EFFECT OF NEW INSECTICIDE (SPIROTETRAMAT) IN MIXTURE WITH NEONICOTINOID ON THE CONTROL OF WHITEFLY, BEMISIA TABACI B-BIOTYPE (HEMIPTERA: ALEYRODIDAE), IN COTTON

Geraldo Papa
Rene Furlan
Willian Takao
Fernando J. Celoto
Gustavo Gerlack
Paulista State University - Unesp
Ilha Solteira-SP, Brazil

Abstract

The increasing search for safer alternatives for pests control, which are less aggressive for the environment, has brought a significant development of news insecticides, with possibilities of use in agricultural pest management and contributing to a safer and more efficient way of pest control. The objective of this work was to evaluate in field conditions the effect of the new chemical molecule (spirotetramat) of the subclass tetramic acid insecticides (chemical group ketoenols), applied in mixture with neonicotinoid (imidacloprid) in cotton, on the control of the whitefly, *Bemisia tabaci* B-Biotype. The experiment was carried out with DeltaOpal cultivar, using the design of randomized blocks, with 6 treatments and 4 replicates. Plot size was 7 rows by 10m length (63m^2). The treatments consisted of two foliar application (7-days of interval between applications): spirotetramat + imidacloprid (Movento Plus) + methyled soy oil at 0.25%v/v (Aureo) at the doses of 96 and 120 g a.i./ha, spirotetramat + imidacloprid (Movento Plus) at the dose of 96 g a.i./ha, thiacloprid (Calypso) at the dose of 96 g a.i./ha, imidacloprid + betacyfluthrin (Connect) + methyled soy oil at 0.25%v/v (Aureo) at the dose of 112 g a.i./ha and control. Evaluations were conducted at 0, 2, 5 and 7 days after each application, by counting of the number of whitefly nymphs in 10 leafs per plot. The analysis of the results showed that the insecticide spirotetramat, applied in mixture with imidacloprid, associated or not with methyled soy oil, was efficient on the control of the whitefly, being viable as a part of the cotton pest management

Introduction

Cotton crop is cultivated in more than seventy countries worldwide. The main purpose of cotton production is related to the need of fibers and seeds. Currently, cotton crop in Brazil occupies an area of approximately 900 thousand hectares. The central-west region is responsible for 50.48% of the national production of cotton, followed by the southeast region with 29.71% and the south with 14.24%.

The modern agriculture not more admits the use of chemical products of broad-spectrum action that usually cause undesirable effects to the agricultural ecosystem as resurgence, change of the status of secondary pests for primary, besides the impact to the environment with intoxication problems in animals and human.

Due to the great amount of pests attacking cotton crop that require the adoption of rational management by the growers, only highly professionalized growers were able to continue cultivating cotton. The silverleaf whitefly, *Bemisia tabaci* B-Biotype, is a serious economic pest of cotton in many countries. In Brazil the increases in the incidence of sticky cotton have also occurred because of honeydew contamination. The cotton whitefly is a highly polyphagous insect, observed today on more than 300 plant species. It lives on the underside of foliage, feeding on intracellular liquids and causing reddish spots on the upper surface. The adults live on the underside of foliage, moving little, mainly during daylight hours. Cool temperatures greatly reduce their activity. The damages are caused by the suction of plant fluids, an abundant production of honeydew and above all, the transmission of viruses, which is a persistent virus.

The current technological advancements on the chemical area have provided the introduction of safer and more adequate insecticide molecules to be used on agriculture, contributing to a more rational management of pests control and safety to growers.

Spirotetramat is a new insecticide belongs to the subclass of tetramic acid insecticides (chemical group Ketoenols). The mode of action is by the inhibition of an enzyme in the lipid metabolism. Spirotetramat is a new systemic leaf insecticide are its efficacy against a broad spectrum of sucking insects and its suitability for use on all types of crops The objective of this work was to evaluate in field conditions the effect of the insecticide spirotetramat, applied in mixture with imidacloprid, in cotton, on the control of the cotton whitefly, *Bemisia tabaci* B-Biotype.

Materials and Methods

The experiment was installed in field conditions at the Experimental Farm, belonging to the campus of Unesp of Ilha Solteira, located in the municipal district of Selvíria/MS/Brazil, during the month of April/2007. The experiment was conducted with DeltaOpal cultivar, using the design of randomized blocks, with 6 treatments and 4 replicates. Each plot was formed by 7 rows by 10m length ($63m^2$), at the spacing of 0.9m and density of 12 plants/m. The fertilizer used at planting was NPK formula 4-18-12 + micronutrients, at the dose of 450 kg/ha. Table 1 describes the treatments and doses used. The application of each treatment was made two time by foliar spray (7-days of interval between applications), using a volume of 180 L/ha. The evaluations seeking to verify the effect of the treatments on the mortality of whitefly nymphs. Evaluations were conducted at 0, 2, 5 and 7 days after each application, by counting of the number of nymphs of the whitefly in 10 leafs per plot. The obtained data were submitted to the analysis of the variance through the test F, comparing the averages by the test of Duncan (5%).

Table 1. Treatments used on experiment. Generic name, trade name, formulation and doses of the insecticides.

Generic name	Trade name	formulation	g a.i./ha	c.p./ha
1. Control	Control	--	--	--
2.(spirotetramat+imidacloprid) + methyled soy oil	Movento Plus + Aureo 0.25%v/v	SC (120g + 360 g a.i./L)	96	200 ml
3.(spirotetramat+imidacloprid) + methyled soy oil	Movento Plus + Aureo 0.25%v/v	SC (120g + 360 g a.i./L)	120	250 ml
4.spirotetramat + imidacloprid	Movento Plus	SC (120g + 360 g a.i./L)	96	200 ml
5. thiacloprid	Calypso	SC (480 g a.i./L)	96	200 ml
6.(imidacloprid+betacyfluthrin) + methyled soy oil	Connect + Aureo 0.25% v/v	SC (100 + 12.5 g a.i./L)	112	1000 ml

Results and Discussion

The analysis of the results at the evaluations of cotton whitefly nymphs control (Table 2 and 3: Figure 1 and 2) showed that until 7 days after each application, the treatments with spirotetramat + imidacloprid at the doses of 96 and 120 g a.i./ha whit addition of 0.25% v/v of methyled soy oil and spirotetramat + imidacloprid at the dose of 96 g a.i./ha, without addition of oil, presented means efficacies superiors to 80%, being equaled to the standards treatments (thiacloprid and imidacloprid + betacyfluthrin).

Table 2. Effect of spirotetramat + imidacloprid on the control of the cotton whitefly, *Bemisia tabaci* B-Biotype. Mean number of nymphs and efficiency percentage (%E) of each treatment at 0, 2, 5 and 7 days after the first application. Selvíria /MS/ Brazil. April/2007.

Treatments and doses (g a.i../ha)		Pre-evaluate	2 daa		5 daa		7 daa	
		nymphs	nymphs	%E	nymphs	%E	nymphs	%E
1. Control	--	28 a	38 a	--	25 a	--	20 a	--
2.(spirotetramat + imidacloprid)*	96	28 a	10 ab	74	4 b	84	4 b	80
3.(spirotetramat + imidacloprid)*	120	31 a	8 b	79	2 b	92	2 b	90
4.spirotetramat + imidacloprid	96	30 a	13 ab	66	5 b	80	5 b	75
5. thiacloprid	96	22 a	10 ab	74	5 b	80	5 b	75
6.(imidacloprid + betacyfluthrin)*	112	19 a	19 ab	50	4 b	84	3 b	85

* methyled soy oil at 0.25%v/v
daa: days after first application.
Means followed by the same letter are not significantly different (Duncan, p=0.05)

Table 3. Effect of spirotetramat + imidacloprid on the control of the cotton whitefly, *Bemisia tabaci* B-Biotype. Mean number of nymphs and efficiency percentage (%E) of each treatment at 0, 2, 5 and 7 days after the second application. Selvíria /MS/ Brazil. April/2007.

Treatments and doses (g a.i../ha)		Pre-evaluate	2 daa		5 daa		7 daa	
		nymphs	nymphs	%E	nymphs	%E	nymphs	%E
1. Control	--	28 a	20 a	--	18 a	--	11 a	--
2.(spirotetramat + imidacloprid)*	96	28 a	3 bc	85	1 b	94	0 a	100
3.(spirotetramat + imidacloprid)*	120	31 a	2 c	90	0 b	100	0 a	100
4.spirotetramat + imidacloprid	96	30 a	3 bc	85	3 b	83	0 a	100
5. thiacloprid	96	22 a	5 b	75	3 b	83	3 a	73
6.(imidacloprid + betacyfluthrin)*	112	19 a	2 c	90	1 b	94	3 a	73

* methyled soy oil at 0.25%v/v
daa: days after first application.
Means followed by the same letter are not significantly different (Duncan, p=0.05)

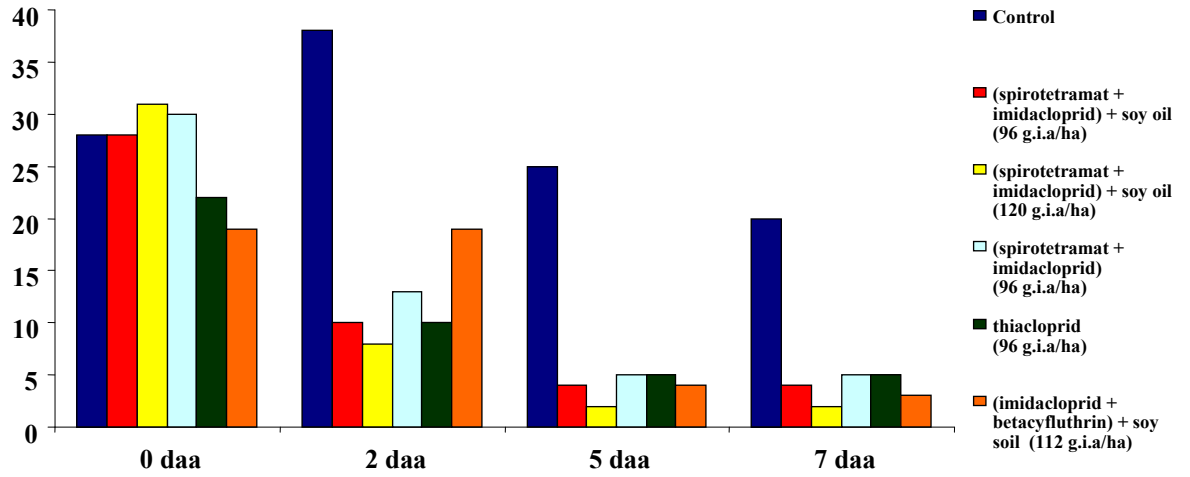

Figure 1. Effect of spirotetramat + imidacloprid on the control of the cotton whitefly, *Bemisia tabaci* B-Biotype. Number of nymphs/treatment at 0, 2, 5 and 7 days after the first application (daa). Selvíria/MS//Brazil. April/2007.

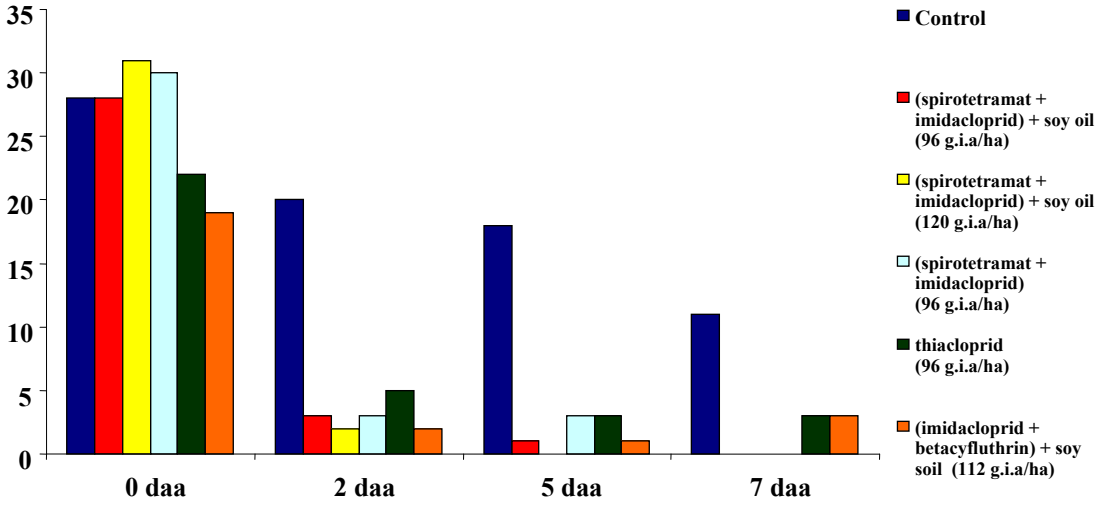

Figure 2. Effect of spirotetramat + imidacloprid on the control of the cotton whitefly, *Bemisia tabaci* B-Biotype. Number of nymphs/treatment at 0, 2, 5 and 7 days after the second application (daa). Selvíria/MS//Brazil. April/2007.

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

Abbott, W.S. A method of computing the effectiveness of insecticide**.** *Journal of Economic Entomology*, v. 18, p. 265-7, 1925

Bellows, T. S., Jr., T. M. Perring, R. J. Gill, and D. H. Headrick. 1994. Description of a species of *Bemisia* (Homoptera: Aleyrodidae). Ann. Entomol. Soc. Am. 81: 195-206.

Berlinger, M. J. 1986. Host plant resistance to *Bemisia tabaci*. Agric. and Environ. 17: 69-82.

Butler, G. D., Jr., and T. J. Henneberry. 1984. *Bemisia tabaci*: Effect of cotton leaf pubescence on abundance. Southwest. Entomol. 9: 91-94.

Butler, G. D., Jr., F. D. Wilson, and G. Fisher. 1991. Cotton leaf trichomes and populations of *Empoasca lybica* and *Bemisia tabaci*. Crop Protection 10: 461-464.

Chu, C. C., T. J. Henneberry, D. H. Akey, S. E. Naranjo, H. H. Perkins, N. Prabhaker, and B. E. Mackey. 1995a. Silverleaf whitefly: development of an action threshold for chemical control on cotton, pp. 873-874. *In* D. J. Herber and D. A. Richter [eds.], Proc. Belt. Cotton Prod. Res. Conf. National Cotton Council, Memphis, TN.

Cohen, A. C., T. J. Henneberry, and C. C. Chu. 1996. Geometric relationships between whitefly feeding behavior and vascular bundle arrangements. Entomologia Experimentalis et Applicata. (in press).

Davidson, E. W., B. J. Segyra, T. Steel and D. L. Hendrix. 1994. Microorganisms influence the composition of honeydew produced by the silverleaf whitefly, *Bemisia argentifolii*. J. Insect Physiol. 40: 1069-1076.