CONTROL OF Anticarsia gemmatalis HÜB. (LEPIDOPTERA: NOCTUIDAE) IN SOYBEANS WITH THIODICARB

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ABSTRACT

Three dosages of thiodicarb (Larvin UCLF-3) (26, 53 and 75g a.i./ha) were compared in field experiments against large (> 1.5cm) larvae of *Anticarsia gemmatalis* Hüb. Cypermethrin (15g a.i./ha) in 1986 and permethrin (15g), lambda cyhalothrin (3.5g) and diflubenzuron (5g a.i./ha) in 1987 were included for comparisons. At 26 and 53g a.i./ha thiodicarb was not effective, except for a short period after application and when larval densities were low. At 75g a.i./ha the efficiency of both formulations of thiodicarb varied between the two experiments; results were consistently better in 1987 under milder climatic conditions than in 1986, when high temperatures and drought persisted throughout the experiment. Thiodicarb was the fastest-acting compound in both years, with control rates above 80% two days after treatment. Between 5 and 15 days after application thiodicarb at 75g a.i./ha did not differ from the other treatments, with control rates between 77 and 91%. Diflubenzuron at 5g a.i./ha provided the longest residual effect after 20 days from the application. Defoliation levels visually estimated at the end of the experimental period in 1987 were lower than 10% in all treatments, except for the two lower dosages of thiodicarb, while the untreated control showed 34% of foliage loss.

KEY WORDS: Insecta, velvetbean caterpillar, chemical control.

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RESUMO

Controle de Larvas de *Anticarsia gemmatalis* Hüb. (Lepidoptera: Noctuidae) em Soja com Tiodicarbe

Três dosagens de tiodicarbe (Larvin UCLF-3 - 350CS) (26, 53 e 75g i.a./ha), foram avaliadas em experimentos de campo para o controle de larvas grandes (> 1,5 cm) de *Anticarsia gemmatalis* Hüb. em 1986, utilizou-se para comparação cipermetrina (15g i.a./ha), e em 1987 foram incluídos permetrina (15g), lambda cialotrina (3,5g) e diflubenzuron (5g i.a./ha). A 26 e 53g i.a./ha, tiodicarbe foi pouco eficiente, exceto aos dois e cinco dias após a aplicação, e apenas quando a densidade larval era baixa. A 75g i.a./ha, a eficiência das duas formulações variou entre os dois experimentos; resultados superiores foram registrados em 1987, sob condições climáticas mais amenas que em 1986, quando altas temperaturas e seca prolongada predominaram durante todo o período experimental, reduzindo a eficiência dos tratamentos. Nesta dosagem, tiodicarbe apresentou a mais rápida ação inicial, com taxas de controle superiores a 80% aos dois dias após a aplicação para as duas formulações, nos dois anos. Entre 5 e 15 dias após a aplicação, em 1987, não houve diferenças entre tiodicarbe a 75g i.a./ha e os demais tratamentos, com taxas de controle entre 77% e 91%. Diflubenzuron a 5g i.a./ha apresentou o maior poder residual após 20 dias da aplicação. As porcentagens de desfolhamento em 1987 demonstraram que todos os tratamentos, exceto as duas menores dosagens de tiodicarbe, apresentaram menos que 10% de redução da área foliar em comparação com 34% na testemunha não tratada.

PALAVRAS-CHAVE: Insecta, controle químico, lagarta da soja.

INTRODUCTION

Although thiodicarb is recommended for the control of the velvetbean caterpillar *Anticarsia gemmatalis* Hüb. in Brazil, few results on its toxicity to this species are available in the literature, and no information is found on its residual effect under field conditions in soybeans. Of the existing results, most consist of abstracts, e.g. Cavero & Menezes Jr. (1986), Wilcken *et al.* (1987), Corso (1991), with little information on its efficiency and persistance in the field.

The following results report on the performance of different dosages of thiodicarb in field experiments carried out during the 1986 and 1987 soybean seasons. Two formulations of thiodicarb were compared to pyrethroids (permethrin, cypermethrin and lambda cyhalothrin) and to an insect growth regulator (diflubenzuron). Residual activity was recorded until 20 days after application and percent defoliation was visually estimated at the end of the second experiment.

MATERIALS AND METHODS

The experiments were conducted during January-February, 1986 and 1987 on 'Bragg' soybeans in Lapa, Paraná State (Lat. 25°44' S; Long. 49°25' W). The insecticides were applied at the end of the flowering stage using a CO2-pressurized knapsack sprayer calibrated for an output of 100 l of water/ha. The following insecticides and dosages in g a.i./ha were used in 1986: thiodicarb (Larvin UCLF-3) (26g, 53g and 75g), Larvin 375 SC (75g), and cypermethrin (Nurelle 250EC) (15g). In 1987 the treatments with thiodicarb were repeated and permethrin (Pounce 384 EC) (15g), lambda cyhalothrin (Karate 50 EC) (3.5g) and diflubenzuron (Dimilin 250 WP) (5g) were included. Each treatment was replicated four times in a randomized block design; plots were 10m long and 10 rows wide, and two samples were taken in the six central rows of each plot, using the ground cloth method. Data were transformed in $(x+0.5)^{1/2}$ and submitted to analysis of variance; means were classified by Duncan's multiple range test at the 5% probability level. In 1987 percent defoliation was visually estimated in each plot at the end of the experiment by three persons independently and the results were transformed to arcsin $(x/100)^{1/2}$ and analyzed as described for the larval counts.

RESULTS AND DISCUSSION

In 1986 the insecticides were applied soon after the detection of the first larvae in the crop on January 26. The population remained low until five days after application, with little differences among treatments, all of them significantly different from the untreated control (Table 1). After 9 and 16 days, larval counts in the control plots averaged 23.5 and 38.0 large larvae/sample, respectively; thiodicarb at 26g a.i./ha was unable to avoid reinfestations after 9 days, and at 53g laval ressurgence was observed after 16 days. No statistical differences were observed between the two formulations of thiodicarb at 75g a.i./ha, even though the percentages of control with Larvin 375 SC were slightly higher (Table 1). Cypermethrin showed the best residual effect, although previous results (Foerster 1982, 1983) had reported higher control rates for the same dosage of cypermethrin.

In 1987 the insecticides were applied on January 22, under heavy larval attack, and significant differences were found among the treatments two days after application (Table 2). At 26g a.i./ha thiodicarb was inefficient since the first count, whereas at 53g, loss of efficiency was observed after 5 days. Both formulations of thiodicarb at 75g a.i./ha provided effective control of large *A. gemmatalis* larvae up to 20 days after treatment. These results are consistently better than the ones obtained in the previous year using similar dosages of thiodicarb. Such differences are probably due to striking variations in climatic conditions from one experimental period to another. In 1986 high temperatures and

drought throughout the experiment seemed to accelerate degradation and/or volatility of the insecticides, mainly of thiodicarb. Guillebeau *et al.* (1989) also recorded variations in the efficiency of pyrethroids to the boll weevil *Anthonomus grandis* Boh. according to the temperature and rainfal during the experimental period. Foerster (1992) attributed differences in the toxicity of chlorpyriphos and hexaflumuron against the velvetbean caterpillar to variations in climatic conditions from one year to another.

Table 1. Mean[1] number of live *Anticarsia gemmatalis* larvae (> 1.5cm) per sample and percentage of control at different intervals after application, average of eight counts/treatment. Lapa, PR, 1986.

Dosage		Pre-	2 Days		5 Days		9 Days		16 Days	
Treatment g.a.i./ha	count	N	%	N	%	N	%	N	%	
Thiodicarb	26	2.8	3.4b	50.0	1.9a	57.1	19.3bc	18.1	35.0bc	5.3
LARVIN UCLF-3										
	53	1.5	1.6ab	75.9	1.1a	74.3	12.4ab	47.3	34.1bc	10.2
	75	1.5	1.3a	81.5	1.1a	74.3	9.6a	59.0	29.0bc	23.7
Thiodicarb	75	2.5	1.3a	81.5	0.6a	85.7	7.4a	68.6	27.5b	27.6
LARVIN 375										
Cypermethrin	15	1.8	2.5ab	63.0	1.8a	60.0	6.6a	71.8	18.9a	50.3
Control	-	1.8	6.8c	-	4.4b	-	23.5c	-	38.0c	-
F 0.05		-	9.3193**		6.2801**		6.8132**		6.2301**	
C.V.		-	21.47		26.69		19.69		9.69	

[1] Means followed by the same letter do not differ at the 5% level according to Duncan's multiple range test.

Permethrin and cyhalothrin despite being initially less toxic, did not differ from thiodicarb in the subsequent countings. Diflubenzuron at 5g a.i./ha showed the longest residual effect despite its slower initial action (Table 2). The efficienty of dosages of diflubenzuron as low as 5g a.i./ha has been previously reported by Heinrichs & Silva (1978) and Foerster (1992).

The data on defoliation levels (Table 3) estimated at the end of the experiment in 1987 are in agreement with the efficiency of the compounds evaluated by the larval counts; all treatments, except the lower dosages of thiodicarb showed less than 10% defoliation, while in the untreated control foliage loss reached 34%.

Table 2. Mean[1] number of live *Anticarsia gemmatalis* larvae (> 1.5cm) per sample and percentage of control at different intervals after application, average of eight samples/treatment, Lapa, PR, 1987.

Treatment	Dosage g a.i./ha	2 Days N	%	5 Days N	%	10 Days N	%	15 Days N	%	20 Days N	%
Thiodicarb	26	13.6cd	51.4	19.5bc	36.6	21.0d	22.6	14.1bc	40.8	4.6c	5.1
LARVIN UCLF-3	53	6.6b	76.3	10.8ab	65.0	13.9c	48.9	9.9bc	58.6	4.6c	5.1
	75	1.9a	93.3	2.8a	91.1	4.4a	83.9	5.5ab	77.0	3.5bc	28.2
Thiodicarb LARVIN 375	75	0.6a	97.8	6.1a	80.1	4.9ab	82.0	4.5ab	81.2	3.0bc	38.5
Permethrin	15	6.9b	75.5	6.3a	79.7	7.6ab	71.9	5.3ab	78.0	1.6ab	66.7
Cyhalothrin	3.5	8.9bc	68.3	5.9a	80.9	8.5b	68.7	8.0ab	66.5	3.8bc	23.1
Diflubenzuron	5	16.9d	39.7	7.5ab	75.6	5.4ab	80.2	2.5a	89.5	0.6a	87.2
Control	-	28.0e	-	30.8c	-	27.1d	-	23.9c	-	4.9c	-
F 0.05		38.9130**		5.3846**		21.6606**		5.1313**		4.0118**	
C.V.		14.81		35.37		14.87		25.42		24.35	

[1] Means followed by the same letter do not differ at the 5% level according to Duncan's multiple range test.

Table 3. Percent defoliation of soybeans 20 days after insecticide treatment, average of 12 evaluations/treatment, Lapa, PR, 1987.

Treatment	Dosage g a.i./ha	Defoliation[1] %
Thiodicarb (Larvin UCLF-3)	26	19.33d
	53	13.16c
	75	8.25ab
Thiodicarb (Larvin 375 SC)	75	7.42a
Permethrin	15	8.75ab
Lambda cihalothrin	3.5	7.75ab
Diflubenzuron	5	9.99b
Control	-	34.33e
F' 0.05		117.0314**
C.V.		6.21

[1] Means followed by the same letter do not differ at the 5% level according to Duncan's multiple range test.

The results indicate that all treatments were more effective under mild weather conditions; high temperatures and prolongued drought in 1986 increased the rate of degradation and/or volatility of the compounds. Dosages of thiodicarb lower than 75g a.i./ha were inefficient for the control of large *A. gemmatalis* larvae after a week from application.

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