

UTILIZING NATURAL BIOLOGICAL CONTROL BY THE COTTON APHID FUNGUS

Don Steinkraus, Jon Zawislak, Gabriele Boys, and Gus Lorenz

Department of Entomology

University of Arkansas

Fayetteville, AR

Patricia O'Leary

Cotton Incorporated

Cary, NC

Abstract

The Cotton Aphid Fungus Sampling Service is a program that helps cotton growers manage cotton aphid problems. It is located in a laboratory at the University of Arkansas in Fayetteville. The program has been free to participants since 1993 because it is funded by Cotton Incorporated and the University of Arkansas. Each year the service diagnoses the fungal prevalence levels in about 300-400 cotton fields from around the Midsouth and Southeast. The information on this natural enemy is used to make IPM decisions for cotton aphids.

Introduction

Scientific Basis

The sampling service is based on field research that shows that the cotton aphid fungus often dramatically limits and reduces aphid populations in June and July across the Midsouth and Southeast and has done so for the past 15 years. The service utilizes a fundamental principle of integrated pest management (IPM). In the original definition of IPM by Stern et al. (Hilgardia 1959) they stated, "Chemical control should be used only when the economic threshold is reached and when the natural mortality factors in the environment are not capable of preventing the pest population from reaching the economic injury level." This is still good advice and is the theoretical basis of the Cotton Aphid Fungus Sampling Service.

Materials and Methods

Who Can Participate

The Cotton Aphid Fungus Sampling Service is a free service for growers, extension agents, private consultants, and other interested cotton specialists in the Southern United States. To request participation in this service, we can be contacted by phone or fax at (479) 575-5024 or by email at aphid@uark.edu. More information is available on the world wide web at www.uark.edu/misc/aphid.

How it Benefits the Grower

The program helps growers make decisions about whether they should treat an aphid infestation with insecticides. When a fungal epizootic is in progress it generally provides control as good or better than chemical control. Therefore, knowing the status of the aphid fungus in a particular field can be useful. Based on experimental data (Hollingsworth et al. 1995), when results indicate that 15% of aphids sampled in a field are infected with the fungus, it is likely that the aphids will decline soon due to the fungus. When 30-90% of the aphids in a field are infected with the fungus, the aphid population undergoes a rapid decline. In both of these cases growers can usually save money by not applying a chemical for aphid control. Therefore the service provides decision makers with additional information that may help avoid expensive applications for insecticides when natural control will control the aphid population.

How it Works

- 1) Participants locate aphid infestations in the cotton field.
- 2) Samples of aphid-infested cotton leaves are preserved in vials from the sampling kit.
- 3) Urgent samples are shipped overnight to the diagnostic lab at the program's expense.
- 4) A random subsample of aphids are mounted on microscope slides.
- 5) Aphids are examined with a high-power phase microscope to detect the presence of fungus.
- 6) Diagnostic results are reported back to the cooperators via fax and posted on the world wide web (usually within 24 to 48 hours).

Results

Each point in the graph (Fig. 1.) shows the percentage of fungus in the sample from one cotton field in 2003. The graph shows that a large number of cotton fields that were sampled had epizootics of the cotton aphid fungus and these fields should not have been treated with an insecticide during in the days preceding or during the epizootic. The data also shows

that after the widespread epizootics occur, few samples are submitted due to the low aphid numbers in the southern United States after the epizootics occur widely.

Conclusions

Is the Aphid Fungus Sampling Service Effective?

The effectiveness of the service can best be evaluated by those who use it. Here are some of the comments we have received from the program's participants over the past 10 years:

“Heavy infestation. Complete control with fungus.” -Richard Davis, Montgomery, AL

“Many sprays were avoided due to early fungus appearance.” -Tim Flanders, Cairo, GA

“Heavily infested. Fungus provided control, prevented additional applications.” -Mike Donahoe, Milton, FL

“This project provides useful information that influences treatment decisions.” -Blake Layton, Miss. State, MS

“Around July 4 aphids started building up after Bidrin treatment. Rain & humidity helped spread fungus and aphids were not a problem for rest of season.” -Donald Sudbrink, Stoneville, MS

“Diagnostic results will be extremely helpful in making treatment decisions.” -Tim Reed, Russelville, AL

“High infestation. Fungus discovered and eliminated need of 4 sprays.” -April Fisher, Lonoke, AR

“Severe infestation, excellent control with fungus.” -Ralph Bagwell, Winnsboro, LA

“Aphid population ... was heavy and prolonged. We sent you samples and the 2nd time, you reported presence of the fungus. We could not detect it visually until 6 days later. We would have seriously considered treating the fields affected if you had not notified us that the fungus had begun to set in.” -Tammy Pickard, Andalusia, AL

Acknowledgments

We would like to thank Cotton Incorporated, our Extension coordinators, our hourly workers, and all the consultants and growers who have participated.

References

Hollingsworth, R. G., D. C. Steinkraus, and R. W. McNew. 1995. Sampling to predict fungal epizootics in cotton aphids (Homoptera: Aphididae). *Environ. Entomol.* 24: 1414-1421.

Stern, V. M., R. F. Smith, R. van den Bosch, and K. S. Hagen. 1959. The integrated control concept. *Hilgardia* 29: 81-101.

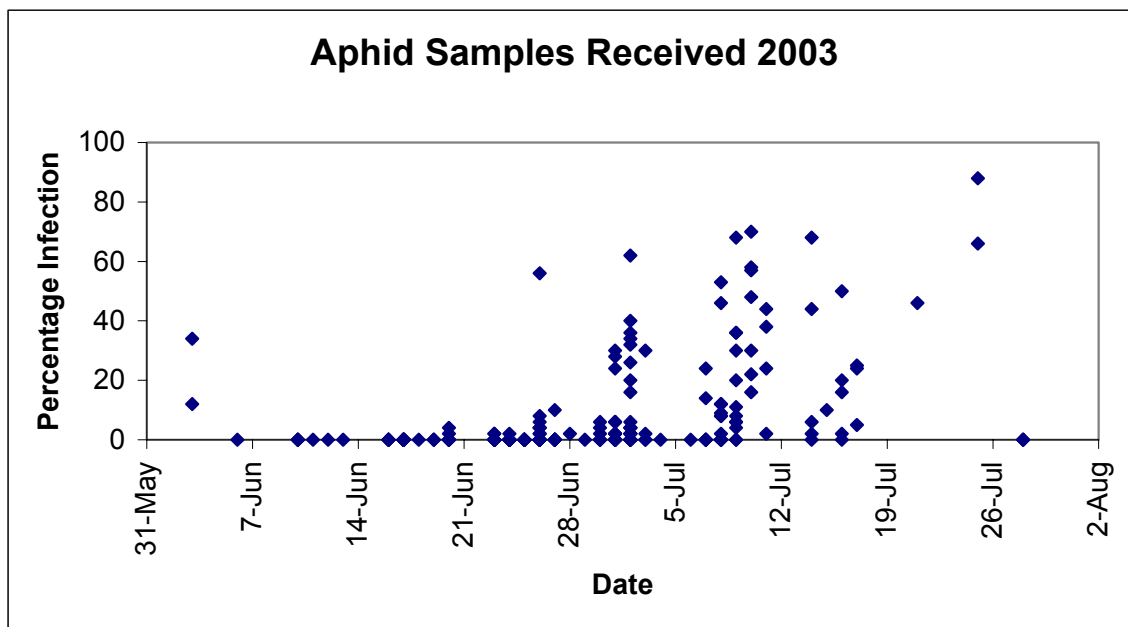


Figure 1. Percentage of *Neozygites fresenii* infection (prevalence) from samples of cotton aphids, *Aphis gossypii*, taken from cotton fields across the Midsouth and Southeast during 2003. The data shows that beginning in late June fungal epizootics began and resulted in control of aphid populations in many fields.