





















PROGRESS REPORT FY 2005

THE ALABAMA FIRE ANT MANAGEMENT PROGRAM *... making fire ants easier to live with*

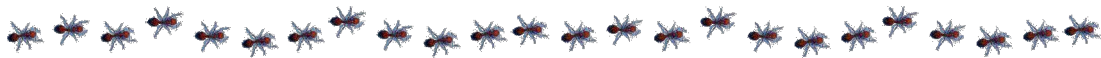


Edited by L.C. "Fudd" Graham and Vicky Bertagnolli

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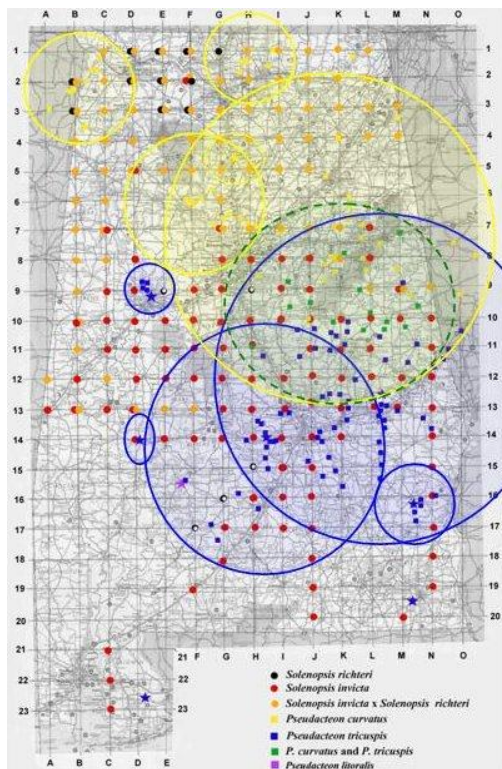
FY2005 in Review



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.*

Probably the only people in Alabama that have not tangled with fire ants are visitors that have not set foot on Alabama soil. We say that because fire ants are literally EVERYWHERE. They are in our homes, at our businesses, in our lawns and landscaping, in recreation areas, at our farms and in farm equipment... *everywhere.*

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.



There are over 20 species of phorid or decapitating fly, a natural enemy of the fire ant, in South America. **Three species of phorid fly have been introduced into fire ant populations in 14 Alabama counties.** 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. **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.** The third species, *Pseudacteon littoralis*, has yet to be recovered in the field.

Education and outreach are important components of our program. **Our fire ant educational exhibit reached hundreds of children and adults at the Alabama National Fair, the National Peanut Festival, Ag Roundup, the College of Ag's Farmer's Markets, the**

Southeastern Agricultural Exposition, the Louise Kreher Forest Ecology Preserve, Donald E. Davis Arboretum, and various other functions, field days, and youth days.

Demonstrations are an effective teaching tool and a large one was established at the Talladega Superspeedway. Over 2,000 pounds of Extinguish[®] Plus fire ant bait was applied to over 1,400 acres in the camping areas, parking lots, and the infield at the Speedway in August. **By race day, 1-2 October, fire ant populations were reduced by 95.2%.** Fans and track personnel were very happy with the results.

Extension agents from Dale, Henry, and Houston counties, in cooperation with the National Peanut Festival, have a bait demonstration on the fairgrounds. A 50 acre area was treated at the recommended rates with baits. There were no complaints from the 90,000 fair attendees regarding fire ant infestations. **Fire ant populations were so low that people were able to sit on the ground during concerts!**



A total of 14 more demonstrations were conducted by 11 Regional Extension Agents and Extension Specialists. One was in a commercial nursery, three were at private homes, eight were in pasture or hay fields and four were in public access areas.

Our management recommendations are used by four Alabama school systems and the Alabama Department of Mental Health and Mental Retardation (MHMR). The Auburn City School System continues to serve as a model for fire ant control on school grounds and athletic fields. Pest management professionals serving the schools in Elmore County, Geneva County, Shelby County, Alexander City and at Lee-Scott Academy are also implementing the recommendations for fire ant control. An ongoing fire ant management demonstration at Auburn University's College of Ag's Ag Heritage Park shows that our recommendations can and do work.

Since we cannot eradicate fire ants, knowledge of their biology is important. Fire ants "farm" aphids for the sugary substance, honeydew, which the aphids produce. However, this is not the case in tomato fields in north Alabama. The five most abundant aphid species in tomato

fields or surrounding weeds are not tended by fire ants. This is because there are not large amounts of honeydew being secreted and also because the fire ants do not tend certain forms of the aphids present in tomatoes. These findings will aid in the management of aphids and other insects in and around tomato fields.

Research continues into the physiology of imported fire ants. Data indicated that there is minimal energetic cost of transporting masses twice the worker ant's own mass. **By measuring the energy used by a fire ant worker to move at different speeds and to carry different amounts of food, we can optimize the size and weight of fire ant bait granules and improve current recommendations.**

The biology and host location behavior of phorid flies is also under investigation. Our research on *P. tricuspis* has shown that adults that are sugar-fed live longer at cooler temperatures than at higher temperatures. **This suggests that the lifespan of *P. tricuspis* may be limited by hot days and that microhabitat (containing certain nectar bearing plants**



and/or aphid honeydew) may be important in phorid survival, establishment, and future distribution. In addition, the roles of chemical cues such as cuticular hydrocarbons and ant pheromones in host location and acceptance are being examined.

A study was conducted to assess the awareness level and the knowledge base of fire ant management in urban environments. **Results suggest that the Alabama Fire Ant Management Program and the Alabama Cooperative Extension System has made progress in educating Alabamians about new technologies and products for fire ant control.**

Research into the genetics of fire ants is ongoing. **We are developing the first state-of-the-art database and a microarray system of red imported fire ant genes.** The information on how these genes function may lead to new fire ant management strategies.



<p>Additional leveraged funding: \$262,750 Publications/articles: 21 Scientific papers and presentations: 22 Outreach activities, presentations, and teaching sessions: 25 Extension Demonstrations: 16</p>
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Alabama Fire Ant Management Program Personnel and Cooperators



Auburn University Department of Entomology & Plant Pathology

Advisory Committee

Michael L. Williams, Ph.D. – Former
Department Chair
Arthur G. Appel, Ph.D. – Department Chair
Kathy L. Flanders, Ph.D.
L.C. “Fudd” Graham, 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
Jason Forster
Chad Harvey
Ian Kaplan
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
Henry D. Dorrough – 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

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
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.



USDA-APHIS
Anne-Marie Callcott
Ron Weeks, PhD.
Debbie Roberts, title?

Local Cooperators

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

Acknowledgements



Dawn Calibeo-Hayes
Kathie Kalmowitz
Clete Youmans



Nancy Stratinsky
Doug VanGundy



Don Murray
Thomas Perkins



David Herd

Sincere apologies to anyone inadvertently omitted from this list

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

Funding Leveraged by Fire Ant Program

Funded \$262,750

Submitted/In Review \$492,269

Submitted, but not funded \$1,179,508

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).

EPA Pesticide Environmental Stewardship Program (PSEP) Grant. Funded October 2003 – September 2005. Strategic Implementation of IPM in Schools Utilizing a Statewide Coalition. \$40,000 (L.C. “Fudd” Graham, PI, Joe Debrow, Co-PI).

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).

Alabama Cattlemen’s Association. Funded January 2005 – December 2005. Sustainable Fire Ant Management Demonstrations in Cattle Production Systems. \$4,660 (K.L. Flanders, PI, L.C. “Fudd” Graham, Co-PI, Josh Elmore, Co-PI).

CSREES eXtension Grant. Funded November 2005 – December 2006. Taking the Sting Out of Imported Fire Ants, a Proposal to Develop an eXtension Program on Imported Fire Ant Management. \$65,910 (K.L. Flanders, PI, Bastian M. Drees, Co-PI).

National Science Foundation, Ecology Program. In Review (submitted July 2005). Effect of Fire Ant – Aphid Mutualisms on the Spread of Aphid-Vectored Plant Viruses. \$492,269 (M.D. Eubanks, PI, J.F. Murphy, Co-PI).

National Science Foundation, Ecology of Infectious Diseases. Not Funded (submitted February 11, 2005). Effects of Biodiversity, Agricultural Intensification, and Invasive Species on Epidemics of Viral Diseases in Plants. \$789,269 (M.D. Eubanks, PI, J.F. Murphy, Co-PI).

United States Department of Agriculture, National Research Initiative. Not Funded (submitted November 2, 2004). The Effects of Fire Ant – Aphid Mutualisms on the Spread of Aphid – Vectored Plant Viruses. \$390,239 (M.D. Eubanks, PI, J.F. Murphy, Co-PI).

Publications (* denotes graduate student)

- 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.
- Barr, C., T. Davis, K. Flanders, W. Smith, L. Hooper Bui, P. Koehler, K. Vail, W. Gardner, B. Drees, and T. Fuchs. 2005. Broadcast Baits for Fire Ant Control. Texas Cooperative Extension Publication B-6099.
<http://www.aces.edu/dept/fireants/documents/broadcastbaits.pdf>
- Chen, L., Ebenezer O. Onagbola, and H.Y. Fadamiro. 2005. Effects of Temperature, Sugar Availability, Sex, Mating, and Size on the Longevity of Phorid Fly *Pseudacteon tricuspis* (Diptera: Phoridae). *Environmental Entomology* 34: 246-255.
- *Cooper, L.B., J.F. Murphy, and M.D. Eubanks. In review. Red Imported Fire Ants May Disrupt Biological Control in Tomato. *Biological Control*.
- Eubanks, M.D. and *J.D. Styrsky. In review. Ant-Hemipteran Mutualisms: Keystone Interactions That Alter Food Web Dynamics and Influence Plant Fitness. In, *Trophic and Guild Interactions in Biological Control, Progress in Biological Control Series*. J. Brodeur and G. Boivin, Editors. Kluwer Academic Publishing.
- Eubanks, M.D. 2005. Predaceous Herbivores and Herbivorous Predators: The Biology of Omnivores and the Ecology of Omnivore – Prey Interactions. Pages 3-16, in *Ecology of Predator – Prey Interactions*, Pedro Barbosa and Ignacio Castellanos, Eds. Oxford University Press.
- Fadamiro, H.Y., L. Chen, E. Onagbola, and L. Graham. 2005. Lifespan and Patterns of Accumulation and Mobilization of Nutrients in Sugar Fed Phorid Fly *Pseudacteon tricuspis*. *Physiological Entomology* 30: 212-224.
- Fadamiro, H.Y., and L. Chen. 2005. Utilization of Aphid Honeydew and Floral Nectar by *Pseudacteon tricuspis* (Diptera: Phoridae), a Parasitoid of Imported Fire Ants, *Solenopsis* spp. (Hymenoptera: Formicidae) *Biological Control* 34: 73-82.
- Flanders, K., L. Graham, S. Porter, and D. Oi. 2005. Biological Control of Imported Fire Ants. Alabama Cooperative Extension System Circular ANR-1149.
<http://www.aces.edu/pubs/docs/A/ANR-1149/>
- Flanders, K. L. 2005. 2005 Fire Ant Control Materials for Alabama Homeowners. Alabama Cooperative Extension System Circular ANR-1149.
<http://www.aces.edu/pubs/docs/A/ANR-0175-A/>
- *Harvey, C.T. and M.D. Eubanks. 2005. Intraguild Predation by *Solenopsis invicta*: a Non-disruptive Interaction. *Entomologia Experimentalis et Applicata* 114:127-135.
- *Kaplan, I. and M.D. Eubanks. 2005. Aphids Alter the Community-wide Impact of Fire Ants. *Ecology* 86:1640-1649.
- Liu, N. and L. Zhang. 2004. *CYP4AB1*, *CYP4AS1*, and *Gp-9* Gene Overexpression Associated With Workers of the Red Imported Fire Ant, *Solenopsis invicta* Buren. *Gene* 327: 81-87.
- *Styrsky, J.D., I. Kaplan, and M.D. Eubanks. In press. Plant Trichomes Indirectly Enhance Tritrophic Interactions Involving a Generalist Predator, the Red Imported Fire Ant. *Biological Control* (accepted August 2005).

- Zhang, L., H. Wang and N. Liu. 2005. The Expression of Cytochrome P450 Genes in the Red Imported Fire Ants. Gene (Submitted)
- Zhang, L. and N. Liu. 2005. Vitellogenin Gene, *Vg1*, Expression and Regulation in the Red Imported Fire Ant, *Solenopsis invicta*. Physiol. Genomics (In Review).

Proceedings Articles

- Fadamiro, H.Y., and L. Chen. 2005. Factors Affecting Longevity of the Phorid Fly *Pseudacteon tricuspis*: Effects of Sugar Availability, Temperature, Mating, and Size. In Proceedings of the 2005 Annual Red Imported Fire Ant Conference, Gulfport Mississippi.
- Graham, L.C., *V. Bertagnolli, and M. Mobley. 2005. Phorids Can Be Released in Cold Weather. A History of Alabama Releases. In Proceedings of the 2005 Annual Red Imported Fire Ant Conference, Gulfport Mississippi.
- Wäckers, F.L., and H.Y. Fadamiro. 2005. The Vegetarian Side of Carnivores: Use of Non-prey Food by Parasitoids and Predators. In Proceedings of the 2005 International Symposium on Biological Control of Arthropods, Davos, Switzerland.
- Tanley, M. J., A. G. Appel, and S. R. Sims. 2005. Toxicity of Granular Ant Bait Formulations Against Cockroaches (Dictyoptera: Blattellidae and Blattidae). In Proceedings of the 5th International Conference on Urban Pests, Suntec, Singapore.
- Wang, H., Q. Lin, L. Zhang and N. Liu. 2005. Cytochrome P450 Gene Expression in the Red Imported Fire Ant, *Solenopsis invicta* (B.). In Proceedings of the 2005 Red Imported Fire Ant Conference, Gulfport, Mississippi.

Scientific Papers and Presentations (* denotes graduate student)

- *Bertagnolli, V.E., L.C. “Fudd” Graham. 2005. Host Location Behavior of *Pseudacteon curvatus* in Alabama. Paper presented at the Imported Fire Ant Conference, Gulfport, Mississippi.
- *Bertagnolli, V.E. and L.C. “Fudd” Graham. 2005. Host Location Behavior in *Pseudacteon curvatus*, a Parasitoid of Imported Fire Ants. Paper presented at the 79th Annual Meeting of the Southeastern Branch of the Entomological Society of America, Tunica, Mississippi.
- *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 Agroecosystems. Department of Entomology, North Carolina State University, April 2005.

- 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. 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., and L.Chen. 2005. The Effects of Food Supplement on Lifespan and Nutrient Metabolism in Parasitic Phorid Fly. International Symposium on Biological Control of Arthropods, Davos, Switzerland. September 12-16, 2005.
- Fadamiro, H.Y., and L. Chen. 2005. Impact of Food Supplements on Lifespan and Carbohydrate Nutrient Levels in a Parasitic Phorid Fly. 90th Ecological Society of America Annual Meeting, Montreal, Canada, August 6-12, 2005.
- Fadamiro, H.Y., and L.Chen. 2005. Factors Affecting Longevity of Phorid Fly, *Pseudacteon tricuspis*: Effects of Sugar Availability, Temperature, Mating, and Size. 2005 Annual Red Imported Fire Ant Conference. Gulfport, Mississippi, March 22-24, 2005.
- Fadamiro, H.Y., L.Chen, and E.O. Onagbola. 2005. Influence of Sugar Availability, Temperature, Sex, Mating, and Size on Lifespan of the Phorid Fly, *Pseudacteon tricuspis*, a Parasitoid of Imported Fire Ant. Entomological Society of America, Southeastern Branch Annual Meeting, Tunica, Mississippi. March 6-9, 2005.
- Graham, L.C., *V. Bertagnolli, and M. Mobley. 2005. Phorids Can Be Released in Cold Weather. A History of Alabama Releases. Paper presented at the Red Imported Fire Ant Conference, Gulfport, Mississippi.
- Graham, L.C. "Fudd", R.K. Vander Meer, K. Ward, R. Ward, and *V.E. Bertagnolli. 2005. Distribution of Imported Fire Ant Populations in Alabama. Poster presented at the 79th Annual Meeting of the Southeastern Branch of the Entomological Society of America, Tunica, Mississippi.
- Graham, L.C. "Fudd" and *V.E. Bertagnolli. 2005. Range Expansion of Two Species of *Pseudacteon* (Diptera: Phoridae) in Alabama. Poster presented at the 79th Annual Meeting of the Southeastern Branch of the Entomological Society of America, Tunica, Mississippi.
- Graham, L.C. "Fudd" and *V.E. Bertagnolli. 2004. Diurnal Patterns of Ovipositional Activity in Two *Pseudacteon* Parasitoids. Paper presented at the 52nd Annual Meeting of the Entomological Society of America, Salt Lake City, Utah.
- Graham, L.C. "Fudd", R.K. Vander Meer, and *V.E. Bertagnolli. 2004. Range Expansion of Two Phorid Flies (Diptera: Phoridae) in Imported Fire Ant Populations (Hymenoptera: Formicidae) in Alabama. Poster presented at the 52nd Annual Meeting of the Entomological Society of America, Salt Lake City, Utah.
- *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).
- Tanley, M. J., S. R. Sims, and A. G. Appel. 2004. Efficacy of Ant Baits Against Cockroaches (Dictyoptera: Blattellidae and Blattidae). 52nd National Meeting, Entomological Society of America, Salt Lake City, UT.
- 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, Gulfport, Mississippi.

Outreach Activities, Presentations, Teaching, and Teaching Materials

- Fire Ant Management, Auburn Civitan Club, November 18, 2005
- Prepared educational presentation on The Alabama Fire Ant Management Program at AU Farmer's Market, Ag Heritage Park, Auburn, Alabama, 8, 15, & 22 September 2005.
- Prepared educational presentation on The Alabama Fire Ant Management Program at Ag Roundup, Ag Heritage Park, Auburn, Alabama, 24 August 2005.
- Prepared educational presentation on The Alabama Fire Ant Management Program at Arboretum Days, Donald E. Davis Arboretum, Auburn, Alabama, 17 August 2005.
- Prepared educational presentation on The Alabama Fire Ant Management Program at 2005 Farm, Home, and Wildlife Expo, Chilton Research and Extension Center, Clanton, Alabama, 6 August 2005.
- Prepared and staffed educational booth on The Alabama Fire Ant Management Program at "Getting Bugged?!" insect program at the Frank Allen Turner Memorial Canopy, Louise Kreher Forest Ecology Preserve, Auburn University, Alabama, 30 July 2005.
- Fire ant Management In-service Training for Extension Agents, July 2005
- Participated in "Unhuggables" program, along with other graduate students from Auburn University's Department of Entomology, for Summer campers at the Frank Allen Turner Memorial Canopy, Louise Kreher Forest Ecology Preserve, Auburn University, Alabama, 13 and 28 June 2005.
- Fire Ant Bait Materials, Application, and Costs, Anniston, Regional Fire Ant Meeting May 19, 2005.
- Fire Ant Biology and Management, Forestry and Wildlife for Youth Field Day and Tour, May 4, 2005, repeated a 30 minute presentation five times to Bullock Co. fifth graders.
- Prepared and staffed educational booth on The Alabama Fire Ant Management Program at TALONS Day (Talented Academic Leaders; Outstanding National Scholars), at the Auburn University Hotel and Dixon Conference Center, Auburn, Alabama, 21 and 28 February 2005.
- Laboratory presentations for ENTM 3040-General Entomology, Auburn University, Auburn, Alabama, 29 November and 1 December 2004.

Prepared educational booth on The Alabama Fire Ant Management Program for the 61st Annual National Peanut Festival, 5-13 November 2004.

Prepared educational booth on The Alabama Fire Ant Management Program at Sunbelt Agricultural Exposition in Moultrie, Georgia, 18-20 October 2004.

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, 9 October 2004.

Prepared and staffed educational booth on The Alabama Fire Ant Management Program at Alabama National Fair, 8-17 October 2004.

Flanders, K.L. and M.C. Lightfoote. Fire Ant Control Made Easy. Video for Alabama Cooperative Extension System. <http://wms.aces.edu/easyants.htm>

Meetings Attended

Entomological Society of America 52nd Annual Meeting, Salt Lake City, Utah, 14-17 November 2004.

Annual Beltwide Cotton Conference, New Orleans, Louisiana, January 2005.

79th annual meeting of the Southeastern Branch of the Entomological Society of America, Tunica, Mississippi, 6-9 March 2005.

2005 Imported Fire Ant Conference, Gulfport, Mississippi, 22-24 March 2005.

Annual Meeting of the Ecological Society of America, Montreal, Canada, August 2005.

90th Ecological Society of America Annual Meeting, Montreal, Canada, August 6-12, 2005.

International Symposium on Biological Control of Arthropods, Davos, Switzerland. September 12-16, 2005.

Pesticide Educators C & T Meeting, Madison, Wisconsin, date.

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

*Lawrence Graham, Kathy Flanders, Vicky Bertagnolli, Henry Dorough,
Rickey Hudson, Danny Cain, Kevan Tucker, Charles Pinkston,
Anthony Wiggins, Charles Mason, Tony Dawkins*

Objectives

- 1) Continue to monitor fire ant bait trials at Talladega, Macon, and Sylacauga phorid sites.
- 2) Release and evaluate the effectiveness of two species of phorid fly.
- 3) Continue study to determine effect of *P. curvatus* activity on foraging fire ants.
- 4) Continue survey of location of red, black and hybrid fire ants in Alabama.
- 5) Monitor fire ant populations in Sylacauga to determine effect of two phorid species.
- 6) Conduct trial for BASF at Prattville Airport and Red Eagle Golf Course.

1) In 2003, study sites were set up in Talladega, Notasulga, and Sylacauga to study fire ant reinfestation in areas where phorids are established. Bait was applied to the Talladega County site in May 2005 and was scheduled to be applied to Sylacauga when the project was discontinued to accommodate a larger educational project.

Negotiations have been on-going with the Talladega Superspeedway (Talladega site), Wellmark International, Starbar, The Alabama Cooperative Extension System and the Alabama Fire Ant Management Program for over a year. An agreement was reached Summer of 2005 to treat approximately 1,400 acres at the Speedway for fire ants. On August 1-3, over 2,000 pounds of Extinguish[®] Plus fire ant bait was applied to camping areas, parking lots and the infield at the Speedway using 16 Herd Model GT-77 ATV Broadcasters. Pre- and post-treatment data were collected at the Speedway. Before bait application, the average number of mounds per acre was 186. After bait application, the average number of mounds per acre dropped to only 9. A 95.2% reduction in fire ant mounds per acre was observed! Race fans were surveyed Friday, September 30, 2005 to determine if fire ant problems have been reduced. Data



and survey findings will be presented at the Annual Red Imported Fire Ant Conference in Mobile, AL in March 2006.

2) Additional phorid flies were obtained from the USDA and released in Alabama in 2005. A *P. tricuspis* release was conducted in DeKalb County in April 2005 and a third phorid species, *Pseudacteon litoralis*, was released in Wilcox County in June/July 2005. Phorid flies have been released at 14 sites across Alabama by the Alabama Fire Ant Management Program (12) and by Alabama A&M (2) (fig.1). A *P. curvatus* release was planned for Mobile County in September 2005, but was cancelled due to Hurricane Katrina.

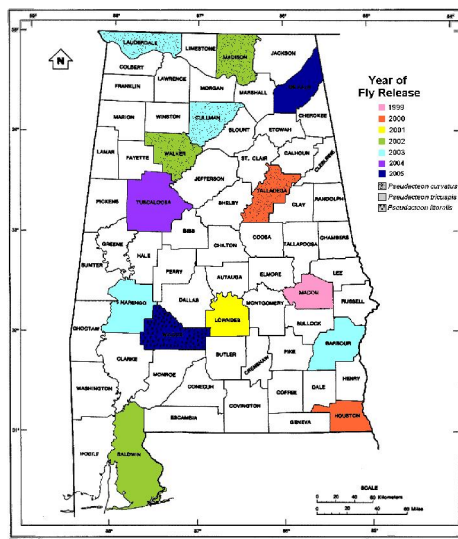


Figure 1. County map of Alabama showing fly release years and fly species.

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 were visited several times to track fly movement. These biological control agents now cover almost 2/3 of the state.

3) The study on host location behavior of *P. curvatus* in Alabama was continued in monogyne colonies and expanded to include polygyne colonies. We determined that *P. curvatus* are more attracted to mound disturbances and interactions where workers are competing at food sources rather than to workers along foraging trails. With *P. curvatus*, the number of ants competing at a food source did not seem to affect the number of flies attracted. However, more flies were attracted to disturbed mounds with competitive interactions than to mounds with a disturbance and no competitive interactions.

4) Two species of imported fire ant were accidentally introduced from South America in the early 1900's. The black imported fire ant can be found in small areas of northern Alabama and Mississippi and south western Tennessee while the red imported fire ant occupies southern Alabama. A hybrid of the red and black imported fire ants occupies a large belt connecting the two different species in Alabama. 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 (fig. 2). These data are important in determining release sites for phorid flies and monitoring movement of fire ant species.

5) Fire ant populations are 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.

6) Pesticide trials were conducted for BASF Corp at Grouby Field Airport (Prattville, AL) and at Red Eagle Golf Course (Eufaula, AL).

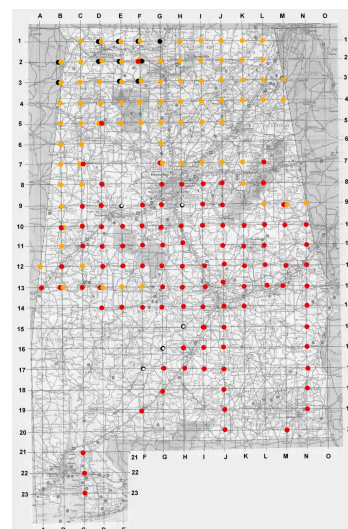


Figure 2. Grid map showing range and species of imported fire ants in Alabama.

Fire Ant Education and Outreach

Kathy Flanders, Lawrence Graham, and Vicky Bertagnolli

Objectives

- 1) Provide the public with information about fire ants with exhibits at the Alabama National Fair, the Southeastern Ag Expo, the Peanut Festival, and other events.
- 2) Conduct fire ant demonstrations (coordinated by Alabama Cooperative Extension System agents)
- 3) Update fire ant educational materials
- 4) Conduct train-the-trainer workshops on fire ants, and provide professional improvement opportunity for three trainers.

Results

This program improved knowledge of fire ant biology and management strategies by the public and increased visibility of the Alabama Fire Ant Management Program. It resulted in more appropriate use of fire ant insecticides and reduced environmental hazard. Field demonstrations and educational exhibits at public use sites such as the National Peanut Festival Grounds, the Talladega Superspeedway, ball fields, and other areas where crowds of people assemble, serve two purposes: people who attend the events are safe from fire ants, and it provides information to these people on how to manage fire ants. The training done with youths today will lead to a new generation of fire ant managers tomorrow.

The School IPM Program and the Alabama Department of Mental Health used recommendations from the Alabama Fire Ant Management Program to make children and patients safe from attack by fire ants. Educational program aids developed through this project, such as publications, videos and PowerPoint presentations are used in training sessions to increase the general knowledge level about fire ants. A grant obtained from eXtension will be used in 2006 to develop a region-wide, web-based resource on fire ant management. The fire ant educational program will be featured in the 2005 Annual Report from the Alabama Cooperative Extension System.

Fire Ant Exhibits

An educational exhibit was prepared for the Alabama National Fair, the Southeastern Ag Expo, Ag Roundup, and the National Peanut Festival. Abbreviated versions of the exhibit were used at the Chilton County Field Day, the Frank Allen Turner Memorial Canopy, Louise Kreher

Forest Ecology Preserve and the Donald E. Davis Arboretum. The exhibit included informational posters, live fire ants, live decapitating flies, and casts of fire ant tunnel systems. Specimens for hands-on experience were also available. Coloring books and fact sheets on fire ants and their 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. The booth was staffed for the duration of each event by participants of the Alabama Fire Ant Management Program or by county Extension agents. Approximately 8,000-10,000 people visited the Alabama National Fair exhibit, 5,000 visited the exhibit at Ag Expo, and 5,000-7,000 came by the booth at the National Peanut Festival.



Visitors to the 2005 Alabama National Fair fire ant booth.

Fire Ant Management in Sensitive Use Sites

We have incorporated fire ant management strategies into the School IPM Program. The sustainable, bait-based approach has been adopted with enthusiasm by four Alabama school systems because it makes school grounds safer for children and reduces potential liability costs. The Auburn City School System continues to serve as a model for fire ant control in school environments. Pest management professionals serving schools in Elmore County, Geneva County, Shelby County, Alexander City, and at Lee-Scott Academy also use our fire ant recommendations. The bait-based approach has also been incorporated into the fire ant management plan at the Alabama Department of Mental Health and Mental Retardation (MHMR) mental health facilities by Bruce Alverson.

Educational Program Aids

In 2005, the fire ant video was revised and distributed to each county Extension office in Alabama. It is available as streaming video at: <http://wms.aces.edu/easyants.htm>. The PowerPoint presentations, *Managing Fire Ants in Urban Areas*, *Imported Fire Ant Biology*, and *Managing Fire Ants in Agriculture*, have

been revised and are being peer-reviewed. The fact sheet, ANR-175A, *2005 Fire Ant Control Materials for Alabama Homeowners*, has been very popular. It helps homeowners determine what products are available and shows how much each fire ant control product actually costs. A Regional publication, Texas Cooperative Extension Publication B-6099, *Broadcast Baits for Fire Ant Control*, was produced with input from Alabama Fire Ant Management personnel. It can be found at <http://www.aces.edu/dept/fireants/documents/broadcastbaits.pdf>.

Training the Trainers

Four Extension agents attended the 2005 Imported Fire Ant Management Conference in Gulfport, MS. Funding for the agents to attend the meeting came from this grant and a matching grant from the Alabama Cattlemen's Association.

Educational Programs by Principal Investigators

Dr. Graham gave at least a dozen talks on fire ants to groups such as turfgrass managers and pesticide dealers. He helped teach the regional fire ant workshop (see report below by Stan Roark). He staffed the fire ant booth at events such as the Alabama National Fair, Ag Roundup, and Southeastern Ag Expo. Dr. Flanders provided training via web-conference to Extension agents, helped teach the regional fire ant workshop in Anniston, conducted a fire ant activity for 200 fifth graders at the Bullock County Forestry for Youth Day, and provided updates on fire ant management at team meetings of the following ACES Program Priority Teams: Commercial Horticulture, Home Grounds and Home Pests, and Animal Sciences and Forages. She also helped out at the fire ant exhibit at the Alabama National Fair, and conducted a program on fire ants for the Auburn Civitan Club. She took the lead in writing a grant to create an eXtension Community of Practice on fire ants. This was one of only 8 pilot eXtension Communities of Practice that were



Fire ant demonstration with Dr. Flanders at Bullock County Forestry for Youth Day.

funded in the U.S. in 2005. The Community of Practice will develop web-based information on fire ants for the national eXtension program. Vicky Bertagnolli staffed the educational booth at the Alabama National Fair, Ag Roundup, Southeastern Ag Expo, and the College of Agriculture's Farmer's Market. She also participated in various youth days at the Donald E. Davis Arboretum and the Frank Allen Turner Memorial Canopy, Louise Kreher Forest Ecology Preserve. Dr. Liu, Dr. Hu, Dr. Appel, Dr. Eubanks, Dr. Fadamiro, and their students all provided help and expertise at the fire ant exhibit at the Alabama National Fair.

Fire Ant Demonstrations and Educational Programs Conducted by Regional Extension Agents and Specialists

Extension agents and specialists conducted fire ant workshops, results demonstrations, talks, and other activities. A brief summary of their activities is included below. An asterisk (*) is placed next to agents that who received mini-grants from the Alabama Fire Ant Management Program. Two asterisks (**) are placed next to agents who received mini-grants from the Alabama Cattlemen's Association. Detailed reports and success stories are included.

***Stan Roark**, Regional Extension Agent, coordinated a regional fire ant management workshop, held May 19, 2005 in Anniston. At least six other Extension agents, as well as fire ant experts from Auburn University and Alabama A&M University participated in the hands-on training. Participants from 8 counties and 3 states were tested on their knowledge of fire ants and control materials before and after the workshop. Initial test results averaged 59% and post workshop scores averaged 89%. Evaluations were very positive with 95% of participants indicating their willingness to attend similar workshops on other pests. Representatives from industry were there to provide information about their products. Stan also developed and conducted a hands-on fire ant training session for six Master Gardener classes. Other fire ant educational activities included talks at the Sylacauga Kiwanis Club, the Roanoke Country Club, and the Camp Lewis Boot Camp for Youth, as well as news articles for local papers.

***Amy Winstead** and **David Koon** established a fire ant management demonstration at the City of Eufaula Parks and Recreation baseball and softball complex. Pre- and post-treatment counts showed a 67% reduction in fire ant mounds after a fire ant bait was used. A global positioning system was used to make maps of fire ant infestations on the site. Koon and Winstead also conducted three Home Grounds and Landscape Workshops, in which fire ant management was a featured topic.

***Jimmy Jones**, County Extension Coordinator, Henry Co.; **Reafield Vester**, Master Gardener Coordinator, Houston Co; and **Rickey Hudson**, Regional Extension

Agent, Animal Sciences and Forages have been cooperating on several demonstrations in Houston and Henry Counties. This is the second year that the Dothan Botanical Gardens has been treated with fire ant bait (two times per year). Between 5,000-8,000 people have toured the gardens and no significant ant problems have been encountered. The National Peanut Festival Grounds in Dothan have been the site of a fire ant demonstration the past three years. In 2004, fire ant populations at the 55 acre site declined from 25-50 mounds per acre to 2-3 mounds per acre following the bait treatment. Last year, some 90,000 people attended concerts and events held on fairgrounds including treated areas. No fire ant stings or problems were reported from fairgoers or from over 200 vendors and fair acts. During the Peanut Festival an exhibit manned by Wiregrass Master Gardeners handed out over 25,000 publications and coloring books during the nine day event. Jimmy Jones also conducted bait-based demonstrations at the playground area of a church, and at two homes in Henry County.

***Bob Goodman**, Extension Economist, conducted a 30 acre bait-based demonstration in North Lee County. The fire ant baits were 90% effective in controlling fire ants in this suburban area.

***Anthony Wiggins**, Regional Extension Agent, Animal Sciences and Forages, conducted a bait-based demonstration on a 10 acre pasture in Conecuh County. After 8 weeks, he observed 75% control of fire ants in the treated area. He organized a field day to teach people about fire ant biology, how to properly, effectively, and efficiently use fire ant baits, and how to calibrate spreaders. Anthony participated in the Talladega Superspeedway demonstration, and has been monitoring for decapitating flies.

Randall Armstrong, Lauderdale County Extension Coordinator, worked with the local cable channel to air the new video, *Fire Ant Control Made Easy*, more than 100 times during June, July, and August. The cable company has an audience of 44,000 people. He also spoke on fire ant control at the County Beef Field Day in April where about 120 producers were present. He presented a handout on Do's and Don'ts of Fire Ant Control to Field Day participants. The information was also presented at the Florence Kiwanis Club in May where about 35 people were present.

****Henry Dorough**, Regional Extension Agent, Animal Sciences and Forages, continued his bait-based fire ant management program on one cattle operation, and started a second demonstration at another cattle operation. He observed 90% control using Extinguish[®] Plus fire ant bait, and 70% control using Amdro[®] alone.

Henry Dorough, Regional Extension Agent, Animal Sciences and Forages, began a fire ant demonstration he has dubbed "The fastest fire ants in NASCAR." In his own words: "For some time I have dreamed of working a deal between the Talladega Superspeedway and one of the major vendors of fire ant bait to conduct a massive demonstration and educational event at the speedway during one of the races.

Well, all the stars have aligned and the folks marketing Extinguish[®] Plus fire ant bait have agreed to provide enough product to treat all of the campgrounds and the infield at the Talladega Superspeedway - over 1,400 acres!!!” Henry, with the assistance of Fudd Graham, Vicky Bertagnolli, Regional Extension Agents **Willie Datcher** and **Anthony Wiggins**, and many others, managed to treat 1,400 acres with fire ant bait. They used at least 16 Herd Seeders to apply the bait, which was donated by Wellmark International and Starbar. Herd Seeder Co., Inc. provided mounts to attach all of the seeders to the ATV’s used to spread the bait. The seeders are usually located at various points across the state for Extension agents and the public to use for demonstrations. Control in excess of 90% was achieved using Extinguish[®] Plus, a product containing a 50/50 blend of hydramethylnon and methoprene fire ant baits. As part of the fire ant survey at the races October 1-3, fire ant program personnel found that racegoers were most appreciative of the excellent fire ant control.

Doug Chapman, Regional Extension Agent, Commercial Horticulture. A public fire ant seminar was held on Saturday, May 28, 2005 at 10:00 a.m. at the Limestone County Extension office in Athens, AL. The meeting was well attended and the mayor of Athens was in attendance as well. A DVD program on urban fire ant management was presented. After the presentation the Limestone County Farmers Co-op, which sponsored the meeting, gave a brief overview of the fire ant products they sell.

***Chip East**, Regional Extension Agent, Commercial Horticulture, applied Extinguish[®] fire ant bait at nursery in Cleburne Co. in Fall 2004. The nursery manager said, “it did a good job.” Spinosad bait was used at a second demonstration site in Fall 2004. In September 2005, fire ant mound density was still less than half of the original population. Fire ants were discussed at the nursery tour in Macon County.

Gary Gray, Regional Extension Agent, Commercial Horticulture, provided 400 fire ant management publications to clientele attending the 2005 Farm, Home and Wildlife Expo at the Chilton Research and Extension Center through the Extension Publications table (approximately 1,500 attending). He educated 500 commercial fruit and vegetable growers concerning fire ant management through 10 regional production meetings, and educated 50 Master Gardeners concerning fire ant management through home fruit production classes and vegetable gardening classes. He provided fire ant management recommendations to approximately 200 homeowners and home gardeners.

Chazz Hesselein, Extension Specialist, Commercial Horticulture, conducted a demonstration trial at the historic Magnolia Cemetery in Mobile, AL. Six plots, ranging in size from 0.51 to 0.62 acre each, were treated. There were three treatments: Extinguish[®] at 1 lb/ acre, Extinguish[®] Plus at 1.5 lb/ acre and an untreated control. A Solo hand cranked spreader was used to apply the bait to the grave area of the plots (an area approximately 2/3 to 1/2 the total area of the plots

but where 90% of the mounds were located and where the concern for fire ant control was focused). There was no rain for at least 24 hours following treatments and ants were observed moving bait into the mounds immediately following treatment. Pretreatment mound counts were made on 6/20/05. Plots were treated on 7/19/05. On October 21, Extinguish[®] Plus had provided 85% control, relative to the untreated plots, and Extinguish[®] had provided 70% control.

****Wayne Robinson**, Statewide Dairy Agent, selected a 7 acre hayfield in Lamar County for his demonstration site. The area was heavily infested with fire ants. The field is used several times a year for horse shows. The first event was scheduled for late April, but too early for baits to be applied effectively. Instead, all visible mounds were treated with a carbaryl drench (the only approved individual mound treatment for hayfields), so that the horse show would not be hampered by fire ants. After the show, two bait applications were made. Very few fire ant mounds were visible during the Summer. A field day will be held at the 2006 horse show, where the results of the demonstration will be discussed.

****Jack Tatum**, Regional Extension Agent, Animal Sciences and Forages, established two bait-based fire ant management demonstrations in cattle operations. One was a 6 acre pasture at the Upper Coastal Plains Research Center, where cattle sales are held several times a year. The initial treatment (Extinguish[®]/Amdro[®] Pro Mix) was made in May. By September, reinfestation of the site had begun, but populations were still 50% less than before the first treatment. A second bait application was made in Fall 2005. The other demonstration was on a 2 acre pasture on a cattle ranch in Walker Co. The same bait mix was applied in May, and post-treatment counts were made in December. A 92% reduction in mounds was observed. However cool weather in December may have resulted in an underestimation the number of fire ant mounds at the site.

Eddie Wheeler, County Extension Agent, Marshall Co, presented information about fire ant biology and management at a muscadine field day conducted in Marshall County. Forty-five people attended the field day. The fire ant mound model was used and several individuals were impressed with the model. A display of fire ant products were available and discussed. Handout materials included ANR-175A, *Fire Ant Control Materials for Alabama Homeowners*, ANR-1161, *Getting The Most out of Your Fire Ant Bait* and ANR-1185, *The Hidden Truth about Red Imported Fire Ants*.

***Stan Windham**, County Extension Coordinator, Coffee Co. is conducting a demonstration in a seven acre calving pasture in Coffee County. In early July, with the assistance of **Amy Winstead**, 483 fire ant mounds were located and logged. The demonstration was evaluated in Fall 2005. A hopper blend of Amdro[®] Pro and Extinguish[®] fire ant baits was used.

New Ways to Control Fire Ants: Comprehensive Fire Ant Training in Anniston

Roland Stanley Roark

Managing imported fire ants presents major problems for Alabama residents. The presence of these insects impacts agricultural production, home lawns, gardens, schoolyards and recreational areas. They create problems for the safe operation of equipment, prey on the young of both domestic and wild animals, and deliver painful bites whenever their mounds are disturbed. Allergic reactions to these bites can cause life threatening experiences for some individuals.

Although it is not possible to eradicate fire ant populations from Alabama, it is possible to reduce their numbers and impact. Older contact insecticides like chloropyrifos and diazinon have been phased out and replaced with newer products. Many



Dr. Fudd Graham discusses phorid flies with media.

of these new products rely on a bait strategy to deliver the control materials to fire ant workers and queens. Application of these bait materials can be very different from the application of older contact insecticides.

While chemical companies have worked on the development of new materials for fire ant control, other researchers have focused on the establishment of biological agents to aid in fire ant control. The most successful biological control agent to date has been the phorid or decapitating fly. The establishment of these small flies in the Alabama landscape is not well known by the general public.

The Alabama Cooperative Extension System held a Comprehensive Fire Ant Management Workshop in Anniston, Alabama May 19, 2005. The purpose of the workshop was threefold: to address questions about new chemical control products and their costs, to familiarize the public with phorid flies used as a biological control agent and to demonstrate effective and economical use of bait products for fire ant control.

Local media including the Anniston Star, Alabama Poultry Monthly Magazine, Alabama Farmers and Consumers Bulletin and Alabama Cooperative Extension System mailing lists were used to promote the Anniston workshop to clients in the surrounding region.



Regional Extension Agent Stan Roark explains bait application to homeowners.

Alabama Fire Ant Management Program members from Auburn and Alabama A&M Universities presented information on Fire Ant Biology, Fire Ant Control Materials and Costs, Biological Agents for Fire Ant Control and Fire Ants in the Home. Regional Extension Agents from the Home Grounds, Commercial Horticulture, and Animal and Forage Production teams, along with Calhoun County Extension Agents and a representative of the Alabama Department of Agriculture and Industries conducted demonstrations on the correct application of bait materials. Industry representatives from four of the principal manufacturers of fire ant control products were on hand to provide additional information and program sponsorship. Additional sponsors included the Coosa

Valley Resource Conservation and Development Council and Calhoun County Farmers Federation.

In order to better target individual client needs, the workshop audience was divided into agricultural producers, homeowners and managers of public use area groups. Each group was then given demonstrations of ways to best apply fire ant control materials to their area of concern.

Workshop success was measured in a number of ways. Participants from 8 counties and 3 states were tested on their knowledge of fire ants and control materials before and after the workshop. Initial test results averaged 59% and post workshop scores averaged 89%. Evaluations were very positive with 95% of participants indicating their willingness to attend similar workshops on other pests. Individual sessions were rated very highly by participants with many favorable comments. Overall this was a high



Regional Extension Agent Chip East demonstrates bait application with a Herd seeder.

quality program combining the skills and knowledge of state specialists, regional agents and county agents. Media coverage was outstanding with 3 television stations on hand to provide coverage of the event.

Barbour County Fire Ant Project

Amy Thompson Winstead

Situation:

The red imported fire ant has become one of the most troublesome insect pests in the Southeast, infesting more than 250 million acres in nine states, with imported fire ants present in all of Alabama's 67 counties. While the presence of fire ant mounds can interfere with mowing and gardening, as well as recreational and sports activities, the greatest cause for concern is the painful and sometimes severe reactions caused by their sting.

Concerned about the number of fire ant mounds located at the municipal baseball/softball complex, the Eufaula Parks and Recreation Department contacted the Barbour County Extension office. The complex consists of eight fields where youth baseball, softball and adult softball games are played and is a central hub of activity for most families during the Spring and early Summer months. In addition, the City of Eufaula traditionally hosts several post season tournaments for each of those categories. The ball seasons last for approximately 16 weeks, four days per week, with an average daily attendance of 300 people per day (20,000 per year). The parks and recreation department had



ATV with Herd Seeder attached for fire ant bait application.

previously treated fire ant mounds on an individual basis with a contact insecticide. This situation provided an excellent opportunity to educate the parks and recreation department as well as the 20,000 annual visitors to the complex through a fire ant treatment demonstration.

Action taken:

A fire ant management plan for the complex was developed by Regional Extension Agents David Koon and Amy Winstead with the help of Extension

Entomologist Kathy Flanders. The project was funded through a grant from the Alabama Fire Ant Management Program. In the Spring of 2005 (May 25, 2005) Regional Extension Agents Amy Winstead and David Koon surveyed and marked the fire ant mounds from two of the eight ball fields (4.2 ac) through the use of a Global Positioning System (GPS). The initial population of mounds was found to be 218 mounds or 51 mounds per acre (fig. 1). Extension agents then treated the fields using fire ant baits Award (growth regulator) and Amdro[®], (metabolic inhibitor). A rate of 1.25 lbs per acre was used during the treatment.

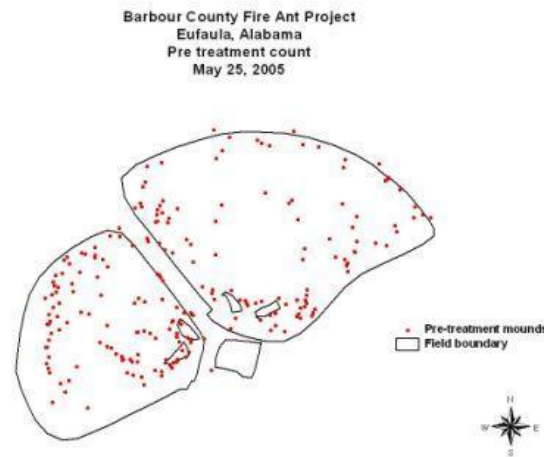


Figure 1. Pre-treatment fire ant mound count.
Individual mounds are marked with red dots.

Impact and Results:

After a period of twelve weeks (August 12, 2005) the mounds were resurveyed and marked. The post treatment mound count was 72 mounds or 17 mounds per acre (fig. 2). The initial treatment resulted in a 67% reduction in the number of mounds present. Treatment with a fire ant bait not only reduces the amount of chemical pesticide used on the area but will also save the parks and recreation complex an estimated \$170 per season in pesticide costs as well as a significant reduction in labor. Research by specialists with the Alabama Cooperative Extension System report individual mound treatments can cost five to ten times as much as baits, if the cost of labor is considered.

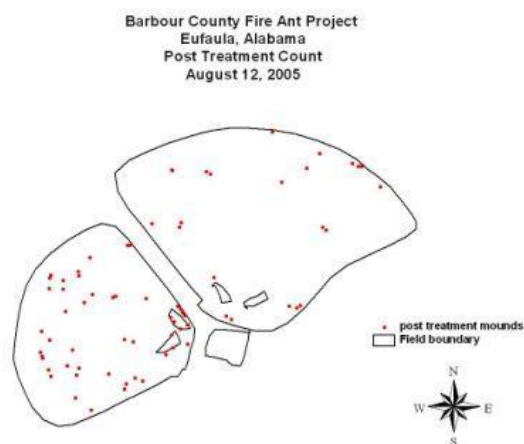


Figure 2. Post-treatment fire ant mound count.
Individual mounds are marked with red dots.

Results of the demonstration will be posted at the recreational complex throughout the 2006 season to increase awareness in the citizens of Eufaula concerning fire ant biology as well as educate them on treatment options for home use. The reduction of mounds has not only improved the quality of the park facility but most importantly has increased the safety of the children and families who regularly use this recreational sports complex.

Henry County Annual Report

James D. Jones, Jr.

The Alabama Fire Ant Program was first derived in 1999 by specialists, County Agents and REA's to fight the imported fire ant that plagues our state. Initial agent training was followed up by field studies in the Wiregrass area. The two-step method was adopted for control of the imported fire ant in Alabama.

In 2004, a 65 acre area within the heaviest travelled areas of the National Peanut Festival grounds was treated with bait. Infestation was medium to heavy with mound numbers ranging from 50-100 mounds per acre. Amdro[®] Pro and Extinguish[®] were used at a 3 to 1 ratio spreading 1.5 pounds total product per acre using a Herd seeder. Random areas were rated prior to spreading and two months later re-evaluated.



Preparing to spread a demonstration plot at the National Peanut Festival.

The 2004 results were outstanding. Where mounds numbered in the range of 75-100 mounds per acre, less than 3-10 mounds were determined to remain active after treatment. Where numbers were less than 50 mounds per acre, no active mounds were reported.

In 2004, National Peanut Festival officials reported over 90,000 fair attendees of which some 15,000 were concert goers who sat on the ground or in chairs in the grass. In 2005, not one injury call due to fire ants was reported to the fair office.

Re-infestation will ultimately occur and repeat treatments will be needed in 12-18 months due to the untreated properties adjacent to the fairgrounds. However, this result demonstration shows the effectiveness and benefits of using baits as a control method of the red imported fire ant in Alabama.



REA Rickey Hudson spreading fire ant bait.

Fire Ant Control Demonstration Project for North Lee County

Bob Goodman and Kathy Flanders

The purpose of this demonstration was to educate interested land owners in the proper handling of pesticide materials, calibration of application equipment, and effectiveness of alternative fire ant control regimens. The site chosen was a large open area in a suburban setting, comprising mostly common Bermuda and some fescue grasses, with widely interspaced pecan trees. It was not grazed or fenced, but was mowed regularly, so fire ant mounds were readily apparent. The site contained over 30 total acres, and the 5-acre plots were delineated by handheld GPS equipment. Before treatment fire ant density was estimated by counting the fire and mound density inside two .25 acre circles inside each treatment area. A mound was considered active if, after disturbing with a rod, fire ants emerged within a 15 second waiting period. Initial density was fairly uniform, at around 40 mounds per acre (Table 1).

Five local property owners, each owning a considerable acreage infested with fire ants, were present for the spreader calibration demonstration and initial treatments. Participants received training in bait spreader calibration, using both hand held and tractor mounted spreading equipment. Participants walked or drove across a plastic tarp while spreading material and the amount spread was collected and weighed. Participants were amazed at the small amount of material spread on the small tarp area that resulted in the proper rate of application per acre.

Four treatments were compared: 1. Conventional Combined: One June 2005 application and one October 2005 application of a 50:50 mix of metabolic inhibitor (MI) bait and growth regulator (GR) bait (Amdro[®] + Extinguish[®]) at the 1.5 lbs/ac rate (5

acres). 2. Early Combined: One late April 2005 and one August 2005 application of 1.5 lbs mixed MI and GR bait (5 acres). 3. Early Bait: One late April 2005 treatment of 1.5 lbs MI bait followed by a June 2005 and an October 2005 application 1.5 lbs of mixed bait (5 acres). 4. Untreated Control. (5 acres)

Table 1. Fire Ant Treatment Results

Treatment	Acres	Fire Ant Mound Density/Acre		
		Before Treatment	After Treatment	% Change
1. Conventional Combined	5	38	2	-95
2. Early Combined	5	35	3	-92
3. Early Bait	5	41	3	-93
4. Untreated Control	5	37	25	-33

All treatments were successful in virtually eliminating fire ant from the area, even though the “early bait” treatment lacks one application at the time of this report (August 2005). Participants were very pleased with the results, and plan to continue using these methods and materials to control fire ants in the area. As a group, the participants agreed that before this demonstration they would not have believed that these materials, spread at the recommended rates, would result in such good control of fire ants. They also reported that before the demonstration they had used these materials at much higher rates on much smaller areas, and did not attempt to treat larger areas because the cost at such rates was prohibitive. Finally, it must be noted that the participants were very impressed with the results after the first treatments, did not understand the necessity of subsequent treatments, and would not have continued with the control program if the specialists did not insist on it. When treating on their own in the future, participants may not continue with the second and/or third treatments.

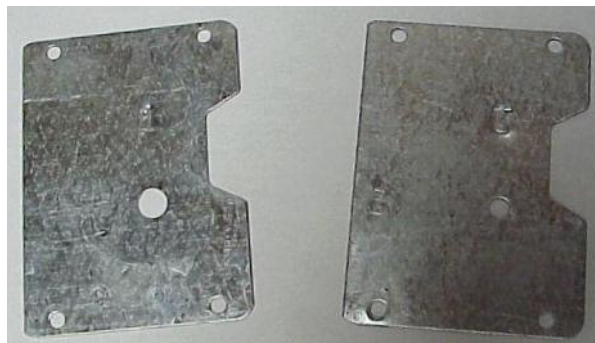
Controlling Fire Ants in Cattle Operations

Anthony Wiggins

Since the accidental introduction of fire ants to the U.S. in the 1930's, they have become an increasing nuisance in livestock operations. Fire ants cost livestock producers millions of dollars annually due to livestock death and injuries, equipment damage, and feed losses.

The Alabama Fire Ant Management Program had funds available for a pilot program to demonstrate how to use fire ant baits to control fire ants in livestock operations. The demonstration consisted of two bait applications, measuring the effectiveness of the baits on controlling the fire ants, and an educational meeting. The makers of the fire ant baits Extinguish[®] and Amdro[®] Pro were gracious enough to donate enough bait to carry out the demonstration.

The demonstration was conducted on a pasture in Conecuh County. On June 13, 2005, nine acres of a ten acre pasture were treated with a mixture of $\frac{3}{4}$ pounds of Extinguish[®] and $\frac{3}{4}$ pounds of Amdro[®] Pro per acre with the other acre being left untreated and serving as our control. The original mound counts determined the fire ants to have a density of 160 mounds per acre. Mound counts were taken again at 2, 5, and 8 week intervals after bait application. At 2 weeks, control was determined to be at approximately 10%, 5 weeks at 60%, and 8 weeks at 75%.



Restrictor plates for Herd Seeder model GT-77 made specifically to spread fire ant bait at the correct recommended rate.

On August 16, 2005, an educational meeting was held at the demonstration site to enlighten the public about fire ant biology, how to use fire ant baits, and how to calibrate spreaders for bait application. Also, attendees were able to compare the control site to the treated area. The difference between the control and treated area was very obvious. People were amazed at how well the baits worked and were interested in where they could purchase the bait products used in the demonstration.

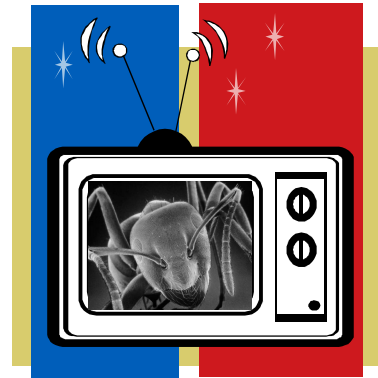
A second application of Amdro[®] Pro and Extinguish[®] was applied to the pasture, in the same manner as the first, on September 13, 2005. Again mound counts were taken at 2, 5, and 8 week intervals. At 2 weeks no change in control was observed. At 5 weeks, the total control had increased to 86% and at 8 weeks the total control remained at 86%. In this demonstration, fire ant mounds were reduced from an average of 160 per acre to an average of 22 mounds per acre.

The owner of the pasture was extremely pleased with the results and intends to treat more of his pastures and hayfields in the future.

Multi-County Workshops and Exhibits on Fire Ants for Urban Areas

Hubert R. Armstrong

Fire Ant control is a constant problem in our area. To better educate and inform clientele about the various aspects of this problem we obtained the new Alabama Cooperative Extension System video on fire ant management. This was given to the Northwest Shoals Community College that has a cable channel on the local cable company. During the months of June, July and August they ran this program over one hundred times going into 44,000 homes in the Shoals area (Lauderdale and Colbert Counties).



A brief one-page handout on the Do's and Don'ts of Fire Ant control was prepared and then used to present a program on fire ant control to about 125 county beef producers at the annual Beef Field Day in April.

This program was presented to the Florence Kiwanis Club in May. A news article was prepared and printed in two newspapers.

Through these educational efforts, thousands of people were made aware of the difficult task of controlling fire ants. Consumers should be able to make better and more economical choices in their fire ant control efforts.

2005 Fire Ant Bait Demonstration

Henry Dorough

Location: Oak Valley Farms, Munford, AL

Owner: Greg Street

The demonstration site is a purebred Angus cattle operation located on Curry Station Road (Co. Rd. 399) approximately 8 miles North of Talladega. The site is approximately 20 acres and has about ¼ mile of road frontage. The site was heavily infested with imported fire ants with an average of 236 mounds per acre. The site was almost evenly divided by a two-track road, which was used as the boundary between the treated and untreated areas. The homestead is located adjacent to the treatment area and was evaluated as a separate area. Evaluation of the site was conducted by using mound counts in four ¼-acre circles in each of treated and un-treated areas and mound counts in the area of a perimeter fence around the homestead.

The owner of Oak Valley Farms was interested in quick results, therefore, Amdro[®] Pro was chosen as the product of choice for this demonstration because it typically reduces fire ant population in two to four weeks. However, a vendor of the fire ant bait Extinguish[®] provided me with a 25 pound bag of the product to blend 50/50 with the Amdro[®] Pro. Extinguish[®] contains an insect growth regulator which is not toxic to fire ants but rather prevents the queen from laying fertile eggs. This mode of action typically results in fire ant population reduction through attrition as worker ants die-off naturally; approximately 60 to 150 days.

The blend of Amdro[®] Pro and Extinguish[®] was used in the pasture treatment area. Amdro[®] Pro was used by itself in the homestead area. The first treatment of 11/2 pounds per acre of the 50/50 blend was made on June 17, 2005, using the skip-swath method with a Herd spreader attached to an ATV. The skip-swath method was not used on the homestead, instead, Amdro[®] Pro was broadcast at 11/2 pounds per acre over the entire area using a Herd spreader attached to an ATV. The weather was ideal with overcast skies and a slight breeze. The temperature was in the upper 70's (Fahrenheit).

Prior to treatment, the average number of mounds per acre for the treated area was 59.75 and 58.5 for the untreated area. The homestead contained 57 mounds prior to

treatment. Evaluation of the site was conducted on November 7, 2005. Post treatment mound counts revealed an overall 90% reduction of fire ant mounds in the treatment area while the untreated area had a 5% increase in the number of fire ant mounds. Treatment around the homestead resulted in a 70% reduction in the number of mounds. Mound counts by plot are listed at the end of this report.

It is interesting to note the difference in overall control of fire ant populations between the area treated with Amdro[®] Pro / Extinguish[®] blend and the area treated with Amdro[®] Pro alone. The 50/50 blend achieved 90% control while the Amdro[®] Pro by itself achieved only 70% control. There was a large untreated pasture on the South side of the homestead as well as property located across the highway, both of which could have been a source of infestation of new queens. However, the same rationale could be used for the treated area which had the untreated area adjacent on the North and the same property located across the highway. Evaluation of the demonstration area was completed five months after treatment which may have led to the difference in control in the two areas. The plots should have been evaluated after four to five weeks to truly measure the effectiveness of the Amdro[®] Pro alone. Because Amdro[®] Pro works in such a short time period, there are fewer, if any, workers to defend the territory thus allowing reinfestation to occur in a relatively short timeframe.

There may be some advantage of using the two products blended together by reaping the benefits of the different modes of action of the active ingredients. Ant colonies not controlled by Amdro[®] Pro may later succumb to Extinguish[®] if the queens received an adequate dose of the insect growth regulator in the product. In addition, fire ant workers that linger in the area treated with Extinguish[®] may have slowed the rate of reinfestation by killing winged fire ant queens that land in their territory. Some of the colonies in the Amdro[®] Pro treated area were small, indicating that the area had been reinfested. In a recent demonstration at the Talladega Superspeedway located approximately 3 miles north of this demonstration site control in excess of 90% was achieved using Extinguish[®] Plus, a product containing a 50/50 blend of Amdro[®] Pro and Extinguish[®]. Fire ant populations at the Superspeedway were comparable to those at Oakview Farms.

The cost of application for Amdro[®] Pro for this project was \$5.94/acre at the 1-1/2 pound per acre rate using the skip-swath method. For this demonstration, Extinguish[®] was provided complimentary, however, the cost of Extinguish[®] is comparable to that of Amdro[®] Pro. Therefore, producers interested in using the 50/50 blend of Amdro[®] Pro and Extinguish[®] could purchase one 25 pound bag of each and then apply the blend at 1-1/2 pounds per acre using the skip-swath method at an approximate cost of \$5.90/acre.

The original plan for this demonstration called for demonstration signs to be displayed along the edge of the field adjacent to the county road, however, after evaluating the idea, it became evident that signs would not be practical because they could not be easily read by individuals passing by at the posted speed limit. Instead, the demonstration was advertised by various means to inform cattle producers and others interested in controlling fire ants on larger tracts of property.

As a result of the change in the budget, the dollars saved by the elimination of demonstration signs and travel were used to purchase one additional 25 pound bag of Amdro[®] Pro to be applied to the entire pasture; treated and untreated areas. Changes in the budget are reflected in the table on the next page.

Results of this demonstration will be posted at the local farm stores and handed out to clientele upon request for fire ant control information. Results will also be published in the local media outlets in a timely manner.

Further evaluation of this project will be completed one year post-treatment to assess the long term effectiveness of the method of application and products used. Continuation of this project will be completed by the landowner.

Proposed Budget: (\$450 allocation)		Actual Budget:	
1 bag of Amdro [®] Pro	\$225	2 bags of Amdro [®] Pro	\$392.40
Demonstration Signs	\$ 50		
Mileage	\$165	Mileage	\$ 50.42
TOTAL	\$440		\$442.82

Results

Treated Plots

Pre-Treatment (# Mounds)*	Post-Treatment (# Mounds)*	Change
1 – 102	1 – 11	- 89%
2 – 63	2 – 3	-95%
3 – 67	3 – 9	-87%
4 – 7	4 – 1	-86%
Avg. 59.75	Avg. 6	Avg. -90%

Untreated Plots

Pre-Treatment (# Mounds)*	Post-Treatment (# Mounds)*	Change
1 – 55	1 – 57	+4%
2 – 47	2 – 58	+23%
3 – 51	3 – 65	+16%
4 – 81	4 – 65	-19%
Avg. 58.5	Avg. 61.25	Avg. +5%

Homestead

Pre-Treatment (# Mounds)*	Post Treatment (# Mounds)*	Change
57	17	-70%

* mounds per quarter acre circle

Agent Develops Team Effort to Control Ants at Superspeedway

Henry Dorough

Since their introduction into the United States in the early 1900's, fire ants have been the primary target of many Extension projects. Regional Extension Agent Henry Dorough enlisted the help of fellow agents, the Alabama Imported Fire Ant Management Program and a company that markets fire ant bait to address a serious fire ant infestation at the Talladega Superspeedway, NASCAR's fastest track and home of two major NASCAR Nextel Cup races.



Talladega Superspeedway

Dorough was no stranger to fire ants. He had received repeated calls from race fans and from Superspeedway staff about fire ant problems on the campgrounds as well as the speedway property. Twice a year, race fans poured into local stores to buy anything that purported to kill the ants, even resorting at times to illegal methods such as igniting gasoline, diesel fuel and lighter fluid within infested areas. With this in mind, he set out with two goals: to employ the most effective strategy available to control the pests and, in the process, to educate as many people as possible about fire ant control.

From Aug. 1 through 3, 2005, Dorough's team, equipped with 16 John Deere Gators mounted with fire ant bait spreaders, trained the speedway staff in calibration and spreading techniques and then monitored the spreading of over 2,500 pounds of a bait product on approximately 1,500 acres of campgrounds owned by the Talladega

Superspeedway. Pre-treatment surveys revealed an average of 189 fire ant mounds per acre throughout the campgrounds, outside the track and in the infield.

Post-treatment surveys conducted from September 30 to October 2, 2005, turned up impressive results: The number of mounds was reduced to only 9 per acre --- a 95 percent reduction. The team also surveyed race fans throughout the campgrounds on 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. They were asked if they had



Speedway staff loading Herd Seeders with fire ant bait.

brought chemicals to control fire ants in their campsite and also how they controlled fire ants within and outside their homes. The survey revealed many fans had encountered serious problems in the past that they believed warranted some form of chemical control. Fans even admitted to using gasoline, diesel and lighter fluid in addition to a long list of insecticides on their campsites to eliminate fire ant problems --- the same kinds of methods many of them used at home.

The survey also revealed that race fans (who had attended the race two or more times and did not use chemicals on their campsite) were very surprised with the results of the project and were enjoying a comparatively fire ant-free race for the first time.

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. 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.

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 in 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.



Signs placed at treated campgrounds.

Controlling Fire Ants in Pastures

Tinsley H. Gregg

Since the introduction of fire ants to the south in the 1930's, they have become an increasing nuisance in livestock operations. Fire ants cost livestock producers millions of dollars annually due to livestock injuries, equipment damage, and feed losses. A test was set up to demonstrate how to use fire ant baits to control fire ants in livestock operations.

The demonstration was conducted on a pasture in Etowah County. A demonstration area was treated with one pound of Amdro[®] per acre with the other acre being left untreated and serving as our control. Mound counts were taken at 4 month and 6 month intervals after bait application. At 4 months, control was determined to be at approximately 70% and at 6 months, 60%.

In this demonstration, fire ant mounds were reduced from an average of 100 per acre to an average of 32 mounds per acre. The owner of the pasture was pleased with the results and intends to treat more of his pastures in the future.

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

Arthur G. Appel and Lawrence C. Graham

1. Determine the energetic costs of movement and foraging speed of mono- and polygyne forms of the red imported fire ant.

Mono- and polygyne forms of the red imported fire ant were obtained from colonies in Alabama and southern California. Dealated queens and workers were weighed and confined individually in a specially constructed running tube respirometer purchased from Sable Systems, Inc. The position of the ant within the running tube and the amount of CO₂ produced by the ant were recorded every 0.5 sec for 30-60 min. A total of 34 1-h runs have been recorded at room temperature of 23°C. Total movement ranged from 0 to 8.53 m. Instantaneous rates of movement ranged from 0 to 10.7 m/h. There was a significant negative relationship between ant mass and rate of movement. Larger, heavier ants (dealated queens and major workers) traveled shorter distances in fewer bouts than smaller (minor workers) ants. It is possible that there is a greater net energy requirement for polygyne colonies of the red imported fire ant than for similar sized monogyne colonies.

2. Determine the energetic costs of load carriage of mono- and polygyne red imported fire ants.

Rates of CO₂ production of running ants were measured using running tube and flow-through respirometry techniques. Individual ants were weighed and various wire weights were gently looped between an ant's head and thorax (as a necklace). Wire weights represented masses of insecticidal bait particles. There was little apparent energetic cost of weights up to twice that of individual worker ants; dealated queens would not move with attached wire weights. Additional replicates are necessary to determine the load

masses that will affect ant energetics. This information can be used to design granular baits of sufficient size to introduce enough toxicant into a colony, yet are light enough to cost little to transport. If particles contain appropriate attractants and food materials and are light enough, they can be carried a longer distance and therefore applied further from the colony mound.

3. Measure the effects of movement and temperature on red imported fire ant desiccation.

Ants were weighed and desiccated at various temperatures (10-35°C) in a constant air flow of 100 ml/min within a Peltier effect incubator (Fig. 1).

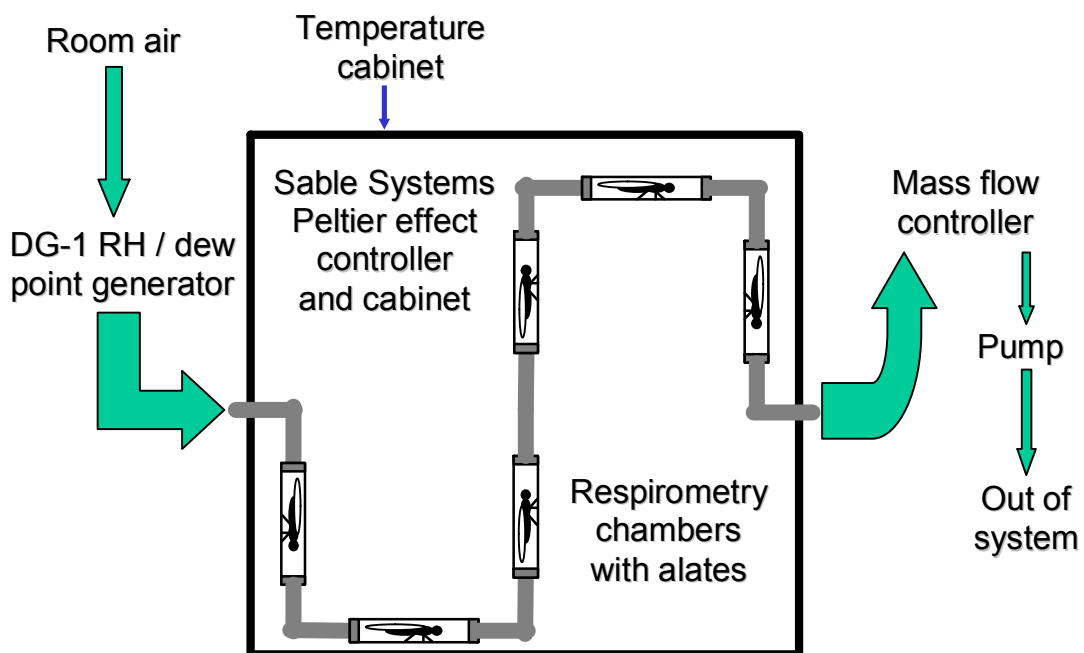


Figure 1. Flow through desiccation system diagram; green arrows indicate air flow.

Agricultural Consequences of Species-Specific Variation in Aphid Tending by Fire Ants

Micky D. Eubanks

In a previous series of greenhouse and field experiments we found that fire ants were strongly attracted to cotton aphids. They actively tended these honeydew-producing insects, and were much more likely to attack insect predators and herbivores on cotton plants with aphids. These results suggest that cotton aphids indirectly increase the mortality of serious cotton pests via their attraction to fire ants. We asked similar questions about the potential role of fire ant – aphid mutualisms in tomato and found very different results. There was no relationship between the abundance of aphids and the predation of other insects by fire ants. We hypothesized that the lack of a strong aphid – fire ant mutualism and corresponding negative effects of the mutualism on herbivores in tomato is because different aphid species inhabit tomato fields and surrounding weeds than cotton fields and a higher proportion of these aphids are alate (winged). The cotton aphid, *Aphis gossypii*, is the overwhelmingly dominant aphid



Fire ants tending aphids.

species in cotton. In Alabama tomatoes and neighboring weeds, however, cotton aphids are relatively rare and at least five other aphid species are far more abundant (*Uroleucon nigrotuberculatum*, *Uroleucon caligatus/tissoti*, *Myzus persicae*, *Aulacorthum solani*, and *Macrosiphum euphorbiae*). We tested the hypothesis that fire ants either do not tend

these species or do not tend alates of these. We found that fire ants did not tend apterous (wingless) or alate (winged) colonies of *Uroleucon nigrotuberculatum* and *Uroleucon caligatus/tissoti*. This is surprising given that these are large aphids that are extremely abundant on goldenrod and other weedy plants around tomato fields. Our observations, however, suggest that these aphids do not excrete honeydew. We also found that fire ants did not tend apterous individuals of *Myzus persicae* or *Macrosiphon euphorbia* and we think this is because the alates do not produce copious quantities of honeydew and are not densely packed together on tomato plants. These experiments should allow us to more accurately predict the effect of fire ants on aphids and other insects in and near tomato fields.

**Biology and Host Location Behavior of
Pseudacteon Parasitoids of *Solenopsis* Fire Ants**

Henry Y. Fadamiro and Lawrence "Fudd" Graham

The research objectives were to:

- 1) Determine the life history strategy of *P. tricuspis* and evaluate the effects of adult feeding and several physiological factors on female fecundity.
- 2) Evaluate the effect of microhabitat on the survival and fecundity of *P. tricuspis*.
- 3) Identify cues used by phorid flies for host location and host acceptance.

Objective 1. Determine the life history strategy of *Pseudacteon tricuspis* and evaluate the effects of adult feeding and several physiological factors on female fecundity.

We have 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 at 20°C, compared to mean longevity of 7 days recorded at 33°C, suggesting that adult *P. tricuspis* is sensitive to high temperatures. Sex (gender) or mating did not significantly influence longevity. These results have been recently published (Chen et al., 2005).



**Dorsal view of
P. tricuspis.**

Objective 2. Evaluate the effect of microhabitat on the survival and fecundity of *P. tricuspis*.

In another study, we examined the effects of water, microhabitat and food supplements (e.g., nectar and honeydew) on the lifespan of *P. tricuspis*. Completely starved (provided no water and no sugar) flies rarely lived beyond one day. Provision of water increases longevity by 2 days. Compared to flies provided with water only, cotton aphid honeydew modestly increased longevity with significant increases in body levels of fructose, total sugars, and glycogen. Adult *P. tricuspis* were observed foraging on buckwheat flowers. However, no significant effects of buckwheat nectar on phorid fly longevity and body nutrient levels were detected. 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 (Fadamiro et al., 2005; Fadamiro and Chen, 2005).

Objective 3. Identify cues used by phorid flies for host location and host acceptance.

We have commenced a study to identify chemical cues used by *Pseudacteon* phorid flies for host location and host acceptance. The roles of chemical cues such as cuticular hydrocarbons and ant pheromones in host location and acceptance are being examined. Our preliminary olfactometer bioassays have demonstrated possible attraction of *P. tricuspis* to fire ant hosts. In one experiment, we tested in an olfactometer the attraction of phorid flies to extracts from different fire ant body parts including head, thorax, abdomen, and whole body from different colonies. In another experiment, we are evaluating the response of *P. tricuspis* to different components of fire ant trail pheromone and other chemicals including farnese and linalool at different doses. This study is currently ongoing.



**Ventral view of
P. tricuspis ovipositor.**

An Assessment of Fire Ant Control Product Use by Urban Residents in Birmingham, Alabama

Xing Ping Hu

There is a growing awareness and hence, a growing concern about red imported fire ant control by residents in urban environments. The Alabama Fire Ant Management Program has made progress in educating Alabamians about new technologies and products for fire ant control.

The purpose of this study was to assess fire ant control products used in urban areas. One hundred eleven homeowners, residents, and public schools in the Birmingham



metropolitan area were surveyed using the personal visit method during 2004. Eighty eight people answered all of the survey questionnaires, a response rate of about 79%.

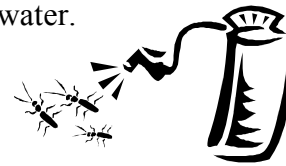
Results of the survey show that 91% of the participants (80 out of 88) considered the fire ant to be the major urban pest. Nine percent answered “not sure” because their pest management professionals cover fire ant problems. When asked who was responsible for fire ant control, replies indicated that 51% hired pest control professionals, 45% did the fire ant control themselves, and 3% did nothing about fire ants. The results indicate the great need of educating both homeowners and the pest control professionals about fire ant control.

Of the 40 homeowners/residents who conducted their own fire ant control, the majority (60%) learned fire ant biology and control with help from the Alabama Extension System (agents, publications, and news letters), 35% learned from the internet alone, and 5% had no knowledge of fire ant biology but consulted salesmen of fire ant

insecticides. These results indicate the importance of the Alabama Fire Ant Management Program and the Alabama Cooperative Extension System and the need for continuing fire ant educational programs.

When asked about common fire ant control practices, 55% replied that they have been using bait products, 40% applied whatever products were available from local stores, and the rest said they used hot water, gasoline, or soapy water.

Again the results indicate the importance of our fire ant educational program and the need for continuing education.



When asked about current available fire ant control technology, an overwhelming majority thought that the products that have both quick kill and long-lasting characteristics are the best. Twenty five percent thought IGR baits are the best because of their environmentally friendly reputation. Only 5% preferred immediate kill products only.

At the end of each visit, extension publications on fire ant management were disseminated. Participants ranked *Fire Ant Control Materials for Alabama Homeowners* the most wanted publication, and biological control using decapitating phorid flies the most interesting program.

**Characterize the Functional Genomics of
the Red Imported Fire Ant, *Solenopsis invicta* Buren**

Nannan Liu

Introduction

A number of genes differentially expressed in the fire ant queens and workers have been uncovered using subtractive hybridization and cDNA array approaches (Liu and Zhang 2004). Although several partial cDNAs identified in queens and workers, showed homologues to known genes, the functions of these genes in the fire ant have not been well reported. Among these genes, two cytochrome P450 genes, *CYP4AB1* and *CYP4AB*, *Gp-9* and *Vg1* have been cloned, sequenced, and characterized from the red imported fire ants (Liu and Zhang 2004). Differential expression of these genes among castes and developmental stages suggests their functional importance in development and caste differentiation. These pioneer studies have provided us with important information on the differential expression of genes presented in workers and queens, confirming that substantial physiological differences between queen and worker fire ants do reflect the differential expression of genes present in both castes.

Current Study and Results

In the age of genomics, the subtractive PCR hybridization technique has not allowed us to achieve our long-term goal through its narrow focus and fails to provide the global examination of genome function. In order to decipher genes involved in the caste differentiation, development, reproduction, response to pathogens, and social behavior of the red imported fire ant and ascertain the functions of genes, we have made the first comprehensive effort to develop the first state-of-the-art EST database and a microarray system of the red imported fire ant to characterize the functional genomics of the red

imported fire ant. The EST library database represents an entire genomic population of mRNAs of the fire ants and will allow us to study many interesting aspects of the biology of fire ants by enabling simultaneous monitoring of the expression of many genes. To date (09/16/04), we have generated 4860 unique EST sequences from the fire ant queen library using the M13(-20) FWD primer.

Using these ESTs as the tool, we have initiated the study on the identify genes differentially expressed among developmental stages, castes, and sexes of the red imported fire ants. We have isolated sixteen cytochrome P450 gene fragments from the fire ant EST library. These P450 fragments exhibited significant protein homologies with cytochrome P450 families 4, 6, 9, and 319, with the similarities arranged from 35 to 72%. Northern blot analysis was performed to compare expression levels of these P450 genes for different development stages (1st+2nd instar larva, 3rd+4th instar larva, pupa, and adult) and castes of fire ants (Figure 1).

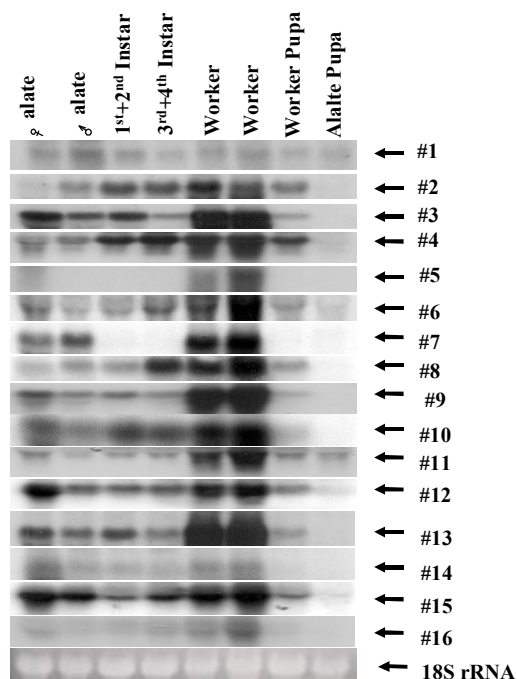


Figure 1. Northern blot analysis of 16 cytochrome P450 gene fragments for different life stages and castes of red imported fire ants. The ethidium bromide stain of 18S ribosomal RNA in agarose gel is shown at the bottom.

We found that the expression of most of these P450 genes were developmentally and caste specifically regulated in red imported fire ants. mRNA levels of these P450s were overexpressed in the workers with no significant differences between big workers and small workers. Their caste-specific overexpression suggests the importance of these P450 genes in workers of the red imported fire ant. The functions of the P450s identified in the fire ant as metabolism of endogenous compounds in workers, response to queens' chemical signals, as well as involved in the caste differentiation merit the consideration.

Significance

Our research on establishing fire ant expressed sequence tag (EST) libraries and database and identifying the genes that are differentially expressed between larvae and adults, queens and workers, and female alates (winged) and queens (wingless) will be extremely important. It represents the first comprehensive effort to characterize the genes involved in the development, reproduction, and behavior of the red imported fire ant and takes the first step toward gaining an understanding of molecular processes associated with the organization of social insect societies. It may result in the discovery of a better way to manage the red imported fire ant.