UPDATE ON PREDICTION OF EPIZOOTICS WITH EXTENSION-BASED SAMPLING SERVICE

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Abstract

An extension-based sampling service for diagnosing cotton aphids for aphid fungal infections is in its fifth year of operation. Its goal is to provide growers with rapid, timely information concerning epizootic development and aphid population declines in their fields. This data helps make IPM decisions and may reduce insecticide applications when epizootics are imminent.

Introduction

The cotton aphid, *Aphis gossypii*, is an important pest of cotton in the Midsouth in many fields every year. A fungus, *Neozygites fresenii*, identified in US cotton in 1991 (Steinkraus et al. 1991), has been a valuable natural enemy of *A. gossypii*. Epizootics have rapidly reduced many aphid populations and have been recorded in the Mississippi Delta each year since 1988 (Steinkraus et al. 1995). Research indicates that when 15% of the aphids in a field are infected (prevalence), a rapid aphid decline can be expected (Steinkraus and Hollingsworth, 1994; Hollingsworth et al. 1995). This information, coupled with accurate sampling of aphids and diagnosis of the prevalence of fungus in the aphid populations in individual fields, opens the possibility of reducing insecticide treatments if epizootics are imminent. Incorporation of natural enemies, such as *N. fresenii*, into insect control is one of the cornerstones of IPM.

Since 1993 we have operated an extension-based sampling program for determining fungal prevalence in individual fields in Arkansas. This program was funded by a USDA Special Grant in 1993, 1994, and 1995. Cotton Incorporated has funded it during 1996 and 1997. While a similar program was proposed for *Nomuraea rileyi*, a fungus that causes epizootics in soybean Lepidoptera larvae (Kish and Allen 1978), the Arkansas insect disease monitoring program is apparently unique at the present time. The service seeks to identify fields that are on the verge of an epizootic, permitting a grower with some confidence to utilize the natural control provided by this fungus.

We provide an update on the status of the extension-based aphid fungus sampling service.

Materials and Methods

Arkansas extension agents were contacted in early summer. An attempt was made to have at least one cooperating agent in each of the major cotton growing counties of the state. Each agent was supplied with aphid sampling kits consisting of vials filled with 70% ethanol for preserving aphids, data sheets, instructions, cardboard mailing tubes to mail the samples to the diagnostic laboratory, and Federal Express envelopes.

Participating agents were instructed to sample aphids in cotton fields when the aphids were reaching economic thresholds and treatment was anticipated. Ideally, each field was sampled from at least four representative areas of the field to collect a sample of 100 to 200 aphids. The aphids were placed in vials, labeled, and mailed via overnight mail to the diagnostic laboratory with the data sheets.

Between 1993 and 1995, diagnoses of aphids for fungus were made in the Plant Disease Diagnostic Laboratory in Lonoke, AR. In 1996 we moved the operation to the Virology-Biocontrol building at the University of Arkansas Research Farm in Fayetteville, AR. Two trained technicians diagnosed aphid samples under our supervision.

Agents mailed samples by Federal Express to the diagnostic laboratory. Fifty aphids were randomly selected from each field's sample, squashed on a microscope slide in a fixative-stain, and permanently sealed under a coverslip. Each aphid was diagnosed at 200x with a phase contrast microscope. The method of diagnosis is nearly 100% accurate. The percentage of infected aphids (prevalence) was then determined.

Within 24 hours of receipt, the results from each sample were Faxed or telephoned to the sending agent. This provided agents with precise information regarding the status of epizootics within individual fields. If the prevalence was 15% or higher, there is a high likelihood that the fungus would reduce the aphid population to low levels within a few days. The fungus is free, doesn't harm predators and parasitoids in the field, and doesn't result in contamination of the environment by toxic chemicals.

Results and Discussion

In 1996, 19 extension agents in 15 Arkansas counties participated in the program and they submitted samples from 97 fields or collection dates. No aphids were found infected between 11 June and 24 June. By June 25 epizootics were detected in southeastern counties, Ashley, Chicot and Drew. This follows a previously reported pattern of epizootics occurring earlier in the south of the state than the north (Steinkraus et al. 1995). By mid-July epizootics were detected in fields from all areas of the state except the northeast. By July 18 epizootics were detected in Craighead and Poinsett counties in the northeast. The

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1047-1048 (1997)
National Cotton Council, Memphis TN

main value of the service is to provide extension agents, consultants, or growers with precise information concerning the status of epizootics in individual fields. It permits IPM decisions to be made with full knowledge of the natural control available.

A second use of the service is to document the effect of the fungus statewide. For instance it supplies information on when epizootics are first observed in Arkansas each year (Table 1). As can be seen the first epizootics have begun earlier each year since 1992, however, epizootics have not occurred prior to late June in any year. The dates of these early epizootics are all from the southeast counties of the state, Ashley, Chicot and Drew. This is clear evidence that the fungus cannot be expected to provide control of early season (before 20 June), heavy aphid infestations, even in the most southern fields. In northern counties such as Craighead and Poinsett, epizootics have not occurred earlier than 15 July, alerting extension that the fungus has not been of use for aphid outbreaks before that date. The reasons for the earlier onset of epizootics in recent years is unclear, it is most likely related to earlier onset of aphid outbreaks in cotton in recent years, which is also poorly understood.

Future of Sampling Service. Cotton Incorporated has funded the service for Arkansas through the 1997 field season. If continued funding can be achieved, we would like to continue the service in subsequent years and expand the service to Louisiana, Mississippi and other interested adjacent states. If the service can be continued, its value to the cotton community needs to be scientifically assessed in cooperation with an agricultural economist.

Acknowledgments

We thank Pat O'Leary, Bob Nichols and Cotton Incorporated for funding these studies. We thank all participating extension agents and growers, for their cooperation. Laura Boys, and Melissa Opela provided technical support.

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Table 1. Occurrence of fungal epizootics in *A. gossypii* caused by *N. fresenii* in Arkansas.

Year	Date of first epizootic occurrence
1992	28 July
1993	25 July
1994	12 July
1995	4 July
1996	25 June