RESIDUAL EFFECT OF INSECTICIDES ON THE CONTROL OF THE ADULT BOLL WEEVIL, *Anthonomus grandis,* IN COTTON

G. Papa
J. A. Zanardi Jr.
F. J. Celoto
R. da Silva
R. C. P. Andrade
Paulista State University, UNESP
Ilha Solteira, SP, Brazil

Abstract

The objective of this research is to evaluate the residual effect of insecticides used on the control of the boll weevil, *Anthonomus grandis*. The experiment was carried out in greenhouse conditions. Each plot consisted of a plant cultivated in vase. The treatments and doses (g of a.i./ha) were: control; beta-cyfluthin (12.5); beta-cyfluthrin + imidacloprid (125+100); thiamethoxam + lambda-cyalothrin (35.25+26.5); thiamethoxam + lambda-cyalothrin (42.3 + 31,8); fipronil (78); zetacypermethrin (60); lambda-cyalothrin (30); methomyl (322.5); malathion (1000); carbosulfan (700); etophenprox (105); bifenthrin (60); thiamethoxam + chlorantraniliprole (50+25); thiamethoxam + clorantraniliprole(60+30) and pymetrozine (200). A single foliar application was accomplished and three artificial infestations, confining with cages of tulle fabric, five adults boll weevil/plant, being the first soon after application and other two with intervals of 3 and 6 days after the application. To the 6, 12, 24, 48 and 72 hours after first infestation and at the 24, 48 and 72 hours after second and third infestation, the number of died boll weevil was counted in each plot. The insecticides methomyl (322.5), malathion (1000) and etophenprox (105) promoted mortality above 80% until 3 days after application; the insecticide carbosulfan (700) promoted mortality of 90% until 6 days after application and the insecticides fipronil (78) and bifenthrin (60) promoted mortality of 85% until 9 days after application

Introduction

Cotton is grown in more than 70 countries. Currently, the cotton area planted in Brazil occupies approximately 1.4 million hectares (3.5 million acres). The Central-Western region of Brazil accounts for 64% of the country's cotton production, followed by the Southeastern region at 30%, and the Southern region at 15%. Due to the great number of pests that attack cotton, producers must adopt measures for a rational insect control management. Among cotton pests, the boll weevil has become the pest with the greatest economic importance; it is also very difficult to control. Damages in plants are represented by squares shedding and destruction of fruits, preventing the bolls from opening normally. Because of square shedding and smaller numbers of fruits, cotton plants exhibited significant vegetative development and large leaves, but with reduced production.

The changes in course in the Brazilian agriculture with plantings successive and/or concomitant, although it provides production increase and optimization of the use of the soil, it favors the reproduction of the pests due to the constant offer of hosts and the constant dispersion of the insects from a crop to another. Thus the attack intensity and occurrence of pests has been increasing and the solution is almost exclusively through of the chemical control. In the case of the boll weevil, that it adapted and expanded practically for all of the producing areas with increase significant of the infestations, the chemical control has been put the proof by the growers with some complaints of reduction of the efficiency, mainly of the pyrethroid. As the boll weevil is protected in the plants by the bracts that it involve the squares, the main form of contamination is through penetration by the tarsus, for occasion of the adults' traversal in the plants, when its move from a square to another. The objective of this research is to evaluate the residual effect of insecticides used on the control of the boll weevil, Anthonomus grandis.

Materials and Methods

The experiment was conducted in greenhouse conditions at the Experimental Area of Unesp - São Paulo State University - located in Ilha Solteira/SP/Brazil, in 2015. The design was a completely randomized with 16 treatments and 4 replications. The treatments and doses are listed in Table 1. Each plot consisted of a cotton plant cultivated in vase. Single foliar application was accomplished using electrical sprayer with volume of 100 L/ha. Three artificial infestations, confining five adult boll weevils/plant with cages of tulle fabric, being the first infestation soon after

application and other two with intervals of 3 and 6 days after the application. To the 6, 12, 24, 48 and 72 hours after first infestation and at the 24, 48 and 72 hours after second and third infestation, the number of died boll weevil was counted in each plot. Data were submitted to analysis of variance by the F test and the means were compared by Scott-Knott test (5%).

Table 1. Treatments and doses of insecticides used to control the cotton boll weevil. 2015.

Treatments	Dose (g of a.i./ha)
1 - Betacyfluthrin	12.5
2 - Betacyfluthrin + Imidacloprid	100 + 12.5
3 - Lambdacyalothrin + Thiamethoxam	26.5 + 35.25
4 - Lambdacyalothrin + Thiamethoxam	31.8 + 42.3
5 – Fipronil	78
6 – Zetacypermethrin	60
7 - Lambdacyalothrin	30
8 – Methomil	322.5
9 – Malathion	1000
10 – Carbosulfan	700
11 – Etofenproxi	105
12 – Bifenthrin	60
13 - Thiamethoxam + Chlorantraniliprole	50 + 25
14 - Thiamethoxam + Chlorantraniliprole	60 + 30
15 – Pimetrozine	200
16 – Untreated	--

Results

For the analysis regarding mortality percentage of the adults boll weevil (Table 2.), it was verified that the etofenproxi at 105 g of a.i./ha, malathion at 1000 g of a.i./ha and bifenthrin at 60 g of a.i/ha promoted knockdown effect, providing percentage of mortality above 80%, with prominence for the insecticide bifenthrin, that provided mortality of the 95%. To the 3 days after application (72 hours), it was observed that the malathion at 1000 g of a.i./ha, carbosulfan at 700 g of a.i./ha, etofenprox at 105 g of a.i./ha and bifenthrin at 60 g of a.i./ha promoted percentage of mortality above 80%, with prominence for the fipronil at 78 g of a.i./ha and methomyl at 322.5 g of a.i./ha, that its promoted 100% of mortality. The beta-cyfluthrin at 12.5 g of a.i./ha and thiamethoxam + chlorantraniliprole at 60 + 30 g of a.i./ha reached mortality percentage of 75 and 70, respectively , being differed from the control, to the 3 days after application.

Table 2. Activity of insecticides on the mortality of the boll weevil. Total Number of adult boll weevil alive and mortality percentage (% M), to 6, 12, 24, 48 and 72 hours after the first infestation. Ilha Solteira/SP/Brazil/2015.

Treatments	Doses (g a.i./ha)	6 h.a.1ª i.		12 h.a.1ª i.		24 h.a.1ª i.		48 h.a.1ª i.		72 h.a.1ª i.	
		Total	%M	Total	%M	Total	%M	Total	%M	Total	%M
1 - Betacyfluthrin	12,5g	11	45	7	65	6	70	6	70	5	75
2 - Betacyfluthrin + Imidacloprid	100 12,5	14	30	14	30	10	50	12	40	11	45
3 - Lambdacyalothrin + Thiamethoxam	26,5 35,25	17	15	12	40	12	40	11	45	8	60
4 - Lambdacyalothrin + Thiamethoxam	31,8 42,3	16	20	16	20	14	30	8	60	5	75
5 – Fipronil	78	14	30	7	65	4	80	1	95	0	100
6 – Zetacypermethrin	60	19	5	11	45	10	50	9	55	7	65
7 - Lambdacyalothrin	30	13	35	10	50	9	55	10	50	8	60
8 – Methomil	322,5	15	25	8	60	5	75	3	85	0	100
9 – Malathion	1000	15	25	4	80	3	85	1	95	1	95
10 – Carbosulfan	700	16	20	11	45	10	50	7	65	3	85
11 – Etofenproxi	105	16	20	7	65	6	70	5	75	4	80
12 – Bifenthrin	60	9	55	1	95	1	95	1	95	1	95
13 - Thiamethoxam + Chlorantraniliprole	50 25	19	5	19	5	17	15	7	65	7	65
14 - Thiamethoxam + Chlorantraniliprole	60 30	13	35	13	35	8	60	5	75	6	70
15 – Pimetrozine	200	19	5	19	5	18	10	17	15	14	30
16 – Untreated	--	20	0	20	0	20	0	20	0	20	0

In the analyses accomplished after second infestation (Table 3.) it was verified that the beta-cyfluthrin at 12.5 g of a.i./ha, carbosulfan at 700 g of a.i./ha, bifenthrin at 60 g of a.i./ha and fipronil at 78 g of a.i./ha promoted percentage of mortality above 80% to the 3 days after second infestation (6 days after application), being significantly differed from the control (untreated), with prominence for the bifenthrin, that promoted 100% of mortality.

Table 3. Activity of insecticides on the mortality of the boll weevil. Total Number of adult boll weevil alive and mortality percentage (%M), to 24, 48 and 72 hours after the second and third infestation. Ilha Solteira/SP/Brazil/2015.

Treatments	Doses (g a.i./ha)	24 h.a.2ª i.		48 h.a.2ª i.		72 h.a.2ª i.		24 h.a.3ª i.		48 h.a.3ª i.		72 h.a.3ª i.	
		Total	%M	Total	%M	Total	%M	Total	%M	Total	%M	Total	%M
1 – Betacyfluthrin	12,5g	11	45	10	50	4	80	20	0	16	0	12	25
2 - Betacyfluthrin + Imidacloprid	100 12,5	17	15	15	25	13	35	--	--	--	--	--	--
3 - Lambdacyalothrin + Thiamethoxam	26,5 35,25	9	55	8	60	6	70	16	20	13	19	12	25
4 - Lambdacyalothrin + Thiamethoxam	31,8 42,3	17	15	7	65	6	70	14	30	13	19	8	50
5 – Fipronil	78	15	25	4	80	3	85	13	35	5	69	3	81
6 – Zetacypermethrin	60	14	30	15	25	15	25	--	--	--	--	--	--
7 – Lambdacyalothrin	30	13	35	5	75	5	75	17	15	16	0	11	31
8 – Methomil	322,5	20	0	13	35	9	55	15	25	9	44	9	44
9 – Malathion	1000	15	25	15	25	11	45	--	--	--	--	--	--
10 – Carbosulfan	700	13	35	6	70	2	90	18	10	12	25	6	63
11 – Etofenproxi	105	12	40	6	70	5	75	13	35	5	69	6	63
12 – Bifenthrin	60	10	50	3	85	2	90	10	50	7	56	3	81
13 - Thiamethoxam + Chlorantraniliprole	50 25	19	5	17	15	12	40	--	--	--	--	--	--
14 - Thiamethoxam + Chlorantraniliprole	60 30	10	50	11	45	10	50	13	35	12	25	8	50
15 – Pimetrozine	200	16	20	16	20	13	35	--	--	--	--	--	--
16 – Untreated	--	20	0	20	0	20	0	20	0	16	20	16	20

Conclusion

The insecticides methomyl (322,5), malathion (1000) and etophenprox (105) promoted mortality above 80% until 3 days after application; the insecticide carbosulfan (700) promoted mortality of 90% until 6 days after application and the insecticides fipronil (78) and bifenthrin (60) promoted mortality of 85% until 9 days after application.

Disclaimer

Mention of a trade name or specific equipment does not constitute a guarantee or warranty by the USDA or Brazilian government and not imply its approval to the exclusion of other products that may suitable.

References

Barros, R.; Silva, R.L.; Cordellini, M.H.; Aramaki, P.; Degrande, P.E. Eficiência do thiametoxam 250 WG em bateria de aplicações no controle do bicudo-do-algodoeiro. In: CONGRESSO BRASILEIRO DE ALGODÃO, 5., 2005, Salvador, BA. *Resumos*. Salvador: Embrapa Algodão, 2005. CD-ROM.

Davich, T.B. The boll weevil – lookin' for a home. In: ADAMS, J. (Ed.). Insect potpourri: adventures in entomology. Gainesville: Sandhill Crane, 1992. p.186-191.

Papa, G. Celoto, F. J. ; Nanuci, R. L. ; Montoro, V. B. ; Zanardi Junior, J. A. ; Stropa, R. K. Activity of the selective feeding blocker insecticide (Pimetrozine) on the control of the boll weevil, Anthonomus grandis, in cotton. In: 2012 Beltwide Cotton Conferences, 2012, Orlando. 2012 Beltwide Cotton Conferences. Orlando, 2012. v. 1. p. 838-842.

Papa, G. ; Celoto, F.J. ; Montoro, V. B. ; Zanardi Junior, J. A. ; Barbosa, E. V. C. . Effect of pymetrozine on square protection and emergence of adults of the boll weevil, Anthonomuns grandis, in cotton. In: 2014 Beltwide Cotton Conferences, 2014, New Orleans. Beltwide Cotton Conferences, 2014. v. 1. p. 758-761.

Specht, A.; Soza-Gómez, D.R.; Paula-Moraes, S.V.; Yano, S.A. Identificação morfológica e molecular de Helicoverpa armigera (Lepidoptera: Noctuidae) e ampliação de seu registro de ocorrência no Brasil. Pesq. Agropecu. Bras. v.48, p.689-692, 2013.