ACTIVITY OF INSECTICIDES ON THE COTTON BOLL WEEVIL CONTROL, *ANTHONOMUS GRANDIS* AND THE EFFECTS ON THE IMBALANCE OF COTTON APHID, *APHIS GOSSYPII*

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Abstract

The objective of this work was to evaluate the activity of the main insecticides on the *Anthonomus grandis* control, and the imbalance caused on the population of the *Aphis gossypii*. The experiment was conducted on the research farmer of Paulista State University, campus of Ilha Solteira/SP, from 04/13/2018 at 06/23/2018, in area cultivated with the variety cotton FM-983-GLT. The design experimental was randomized blocks with 7 treatments and 4 replicates, with plots of 108m². The treatments consisted of three applications with 5 days interval of the insecticides lambda-cyhalothrin + thiamethoxan, lambda-cyhalothrin + thiamethoxan + lufenuron, malathion, carbosulfan, profenophos + cypermethrin and bifenthrin + acetamipride. The sprays were made with CO2 propelled equipment, with a volume of 150L / ha, 40 psi pressure and conical tips TXVK-8. Evaluations were carried out at 5 days after the first and second application and at 5, 7 and 10 days after the third application, counting the number of feeding symptoms, oviposition or presence of adults in 50 floral buds per plot and number of aphids in 5 plants per plot. The results were submitted to analysis of variance by the F test and the Tukey Test (5%) compared the means. The percentage of efficiency was calculated using the Abbott (1925). All tested insecticides provide satisfactory control of the boll weevil up to 5 days after the third application, resulting in an increase in yield. The insecticide bifenthrin + acetamipride obtained better control performance for cotton aphid, boll weevil and the largest increase in yield.

Introduction

Cotton is grown in more than seventy countries. Currently, the area planted with cotton 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%. Modern agriculture no longer admits the utilization of chemical products with a broad spectrum of action, which normally causes undesirable effects in the agricultural ecosystem, such as pest resurgence, pest status changes from secondary to primary and environmental impacts such as intoxication problems in animals and humans. Due to the great number of pests that attack cotton, producers must adopt measures for a rational insect control management

The cotton boll weevil, *Anthonomus grandis* Boheman, was reported in Brazil for the first time in 1983, attacking cotton flower buds located in the around Viracopos airport in the Campinas/SP region (HABIB; FERNANDES, 1983). It is currently considered one of the main pests of the crop due to the damages provided and the difficulty of control, besides being present in all producing regions (AZAMBUJA, 2014).

Due to the difficulty in adopting measures of control of the boll weevil, Brazilian cotton cultivation is based on its control almost exclusively in the chemical spraying, so that around 50% of the costs with insecticides used in the cotton crop is directed to pest control, with sprays targeting adults. Cotton is susceptible to the loss of reproductive structures by attack of the beetle for a long period, requiring intense monitoring and control action (SPECHT et al., 2013).

In this context, the objective of the work was to evaluate the activity of the insecticides lambda-cyhalothrin + thiamethoxan, lambda-cyhalothrin + thiamethoxan + lufenuron, malathion, carbosulfan, profenofos + cypermethrin and bifenthrin + acetamipride on the cotton boll weevil control, *A. grandis*, and the imbalance caused by the insecticides on the population of the cotton aphid, *Aphis gossypii*.

Methods

The experiment was conducted in the field, under conventional planting system. The cultivar used was FM-983 GLT, sown on 02/24/2018, with an emergency observed on 01/03/2018, conducted at a spacing of 0.90 m between rows and density of 15 seeds / m, making up a population of 166.600 plants approximately. Planting fertilization was performed in the proportion of 400 kg / ha of the N-P-K formulation (08-28-16). At 35 days after emergence of

the crop, cover fertilization was carried out in the proportion of 100 kg / ha of Potassium Chloride (KCl) 100 kg of Urea. For control of weeds, an application of glyphosate herbicide at the dose recommended by the manufacturer was performed after 35 days after emergence of the crop.
The experiment was installed on 03/04/2018, when the first symptoms of feeding and oviposition of the cotton boll weevil were contacted in the experimental area.
The treatments consisted of three applications with 5 days interval of the insecticides and rates described in Table 1. The sprays were made with CO2 propelled equipment, with a volume of 150L / ha, 40 psi pressure and conical tips TXVK-8.

Table 1. Treatments and rates of insecticides on the control of cotton boll weevil, *A. grandis*.

Treatments	Rate (active ingredient/ha)	Rate (comercial product/ha)
1. untrated check	--	--
2. lambda-cyhalothrin + thiamethoxan	35,3 + 26,5	250 ml
3. lambda-cyhalothrin + thiamethoxan + lufenuron	45 + 30 + 22,5	300 ml
4. malathion	1000	1000 ml
5. carbosulfan	700	1000 ml
6. profenofos + cypermethrin	40 + 400	1000 ml
7. bifenthrin + acetamipride	50 + 50	200 g

The evaluations were carried out at 5 days after the first and second application and at 5, 7 and 10 days after the third application, counting the number of feeding symptoms, oviposition or presence of adults in 50 floral buds per plot and number of aphids in 5 plants per plot.
At the end of the crop cycle, on 06/23/2018, the productivity evaluation was carried out by the weight of the feathers plus core of two lines of 5m each. The mean weight obtained by treatment was transformed into arrobas/ha.
The results were submitted to analysis of variance by the F test and the means were compared by the Tukey Test (5%). The percentage of efficiency was calculated using the Abbott (1925).

Figure 1. Plant of cotton attacked by aphid, *Aphis gossypii*.

Results

In the counting of the number of flower buds with presence of oviposition, feeding or presence of adults (Figure 2), It was verified that the untreated check reached more than 40 flower buds attacked at 7 days after the third application, representing more than 20% of the flower buds evaluated, whereas treatments that included insecticides

did not reach 10 flower buds attacked in the same evaluation, which represents less than 5% of the total evaluated, with emphasis on treatment 7 (bifenthrin + acetamipride, at 200 g of commercial product/ ha) with only three floral buds attacked at 10 days after third application (1.5% of the total evaluated in the treatment).

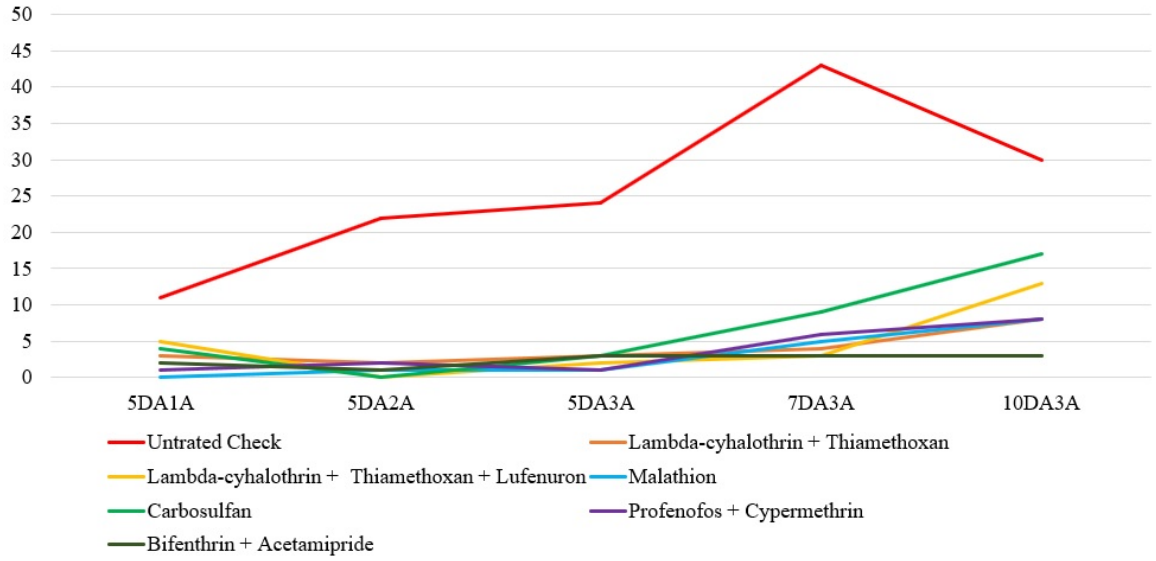

Figure 2. Number of flower buds with presence of feeding, oviposition or adults of boll weevil, *A. grandis* in cotton crop.

In the counts of the number of cotton aphid, *A. gossypii* (table 2), it was verified that there was no difference between treatments at 5 days after the first application. However, at 5 days after the second and at 5 and 10 days after the third application, there was an increase in the aphid population in the treatments 2, 3, 4, 5 and 6 (lambda-cyhalothrin + thiamethoxan at 250 ml of cp/ha , lambda-cyhalothrin + thiamethoxan + lufenuron to 300 ml of cp/ha, malathion to 1000 ml of cp/ha, carbosulfan to 1000 ml of cp/ha and profenofos + cypermethrin to 1000 ml of cp/ha). At 5 days after the third application, treatments 1 and 7 (utrated check and bifenthrin + acetamipride, at 200 g cp/ha, respectively) obtained lower numbers of aphids than treatments 3, 4 and 6 (lambda-cyhalothrin + thiamethoxan + lufenuron at 300 ml cp/ha, malathion at 1000 ml cp/ha and profenofos + cypermethrin at 1000 ml cp/ha, respectively), evidencing the imbalance caused in the aphid population due to the application of these insecticides, with emphasis on treatment 4 (malathion at 1000ml cp/ha), with a difference of 2732 aphid when compared to the untreated check in the 20 plants evaluated. In the efficiency analysis, the treatment 7 (bifenthrin + acetamipride, at 200 g of cp/ha) provided 83% and 68% efficiency in the control of the cotton aphid at 5 days after 2nd application and 10 days after third application.

Table 2. Number of cotton aphid, *A. gossypii* in 20 plants per tratament e perncentage of efficiency (%E) at 5 DA1ªA, 5 DA2ªA e 5 and 10 DA3ªA.

Treatments	Rate (*c.p./ha)	5 DA1ªA		5 DA2ªA		5 DA3ªA		10 DA3ªA	
		Total	%E	Total	%E	Total	%E	Total	%E
1. untrated check	--	45 a	--	150 bc	--	118 c	--	200 ab	--
2. lambda-cyhalothrin + thiamethoxan	250 ml	26 a	42	115 bc	23	1020 abc	0	1500 ab	0
3. lambda-cyhalothrin + thiamethoxan + lufenuron	300 ml	25 a	44	260 ab	0	1830 a	0	1605 ab	0
4. malathion	1000 ml	18 a	60	610 a	0	2850 a	0	2320 a	0
5. carbosulfan	1000 ml	8 a	82	145 bc	3	205 bc	0	510 ab	0
6. profenofos + cypermethrin	1000 ml	12 a	73	365 ab	0	1620 ab	0	1210 ab	0
7. bifenthrin + acetamipride	200 g	22 a	51	25 c	83	97 c	18	65 b	68
C.V. (%)	--	40,70		28,18		36,60		59,88	

*c.p. = commercial product.

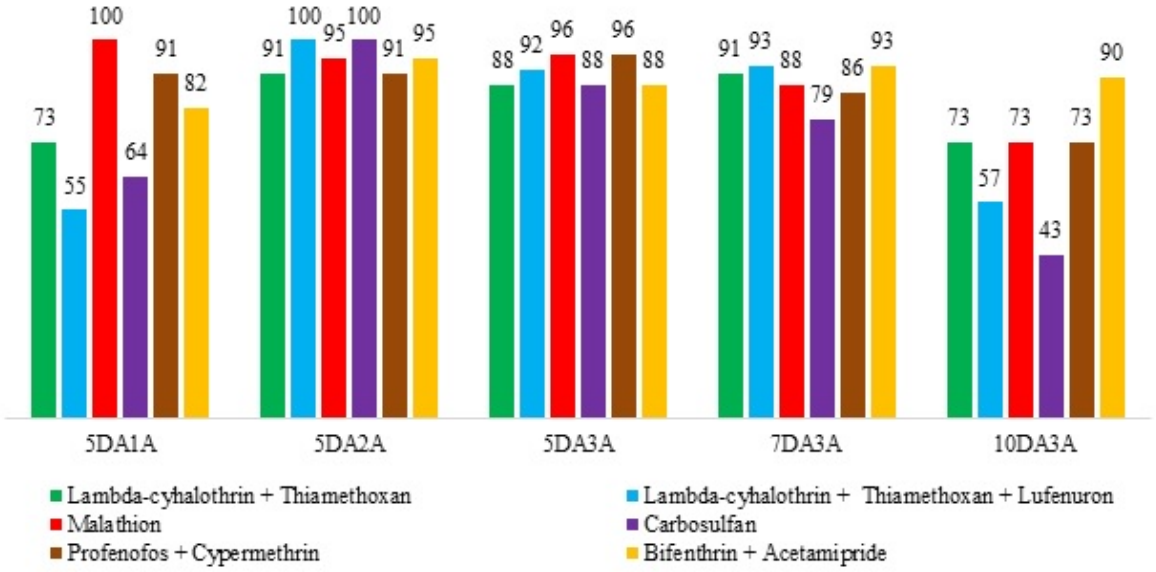

Figure 3. Percentage of efficiency to control of boll weevil, *A. grandis* in cotton crop.

By the yield analysis (table 3), it was verified that all treatments based on insecticide provided yield higher than the untreated check, with emphasis on treatment 7 (bifenthrin + acetamipride, at 200 g of cp/ha), with an increase of 45.5%, justified mainly by control of the boll weevil of cotton, *A. grandis* (Figure 3).

Table 3. Average weight of cotton pen more seeds of 9m² per plot, estimated yield at arroba/ha and increase of productivity per treatment. 06/23/2018.

Treatments	Rate (*c.p./ha)	Yield		Increase
		9m²	Arroba/ha	
1. untreated check	--	1,13 b	83,3	--
2. lambda-cyhalothrin + thiamethoxan	250 ml	1,77 a	131,1	36,5 %
3. lambda-cyhalothrin + thiamethoxan + lufenuron	300 ml	1,95 a	144,1	42,2 %
4. malathion	1000 ml	1,76 a	130,2	36,0 %
5. carbosulfan	1000 ml	1,93 a	143,1	41,8 %
6. profenofos + cypermethrin	1000 ml	1,99 a	147,0	43,3 %
7. bifenthrin + acetamipride	200 g	2,06 a	152,8	45,5 %
C.V. (%)	--	10,15		

*c.p. = commercial product.

Conclusion

The insecticide Malathion provided greater cotton aphid imbalance. All tested insecticides provide satisfactory control of the boll weevil up to 5 days after the third application, resulting in an increase in yield. The insecticide Bifenthrin + Acetamipride obtained better control performance for cotton aphid, boll weevil and the largest increase in yield.

Disclaimer

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