# EFFECT OF PYMETROZINE ON SQUARE PROTECTION AND EMERGENCE OF ADULTS OF THE BOLL WEEVIL, Anthonomus grandis, IN COTTON

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# <u>Abstract</u>

The ever increasing quest for alternatives that are both safer and less aggressive to the environment in the control of agricultural pests has brought a significant development of new insecticides, thus contributing towards a safer and more effective pest control management. Within this context, insecticides in the selective feeding blocker group are considered selective with a beneficial toxicological profile. This experiment was installed under field conditions to investigate the effect of pymetrozine (Selective Feeding Blocker) on cotton square protection and boll weevil adult emergence, in order to be used as an alternative to the utilization of older insecticides with higher toxicity, such as organophosphorus compounds and pyrethroids. The experimental design was arranged as random blocks, with 5 treatments and 4 replicates. The treatments and doses (g a.i./ha) consisted of 4 foliar applications (at 5-day intervals between applications) of pymetrozine at 50, 100, and 200 g a.i./ha, endosulfan at 700 g a.i./ha, and a control. Sprays were initiated when the mean percentage of squares attacked by the boll weevil was 1.25%. Evaluations were conducted 5 days after the fourth application, by counting the number of squares damaged by the boll weevil. Fallen squares were collected 12 days after the fourth application, taken to the laboratory, and placed in plastic containers. Counts were obtained daily for the number of boll weevil adults emerged from each container. The data were submitted to analysis of variance and the means were compared by Tukey's test (5%). At doses of 100 and 200 g a.i/ha, the insecticide pymetrozine was effective to protect squares against boll weevil attack, and reduced the emergence of adult weevils. The insecticide can thus be used as a new option for boll weevil management in cotton.

# **Introduction**

Cotton is grown in more than seventy countries. The main objective of cotton production relates to obtaining fiber and seeds. 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. 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 flower bud shedding and destruction of fruits, preventing the bolls from opening normally. Because of square shedding and smaller numbers of fruits, cotton plants exhibit significant vegetative development and large leaves, but with reduced production. Initially developed to control sucking insects, insecticides in the selective feeding blocker group affect the feeding behavior of insects. Their action on the insects is rapid and causes the immediate clogging of feeding due to a neural blockade of the insects mouthparts. The insects remain alive, walk on the plant, but no longer feed on it. The insecticide's action on feeding behavior is irreversible and insect death occurs 3 to 5 days after treatment, caused by starving. The mechanism of action takes place when the molecule binds to the neural receptors, with the release of serotonin into the synaptic spaces. Due to the presence of serotonin in the synaptic spaces, their respective receptors inhibit the nervous system of the insects mouthparts, causing a rapid and irreversible paralysis of suction, followed by a retraction of the style and uncoordinated insect movement, leading to insect death caused by weakness and lack of food, and a significant reduction in the transmission of persistent viruses. In chewing insects, the action of this group of insecticides is not well known; however, some action has been observed on the locomotion and motor coordination of insects treated with insecticides of this group. The current technological progress in pesticide development and the need for replacing insecticides from old groups that possess high toxicity, such as endosulfan and some organophosphorus insecticides, has stimulated the introduction

of safer insecticidal molecules that are more appropriate for use in agriculture, contributing towards a more rational pest control management, with added safety for growers. The objective of this study was to evaluate the activity of the insecticide pymetrozine (selective feeding blocker), via foliar applications, to control the cotton boll weevil under field conditions.

### Materials and Methods

The experiment was conducted in a cerrado region at Unesp's Experimental Farm (Universidade Estadual Paulista), located in Selvíria/MS/Brazil, in January/2011. A random block design containing five treatments and four replicates was adopted. Treatments and doses are listed in Table 1. Each plot consisted of 6 meters (width) by 10 meters (length), totaling 60 m<sup>2</sup>, sown with cotton cultivar IMACD 6001 LL. Four foliar applications were performed at 5-day intervals between sprays. A backpack sprayer was used, equipped with a spraying boom containing six cone tips (TXVK-8), at a volume of 150 L/ha. Sprays were initiated when the mean percentage of squares attacked by the boll weevil was 1.25%. Evaluations to determine treatment effectiveness in protecting the plants against attack of the boll weevil were performed 5 days after the fourth application, by counting the number of damaged squares in a total of 50 buds taken at random from each plot. Twelve days after the fourth application, evaluations were made to determine treatment influence on boll weevil adult emergence, by collecting 50 fallen squares from the central rows of each plot. The squares thus collected were taken to the laboratory and placed in plastic containers. Counts were obtained daily for number of emerged adults. The results were submitted to analysis of variance by the F test and the means were compared by Tukey's test (5%).

Table 1. Treatments and doses of insecticides used to control the cotton boll weevil. Selvíria/MS/Brazil. January/2011.

Treatments	Doses (g a.i./ha)	Doses (c.p./ha)
1. Control		
2. Pymetrozine (Chess 500 WG)	50	1500 g
3. Pymetrozine (Chess 500 WG)	100	2000 g
4. Pymetrozine (Chess 500 WG)	200	2500 g
5. Endosulfan (Thiodan EC)	700	2000 mL

# **Results**

Based on the analysis of results for percentage of squares damaged by the boll weevil 5 days after the fourth application (Figure 1), treatments with pymetrozine at doses of 50, 100, and 200 g a.i./ha significantly reduced the percentage of squares damaged by boll weevil attack. Doses of 100 and 200 g a.i./ha provided percentages of attacked squares lower than 5%, while in control plants the percentage of squares attacked by the boll weevil reached 16.5%. In the standard treatment (endosulfan at 700 g a.i. / ha) the percentage was 8%. From the analysis of results for number of emerged adults from fallen squares, performed 12 days after the fourth application (Figure 2), treatments containing pymetrozine at doses of 100 and 200 g a.i./ha significantly reduced the number of emerged adults, respectively, while 37 adults emerged from squares collected in control plants, and 23 adults emerged from the standard treatment (endosulfan at 700 g a.i./ha).



Figure 1. Effect of the insecticide Pymetrozine on the control of boll weevil in cotton. Percentage of damaged squares, 5 days after the fourth application. Selvíria/MS/Brazil. 2011.



Figure 2. Effect of the insecticide Pymetrozine on the control of boll weevil in cotton. Number of emerged adults, 12 days after the fourth application. Selvíria/MS/Brazil. 2011.

# **Conclusion**

At doses of 100 and 200 g a.i/ha, the insecticide pymetrozine was effective to protect squares against boll weevil attack and reduced the emergence of adult weevils. The insecticide can thus be used as a new option for boll weevil management 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 does not imply its approval to the exclusion of other products that may suitable.

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