WORD OUT : ON-CAMPUS FIRE ANT DEMONSTRATIONS:

The Alabama Fire Ant Management Program has three on-going bait demonstrations on Auburn's campus. One, located at the Ag Heritage Park, is sponsored by Wellmark International and uses Extinguish Plus® twice per year (Fig. 13). Another, located at the AU Horse Research & Teaching Unit, is the site where the National Champion AU Equestrian Team trains and competes. Esteem® Fire Ant Bait, provided by Valent is spread late summer-early fall (Fig. 14). The third demonstration is at the AU Intramural Field and is sponsored by Dupont and Advion® Fire Ant Bait is spread at the beginning of every fall semester. If you want to see the effectiveness of fire ant baits, visit these parts of campus on your next visit to AU.

Figure 13: Ag Heritage Park fire ant bait demonstration site on Auburn's campus.

Figure 14: Auburn University's Equine Center, another fire ant bait demonstration site.

Making Fire Ants Easier to Live With: Fire Ant Education and Outreach

Kathy Flanders[1], Fudd Graham[1], Kelly Ridley[1], Henry Dorough[2], & Vicky Bertagnolli-Heller[3]
[1]Department of Entomology and Plant Pathology, Auburn University
[2]Regional Extension Agent, Animal Sciences and Forages, Alabama Cooperative Extension System
[3]Currently, Regional Extension Agent, Clemson University

Fire Ants at the Fair:

Each year, The Alabama Fire Ant Management Program creates a fire ant booth for use at public events. The 2008 exhibit was created by Kelly Ridley and Fudd Graham, and was used to highlight the accomplishments of The Alabama Fire Ant Management Program, and give practical tips to stakeholders on managing fire ants. The booth targets children and their parents, with educational materials ranging from coloring books to live ants and decapitating flies, as well as educational publications.

The booth was used at the following events:

- Alabama Pest Control Association Meeting, Auburn, AL, February 2008
- Oxbow Meadows Insectival, Columbus, GA, July 2008
- Cattleman's Field Day, Elba, AL, August 2008
- Alabama National Fair, Montgomery, AL, October 2008
- Sunbelt AgExpo, Moultrie, GA, October 2008
- Alabama Peanut Festival, Dothan, AL, November 2008
- Auburn University's Fall AgRoundup, Auburn, AL, November 2008

Left: Alabama Master Gardener Michelle Burns staffing the booth at the Alabama National Fair.
Right: AU Graduate Student Tim Nafziger explaining decapitating flies at the Alabama National Fair.
Courtesy Kathy Flanders

Staffing The Booth & Training Volunteers:

Members of The Fire Ant Management Team and Master Gardeners staffed the booth at the Alabama National Fair. In order to prepare the local Master Gardeners The Alabama Fire Ant Management Program leader Fudd Graham along with Kelly Ridley, and Regional Extension Agent Shane Harris conducted a training session to better equip the Master Gardeners to answer fire ant related questions

at the Alabama National Fair. Another training session was held in Dothan to work with the Southeast Alabama Master Gardeners who helped work the Alabama Peanut Festival. This training was lead by Fudd Graham with the help of Kelly Ridley, and Extension Agents Rachel Dykes and Jimmy Jones. Fudd Graham and Kelly Ridley staffed the booth at AgRoundup in Auburn, and Fudd Graham with the help of Krystal Waltman-McDuff staffed the booth at Sunbelt AgExpo in Moultrie, GA.

Master Gardeners & Extension Agents At The Fair:

Alabama National Fair:

Autauga Co: Shirlie Jensen, Carol Jones
Elmore Co: Jeanette Kempter, Charlene Lovelace, Judy May
Montgomery Co: Turpin Ashurst, Nancy Bowden, Michelle Burns, Linda Carleton, Judy Crockett, Patsie Demo, Martha Given, Sheila Robertson, Susan Samuel, Annie Smith, Marie Tomlin, Karen Weber, Carolyn A. Wright
Tallapoosa Co: Sue Whitten, Sharon Young
Alabama Cooperative Extension System: Dani Carroll, Shane Harris, Ellen Huckabay, Jimmy Smitherman, Roger Vines
Auburn University: Nathan Burkett, Henry Fadamiro, Kathy Flanders, Fudd Graham, David Held, Xing Ping Hu, Krystal Waltman-McDuff, Alicia Phillips, Kelly Ridley

National Peanut Festival: A Peanut "Round-Up"
Courtesy Dothan Eagle

Alabama Peanut Festival:

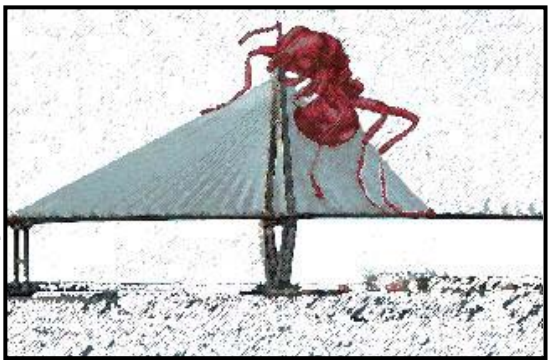
Houston Co: Bob Apida, Kathy Bass, Suzanne Beckinger, Eric Bruggink, Eldon Bryant, Susan Cox, Bettie Davis, Joyce Dees, Anne Edwards, Cheryl Fair, Sandra Faria, Barbara Farthing, Carol Hardin, Jean Inscho, Beverly Ketcham, Jim Ketcham, Jenni Nelson, Gail Smith, Glen Swicegood, Kinberly Ylitalo
Alabama Cooperative Extension System: Rachel Dykes, Jimmy Jones

By The Numbers:

- Master Gardeners **donated 135 hours** at the Alabama National Fair!
- Master Gardeners **donated 104 hours** at the Alabama Peanut Festival!
- Master Gardeners **made ~8,000 face-to-face contacts** between the National Fair and the Peanut Festival!

Fire Ant Training for Extension Agents:

2008 Imported Fire Ant and Invasive Ant Conference:
The conference was held in Charleston, S.C. March 24-26. This meeting **gathers fire ant experts from across the globe** and allows them to discuss and review research findings from other fire ant programs. In 2008, **several Extension Agents from Alabama attended the meeting to gain further fire ant knowledge**. Those agents were: Danny Cain, Henry Dorough, Shane Harris, Taylor Hatchett, and Tim Reed. Also, **several specialists and program assistants attended the meeting**, they were: Kathy Flanders, Fudd Graham, Ellen Huckabay, Maggie Lawrence, Virginia Morgan, and Kelly Ridley.



2008 Imported Fire Ant Conference Logo
Courtesy Clemson Sandhill REC

Web Conference On eXtension:
In April, Extension Agents had 3 opportunities to participate in a web conference with emphasis on the fire ant eXtension website. These meetings were held by Russell Duncan and Kathy Flanders. At this web conference, they showed how eXtension can help extension agents do their jobs. We started with a tour of the public eXtension site (www.extension.org), then moved on to the latest features that are available on the fire ant site (www.extension.org/fire+ants). Lastly, **we spent a few minutes on the latest fire ant control products, and on how to help each client pick the best fire ant management strategy.** With this further training, Extension Agents are better equipped to answer fire ant related questions from stakeholders.

IMPORTED FIRE ANT EXTENSION:

eXtension is an Internet-based, nationwide resource of information and advice from Cooperative Extension. Ten specialists or professionals from the Alabama Cooperative Extension System are on the leadership team responsible for developing and marketing an eXtension module on imported fire ants, www.extension.org/fire+ants. More than 30 Extension agents from Alabama are members of the fire ant community of practice, and participate by reviewing content, marketing the eXtension site, and answering questions about fire ants.

eXtension Logo
Courtesy eXtension.org

This project targets the 85 million people who live in fire ant infested areas of the U.S. The end product is a 24/7 one-stop shopping place for advice on managing fire ants.

eXtension Improves Rapidly:

- Launched at the Imported Fire Ant Conference in April 2007 in Gainesville, FL.
- **2 work days were held** after the 2008 Southeastern Branch Meeting of the ESA, and after the 2008 Imported Fire Ant Conference; used to review content and plan new features for the site.
- **2008: Fire Ant Decision Module was made public, a new publication was developed, and video & gif files were incorporated into the basic information.**
- A 3rd on-line publication, Fire Ant Control: The Two-Step Method and Other Approaches is now available at: Fire Ant Control: The Two-Step Method and Other Approaches.
- A regional information section was added.
- **A youth module was added, which provides learning lessons and educational exercises for children at the 3rd-5th grade levels.**
- The fire ant FAQ's section was translated into Spanish and was published at: Materiales en Español sobre Hormigas Bravas Importadas.
- **Several eXtension leaders attended the 2008 National eXtension Community of Practice Conference in June in Louisville, KY,** they were: Glenda Freeman, Kathy Flanders, Fudd Graham, Shane Harris, Virginia Morgan and Kerry Smith.

People In Alabama Who Are Involved in eXtension:

- **Dr. Kathy Flanders**, Extension Entomologist and Associate Professor, Department of Entomology and Plant Pathology, Auburn University, is co-leader of this initiative.

- **Dr. Anne M. Adrian**, Co-leader, Extension Computer Technology Unit, Alabama Cooperative Extension System, facilitates web conferencing, internet video-conferencing, chat sessions, and other methods used to create and maintain the fire ant eXtension web portal.

- **Dr. Jeffrey Bastuscheck**, Contracts and Grants Specialist, Alabama Cooperative Extension System, facilitates the process of applying for and administering the eXtension grants. He will aid in the recruitment of non-eXtension resources for support of the program.

- **Dr. Diego M. Gimenez, Jr.**, Extension Specialist & Hispanic/Latino Initiative Coordinator/Associate Professor, Auburn University, facilitates the translation of eXtension products into Spanish. Our translator is Mr. Sergio Ruiz-Córdova.

- **Dr. M. Virginia Morgan**, Co-chair, ACES eXtension Work Team, Alabama Cooperative Extension System, provides guidance on design, marketing, and assessment of the eXtension products.

- **Kerry P. Smith**, Alabama Master Gardener Program Coordinator and Ag Program Associate, Dept. of Horticulture, Auburn University, is co-chair for the development of a fire ant training module for Master Gardener Community Advisors.

- **Dr. Carol A. Whatley, Glenda Freeman, Maggie Lawrence, and Mario Lightfoote**, Extension Communications, Alabama Cooperative Extension System, provided expertise in technical writing, copy editing, marketing, and video production.

- **Dr. Paul L. Mask**, Assistant Director, Agriculture, Forestry and Natural Resources, Alabama Cooperative Extension System, and Professor, Agronomy and Soils, Auburn University, is the Administrative Advisor.

The following people are also involved in this project:

They help by providing, editing, and reviewing content, answering questions about fire ants, and marketing the web site.

Auburn University: Fudd Graham, Jerri Caldwell, Kelly Ridley

Alabama Cooperative Extension System: Robert Boozer, Chuck Browne, Danny Cain, Doug Chapman, Willie Datcher, Henry Dorough, Rachel Dykes, William East, Wayne Ford, Tommy Futral, Ted Gilbert, Jonathan Gladney, Tony Glover, Gary Gray, Tinsley Gregg, Warren Griffith, Shane Harris, Taylor Hatchett, Charles Hesselein, Ellen Huckabay, Ken Kelley, David Koon, Willie Lampley, Sallie Lee, Paul Mask, Charlie Mason, Gerald (Mike) McQueen, Charles Pinkston, Dan Porch, Stan Roark, David Robinson, Donna Shanklin, Terry Shackelford, Jimmy Smitherman, Lewis Tapley, Jimmy Todd, Eddie Wheeler, Anthony Wiggins

Alabama A&M University: Rufina Ward, Ken Ward

Tuskegee University: George Hunter, Rory Stephens, William Hodge

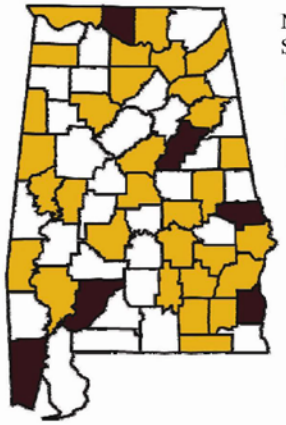
Fire Ant Educational Programs Conducted by Alabama Cooperative Extension System:

Alabama Cooperative Extension Agents conducted a variety of educational programs, including workshops and field demonstrations.

Fire ant demonstrations allow Extension agents to show the general public how easy and effective fire ant bait applications are. Fire ant baits are the most cost-effective way to treat moderate to large areas for fire ants. Small amounts of the insect control chemical are placed on small morsels of fire ant food. When this bait is spread over an area, fire ant workers are amazingly efficient at finding the bait, carrying it back to their nest, and passing it around among themselves. This eventually delivers the insect control chemical to the queen, the heart of the colony. **Forty-five Herd seeders for applying fire ant bait are available in Alabama. They are located at county offices of the Alabama Cooperative Extension System (see map below).**

Extension agents routinely incorporate information on managing fire ants in their educational talks and workshops. Fire ant education may be part of other programs being done, or may be the topic of a dedicated workshop. **The following reports show how educational products developed with support from The Alabama Fire Ant Management Program are used.**

Location of the Herd Seeders Used to Apply Fire Ant Bait



If you want to borrow a Herd Seeder, please contact one of the following people:

County	Contact Person[1]
Barbour	David Koon
Bullock	George Tabb
Calhoun	David West
Chilton	Jim Pitts (Chilton Regional R&E Ctr)
Choctaw	John Ollison
Clarke	Kevin Tucker
Coffee	Stan Windham
Crenshaw	Russty Parish
Cullman	Charles Pinkston
Dale	Tommy Agee
Dallas	Mike Davis (Blackbelt Regional R&E Ctr)
De Kalb	Tony Dawkins (blower seeder) (Sand Mountain Regional R&E Center)
Elmore	Rich Beauchamp
Etowah	Tinsley Gregg
Franklin	Tim Reed
Geneva	Mary Baltikauski
Greene	Willie Datcher
Hale	Johnny Gladney, Brenda Glover
Henry	Jimmy Jones
Lamar	Wayne Robinson
Lauderdale	Randall Armstrong
Lee	Chuck Browne
Limestone	Doug Chapman Gerry Thompson (Tennessee Valley Regional R&E Ctr)
Madison	Ken Creel, Tyrone Smith (blower seeder)
Marshall	Dan Porch
Mobile	Ken Kelly Chazz Hesselein (blower seeder) (Ornamental Horticulture Research Ctr).)
Monroe	Anthony Wiggins
Montgomery	Jimmy Smitherman
Morgan	Mike Reeves
Pickens	Sam Wiggins
Pike	Tommy Powell
Randolph	(Randolph Co. Cattlemen's Association)
Russell	Ted Gilbert
Shelby	Jack Tatum, Nelson Wynn
Talladega	Henry Dorough 2 seeders, one a blower seeder
Tallapoosa	Tommy Futral, Shane Harris
Walker	Danny Cain

[1]At the County Office of the Alabama Cooperative Extension System unless otherwise noted

East Alabama Fire Ant Field Day

Shane Harris
Regional Extension Agent, Home Grounds, Gardens & Home Pests

Fire Ant Field Day:

The Alabama Cooperative Extension System hosted a fire ant field day on April 18, 2008, to **discuss and demonstrate how to effectively manage fire ant populations**. This workshop was held from 9 am to 3 pm on the campus of Lyman Ward Military Academy, Camp Hill, AL, and 95 people attended. Regional Extension Agent Shane Harris coordinated the event, and presenters discussed topics such as fire ant biology, research based and proven control techniques, and the latest 2008 fire ant control products. There were six educational tracks (Athletic Fields, School Grounds, & Parks; Pastures & Hayfields; Commercial Nursery & Vegetable Crops; Home Lawns & Gardens; Pest Control Operators; and Extension Agents) for showcasing location-specific hands-on fire ant management techniques. Fire ant product exhibits and vendors were also on hand.

Left: Regional Extension Agent Chip East explains how to apply fire ant bait using a vehicle-mounted spreader at the East Alabama Fire Ant Field Day.
Right: Regional Extension Agent Stan Roark explains how to apply fire ant bait using a hand spreader at the East Alabama Fire Ant Field Day.

Courtesy Shane Harris

Fired Up About Fire Ants

Rachel Dykes

Regional Extension Agent, Home Grounds, Gardens, and Home Pests

Stan Windham

County Extension Coordinator, Coffee County

Reaching Alabama's Children:

Sometimes, the most effective way to educate a community on a particular issue is by reaching the children. For this reason, **a children's fire ant exhibit was set up at the Coffee County 18th Annual Petting Zoo, held in September 2008**. The zoo attracted school groups from all over Coffee County, which gave Extension a great opportunity to teach the local children about fire ants. The fire ant display consisted of a fire ant mound model, a mound cast, and paper mâché ants (made by Dale County Master Gardeners and the Dale County Extension office staff). Coffee County Master Gardener volunteers distributed educational fire ant coloring books along with eXtension stickers and bookmarks that provided parents and students with a link to the eXtension fire ant website. The Master Gardeners taught about the dangers of fire ants, their life stages, and their mound structure. **There were 1,183 kids in attendance at the petting zoo, along with 178 teachers / parents, and 15 nursing home residents.**

The petting zoo itself was organized by Stan Windham, Coffee County Extension Coordinator, and his office staff, and was run by 18 Extension volunteers, 83 high school volunteers, and 6 Extension agents. The zoo was enjoyed by people of many different ages and cultures. Overall, the petting zoo educated the community about the many different facets of agriculture and included livestock, farm equipment, honeybees, and more!

Left: Master Gardeners teaching a group of kids about fire ants
Right: Children's Fire Ant Booth
Courtesy Rachel Dykes & Stan Windham

***This is a 2008 Success Story for the Alabama Cooperative Extension System: Fired Up About Fire Ants, By RACHEL E DYKES from CES DISTRICT TWO for ETP19F on 2008-10-03, Co-author: STANLEY T. WINDHAM, https://ssl.acesag.auburn.edu/etp/eval_public_view.php?id=48e66c0741a50

Keeping Children Safe In The Home

Valerie Conner
Regional Extension Agent, Nutrition, Diet, and Health

Three programs were conducted on “Keeping Children Safe in the Home” in Dallas, Perry, and Butler Counties. The eXtension "Fire Ant Problems" web-site information tear-off sheets and book markers were distributed and discussed. Even though this topic was just a part of my presentation the participants were very interested in how to control fire ants in and around the home. It was not uncommon for a participant to mention problems with fire ants coming up around water and drain pipes. Ants in general can be a problem when found in the home but fire ants are a health problem when left uncontrolled. Most of the 44 participants were parents, grand parents, foster parents, and day care providers.

Child with allergic reaction to fire ant stings.
Courtesy Alabama Cooperative Extension System

Fire Ant Management & Forestry, Wildlife, & Natural Resources Management

Patrick Cook
Regional Extension Agent, Forestry, Wildlife & Natural Resources Management

Patrick Cook discussed fire ant management as part of two newsletters to his clientele:

- **2007 Drought Still Affecting Fish Ponds**
- **Watch Out For Warm Weather Critters**

Man applying fire ant bait near pond.
Courtesy Bart Drees

Fire Ant Education Programs in Henry County

James Jones
County Extension Coordinator, Henry Co.

A bait-based demonstration was conducted on the grounds of the First Baptist Church in Headland. **500 fire ant coloring books were passed out to the Henry County Pre-K and K classes during the Farm City Petting Zoo** in November 2008. As in past years, Jimmy Jones helped with the fire ant exhibit at the Alabama Peanut Festival.

Fire Ant Management in Cattle Operations in Alabama

Anthony Wiggin, Ken Kelley, and Tinsley Gregg
Regional Extension Agents, Animal Science and Forages

In 2006-2007, Regional Extension Agents Anthony Wiggins and Ken Kelley conducted bait-based fire ant management demonstrations on several cattle farms in southwest Alabama. This year, Anthony reports that **one of these producers was so impressed with the results that he borrowed the bait applicator so he could continue treating fire ants in his operation.** This is the ultimate positive outcome for a bait-based demonstration. The producer changed his behavior, establishing a sustainable, cost-effective fire ant management program in his cattle operation.

Fire Ant Mounds in Pasture
Courtesy USDA

Tinsley Gregg conducted a demonstration in a pasture in Northeast Alabama and saw an 85% reduction in mounds in his demonstration in a DeKalb county pasture.

Fire Ant Management in Blueberry Operation

Lloyd D. Chapman
Commercial Horticulture Regional Extension Agent, Limestone County

Mr. John Robinson operates Gin House Farm in Somerville, AL as a Pick-Your-Own blueberry operation. The farm is open to the public and people bring children, infants in strollers and elderly people to the farm. **Fire ants are a huge liability issue for Mr. Robinson.** He has had numerous complaints about the fire ants and one person threatened civil action over the fire ants. He applied Esteem® fire ant bait in Spring 2008. The blueberry farm consisted of 31 rows of blueberry plants spaced 12' apart in rows 330' long. We counted the row middles which were about 5' wide. There was an average of 6.67 mounds per row before treatment. **In late September, 4 months after the application, there were 54% fewer mounds than occurred in the spring before treatment.**

Left: Doug Chapman conducted a demonstration at the Gin House Farm pick-your-own blueberries operation in North Alabama.
Right: Demonstration of a Herd seeder being used to distribute fire ant bait.
Courtesy Doug Chapman

FIRE ANT ACTIVITIES

EDDIE J. WHEELER
Urban Regional Extension Agent, Marshall County

FIRE ANT DEMONSTRATIONS:

Two demonstrations were conducted in Marshall County with the cooperation of Mr. Dan Porch, County Extension Coordinator of Blount County, and there was one presentation given in 2008 discussing fire ants.

1. Treasure Forest:
A demonstration was conducted for the forest of Mr. John Troup. The fire lanes of the forest were treated with Esteem® at a rate of 1.5 lbs per acre on June 17, 2008. The area treated was approximately eight acres. The temperatures were in the upper 70's. The bait was applied with the use of a Herd spreader mounted on an ATV. It was determined that the bait was about 80% effective. Mr. Troup continues to allow our office to conduct a "Classroom in The Forest: Forest in The Classroom" Field Trip on his property.

Example of Herd Seeder used to spread Fire Ant Bait mounted to ATV.
Courtesy Bart Drees

2. Muscadine Grape Vineyard:
A demonstration for the muscadine grape vineyard of Mr. Jerry Wenker of Martling, Alabama was continued from the 2007 year**.** The area treated was approximately three acres. The vineyard was treated with Esteem® at a rate of 1.5 lbs per acre on June 17, 2008. The temperatures were in the upper 70's. The bait was applied with the use of a Herd spreader mounted on an ATV. **Mr. Wenker indicated that he is very pleased with the results of the fire bait used in his vineyard**. Mr.Wenker allowed our office to conduct a muscadine grape tour and a muscadine pruning workshop on his property. Students from the Marshall Technical School Horticulture Project toured the vineyard to learn about fire ant management and growing muscadines.

See ***Marshall Technical School Horticulture Project Partnership,* *By EDDIE J. WHEELER from MARSHALL COUNTY for ETP20A on 2008-12-11,* https://ssl.acesag.auburn.edu/etp/eval_public_view.php?id=49416c9761fb5

3. Horticulture Tour/Field Day: a presentation on fire ant biology and management was a part of the tour conducted on June 26, 2008. The tour was conducted at Davy's and Maggie's Berry Patch owned by David and Margaret Cox of Grant, Alabama. The other topics discussed during the tour were: herbs, small fruits, soil fertility, vegetable garden and knock out roses. **Forty two (42) individuals participated in the tour. Fire ant products, especially baits, were available for observation and discussion.** Fire ant publications discussed in the presentation were distributed to give the participants more information.


Fire ants feeding on okra bud, showing the damage they can do to urban gardens.
Courtesy Bart Drees

Read more at: ***Horticultural Tour/Field Day,* *By EDDIE J. WHEELER from MARSHALL COUNTY for ETP20B on 2008-10-30Co-author: TERRY L. SHACKELFORD*
https://ssl.acesag.auburn.edu/etp/eval_public_view.php?id=490a736845b00

West Central Alabama Fire Ant Demonstrations

Taylor Hatchett
Regional Extension Agent, Home Grounds, Gardens, and Home Pests
Wayne Ford
County Extension Coordinator, Tuscaloosa County

Taylor Hatchett conducted a fire ant demonstration at the Chilton Research and Extension Center. The results were used during the 2008 AgExpo by Fudd Graham and will also be shared with the Chilton County Master Gardeners during their September meeting on controlling fire ants.

Taylor Hatchett also conducted a fire ant demonstration at the UA Arboretum in Tuscaloosa with Wayne Ford. They used a broadcast granular insecticide, bifenthrin. After 1 month, they observed approximately 90% control with this product, based on pre- and post-treatment mound counts. The results were presented to the Tuscaloosa Master Gardeners during their monthly meeting along with general information on proper fire ant management.

Picture of UA Arboretum trees in the fall.
Courtesy Kenneth Byrd

Training Master Gardeners to Conduct Fire Ant Management Demonstrations

Tony Glover
Regional Extension Agent, Home Grounds, Gardens, Home Pests & Commercial Horticulture

Fire ant mound next to sidewalk.
Courtesy Bart Drees

Tony Glover did 5 bait demonstrations in home lawn situations in the Birmingham area. He enlisted the help of Master Gardeners to aid him in the demonstrations. First, he conducted a classroom training session, in which the participants increased their level of knowledge about fire ants by 24%. Then, he showed the participants how to apply the fire ant bait in their own yards, then provided them with pyriproxyfen fire ant bait. Results of these demonstrations are still being summarized. The majority of participants took the training to learn more about fire ant biology because they had a fire ant problem.

Fire Ant Management at Sumter County Head Start Centers

Willie Datcher
Regional Extension Agent, Home Grounds, Gardens, and Home Pests
Willie Lampley
County Extension Coordinator, Sumter Co.

Willie Lampley and Willie Datcher did demonstrations at 6 Headstart Centers in Sumter County beginning in October of 2007, and continuing in 2008. **In 2008, they also started five demonstrations with homeowners that had never used bait before.** These homeowners had always used mound treatments. The purpose of these demonstrations was to let the homeowners give fire ant baits a try to see if it would work better than the mound treatments. If this works, they are going to see if they can get a couple of neighborhoods to use bait for another demonstration.

Bait Demonstrations at Head Start Center.
Courtesy Willie Datcher & Willie Lampley

East Alabama Fire Ant Demonstrations

William "Chip" East
Regional Extension Agent, Commercial Horticulture

Chip East conducted several demonstrations using baits in commercial horticulture operations in east central Alabama, including a demonstration at the Talladega School for the Deaf, and another with a fruit farmer in Elmore County. He has been working closely with the South Eastern Christmas Tree Association by conducting a bait-based demonstration prior to their annual meeting. At the meeting he explained results of the demonstration, did a calibration demonstration with a Herd Seeder, and co-presented a talk on fire ant management. He also helped with the East Alabama Fire Ant Field Day, described elsewhere in this report.

Blount County Fire Ant Demonstrations

Wendy Ulrich
Agent Assistant, 4-H and Youth Development and Home Grounds, Gardens and Home Pests, Blount Co.

Wendy Ulrich conducted several meetings for 4-H'ers from the 5 Star 4-H Club in Blount County. Over the course of three monthly meetings, **the 4-H'ers completed an exercise from the Imported Fire Ant eXtension Youth module**. Here is a link to the fire ant youth module:

http://www.extension.org/pages/Imported_Fire_Ants_Youth_Content.

While they were building the models of fire ants from papier-mâché, they learned about fire ant biology and management. The club members ranged in age from 9-18 years.

By working with youth you often get more interest from the parents as well, and this is very important for fire ant management.

Models created by members of the 5 Star 4-H Club in Blount County. Here, the fire ants are picking up "fire ant bait."
Courtesy Wendy Ulrich

Fire Ant Management in Commercial Horticulture Operations

Gary Gray
Commercial Horticulture Regional Extension Agent

Fire ants are a huge liability on pick-your-own fruit and vegetable farms. In vineyards, presence of fire ants on the vines at harvest time creates risky conditions for field workers. Additionally, fire ants undermine the trellis support posts when they build nests around the posts. Gary Gray conducted two fire ant management demonstrations in vineyards, and one in a pick-your-own fruit and vegetable operation in Shelby Co. He used Extinguish® fire ant bait early in the season, and then evaluated the plots at harvest time. **Mound counts and bait tubes provided similar results, namely, that treating with the bait reduced fire ant activity by 90%. Owners of the farms were very pleased with the results.**

Hay and Forage Field Day for Horse Owners

Ronald Britnell
County Extension Coordinator, Morgan Co.
Gerald Thompson
Regional Extension Agent, Animal Science and Forages
Ken Stanford
Extension Specialist, Alabama Cooperative Extension System

Ronald Britnell demonstrated the use of the herd seeder and did a **45 minute talk to 30 horse owners in Morgan County on Saturday, June 7, 2008.** This was part of a larger "Hay and Forage Field Day for Horse Owners." He was assisted by Gerald Thompson and Kent Stanford, who had organized the field day. This included classroom instruction as well as some outdoor demonstration of using the Herd seeder to apply baits. Several of the fire ant publications from the ACES website were included in the manual that was provided to each student. **Over 25 students from 10 counties participated in this event.**

Ronald Britnell demonstrating the use of the Herd Seeder to apply fire ant bait.
Courtesy Ronald Britnell

Fire Ant Management in Montgomery County Cattle Operations

Jimmy Smitherman
County Extension Coordinator, Montgomery County

Cooperators Dickey and Trey Flowers.
Courtesy Jimmy Smitherman

Jimmy Smitherman gave a talk to Montgomery County Cattlemen on fire ant management, which led to a bait-based demonstration he conducted on a cattle ranch belonging to Dickey and Trey Flowers in Montgomery County. They started the demonstrations in May 2008. Mr. David McCurdy with the FSA office came out to assist them with the field measurements. They marked off 2 one acre size plots and counted the active ant mounds. One plot was treated with a fire ant bait and the other was their control. On June 11, the number of active fire ant mounds on the two plots (one acre in size) was counted. The untreated plot continued to have active mounds at the same rate (approximately 200 per acre). **On the treated plot they were only able to find 9 active mounds where there had been 200 plus prior to the treatment.**

Marion County Master Gardener Class of 2008

Mac Washington
County Extension Coordinator, Lamar Co.
Nelson Wynn
Regional Extension Agent, Home Grounds and Horticulture
Lisa Murphy
County Extension Coordinator, Marion Co.

Fire Ant Management has become a routine part of Alabama Master Gardener Classes. **The 24 graduates of the 2008 Marion Co. Master Gardener Class were trained in fire ant biology and management,** in addition to plant physiology, soils, turf management, composting, vegetable gardening, entomology, fruit production, plant selection and pathology, weed science, landscape design, water gardening and pesticide education. By educating Master Gardeners we get more of the proper information out to the public by word-of-mouth, which helps tremendously in the fight against fire ants!

Mac Washington, CEC Lamar County presented the fire ant management program to Master Gardener participants. Courtesy Mac Washington

****More Information about the Marion County Master Gardener Class of 2008 can be found at:**

Growing Master Gardeners, by Nelson Wynn and Lisa Murphy,
https://ssl.acesag.auburn.edu/etp/eval_public_view.php?id=48e2598083c6b

Master Gardener Program A Success, by Lisa Murphy and Nelson Wynn,
https://ssl.acesag.auburn.edu/etp/eval_public_view.php?id=496f54d2690dc

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Evaluating the Toxicity & Repellency of Essential Oils to the Red Imported Fire Ant

Dr. Arthur G. Appel & Marla J. Eva

Introduction:

Naturally occurring insecticides have been used in pest control for centuries. Many of these compounds are secondary plant substances produced by aromatic plants and collectively known as essential oils. Essential oils are secreted in oil glands, distributed in flowers, fruits and seeds, leaves, bark, roots and wood of >60 plant families.

Several studies have evaluated the efficacy of essential oil-containing formulations against red imported fire ants. Citrus oil formulations containing d-limonene were as effective as a conventional insecticide when used as a mound drench. One hundred percent of mounds opened and treated with 2% mint oil granules were abandoned 5 d after treatment and had relocated or formed satellite mounds by 2 d after treatment. Unopened mounds treated topically with mint oil granules were not abandoned, but formed satellite mounds 2 d after treatment. These mound treatment studies show that essential oils are both repellent and toxic to red imported fire ants. Essential oil products could therefore provide another management tool for red imported fire ants, particularly in situations in which conventional insecticides would be inappropriate. The purpose of this study was to compare several procedures for determining the repellency and toxicity of essential oils to the red imported fire ant.

Methods and Results:

Insects:

Worker red imported fire ants were collected from monogyne colonies on the Auburn University campus, Lee County, Alabama, U.S.A.

Essential oils:

Extracts containing essential oils were obtained from NOW Foods (Bloomington, IL), and Sigma-Aldrich (St. Louis, MO). The major constituents of these essential oils are seen in Table 1.

Table 1. Major chemical constituents of several commercial essential oil extracts.

Common name	Scientific name	Major constituents
Allspice	*Pimenta dioica*	eugenol, menthyl eugenol, cineol, phellandrene and caryophyllene
Cinnamon	*Cinnamomum zeylanicum*	eugenol, eugenol acetate, cinnamic aldehyde, benzyl benzoate
Clove	*Eugenia caryophyllata*	>90% eugenol
Ginger	*Zingiber officinale*	• -pinene, camphene, • -pinene, 1,8-cineole, linalool, borneol, y-terpineol, nerol, neral, geraniol, geranial, geranyl acetate, • -bisabolene, zingiberene
Jasmine	*Jasminum officinalis*	benzyl acetate, linalool, benzyl alcohol, indole, benzyl benzoate, cis-jasmone, geraniol, methyl anthranilate

Toxicity:

A microapplicator was used to topically apply 1 µl of an essential oil (5-50%) dissolved in acetone to individual ants (Figure 1A). LT50 values ranged from 8.8 to 50.6% for clove and cinnamon, respectively (Figure 1B). In continuous exposure tests, ants were confined in 163 ml cups with Teflon ® emulsion. The bottom of each cup was covered with 5 g of sand containing 6.25-100 ppm essential oil and wetted with 0.3 ml of water (Fig 2A). Ten ants were transferred to each cup and incubated at 28°C and 90% RH for 24 h. LC50 values ranged from 120 ppm for jasmine oil to 5,000 ppm for cinnamon, clove, and ginger oils (Fig. 2B). Fumigation toxicity was determined by sealing 10-15 ants in a 0.95-L glass jar with 10 µl of water and 10 µl of an essential oil (Fig. 3A). LT50 values ranged from 2.5 h for jasmine oil to 6.9 h for clove oil (Fig 3B).

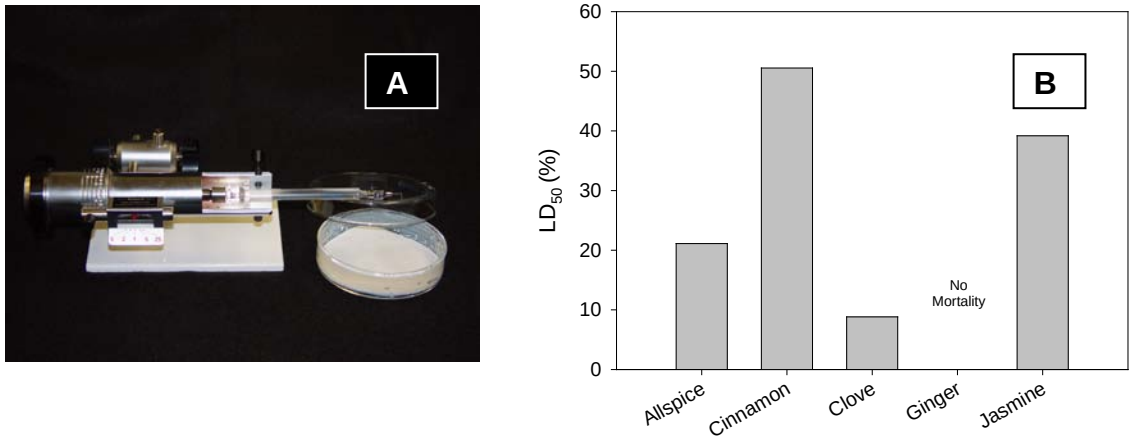


Figure 1: Microapplicator for topical toxicity assay (A) and toxicity of each extract (B).

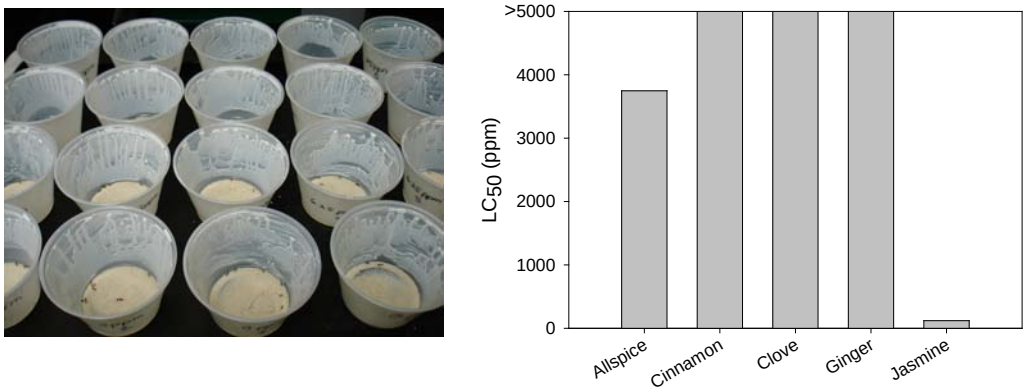


Figure 2: Continuous exposure toxicity assay (A) and LC_{50} values after 24 h exposure (B).

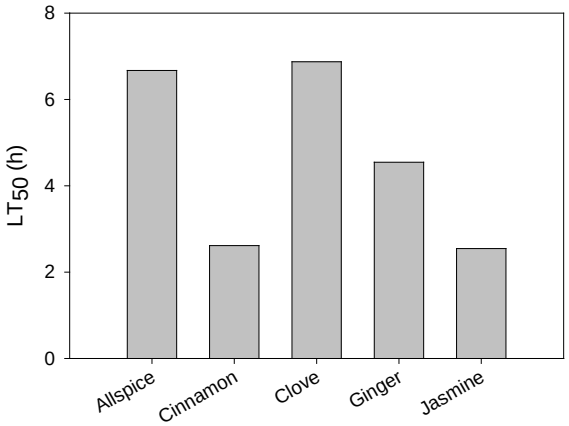


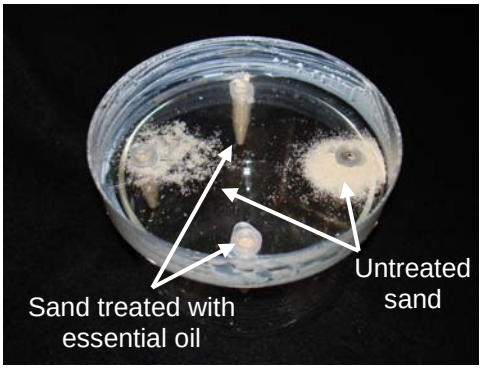
Figure 3: Fumigation toxicity assay (A) and LT_{50} values for 1-9 h continuous exposure (B).

Repellency:

We measured repellency using a digging bioassay developed by Chen (2005, J. Entomol. Sci. 40: 368-377) where repellency was defined in terms of digging behavior and sand removal (Fig. 4A): less sand removed equated to greater repellency.

All extracts were repellent in the digging assay. However, cinnamon was the least repellent at 100 ppm whereas jasmine and ginger extracts were most repellent (Fig. 4B).

Repellency was also measured by coating half of the bottom of a glass Petri dish with 100 ppm of oil-treated sand; the other half of the dish was untreated sand or glass (Fig. 5A). The number of ants on each half was counted after 1 h. Percentage repellency was greatest for jasmine oil and least for ginger oil (Fig. 5B).



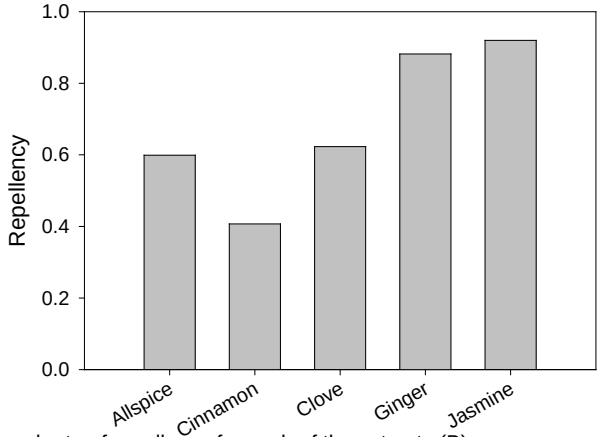


Figure 4: Digging repellency assay (A) and rate of repellency for each of the extracts (B).

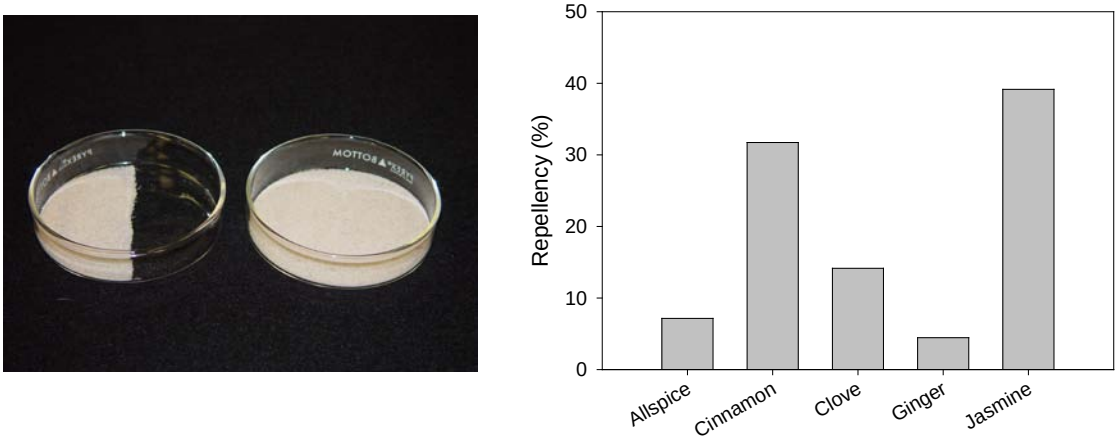


Figure 5: Surface avoidance repellency assay (A) and percentage repellency for each of the extracts (B).

DISCUSSION:

Our data demonstrate that essential oil extracts of allspice, cinnamon, clove, ginger, and jasmine are toxic and repellent to red imported fire ants. Jasmine oil was the most toxic in continuous exposure and fumigation assays and also the most repellent, however, it was not the most toxic in the topical application assay. Our results also point out the importance of bioassay methodology for determining toxicity and repellency. Several different methods should be used to measure toxicity (continuous exposure and topical application assays) as well as repellency (digging and avoidance assays) of essential oils to red imported fire ants. Jasmine extract and its essential oil components merit further investigation and development as fast acting natural insecticides for red imported fire ant management. Our studies are continuing with more plant extracts and with pure essential oil components such as those indicated as the major constituents in Table 1. **Our goal is to identify the most toxic and repellent constituents and to develop our own blend and formulations for safe, fast, and effective fire ant management.**

How Do Parasitic Phorid Flies Find Fire Ants? Identification of Chemicals That Mediate Fire Ant-Phorid Fly Interactions

Dr. Henry Y. Fadamiro

Project Objectives:

The main goal of this project is to identify the chemicals which attract parasitic phorid flies (*Pseudacteon* spp.) to fire ants. The results will likely improve the efficacy of phorid flies as biological control agents for imported fire ants (IFA) in the U.S. Specific objectives were to:

1) Isolate and determine the glandular source(s) of fire ant chemicals attractive to phorid flies.

2) Identify the active components of fire ant chemicals attractive to phorid flies using coupled gas chromatography electroantennogram (GC-EAG) and analytical (e.g. GC-MS) techniques.

Research Completed:

We received funding in FY07 to study the structure of antennae of phorid flies. Like other insects, phorid flies use their antennae (sense organ for smell) to perceive and process odor (volatile chemicals). Knowing the structure and function of the antennae of phorid flies will help us to better understand and appreciate the importance of odor in this insect, and will also support the main goal of our research, which is to identify the chemicals that attract phorid flies to fire ants.

We have concluded and published our study on the detailed structure of antennae of the phorid fly, *Pseudacteon tricuspis*. The antenna of female *P. tricuspis* is quite different from that of male in structure and shape (Figure 1A & B): the female has a feathered arista which is located distally on the flagellum;

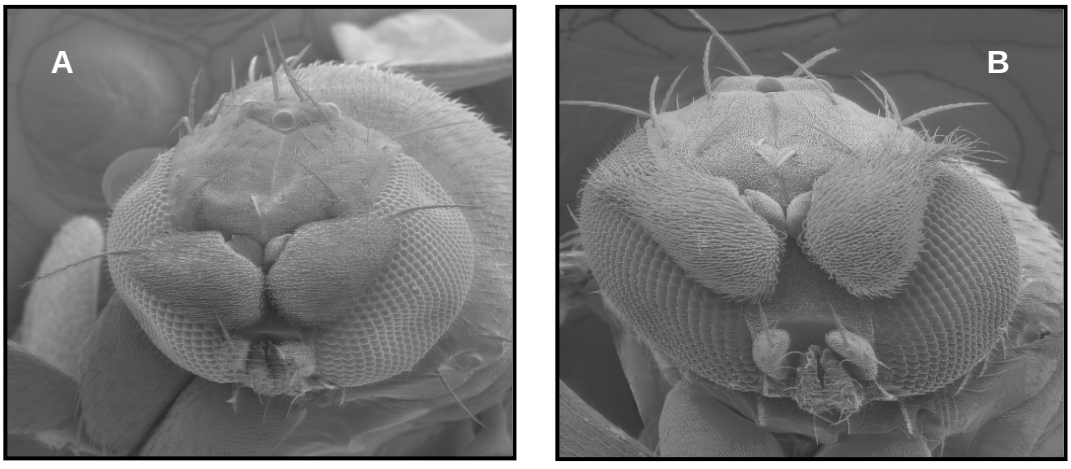


Figure 1: Antennae of the phorid fly, *Pseudacteon tricuspis*. Female (A); Male (B)
Courtesy Henry Fadamiro

however, this is not found on the male. Three major types of sensilla (sensory hairs) were found on the flagellum of both sexes of *P. tricuspis*: sensilla trichodea, sensilla basiconica, and sensilla coeloconica (Fig. 2). Two of these, **s. trichodea and s. basiconica were found to serve as chemoreceptory sensilla and are possibly the organs used by phorid flies to perceive fire ants** and other types of odor. The third and least abundant sensilla type, s. coeloconica, had no wall pores and may function as thermo-hygroreceptors.

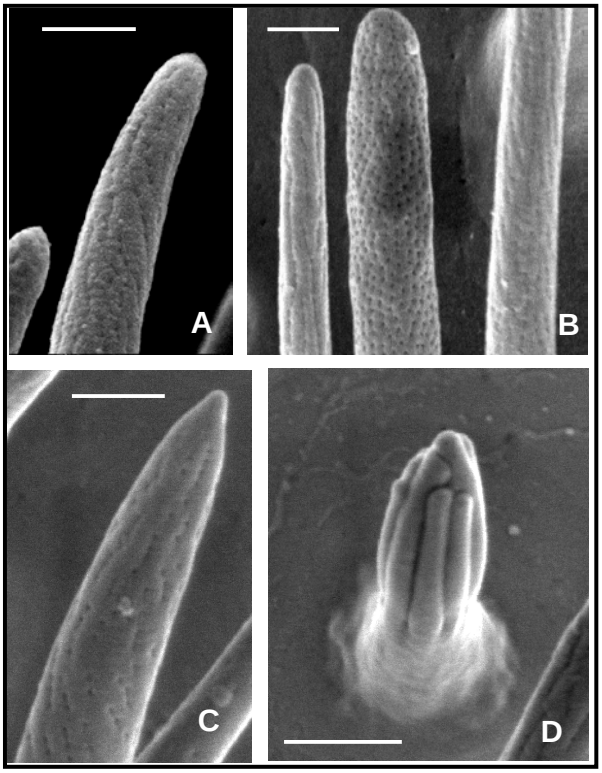


Figure 2: Different types of sensilla (sensory hairs) found on the antennae of male and female *P. tricuspis*. sensilla trichodea (A); s. basiconica (B & C); s. coeloconica (D).
Courtesy Dr. Henry Fadamiro

PROGRESS REPORT & ACCOMPLISHMENTS:

Objective 1: Isolate and determine the glandular source(s) of fire ant chemicals attractive to phorid flies.

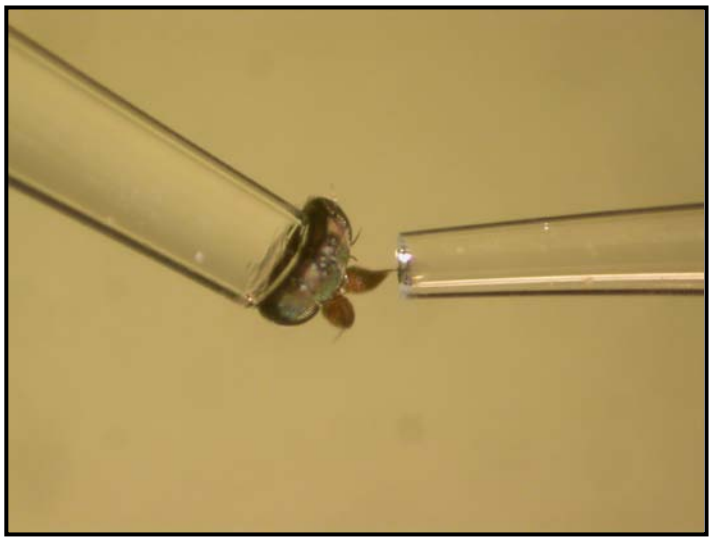


Figure 3: Preparation for studying electroantennogram (EAG) response of phorid flies to fire ant odor (the head of phorid fly placed in between two glass electrodes).
Courtesy Dr. Henry Fadamiro

We have determined in previous studies that phorid flies are attracted to the odor of fire ant workers. Phorid flies also showed attraction to extracts of the whole body and the thorax of fire ants. In follow-up studies using the electroantennogram (EAG) technique (Fig. 3) to determine the ability of phorid flies to perceive the odor of different parts of fire ants, we found that **the antennae of phorid flies showed the strongest response to extracts of the abdomen of fire ant workers.** There are two major chemical-producing glands in the abdomen of fire ant workers: Dufuor's gland (which produces trail and alarm pheromones) and the venom/poison gland (which produces ant venom). The aim of this objective was to determine which of these glands in the abdomen of fire ant workers produces the chemicals which elicited the strong antennal responses in

phorid flies. We dissected each gland and extracted it with hexane. We then measured the response of phorid flies (*Pseudacteon tricuspis*) to the gland extract using the EAG technique. In summary, our results showed that the venom gland and poison sac (Fig. 4) together elicited very strong EAG response in *P. tricuspis* females comparable to the response elicited by the whole abdomen, **indicating that the venom gland and poison sac are the likely source of the active compounds which triggered strong antennal response in phorid flies.** This research was conducted with both red (*Solenopsis invicta*) and black (*S. richteri*) IFA, and the results were generally similar.

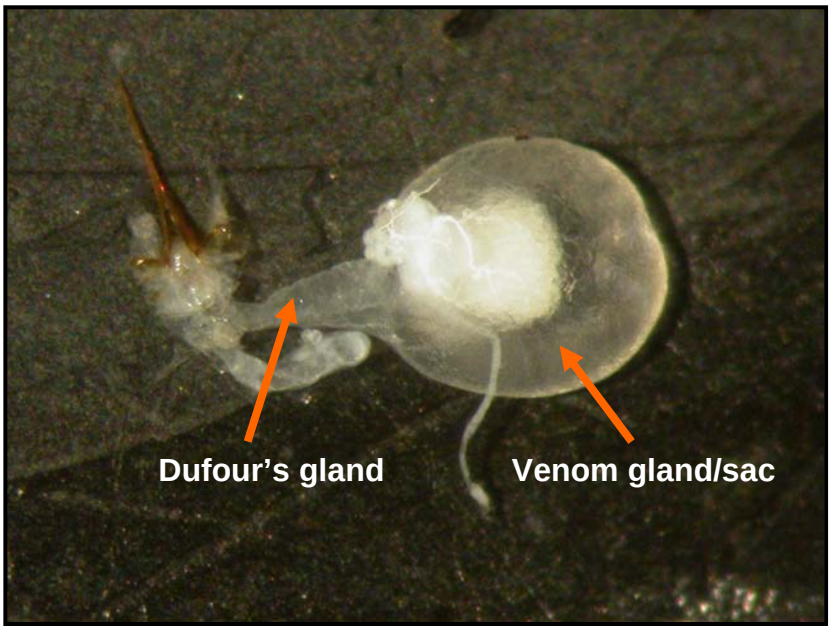


Figure 4: Dissected glands in the abdomen of fire ant workers showing Dufour's gland and venom gland/sac.
Courtesy Henry Fadamiro

Objective 2: Identification of the active components of fire ant semiochemicals eliciting responses in *Pseudacteon* phorid flies using GC-EAG and GC-MS techniques.

We have commenced a study to determine the identity of the chemicals produced in the venom glands of workers of imported fire ants (red and black species) and to determine their biological activity on phorid flies. We started by purifying fire ant body extracts. Next, we used silica gel short column chromatography to separate the two major kinds of compounds (*cis* and *trans* stereoisomers) in the venom of fire ant workers and then used coupled gas chromatography mass spectrometry (GC-MS) to identify the compounds.

In addition to the compounds previously identified in the venoms of fire ants by other authors, **we detected and identified seven novel (new) compounds (mainly alkaloids such as piperideines) from the venom of black IFA workers and eleven new compounds from the venom of red IFA workers.** This is a very important finding in that it reveals that there are more compounds in the venom of fire ant workers than originally thought. The key questions of interest are:

1. Do these compounds play a role in the attraction of phorid flies to fire ants?
2. What roles (if any) do these compounds play in the biology and ability of fire ants to defend themselves and their colonies against aggression or other forms of danger?

To answer the first question, we used the coupled gas chromatographic-electroantennogram detection (GC-EAD) technique to record from the antennae of phorid flies. Our results are quite revealing and showed that **several of the new compounds identified from the venoms of black and red IFA triggered strong GC-EAD response in *P. tricuspis*.** Behavioral experiments will be conducted this year to confirm whether or not phorid flies are attracted to these new compounds found in the venom of fire ants.

Other Results:

In another study, we tested the abilities of workers of the three forms/species of imported fire ants (*Solenopsis invicta* = red, *S. richteri* = black, and their hybrids = *S. invicta* × *S. richteri*) to recognize individuals from their nests (nestmates) and intruders (non-nestmates). **Workers of all three forms showed significant aggression toward non-nestmate intruders.** The results of the intraspecific (same species) aggression bioassays showed that *S. invicta* had the lowest aggression threshold, whereas *S. richteri* was the least aggressive. Survival rates one day after intraspecific encounters were higher for *S. richteri* than for *S. invicta* or hybrids, consistent with its lower aggressiveness. In interpecific (different species) interactions, *S. invicta* workers showed the greatest aggression and were more aggressive toward *S. richteri* than to hybrids. Furthermore, survival one day after interspecific encounters was highest for *S. invicta* workers, whether they were the intruders or residents. The hybrid form was intermediate between both parental forms in aggression and post-aggression survival. **These results may explain why the red and hybrid IFA continue to expand their range in southern United States at the expense of the black IFA.**

Practical Applications of the Project:

This project has potential practical benefits to U.S. agriculture, public health and the environment by suggesting novel environmentally friendly strategies for control of invasive fire ants in the U.S. Identification of new chemical compounds used as attractants by parasitic phorid flies to locate fire ants will **assist in current efforts at utilizing phorid flies as biological control agents for fire ants**. For instance, such compounds could be used to attract phorid flies to fire ants for parasitism.

Introducing A New Member Of The Fire Ant Team:

Dr. David W. Held
Assistant Professor of Entomology

Brief Bio:

Dr. Held joined Auburn University in August 2008 from Mississippi State University where he had an active research and extension program in turfgrass and ornamental entomology. Dr. Held has published 30 scientific papers, 8 book chapters, and numerous articles for state and regional newsletters in AL, MS, and LA. In addition to speaking to Green Industry clientele in AL and MS, he has also been invited and presented his lectures at Green Industry Conferences in GA and LA. For these reasons, **Dr. Held is recognized as a regional and national expert in the turf and ornamental entomology areas**. Dr. Held is an accomplished grantsman securing about $225,000 in extramural funding from 2004–2008 with another $175,000 in pending proposals for 2009.

Research Program:

Dr. Held's research program investigates biology, ecology and management of pests of turfgrass and ornamentals in the landscape and production areas. The Green Industry is the fastest growing sector of the economy in Alabama and the U.S. Dr. Held applies basic questions of insect ecology to solve pest problems for the Green Industry. Significant findings thus far in Alabama include the **first record of a wasp parasite** (*Larra bicolor,* Figure 1a & 1b) of mole crickets in Alabama and the **discovery of a new species of white grub pest** (Asiatic garden beetle, Figure 2) previously only reported from northeastern states. Current projects include:

Figure 1a: ***Larra bicolor***, parasite of mole crickets, now established in Alabama. Courtesy Dr. David Held

1. Investigate fire ant predation on egg-laying females, eggs, and grubs in areas where ants are selectively removed (graduate student project). Fipronil (Over'n'Out and TopChoice) is widely used for control of fire ants and mole crickets in residential and commercial turfgrass but is not toxic to white grubs.

2. Basic and practical aspects of feeding ecology of mole crickets (graduate student project). Mole crickets are the **most destructive pest of southern turfgrass**. Mole crickets allegedly feed on insects as well as plant roots but this is not well understood. The diet of mole crickets effects lifespan and number of eggs produced by females which impacts management. Also, if mole crickets depend more on insects in their diet this may explain why all past attempts to develop mole cricket resistant grasses have failed. Furthermore, baits similar to those used for fire ants are being used for mole cricket control, which requires a better understanding of food choices of mole crickets, which we plan to further evaluate.

Figure 1b: Mole cricket with a developing wasp larva. Courtesy Dr. David Held

3. Biological control of mole crickets using flowering annuals as nectar sources for *Larra bicolor* (mentioned above). The goal of this project is to determine if landscape plantings of flowers can increase parasitism of mole crickets in adjacent turf.

4. Determine the number of generations and nightly flight activity of Asiatic garden beetle. This species was only previously known in northern states. In southern turfgrass, this grub (right) may have multiple generations per year. Adult beetles are night active and are known to defoliate plants and flowers, although the beetles are seldom observed. This project is important because the **species is new to the south** and is not susceptible to some insecticides commonly used for grub control.

Figure 2: Asiatic garden beetle grub collected in Alabama. Courtesy Dr. David Held

5. Determine the susceptibility of popular holly varieties to Florida wax scales. This project will confirm reports of resistance among certain holly varieties and try to identify the factor that makes them resistant to this scale. **Florida wax scale is one of the most damaging scales on ornamental plants in landscapes and production in Alabama.**

SERVICE & LEADERSHIP:

1. Associate or technical editor for three scientific journals: Mid-South Entomologist, the Florida Entomologist, Applied Turfgrass Science, and Arthropod Management Tests.
2. Organizer and Moderator of the 2008 Symposium on Landscape and Turfgrass Entomology at the national meeting of the Entomological Society of America (ESA).
3. Member of the Southeast Branch of the ESA, Auditing Committee.

OUTREACH:

Dr. Held regularly contributes articles to the newsletters of the Alabama Turfgrass Association and the MS-LA Golf Coast Superintendents Association. He has been a speaker at state turfgrass associations in AL, GA, LA, MS, and TN. He has also has been an invited speaker at various nursery and landscape professional meetings in AL as well as at the Gulf States Horticulture Expo and the Southern Nursery Association. Dr. Held answered questions and provided extension literature to people at the fire ant booth at the AL National Fair in October 2008. Dr. Held was also the editor and moderator of the Entomology section of the Southern Nursery Association meeting. In spring 2009, Dr. Held has been invited and accepted to speak at five traveling roadshows sponsored by the Alabama Turfgrass Association at various locations around the state.

Will Disturbing Mounds & Applying Bait to Mounds Reduce Fire Ant Foraging Activity & Effectiveness of Control Measures?

Dr. Xing Ping Hu

Summary:

Our results provided evidence that **disturbing mounds does not reduce fire ant bait foraging,** despite a short delay in foraging activity in the disturbed mound treatment. Bait placement, relative to mounds, had a significant impact on the rate of bait removal. The fastest foraging rate occurred within one hour post-application, which resulted in >78% bait removal, regardless of the treatments and seasons (spring and summer). At the end of the tests, both disturbed and undisturbed colonies had a bait removal >95%. When the bait locations were compared, the fastest foraging rate occurred on the mounds surface, followed by 0.18-0.3m from the mound base. This trend was held consistent regardless of the treatment and season. All treatments, disturbed or not, spring or summer, resulted in 100% control. The only seasonal effect we observed was on the time to maximum bait removal, which was 3 hours in spring and 2 hours in summer. In conclusion, disturbing mounds before bait application does not reduce foraging activity or decrease control efficacy when bait products are used. Baits placed on the mounds surface had an equally or better chance to be foraged than those placed around the mounds.

Observing treatment plots.
Courtesy Dr. Xing Ping Hu

Bait resting on top of disturbed fire ant mound (left), the same mound 1 hour post-application with most of the bait already foraged (right).
Courtesy Dr. Xing Ping Hu

RATIONALE:

One approach to control fire ants is the use of bait containing a food attractant and poison. **Bait is considered a necessary component in the fire ant IPM program because it is easy to use, less expensive, safe and effective.** Because fire ants often switch to colony defense when disturbed or intruded, it has been theoretically assumed that, when bait is used, disturbing mounds may reduce bait foraging or stimulate colony relocation, which may result in a decrease in the control effectiveness of the

Fire ant bait applied to disturbed mound (left) & Applying fire ant bait to undisturbed mound(right).
Courtesy Dr. Xing Ping Hu

bait. Also, because foraging tunnel entrances often do not open on the mound, it is speculated that placing baits on the mound surface may reduce the chance of fire ant workers locating the baits. The registration labels on commercial bait products also recommend not disturbing mounds and to distribute bait on the ground around the mound. Despite the labeling and the speculation, disturbing mounds and applying baits on the mound surface are a common practice of homeowners and PCO's.

We tested the premise that disturbing and placing bait on mounds will reduce fire ant bait foraging, and a consequential less effective control. We used paired plots where we disturbed one plot but not the second, and a subplot of each mound received baits in 3 locations. This study was repeated in winter, spring and summer seasons.

RESULTS:

1. Our results provided evidence that mound disturbing does not discourage fire ant bait foraging despite a short delay in foraging activity in the disturbed treatments. Mound disturbance treatment (Figure 1) and undisturbed control resulted in similar amount of bait removal.

2. Our results indicated a considerable effect of bait location on bait foraging. Contrary to general assumption, **faster and more bait removal occurred in the baits placed on mound surface,** followed by those 0.18-0.3m around the mound, and the slowest located 1.08-1.2m away from the mound in the winter and summer seasons (Figure 2).

3. Our results also showed a significant season-effect on the removal rate of baits regardless of mound disturbances. In the spring, three hours were needed for 95% removal of bait. In the summer, the same amount of bait was removed in two hours (Figure 3).

Figure 1. Comparison of percentage decrease of unmoved baits by disturbed and undisturbed colonies, (A) Spring, (B) Summer.

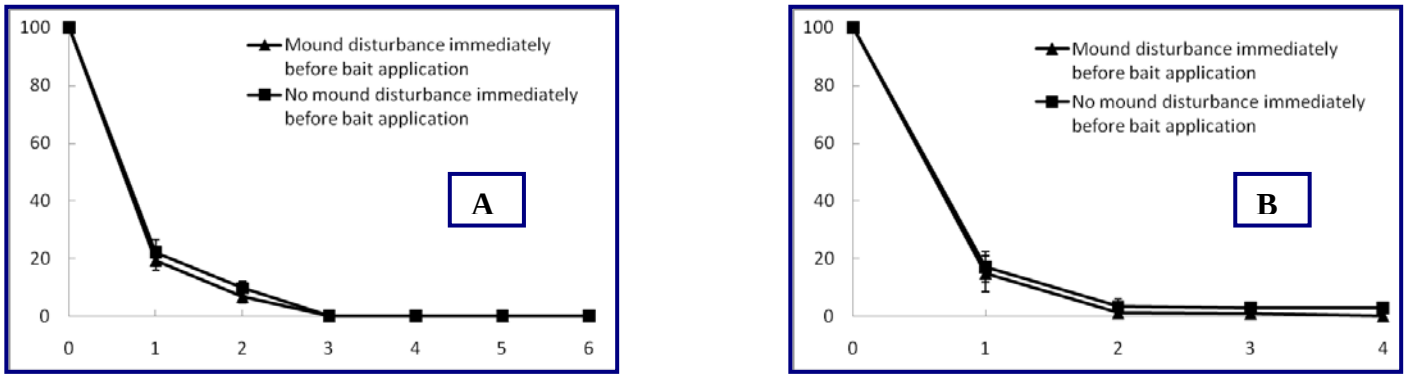


Figure 2. Comparison of percentage decrease of unmoved bait from 3 locations in Spring trail, (A) disturbed colonies, (B) undisturbed control.

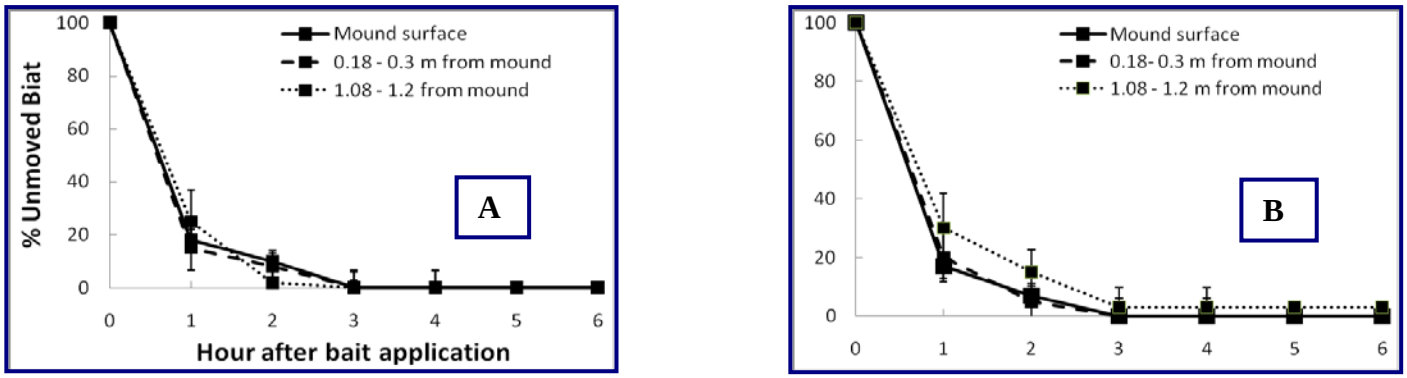
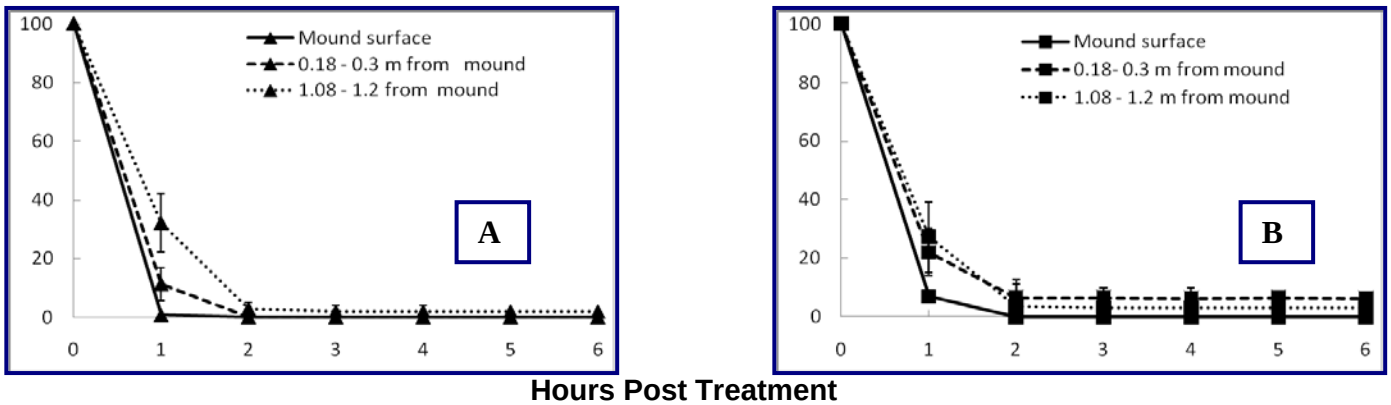


Figure 3. Comparison of percentage decrease of unmoved bait from 3 locations in summer trial, (A) disturbed colonies, (B) undisturbed control.



Characterization of Arginine Kinase Activities In Red Imported Fire Ants

Dr. Nannan Liu

Introduction:

The long-term goals of our project are to decipher genes involved in the development, reproduction, and social behavior of the red imported fire ant, *Solenopsis invicta*. Differences in gene expression have resulted in polyphenism, or alternative morphology, in many insect species and underlies a range of biological and physiological processes. **Recently, we have isolated the first arginine kinase (AK) gene from the red imported fire ant** (Wang et al. 2009). The expression of the AK gene was developmentally and caste-specifically regulated in the fire ant with a maximum expression in workers. We also found that the expression of the AK gene is tissue-specifically regulated with the highest expression level in both the thorax and head of workers. AK is a primary enzyme participating in cell metabolism and ATP-consuming processes. It plays an important role in cellular energy metabolism, and maintains constant ATP levels in insect cells. The caste- and tissue-specific expression of the AK gene strongly suggests the different demand for energy-consumption and production in the different castes and tissues of fire ants.

Study & Results:

The objective was to conduct the functional study at the protein level to examine the correlation of the levels of the AK protein activities and the levels of AK gene expression in the fire ant. To determine whether the pattern of AK gene expression reflects the general pattern of protein activity in the fire ant, we examined the AK activity in corresponding developmental stages, castes and tissues of the fire ant. A significant difference (P • 0.05) in the AK activity was observed in the fire ant with the descending order of: **worker (significant greater than) > alate female > alate male > larvae > worker pupae > alate pupae (Fig. 1)**, which is strongly correlated with the levels of RNA expression in each.

The highest level of the AK activity was found in the workers. A significant difference in the AK activity was also detected among the different tissues of workers, male alates and female alates. In the female alates, the AK activity was low in the abdomen, higher in the thorax, and reached a maximum in the head (Fig. 1). In the workers, the expression of AK activity was very high in both the thorax and head and very low in the abdomen.

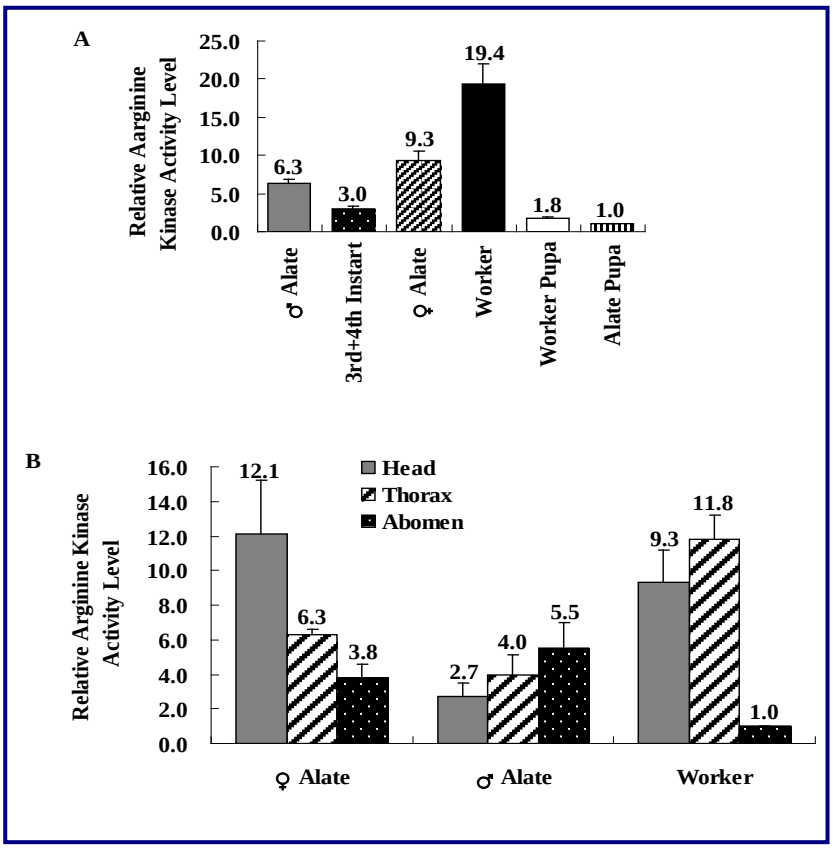


Figure 1: Arginine kinase protein activity analysis in the red imported fire ant. **A:** The protein activity in different life stages and castes of the red imported fire ant. **B:** The protein activity in head, thorax, and abdomen tissue of the red imported fire ant.

In male alates, however, the AK activity was relatively high in the abdomen and head compared to the thorax (Fig. 1). The overall tissue specific AK activity among the fire ants was again strongly correlated with the RNA expression pattern in each. These results suggest that the RNA level of AK reflects the level of protein activity in the fire ant.

Our study has indicated that the highest level of the AK gene expression and activity was identified in head tissue of both female alates and workers and in the thorax tissue of workers, followed by thorax tissue of female alates and abdomen tissue of male alates. These results suggest a different demand for energy-consumption and production in the different castes of the red imported fire ant, probably related to the energy demands of their different missions and physiological activities in the colonies. The AK gene is expressed strongly in head tissue of both worker and female alates and in the thorax of workers, where brain, muscle and neurons are mainly located, and the abdomen of the male alates, where the reproductive organ is located and spermatozoa are formed, suggesting these tissues play a key role in linking energy production and its utilization in the fire ant.

IMPACT:

Our research comprises the first effort to characterize the AK gene function or activity in the fire ant and provides the first information on how the fire ant 1) wisely uses ATP-consuming processes in cellular energy metabolism and 2) maintains constant ATP levels in social life.
