PRELIMINARY RESEARCH RESULTS WITH ALTERNATIVE TACTICS FOR BOLL WEEVIL ERADICATION

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Abstract

Studies were continued in 1997 to evaluate the feasibility of incorporating spring and fall trap crops, bait-sticks, in-furrow Temik, and foliar Finish applications and the expert system COTMAN into the eradication program for the boll weevil (*Anthonomus grandis* Boheman). Preliminary data suggest that together these tactics show some promise. A tentative plan for their use is briefly outlined.

Introduction

Researchers have little time to persuasively test and retest each potential alternative tactic for boll weevil eradication, if one believes the constraints implied by the present Midsouth program schedules. The dilemma is that nobody can be sure that eradication will proceed through the Midsouth. We suspect that cost of eradication is not the only reason most growers in NE Arkansas (and other parts of the northern Midsouth) object to the program, but we assume that a cost reduction both in low and high infestation zones would eliminate most opposition. So despite the time constraints on research, we initiated efforts to cut costs of the program in 1995. Other options seem more unrealistic. Those are, (1) stop the program where growers are not supportive of eradication and do nothing else, regardless of reinfestation threat, (2) stop and create a permanent protective buffer zone to prevent reinvasion into an eradicated zone, regardless of the ecological and financial costs of the buffer. Our goal was to select biologically sound alternative tactics that can be used to link eradication costs to boll weevil infestation levels in a region.

Methods

The major difference in this proposed plan with alternatives and the traditional eradication method is one of emphasis on the site of weevil suppression. The traditional program attacks the boll weevil in its breeding site, the cotton field, where the major suppression cost is for 8 to 13 diapause sprays. We are suggesting little change in the traditional plan where boll weevil population densities are high. For these areas we recommend using the COTMAN decision rule for timing the late-season elimination of worthless squares and young bolls as weevil food sources, and for timing defoliation and sequencing fields for harvest. This should reduce costs substantially and justify an equitable incentive fee to reward early crop harvest and stalk destruction.

The purpose of diapause sprays, of course, is to reduce infestation levels. Where infestations are low already and growers are spending no more than $5 to $8 per acre for weevil control, we propose elimination of diapause sprays altogether and substitution of alternative tactics. Alternatives will be used to deprive the weevil of food and suppress populations at their hibernation quarters.

The cost of suppression will be coupled directly to overwintering habitat quality. Even in zones with low weevil infestations, some high quality hibernation habitats will occur. For high quality hibernation habitats that provide good winter insulation (Teague and Tugwell, 1996 & 1997) and spots where spring boll weevil numbers are likely to be high (Singer et al., 1997), the more costly and more efficacious alternative tactics will be used to suppress those populations. For habitats less suited for boll weevil survival, less costly tactics will be employed. Both in high infestation zones where COTMAN decision rules are used and in low weevil infestation zones, costs will be allocated according to habitat quality.

Habitat descriptions that are simple and easy to follow can be used, but intuitive questions about the practicality of alternative tactics are more serious. In most cases tactics have been considered in the past and rejected, - - and usually for good reasons. Resistance to reconsideration is quite high and significantly influenced the focus of our research on each tactic.

Results

Tactics tested for low weevil infestation zones.

1. Spring Trap Crop -- Niles et al (1978) point out that a trap crop to attract boll weevils emerging from hibernation was proposed as far back as 1896, but never was widely used probably because of the difficulty in obtaining an age differential between the trap and the main crop. We too believe this was an important limitation, so experiments were conducted to determine if a differential could be obtained. Results reported by Teague and Tugwell (1997) indicated that highspeed tranplanters could be used to obtain a trap maturity differential of 3 to 4 weeks earlier than commercial crops. A second objection to a trap crop is its perceived cost, but cost is relative to the amount of high quality habitat and the proximate acres of cotton protected. Our data show that one-mile of trap crop that suppressed weevils on 1000 proximate acres would $0.93/cotton

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acre. A third major objection is the complexity of growing transplants, and establishing the crop. We propose to make contracts with proven professionals within the vegetable industry to do both jobs. Program personnel will bait trap crops with pheromone and spray.

2. Fall Trap crop – Brazzel et al (1961) and Rummel and Frisbie (1978) indicated that most newly emerged or young weevils require extended feeding periods before they exhibit a firm diapause. Fall traps are suggested for feeding sites. As commercial cotton approaches 50 days from planting, cotton (2 rows) bordering quality habitats will be cut at about the 7th node with a mower to obtain ratooned cotton for a fall trap crop. Our research shows that green, flowering plants can be expected up to frost with ratooned cotton. Program personnel will bait trap crops with pheromone and will spray them at appropriate intervals.

3. Bait-Stick **--** Each 60 mg pheromone lure provides a pheromone release equivalent to that of several thousand male boll weevils per week, depending on how long the bait remains in the field. Consistent with our aim to focus the attack along hibernation sites, we limited placement of these potent baits along target sites, so fewer adults would be dispersed or lured away from overwintering habitat. A replicated (5) experiment with three treatments (50-acre plots (3)/replication) was installed in 1996 and was evaluated in 1997. Spring through fall treatments with baited sticks (without attractant or toxin) and the standard BWACT were compared with an untreated control. Treatments applied in 1996 were evaluated in 1997 for five weeks with pheromone trap (100 ft. intervals) catches beginning mid-March. All 1996 sticks had been removed so as not to interfere with pheromone trap efficiency. Treatments were further evaluated with weekly field inspections through the season for punctured squares up to cotton cutout. Results based upon pheromone trap catches indicated that both bait-stick treatments significantly reduced weevil numbers. Infestations in fields were extremely low (< 1%) in all plots, and numbers of punctured squares were not significant, although numbers appeared higher in the untreated than in other plots.

4. Strip Sprays – Strip sprays along habitats were not evaluated. They are recommended (Johnson and Jones 1997) already and apparently are accepted by growers even in high infestation zones. We propose they be used along a range of habitat types within the low infestation zones following rainfall and pheromone trap cues.

5. Temik – Bioassays to determine the adult boll weevil mortality after feeding on cotton seedlings treated with in-furrow Temik 15G (0.7 lbs. ai/A) and Gaucho seed treatments indicated that only Temik caused significant mortality. Use of Temik could reduce weevil dispersal and survival and enhance effectiveness of control with other alternative tactics near overwintering habitats.

6. Standard in-season practices in the breeding site will be proposed, including pinhead applications.

Tactics tested for high weevil infestation zones.

1. COTMAN – The computer-aided cotton management program, COTMAN, will be released in 1998 through Cotton Incorporated (Bourland et al., 1992; Oosterhouis et al., 1996). It offers a fast, easy procedure for defining the last effective boll population including the last possible cutout date for a region. Once determined, heat unit accumulations are used to sequence fields for harvest, time defoliation, and identify when squares and young boll are likely to contribute little more than insect food. COTMAN will be proposed for high infestation zones as a way to reduce number of fall diapause sprays. Observations suggest that defoliation is delayed 3 to 4 weeks longer than necessary in many commercial fields. COTMAN can be used to identify the fields requiring further diapause sprays.

2. Plant Growth Regulators – Brazzel (Niles et al 1978) suggested that defoliation or desiccation is the single most important practice that can be used to reduce populations of diapausing boll weevils. Cleveland and Smith (1964) indicated that defoliants in their study were more effective than 7- 8 insecticide applications in reducing the number of weevils entering ground trash. Square removal, after the last effective boll population had been set by the plant, was attempted in 1997 field trials in near Dell, AR with different rates of the defoliant, Finish. Results indicated that Finish (0.2 lbs. ai/A) significantly reduced square numbers without reducing yield. Weevil punctures were reduced significantly at rates as low as 0.05 lbs. ai/A. Although preliminary, these data suggest that chemical defruiting also may have a place in reducing diapause sprays.

Future research plans include evaluations of combined tactics on the Judd Hill Plantation in Poinsett County, AR beginning in 1998.

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