PLANT BUG, *LYGUS LINEOLARIS*, MANAGEMENT IN COTTON

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Abstract

The decreased use of insecticides in many cotton integrated pest management programs could potentially increase plant bug damage in Arkansas cotton. Experiments were conducted in Jefferson Co. and Mississippi Co., AR, in 1999 and 2000, respectively, to evaluate the performance of conventional and new insecticides in controlling plant bugs in cotton. Insecticide applications were made the first week in August of each year and immature and adult plant bugs were counted using drop sheets three or four days later. Conventional plant bug insecticides performed well in both years, with Bidrin and Othene providing the highest levels of control. New insecticides including Regent, Denim, and Actara had no effect on plant bug populations. Steward was the only new insecticide that provided acceptable plant bug control. The conventional insecticides used in these experiments will provide acceptable control in areas where resistance is not present. Steward is a welcome addition to IPM programs where plant bug resistance to conventional insecticides has been reported.

Introduction

The plant bug is a pest of cotton production in Arkansas that requires attention each year. The damage is normally inflicted on the youngest squares in the terminal area of the plant. Prolonged infestations will cause substantial damage and subsequent loss of yield. In Arkansas, treatment is recommended when infestations are around 1 plant bug per row foot or when infestations are present and square set is starting to decline below 75 to 80 percent set. An average of 0.68 applications per acre was utilized to control plant bugs in 1992 and 0.73 applications in 1993 (Johnson et al 1999).

The tarnished plant bug is one of the most polyphagus insects that have hundreds of hosts (Young 1986). Tarnished plant bugs overwinter as an adult in and around host plant areas. The availability of host plants in the spring in an important factor of population expansion in the spring. When the early host plants begin to senesce and decline in abundance, the plant bug starts migrating into areas where favorable host plants occur and in many areas of Arkansas that host plant is cotton. Plant bugs have also been found on other host plants in the Delta region including soybean but cotton is the most important crop that is directly affected by plant bugs. In cotton, a generation may be produced in approximately 30 days. As a result, two or more generations may develop in cotton.

The introduction and adoption of the transgenic cotton containing the *Bacillus thuringiensis* gene has reduced the overall requirements for insecticide in the cotton production system. Furthermore, the success of the boll weevil eradication program is eliminating the need for insecticide use to control boll weevil. The evolution of cotton insecticides has also shifted toward the newer insecticides emamectin benzoate (Denim), spinosad (Tracer) and indoxacarb (Steward). Spinosad has not shown activity in the control of plant bugs but the use of indoxacarb has shown some plant bugs activity. Overall, the trend in insecticide development is to develop products that are not as broad spectrum and more specific in activity. As a result, the potential for plant bug population increases in cotton fields appears to be a larger problem in the future that in the past.

In the mid-south cotton production region, entomologists have been concerned about the plant bug for many years and have conducted numerous studies on this insect. Scott et al (1985) reported significant yield losses in plots that were attributed to the tarnished plant bug. The standard approach to solving the problem has been to apply one of a wide range of insecticides that would control plant bugs. In the mid 80's, county agents and consultants started reporting failures of insecticides to control plant bugs. In 1988, Holloway et al reported that tarnished plant bug resistance to oxamyl, acephate and cypermethrin increased with time during the 1995 and 1996 growing season. Resistance of the tarnished plant bug seemed to be associated with the use of the pyrethroid insecticides (Luttrell et al 1998). The development of insecticide resistance in the tarnished plant bug is of major concern because of the potential expanding pest status of the plant bug. The control of tarnished plant bug using acephate, dicrotophos and several new insecticides gave excellent control in Central Arkansas indicating the resistance was not present in all areas of the Delta or at all periods of time in the growing season.

Methods

The field experiment in 1999 was conducted on a producer farm in Jefferson County and 2000 in Mississippi County. The location was moved into the Mississippi County location because the boll weevil eradication program was in progress in Jefferson County and malathion applications had drastically reduced plant bug populations. In 1999, the treatments were applied using a John Deere 6000 sprayer equipped with a CO_2 powered spraying system with 12 spraying booms. Treatments were applied at 45 PSI in 10 gallons of total solution. Plots were 8 rows wide and 75 feet long. Treatments were applied on August 4 and evaluated 3 days after treatment. In 2000, treatments were applied with a backpack CO_2 powered sprayer. Plots were 4 rows wide by 50 feet long. The first 3 rows of each plot were sprayed. Plots were sprayed on August 3 and evaluated 4 days after treatment. In both tests, the treatments were evaluated using a drop sheet to count adult and immature plant bugs. In 1999, the sample size was 12 row feet and 24 row feet in 2000.

Results and Discussion

Tarnished plant bug experiments indicated varying degrees of control in 1999 (Tables 1 and 2) and 2000 (Table 3) with the control ranging from 52% to 97%. The older insecticides Bidrin (dicrotophos), Orthene (acephate) and Vydate (oxamyl) gave control ranging from 72% to 97%. Bidrin gave the best overall control of plant bugs in both 1999 and 2000. In 1999, Bidrin had an average of 1.6 plant bugs per sample compared to 17.6 in the untreated check or 90%. Similarly, in 2000, Bidrin achieved 92 to 97% control in the 0.5 and 0.33 lb. active ingredient per acre (ai/A) treatments. The plant bug counts averaged 0.8 in the 0.33 lb treatment and 2.3 in the 0.5 lb treatment compared to 27.8 in the untreated check. Orthene averaged 5.5 plant bugs at the 0.25 lb rate and 4.5 at the 0.5 lb rate or 72% and 77% control in 1999. In 2000, the plant bug counts for Orthene at the 0.5 lb rate was 2.3 plant bugs or 92% control. Vydate treatment resulted in 4.0 plant bugs per sample in 1999 and 7.8 plant bugs in 2000 or 79% and 72% control respectively. Overall, these insecticides gave good control of plant bugs in these experiments. The test conducted in 1999 was in South Arkansas where insecticide use is greater and in 2000 in North Arkansas where insecticide use is less. The insecticide use pattern may

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have an influence on the degree of control since insecticide resistance is more apparent in areas where insecticide use is greater. Plant bug control using Bidrin and Orthene was less in 1999 compared to 2000 indicating that the resistance detected in other regions of the Delta is probably causing the decreased control using these older insecticides.

The pyrethroid insecticides Karate (lambda-cyhalothrin) and Asana (esfenvalerate) were also evaluated in 2000 giving 77% and 85% control, respectively. Karate averaged 6.5 plant bugs per sample and Asana 4 plant bugs per sample. Both of these treatments were significantly different from the untreated check. Leverage (imadacloprid plus cyfluthrin) provided improved control of plant bugs compared to Provado alone giving an 88% reduction or averaging 2.1 plant bugs per sample.

The control of plant bugs using several new insecticides was also evaluated in the experiments. Steward (indoxacarb) has recently received registration and currently is recommended to control most lepidopterous pests in Arkansas cotton. Steward was evaluated in both years for control of plant bugs. Plant bug control in 1999 averaged 74% for Steward across all rates and 70% in 2000. Steward averaged 2.9 plant bugs at 0.065 lb rate, 4.5 at the 0.09 lb rate, and 5.8 at another 0.09 rate in 1999 (Table 1). In another test, plant bug counts were 3.25 and 7.5 in the 0.09 and 0.11 lb treatment, respectively (Table 2). In 2000, plant bugs in the Steward treatments averaged 9.5 at the 0.65 lb rate, 9.5 at the 0.09 rate and 9.0 at the 0.11 rate. Steward does not have an obvious rate response but may be expected to deliver fair plant bug control of approximately 70%.

Regent (fipronil) was only evaluated in 1999. Regent averaged 7.5 plant bugs at the 0.038 rate and 4.0 plant bugs in the 0.05 treatments in one test (Table 1). In another test (Table 2), Regent tested at the same rates had a slip in control averaging 16.25 plant bugs in the lower rate, not significantly different from the untreated check, and 5.5 at the next higher rate. Denim (emamectin benzoate) was also evaluated at the 0.01 lb rate and had 8.5 plant bugs per sample, around 52 % control. This treatment was not significantly different from the untreated check. Another new insecticide, Actara averaged 9.5 plant bugs per sample or 48% control, not significantly different from the check. Provado (imadicloprid) was evaluated both years. Provado treatments averaged 55% control in 1999 and 66% control in 2000. The plant bugs averaged 8.0 per sample in 1999 and 9.5 in 2000.

Overall, the conventional insecticides Bidrin and Orthene provided the highest level of control in these tests. Steward performed well compared to other new insecticides and should be in an excellent position to assist in future pest management.

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Table 1. Performance of insecticides in control of tarnished plant bugs during 1999.[1]

Treatment/ Rate lb ai/A	Immature plant bugs 3DAT	Adult plant bugs 3DAT	Total plant bugs 3DAT
Regent / 0.038	6.5ab	1.0a	7.5ab
Regent / 0.05	4.0ab	0.0a	4.0ab
Bidrin / 0.5	1.3b	0.3a	1.6b
Provado / 0.047	7.0ab	1.0a	8.0ab
Leverage 3.75 oz/A	1.8b	0.3a	2.1b
Actara / 0.062	7.3ab	1.8a	9.1ab
Steward / 0.065 [2]	2.3b	0.3a	2.6b
Steward / 0.09 [2]	3.5ab	1.0a	4.5ab
Untreated	16.0a	1.3a	17.3a
Steward / 0.09 [2]	5.5ab	0.3a	5.8ab
Denim / 0.01	8.0ab	0.5a	8.5ab
Untreated	16.3a	1.3a	17.6a

[1]Means followed by the same letter are not significantly different (P=0.05).
[2]All Steward treatments had surfactant Dyne-Amic added at 0.5% v/v.

Table 2. Performance of insecticides in control of tarnished plant bugs during 1999.[1]

Treatment/ Rate lb ai/A	Immature plant bugs 3DAT	Adult plant bugs 3DAT	Total plant bugs 3DAT
Regent / 0.038	15.00a	1.25a	16.25ab
Regent / 0.05	3.75b	1.75a	5.50bc
Provado / 0.047	5.25b	1.25a	6.50bc
Steward / 0.09 [2]	2.50b	0.75a	3.25c
Steward / 0.11 [2]	6.75b	0.75a	7.50bc
Vydate / 0.33	4.00b	0.00a	4.00c
Orthene / 97 0.25	4.75b	0.75a	5.50bc
Orthene / 97 0.5	4.25b	0.25a	4.50c
Untreated	16.75a	2.25a	19.00a

[1]Means followed by the same letter are not significantly different (P=0.05).
[2]All Steward treatments had surfactant Dyne-Amic added at 0.5% v/v

Table 3. Performance of insecticides in control of tarnished plant bugs during 1999. Mississippi county, AR.

Treatment /Rate AI/A	Total Plant bugs 4DAT
UTC	27.8a
Steward / 0.065	9.5b
Steward / 0.075	9.5b
Steward / 0.09	9.0b
Steward / 0.11	5.5bcd
Vydate C-LV / 0.33	7.8bcd
Karate Z / 0.028	6.5bcd
Orthene / 0.5	2.3cd
Asana XL / 0.04	4.3bcd
Bidrin / 0.33	0.8d
Bidrin / 0.5	2.3cd
Provado / 0.047	9.5b

[1]Means followed by the same letter are not significantly different (P=0.05).
[2]All Steward treatments had surfactant Dyne-Amic added at 0.5% v/v.