Table 1. Number of Green Bolls and Diapause PBW Larvae After Harvest Yields in Chemical Termination Plots, Maricopa, AZ, 1985*

Treatment Number	Green Bolls (13.1 ft) after harvest	Larva per acre**	Yields lbs lint/ac
1	21.6 ab	66,096 a	938 a
2	14.2 a-d	40,044 b	912 a
3	15.6 a-c	30,576 b-d	862 a
4	4.0 d-f	4,400 de	906 a
5	6.0 c-f	7,320 c-e	919 a
6	11.8 b-e	22,656 b-e	870 a
7	24.0 a	69,120 a	958 a
8	11.2 c-e	34,496 bc	925 a
9	0.2 f	346 e	1,058 a
10	2.6 ef	5,304 c-e	957 a
11	0.4 f	960 e	924 a
12	5.4 c-f	17,928 b-e	967 a
13	4.2 d-f	11,046 c-e	1,035 a

* Each figure is an average of 4 replicates. Means in a column not followed by the same letter are significantly different (Duncan's Multiple Range Test; P=0.05).

** Based on estimates of the number of green bolls per acre after harvest and number of larvae per boll in samples from each treatment after harvest.

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Report on the Effects of Prep on Cotton Fruiting, Boll Opening, and Boll Weevil Populations

T. J. Henneberry, L. A. Bariola, J. E. Leggett, T. Meng, D. Akey, and B. Deeter

Plant growth regulators have been suggested as a tool to selectively remove late-season cotton fruiting forms that serve as a source of host material for the development of overwintering populations of pink bollworm, Pectinophora gossypiella Saunders, boll weevil, Anthonomus grandis Boheman, and Heliothis spp. The technique involves the removal of fruiting forms but remaining

leaves continue to produce photosynthate to mature green bolls that are on the plant at the time of treatment, thus resulting in minimal reduction in cotton yield.

The feasibility of the method for pink bollworm and boll weevil has been demonstrated, but the chemicals used were not registered for use on cotton. Recently late-season applications of thidiazuron (= Dropp^{R}) have been shown to dramatically reduce boll weevil and bollworm, Heliothis zea (Boddie), populations in South Carolina without affecting yield, seed germination, or fiber properties.

The boll weevil complex has been known to occur in Arizona since 1912. Measurable infestations had not been recorded from 1966 to 1978 when stub cotton growing was banned and mandatory plowdown and planting date enforced. Resumption of stub cotton growing in 1978 resulted in the first documented field infestations of the boll weevil since 1966. Infestations have spread throughout Arizona and have been reported in California.

Increasing concern regarding the spread of the insect in the Southwestern desert growing areas and the need for technology to reduce populations of the insect prompted us to conduct studies in 1985 to determine the effects of ethephon (= Prep^{R}) treatments on cotton fruiting in relation to boll weevil population development. Prep is a plant growth regulator registered for use on cotton to accelerate opening of mature unopened cotton bolls and also causes abscission of squares, flowers, and small bolls which are sources of food and oviposition sites for boll weevils.

Methods and Materials

Two commercial Deltapine 90 cotton fields infested with boll weevils were selected for the study. Fields were about 5.6 ha in size and located at Laveen, Arizona. In one field, plots were 24 rows wide by 238 m long and, in the other field, 12 rows wide by 402 m long. The last irrigation in each field occurred during 29-31 August 1985.

Treatments were Prep^{R} 1.12 kg a.i./ha applied on 6 or 13 September, Prep 2.24 kg a.i./ha applied on 6 September and an untreated control. The experiment was replicated four times and treatments were applied with ground equipment in approximately 94 liter of water/ha. All plots were treated with the defoliant DEF^{R} applied with ground equipment on 20 September 1985.

The effects of the treatments on cotton fruiting were determined by counting squares, flowers, and immature green bolls in ca. 4 m

row sections randomly picked in each plot at periodic intervals after treatment. Additionally, open bolls in the top 46 cm of the plants were counted on 16 September and at periodic intervals thereafter until harvest to determine the effect of the treatments on boll opening.

Squares and bolls (100 in each case) were randomly picked from each plot beginning 4 September (2 days before first treatments) and at 3 to 7 day intervals thereafter until harvest. Samples were held separately in ventilated plastic boxes (Fye 1976) in an outdoor insectary for 3-4 weeks and the number of emerged boll weevils counted. All squares and bolls were also dissected to detect any additional boll weevil forms remaining in the fruiting structures.

Cotton in all plots was machine harvested with a spindle picker on 31 October and 1 November to determine the effect of the treatments on yield.

Results

Cotton Fruiting. The average numbers of squares from September 9 to October 28 were reduced 85% for the September 6 and 57% for the September 13 application (Table 1). Reductions also occurred in numbers of flowers and immature green bolls.

Boll Weevil Population Development. The reduced numbers of squares and bolls for boll weevil feeding and oviposition as a result of the Prep^{R} treatments caused a dramatic reduction in the number of boll weevils developing per ha of cotton as compared to population development in the untreated cotton plots (Table 1). Treatments of 1.12 and 2.24 kg a.i./ha on 6 September were more effective than the 1.12 kg a.i./ha treatment on 13 September.

Boll Opening. All Prep^{R} treatments significantly accelerated boll opening (Table 2). Higher percentage of open bolls was found in plots treated with the 2.24 kg a.i./ha rate on 6 September, as compared to the untreated check plots, within 24 days after treatment. Within 39 days after 6 September treatments and 32 days after the 13 September treatment, 96 to 99% of the bolls were open in the Prep^{R} treated plots as compared to 58% open bolls in the untreated check plots.

Cotton Yield. Prep treatments of 1.12 kg a.i./ha on 6 or 13 September had no effect on seed cotton yield (Table 2). Reduced cotton yield occurred in plots treated with 2.24 kg a.i./ha on 6 September. Samples from each plot have been taken to measure the effect of the treatments on cotton quality. Those data will be reported at a later date.

Discussion

Additional studies need to be conducted with Prep^R to optimize rates and dates of application to obtain maximum effect on boll weevil populations and minimum or no effect on cotton yield. Additionally, Prep^R treatments did not prevent regrowth of cotton and by mid-October squares were observed with feeding and oviposition punctures. No efforts were made to quantify the number of weevils in the cotton regrowth, but this will have to be considered in future studies.

Acknowledgment

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Trade names and the names of commercial companies are used in solely to provide specific information. Mention of a trade name or manufacturer does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture nor an endorsement by the Department over other products not mentioned.

Table 1. Mean[1/] Number of Squares, Flowers, and Immature Green Bolls and Boll Weevils/ha (1000's) in Prep[R] Treated and Untreated Cotton Plots

TREATMENT		FRUITING FORM	BOLL WEEVILS
Date Applied	Rate (kg a.i./ha)		
		Squares	
Sept. 6	1.12	19	1
Sept. 13	1.12	20	3
Sept. 6	2.24	13	1
Untreated Check	0	54	7
		Flowers	
Sept. 6	1.12	1	-
Sept. 13	1.12	<1	-
Sept. 6	2.24	0	-
Untreated Check	0	7	-
		Immature Green Bolls	
Sept. 6	1.12	148	5
Sept. 13	1.12	229	16
Sept. 6	2.24	89	3
Untreated Check	0	260	25
		Total[2/]	
Sept. 6		167	6
Sept. 13		249	19
Sept. 6		102	4
Untreated Check	0	314	32

1/ Means of 4 replications, 8 weekly sampling dates for each replication from September 9 to October 28.
2/ Total for squares and bolls.

Table 2. Mean[1/] Percentages of Mature Open Bolls/ha in Prep[R] Treated and Untreated Cotton Plots.

TREATMENT		SEPTEMBER			OCTOBER				SEED COTTON
Date Applied	Rate (kg a.i./ha)	16	23	30	7	15	21	28	YIELD (kg/ha)
Sept. 6	1.12	26ab	19b	41b	80a	96a	96	97	3632ab
Sept. 13	1.12	1b	23b	23b	68ab	96a	97	99	3758a
Sept.6	2.24	46a	49a	77a	89a	99a	99	100	3383b
Untreated check	0	22ab	19b	20b	47b	58b	78	99	3810a

1/ Means of four replications. Means in the same column not followed by the same letter are significantly different. (Duncan's multiple range test (P=0.05).

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Comparative Trap Catches in Four Boll Weevil Trap Types

T. Meng, Jr., Program Specialist
L. A. Bariola and T. J. Henneberry, Research Entomologists
Western Cotton Research Laboratory, USDA-ARS, Phoenix, AZ

Summary

Four trap types were used to trap boll weevils at 1 m heights, with and without grandlure, and 2 trap types were compared at 0.5 m height, with and without grandlure. The results indicate trap height may be an important factor in boll weevil catches at certain times during the cotton season. Also trap color, design and other factors may influence trap catches since traps not baited with grandlure caught high numbers of boll weevils during certain times during the cotton growing season.

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Leggett (1971) and Boll Weevil Scout[R] (Heath-Chem Corp., 1107 Broadway, New York, NY) traps have been used successfully to trap