EFFECT OF THE BIOLOGICAL INSECTICIDE HzNPV (nucleopolyhedrovirus) ON THE CONTROL OF THE COTTON BOLLWORM, *Helicoverpa Armigera*, IN COTTON

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Abstract

Helicoverpa armigera (Hubner) presents a wide geographical distribution and it is registered in several countries. In March 2013 was officially reported in Brazil where it was considered a quarantine pest. *H. armigera* has a high destructive potential and has brought concerns to Brazilian farmers because of the difficulty of its control and the lack of information about its management in Brazil. In order to evaluate the activity of the biological insecticide HzNPV (nucleopolyhedrovirus) on the control of the *H. armigera*, in cotton, settled this experiment that was carry out in field conditions in Selvíria/MS/Brazil. The treatment and doses (g a.i./ha) were: control, flubendiamide (60) and HzNPV (250, 375, 500 and 625 x 10^9 occlusion bodies). Three foliar applications were accomplished (interval of 7 days), being used a back sprayer equipped with conical nozzles (TXVK-8) and volume of 200 L/ha. To the 0 (pre-sparay), 3 and 7 days after each application, it was counted the number of attacked plants and the number of caterpillars of *H. armigera* in 10 plants/plot. The biological insecticide HzNPV, at doses of 250, 375, 500 and 625 g a.i./ha (x10^9 occlusion bodies) was efficient on the control of the *H. armigera*, achieve average efficiencies above 80% until 7 days after the third application.

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. *Helicoverpa armigera* (Hubner) presents a wide geographical distribution and it is registered in several countries. In March 2013 was officially reported in Brazil (Cezepak et al., 2013), where it was considered a quarantine pest. *H. armigera* has a high destructive potential and has brought concerns to Brazilian farmers because of the difficulty of its control and the lack of information about its management in Brazil. *H. armigera* is recorded in several countries (Guo, 1997); But until March 2013 had not been officially registered in Brazil. *H. armigera* is a highly polyphagous species with high mobility and high survivability even in adverse conditions, and can complete several generations per year (Fitt, 1989). These biological characteristics give the pest high damage production capacity and bring concern to Brazilian cotton farmers, due to the difficulty of its control and the lack of information regarding this pest in Brazil The cotton bollworm feed of leaves and stems, however, Its have preference for squares and boll and cause damages in the phase vegetative and reproductive. The characteristics of that pest demonstrate its destructive potential that caused world losses of about 5 billion dollars/year (Lammers; Macleod, 2007). In Brazil the losses reached about one billion dollars already in the first harvest after the detection (ABRAPA) and caused losses above 80% in the production of the cotton in the west of Bahia (EMBRAPA, 2013). The objective of this research is to evaluate the effectiveness of the biological insecticide HzNPV (nucleopolyhedrovirus), on the control of the cotton bollworm, *H. armigera*, in cotton.

Methods

The experiment was conducted in field conditions at the Experimental Area of Unesp - São Paulo State University - located in Selviria/MS/Brazil, in 2014. The design was randomized blocks with 6 treatments and 4 replications. The treatments and doses are listed in Table 1. Each plot consisted of the 48m^2 of cotton crop. Three foliar applications

were accomplished (interval of 7 days), being used a back sprayer equipped with conical nozzles (TXVK-8) and volume of 200 L/ha, initiate when the mean percentage of squares attacked by the cotton bollworm was of 5%**.** To the 0 (pre-spray), 3 and 7 days after each application, it was counted the number of attacked plants and the number of caterpillars of *H. armigera* in 10 plants/plot. Data were submitted to analysis of variance by the F test and the means were compared by Tukey test (5%).

Table 1. Treatments and doses of the insecticides for cotton bollworm control. Selvíria/MS/Brazil. 2014.

Treatments	Doses (g a.i./ha)	Doses (c.p./ha)
1. Control	--	--
2. Flubendiamide	60	1500 g
3. HzSNPV*	250	x10^9 occlusion bodies
4. HzSNPV*	375	x10^9 occlusion bodies
5. HzSNPV*	500	x10^9 occlusion bodies
6. HzSNPV*	625	x10^9 occlusion bodies

* addition of mineral oil at 0,2% v/v

Results

For the analysis of the number of alive caterpillars (table 2.), it was verified that the biological agent HzNPV reached 100% of efficiency on the control of caterpillars until 7 days after third application, at the dose of 625 g of a.i. g/ha. To the three days after third application, the HzNPV at the doses of 250 and 375 g of a. i./ha is also provided 100% of efficiency on the control it of the *H. armigera*.

Table 2. Total number of alive caterpillars of *Helicoverpa armigera* in 40 plants/treatment to the 0 (pre-sparay) and to the 3 and 7 days after first, second and third application. Selvíria/MS/Brazil/2014.

Treatments	Dose (g a.i./ha)	Pre	3 d.a.1ªa.		7 d.a.1ªa.		3 d.a.2ªa.		7 d.a.2 ªa.		7 d.a.3ªa.	
		Total	Total	%E	Total	%E	Total	%E	Total	%E	Total	%E
Control	--	3 a	4 a	--	10 a	--	12 a	--	10 a	--	9 a	--
Flubendiamide	60	4 a	2 a	50	3 b	70	3 b	75	2 b	80	2 ab	100
HzSNPV	250*	2 a	5 a	0	2 b	80	2 b	83	3 b	70	2 ab	100
HzSNPV	375*	3 a	6 a	0	2 b	80	2 b	63	2 b	80	0 b	100
HzSNPV	500*	3 a	5 a	0	1 b	90	1 b	92	2 b	80	1 b	89
HzSNPV	625*	2 a	5 a	0	0 b	100	0 b	100	1 b	90	0 b	100

Means followed by different letters in each column are significantly different by to Tukey (5%)
* Dose x10^9 occlusion bodies

In the analysis regarding percentage of plants attacked by treatment (Figure 1), it was verified that in all evaluations, starting from the three days after the first application, the treatments with the biological agent HzNPV provided smaller percentage of attacked plants when compared to the control (untreated) . To the three days after first application, the insecticide flubendiamide at 60 g a.i./ha provided percentage of plants attack lower to the control, providing faster control when compared to HzNPV. However, to the seven days after first and second application, HzNPV provided smaller percentage of attacked plants.

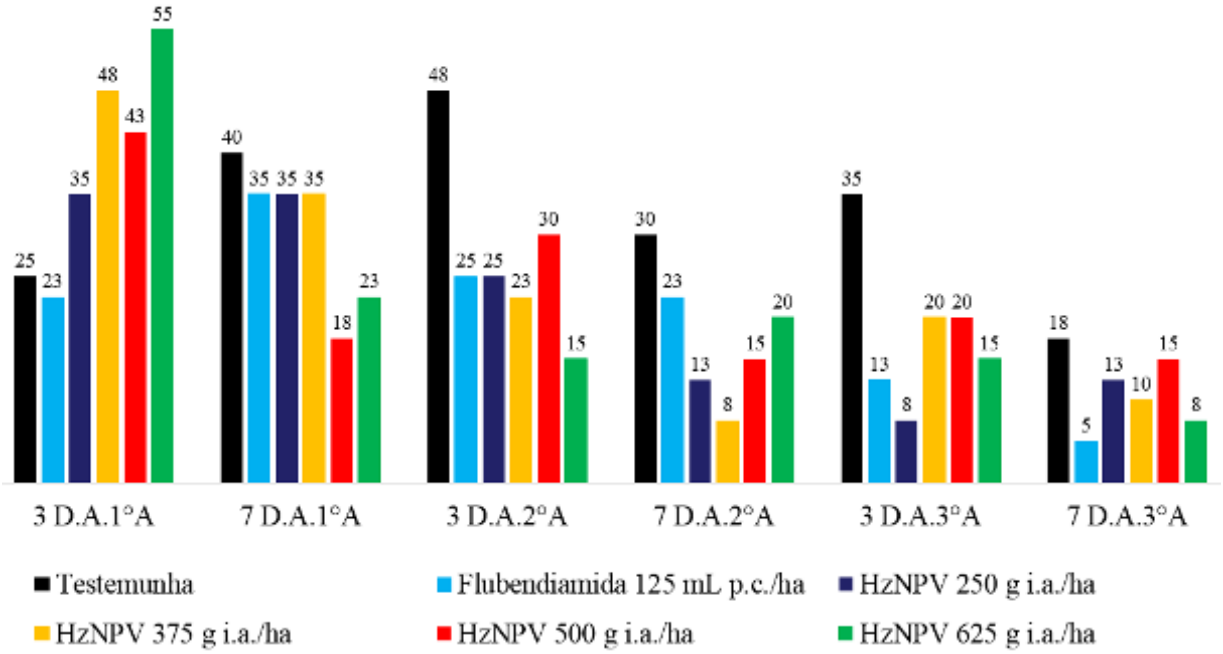

Figure 1**.** Percentage of cotton plants attacked by *Helicoverpa armigera*, to the 3 and 7 days after each application. Selvíria/MS/Brazil, 2014.

Conclusion

The biological insecticide HzNPV (nucleopolyhedrovirus), at doses of 250, 375, 500 and 625 g a.i./ha (x10^9 occlusion bodies) was efficient on the control of the *H. armigera*, achieve average efficiencies above 80% until 7 days after the third application, could be used as new option for the management of the cotton bollworm, in cotton.

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.

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