

EVALUATION OF INSECTICIDES FOR LYGUS MANAGEMENT IN CALIFORNIA COTTON

I. Grettenberger

T. Pierce

University of California, Davis
Davis, CA

Abstract

Lygus bugs (*Lygus hesperus*) are a key mid-season pest in California cotton. They are often managed intensively as they move into fields, threatening yields from the beginning of squaring through cutout. Heavy migrations of lygus into fields can necessitate multiple applications of insecticides. Our project evaluated a range of insecticide options for lygus management in Upland cotton. We made two applications over a two-week period. We assessed pest population at multiple time points following each treatment to determine the efficacy of the tested insecticides. In addition, we estimate the efficacy of the insecticide treatments for decreasing yield loss.

Introduction

Lygus bugs (Western tarnished plant bug, *Lygus hesperus*) are one of the key pests in California cotton and management of this pest can drive future pest issues due to non-target effects. This pest can cause substantial yield reductions with high pressure and if left unmanaged. Lygus have a wide host range and typically migrate to cotton from other hosts, including weeds in other cultivated fields, weeds in non-crops areas, and from other crops such as harvested alfalfa. Lygus threaten yields from the beginning of squaring through cutout. Especially as nymphs, they cause damage by feeding on developing squares, causing them to shrivel and/or drop from plant, reducing yield potential by eliminating future bolls. Sustained migration into fields can necessitate multiple applications of insecticides, increasing the need for the ability to rotate materials. In high-pressure years, lygus can be especially problematic pests with a strong negative effects on yields and can be challenging to manage. Given the lack of cultural tools, developing lygus often require management with insecticides. For lygus management, mixtures of insecticides are sometimes used, but the benefit of this tactic is not completely clear in addition to the level of control provided by different mixtures. Lygus populations also sometimes co-occur with other pests such as aphids and whiteflies, so materials that work for lygus may also need to work for these pests. In addition, these pests are often suppressed by natural enemies, so the insecticide applications made for lygus but that have non-target effects on the natural enemy community can affect them. Insecticide resistance to older materials (e.g., pyrethroids) has been noted, necessitating refinement of management strategies and information needed for design of management programs. The objective of this study was to compare the efficacy of selected insecticides, mixtures, and rotations for lygus management in California cotton.

Materials and Methods

This study was conducted at the West Side Research and Extension Center in Five Points, CA (Fresno Co.) in 2020. This field project was conducted to evaluate the efficacy of foliar applications of a number of treatments for lygus. We used plots that were 10 rows wide × 70 ft long and with replications in a randomized block design. Upland cotton was planted on 38 in beds. We made applications with a tractor-mounted, high clearance sprayer at 20 GPA, 40 PSI, and 3.5 MPH. The boom was set up with 5 nozzles per row (TX-VS10 nozzles). Lygus populations were monitored weekly with sweep net sampling from late June into July to monitor population build up. We made two applications as part of this study, spaced 14 days apart. Treatments were applied on 7 July and 21 July. Treatments are listed in Table 1. To assess adult and nymph lygus populations, we used samples of 50 sweeps with a sweep net in each plot. We assessed populations the day before the first application, and then 2, 6, 9, and 13 days after treatment 1 (DAT1) and 2, 6, 10, 14, and 21 days after treatment 2 (DAT2). We also assessed secondary/late-season pests (cotton aphids and two-spotted spider mites). For these assessments, we used 10 leaves/plot (5th main stem node leaf from top). These leaves were collected and aphids and spider mites counted in the lab 16 DAT #2 to assess if the various treatments led to sustained increases or decreases of these pests. To evaluate yield, we picked the middle two rows with a commercial picker. We weighed seed cotton and calculated yield per acre, correcting for the exact length of the plot that was harvested.

Table 1. Treatments tested in 2020. Treatments with numbered treatments (#1, #2) indicate successive treatments while mixtures are indicated with a “+”.

Treatment	Rate (per acre)
Admire#1, Carbine #2	1.7 fl oz, 2.8 oz
Assail 70WP	2.3 oz
Baythroid XL	2.6 fl oz
Belay #1, Carbine #2	5 fl oz, 2.8 oz
Brigade 2EC	6.4 fl oz
Carbine 50 WG	2.8 oz
Diamond	12.0 fl oz
Diamond + Carbine	9 fl oz + 1.4 fl oz
Orthene 97	1.0 lb
Sivanto HL	7.0 fl oz
Transform-High	2.25 oz
Transform-Low	1.50 oz
Untreated	---
Vydate C-LV	34.0 fl oz
Warrior II	1.92 fl oz

Results and Discussion

Lygus Nymphs

Pre-treatment populations of nymphs were 7.75/50 sweeps. At 2DAT1, only Warrior and Vydate and provided any level of control (70 and 76%). At 6DAT1 Vydate provided 80% control, while both Transform treatments, Carbine, and Diamond+Carbine all provided 70-80% control. Differences were more pronounced 10DAT1, with the same treatments (other than Transform-L) providing 80-90% control. Only Vydate had high levels of control 13DAT1. At 2DAT2, a number of treatments had 80-90% control. At 6DAT2, Diamond+Carbine, Orthene, Transform (L and H) and Vydate all had 90-100% control. Diamond alone provided 80%. At 10DAT2, only Orthene and Vydate had above 80% (83) control. The pattern was similar 13DAT2 and at 21DAT2, Diamond provided 90% control, Orthene 97%, and all remaining 51% and lower.

Lygus Adults

Immediately (2DAT1), Transform-L and Vydate provided a degree of control (70 and 80%). At 6DAT2, only Transform-L provided any degree of control (75%). At 10DAT2, many of the materials provided some degree of control in the 40-50% range, and Carbine, Diamond, Transform-H, and Warrior all provided 64-68% control. At 13DAT1, Transform-H provided the best level of control (70%), with some control (54 and 59%) still offered by Carbine and Diamond+Carbine. 2DAT2 Orthene provided 86% control. At 6DAT2, both Transform rates provide 88% control. At 10DAT2, a number of materials provide 45-60% control.

Secondary Pests

Aphid and mite populations were low during this trial and none of the treatments led to very high levels. At 10DAT1 when they were assessed, aphid populations were highest in the Brigade plots (1 per leaf), followed by Baythroid, Vydate, and then the Untreated. The only significant differences were between Baythroid and Assail, which had the fewest. Mites were extremely low overall, with the fewest in the Admire followed by Carbine treatment, and highest in Orthene, Sivanto, Warrior, and Transform-L.

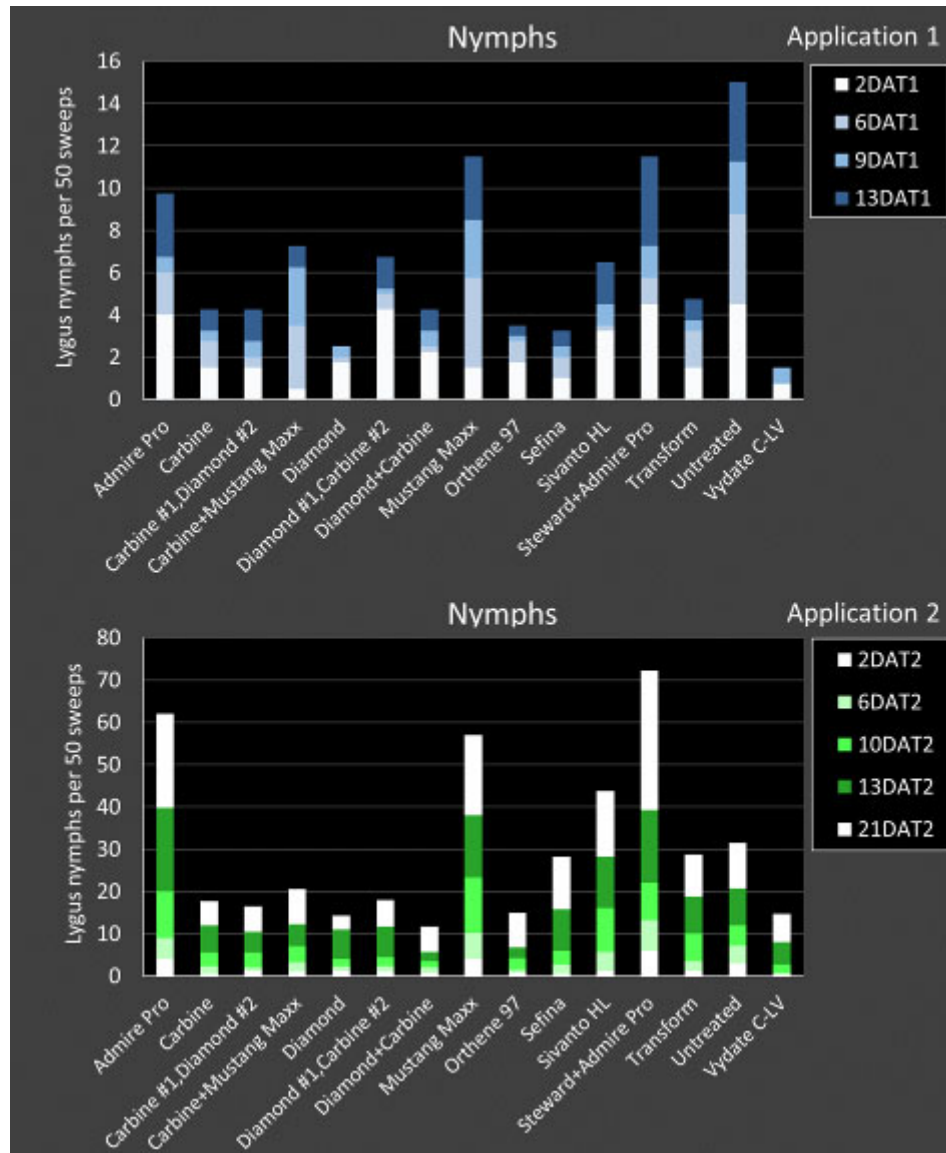


Figure 1. Effect of various treatments on lygus nymph populations at various times after application 1 and 2.

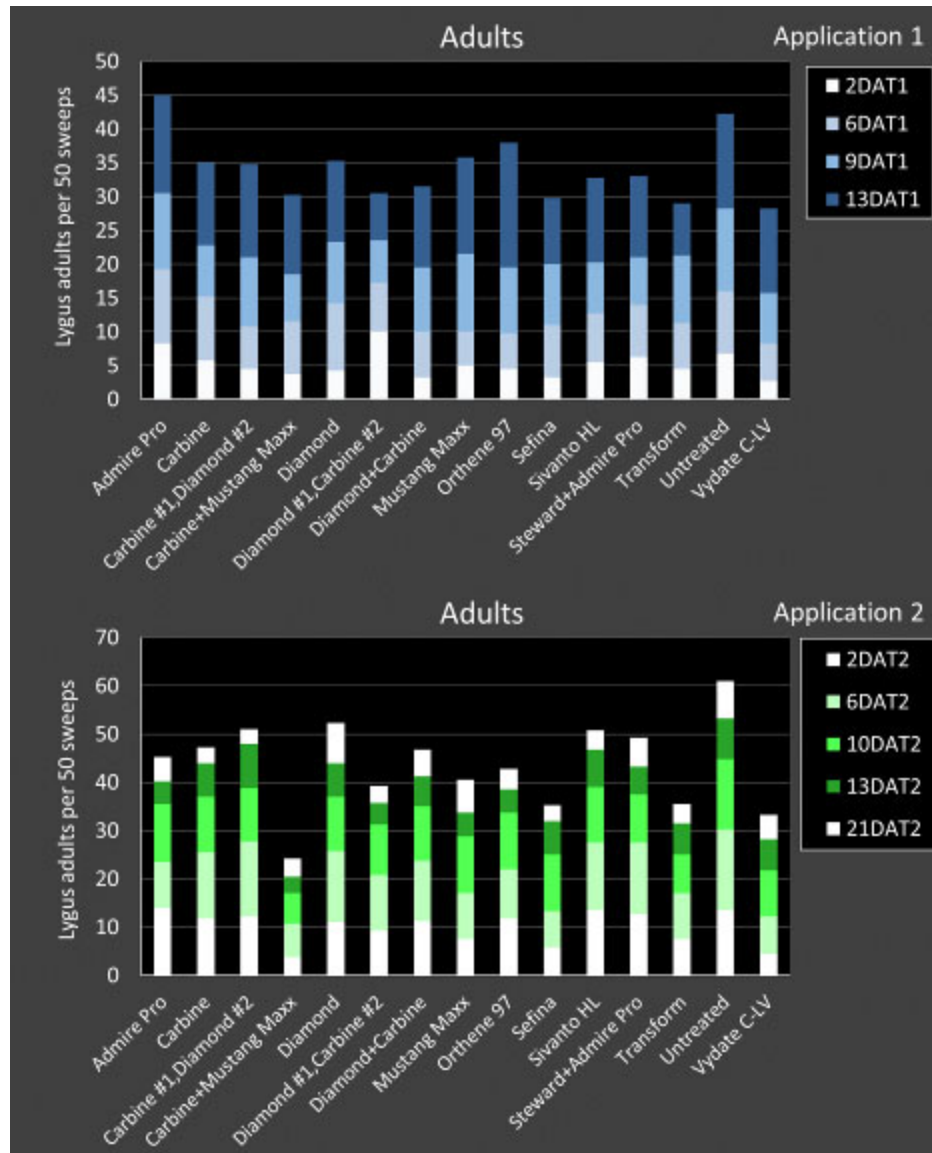


Figure 2. Effect of various treatments on lygus adult populations at various times after application 1 and 2.

Yield

No significant differences were detected in our trial likely due to substantial variation among plots within a treatment, which was accounted for by block. Numerically, yield was highest in the Vydate treatment with 3254 lbs seed cotton per acre. This was followed by Diamond+Carbine with 3152 lbs, Carbine with 3093 lbs, Transform with 3090. Brigade had the lowest yield at 2015 lbs, followed by Baythroid at 2148 lbs.

Summary

There were several effective registered products for lygus management in our trial. Over the course of the study, Vydate, Sefina, Orthene 97, Diamond, and treatments including Carbine were the most effective on nymphs. Effects on adults were more muted, especially after only one application where we saw minimal effects. After the second application, Carbine+Mustang Maxx was the most effective. While we did not detect significant differences in yield, the Vydate and Diamond+Carbine treatments appeared to protect yield the most. Aphids were not that abundant during our trial, although mites increased in some treatments, notably Orthene and Steward+Admire.

Acknowledgements

This work was supported by the CA Cotton Alliance, Cotton Inc. and agrichemical companies.

We thank staff at West Side REC (UCCE) for technical support and our field assistants for their invaluable help in this study.