PROGRESS REPORT
FY 2006

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

The Alabama Fire Ant Management Program
...making fire ants easier to live with.

FY2006 IN REVIEW

Auburn University—Department of Entomology and Plant Pathology Auburn, AL Volume 1, Issue 1

Introduction

The Alabama Fire Ant Management Program, in conjunction with the Alabama Cooperative Extension System, the Tuskegee Cooperative Extension System, Alabama A&M, the USDA-APHIS and the USDA-ARS, is *making fire ants easier to live with.*

Fire ants invade every aspect of Alabama life. They raid our homes and businesses. They infest our lawns and landscaping. They swarm our recreation areas. They even plague our equipment. Probably the only people in Alabama that have not tangled with fire ants are visitors that have not set foot on Alabama soil.

Imported fire ant worker.
Courtesy Vicky Bertagnolli-Heller

The loss to households in Alabama is estimated to be $175 million dollars annually. Economic losses to agriculture, businesses, airports, golf courses, schools, utilities, and others are not included. Imported fire ants impact domesticated and wild animals and plants, but economic losses are difficult to estimate.

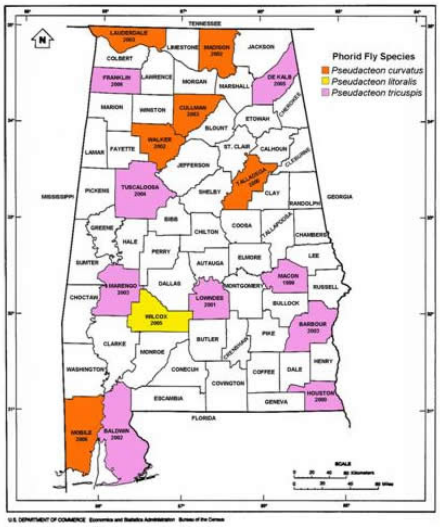
Phorid Flies in Alabama

There are over 20 species of phorid or decapitating fly, a natural enemy of the fire ant, in South America.

Since starting the phorid program in 1998, three species of phorid fly have been introduced into fire ant populations in 16 Alabama counties. The three species are: *Pseudacteon tricuspis*, *Pseudacteon curvatus* (2 biotypes), and *Pseudacteon litoralis*. Two fly releases were conducted in 2006: *P. tricuspis* in Franklin County and the new biotype of *P. curvatus* in Mobile County on a gopher tortoise reserve.

Two of the species, *Pseudacteon tricuspis* and *Pseudacteon curvatus*, have established populations that are spreading throughout the state at a rate of 10-20 miles per year. Currently, populations cover 1/2 to 2/3 of the state. Leading edges of expansion are tracked each summer. The release of *P. curvatus* in Talladega Co. was the first successful release of this species in the United States. Near Sylacauga, the ranges of the two fly species have overlapped. This is only the second site in the United States where two species of the fly coexist.

Phorid fly relative to penny.
Courtesy Vicky Bertagnolli-Heller



Phorid release sites in Alabama.

Pseudacteon litoralis was released in Wilcox County in 2005. One individual female of this third species was recovered from the release site in summer 2006. This is the first field reared specimen of this species to be captured.

Exhibiting Around the State and Beyond

An educational exhibit was prepared for the Alabama National Fair, the Southeastern Agricultural Expo, and the National Peanut Festival. The exhibit includes informational posters, live fire ants, live decapitating flies, casts of fire ant tunnel systems, and specimens. Fire ant coloring books and Extension fact sheets on fire ant management are also distributed. The booth is staffed by participants of the Alabama Fire Ant Management Program, Extension Agents, and Master Gardeners. Approximately 8,000-10,000 people visited the Alabama National Fair exhibit, 5,000 people visited the Ag Expo exhibit, and 5,000-7,000 people visited the exhibit at the Peanut Festival.

In this issue:

By the numbers:

- Amount of additional leveraged funding for FY 2006: $657,207
- 27 publications and articles
- 24 Scientific papers and presentations
- 10 outreach activities conducted
- 6 Extension publications and articles
- 34 Extension presentations, workdays, or workshops
- 3 updated Extension slide sets
- 22 bait-based demonstrations in 15 counties by 13 Extension agents
- 13 mass media spots

Fire Ants and Extension

In 2006, 13 Extension agents established a total of 22 bait-based fire ant management demonstrations in 15 different counties around the state of Alabama.

Extension agents feature fire ant management in their programming in many different and varied ways. Magazine articles and presentations at professional meetings help spread the word about fire ant management. Materials developed by the Alabama Fire Ant Management Program to train master gardeners are also utilized by Extension agents. Presentations are made to garden clubs, Youth Services programs, Senior Citizens meetings, Boys and Girls Clubs, Habitat for Humanity and at Alabama Agricultural Experiment Station field days.

Herd spreader in action.
Courtesy Texas A&M University

Currently, 20 Herd spreaders are available to Alabama stakeholders around the state. An additional 20 spreaders were purchased and will be in place by Spring 2007.

2006 IFA Conference

The Alabama Fire Ant Management Program hosted the 2006 Imported Fire Ant Conference in Mobile, Alabama March 28-30.

157 registered attendees from across the globe convened for the 2006 IFA Conference. Researchers and educators from the Southeast, Texas, New Mexico, California, Taiwan, China, and Australia gathered to share research results and exchange ideas on how to manage fire ants.

The budget this year's conference was over $29,000 with approximately $6,500 generated from Industry. This conference is a self-funding rotating conference in which hosting responsibilities are given to states where fire ants are found. Approximately $6,000 will be forwarded to the 2008 conference host, South Carolina.

Proceedings of the conference were prepared and sent to conference participants.

Awards were presented to Commissioner Ron Sparks and Senator Jack Biddle for their support of the Alabama Fire Ant Management Program.

Fire Ants and eXtension

The Alabama Cooperative Extension System and the Alabama Fire Ant Management Program are leaders of a nationwide effort to provide fire ant information for eXtension.

What is eXtension? eXtension is an educational partnership of more than 70 universities to help improve life with access to objective, research-based information and educational opportunities. eXtension provides this information any time, any place, in any format and on any Internet-ready device. This nationwide effort involves fire ant experts and others from all of the fire ant infested states. The group is called a Community of Practice. In addition to developing fire ant content, the fire ant Community of Practice is one of the first eight Communities that was formed. These communities, called pioneers, are determining how eXtension will be implemented. Imported Fire Ant eXtension will be the fourth community to launch information at *www.extension.org*. Formal launch of Imported Fire Ant eXtension is scheduled for April 2007. Fifteen Extension Agents and Specialists from the Alabama Cooperative Extension System are participating in this project.

Fire Ant Research Projects

Researchers in the Alabama Fire Ant Management Program are leading the way in cutting edge fire ant related research.

We are evaluating the effects of environmental and physiological factors on the lifespan of *P. tricuspis*. We have found that temperature and food availability are two major factors influencing adult fly longevity. We have also found that sugar-fed flies live about twice as long as non-sugar-fed flies. This finding suggests that conserving naturally occurring sugar sources in the field (i.e. honeydew, nectar, etc.) may promote *P. tricuspis* lifespan and possibly its impact as a biological control agent against imported fire ants.

We have also investigated the effects of artificial loads on the energetics and foraging of the red imported fire ant. We have found that the fire ant can carry almost 100 times its own body weight with minimal effect on energy consumption. This shows that baits formulated with very light granules can be reformulated with a heavier bait particle.

A survey was developed to access the knowledge base of pest control professionals, who are fighting the frontline in the battle against fire ants. Answers indicate that the majority of the participants were knowledgeable in the appropriate use of fire ant control technologies. However, an educational fire ant control program targeting professionals is still needed.

A long-term goal of one project is to decipher genes involved in the development, reproduction, and social behavior of the red imported fire ant. We have isolated the first arginine kinase gene from the RIFA. The expression of this gene is developmentally, caste specifically and tissue specifically regulated in the fire ant. Arginine kinase is a primary enzyme participating in cell metabolism and ATP-consuming processes, plays an important role in cellular energy metabolism, and maintains constant ATP levels in insect cells.

Fire Ants and Crops

Research shows that fire ants can have an effect on arthropod communities. Fire ants are found to dramatically suppress the abundance of many arthropod species in 'old fields'. For example, grasshoppers and spiders were 4 times more abundant in plots with low numbers of fire ants than in control plots with high fire ant densities. In contrast, some arthropod pests are positively affected by fire ant presence. Aphids, known to transmit tomato diseases, were 2.5 times more abundant in plots with high densities of fire ants as opposed to plots with low fire ant densities.

Fire ants and aphids on cotton.
Courtesy Eubanks Lab

The Alabama Fire Ant Management Program
301 Funchess Hall Auburn, AL 36849
L.C. "Fudd" Graham, Ph. D.—*Coordinator*
fgraham@acesag.auburn.edu 334.844.2563

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

All Researchers
Micky D. Eubanks, Ph.D.
Henry Y. Fadamiro, Ph.D.
Xing Ping Hu, Ph.D.
Nannan Liu, Ph.D.
Vicky Bertagnolli
Li Chen
Laura Cooper
Chad Harvey
Ebenezer Onagbola
John Styrsky
Marla Tanley

Alabama Cooperative Extension System

Randall Armstrong - Lauderdale Co. Extension Coordinator
Danny Cain – Walker Co. Extension Coordinator
Doug Chapman – REA, Commercial Horticulture
Willie Datcher – REA, Home Grounds, Gardens & Home Pests
Mike Davis -
Henry D. Dorough – REA, Animal Sciences & Forages
Chip East – REA, Commercial Horticulture
Bob Goodman – Extension Economist
Gary Gray – REA, Commercial Horticulture
Tinsley Gregg – REA, Animal Sciences & Forages
Chazz Hesselein – Extension Specialist, Commercial Horticulture
Rickey Hudson – REA, Animal Sciences & Forages
Jimmy Jones – Henry Co. Extension Coordinator
Ken Kelley -
David Koon – REA, Home Grounds, Gardens & Home Pests
Charlie Mason – Barbour Co. Extension Coordinator
Michelle Mobley – Urban REA, Forestry, Wildlife & Natural Resource Management; Home Grounds, Gardens & Home Pests
Charles Pinkston – REA, Home Grounds, Gardens & Home Pests
R. Stan Roark – REA, Home Grounds, Gardens & Home Pests
Wayne Robinson – Statewide Dairy Agent
Jack Tatum – REA, Animal Sciences & Forages
Kevan Tucker – Clarke Co. Extension Coordinator (in training)
Reafield Vester – Master Gardener Coordinator
Mac Washington -
Eddie Wheeler – Marshall Co. Extension Agent
Anthony Wiggins – REA, Animal Sciences & Forages
Stan Windham – Coffee Co. Extension Coordinator
Amy Winstead – REA, Home Grounds, Gardens & Home Pests

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 Department of Agriculture & Industries

USDA-ARS .....
Sanford D. Porter, Ph.D.
Robert K. Vander Meer, Ph.D.

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

Local Cooperators

Mark Kaiser – Baldwin Co.
Lee Fenn – Barbour Co.
Mr. & Mrs. F.D. Alexander – Cullman Co.
St. Bernard Abbey Farm – Cullman Co.
- Franklin Co.
Joe Carothers - Houston Co.
John McDaniel - Houston Co.
George Hunter - Lowndes Co.
Tim & Susan Gaasch - Macon Co.
Tony & Diane Silva - Macon Co.
Carolyn & Michael Williams - Macon Co.
Lynn Crocker – Marengo Co.
- Mobile Co.
Mike Duke - Talladega Co.
Greg Myrick - Talladega Co.
Greg Streett – Talladega Co.
Munny Sokol Park – Tuscaloosa Co.
Dorman Grace – Walker Co.
Jack Biddle – Wilcox Co.
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Red Eagle Golf Course – Eufaula, AL
Talladega Superspeedway – Talladega, AL

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Funding Leveraged by Fire Ant Program

Funded $657,207 **Submitted/In Review $351,435**

Alabama Agricultural Experiment Foundation Grant, Auburn University. In Review. Live plant intercropping of vegetables to reduce losses to insect-borne plant viruses, insects, and weeds. $72,402 (J.F. Murphy, PI, J. Mosjidis, Co-PI, M.D. Eubanks, Co-PI).

National Science Foundation, Population Biology/Evolutionary Program. In Review. Do positive species interactions promote invasions? Effects of ant-hempiteran mutualisms on the success and consequences of ant invasions. $269,033 (M.D. Eubanks, PI). (collaborative project with D. Holway at UC-San Diego and A. Suarez at UI at Champaign)

Alabama Agricultural Experiment Station Foundation Grant, Auburn University. Funded May 2003 – April 2006. Breaking the cycle: Development of a novel plant disease management strategy targeting pathogen vectors. $108,060 (M.D. Eubanks, PI, J.F. Murphy, Co-PI).

United States Department of Agriculture, National Research Initiative. Funded September 2003 – August 2005. Live mulch and PGR-mediated enhanced plant growth to manage insect-borne Cucumber mosaic virus in fresh-market tomato. $100,000 (J.F. Murphy, PI, J. Mosjidis, M.D.)

Biogrant, Vice President for Research, Auburn University. Funded May 2004 – April 2006. Predicting the ecological and economic consequences of a fire ant – aphid mutualism. $44,120 (M.D. Eubanks, PI)

CSREES eXtension, Oct. 2005. Taking the Sting out of Fire Ants: A Proposal for an eXtension Program on Imported Fire Ant Management. $65,910 (K. L. Flanders, and B. M. Drees).

Chemical Ecology of Phorid Fly Parasitoids of Imported Fire Ants. Auburn University Title VI Mentor Research Grant. Funded June 1, 2006 – May 31, 2007. $21,675. (H.Y. Fadamiro, PI).

National Science Foundation, Population Biology/Evolutionary Program. Funded August 2006 – July 2009). Collaborative Research: Does mating-system evolution constrain the adaptive evolution of other traits? $264,010 (M.D. Eubanks, PI).

ACES IPM Mini-grant. 2006. Taking the Sting out of Fire Ants: Facilitating Extension Agent Participation in the Imported Fire Ant eXtension Project. $3,500 (Gimenez, D. and cooperators, including K. Flanders).

CSREES eXtension. Dec. 2006. Taking the Sting out of Fire Ants: A Proposal for an eXtension Program on Imported Fire Ant Management. $30,000 (Flanders, K. L., and B. M. Drees, P. Nester, and P. Beckley).

CSREES eXtension. Dec. 2006. Support for leader of the Imported Fire Ant eXtension CoP to Offset Time and Travel Expenses. $19,932 (Flanders, K. L., and B. M. Drees).

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Chen, L., and H.Y. Fadamiro. Behavioral and electroantennogram rsponses of phorid fly *Pseudacteon tricuspis* (Diptera: Phoridae) to red imported fire ant *Solenopsis invicta* odor and trail pheromone. Journal of Insect Behavior. in review.

*Cooper, L.B., J.F. Murphy, and M.D. Eubanks. In revision. Red imported fire ants may disrupt biological control in tomato. Florida Entomologist.

Dorough, H. D. 2006. What Fire Ant Problem? Cooperative Farming News, July, 2006.

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*Harvey, C.T. and M.D. Eubanks. 2005. Intraguild predation of parasitoids by *Solenopsis invicta*: a non-disruptive interaction. Entomologia Experimentalis et Applicata 114:127-135.

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Hu, X.P. 2006. A survey of homeowners on fire ant control practices in AL. Pest Control (submitted)

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*Kaplan, I. and M.D. Eubanks. 2005. Aphids alter the community-wide impact of fire ants. Ecology 86(6): 1640-1649.

*Strysky, J.D. and M.D. Eubanks. In review. Effects of ant-aphid mutualisms on plant fitness. Ecology

*Styrsky, J.D. and M.D. Eubanks. In press. The ecological consequences of ant-hemipteran mutualisms. Proceedings of the Royal Society, London Series B (Invited Review; scheduled for fall/winter publication)

*Styrsky, J.D., *I. Kaplan, and M.D. Eubanks. 2006. Plant trichomes indirectly enhance tritrophic interactions involving a generalist predator, the red imported fire ant. Biological Control 36:375-384.

Valles, S. M.,[a,*] Charles A. Strong,[a] David H. Oi,[a] Sanford D. Porter,[a] Roberto M. Pereira,[a] Robert K. Vander Meer,[a] Yoshifumi Hashimoto,[a] Linda M. Hooper-Bui,[b] Hussein Sánchez-Arroyo,[c] Tim Davis,[d] Vedham Karpakakunjarum,[e] Karen M. Vail,[f] L. C. "Fudd" Graham,[g] Juan A. Briano,[h] Luis A. Calcaterra,[h] Larry E. Gilbert,[i] Kenneth Ward[j], and David C. Thompson[k], in preparation, Host Specificity, Distribution, and Phenology of *Solenopsis invicta* Virus .

Wang, H., Q. Lin, L. Zhang and N. Liu, 2006. Cloning, sequencing, and expression of arginine kinase gene in the red imported fire ant, *Solenopsis invicta* Buren. Insect Molecular Biology (Submitted).

Proceedings Articles

Bertagnolli, V. E. and L. C. Graham. 2006. Host Location of *Pseudacteon curvatus* (Diptera: Phoridae) in Mono- and Polygyne Fire Ant Colonies (Hymenoptera: Formicidae). pp. 89-93. *In* Proceedings of the 2006 Annual Red Imported Fire Ant Conference, Mobile, Alabama.

Fadamiro, H.Y., and L. Chen. 2006. The vegetarian side of parasitic phorid flies: use of non-host food by *Pseudacteon tricuspis. In* Proceedings of the 2006 Annual Red Imported Fire Ant Conference, Mobile, Alabama.

Flanders, K. L. and B. M. Drees. 2006. eXtension: Taking the Sting out of Fire Ants, *In* Proceedings of the 2006 Annual Red Imported Fire Ant Conference, Mobile, Alabama.

Graham, L. C. and V. E. Bertagnolli. 2006. *Pseudacteon* spp. (Diptera: Phoridae) Range Expansion in Alabama. pp. 94-99. *In* Proceedings of the 2006 Annual Red Imported Fire Ant Conference, Mobile, Alabama.

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Scientific Papers and Presentations (* denotes graduate student)

*Barnum, T. and M.D. Eubanks. Is an invasive ant a better bodyguard than a native ant? 91st Annual Meeting of the Ecological Society of America, Memphis, Tennessee, August 2006.

Bertagnolli, V. E. and L. C. Graham. 2006. Host Location of *Pseudacteon curvatus* (Diptera: Phoridae) in Mono- and Polygyne Fire Ant Colonies (Hymenoptera: Formicidae). Poster presented at the 2006 Annual Red Imported Fire Ant Conference, Mobile, Alabama.

Bertagnolli, V. E. and L. C. Graham. 2006. Host Location of *Pseudacteon curvatus* in Alabama. Poster presented at the 80th Annual Meeting of the Southeastern Branch of the Entomological Society of America, Wilmington, North Carolina.

Bertagnolli, V.E. and L. C. "Fudd" Graham. 2005. Host location behavior of *Pseudacteon curvatus* (Diptera: Phoridae) in Alabama. Poster presented at the 53rd Annual Meeting of the Entomological Society of America, Fort Lauderdale, Florida.

*Cooper, L.B., J.F. Murphy, and M.D. Eubanks. Effects of ant- aphid mutualisms on epidemics of plant viral diseases. Annual Meeting of the Ecological Society of America, Montreal, Canada, August 2005.

*Cooper, L.B., J.F. Murphy, and M.D. Eubanks. Effects of a fire ant – aphid mutualism on spatial dynamics of plant viruses. 79th Annual Meeting of the Southeastern Branch of the Entomological Society of America, Tunica, Mississippi, March 2005 (first place in student competition).

Eubanks, M.D. Pervasive invasives and complex trophic interactions: the effects of fire ants in agroecosytems. Department of Entomology, North Carolina State University, April 2005. (invited departmental seminar)

Eubanks, M.D., *L.B. Cooper, and M.D. Eubanks. Fire ant – aphid mutualisms can increase the spread of aphid-vectored plant viruses. 91st Annual Meeting of the Ecological Society of America, Memphis, Tennessee, August 2006.

Eubanks, M.D., *J.D. Styrsky, *L.B. Cooper, *I. Kaplan, and *C.T. Harvey. Variation in the ecological consequences of fire ant - aphid mutualisms. Annual Meeting of the Ecological Society of America, Montreal, Canada, August 2005.

Fadamiro, H.Y., and L. Chen. 2006. The vegetarian side of parasitic phorid flies: use of non-host food by *Pseudacteon tricuspis*. 2006 Annual Red Imported Fire Ant Conference, Mobile, Alabama, March 28-30, 2006

Fadamiro, H.Y., and L. Chen. 2005. Detection of sugar-feeding and quantification of nutrient levels in the phorid fly, *Pseudacteon tricuspis* (Diptera: Phoridae). 53rd Annual Meeting of the Entomological Society of America, Fort Lauderdale, Florida, November 6-9, 2005

Fadamiro, H.Y. 2006. Semiochemical-mediated interactions in insects: fine scale olfactory sensitivity predicts fitness. University of Maryland, College Park, Department of Entomology. April 28, 2006. (Invited seminar).

Fadamiro, H.Y. 2005. Semiochemicals: the language of love and survival in insects. American Chemical Society, North Alabama Section, Madison Marshall Award and Mini-Symposium Banquet, University of Alabama, Huntsville. December 6, 2005 (invited seminar).

Graham, L. C. and V. E. Bertagnolli. 2006. *Pseudacteon* spp. (Diptera: Phoridae) Range Expansion in Alabama. Poster presented at the 2006 Annual Red Imported Fire Ant Conference, Mobile, Alabama.

Graham, L. C. and V. E. Bertagnolli. 2006. *Pseudacteon* spp. (Diptera: Phoridae) Range Expansion in Alabama. Poster presented at the 80th Annual Meeting of the Southeastern Branch of the Entomological Society of America, Wilmington, North Carolina.

Liu, N. and H. Wang. 2006. Arginine kinase gene in the red imported fire ant, *Solenopsis invicta* Buren. Presentation in the National Annual Red Imported Fire Ant Conference.

Liu, N. 2006. The functional genomics of the red imported fire ant, *Solenopsis invicta* Buren. Invited Lecture at China Agricultural University, Beijing, China.

*Rice, K.B. and M.D. Eubanks. The effects of fire ants on an old field arthropod community. 91st Annual Meeting of the Ecological Society of America, Memphis, Tennessee, August 2006.

*Rice, K.B. and M.D. Eubanks. Direct benefits of ant-aphid mutualisms: fire ants increase the survival of aphids in the absence of natural enemies and honeydew influences colony survival and growth. Annual Meeting of the Ecological Society of America, Montreal, Canada, August 2005.

*Rice, K.B. and M.D. Eubanks. Direct effects of fire ants on aphid population growth. 79th Annual Meeting of the Southeastern Branch of the Entomological Society of America, Tunica, Mississippi, March 2005.

*Styrsky, J.D. and M.D. Eubanks. The benefit of an ant-aphid mutualism to its host plant: cotton aphids indirectly increase cotton plant fitness. Annual Meeting of the Ecological Society of America, Montreal, Canada, August 2005.

*Styrsky, J.D. and M.D. Eubanks. Cotton aphids indirectly benefit yield by increasing fire ant suppression of caterpillar pests. Annual Beltwide Cotton Conference, New Orleans, Louisiana, January 2005 (first place in student competition).

Wang, H., Q. Lin, L. Zhang and N. Liu. 2005. The gene expression in the red imported fire ant, *Solenopsis invicta* (B.). Presentation in The National Annual Meeting of the Entomological Society of America (ESA).

Wang, H., Q. Lin, L. Zhang and N. Liu. 2005. Cytochrome P450 Gene Expression in the Red Imported Fire Ant, *Solenopsis invicta* (B.). Presentation in the National Red Imported Fire Ant Conference.

Extension Publications

Drees, B. M., S. B. Vinson, R. E. Gold, M. E. Merchant, E. Brown, K. Engler, M. Keck, P. Nester, D. Kostroun, K. Flanders, F. Graham, D. Pollet, L. Hooper-Bui, P. Beckley, T. Davis, P. M. Horton, W. Gardner, K. Loftin, J. Hopkins, K. Vail, R. Wright, W. Smith, D. C. Thompson, J. Kabashima, B. Layton, P. Koehler, D. Oi, and A-M. Callcott. 2006. Managing Imported Fire Ants in Urban Areas, B-6043, Rev., Texas Cooperative Extension System. *http://www.aces.edu/dept/fireants/documents/b-6043.pdf*

Flanders, K. L. 2006 Fire Ant Control Materials for Alabama Homeowners. Alabama Cooperative Extension System Circular ANR-175-A, rev. *http://www.aces.edu/pubs/docs/A/ANR-0175-A/ANR-0175-A.pdf*

Flanders, K. L. Imported Fire Ant eXtension. Update on FAQ's. eXtension Community of Practice Leadership Conference, Louisville, KY, October 2006.

Flanders, K., D. Gimenez, T. Gregg, and H. Dorough. Imported Fire Ants. Alabama Cooperative Extension System Animal Science and Forages Program Priority Team Review, Clanton, September 2006.

Flanders, Kathy, Hubert Armstrong, Chuck Browne, Danny Cain, Ken Creel, Willie Datcher , Buck Farrior, Ted Gilbert, Shane Harris, Chazz Hesselein, David Koon, Charlie Mason, Rusty Parrish Jr, Charles Pinkston, John Pullium, Stan Roark, George Tabb, Mac Washington, David West, Anthony Wiggins, Stan Windham, and Nelson Wynn. Sustainable Management of Red Imported Fireant 2005 & 2006. Alabama Cooperative Extension System Home Grounds, Home Pests, and Horticulture Program Priority Team Review, Auburn, Sept. 2006.

Flanders, K. L. and Bart Drees, What is eXtension, Web Conference with the Imported Fire Ant Community of Practice, March 2006.

Flanders, K. L. and Bart Drees, eXtension: Taking the Sting out of Fire Ants, Annual Red Imported Fire Ant Conference, Mobile, March 2006.

Flanders, K. FAQ, Ask the experts. Annual Meeting Entomological Society of America, December 2006.

Flanders, K. L. Fire Ant Control, Alabama Christmas Tree Growers Association, Birmingham, January, 2006

Outreach Activities, Presentations, Teaching, and Teaching Materials

Prepared educational booth on The Alabama Fire Ant Management Program for the 61st Annual National Peanut Festival, 5-13 November 2005.

Prepared and staffed educational booth on The Alabama Fire Ant Management Program at the 25th Annual CoAg Fall Roundup/Taste of Alabama Agriculture, Auburn University, Alabama, 21 October 2006.

Prepared educational booth on The Alabama Fire Ant Management Program at Sunbelt Agricultural Exposition in Moultrie, Georgia, 18-20 October 2005.

Prepared and staffed educational booth on The Alabama Fire Ant Management Program at Alabama National Fair, 7-16 October 2005.

Educational presentation on The Alabama Fire Ant Management Program at 2006 Farm, Home, and Wildlife Expo, Chilton Research and Extension Center, Clanton, Alabama, August 5, 2006.

Hu, XP. - 4 workshops (Fire Ant Biology and Management, an educational program for Native Americans) on April 21-23, May 21-22, June 20 and July 10-11, 2006

Bertagnolli, V.E.. Classroom presentation on insects for 1st graders at Wright's Mill Road Elementary School, Auburn, Alabama, 7 April 2006.

Bertagnolli - One lecture for Insecticides in the Environment.

Graham - Two lectures for Insecticides in the Environment, One lecture for IPM course.

Hu, XP - 3 demonstrations of fire ant baits vs. granule, and broadcast vs. individual mount treatment

Mass Media

2006. Fire Ants: Farmers Friends and Foes. Ag Illustrated Vol. 4, No. 1 Fall Issue. pp. 10.

Interview for ALFA Home Magazine and Alfa Farm Magazine, August 2006 – Fudd Graham

Article for Alabama Turfgrass Association Newsletter, September 2006 – Fudd Graham

ACES 2005 Ag Highlights – Take the Sting Out of Fire Ants – Extension Agents with Fire Ant Management Program

Alabama Farmers and Consumers Bulletin – Alabama Fire Ant Management Program Appreciation Award - Graham, Bertagnolli, Flanders
Cooperative Farming News – Fire Ant Management Program Thanks Dept. of Agriculture & Industries
Franklin County Times – Project Releases Flies to Control Fire Ants – Tim Reed
Decatur Daily – Fighting the Feisty Fire Ant – Charles Pinkston
Talladega Daily – Sylacauga School System Getting Rid of Fire Ants - Henry Dorough
Cooperative Farming News – What Fire Ant Problem? – Henry Dorough
Interviewed for article that appeared on the front page of the Wall Street Journal on June 12, 2006. – Micky Eubanks
The Talladega SuperSpeedway demonstration was featured on RFD TV in Fall 2006.
TV coverage from Columbus GA, 10/11/06, Russell CO. Fire Ant Workshop 40 clients

Scripted PowerPoint Presentations on CD

Flanders, K. L., K. Ward, and R. Ward. Managing Imported Fire Ant Problems in Agriculture (http://www.aces.edu/dept/fireants/slidesets/sareagric2006_files/frame.htm)
Flanders, K. L., R. Ward, and K. Ward. Managing Imported Fire Ant Problems in Urban Areas (http://www.aces.edu/dept/fireants/slidesets/sareurban2006_files/frame.htm)
Flanders, K. L., K. Ward, and R. Ward. Imported Fire Ant Biology (http://www.aces.edu/dept/fireants/slidesets/ImportedFireAntBiology2005_files/frame.htm)

Meetings Attended

Entomological Society of America 53rd Annual Meeting, Fort Lauderdale, Florida, November 6-9, 2005.
80th Annual Meeting of the Southeastern Branch of the Entomological Society of America, Wilmington, North Carolina, March 5-8, 2006.
2006 Annual Red Imported Fire Ant Conference, Mobile, Alabama, March 28-30, 2006.

Evaluation of Integrated Pest Management Methods for Red Imported Fire Ants

Lawrence Graham, Kathy Flanders, Vicky Bertagnolli,
Dept. Entomology, Auburn University

Rufina Ward and Ken Ward
Alabama A&M University

Henry Dorough, Rickey Hudson, Danny Cain, Charles Pinkston,
Anthony Wiggins, Charles Mason
Alabama Cooperative Extension System

Tony Dawkins
Alabama Agricultural Experiment Station

1) Release and evaluate the effectiveness of three species of phorid fly.
2) Continue survey of location of red, black and hybrid fire ants in Alabama.
3) Monitor fire ant populations in Sylacauga do determine effect of two phorid species.
4) Fire ant insecticide trials.
5) Establish new bait trials to determine most effective time to apply bait where phorids are established
6) Host Imported Fire Ant Conference in Mobile, AL.

1) Additional phorid flies were obtained from the USDA and released in Alabama in 2006. A *P. tricuspis* release was conducted in Franklin County in May 2006 and a new biotype of *Pseudacteon curvatus,* was released in Mobile County in September 2006. Phorid flies have been released at 14 sites across Alabama (two by Alabama A&M). A field-reared specimen of *Pseudacteon litoralis* was recovered from the 2005 release site in Wilcox County. This is the first field reared specimen captured of this species. Other existing sites were sampled in the spring and fall. Data from these sites are collected in cooperation with USDA-APHIS in Gulfport, MS. All sites (or leading edges of movement from the site) were visited several times to track fly movement.

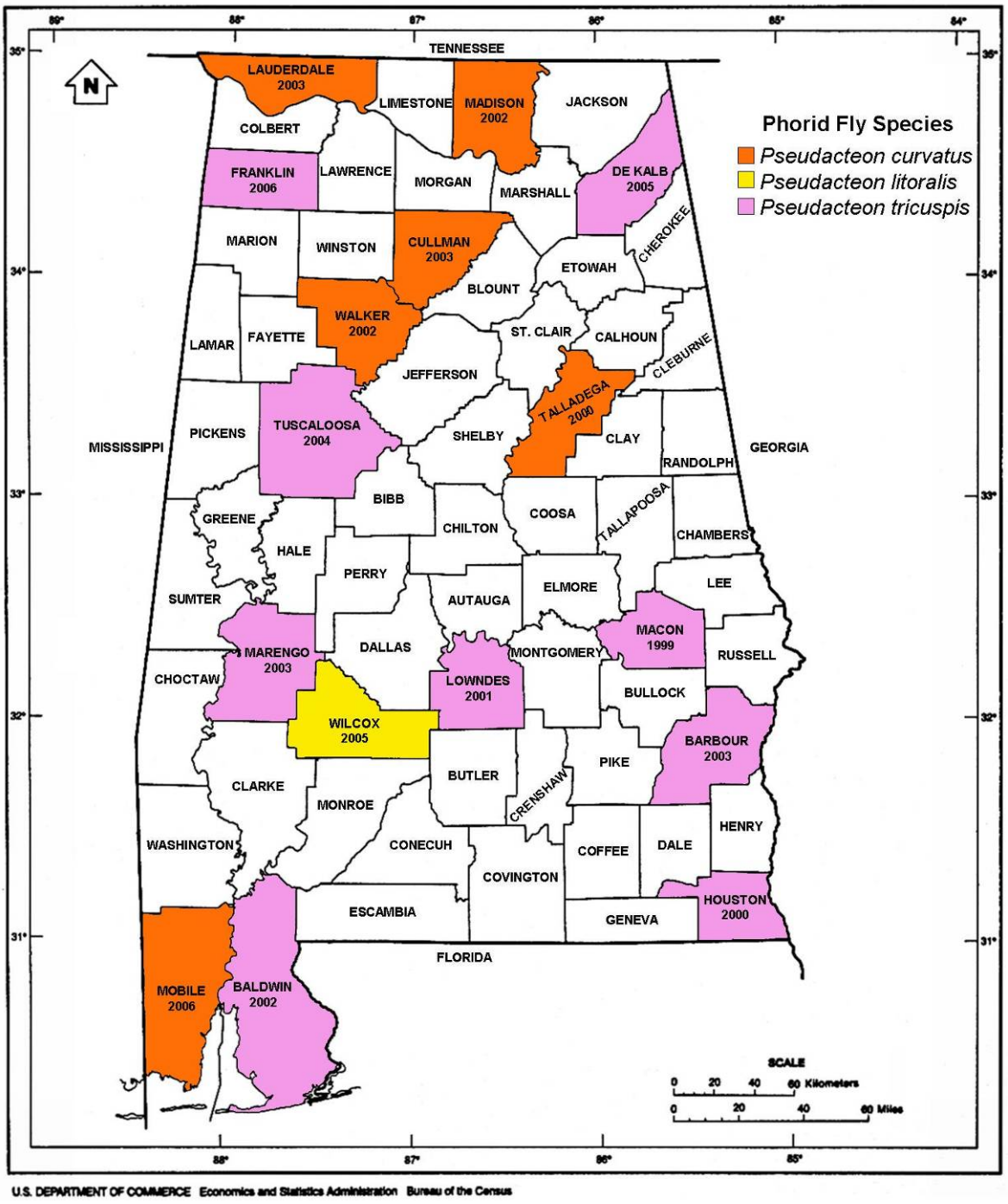
2) Fire ants were collected on trips throughout the state, processed, and sent to Bob Vander Meer at the USDA lab in Gainesville for species determination by cuticular hydrocarbons. These fire ant species were then plotted on a grid map of Alabama showing species populations in Alabama. The entire northern two thirds of Alabama have been sampled for these species and the data will be published.

3) Fire ant populations were monitored at the Sylacauga site to determine affects of two species of phorid flies. This is one of two sites in the US where more than one species of phorids occur.

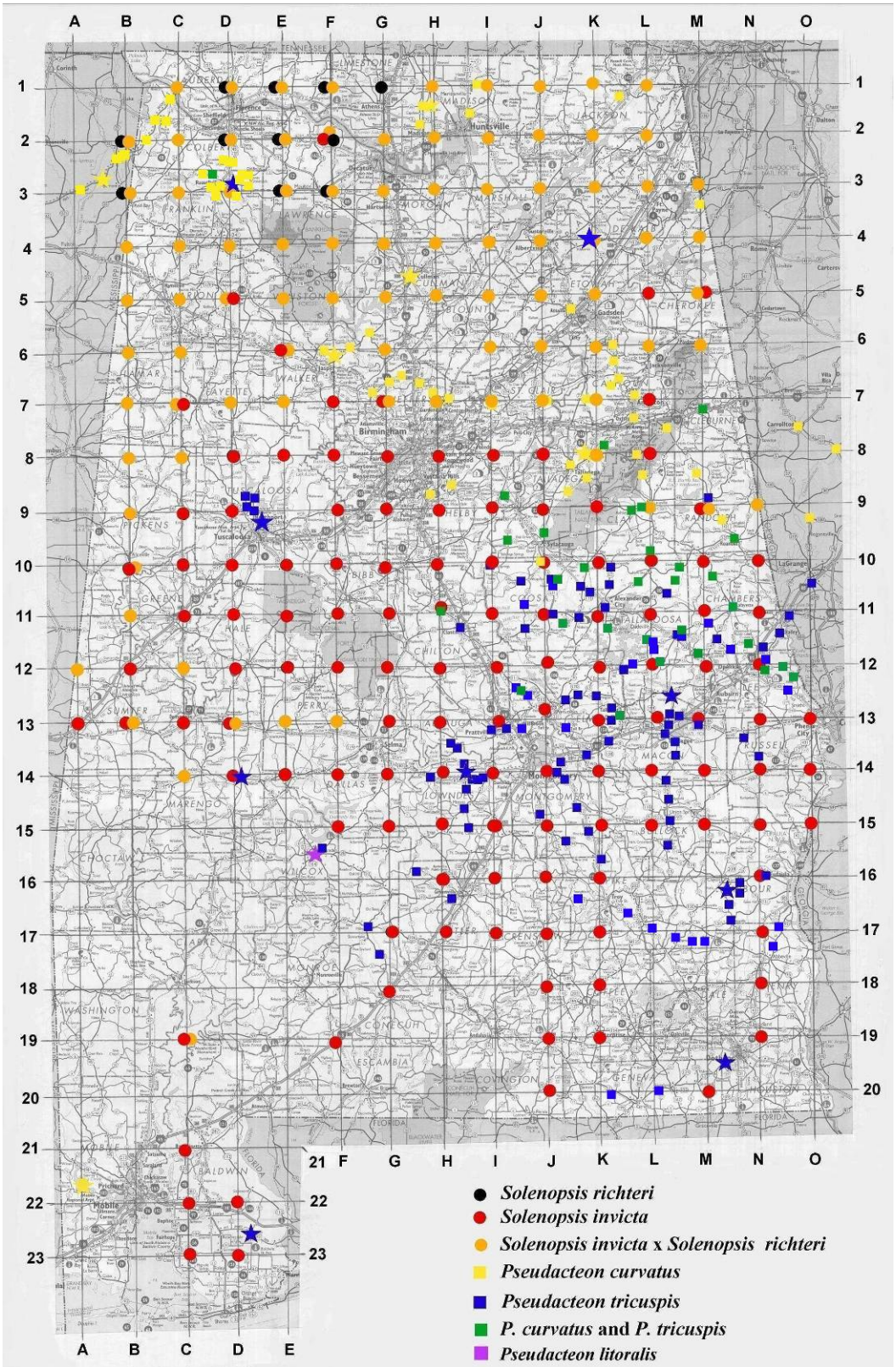
4) Three fire ant insecticide trials were conducted to test new and current fire ant products. Two trials were conducted with BASF, one at the Red Eagle Golf Course in Eufaula and one at the Talladega Airport. Another trial was established at the Stillwaters Golf Course near Dadeville testing new formulations of fipronil.

5) Due to the drought, these bait trials and another insecticide trial using Esteem mixed with fertilizers were not conducted.

6) Hosted the 2006 Imported Fire Ant Conference in Mobile, AL. The conference is international in scope with attendance from Australia, Taiwan and China. The budget this was over $29,000. Approximately $6000 will be forwarded to the 2007 conference sponsors in Florida. There were 157 registered attendees. Proceedings of the conference were prepared and sent to conference participants. Awards presented to Commissioner Ron Sparks and Senator Jack Biddle for their support to the Alabama Fire Ant Management Program.



Map 1. Map of phorid fly release sites in Alabama.



Map 2. Map showing fire ant and phorid fly release species and their locations.

Fire Ant Education and Outreach

Lawrence Graham, Kathy Flanders, Vicky Bertagnolli,
Department of Entomology and Plant Pathology, Auburn University

Objectives

1) Provide the public with information about fire ants with exhibits at the Talladega SuperSpeedway, the Alabama National Fair, the Southeastern Ag Expo, the Peanut Festival, and other events.
2) Conduct fire ant demonstrations (coordinated by regional Extension agents)
3) Facilitate the development of Imported Fire Ant eXtension program
4) Provide the opportunity for Extension agents and graduate students to attend the 2006 Annual Imported Fire Ant Conference in Mobile AL

Expected Outcomes

This program resulted in improved knowledge of fire ant biology and management strategies by the public and increased visibility of Alabama Fire Ant Management Program. It has led to more appropriate use of fire ant insecticides and reduced environmental hazards due to misapplication of fire ant insecticides. The training done with youths today will lead to a new generation of fire ant managers. The school IPM program and the Alabama Department of Mental Health use recommendations from the Alabama fire ant management program to make children and patients safe from fire ant attacks and reduce liability. Our training programs have been documented to increase the general level of knowledge of fire ants by 29%. In calendar year 2003, we estimated that we saved Alabama stakeholders $928,340 through our on-going train-the-trainer program. We will have made life safer for the general public.

Total amount requested: $16,249

Exhibit at the Talladega SuperSpeedway, Alabama National Fair, the Southeastern Ag Expo, and the Peanut Festival, October-November, 2005

Coordinated by Lawrence Graham and Vicky Bertagnolli

An exhibit was prepared for the Talladega SuperSpeedway, Alabama National Fair, the Southeastern Ag Expo and the Peanut Festival. The exhibit included informational posters, live fire ants, live decapitating flies, and plaster casts of fire ant tunnel systems. Fire ant coloring books and fact sheets on fire ant management were distributed. Our experience in past years has shown that most of the children were fascinated, rather than repelled by the live fire ants. 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 each event by participants of the Alabama Fire Ant Management Project, Extension agents, or Master Gardeners. We made life safer for over 200,000 campers that attended the races at Talladega Superspeedway. In Fall 2005, approximately 10,000-20,000 people visited the speedway exhibit, 8,000-10,000 people visited the fair exhibit, 5,000 visited Ag Expo exhibit, and 5,000-7,000 visited the exhibit at the Peanut Festival. In Summer 2006, a field day at the Chilton Regional Research and Extension Center drew an interested crowd. In Fall 2006, approximately 8,000-10,000 people visited the fair exhibit, 5,000 visited Ag Expo exhibit, and 5,000-7,000 visited the exhibit at the Peanut Festival.

Sustainable fire ant management demonstrations
Coordinated by Kathy Flanders and Fudd Graham

In 2006, 13 Extension agents established a total of 22 bait-based fire ant management demonstrations (Table 1). Results of these are summarized in the attached table and in the reports in the Appendix. Extension agents feature fire ant management in their programming in other ways. Magazine articles and presentations at professional meetings help spread the word about fire ant management. An article by Regional Extension Agent Henry Dorough was published in AFC News, and others are posted at www.aces.edu/dept/fireants. Extension agents used materials developed by the Alabama Fire Ant Management Program to train master gardeners and made presentations to garden clubs, Youth Services programs, Senior Citizens meetings, Boys and Girls Clubs, Alabama Agricultural Experiment Station field days, and Habitat for Humanity volunteers. Twenty Herd seeders were available for use by Alabama stakeholders in 2006, and each one is used more each year. Twenty more seeders were purchased and will be in place by spring 2007.

Fire Ant eXtension
Kathy Flanders

The Alabama Cooperative Extension System is the lead institution in a grant proposal to develop a fire ant eXtension module. Eight members of the eXtension work team attended the fire ant conference, and participated in eXtension work days. One hundred frequently asked questions about fire ants have been answered and are posted on the eXtension FAQ site. Formal launch of

Imported Fire Ant eXtension is scheduled for April 2007. Fifteen Extension Agents and Specialists from the Alabama Cooperative Extension System are participating in this project.

Professional Development Opportunity for Extension agents and graduate students to attend the 2006 Alabama Fire Ant Management Conference n Mobile, AL in 2006.
Kathy Flanders and Fudd Graham

Ten Extension agents and two graduate students were able to attend the fire ant conference. Funding from the Alabama Fire Ant Management Program and the eXtension project was used to leverage additional funds from the Alabama Cooperative Extension System IPM Mini-Grants Program.

Other fire ant education activities:

The Alabama Fire Ant Management Program hosted the 2006 Imported Fire Ant Conference in Mobile, Alabama, in March. Researchers and educators from the Southeast, Texas, New Mexico, California, Taiwan, China, and Australia gathered to share research results and exchange ideas on how to manage fire ants.

Three fire ant slide sets were updated and sent to each county Extension office and each regional Extension agent who helps educate people about fire ant management. The publication, 2006 Fire Ant Control Products for Alabama Homeowners, helps Extension agents and homeowners choose the right fire ant control products for each situation. A regional publication, Broadcast Baits for Fire Ant Management, was published in late 2005. Members of the Alabama Fire Ant Management Program helped revise another regional publication, Managing Imported Fire Ants in Urban Areas, published in August 2006.

Table 1. Fire Ant Demonstrations and other educational activities 2006

Name	Location of demon-stration (County)	Type of site	Size	Time bait applied	Bait(s) used	Owner/contact name	Was data on fire ant control collected?
Mike Davis	Dallas	pasture	5 acres	June	Extinguish and Amdro Pro	Buck Shand	93% control
Mike Davis	Perry	pasture	5 acres	June	Extinguish and Amdro Pro	George Crawford	87% control
Henry Dorough	Talladega	school campus	5 school campuses	June	Esteem	Sylacauga Schools	yes
Henry Dorough	Randolph	cattle pasture	7.8 acres	May	Amdro Pro	Joe Marable	yes, see appendix
Henry Dorough	Calhoun	school campus	3 acres	July	Amdro	Sacred Heart of Jesus Catholic School	no
Henry Dorough	Calhoun	turfgrass	~15 acres	July	Amdro	Sacred Heart of Jesus Catholic Church	no
Chip East	-	nursery, lawn	-	Fall '06	Extinguish	-	no
Gary Gray	Chilton	Fruit, lawn at CREC	~15 acres	June	Extinguish, Esteem	Chilton Research and Extension	Not conclusive due to drought
Tinsley Gregg	St. Clair	homestead	3 acres	May	Extinguish Plus	Ernie Cone	yes, see appendix

Name	Location of demon-stration (County)	Type of site	Size	Time bait applied	Bait(s) used	Owner/c ontact name	Was data on fire ant control collected?
Charles (Chazz) Hesselein	Mobile	Cemetery	4 acres	May	Extinguish , Extinguish Plus, Distance	Magnolia Cemetery /Mark Halseth	yes, see appendix
Jimmy Jones	Henry	Research Station	3 Ac	April	Amdro Pro	WREC	Yes
Jimmy Jones	Henry	First Baptist Church CDC	1 Ac	April, July	Amdro/ Orthene	First Baptist Child Care	No
Jimmy Jones	Houston	festival grounds	75 A	Sept 05 Sept 06	Amdro Pro or Amdro Pro and Extinguish	National Peanut Festival	No
Charles Pinkston	Blount	School Campus	Approxi mately 6 acres	June 14	Extinguish Plus	Hayden Elem School	yes
Dan Porch	Blount	Ornament al nursery	5 ac total 3 ac treated 2 ac or	July14	Extinguish Plus	Roger Jenkins	Yes, see appendix
Dan Porch	Marshall	U-Pick Straw-berry field	4 ac.	July 7	Esteem	Jimmy Witt	Yes, see appendix
Dan Porch	Marshall	Vineyard	-	Nov. 11	Esteem	Wenker Vineyard	No
Dan Porch	Blount	U-Pick Straw-berry	-	Nov. 9	Esteem	-	Yes
Wayne Robinson	Lamar CountyVer non, AL	Horse riding club and hay field	5 acres	June	Extinguish	Clanton Dubose	Yes

Mac Washington	Lamar CountyVernon, AL	City Park and Court House	5 acres	June	Extinguish	City of Vernon & Lamar County	No
Anthony Wiggins & Ken Kelley	Washington	Pasture	10 acres	July	Extinguish & Esteem	Russell Hendrix	Yes, see appendix
Anthony Wiggins	Conecuh	Athletic Field	3 acres	August	Extinguish	Sam Wiggins	No

Extension Presentations

Stan Roark
Regional Extension Agent, Horticulture

Stan conducted the following fire ant workshops. For each group, the presentation included a demonstration of bait application, distribution of fire ant publications and playing of video or DVD, *Fire Ant Control Made Easy*.

Location	Group	Date	# of clients
Russell Co.	Master Gardners	01/31/2006	22
Cleburne Co.	Master Gardners	02/02/2006	21
Lee Co.	Master Gardners	02/03/2006	28
Talladega Co.	Master Gardners	10/12/2006	34
Calhoun Co.	Coosa Valley Youth Services	02/28/2006	26
Calhoun Co.	Coosa Valley Youth Services	05/30/2006	30
Calhoun Co.	Coosa Valley Youth Services	11/07/2006	28
Cleburne Co.	Ranburne Garden Club	04/18/2006	24
Russell Co.	Parks and Recreation Department, Master Gardners, General Public		

Mike Reeves
Urban Regional Extension Agent, Home Grounds, Gardens, and Home Pests

Mike spoke to about 15 groups during the year (mostly garden clubs). Each time he talked about fire ant management and provided them with publications. He felt that each time people came away with a good idea of how to treat for fire ants other than the traditional mound application.

Chip East
Regional Extension Agent, Commercial Horticulture

Chip discussed fire ant management at a nursery tour he conducted in Tallapoosa county in which several nursery owners were present.

Rudy Yates
Regional Extension Agent, Agronomic Crops
&
Kathryn Friday
County Extension Coordinator, Marengo Co.

Rudy and Kathryn conducted a fire ant control and pesticide safety program on May 12, 2006, in the conference room of the Marengo County Health Department in Linden, Alabama (see attached report).

Gary Gray
Regional Extension Agent, Commercial Horticulture

Gary distributed > 500 publications on RIFA IPM at the Chilton Regional Research and Extension Center Farm, Home and Wildlife EXPO, Aug. 2006 (approx. 700 attending). He discussed RIFA IPM with 1250 clientele, in production meetings, newsletters and farm visits from January to August, 2006.

Beef Cattle and Fire Ants Don't Mix

Stanley T. Windham and Amy Thompson Winstead

Fire ants are a significant problem for home owners, athletic fields, and businesses. They are also a big problem for farmers and ranchers. This is particularly true in calving pastures. These are pastures where cattlemen bring mama cows to calve generally in the months of September through January. Calves born in the early to late Autumn are a great risk to fire ant injury when calving in a pasture heavily infested by these insects.

In the summer and fall of 2005 Amy Winstead and I conducted a fire ant demonstration treating a 7.03 acre calving pasture on the Don Bradshaw Farm near Elba, AL. To say this pasture was heavily infested is an understatement. Treatment consisted of Extinguish and Amdro Pro. Then a retreat with Extinguish. In the spring of 2006 I conducted a follow up mound count and there was a kill of 85-90%! This pasture does not even appear to be the same place.

We have presented this data at several beef, dairy, and goat meetings throughout 2006 and the feedback has been very good as to other producers that have tried this treatment. In fact it will be presented again in January 2007 at a forage meeting to be held in Coffee County along with information from Dr. Don Ball.

The one problem according to producers, appears to be justifying the cost of treatment over a large area. However on small areas like calving pastures the cost can be justified. The 7 acre treatment cost was $276.00 (approximately $19 per acre per application).

This study provided us valuable information related to treating calving pastures. Much thanks to Dr. Kathy Flanders, Project Coordinator

Fire Ant Control

Tinsley H. Gregg

The U.S. Department of Agriculture has estimated that the annual cost of problems caused by imported fire ants is $38 million in losses to livestock. Losses occur mainly where ants and vulnerable animals are found together. In some small operations, such as those where profit is not the goal or where the ants' impact is more emotional than economic, the decision to control ants can be subjective. Conversely, the cost of eliminating ants from an entire opertion may not be justified by the economic losses caused by fire ants. The better option may be to identify and treat those areas only where control costs are justified.

By analyzing where imported fire ants are causing problems, managers can determine where economic losses occur.

The estimated cost for treatments using broadcast application of conventionally formulated fire ant bait products, such as hydramethylnon (Amdro Pro), fenoxycarb (Logic or Award*), or methoprene (Extinguish) is $10 per acre. In small operations in heavily infested areas, this treatment cost may be negligible. With the exception of Extinguish, products are generally not approved for all use sites that comprise a cattle operation. In these situations, a better approach to the whole-ranch treatment option is the implementation of more refined, site-specific IPM techniques that can include chemical as well as nonchemical (cultural) methods.
A demonstration was done, to show this, using Extinguish Plus @ 1.5 lb/a broadcast around house and tool shed, etc. (about 3 a.).
A 12 volt "Herd" spreader loaned from Etowah County Extension Office was used on May 2nd, 2006 to spread bait on Ernie Cone's farm in St. Clair County. This little farm is like hundreds of others in N.E. Alabama.
By July 7, 2006 a 70-90% reduction was found by T.H. Gregg, in fire ants. The farmer was very happy about reduced nuisance and damage to equipment.

He intends to use bait at least once per year and has told others of his success.

Fire Ant Control and Pesticide Safety Go Hand-In-Hand

RUDY P. YATES JR and KATHRYN B FRIDAY

Agriculture, the environment and our health can be adversely affected by fire ants. Time and money are spent trying to manage fire ants. Fire ant control usually involves chemical insecticides. Pesticide safety is an important issue when chemicals are involved. Safety measures need to be followed to insure the proper handling of chemicals, to reduce the risk of pesticide poisoning to ourselves and the world around us, and many other issues.

Pesticide safety must start with reading the label, as Kathryn Friday, County Extension Coordinator in Marengo County, is doing here.

The Alabama Cooperative Extension System held a fire ant control and pesticide safety program on May 12, 2006, in the conference room of the Marengo County Health Department in Linden, Alabama. The purpose of the program was to update farmers and homeowners in fire ant management and emphasis the importance of practicing pesticide safety when handling chemicals.

Kathryn Friday, County Extension Coordinator of the Marengo County office, and Rudy Yates, Regional Extension Agent, planned the program. Friday made arrangements for the location and refreshments, advertised the program through her news article and fliers at area businesses, and hosted the program. Yates advertised and presented the program.

Residents from across Marengo County attended the two-hour program. The program started with a test to determine knowledge about fire ant control and pesticide safety. Eighty percent failed the pretest. Following the test, Friday handed out Extension publications on fire ant management, such as ANR-175, "Imported Fire Ants in Lawns, Turf, and Structures", and ANR-175A, "2006 Fire Ant Control Materials for Alabama Homeowners". Yates covered fire ant biology, chemical control measures that were available as well as biological control measures being researched. Following a break, Yates continued the program with pesticide safety. Yates stressed the importance of reading and following the chemical label, using safety equipment, and the storage and disposal of containers. Signs and symptoms of pesticide poisoning, first aid measures, and other pesticide safety measures were covered. During the fire ant and pesticide safety presentations, Yates answered questions from the first test that pertained to each topic. At the conclusion of the pesticide safety presentation, a second test was given to determine knowledge gained. The test results were 100% passing.

Regional Extension Agent Rudy Yates discusses fire ant control and pesticide safety with Marengo County residents.

The program provided clientele with knowledge in managing fire ants and the importance of following pesticide safety measures. Satisfaction in the program was expressed by the clientele attending.

Fire Ant Control in Washington County

Anthony Wiggins, REA, Animal Sciences and Forages

Ken Kelley and I conducted an on farm fire ant control project on Russell Hendrix's farm in Washington County. We treated 10 acres of Mr. Hendrix's pasture with Extinguish (5 acres) and Esteem (5 acres).

Before applying the baits on July 19, 2006, we tried to determine a fire ant population for the area. The area was under a severe drought and very few active fire and mounds were noticeable in the pasture. So, we used hotdogs in test tubes to determine the entire area was heavily infested with fire ants.

Approximately 5 weeks after bait application we monitored the site again and found that both the Extinguish and Esteem treated areas were still heavily infested.

On September 21, 2006, we conducted a fire ant control educational program for the public on Mr. Hendrix's farm and allowed the participants to view the treated areas. Again we used the test tubes to monitor the severity of the fire ants. We were not able to determine exactly how much control we got from the baits, but it was obvious the treated areas were better than the untreated. All of the test tubes in the untreated area filled with fire ants. In the treated areas, approximately 30% of the test tubes had no fire ants with the remaining test tubes having just a few fire ants. Also, we could see no measurable differences between the Extinguish treated areas vs. the Esteem treated areas.

Fire Ants at Talladega
Bringing NASCAR Fans Back Down to Earth

Henry D. Dorough
Regional Extension Agent
Animal Science & Forages
Alabama Cooperative Extension System
Talladega, Alabama

Since their introduction into the United States in the early 1900's, fire ants have been the primary target of many Extension projects. One recent project involved treating for fire ants at the Talladega Superspeedway, NASCAR's fastest track and home of two major NASCAR Nextel Cup races in Talladega, Alabama. Twice each year about 150,000 race fans converge on campgrounds owned by the Talladega Superspeedway. An additional 100,000 fans will arrive on race day and picnic in the day parking areas. Track officials and race fans routinely called the local Extension office to get recommendations for controlling fire ants in the campgrounds at the track. Twice a year, race fans poured into local stores to buy anything that purported to kill fire ants, even resorting at times to illegal methods such as the use of gasoline, diesel fuel and lighter fluid within infested areas.

A visit with track officials revealed that fire ants were the number one complaint from race fans camping on speedway property. Track officials had been giving small bags of Amdro to campers that complained of fire ant problems; a practice that has obvious flaws. Amdro requires two to four weeks to control fire ant populations whereas race fans are only at the track for a maximum of one week for each race. Also, without specific label instructions, intoxicated race fans are hardly likely to apply the bait according to label directions.

After visiting with track officials, a team of Extension personnel along with the Alabama Fire Ant Management Program worked together to develop the largest site-specific demonstration ever conducted in the State of Alabama.

The primary project goals for the team were:

- To educate Talladega Superspeedway employees on proper bait calibration and application techniques.
- To educate race fans on effective fire ant control methods.
- To minimize the environmental impact of race fans killing fire ants on speedway property.

The goals for Talladega Superspeedway officials were:

- To eliminate fire ant complaints from campers in the more expensive campgrounds.
- To eliminate fire ants during race week.

Pre-treatment surveys of speedway property revealed an average fire ant population of 186 mounds per acre. The infield at the track had a population of 243 mounds per acre. From August 1 through 3, 2005, the team equipped 16 John Deere Gators with Herd GT-77 seeders, trained the speedway staff in calibration and spreading techniques and then monitored the spreading of over 2,500 pounds of Extinguish Plus on approximately 1,500 acres of campgrounds owned by the Talladega Superspeedway.

On August 31, 2005, 30 days after the initial treatment, the population was reduced to just 49 mounds per acre. Speedway officials, although impressed with the results, insisted on a zero tolerance for fire ants during race week in October. Therefore, the decision was made to make an additional application of Extinguish Plus to the most expensive campgrounds inside and outside of the track where the greatest fire ant populations existed and where the most camper complaints originate. On September 23, 2005, nine days before the Nextel Cup championship points race, the population was reduced to only nine (9) mounds per acre, an overall 95 percent reduction. The most expensive campgrounds in the infield were practically devoid of fire ants.

During race week, the team surveyed approximately 10 percent of the campers about their experiences with fire ants at Talladega. Fans were asked to rate past and present experiences on a scale of 1 – 10, where 1 was no problem and 10 was an extreme problem. First-time campers rated their present experience at 1.3. Fans camping at Talladega two to four years rated their past experience at 4.1 and their present experience at 1.2. Fans camping five or more years rated their past experience at 6.9 and their present experience at 1.4. The numbers clearly indicate that race fans considered fire ants a serious issue at their campsites in past years and that the treatment with Extinguish Plus greatly improved their overall camping experience.

Fans were asked if they had brought chemicals to control fire ants in their campsite and if so, if they were used since arriving on speedway property. Thirty-nine percent indicated they brought chemicals with them and only 47 percent of those individuals said they actually used the product. In all, 80 percent of the campers used no chemicals to control fire ants in their campsite. Of those who used the chemicals they brought, most said based on past experiences they were in the habit of treating their campsite prior to parking their RV and did so before learning of our project. The list of products brought with the campers included a variety of contact insecticides, baits, aerosols as well as gasoline, diesel fuel and lighter fluid.

Fans were also asked if they had fire ants where they lived and if so, how they controlled fire ants within and outside their homes. Sixty-seven percent said they lived in a fire ant infested area. The rest resided outside areas of the U.S. where fire ants have invaded. For those with fire ants at home, most said the same methods used at the Talladega Superspeedway were used at home while some indicated they used pest control operators to treat their personal property. When asked to rate the effectiveness of the treatments they used, the results were the same for treatments on speedway property and at home. Using the same scale of 1 – 10, fans rated their control methods an average of 5.7. Contact insecticides rated 5.2 and baits rated 6.2.

On an interesting note, the fans surveyed represented 24 states including: Alabama, Arizona, Arkansas, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, South Carolina, Tennessee, Texas and Virginia.

In addition to the surveys, race fans were educated about the method of fire ant control used at Talladega. Literature was handed out giving details of the Talladega project, results and information on controlling fire ants at home with a bait product using the two-step method. Several local newspapers assisted with the educational effort by publishing articles on the project's results. Signs also were posted throughout the speedway property to inform fans about the project.

Seven months after the initial treatment, control of fire ants at the speedway remained at 95 percent. During the spring race in April 2006 there were no complaints registered with track officials by campers on speedway property. A one year survey of fire ant populations at the Talladega Superspeedway is planned and the results will be added to this report at that time.

In summary, the project was a tremendous success. All of the project goals were met. Talladega Superspeedway employees learned the proper methods for controlling fire ants using a bait product, race fans were educated about fire ants and their control and Talladega Superspeedway property was protected from the tremendous volume of chemicals normally used to control fire ants during race week twice each year. The project was highly successful not only for its effect in controlling fire ants but through its use of environmentally sound and sustainable methods. It is a success not only reflected by the survey but by the positive comments of race fans who, by becoming better informed about effective fire ant control methods, were less inclined to resort to harsh and, in many cases, largely ineffective control measures.

Fire Ant Demonstrations in U-Pick Operations, Nursery and Vineyard

Dan Porch, REA Commercial Horticulture

U-Pick Strawberry field in Marshall County treated with Esteem at 1.5 # / ac. Rate on July 7, 2006. Field had been disc for 1 month in prep for laying plastic. Most ants on perimeter but some visually in field. Two samples pulled, one on north end, one in middle. Samples were ¼ ac dia., used hot dog tubes, out for 20 min. Caught 221 in N sample and 880 in M sample, used 15 tubes in both settings. Trapping area included ½ of disc field and ½ of dia in grass area on perimeter. Temps. About 88 F, field treated at 6:00 p.m.

Field retreated on Nov. 10. Some fire ant activity observed around mounds but not as active as in July, as would be expected. Temps in upper 60's to 70 degrees on 11/9 & 11/10. I wasn't able to re-apply baits and take counts in October as planned because of wet and damp conditions. Most rainfall in October in last 12 years.

I do not consider this work finished. I will do hot dog traps again on or about May 1, 2007 and pull samples from N end, Middle , as well as a couple from grassed areas away from treated area for comparison.

U-Pick strawberry field in Blount County treated with Esteem at 1.5 # ac. Rate on Nov. 9. Temps in upper 60's to low 70's. Strawberries planted on about Oct. 5. Fire ant activity visually noted on perimeter of field, none in the field. Hot dog traps utilized, out for 35 minutes, one sample pulled, caught 135 ants with 15 tubes. Trapped area was 50% in field and 50% on perimeter grassed area1/4 ac in size

Counts will be taken on or about May 1, 2007 to evaluate effectiveness of treatment, trying to get bait applied after planting and before cold weather was more difficult than expected due to rainfall in Oct.

Fire Ant Demonstration at Circle J Nursery in Blount County
Extinguish Plus applied to nursery and greenhouse area at 1.5 lb. ac. rate on 7/14/2006. Hot dog tubes utilized in grass area, ¼ acre. Area, caught 920 ants in 35 minutes. Temp 98 degrees, sampled at 6:00 p.m. bait applied immediately after.

Area re-treated on Nov. 9, 2006, temps in upper 60's. Hot dog tubes out, caught no active ants, but did find one mound in the area that had some activity. I plan to evaluate with hot dog traps on May. 1 2007. Grower fairly satisfies with work and product to date. I plan to keep working with this individual on his ant control with the Extinguish product in '07. I don't consider this work finished yet.

Fire Ant work at Wenker Vineyard in Marshall Co
Esteem applied at 1.5 lb ac rate to muscadine vineyard on Nov. 10, 2006. No traps set or counts taken. Some ant activity visually observed on or close to mounds. I plan to continue to work at this vineyard site in '07. Grower very interested in treatment and methods used.

All bait applied using a Herd spreader mounted on Yamaha ATV.

What Fire Ant Problem

Henry Dorough
Regional Extension Agent
Animal Science & Forages
East Alabama, Piedmont Region

Since their introduction in Mobile, AL in the early 1900's imported fire ants have become the scourge of the southland. The sting of fire ants is painful and can cause allergic reactions and even death of livestock and humans. Two species of imported fire ants were introduced into the United States from South America in the early 1900's. The black imported fire ant, Solenopsis richteri and the red imported fire ant, Solenopsis invicta, have interbred and produced a hybrid that lives in much of northern Alabama. Most fire ants in Alabama live in highly territorial single-queen colonies which may produce on average about 40 mounds per acre, however, in some portions of Alabama fire ants live in multiple-queen colonies which are more tolerant of each other and may produce in excess of 200 or even 300 mounds per acre.

In 2003, the USDA estimated production losses to exceed $38 million in livestock operations. However, many livestock producers do not attempt to control fire ants because of a perceived high cost and low effectiveness of treatment options. To the contrary, effective and economical control of fire ants in pastures and hayfields is very easy to achieve. In fact, a once per year treatment can reduce fire ant populations by as much as 90% and maintain that level of control for less than $6 per acre. For some producers, one treatment every other year may be plausible.

Oak Valley Farms in Munford, AL is a purebred Angus cattle operation that had a serious fire ant problem. A survey of pastures on the farm found an average of 236 live mounds per acre. It is easy to assume that such a fire ant population could disrupt cattle grazing and cause problems during the calving season and that immediate control of fire ants was necessary. With a State Beef Check-off grant from the Alabama Cattlemen's Association, I set up a demonstration to evaluate the effectiveness and economics of treating cattle pastures with a fire ant bait product.

Using a Herd GT-77 seeder calibrated to spread 1.5 pounds of bait per acre, a 50/50 blend of Amdro Pro® and Extinguish® fire ant bait was applied to approximately 12 acres using a skip-swath method. An adjacent twelve acres were not treated for comparison.

The seeder is equipped with a restrictor-plate that allows easy calibration of any bait product and will spread bait in a 20-foot swath. It is a well know fact that fire ants will forage over 100 feet from the mound for food, therefore, it makes sense that not every square foot of pasture needs to be treated. The skip-swath method (Fig. 1) simply leaves every other swath untreated allowing producers to cover more acres with one bag of bait thus reducing the cost of application.

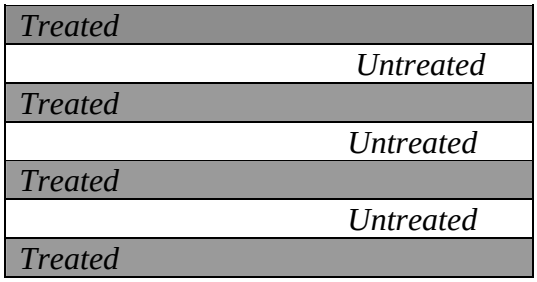


Fig. 1: Illustrates the skip-swath method for treating pastures & hayfields with a fire ant bait.

The 50/50 bait blend was applied on June 17, 2005. Four sampling plots were established within each of the treated and untreated areas. At the time of application, the treated and untreated areas had an average of 239 and 234 mounds per acre, respectively. In November, evaluation of the project revealed an overall 90% reduction of fire ant mounds in the treatment area while the untreated area had a 5% increase (Fig. 2). On April 28, 2006, 10 months after treatment, the fire ant population had fallen slightly in the treated area to 20 mounds per acre while the untreated area remained relatively unchanged at 235 mounds per acre.

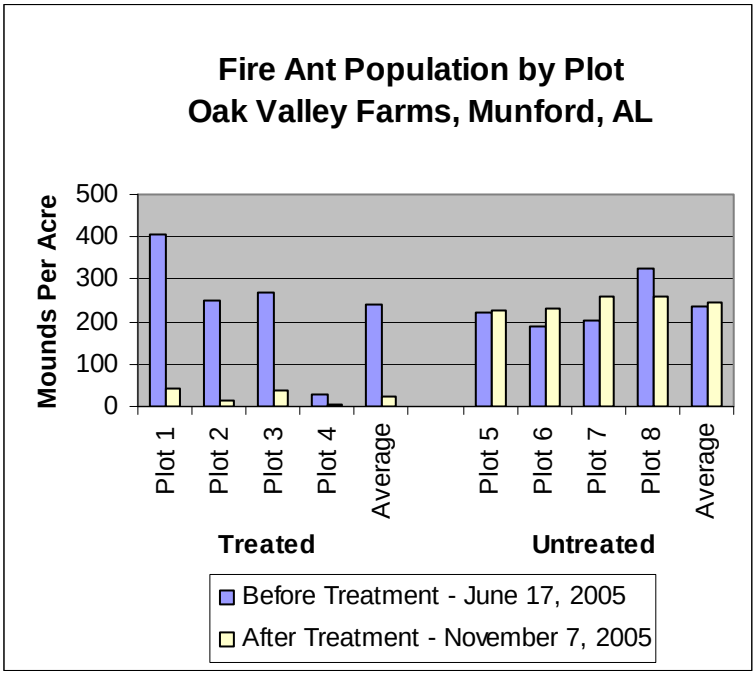


Fig. 2: Fire ant population by plot. Average number of mounds per acre in the treated area decreased from 239 to 24, while in the untreated area the average increased from 234 to 245 mounds per acre.

The cost of this application was $5.94 per acre. This is pretty cheap by most standards, especially for a farm heavily infested with fire ants as was Oak Valley Farms. My best

recommendation is to treat your pastures once a year, every year with a bait product using the skip-swath method; however, some farms may get by with one treatment every other year.

One question you need to ask yourself is "How many fire ant mounds can I live with?" We cannot eradicate fire ants from our pastures because new queens will reinfest the area during the warmer months if conditions are favorable. Single-queen colonies of fire ants are very territorial and will kill all new queens entering their territory as long as their queen is alive. So, it is to our advantage to tolerate a few mounds per acre to take advantage of that natural control. As long as the fire ant population is below your tolerance level, there will be no need to treat. But one thing is for sure, you will have to treat again at some point to maintain the population at an acceptable level.

The big question is "What bait should I use?" There are only a few baits labeled for use in cattle pastures and hayfields (Fig. 3) and they basically work in one of two ways. Insecticide-based baits kill the queen, immatures, and adult fire ant workers and typically control the colony in 2 – 4 weeks. These are considered "fast-acting" baits. Insect Growth Regulator-based baits (IGR) prevent new fire ants from developing and can take as long as 4 – 12 weeks for complete control of a colony. IGR-based baits allow you to take advantage of the territorial nature of fire ants and minimize reinfestation because the queen does not die; the colony slowly disappears as the workers die-off naturally and no new workers develop. Ultimately, the queen dies when there are no workers left to take care of her.

Tradename	Active Ingredient	Rate	Timeline
Insecticide-based Baits			
Amdro Pro	hydramethylnon	1 – 1.5 lbs/acre	2 – 4 weeks
Siege Pro	hydramethylnon	1 – 1.5 lbs/acre	2 – 4 weeks
IGR-based Baits			
Extinguish	s-methoprene	1 – 1.5 lbs/acre	8 – 12 weeks
Esteem	pyriproxyfen	1.5 – 2 lbs/acre	4 – 8 weeks

Fig.3: Fire ant bait products currently labeled for use in cattle pastures and hayfields.

As a result of this project it is easy to see that effective and economical control of fire ants is easy to achieve and can have a beneficial affect to your operation. If you are interested in treating your property you can do so easily by using one of 21 Herd GT-77 spreaders located at several Extension offices in Alabama. Contact your local county Extension office or your Regional Extension Animal Science Agent to schedule the use of one of the spreaders free of charge. For additional information about management of fire ants on your farm visit your local Extension office or check us out on-line at www.aces.edu and look for our publication ANR-1248 Management of Imported Fire Ants in Cattle Production Systems.

Fire Ant Demonstration at Magnolia Cemetery in Mobile County

Chazz Hesselein, Regional Extension Agent, Commercial Horticulture

I treated my plots at the Magnolia Cemetery in Mobile, AL on May 4, 2006. This year I treated all plots with 1.5 lb/acre formulated bait. I also added a Distance Fire Ant Bait treatment. There were a total of four treatments, Extinguish, Extinguish Plus, Distance Fire Ant Bait and an untreated control. All treatments were replicated twice. The Extinguish and Extinguish Plus treated plots had been treated once in 2005 on 7/19/05 with 1 lb and 1.5 lb/ acre respectively. The Distance Fire Ant Bait (which I got from Valent) smelled sour and I believe it was rancid which may explain why it didn't lower fire ant populations. I was happy to see that the hot dog trick during the dry weather we had this summer corroborated the mound data both in terms of average number of ants collected and number of vials that contained ants.

Mean Number of Active Mounds per Plot

	Rate	3-Mar	4-May	15-Jun	1-Aug	1-Nov
Untreated Control		23.5	39.0	7.5	9.5	35.5
Extinguish	1.5 lb/ acre	8.5	11.0	1.5	1.5	11.5
Extinguish Plus	1.5 lb/ acre	11.5	12.0	1.0	2.0	12.0
Distance Fire Ant Bait	1.5 lb/ acre	29.5	33.5	--	8.5	31.5

Mean Number of Fire Ants Collected in Hot Dog Baited Vials on 7/5/2006

Treatment	Rate	Ants
Untreated Control		74.0
Extinguish	1.5 lb/ acre	11.5
Extinguish Plus	1.5 lb/ acre	11.1
Distance Fire Ant Bait	1.5 lb/ acre	66.9

Mean Number of Hot Dog Baited Vials Containing Fire Ants on 7/5/2006

Treatment	Rate	Vials
Untreated Control		18
Extinguish	1.5 lb/ acre	8
Extinguish Plus	1.5 lb/ acre	8
Distance Fire Ant Bait	1.5 lb/ acre	16

x

Beef Cattle and Fire Ants Don't Mix

Henry Dorough
Regional Extension Agent
Animal Science & Forages
East Alabama, Piedmont Region

In an effort to educate landowners about the proper treatment methods for imported fire ants and to encourage them to treat large parcels of land with fire ant bait products, the Alabama Fire Ant Management Program has placed 21 Herd GT-77 seeders at various Extension offices across Alabama (See attached map). These seeders are capable of spreading fire ant bait at recommended label rates of one to one and one half pounds per acre and can be attached to almost any vehicle for field applications. The seeder is equipped with a restrictor-plate that allows easy calibration of any bait product. The seeders are available for any citizen of the State of Alabama to use in order to correctly apply fire ant bait products on their property. Partial funding for the seeders came from a grant from the USDA Federal Crop Insurance Corporation.

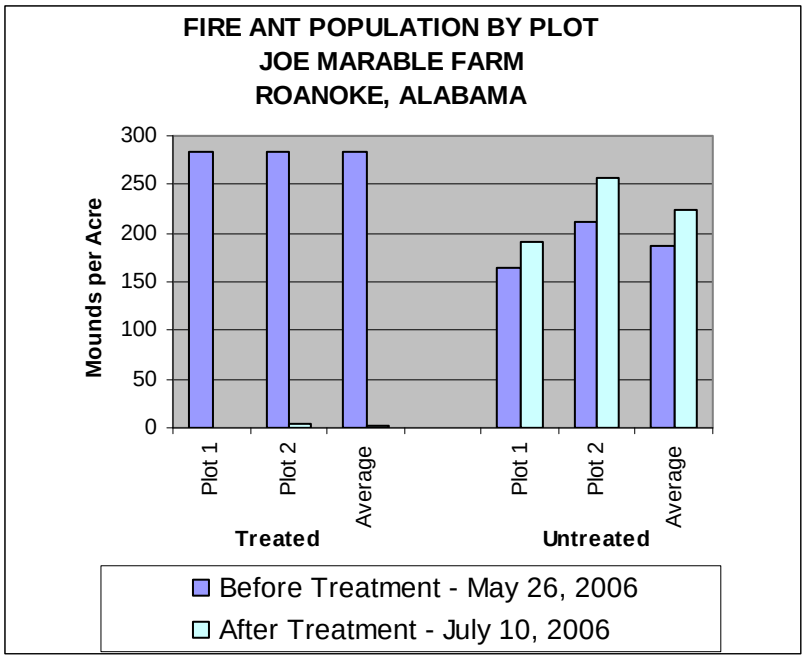
One such seeder was placed in Randolph County. However, after two years it had remained unused and in its original box. Using a small grant from the Alabama Fire Ant Management Program and with the help of the Randolph County Cattlemen's Association, I set up a demonstration in an effort to educate the cattle producers of Randolph County and to encourage the use of the spreader.

The site of this demonstration was a commercial cattle operation owned by Mr. Joe Marable of Roanoke, AL. A survey of the pastures selected for this demonstration found an average of 236 live mounds per acre. Mound densities of this magnitude usually indicate the presence of polygyne, or multiple-queen colonies. Polygyne colonies are much less territorial than single-queen colonies, live very close together and may also share some resources.

Using a Herd GT-77 seeder calibrated to spread 1.5 pounds of bait per acre, Amdro Pro® fire ant bait was applied to a 7.8 acre pasture on May 26, 2006. An adjacent pasture was not treated for comparison.

.....

Two sampling plots were established within each of the treated and untreated areas. At the time of application, the treated and untreated areas had an average of 284 and 188 mounds per acre, respectively. Five weeks after the application, an evaluation of the project revealed a 99% reduction of fire ant mounds in the treatment area while the untreated area had a 19% increase (Fig. 1).



..... Fig. 1: Fire ant population by plot. Average number of ..... mounds per acre in the treated area decreased from 284 to 2, while in the untreated area the average increased from 188 to 224 mounds per acre.

The cost of this application was $10.80 per acre. This cost could be reduced to as low as $6.00 per acre using the skip-swath method of application where every other 20-foot swath is left untreated allowing more acreage to be treated with one 25-pound bag of bait. Fire ants will forage over 100 feet from the mound for food so it makes sense that not every square foot of pasture needs to be treated.

In 2003, the USDA estimated production losses to exceed $38 million in livestock operations. Therefore, whether your cost is $11 or $6 per acre, the expense of treating a pasture as heavily infested as this demonstration site is relatively cheap when considering cattle production losses associated with the presence of fire ants.

There are four commercial bait products labeled for the control of fire ants in cattle pastures and hayfields (Fig. 2) and they basically work in one of two ways. Insecticide-based baits kill the queen, immatures, and adult fire ant workers and typically control the colony in 2 – 4 weeks. These are considered “fast-acting” baits. Amdro Pro® and Siege Pro® fall into this category.

Insect Growth Regulator-based baits (IGR) prevent new fire ants from developing and can take as long as 4 – 12 weeks for complete control of a colony. IGR-based baits allow you to take advantage of the territorial nature of fire ants and minimize reinfestation because the queen does not die; the colony slowly disappears as the workers die-off naturally and no new

workers develop. Ultimately, the queen dies when there are no workers left to take care of her. Extinguish® and Esteem® are IGR-based bait products.

Tradename	Active Ingredient	Rate	Timeline
Insecticide-based Baits			
Amdro Pro	hydramethylnon	1 – 1.5 lbs/acre	2 – 4 weeks
Siege Pro	hydramethylnon	1 – 1.5 lbs/acre	2 – 4 weeks
IGR-based Baits			
Extinguish	s-methoprene	1 – 1.5 lbs/acre	8 – 12 weeks
Esteem	pyriproxyfen	1.5 – 2 lbs/acre	4 – 8 weeks

Fig. 2: Fire ant bait products currently labeled for use in cattle pastures and hayfields.

Two things to consider when choosing between Insecticidal baits or IGR's are the number of fire ant mounds you can live with and how often you want to treat your fields. We cannot eradicate fire ants from our pastures because new queens will reinfest the area during the warmer months if conditions are favorable. Single-queen colonies of fire ants are very territorial and will kill all new queens entering their territory as long as their queen is alive. So, it is to our advantage to tolerate a few mounds per acre to take advantage of that natural control. However, this is not the case with a polygyne infestation. But, as long as the fire ant population is below your tolerance level, there will be no need to treat. You will have to treat again at some point to maintain the population at an acceptable level.

Products like Amdro Pro® work very well as illustrated in this demonstration, however, because of the relatively quick kill, reinfestation will likely occur several months after treatment. This is especially true if multiple-queen colonies are present. However, the population should remain well below the pre-treatment level. As long as you are treating your property for fire ants using the correct equipment and procedures you will notice an obvious decrease in fire ant activity. This reduction in fire ant population can be maintained at an acceptable level with only one bait application per year. For some farms, one treatment every other year may be adequate.

As a result of this project it is easy to see that effective and economical fire ant control is easy to achieve and can have a beneficial effect on your operation. If you are interested in treating your property you can do so easily by using one of the Herd GT-77 spreaders located in Extension offices across Alabama. Contact your local county Extension office or your Regional Extension Animal Science Agent to schedule the use of one of the spreaders free of charge. For additional information about management of fire ants on your farm visit your local Extension office or check us out online at www.aces.edu and look for our publication ANR-1248 Management of Imported Fire Ants in Cattle Production Systems.

Energetics of Foraging and Load Carriage of Mono- and Polygyne forms of the Red Imported Fire Ant, *Solenopsis invicta* Buren

Research results.

We investigated the effects of artificial loads on the energetics and foraging of the red importefd fire ant, *Solenopsis invicta* Buren. Small weights consisting of lengths of thin copper wire were threaded around the petiole (area between the thorax and abdomen) or between the legs of individual fire ants. In general, ants can successfully carry weights of more than 100 times their body weight with little effects on energy consumption. Heavier masses tended to reduce the speed that ants could travel, but all ants could move at least 1 meter with all but the heaviest weights. There was no difference between the relative range of weights that mono and polygyne ants could carry. These results indicate that red imported fire ants are capable of carrying very heavy loads relative to their body size. Therefore, insecticidal baits that have been formulated as extremely light particles could be formulated as heavier granules. Heavier granules could increase the possibilities for use of sufficient quantities of heavier insecticides including natural oils that would increase the choice of products for pest control professionals.

Leveraged funds.

Our research with foraging energetics and insecticidal baits has resulted in approximately $15,000 of grant and gift funds for fire ant related research. This research has also resulted in a peer review publication:

Appel, A. G., M. J. Eva, and S. R. Sims. 2005. Toxicity of granular ant bait formulations against cockroaches (Dictyoptera: Blattellidae and Blattidae). Sociobiology. 46: 65-72.

Effect of Fire Ants in Highly Diverse Arthropod Communities

Micky D. Eubanks

The red imported fire ant, *Solenopsis invicta*, is an abundant, voracious, generalist predator in many habitats. We studied the effects of fire ants in early successional plant communities or 'old fields' that contain many species of plants and a species-rich, highly diverse arthropod community. We found that fire ants dramatically suppressed the abundance of half the arthropod species. For example, grasshoppers and spiders were four times more abundant in fire ant suppressed plots than in control plots with high densities of fire ants. In contrast, some arthropods were positively affected by fire ants. For example, aphids were 2.5 times more abundant in plots with high densities of fire ants than in plots with suppressed densities of fire ants, mainly due to fire ant 'tending' of aphids in exchange for 'honeydew'. Likewise, spittlebugs were seven times more abundant in plots with high densities of fire ants than in plots with low densities of fire ants. Fire ants did not directly increase the abundance of spittlebugs, but rather fire ants indirectly increased their abundance through the suppression of spiders, forming a comensalistic relationship.

Nutritional Ecology and Response of Phorid Flies to Fire Ant Odor

Henry Y. Fadamiro and Lawrence "Fudd" Graham

OBJECTIVES

1) Examine the suitability of naturally occurring sugar sources (e.g., nectar and honeydew) as potential food supplements for *Pseudacteon. tricuspis* in the field.
2) Determine the life history strategy of *P. tricuspis*.
3) Investigate the behavioral responses of *P. tricuspis* to fire ant host-related odors.

PROGRESS REPORT AND ACCOMPLISHMENTS

1. We examined the effects of cotton aphid honeydew and buckwheat floral nectar on the lifespan and body carbohydrate nutrient levels of the phorid fly, *P. tricuspis*. Compared to flies provided water only, cotton aphid honeydew significantly increased longevity of female and male *P. tricuspis* with significant increases in the body levels of fructose, total sugars, and glycogen. *Pseudacteon tricuspis* flies were also observed foraging on buckwheat flowers (Fadamiro and Chen, 2005). These results suggest that conservation of naturally occurring sugar sources in the field, including exposed sugar sources such as honeydew, may promote *P. tricuspis* lifespan and possibly, its impact as a biological control agent against imported fire ants, *Solenopsis* spp. (Hymenoptera: Formicidae). Future studies will investigate the mechanisms behind the observed reduced suitability of buckwheat nectar as a food source for *P. tricuspis*.

2. We also evaluated the effects of several environmental and physiological factors on the lifespan of *P. tricuspis*. Our results showed that temperature and food availability were the two major factors influencing adult longevity. In general, sugar feeding increased longevity by a factor of 2-3. Longevity was inversely related to temperature. The greatest mean longevity (~ 15 days) was recorded for sugar-fed flies kept 20ºC, compared to mean longevity of 7 days recorded at 33ºC, suggesting that adult *P. tricuspis* is sensitive to high temperatures. These results suggest that availability of adult food sources and suitable microclimate are important factors that could potentially influence the survival, establishment, distribution, and overall impact of *P. tricuspis* released in different parts of southern United States for biological control of imported fire ants. These results have been recently published (Chen and Fadamiro, 2006).

3. We have started a study to demonstrate the possible use of fire ant odor as cues for host location by *P. tricuspis*. We tested the behavioral responses of *P. tricuspis* of

different sex and mating status to several fire ant host-related odor stimuli including live fire ant workers, extracts of worker whole body, head, thorax, and abdomen, and (*E*, *E*)-α-farnesene, a trail pheromone component of *Solenopsis* fire ants. Our results demonstrated the attraction of mated female *P. tricuspis* to live *S. invicta* workers. In addition, extracts of *S. invicta* worker whole body and thorax elicited strong behavioral response in females (mated and unmated) and mated males, but not in unmated males. *Pseudacteon tricuspis* did not show significant attraction to extracts of *S. invicta* worker head and abdomen, or to (*E*, *E*)-α-farnesene, irrespective of sex and mating status. These results suggest that fire ant thorax is likely the source of attractants used as host location cues by *P. tricuspis*.

Assessment of Fire Ant Control Technologies on Pest Control Industry in Alabama

Xing Ping Hu

Our previous 2005-2006 project results indicate that Pest Control Professionals are the main force for providing effective fire ant control service in urban areas in Alabama. A survey conducted by Alabama Cooperative Extension System in 2004/05 revealed that the majority of residents in urban environments rely on our professionals for their fire ant problems. The **objective of our 2005/06 project** was to access the knowledge level of Pest Control Professionals, who are fighting the frontline in the battle with fire ants, on fire ant management technologies and appropriate use of these technologies. The purpose of the study is to determine whether our technicians need to be educated on control technologies and what kind of scientific knowledge they need.

Results

During the years of 2005/06, 322 Pest Control Professionals were surveyed with a response rate of 82%.

1. The majority of the participated technicians knew the appropriate application of products and were capable of making the right decisions (**Figure 1**).

Significantly more professionals (81%) were knowledgeable of not applying baits just before rain. The majority of professionals (70%) knew that fire ant mounts should not be disturbed before treatment. However, only about half the professionals (53%) considered broadcasting albeit there are not too many mounts visible.

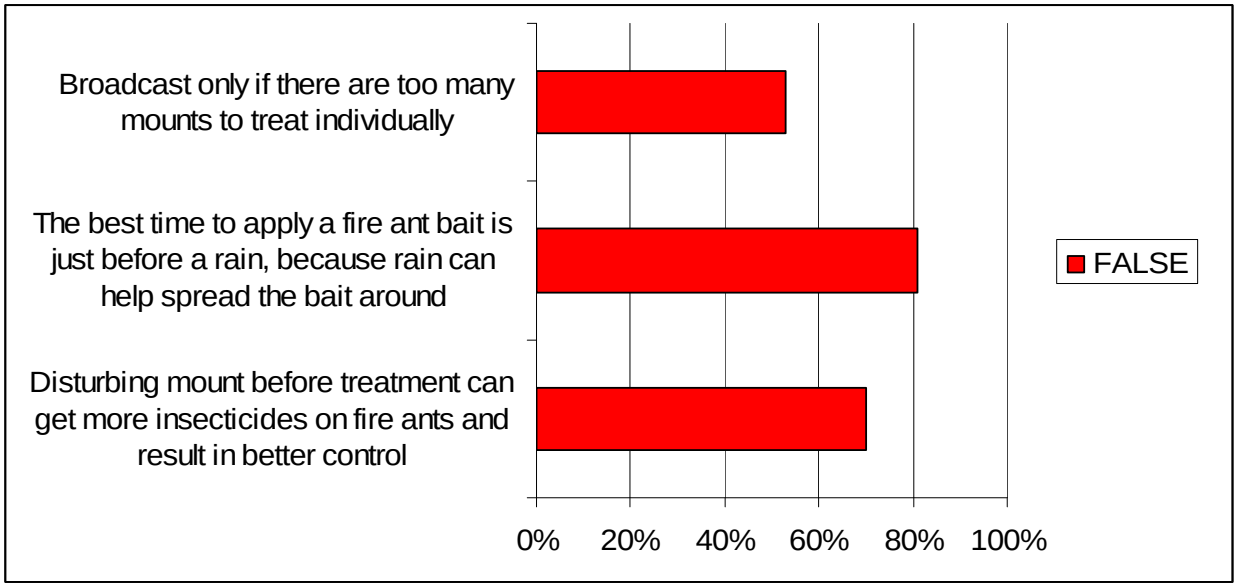


Figure 1. Percentage of correct answer to the questionnaires

2. Although most technicians used baits, only 17% of them understood how a bait containing Insect Growth Regulator works (Figure 2)

Only 17% of the surveyed professionals had a clear understanding of how insect growth regulator products work.

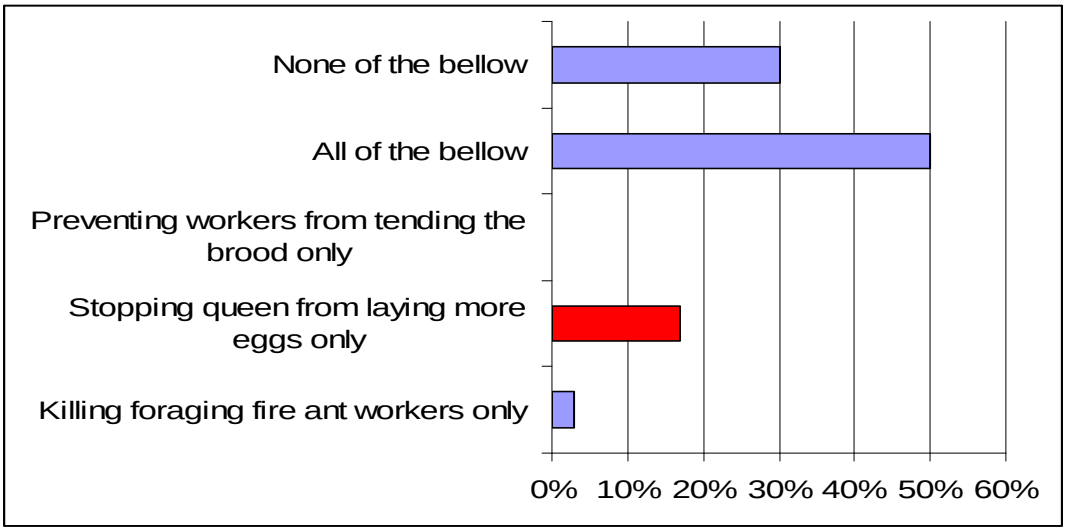


Figure 2. **= correct answer** **= incorrect answer**

3. Baits and granular are the two popular product formulas (Table 3)

There were 73% of participants preferred using baits and granular product to other formulas, 22% in favor of liquid products, and only 5% in favor of dust. A preliminary survey

3 years ago had less than 30% professionals in favor of baits or granular. This dramatic change in favorable product formulate shows a positive adoption of new technologies by our industry.

We asked about the reasons of their favor in different product formulas. 70% liked baits because “baits provide longer control” and 15% believed “baits are cost effective”.

Of those who preferred the use of granular, 40% considered “they kill fire ant fast” and 35% thought “they provide longer control”. Other given reasons included “homeowners like it” and “easy to use”.

Of those listed liquid products as their first choice, “kill fast” and “cost effective” are the main reasons.

Discussion

Knowledge levels derived from specific survey questions indicate that the majority of the participants were knowledgeable of appropriate use of fire ant control technologies, and were capable of making the right decisions in fire ant control. However, there are still more than 30% participants who lack of the needed knowledge. Therefore, there is an urgent need to launch an extension educational fire ant control program targeting the professionals, considering they are the main force in managing fire ant in Alabama.

To improve the effectiveness of such an education and Outreach Program and to convince professionals the appropriate fire ant management strategies, two research projects must be conducted to gain the first-hand information. One is to access the impacts of mount disturbance vs. no disturbance before applying control products. Another is to elucidate the effectiveness of broadcast vs. individual mount treatment.

Expression of Arginine Kinase Gene in the Red Imported Fire Ant, *Solenopsis invicta* Buren

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* Buren. With a great effort to identify genes that are differentially expressed between larvae and adults, queens and workers, female alates (winged) and queens (wingless) of the fire ant, in the current study, we isolated the first arginine kinase gene from the red imported fire ant. Full-length of arginine kinase gene has been clone and sequenced. The expression of this gene is developmentally, caste specifically and tissue specifically regulated in the fire ant. Arginine kinase is a primary enzyme participating in cell metabolism and ATP-consuming processes, plays an important role in cellular energy metabolism, and maintains constant ATP levels in insect cells.

Cloning and sequencing of the arginine kinase gene The full length of the arginine kinase *gene* was obtained using 3'- and 5'-RACE. The putative protein sequence shared 89% identity with *Apis mellifera* arginine kinase. The substrate recognition region (GS region) of arginine kinase, composed of Ser^{63}, Gly^{64}, Val^{65}, and Tyr^{68}, has been identified. The arginine kinase protein binding signature, CPT NLGT, is present at amino acid residues 270-276 (Fig. 1).

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A          V          L          D          K          L          E          F
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H                        P                              P                        K
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L                  V                    W                    C                    N
GAGGAAGATCATCTTCGTATCATCTCTATGCAGATGGGTGGTGATCTTGGACAGGTATACCGGCGTTTGGTGACGGCGGTGAA
CGAGATC   E  E  D  H  L  R  I  I  S  M  Q  M  G  G  D  L  G  Q  V  Y  R  R  L  V  T
A                  V                    N                    E                    I
GAAAAACGGCTGCCGTTCTCGCACAACGATCGCTTCGGCTTCCTGACGTTCTGCCCGACGAATCTGGGTACGACAGTGCGCGC
CTCAGTG   E  K  R  L  P  F  S  H  N  D  R  F  G  F  L  T  F  C  P  T  N  L  G  T  T
V                  R                    A                    S                    V
CACATCAAAGTGCCGAAACTCGCGGCGAACATGGCCAAGCTTGAGGAGGTCGCGGCCAAATACAATCTGCAAGTGCGTGGCAC
CCGCGGC   H  I  K  V  P  K  L  A  A  N  M  A  K  L  E  E  V  A  A  K  Y  N  L  Q  V
R                  G                    T                    R                    G
GAACACACTGAGGCTGAAGGCGGCATCTATGACATCTCTAACAAACGCCGTCTCGGCCTGACTGAGTTCCAGGCTGTGAAGGA
GATGTAC E  H  T  E  A  E  G  G  I  Y  D  I  S  N  K  R  R  L  G  L  T  E  F  Q  A
V                  K                    E                    M                    Y
GACGGCATCGCTGAGCTCATCAAAATCGAAGCCAGCCTCTAAACCCGCCCCCTCCTCCCGACACACCTCGTATTCGTTTACTC
TCCATCG     D    G    I    A    E    L    I    K    I    E    A    S    L    *    355
TAGCCCCGTCGGACGCCACTGTATTACGTGACGTCACGCTGGAAGCTGTGTCTACGGCGTAAGAATTTTATTCTGAGAACAAA
TCGCAAG
AACATGATTTAAAGAGAATCGTTCAATGACGATCTACGCCTGTGGGCATCGAGCTTGTCAGCCATTTTTTCGCGTTACCCATA
TATATAT
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Fig. 1. The cDNA and deduced amino acid sequences of the arginine kinase gene in the red imported fire ant. The substrate recognition region of arginine kinase is indicated in black. The arginine kinase protein binding signature is underlined.

Expression analysis of the arginine kinase gene in different castes and developmental stages The molecular basis underlying insect polyphenism is differential gene expression. We investigated the expression profile of arginine kinase mRNAs between different castes and among different developmental stages of fire ants. Northern blot analysis indicated that levels of arginine kinase mRNA were readily detectable in 3rd+4th instars, worker pupae, and alate (mixed sex) pupae; increased in male alates (3.7-fold) and the female alates (6.8-fold); and

rose to a maximum in workers (Fig. 2). The caste-specific expression of the arginine kinase gene suggests the different demand for energy-consumption and production in the different castes of the red imported fire ant.

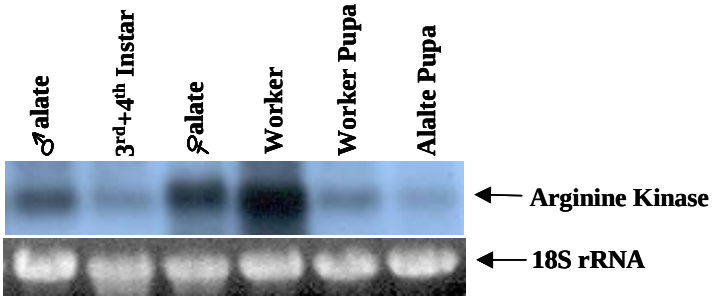

Figure 2. Expression analysis of the arginine kinase gene for different life stages and castes of red imported fire ants.

Expression analysis of the arginine kinase gene in different tissues To investigate whether arginine kinase gene expression was tissue specific, mRNAs from the head, thorax, and abdomen of worker, male alate and female alate were subjected to Northern blots. Results indicated that in the the female alate, the expression of arginine kinase mRNA was very low in abdomen, increased in thorax, and reached a maximum in head (Fig. 3). In worker, the expression of arginine kinase mRNA was very high in both thorax and head and very lowin abdomen. Whereas, in male alate, arginine kinase mRNA was very low in all three tissues tested. This result strongly suggests that head and thorax in worker and head in female alate are the specific tissues where arginine kinase provides as a buffer system for high-energy phosphate to maintain ATP homeostasis.

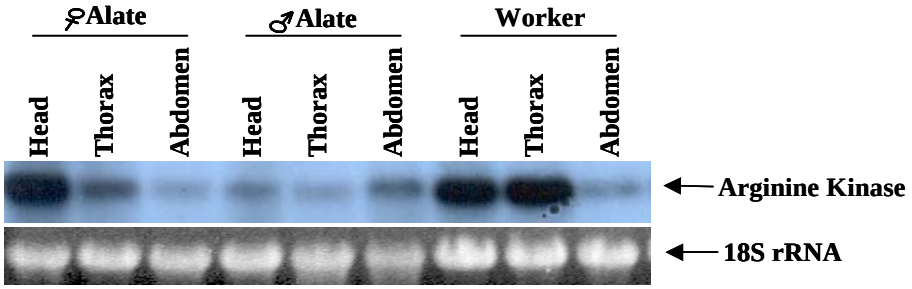

Figure 3. Expression analyses of the arginine kinase gene in head, thorax, and abdomen of red imported fire ants.

Impact Our study is expected to contribute conceptually, methodologically and materially toward designing future experiments, such functional studies on the roles of the arginine kinase gene in fire ants, by knocking out the gene using the double-stranded RNA-mediated interference technique.