EVALUATION OF DIFLUBENZURON FOR BOLL WEEVIL CONTROL IN THE LOWER RIO GRANDE VALLEY OF TEXAS[1/, 2/]

J. A. Harding[3/] and D. A. Wolfenbarger[4/]

ABSTRACT

Field experiments were conducted in 1976, 1977, and 1978 to evaluate diflubenzuron (N-[[(4-chlorophenyl)amino]carbonyl]-2,6-difluorobenzamide, Dimilin®, TH-6040) for boll weevil, Anthonomus grandis Boheman, control. Weevil reduction was shown but not on a seasonal basis and yields were not affected. The predator complex was not adversely affected. No phytotoxicity or fruiting variations of the cotton were recorded due to treatments.

INTRODUCTION

Diflubenzuron (N-[[(4-chlorophenyl)amino]carbonyl]-2,6-difluorobenzamide, Dimilin®, TH-6040) was 1st shown to suppress populations of the boll weevil, Anthonomus grandis Boheman, in South Carolina in 1974 (Taft and Hopkins 1975). Subsequently, Ganyard et al. (1977,1978) demonstrated its effectiveness against the same insect in North Carolina. In Texas, House et al. (1978) and Rummel et al. (1979) obtained reductions in boll weevil populations with diflubenzuron, but not on as great a scale as was shown for the eastern sections of the United States. Wolfenbarger et al. (1977) reported on the effects of diflubenzuron on boll weevils in the laboratory and on caged cotton in the Lower Rio Grande Valley of Texas, but the activity of this compound in the field had not been shown for that area. Therefore, the experiments described herein were conducted to evaluate the use of diflubenzuron for boll weevil control under the semiarid, semitropical conditions that are found in South Texas.

MATERIALS AND METHODS

The experiments were conducted with SP-37 variety cotton in 1976-77 and with Stoneville 213 variety cotton in 1978; crops were planted from early to mid-March in beds with centers ca. 1 m apart. All fields used had a history of heavy infestations of boll weevils. Each treatment was replicated 3 times in 1976-77 and 4 times in 1978. Plot sizes were ca. 0.7 ha in 1976, 1.5 ha in 1977, and 4 ha in 1978. All samples of squares from the ground or from the plant were taken from the middle of each plot.

For tests in 1976, diflubenzuron (W-25) was applied with a self-propelled spray rig calibrated to deliver 21.14 L of formulation/ha; each tank mix included

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2/This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation for use by the USDA nor does it imply registration under FIFRA as amended. Also, mention of a commercial (or proprietary) product in this paper does not constitute an endorsement of this product by the USDA.
3/Associate Professor, Texas Agricultural Experiment Station, Weslaco, TX 78596.
4/Entomologist, AR, SEA, USDA, Brownsville, TX 78520.

10% cottonseed oil (9.35 L/ha). In 1977 and 1978, treatments were applied by air at a rate of 12.68 L/ha of formulated material. EC formulations of paraffinic crop oils (Savol® in 1977 and Crop Oil® in 1978, 4.67 L/ha) were included with each application of diflubenzuron.

The experiments were designed as completely randomized blocks. Data were analyzed by use of the F-test and treatment means were separated by use of Duncan's new multiple range test. Data were analyzed per date and over dates. Heliothis spp. data are not shown because infestations were subeconomic or maintained at subeconomic levels throughout the test by overspraying the entire experiment with chlordimeform (141 g AI/ha) when necessary.

RESULTS AND DISCUSSION

The larger plots of 1977 and 1978 were sampled with a D-Vac® to provide an estimate of predatory insects. The results (Table 1) indicated there were no differences attributable to treatments. Based on these data, it appears that diflubenzuron does not adversely affect the naturally occurring predator complex in cotton.

TABLE 1. Effect of Diflubenzuron on D-Vac Collected Predators in Cotton, Weslaco, TX, 1977 and 1978.

	Mean[b/] no./61 m of row	
Kg AI/ha[a/]	1977[c/]	1978[d/]
0.0000	10.4 a	10.1 a
0.0351	7.8 a	10.4 a
0.0526	9.2 a	7.9 a
0.0701	7.6 a	10.2 a
0.1403	9.0 a	-

[a/]Applied 5/2, 7, 12, 18, 23, 28, 6/2 and 9, 1977; applied 5/4, 9, 15, and 20, 1978.
[b/]Means in a column followed by the same letter are not significantly different.
[c/]Sampled 5/4, 13, 18, 25, and 6/10, 1977.
[d/]Sampled 5/10 and 25, 1978.

When treatments were initiated in 1976, there were 145,789 pinhead squares/ha (Table 2). Mean boll weevil emergence and yield were not significantly affected by the treatments, but yields of all plots were drastically reduced due to intermittent rains the last half of July. On the 1st square sampling date (May 26), the highest dose of diflubenzuron (0.28 kg/ha) significantly reduced boll weevil emergence; only 15% emerged from squares collected in the treated plots, compared to 43% in the untreated plots. There were no apparent differences at other sample dates.

An average of ca. 61,775 pinhead squares/ha was recorded when treatmens were initiated in 1977. Cotton yields and season-long means for boll weevil emergence were not statistically different among treatments (Table 3). However, data from samples obtained June 3 and 9 did indicate some significant differences for the highest rate of diflubenzuron. On these dates only, boll weevil emergence was significantly reduced; 18% in treated plots vs. 80% in untreated plots on the 3rd, and 17% vs. 63% on the 9th. The meters of row necessary to obtain 1 emerged weevil was increased from 1.83 m, the checks to 50.3 in the diflubenzuron (0.14 kg/ha) plots on the 3rd, and from 4.3 to 109.1 on the 9th. The meters of row searched to find a weevil damaged square in the check vs. the diflubenzuron (0.14 kg/ha) plots was 1.5 vs. 11.0 and 3.35 vs. 16.76 m on the 3rd and 9th, respectively.

TABLE 2. Effect of Diflubenzuron on Boll Weevil Emergence and Cotton Yield, Brownsville, TX, 1976.

Kg AI/ha[a]	Mean[b] % emergence (from damaged squares)	Mean[b] bales/ha (561 kg)
0.0000	28 a	0.33 a
0.0027	21 a	0.25 a
0.0270	24 a	0.33 a
0.2700	19 a	0.36 a

a/Applied 4/27, 28, 5/3, 5, 7, 10, 17, 25, 26, 29, 6/1, 4, 8, 10, 12, 14, 17, 21, 24, 29, and 7/2.
b/Means in a column followed by the same letter are not significantly different. Square samples for weevils taken 5/26, 28, 6/4, and 8.

TABLE 3. Effect of Diflubenzuron on Boll Weevil Emergence and Cotton Yield, Weslaco, TX, 1977.

Kg AI/ha[a]	Mean[b] % emergence (from damaged squares)	Mean[b] bales/ha (561 kg)
0.0000	57 a	1.28 a
0.0351	68 a	1.34 a
0.0526	60 a	1.31 a
0.0701	63 a	1.33 a
0.1403	34 a	1.09 a

a/Applied 5/2, 7, 12, 18, 23, 28, 6/2, 9, 16, 27, and 7/2.
b/Means in a column followed by the same letter are not significantly different. Square samples for weevils taken 6/3, 9, 17, and 28.

There were ca. 108,724 pinhead squares/ha when applications were begun in 1978. As in 1977, no differences were found in season-long means for boll weevil emergence or in yields (Table 4); however, there were statistical differences due to treatments on some days. Diflubenzuron at all rates significantly reduced the number of boll weevil damaged squares per 122 m of row on 6/30 and 7/3.

TABLE 4. Effect of Diflubenzuron on Boll Weevil Emergence and Cotton Yield, Weslaco, TX, 1978.

Kg AI/ha[a]	Mean[b] % emergence (from damaged squares)	Mean[b] bales/ha (561 kg)
0.0000	22 a	1.42 a
0.0351	26 a	1.19 a
0.0526	12 a	1.15 a
0.0701	28 a	1.31 a

a/Applied 5/4, 9, 15, 20, 26, 6/1, 7, 14, 20, 24, and 29.
b/Means in a column followed by the same letter are not significantly different. Square samples taken 6/16, 21, 30, 7/3, and 10.

Incidental data obtained from these tests showed that diflubenzuron produced no detectable effect on the squaring rate or on boll formation. Maturity of the fruit was not hastened or delayed.

An overview of the results obtained from these 3 experiments conducted over 3 yr suggests the following: (1) Diflubenzuron did not adversely affect beneficial insects, a result which supports similar reports by Ables et al. (1977), Keever et al. (1977), and Rummel et al. (1979). (2) Diflubenzuron treatments did not result in a consistent reduction in boll weevil emergence or in a significant yield increase. (3) In each test diflubenzuron exhibited field activity, particularly at the highest rate, until square damage by boll weevils exceeded 35%. When this damage level is reached, movement of boll weevils among plots or from adjacent untreated fields may account for the apparent decrease in diflubenzuron effectiveness. (4) No phytotoxicity was observed in any of the experiments.

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