THE EFFECTS OF EARLY SEASON INSECT CONTROL ON FRUITING CHARACTERISTICS OF COTTON

Jay Phelps,
Cooperative Extension Service
Indianola, MS
Jon Ruscoe,
Cooperative Extension Service
Greenville, MS
Gordon L. Andrews,
Delta Research and Extension Center
Stoneville, MS

Abstract

Tarnished plant bugs, Lygus lineolaris (Palisot de Beauvois), Cotton bollworm, Helicoverpa zea (Boddie) and Tobacco budworm, Heliothis virescens (Fabricus) damage cotton (Gossypium spp.) plants by feeding in the terminals and squares. Insect-day calculations were used to determine the effects of insect control on insect populations over time and the resulting fruiting characteristics of cotton during early season. Differences were observed between insecticide treatments in first fruiting node, sites per plant, number of squares per plant, and percent square retention. Interactions were significant for Lygus days X squares per plant, Lygus days X percent squares retained, and Heliothine days X percent damaged terminals.

Introduction

Tarnished plant bug, Lygus lineolaris (Palisot de Beauvois), Cotton bollworm, Helicoverpa zea (Boddie), and Tobacco budworm, Heliothis virescens (Fabricus) damage cotton (Gossypium spp.) plants and reduce yield potential by feeding in the plant terminal and developing squares. Tarnished plant bug feeding destroys meristematic tissue in the plant terminal, developing anthers and ovules in small squares and developing seeds in bolls (Leigh et al. 1988). Tobacco budworm and Cotton bollworm also feed in the plant terminal and on developing squares. Insect-day calculations have been used to describe the effects of insect feeding over time intervals (Ruppel 1983, Morrill & Wrona 1987, Harris et al 1992). This study reports the effects of early season insect control on insect-day accumulation and resulting fruiting characteristics of cotton.

Materials and Methods

A cotton field with a history of high tarnished plant bug populations was located in Sunflower county, MS, adjacent to the Sunflower River. The field was divided into 18 row plots approx. 1 mile in length with 4 replications per treatment. Sampling began on May 24, 1995 and continued at 2 day intervals until June 12, 1995. Samples consisted of 50 sweeps of a 15-inch sweep net and visual examination of 13 cotton terminals per plot. Insects collected in the sweep were anesthetized with ether and placed in a kill bucket containing ethyl acetate. These samples were transported to a laboratory where insects collected were identified and counted. Terminals were examined for Helio-thine eggs, larvae and evidence of larval feeding. Insect- days (ID), Lygus days and Heliothine days, were calculated as: $ID = (X_{i+1} - X_i)[(Y_i + Y_{i+1}) / 2]$ where X is sample days and Y are insect sample numbers. Cumulative insect-days were computed by summing the individual insect-days.

All insecticide treatments were applied on May 25 after low populations of insects were detected. Subsequent applications were based on MCES control guide recommendations. Two applications of each insecticide were made during the study using a Melroe Spray Coupe delivering 5 GPA.

Fruiting characteristics were evaluated by mapping 100 plants per treatment on June 13. Total nodes, number of first fruiting node (cotyledon=0), number of fruiting sites per plant, and number of squares per plant were recorded. Percent square retention was calculated as squares per plant / number of fruiting sites * 100.

Results and Discussion

Analysis of variance for the plant mapping data indicated Baythroid treatments resulted in a significantly lower first fruiting node than Vydate C-LV and Orthene; Karate treatments had a significantly lower first fruiting node than Orthene. Baythroid treatments also had significantly more fruiting positions than Provado. Baythroid and Provado treatments resulted in a significantly higher percent square retention than Vydate C-LV (Table 1).

A general linear regression model (SAS Institute 1988) was used to determine correlations between dependent variables; total nodes per plant, number of first fruiting branch, number of squares per plant, percent squares retained, percent damaged terminals, and independent variables; Lygus days, Heliothine days, replications, treatments, all interactions. Significant correlations were observed for Lygus days X number of squares per plant, Lygus days X percent squares retained and Heliothine days X percent damaged terminals (Table 2).

As Lygus days increased, percent squares retained and number of squares retained decreased. Percent damaged terminals increased as Heliothine days increased.

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Table 1. Comparison of plant mapping by treatment.

Treatment	Lbs. A.I. / Acre	First Frt. Node	Sites/ Plant	Squares/ Plant	Percent Retention
Baythroid	0.036	5.55 c	4.8 a	3.9 a	90.8 a
Orthene	0.33	5.89 a	4.5 ab	3.6 ab	85.4 ab
Vydate C-LV	0.25	5.84 ab	4.6 ab	3.3 b	81.4 b
Provado	0.047	5.68 abc	4.2 b	3.4 b	86.7 ab
Karate	0.033	5.66 bc	4.6 ab	3.7 ab	85.9 ab
LSD (P=0.10)					

Table 2. Correlations between insect-days and fruiting characteristics.

	n	y intercept	slope	F	P
Lygus Days X Squares/Plant	20	3.98	-0.014	9.48	0.0065
Lygus Days X % Squares Retained	20	84.70	-0.196	8.36	0.0097
Hel. Days X % Damaged Terminals	20	27.07	0.151	4.96	0.0390