

RESULTS OBTAINED IN THE BIOLOGICAL CONTROL OF *DIABROTICA VIRGIFERA VIRGIFERA* LARVAE

**TEODORA FLORIAN, I. OLTEAN, H. BUNESCU, C.V. FLORIAN, ILONKA
BODIS**

University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca

Keywords: *pest, western maize root worm, biological control, bioproduct, maize*

Abstract

*To establish a pest control strategies in an agroecosistem, the first requirement is the correct diagnosis and identification. In the literature there is much information about the chemical control of the species *Diabrotica virgifera virgifera* Le Conte. In biological control, which is the subject of the present article, we used the bioproduct "BIOBIT" based on *Bacillus thuringiensis* either as seed treatment or treatments on the vegetation.*

In the experimental period, the larvae attack symptoms were manifested by the appearance of "goose neck", in control plot, the attack frequency being about 15.46% in 2008, 25.33% in 2009 and 26.88% in 2010. Biobit bioproduct applied only to the seed reduced the incidence of attack to 5.76% in 2008 (about 63% less compared to the control), 8.12% in 2009 (about 68% less compared to the control) and 6.23% in 2010.

INTRODUCTION

The pest *Diabrotica virgifera virgifera* Le Conte was accidentally introduced in Europe (1992) in Yugoslavia (Serbia) [8].

The Western maize root worm (*Diabrotica virgifera virgifera* Le Conte) has in his origin country, U.S.A., 1-2 generations per year and in Europe, the investigations of Camprag (1993 to 1994 in Yugoslavia) and Ioana Grozea (1998-2002 in Timis District - Romania) has established a generation per year [2, 3, 5].

Research on the biology, morphology and ecology of insects, in the ecological conditions of our country, have concluded that the species is monovoltine, wintering on egg stage [6].

The use of pathogenic organisms (viruses, bacteria, fungi) that cause illness and death of the insect is one of biological control methods. To control the maize pest *Diabrotica virgifera virgifera* Le Conte, was used bacterium *Bacillus thuringiensis* [4]. Of the 350 species of entomopathogenic fungi, *Beauveria bassiana* is the most important, parasitizing over 100 species of pests [6].

MATERIAL AND METHODS

To determine the efficacy of the bioproduct against the western maize root worm, since the spring of 2007 was organised an experimental field in the area Tărtăria, Alba County (Romania). The experiments were made according to the experimental technique. It should be noted that they were located in an area where the pest has been reported since 2002, under monoculture.

The total area of the experimental field is about 900 square meters. Sowing was performed manually using special planting tools; the distance between rows was of 70 cm and of 20 cm between plants per row, plant density of around 7 per square meter.

A variant has an area of 10.5 square meters, and within it, the plants are arranged in three rows of 5 meters long each. Sowing date varied from year to year depending on climatic factors and weather conditions. In 2008 sowing took place on April 21, May 1 in 2009, and April 30 in 2010.

Tracking the attack frequency produced by adult pest, both on the leaves and maize silk was made in two periods: first in late July and second in August 1 to 15 taking into account the two treatments applied on vegetation with the bioproduct BIOBIT.

In the experimental plot the efficacy of bioproduct BIOBIT was tested, fighting against larvae and adults of *Diabrotica virgifera virgifera* Le Conte. BIOBIT is a product that has the active ingredient *Bacillus thuringiensis* bacterium. The product is approved in dose of 40 ml/1 kg to the seed, and 3.5 l/ha on vegetation applies. Treatments with the tested product were applied to seed and vegetation. The product was applied to seed on sowing day.

RESULTS AND DISCUSSION

In 2008, using Biobit product applies only to the seed reduced the incidence of attack by 63% compared to the control, and the number of plants being attacked by 5.76%. In the variant where the bioproduct was applied in two stages, to the seed and on vegetation, the percentage of attacked plants was reduced by 4.49%, with an efficacy of 71% (Table 1).

Table 1

**Efficacy of products used in the prevention and biological control of
Diabrotica virgifera virgifera larvae (Tărtăria - 2008)**

| Variant | Attack frequency, % | % of control | Difference to control | Significance of difference |
|----------------------------|---------------------|--------------|-----------------------|----------------------------|
| Control | 15.46 | 100.0 | 0.00 | Control |
| Biobit (seed) | 5.76 | 37.3 | -9.70 | ooo |
| Biobit (vegetation) | 7.62 | 49.3 | -7.84 | oo |
| Biobit (seed + vegetation) | 4.49 | 29.0 | -10.97 | ooo |

LSD (p 5%) = 4.68; LSD (p 1%) = 6.23; LSD (p 0.1%) = 8.07

In 2009, using Biobit product applied only to the seed, there was reduced the incidence of attack at 8.12%. In the variant where the bioproduct was applied in two stages, to the seed and on vegetation, the percentage of attacked plants was reduced by 5.62%, with an efficacy of 77.8% (Table 3).

Table 2

**Efficacy of products used in the prevention and biological control of
Diabrotica virgifera virgifera larvae (Tărtăria - 2009)**

| Variant | Attack frequency, % | % of control | Difference to control | Significance of difference |
|----------------------------|---------------------|--------------|-----------------------|----------------------------|
| Control | 25.33 | 100.0 | 0.00 | Control |
| Biobit (seed) | 8.12 | 32.1 | -17.20 | ooo |
| Biobit (vegetation) | 13.47 | 53.2 | -11.86 | ooo |
| Biobit (seed + vegetation) | 5.62 | 22.2 | -19.71 | ooo |

LSD (p 5%) = 4.68; LSD (p 1%) = 6.23; LSD (p 0.1%) = 8.07

In 2010, the use of the product Biobit significantly reduced the attack frequency. Applied only to the seed reduced the incidence of attack by 76.8% compared to the control. In this variant the number of plants being attacked was 6.23%. In the variant where the bioproduct was applied in two stages, to the seed and on vegetation, the percentage of attacked plants was reduced up to 4.28%, with an efficacy of 84.1%. This version has increased the efficacy by 7.3% compare to applying only to the seed (Table 3).

Table 3

**Efficacy of products used in the prevention and biological control of
Diabrotica virgifera virgifera larvae (Tărtăria - 2010)**

| Variant | Attack frequency, % | % of control | Difference to control | Significance of difference |
|----------------------------|---------------------|--------------|-----------------------|----------------------------|
| Control | 26.88 | 100.0 | 0.00 | Control |
| Biobit (seed) | 6.23 | 23.2 | -20.65 | ooo |
| Biobit (vegetation) | 12.79 | 46.7 | -14.09 | ooo |
| Biobit (seed + vegetation) | 4.28 | 15.9 | -22.60 | ooo |

LSD (p 5%) = 4.68; LSD (p 1%) = 6.23; LSD (p 0.1%) = 8.07

Table 4

**Efficacy of products used in the prevention and biological control of
Diabrotica virgifera virgifera larvae (Tărtăria - 2008-2010)**

| Variant | Attack frequency, % | % of control | Difference to control | Significance of difference |
|----------------------------|---------------------|--------------|-----------------------|----------------------------|
| Control | 22.56 | 100.0 | 0.00 | Control |
| Biobit (seed) | 6.70 | 29.7 | -15.86 | ooo |
| Biobit (vegetation) | 11.29 | 50.0 | -11.27 | ooo |
| Biobit (seed + vegetation) | 4.80 | 21.3 | -17.76 | ooo |

LSD (p 5%) = 2.70; LSD (p 1%) = 3.60; LSD (p 0.1%) = 4.66

Using the product Biobit, the average frequency of attacks in the three years of experimentation, was lower than control, which is between 6.70% (applied to seed) and 11.29% (applied to vegetation) (Table 4). Best efficacy was recorded when the product was applied in two stages, to the seed and on vegetation, this being 78.7%.

CONCLUSIONS

1. The best results in the fight against larvae and adults were obtained with the bioproduct Biobit applied to seed and vegetation.
2. In the variant with the bioproduct applied in two rounds to sow and growing, percentage of plants attacked by larvae was reduced to 4.49% in 2008 (an efficacy of 71%), at 5.62% in 2009 (an efficacy of 78%) and 4.28% in 2010 (84% efficacy).

ACKNOWLEDGEMENTS

Research was supported by the Research Program PD-PN II, Contract no. 186/2010.

REFERENCES

1. Bača, F., 1994. *New member of the harmful entomofauna of Yugoslavia, Diabrotica virgifera virgifera Le Conte (Coleoptera, Chrysomelidae)*. Zastita Bilja 45 (pp. 125-131).
2. Camprag D., R. Sekulić, 1994. *Diabrotica virgifera virgifera kukuruza jugoslavz, revija agronomska saznanja*.
3. Camprag D., F. Baca, R. Sekulić, 1995. *Diabrotica virgifera virgifera kukuruza zlatic*. Revija Društvo za zastitu biljua Srbije, Beograd.
4. Părau (Florian) Teodora, 2009. *Cercetări privind răspândirea, morfologia, biologia și combaterea dăunătorului Diabrotica virgifera virgifera Le Conte în condițiile ecologice din Transilvania și influența acestuia asupra infecțiilor cu unele boli parazitare*. Teză de Doctorat.
5. Grozea Ioana, 2003. *Diabrotica virgifera virgifera Le Conte, viermele vestic al rădăcinilor de porumb*. 184, Ed. Mirton, Timisoara.
6. Grozea Ioana, 2003. *Some aspects of maize plants damaged by Diabrotica virgifera virgifera Le Conte species*. USAMVB Lucr. St. Agricultura, Ed. Agroprint Timisoara, XXXV (pp. 503-507).
7. Oltean I., Teodora Părau, Anca Preja, V. Inoaș, Maria Telegaru, N. Voichin, 2004. *Monitorizarea speciei de Diabrotica virgifera virgifera Le Conte, în județul Alba*. Rev. Protecția Plantelor XIV/55-56, ISSN-1453-2271 (pp. 23-28).
8. Pălăgesiu I., 1995. *Diabrotica virgifera virgifera Le Conte un dăunator potențial al porumbului în țara noastră*. Agricultura Banatului II, 6: 2.