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# OPTIMIZING POST-ERADICATION MONITORING FOR THE BOLL WEEVIL

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## Abstract

Pheromone dispensers prepared by several companies were tested in Arkansas and in Texas. The lures contained about 25 mg grandlure (compared with 10 mg for the usual lure), and were prepared both with and without the enhancer, eugenol. Results showed that it is possible to prepare pheromone dispensers that will last one month or longer, and that eugenol greatly improves efficacy of the lures. In some programs the use of one month lures instead of the currently used ones lasting two weeks will yield considerable cost savings in labor.

## Introduction

In order to protect the considerable investment that has been made to eradicate the boll weevil from U.S. cotton, careful planning is needed to avoid costly re-infestations. Since the pheromone trap is the sole weapon in our arsenal against re-introduction of this pest, the lure used in the trap is of extreme importance. The primary purpose of this study was to develop a lure that would last one month without re-baiting. Post eradication procedures used in North Carolina have been of interest in other States where the boll weevil either has been or soon will be eliminated. This is at least partly because this State has been successful for more than 10 years in preventing any large-scale re-infestation.

There have been one or more weevils captured somewhere in North Carolina every year since 1987 except for 1991 (Dickerson et al. 2001). Capture locations included 21 counties. Numbers captured ranged from 1 to 2303, for an average of 68 per year. The median value was 1 weevil.

Post-eradication procedures in North Carolina involve the use of one trap per acre, with a minimum of 2 traps/field, from mid-August until frost occurs. Traps are checked every two weeks, and are baited with the standard 10-mg dose of Grandlure.

When a weevil is captured, the trap density is increased to 1/acre within ½ mile of the capture site. In addition, a 70' by 70' trap grid in stalled in the field where the capture occurred. Traps are then checked 3 times per week. In many cases, no additional weevils were captured. If an infestation is deemed to be present (additional weevils are captured at the site), insecticide is applied at a 3-day interval for 2 to 3 weeks, then once per week until frost. Thereafter, the infested site is trapped through the winter and the next growing season at a trap density of one trap per acre. Cotton produced at the infested field is fumigated on site before going to the gin

Since 1987 the number of counties with one or more captures of boll weevils ranged from 0 in 1991 to 7 in 1987. The per-year average number of counties is 3; the median value is 2. Total costs of treatments in response to weevil captures from 1987 to 1999 were $291,400.00, or an average of $22,415 per year. The median value is about $3,000, with a range of 0 - $137,000. Annual grower assessments began at $10.00 per acre in 1987 and have steadily declined to less than $4.00 per acre the last eight years.

Long-term post-eradication efforts will need to be continued to protect the considerable investment in boll weevil eradication. Since the pheromone trap is the sole weapon in the monitoring arsenal, some discussion of the trap and lure issues is in order. Since the discovery and synthesis of the pheromone produced by the male boll weevil, the pheromone dosage used has always been an arbitrary one. The first field test with the synthetic material was limited by availability of the small amounts that were being prepared in laboratory-scale equipment, a slow and tedious procedure. The amounts used in the field began at .08 mg, which was increased ten-fold to 0.8 mg when more material was available. Three mg were used in the first controlled-release formulation, which lasted less than one week. Once an improved dispenser became available, it was loaded with six mg, and this became the standard two-week dose in the early years of the eradication program.

Later, as the cost of grandlure came down, the dosage was increased from 6 to 8 mg, and eventually to the present 10 mg dose. In trapping programs, whether pre- or post-eradication, cost of the lure represents a minor proportion of the overall program cost.

Since there is a 1:1 correspondence in lure strength and capture efficacy, serious consideration should be given in future monitoring programs to increasing the lure strength. This can be done by increasing the amount of grandlure, and/or by adding certain plant-derived compounds that have been shown to be synergistic with grandlure (McKibben 2001). For example, 30 mg of eugenol increases the trap captures by 40 – 50% and costs only about one cent. At the current cost of grandlure, each mg. costs less than one cent, so that increasing the grandlure dosage by 50% would only increase cost by less than 5 cents each.

## Materials and Methods

Grandlure dispensers with increased grandlure doses were tested during 2001 to determine if it is feasible to prepare a lure that will last 4 weeks or longer. The dispensers were to be prepared both and without 30 mg eugenol. Table 1 shows results with Scentry lures, and tables 3 and 4 show results with Plato and Hercon lures, respectively. All candidate lures were compared with the Hercon 9.5 mg lure re-baited bi-weekly ("standard"). Traps used were the standard Southeast Program trap.

## Results and Discussion

A gas chromatographic analysis showed that the Scentry lure that was to have eugenol instead contained methyl eugenol, a similar but chemically different compound which was obviously not active. However, both Scentry dispensers performed well throughout the 4-week period of the test.

The Plato dispensers (Table 2) contained more than the target 25 mg grandlure. The one with 30 mg eugenol did as well as the Hercon 9.5 mg lure baited bi-weekly; the one without did not. Although not shown in the table, the fourth week results showed that the lure without eugenol fell well below the standard.

Table 3 shows results with Hercon lures. The one containing eugenol did as well as the standard.

Results indicate that it is possible to manufacture a pheromone dispenser that will last one month or longer. This should provide more lea-way in designing future monitoring programs in cases where less frequent trap checking is desired. Although any changes to proven procedures must be done with extreme caution, it is anticipated that in some situations, some modification may be in advisable.

## Acknowledgment

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## References

Dickerson, Willard A., Gene B. Cross, and Marshall Grant. 2001. North Carolina boll weevil eradication and post-eradication programs, *in* Boll Weevil Eradication in the United States Through 1999, Dickerson et al, ed. The Cotton Foundation Reference Book Series No. 6. 627 pp.

McKibben, Gerald H. 2001. Field Testing of Enhanced Grandlure Dispensers in 2001. Proc. Beltwide Cot. Conf., Anaheim, CA.

Table 1. Testing of one-month lure. Brownsville, TX, July 4 – August 3, 2001.

| **Average weevils/trap/week. Ten reps checked twice/week.** | |
|---|---|
| Scentry 22.4 mg | 1.7 |
| Scentry 23.5 mg | 1.7 |
| Hercon 9.5 mg[1] | 1.4 |

[1] Replaced at 2-week interval.

Table 2. Testing of enhanced one-month lure in Brazoria County, TX, July 10 – August 10, 2001.

| **Average weevils/trap/week. Ten reps checked twice/week.** | |
|---|---|
| Plato 34.9 | 31 |
| Plato 43.7 + EUG | 60 |
| Hercon 9.5[1] | 59 |

[1] Replaced at 2-week interval.

Table 3. Testing of enhanced one-month lure at Manila, AR, August 21 – September 25, 2001.

| **Average weevils/trap/week. Ten reps checked twice/week.** | |
|---|---|
| Hercon 22.6 | 42 |
| Hercon 22.4 + EUG | 72 |
| Hercon 9.5[1] | 73 |

[1] Replaced at 2-week interval.