FIELD TESTING OF ENHANCED GRANDLURE IN 2000

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Abstract

Testing was continued during the year 2000 of several plant-derived compounds which, when used with grandlure in traps, enhance the response of boll weevils. The enhancement effect of caryophyllene and eugenol was confirmed in various locations with several researchers. Mixtures of myrcene, caryophyllene, and eugenol appear to offer a more potent effect than any single compound alone.

Introduction

Extracts of several plants other than cotton have been found to be attractive to boll weevils (Hedin et al. 2000), leading to speculation that volatile compounds found in leaves of many diverse plant species may play a role in the location of favorable hibernating sites by boll weevils. Beta-caryophyllene was found to persist for at least one year in dried, fallen leaves (Hedin et al. 2000). Three commercially available compounds, common in essential oils of green plants in general, were found to be synergistic with grandlure in attracting boll weevils to traps (McKibben 2000).

Materials and Methods

Controlled release dispensers were prepared by Hercon Environmental Corporation, Emigsville, PA. All dispensers contained a nominal 9.5 mg Grandlure. The amounts of the enhancers were: caryophyllene, 25 mg, and eugenol, 12.5 mg. Dispensers containing eugenol and caryophyllene in the same dispenser contained 6.25 mg of each. Dispensers containing caryophyllene, eugenol, and myrcene in the same dispenser contained 4.2 mg of each compound. Grandlure content was matched with test and standard lures to plus or minus 10% based on gas chromatographic analysis.

Field tests were conducted by baiting traps with either grandlure alone ("Standard"), in the standard 9.5 mg dispenser used in the eradication programs, or with grandlure plus the candidate lure enhancer. Residual analyses were done by extracting the dispensers with chloroform followed by injecting in a Varian 4400C gas chromatograph with a 25 m DB-3 column. Quantitation was done with peak area ratios comparing with alpha-terpineol as internal standard.

Test 1 was run at Marianna, AR during May and June, at Keiser, AR during August and September, and in Haywood Co., TN in September and October. Traps were spaced at 50 ft. at the Marianna test and 100 ft at the two other locations. There were 10 replicates at Marianna and 8 at the two other locations. Capture counts were made at intervals of 2 to 7 days depending on capture totals. The tests were run from 4 to 8 weeks.

Test 2 was run on a Farm at Friars Point, MS, using Eradication Program traps at the nominal 350 ft. spacing. This test 4 was set up on August 7 and rebaited on August 21. The last count was done on September 4.

Test 3 was run from early May to mid June in New Mexico. Both 50 and 100 ft. trap spacing were used. As there was no apparent difference in results from the 2 trap spacings, they were combined. There were 9 replicates.

Test 4 was set up (8 reps) at Marianna, AR on September 19. Data were collected on September 26 and again on October 4. This was the only test containing more than one enhancer per dispenser.

Results and Discussion

Since the statistical analysis for Test 1 showed no significant interaction between location and treatment, these three tests were combined in the analysis. Results are presented in Table 1. The mean capture for eugenol represents a 62.5 % increase in capture to grandlure alone. Caryophyllene captured 22.5% more than grandlure alone.

Table 2 shows results from Test 2. The mean of 1.17 weevils/trap represents a 60% increase over the standard, but the means were not significantly different due to the extreme variability in trap capture around the field.

There was no significant difference in the means for the standard and enhanced lure (caryophyllene) in Test 3 (Table 3). Weevil numbers were very low, with about three fourths of all observations zero. Weevil captures were clumped with respect to location and date. This is a likely explanation for caryophyllene not showing an increase over the standard in this test.

Test 4 will be repeated, but initially at least, it appears that mixtures of the three compounds may be much better than eugenol or caryophyllene alone (Table 4). The mean of 19 weevils/ trap for the three-compound mixture represents a 73% increase over the standard.

Caryophyllene, eugenol and myrcene have been tested extensively as lure enhancers for the boll weevil throughout the season for the past three years. Caryophyllene and eugenol, and mixtures of these compounds plus myrcene, are synergistic with grandlure, giving a statistically significant increase in capture as compared with grandlure alone. Since the compounds are relatively inexpensive, they should provide a feasible way to improve the attractancy of pheromone baited traps. Their cost is low enough that the final product should not cost much more than the current grandlure dispenser. Future work will be aimed at investigating the role of the enhancers in formulating a grandlure dispenser optimized for post-eradication monitoring.

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References

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Table 1. Boll weevil capture in pheromone enhancer test, Marianna, AR, Keiser, AR, and Haywood County, TN May – October 2000.
Treatment Mean (Weevils/trap)

Treatment	Mean (Weevils/trap)
Standard	40a
+ Caryophyllene	49b
+ Eugenol	65c

Means not followed by a common letter are not significantly different, p>=.05; 2, 258 df.

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Table 2. Boll weevil capture in pheromone enhancer test, Friars Point, MS, June 2000.

Treatment	Mean (Weevils/trap)
Standard	0.73a
+Caryophyllene	1.17a

Table 3. Boll weevil capture in pheromone enhancer test, New Mexico, May – June 2000.

Treatment	Mean (Weevils/trap)
Standard	0.89
+ Caryophyllene	0.81

The captures were mostly zeros (100 zeros out of 144 observations), and the weevil captures were clumped with respect to location and date.

Table 4. Boll weevil capture in pheromone enhancer test, Marianna, AR, September – October 2000.

Treatment	Mean (Weevils/trap)
Standard	11a
+Eugenol	15ab
+Eug. & Cary.	18b
+Eug., Cary., & Myrcene	19b

Means not followed by a common letter are significantly different (P >= .01, 3/63 df).