PRESENT POSSIBILITIES FOR DIABROTICA VIRGIFERA VIRGIFERA LE CONTE CONTROL WITHIN THE NEW CONCEPT OF SUSTAINABLE AGRICULTURE

POSIBILITĂȚI ACTUALE DE COMBATERE A SPECIEI DIABROTICA VIRGIFERA VIRGIFERA LE CONTE ÎN CONCEPTUL UNEI AGRICULTURI DURABILE

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***Abstract**: Diabrotica virgifera virgifera Le Conte, a pest of corn, relative recently penetrated in Romania (1996) from west part of country, created in a short time a very numerous and dangerous population. The research made in 2005 – 2006 period at Agricultural Research and Development Station Oradea, furnish evidence of agrophytotechnical and chemical measures role in limiting of wide-spread area in new zones and for diminishing of caused losses by this pest.*

***Rezumat**: Diabrotica virgifera virgifera Le Conte, dăunător al porumbului pătruns relativ recent în România (1996) prin partea de vest a ţării, şi-a creat într-un timp relativ scurt în zonele infestate o populaţie apreciabilă şi periculoasă prin pagubele produse. Cercetările efectuate în perioada 2005 – 2006 la Staţiunea de Cercetare Dezvoltare Agricolă Oradea, evidenţiează rolul măsurilor agrofitotehnice şi chimice în limitarea arealului şi a răspândirii în noi zone precum şi a diminuării pagubelor produse de acest dăunător.*

***Key words**: degree attack of larvae and adults, crop rotation, density and seeding period, efficacy of insecticides*
***Cuvinte cheie**: grad de atac al larvelor şi adulţilor, rotaţia culturilor, desimi şi epoci de semănat, eficacitatea insecticidelor*

INTRODUCTION

Diabrotica virgifera virgifera Le Conte is a dangerous species because attack the one of the most important crop maize. The attack manifested was at the level of roots, damage caused by the larva and the aerial part of the plant is attacked by adults. The main damage is caused by larvae which leave in soil and feed the roots and the adults feeding damage on maize leaves and especially corn silk and the maize in the milk stage, but also with other species of plants, but the multiplication of this species is assured only by the maize crop (Čamprag et al, 1995).

For the limitation of spreading and damages decreasing, the knowledge of biology and ecology of this pest can create a real possibility of control this pest.

The research made in Romania (Ioana Grozea, 2003; Pălăgeşiu I. et al, 2000, 2001, 2002) established the wide-spread, biologic and ecology of pest in Banat area and chemical control of species.

In present paper are presented the influence of agrophytotechnical measures on prevention and control of this pest and in the same time the biological efficacy of some insecticides in larvae and adults control.

MATERIAL AND METHOD

The researches were carried out in the stationary long term experiences with crop rotations. The experience was made in 1990 on a preluvosoil weak acid (pH – 6.5) and humus

content 1.8%.

The maize is present in crop rotations as: monoculture, crop rotations of two or three years and in crop rotation by 6 years (unirrigated) which began in 1982. With this experiments was noticed the influence of date and density of sowing upon Diabrotica virgifera virgifera Le Conte adults and larvae.

The appearance of Diabrotica virgifera virgifera Le Conte was based by monitoring of adults through pheromones traps like AtraVirg (Cluj - Napoca) applied in the field before the appearance of corn silk till October and noted every week, the larva was determined through soil sample like a cub with side of 18 cm circa maize plants and then larvae numbering. We used the F 376 hybrid (FAO 500 - 600).

For chemical larva control was tested a lot of utilized insecticides in seeds treatment or applied in soil at seeding. The efficacy of chemical products was established through appreciation of damage degree of corn roots and through giving the mark from 1 to 6 (1 – without attack, 6 – three or more plants knots complete destroyed), and in adults control, through appreciation of the adults number witch are determined on the treated plants.

RESULTS AND DISCUSSION

In the area of Agricultural Research and Development Station Oradea, Diabrotica virgifera virgifera Le Conte penetrated beginning with 2001 which was registered the first adults in a corn monoculture. Begging with this year the adults were monitories beginning with 2005. We studied in stationary experiments with crop rotation, the biology and ecology of the pest and control possibilities.

The area limitation of the spreading and the pest negative effects on quantity and quality of production may have success if the accent is put on agrophytotechnical measures. From all this measures, crop rotation has the preponderant role.

The larvae attack was registered only in the corn monoculture having 5.43 mark in irrigated conditions and 3.6 in the unirrigated conditions. (Table 1) In high humidity condition the aggressiveness of larvae are increasing. The plant percentage which present characteristic attack aspects produced by larva on roots (the tilted plants) is in unirrigated condition as big as in irrigated conditions.

Table 1

Influence of crop rotation and water regime on Diabrotica virgifera virgifera Le Conte, Oradea 2005-2006

Crop rotation	Water regim	Root attack	The percentage of attack on roots %
Corn monoculture	Irrigated	5.43	26.3
	Unirrigated	3.60	12.7
Wheat - corn	Irrigated	1.0	0
	Unirrigated	1.0	0
Soybean – wheat – corn	Irrigated	1.0	0
	Unirrigated	1.0	0
Oat (+ clover) – clover – corn – wheat – corn – sunflower	Unirrigated	1.0	0

As regards of adults attack has been present in all plant rotation depending on utilized rotation and water regime.

The higher adults' number was registered in monoculture irrigated corn. (Table 2)

Table 2

Adults number/trap in function of crop rotation on irrigated and unirrigated conditions, Oradea 2006

Adults number/trap (July – October period)	Crop rotation						
	Corn monoculture		Wheat - corn		Soybean – wheat – corn		6 years crop rotation*
	Irrigated	Unirrigated	Irrigated	Unirrigated	Irrigated	Unirrigated	Unirrigated
Adults number	408	342	208	168	168	136	97
Decreasing %	100	100	49.1	50.0	63.0	60.0	71.0

* Oat (+ clover) – clover – corn – wheat – corn – sunflower

The research results obtained at corn sowed in four different periods has shown that the lowest attack degree of the larvae (8.68%) appreciate through percentage of root attacked plants. Was registered at corn seeded in 25 of April (the optimum sowing period is for this area 15 – 25 April) and the bigger percentage (28.12%) at sowing period from 20 of May. These are due to the fact that at the appearance of majority of larvae the root system of later raised plants is more sensitive at pest attack (in average the first larvae was registered from middle of May and the last one at the end of July) (Figure 1).

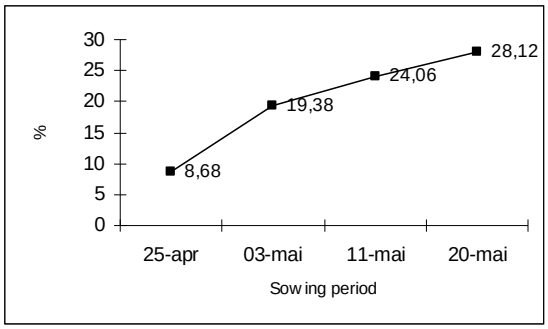

Figure 1. The percentage of attack plants in function of sowing period, Oradea 2005 - 2006

As regarding adults monitoring in function of sowing period, utilizing the corn hybrid F – 376, the seeding at optimum period lead to the lowest number of adults, comparative with the later sowing period. (Figure 2)

The explanation is that later sowing determines a later appearance of generators parts of the plants (pollen and stamens) the preferable food of the adults and this period coincide with maximum flying period.

The size of damage and the impact on production level caused by this pest is also depending by the seeding density (Weiss and Mayo, 1985, after Ioana Grozea, 2003). It was determined that a bigger density favour a bigger attack degree.

The made research utilizing four seeding density in irrigated and unirrigated conditions, demonstrate that increasing the larvae number from 2.52 (when plants density was 40.000/ha) to 3.47 (when plants density was 70.000/ha) at irrigated corn and from 1.70 to 2.85 larvae, plant at unirrigated corn. (Table 3).

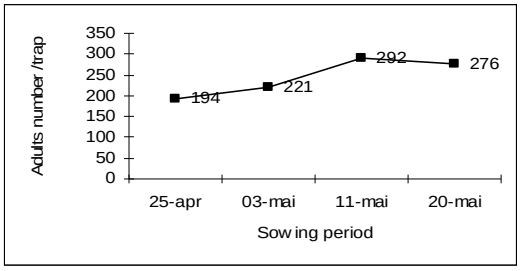

Figure 2. The number of captured adults/trap in function of sowing period, Oradea 2005 - 2006

Table 3

Larvae number /plant in function of plants density on irrigated and unirrigated conditions, Oradea 2006

Density pl/ha	Larvae number /plant		Limits variation
	Unirrigated	Irrigated	
40000	1.70	2.52	1-6
55000	2.72	4.14	2-11
70000	2.85	3.47	1-9
85000	2.5	3.15	1-7

The percentage of attacked plants by the larvae is also bigger at irrigated corn in comparison with unirrigated corn and that is increasing when seeding density is higher. (Fig. 3)

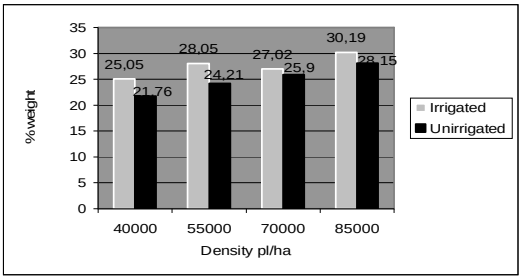

Figure 3. The weight attacked plants of larvae in function of plants density on irrigated and unirrigated conditions, Oradea 2006

The number of adults is increasing when seeding density is increasing from 40.000 plants/ha to 85.000 plants/ha and is advantaged by the favourable water regime created in irrigated conditions. (Figure 4)

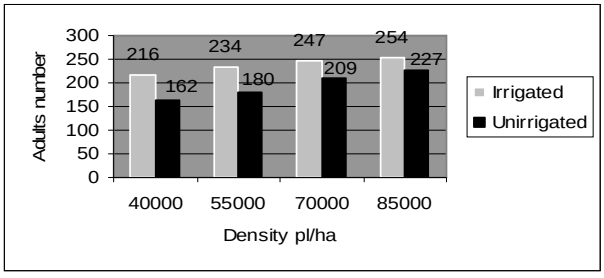

Figure 4. The number of captured adults/trap in function of seeding density, Oradea 2005 - 2006

In cultural corn technology is recommended to establish corn density in function of hybrid demands and level of applied technology.

The elaboration of a control strategy for Diabrotica virgifera virgifera Le Conte, include and the chemical control method that will be applied in special for corn cultivated in monoculture (for larvae and for adults too).

In 2005 – 2006 period was tested the insecticides Force 1.5G (teflutrin) 12 and 15 kg/ha, Cruiser 350 (tiametoxam) 10.0 l/t, Poncho 510 (clotianidin) 12.5 l/t, ST 280 FS (tiametoxam + teflutrin) 15 and 25 l/t, Carbofuran 28 l/t, Sesam G (carbofuran) 20 and 25 kg/ha for larvae control following the percentage of plants which present the characteristic aspects of pest attack on root.

Between the utilized insecticides in seeds treatment the best efficacy was obtained in treated variants with Poncho 510 and Cruiser 350, when the percentage of root attacked plants was lower than 4%. More efficient was proved soil application at seeding for insecticide Force 1.5G when was registered only 2 – 2.8 attacked plant in function of applied rate. (Table 4)

Table 4

Utilized insecticides in larvae control, Oradea 2006

Variant	Rate l,kg / t, ha	Percentage of plants attacked	Root attacked
			Scale IOWA
Seeds treatment			
1 Untreated	-	25.0	4.96
2 Poncho 510	12.5 l / t	4.0	2.78
3 Cruiser 350	10 l / t	4.0	2.18
4 ST 280	15 l / t	6.9	2.80
5 ST 280	25 l / t	5.6	2.28
6 Carbofuran	28 l / t	7.9	3.48
Treatment in soil at seeding			
7 Force 1,5G	12 kg / ha	2.8	1.29
8 Force 1,5G	15 kg / ha	2.0	1.15
9 Sesam G	20 kg / ha	6.06	3.25
10 Sesam G	25 kg / ha	5.85	3.06

The adults are considerable dangerous when they are in a big number in flowering period of corn (20 adults/plant - Capinera et al, 1986; 8 – 10 adults/plant in the case of commercial corn and 5 adults/plant at corn for seed – Higgins et al, 1988).

Was tested some insecticides well known like efficiency in control of other pests and the results obtained is presented in table 5. The insecticides efficacy was bigger in most cases over 90%.

If insecticides application is determining a decreasing of damaged leaves and silk and in the some time a decreasing adults' number per plant that mean that the treatment efficacy was good.

Table 5

Adults number/plant determined before treatment and efficacy of insecticides, 2005 – 2006

Variant	Rate/ha	Adults no./plant	Efficacy %
1. Actara	0.060	14.44	87.6
2. Actara	0.080	16.2	90.3
3. Actara	0.100	14.33	92.8
4. Karate 5 EC	0.25 l/ha	14.11	92.6
5. Fury 10 EC	0.200 l/ha	15.4	91.0
6. Talstar 10 EC	0.200 l/ha	14.66	92.5
7. Calypso 480 SC	80 ml/ha	15.3	90.3
8. Calypso 480 SC	100 ml/ha	14.9	92.0
9. Mospilan 20 SP	0.08 kg/ha	16.6	84.6
10. Samurai	0.5 l/ha	15.4	90.8
11. Decis 2,5 EC	0.3 l/ha	14.9	91.4
12. Fastac 10 EC	0.100 l/ha	16.4	92.1
13. Untreated	-	16.4	0

CONCLUSIONS

The corn rotation with other plants interrupt the biological cycle of pest, the larvae don't survey in the lack of corn plants;

Including of the corn in three years plant rotation is one of the most important measure for preventing of losses;

Later seeding in comparison with optimum period of the area determine an increasing of number of attacked plants by the larvae and an increasing of adults number especially in the case of late hybrids from FAO 500 – 600 group;

A high plants density favour the larvae and adults developing and a favourable water regime of the soil advantages the larvae number and the attack degree and in the some time the adults number;

The chemical control is apply especially for cultivated corn in monoculture against larvae but against adults, too;

The best results in larvae control was obtained with the insecticides utilized in seed treatment and treatment in soil at seeding.

In adults' control, the tested insecticides had an efficacy between 84.6% and 92.8%.

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