THE ATTACK AND METHODS OF PREVENTION AND COMBAT OF THE SPECIES *DIABROTICA VIRGIFERA VIRGIFERA* LE CONTE IN THE CONDITIONS OF CENTRAL MOLDOVA

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Abstract

The species *Diabrotica virgifera virgifera* Le Conte (western corn rootworm) is part of the order Coleoptera, family Chrysomelidae. Originally from North America, it entered in Europe in 1992, and in Romania in 1996. Both adults and larvae of this species are harmful, with the adults attacking the aerial parts of the plant (leaves, panicle, silk, pollen and milk stage berries) and the larvae causing root damage (Moeser and Hibbard, 2005). To recognize plants attacked by larvae, a preventive assessment can be made regarding the characteristic symptomatology of the stem, namely "swan neck" (Krysan and Miller, 1986). In the conditions of Central Moldova, in the year 2024, the average number of larvae per plant ranged from 1 to 7, and the frequency of swan neck symptom ranged from 0% to 44.7%. The average attack frequency produced by adults on leaf was 59%, and on silk 89%. The average number of adults per plant recorded values between 3.8 and 7.1 before the chemical treatment was applied to the vegetation, which was reduced to 0.2 adults per plant after the application of the treatment. The efficacy of insecticides was between 96.6% and 97.2%.

Key words: attack, larvae, adults, *Diabrotica*, chemical treatment

Diabrotica virgifera virgifera Le Conte is part of the order Coleoptera, family Chrysomelidae.

Originally from North America, it entered Europe in 1992, and in Romania in 1996. The multiplication and mass spread of this pest is due to the large areas cultivated with corn, as well as the use of monoculture (Baca et al., 1993).

Both adults and larvae of this species are harmful, with the adults attacking the aerial parts of the plant (leaves, panicle, silk, pollen and milk stage berries) and the larvae causing root damage (Moeser and Hibbard, 2005). To recognize plants attacked by larvae, a preventive assessment can be made regarding the characteristic symptomatology of the stem, namely "swan neck" (Krysan and Miller, 1986).

The specialized literature specifies the fact that through the method of attack and the damage produced, the attack produced by larvae is of particular importance, and to a lesser extent the one produced by adults (Bărbulescu, 1997).

Production can be reduced by 10-13%, sometimes even up to 50% (Horgoș and Grozea, 2020).

As methods of prevention and control, Grozea (2007) recommends crop rotation, avoiding monoculture being the most important method, the chemical method through the treatment of the seed but also the soil to control the larvae, as well as treatments on the vegetation to control the adults. He also recommends mechanical methods, by using yellow traps with glue, but also pheromonal ones, with their help a significant number of adults are captured. And biological methods with the help of natural enemies but also by using biopreparations, can reduce the attack produced by the species *Diabrotica virgifera virgifera* Le Conte.

Regarding the chemical control of adults, Levine (1991) and Meinke (1996) state that chemical treatments against adults are applied to reduce the population of adults, in order to reduce the number of eggs laid, so that the number of larvae in the following year to be diminished and not present a danger.

In the present work, are presented preliminary results regarding the attack and prevention and control methods of the species *Diabrotica virgifera virgifera* Le Conte in the conditions of Central Moldova, in the year 2024.

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MATERIAL AND METHOD

In the spring of 2024, in the experimental field of the plant protection laboratory of ARDS Secuieni, two maize experiences were placed, consisting of four variants, placed according to the randomized block method, in three repetitions, where was followed the influence of the applied chemical treatment on the soil, as well as on the vegetation, on the reduction of the attack produced by the species *Diabrotica virgifera virgifera* Le Conte.

The placement of the experiences was carried out on a typical cambic phaeosium type soil, with pH in water 6.29, nitrogen index 2.1, mobile P2O5 39 ppm, mobile K2O 161 ppm.

Sowing was done on 15.04.2024, the hybrid used was Turda Star. The emergence of the plants was recorded on 06.05.2024.

Three granular products with insecticidal action were tested, applied to the soil at the same time as sowing: Force G (tefluthrin 15 g/kg) – 15 kg/ha, Picador (cypermethrin 1.6 g/kg) – 12 kg/ha and Trika expert (lambda cyhalothrin 4 g/kg) – 15 kg/ha and three products with insecticidal action, applied to vegetation at the end of flowering: Decis (deltamethrin) – 0.075 l/ha, Inazuma (acetamiprid + lambda cyhalothrin) – 0.2 kg/ ha and Fastac (alphacypermethrin) – 0.6 l/ha.

To identify the larvae of *Diabrotica virgifera virgifera* in the soil, determinations were made consisting of the analysis of 10 maize plants in three repetitions and the counting of the larvae on the root.

To determine the attack of adults of *Diabrotica virgifera virgifera* on leaves and silk, observations were made on 25 plants, in three repetitions, and the frequency of attack was determined. The determination of the number of adults per plant was achieved by visual assessment of 25 plants in three repetitions.

The experimental data obtained were analyzed by appropriate statistical methods using the difference test (DL) (DL < 0.01 %– ***/OOO – highly significant positive/highly significant negative; DL < 1% —**/– ** / OO – distinctly significant positive/distinctly significant negative; DL < 5 %—*/ – */O – significant positive/significant negative).

The calculation of the efficacy of the insecticides was done with the help of Abbott's formula.

The agricultural year 2023/2024 is characterized as warm and dry.

According to the meteorological data recorded at the unit's own weather station, between October 1, 2023 and August 31, 2024, the agricultural year included a warm autumn (October and November), December and February were warm, while January was normal from temperature point of view. The increase in average temperatures was also maintained in the spring and summer months, except for May, which was normal in terms of temperatures. The monthly deviations in terms of temperatures were between -1.9℃ (January) and 7.7℃ (February) (table 1).

The period from April to August was extremely warm.

The amount of precipitation recorded in the interval October 1, 2023 - August 31, 2024 was 323.2 mm, which is -164.4 mm less than the multi-year amount for the same interval October - August, which is 487.6 mm. In terms of precipitation, the April - August period recorded monthly deviations from the multi-year monthly amount between -61.6 mm (July 2024) and -0.3 mm (June 2024) (table 1).

RESULTS AND DISCUSSIONS

In the year 2024, the larvae of the species *Diabrotica virgifera virgifera* were identified in the corn crops in Central Moldova starting from the first decade of June. The average number of them per plant varied from 1 to 7, the fewest larvae being registered in the variant where the granular insecticide Force G was applied to the soil in a dose of 15 kg/ha (figure 1).

Analyzing the swan neck symptom on the stem, it was found that its frequency recorded values between 0%, as was recorded in the variant where the granular insecticide Force G was applied to the soil in a dose of 15 kg/ha and 44.7% as it was recorded in the control variant, without soil treatment (figure 2).

The attack produced by the adults of the species *Diabrotica virgifera virgifera* Le Conte on leaves and silk was also noted, and it was found that they produced an attack on the leaf whose frequency was on average 59%, and on silk 89% (figure 3).

Table 1

The evolution of temperatures and rainfall in the agricultural year 2023 - 2024, A.R.D.S. Secuieni

Specification		X	XI	XII	I	II	III	IV	V	VI	VII	VIII	Total
Temperature °C	Dec, I	13,3	10,7	-0,8	-0,9	6,2	4,6	14,4	15,4	22,0	23,2	22,6	
	Dec, a II a	10,5	5,6	1,6	-3,2	4,7	4,7	13,6	13,5	20,7	27,6	25,4	
	Dec, a III a	15,3	1,6	3,0	-1,2	6,6	9,7	11,7	18,1	23,0	22,7	24,0	
	Monthly average	13,1	6,0	1,3	-1,8	5,8	6,4	13,2	15,8	21,9	24,5	24,0	11,8
	Multiannual average	9,2	3,6	-1,5	-3,7	-1,9	2,8	9,6	15,4	18,9	20,4	19,7	8,4
	Deviation	**3,9**	**2,4**	**2,8**	**-1,9**	**7,7**	**3,6**	**3,6**	**0,4**	**3,0**	**4,1**	**4,3**	**3,4**
Rainfall MM	Dec, I	1,2	5,2	2,2	11,8	0,2	2,6	3,0	6,8	8,2	12,8	12,8	
	Dec, a II a	7,4	43,6	2,2	0,8	7,4	28,8	11,6	5,0	73,4	0	0	
	Dec, a III a	0,2	2,8	1,2	3,8	1,8	9,2	18,8	24,2	2,8	6,2	5,2	
	Monthly total	8,8	51,6	5,6	16,4	9,4	40,6	33,4	36,0	84,4	19,0	18,0	323,2
	Multiannual average	36,9	27,7	25,4	19,6	19,2	26,3	44,9	64,3	84,7	80,6	58,0	487,6
	Deviation	**-28,1**	**23,9**	**-19,8**	**-3,2**	**-9,8**	**14,3**	**-11,5**	**-28,3**	**-0,3**	**-61,6**	**-40,0**	**-164,4**

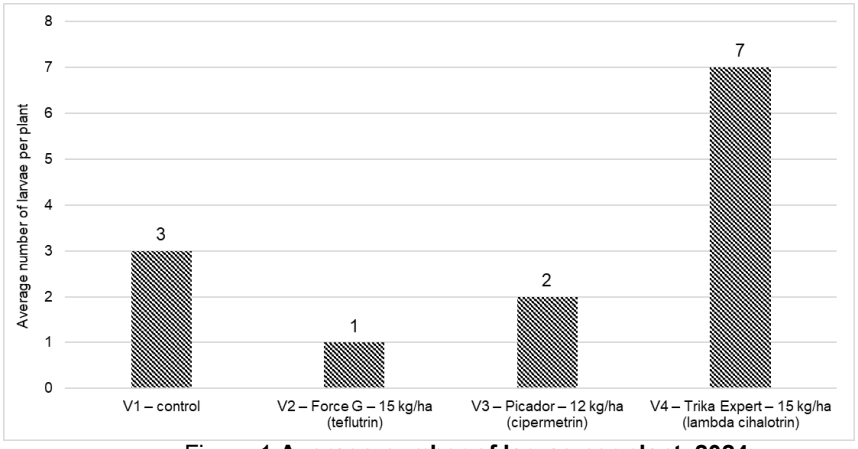

Figure 1 **Average number of larvae per plant, 2024**

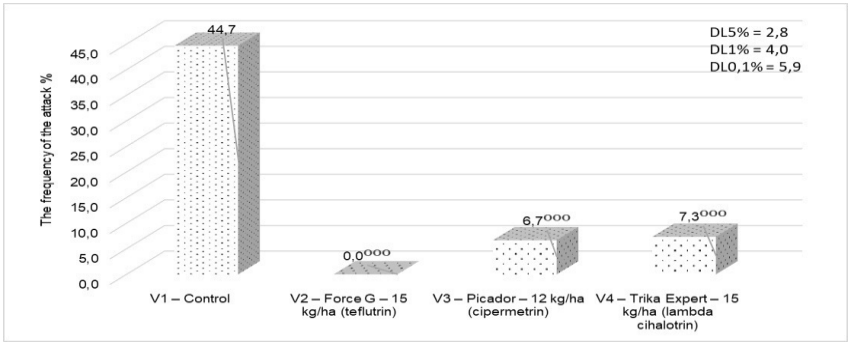

Figure 2 **Frequency of swan neck symptom, 2024**

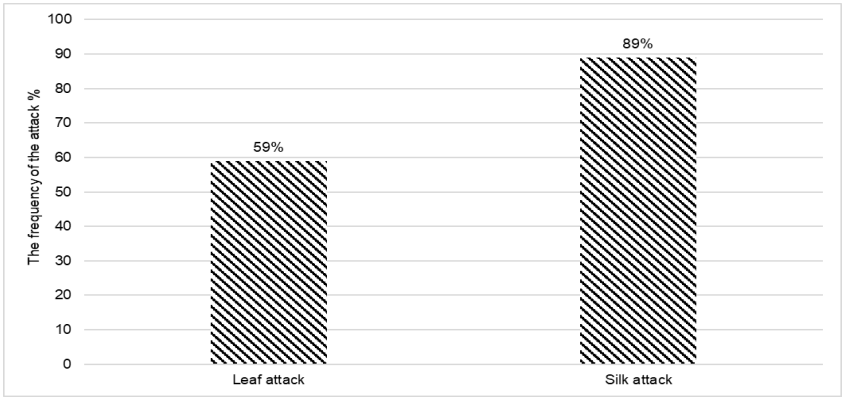

Figure 3 **Frequency of the attack produced by the species *Diabrotica virgifera virgifera* Le Conte on leaf and silk**

The average number of adults per plant before the chemical treatment on the vegetation was between 3.8 and 7.1 specimens/plant. Observations made 72 hours after the chemical treatment on the vegetation showed that the average number of adults per plant was reduced to 0.2 specimens (figure 4).

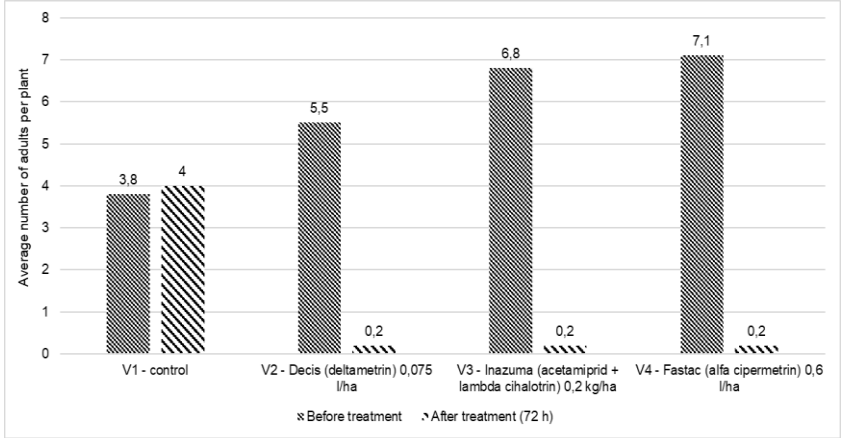

Figure 4 **Average number of adults per plant before and after application of the treatment on the vegetation, 2024**

The applied insecticides registered close efficacies to each other, the best results being obtained in the variant where the Fastac insecticide was applied in a dose of 0.6 l/ha, the efficacy being 97.2%, followed by the Inazuma insecticide (0.2 kg/ha), with a very close efficacy (97.1%) and the insecticide Decis (0.075 l/ha) with an efficacy of 96.6% (figure 5).

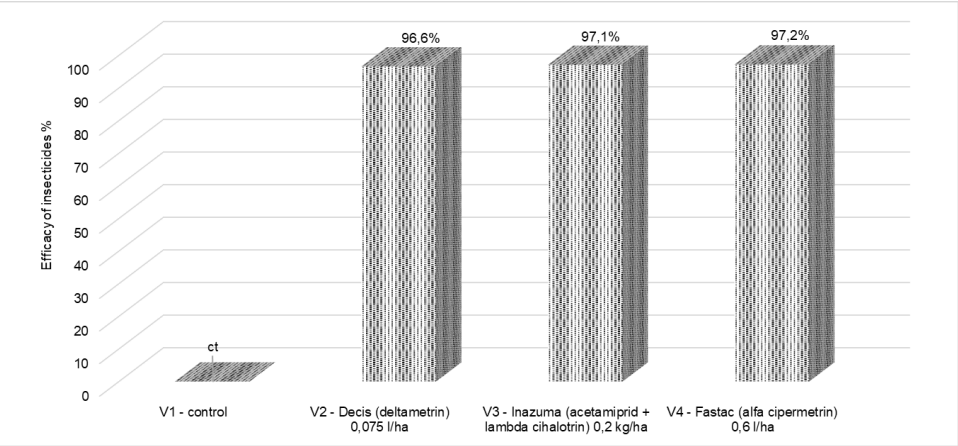

Figure 5 **The efficacy of applied insecticides (E %), 2024**

CONCLUSIONS

In 2024, the species *Diabrotica virgifera virgifera* produced attack in both the larval and adult stages.

The average number of larvae per plant was between 1 and 7, the lowest number of larvae being recorded in the variant where Force G insecticide was applied to the soil in a dose of 15 kg/ha.

The frequency of the swan neck symptom recorded values between 0% (Force G at a dose of 15 kg/ha) and 44.7% (the control variant).

The frequency of adult attack on leaf was 59% and on silk was 89%.

The average number of adults per plant was reduced to 0.2 specimens after applying the chemical treatment on the vegetation.

Regarding the insecticides applied to the soil, in 2024, the best results were obtained in the variant where the Force G granulated insecticide was applied in a dose of 15 kg/ha.

Regarding the insecticides applied on the vegetation, the best results were recorded by Fastac insecticide (0.6 l/ha), followed by Inazuma insecticide (0.2 kg/ha).

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