

THE OCCURRENCE OF A FUNGAL ENTOMOPATHOGEN IN WESTERN TARNISHED PLANT BUG POPULATIONS IN THE SAN JOAQUIN VALLEY

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Abstract

In November, 2000, the fungal entomopathogen, *Beauveria bassiana* was found in *Lygus hesperus* populations in the San Joaquin Valley of California. In 2001, six cotton producing counties were surveyed in the spring, summer, and fall for prevalence of *B. bassiana* in *L. hesperus* populations. In addition, six alfalfa fields in Kern County, CA were sampled weekly for prevalence of the fungus. In all counties, *B. bassiana* was found infecting an average of less than 5% of the resident *L. hesperus* with the fall sample generally producing higher prevalence of infection. Prevalence of infection varied in the Kern County alfalfa fields throughout the growing season with infections typically increasing in the fall and early winter. Prevalence of infection was not directly related to *L. hesperus* population size at the time of sampling.

Introduction

The Western tarnished plant bug, *Lygus hesperus* is a key pest of cotton in the San Joaquin Valley (SJV) of California and can cause losses of up to \$30 million per year. Because there are no pesticides specific for *L. hesperus*, current control practices rely on the use of broad spectrum pesticides early in the season that can result in the later emergence of secondary pests such as aphids and whiteflies. The development of a specific control agent for *L. hesperus* and other species of plant bug would greatly benefit IPM approaches to cotton insect control.

Beauveria bassiana is a well known entomopathogenic fungus that infects a wide range of insect pests. Steinkraus and Tugwell (1997) found *B. bassiana* infecting *L. lineolaris* in Arkansas. Subsequent tests with the Arkansas strain provided good field results but tests with the commercial product Mycotrol provided less than satisfactory control. Noma and Strickler (1999) reported good laboratory activity of Mycotrol against *L. hesperus* in Idaho but, again, field results were relatively poor. The strain used for the production of Mycotrol was originally isolated from a Chrysomelid beetle and does not survive well at temperatures commonly found in the SJV (Inglis et al. 1999). Fargues et al. (1997) demonstrated a wide range in thermo tolerance and optimal growth rates at different temperatures for 65 isolates of *B. bassiana* and suggested that it is "important to match the thermal requirements of a prospective microbial control agent to the climatic conditions expected at the targeted environment". The development of a *Lygus spp.* strain of *B. bassiana* that can survive at higher temperatures found in the SJV may prove useful to *L. hesperus* control.

Last year, we reported (McGuire et al. 2001) naturally occurring *B. bassiana* infections in California populations of *L. hesperus*. The purpose of this study was to determine the prevalence of naturally occurring *B. bassiana* in the SJV and to determine if the fungus had an impact on *L. hesperus* populations. This baseline information is necessary before releases of different strains of *B. bassiana* are made.

Materials and Methods

SJV County Surveys

The counties of Kern, Tulare, Fresno, Kings, Merced and Madera were sampled at least once during April - May, June- July, and October-November. At least six sites were sampled in each county for each time period although not all sites had *L. hesperus* populations present. At each site, a GPS receiver was used to record position and then a sweep net was used to collect insects. Estimates of *L. hesperus* populations were made based on a 50 sweep sample. Up to 50 adults and 50 nymphs from each site were transferred to glass vials that contained a piece of green bean. Samples were placed on ice and returned to the laboratory where the insects were held for development of disease. In the spring surveys, roadside weeds (london rocket and other mustards) were typically sampled. In the summer and fall samples, alfalfa was generally sampled. *L. hesperus* were not common in cotton in 2001.

Kern County

In an attempt to determine the impact of *B. bassiana* on *L. hesperus* populations, six alfalfa fields were selected and sampled weekly. For each sample, 50 sweeps were made to estimate population size and, as above, up to 50 adults and 50 nymphs were placed in vials and returned to the laboratory where they were held for up to two weeks to determine presence of *B. bassiana*. Samples were not obtained if the field had been recently harvested or was under irrigation.

Results and Discussion

SJV County Surveys

In every county sampled, *B. bassiana* was isolated from *L. hesperus* (Table 1). In addition, *B. bassiana* was collected during the spring, summer and fall. Average prevalence of *B. bassiana* was lowest in the spring and highest in the fall suggesting a build up of infections. Interestingly, *B. bassiana* was easily recovered in the heat of summer and from a variety of habitats (roadside weeds, alfalfa and cotton) suggesting wide variation among isolates.

Kern County

B. bassiana was found in all alfalfa fields sampled and on most sampling dates. Only three of the fields are presented (Figure 1) but they are representative of the six that were sampled. Typically, percentage infection was below 10% through most of the samples taken in the summer months. However, in Field 56, high levels of infection (40%) were found in June, suggesting some isolates may have high temperature thresholds. In the fall, percentage infection in all fields increased and peaked in October and November. The South 40 field was planted in February, 2001 and was not big enough to sample until early June. Prevalence of *B. bassiana* was very low (less than 5%) through the summer but increased to 25% in the fall.

B. bassiana isolates from all fields sampled are currently in culture and work to characterize the strains has begun. Host range, toxin production and temperature optima will be studied before strains are selected for release into *L. hesperus* populations in the SJV.

Literature Cited

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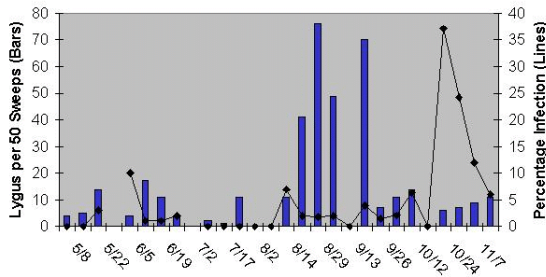
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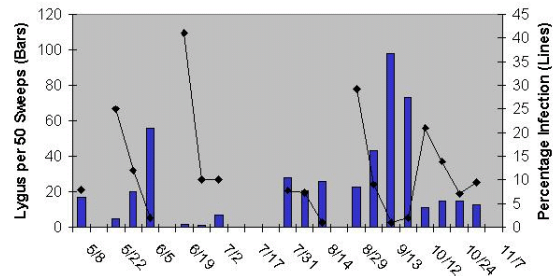
Table 1. Average *Lygus hesperus* population density and prevalence of *Beauveria bassiana* in San Joaquin Valley Cotton Producing Counties, 2001.

County	Spring		Summer		Fall	
	<i>Lygus</i> /50 Sweeps	% <i>B. bassiana</i> Inf.	<i>Lygus</i> /50 Sweeps	% <i>B. bassiana</i> Inf.	<i>Lygus</i> /50 Sweeps	% <i>B. bassiana</i> Inf.
Kern	3.7	2.8	10.9	2.4	18.0	3.1
Fresno	5.1	5.0	17.1	4.3	20.0	12.0
Madera	1.8	0.0	17.8	3.0	6.3	7.4
Merced	3.4	1.4	27.3	1.4	10.6	5.0
Tulare	8.5	0.0	8.3	4.7	12.5	17.3
Kings	8.9	1.4	6.4	4.3	8.3	6.2

Field 55



Field 56



South 40

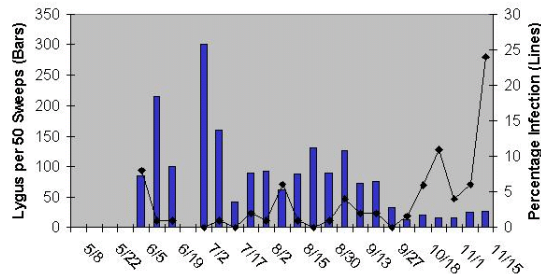


Figure 1. Three fields from Kern County sampled weekly for *L. hesperus* density and *B. bassiana* prevalence.