

## THE CHEMICAL CONTROL OF *DIABROTICA VIRGIFERA VIRGIFERA* LE CONTE (WESTERN ROOT WORM) LARVAE SPECIES IN THE NORTH-WESTERN PART OF ROMANIA

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### Abstract

*Diabrotica virgifera virgifera* Le Conte represents a potential risk for maize crops with file in Romania more than 3 millions hectares, from this area a significant part is cultivated in monoculture. The different danger represents the larvae with through the attack on root system lead to significant reduction of kernel yield.

The most utilized application method of pesticides in larvae control is at soil during the seeding and through seed treatments.

The best results was obtained through application of the following insecticides: Force 1,5 G when the root attack decreased at 2,6 (on scale 1-6) comparative with 4,77 - the registered value in control variants. The seeds treatment with Cruiser 350 FS, Force 1,5 G, Poncho 600 FS, Gaucho 600 FS, delivered the best results and determine o significant decreased of dropped plants (6,65-7,65%) comparative with untreated control (32,5%) and root attack are taking values bet went 2,32-2,54 (Annex 1-Normes OEPP PP 1(2): 1,0 = without attack relics full, 6,0 = 3 bows are more full destroyed).

**Key words:** *Diabrotica virgifera virgifera* Le Conte, attack degree, chemical control, insecticides, efficacy

### INTRODUCTION

The large spreading area of *Diabrotica virgifera virgifera* Le Conte in our country in a short time (present in Romania time 1996) was favoured by the ecological conditions and presents a higher risk for the maize crop. The great weight and the monoculture of maize represents the most important factors which are responsible for the pest multiplication and spreading.

The attack produced by larvae at radicular system level of maize plants present a stem typically belted like a "goose neck". This aspect is caused by larvae which eat the roots even the individual roots and all roots which forms plants knots.

The danger presented by this pest is the attack on the radicular system which affected the water and nutritive elements absorption by plant and establishing a decreasing of grain yields and it's obviously need the application of prevention measures against this larvae attack. About this measures is necessary to mentioning that chemical treatment of seeds represents an efficient economical method and not pollution method for the maize. Another alternative is represented by the application of the insecticides in soil in the some time with sowing on a band about 15 cm upon the lime maize and at a small depth.

In this paper are presented the research results obtained along 2007-2008 regarding to chemical control of *Diabrotica virgifera virgifera* Le Conte larvae to elaborating technologies for the protection assurance of crop maize against larvae attack.

## MATERIAL AND METHOD

The researches were carried out in monoculture the 8 years on a preluvosoil with properties like humus content by 2.32%, phosphorus content by 150,8 ppm and a higher content in assimilated potassium (124,5 ppm) and a pH by 6,8 in the arable horizon.

The experiences was organized in the maize plots in monoculture for eight years because it's favorising the pest multiplication and assure a big population of pests. The experiments was mode by rectangle Latin method in six replications with the lot size by 5,6/6 m. The experimental variants for maize seeds treatment were: Poncho 600 FS (clotianidin); Nuprid AL 600 (imidacloprid); Picus 600 (imidacloprid); Cruiser 350 FS (tiametoxam); Cruiser force (tiametoxam + treflutrín); Gaucho 600 FS (imidacloprid) and for the application in soil were used granulated insecticide like Force 1,5 G (treflutrín).

For the evaluation of insecticides efficacy it's using a scale with 6 steps of damage evaluation : (Annex 1-Normes OEPP PP 1(2): 1,0 = without attack relics full, 6,0 = 3 nodes are more full destroyed) and the percentage of the attack plants in a specific way goose neck or down plants.

## RESULTS AND DISCUSSIONS

The larvae of maize western root worm produce damage at maize in continuers monoculture on the same plot. The most danger ores an the larvae in the third period of living (from the 3 stages of living). After the hatching period the younger larvae are feeding with roots plant and extern cortical texture and after they are growing they hiding in cortical parenchyma and going to the growth area of radicular system producing damages on the roots and could even to cut it.

Appearance of larvae is echeloned, the first larvae was detected in 2007 in first decade of June (6.06) and in 2008 was in 29.05. and the last appearance was registered at the beginning of August and because of this appearance every year establishing that the critical moment of attack is not in the period of plant growing or after rising is about 30-40 days since sowing.

From statistical point of view the differences of roots attack in comparison with untreated variant were very significant at all the insecticides used, but had importance only the values which had the value attack degree under 2,5 because at this value it's considered a significant yield losses.

The spring of 2007 start with a very dry period in April with temperatures values higher than multiannual average, determining a later appear and development of larvae (6.06.2007), comparative with year of 2008 which had normal values of temperatures and precipitations (Figures 1 and Figures 2).

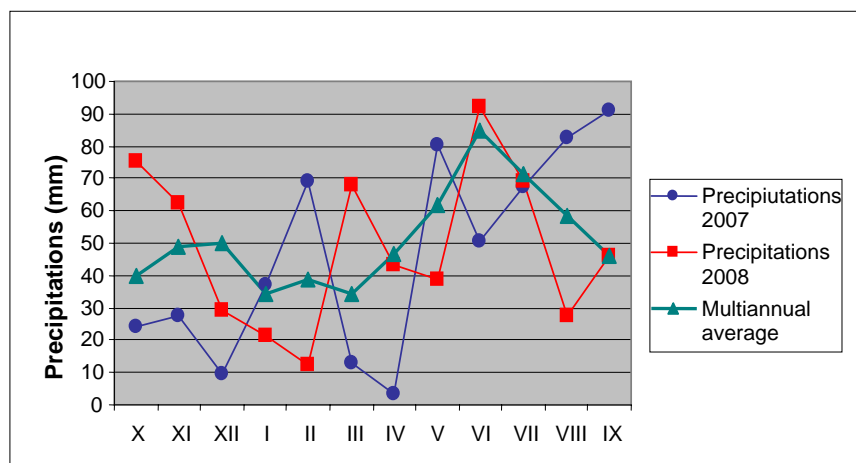


Fig.1. The precipitation registered in 2007-2008, Oradea

The attack symptoms determined periodical (July, August, September) developed during June- when a part of plants was curved like a elbow in the area of bows from base of plant. After precipitations and storms from the end of July and beginning of August (14.07.2007, 28.08.2008) was intensified the larvae attack increasing the frequency of affected plants (with characteristic symptoms “goose neck”) – in the case of untreated variant from 8,3% in June to 22,4% in July and 32,5% before harvesting. It is remarked that along of July, the plants attacked by larvae was registered only in untreated variant. When the values of precipitations are optimum (over 90 mm in 2007, respective 50 mm in 2008), the maize has a good regeneration capacity of partial consumed roots by the larvae.

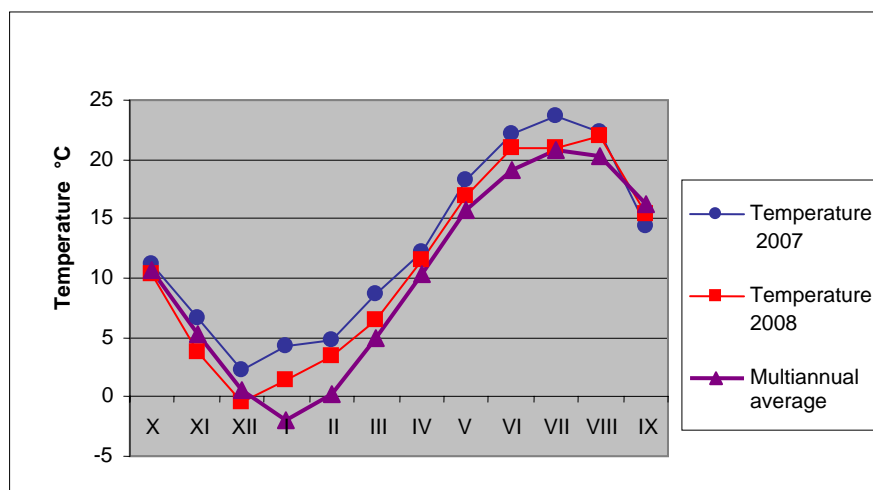


Fig.2. The average of month temperatures, Oradea 2007-2009

If larvae's are destroyed because of chemical seed treatment or in soil in the same time with seeding, will decrease the negative effect of this on maize plants.

The best results in larvae control were obtained through application of insecticides in soil during of seeding. So, using the insecticides Force 1.5 G, the weight of

attacked root plants were 2,65% in July (untreated variant 22,40%) and before harvesting were 3,55% comparative with 32,5% in the case of untreated variant and leading to the decreasing of attacked plants with values between 24,85 – 25,85% (Table 1).

Table 1.

**The weight of attacked plants by *Diabrotica virgifera virgifera* larvae, Oradea 2007-2008**

Insecticides	Rates	The weight of attacked plant with symptoms "goos neck"				Difference from untreated variant	Difference from average
		20 of June	20 of July	15 <sup>th</sup> August	15 <sup>th</sup> September		
Poncho 600FS	10,0 l/t	0	4,85	5,55	7,65	-24,85	-0,87
Nuprid AL600	10,0 l/t	0	5,45	6,55	9,55	-22,95	+1,03
Picus 600	10,0 l/t	0	5,80	6,65	8,95	-23,55	+0,43
Cruiser 350 FS	10,0 l/t	0	4,80	5,55	7,75	-24,75	-0,77
Cruiser Force	12,5 l/t	0	4,35	4,95	7,15	-25,35	-1,37
Gaicho 600FS	10,0 l/t	0	4,50	4,70	6,65	-25,85	-1,87
Force 1,5 G	15 kg/ha	0	2,65	3,40	3,55	-28,95	-4,97
Untreated variant	-	8.3	24,40	26,80	32,50	-	+23,98
Average exp.	-	-	-	-	8.52	-	-

Through the chemical seed treatment the best results were registered using insecticides like Gaicho and Cruiser Force, also was obtained the lower level of attacked plants weight by 6,65% respective 7,15% followed by Poncho (7,65%) and Cruiser 350 FS (7,75%) with a decreasing of attacked plants weight comparative with untreated variant.

It is noticed that the chemical seed treatment assure a satisfactory protection of maize crop for a relative short period from plants rising.

In June wasn't registered any attacked plants by the larvae in all variants. In July the attacked plants weight by larvae were 4,35% in the case of Cruiser force and attained at 4,5-4,85% at other insecticides, comparative with 24,4% at untreated variant. Before harvesting the attacked plants weight attained in the untreated variant at 32,5% and in the best variants at 6,65% - 7,15%. The insecticides used in seed treatment and the insecticides in soil application don't assure a control of larvae, but offer a good protection of basic roots of plants and this prevent the plants falling.

Because the insecticides protect the roots only in a limited area around of application place, that mean that a lot of larvae will survive on the marginal roots outside of treated marginal roots outside of treated space.

Table 2.

**The efficacy of insecticides for control of *Diabrotica virgifera virgifera* larvae, Oradea 2007-2008**

Insecticides	Rates	Attack at root (mean)	Signification for difference with control	Signification of differences for average
Seed Treatments				
Poncho 600FS	10,0 l/t	2,50	+++	++
Nuprid AL 600	10,0 l/t	3,05	+++	-
Picus 600	10,0 l/t	3,09	+++	-
Cruiser 350 FS	10,0 l/t	2,61	+++	+
Cruiser Force	12,5 l/t	2,32	+++	+++
Gaicho 600 FS	10,0 l/t	2,54	+++	+
Force 1,5 G	15 kg/ha	2,16	+++	+++
Untreated variant	-	4,77	-	000
Average experiment	-	2,87	-	-

LSD 5% = 0,26

LSD 1% = 0,36

LSD 0,1% = 0,50

The compromised degree of maize roots is another factor which indicate the insecticides efficacy. Studying the attacked roots degree after evaluation scale (with 6 evaluation degree) introduced by (Ostlie and Noetzel, 1987) was dignified the insecticide Force 1,5 G with an average of attack under 2,16% comparative with 4,77% value registered in the untreated variant. (Table 2).

The satisfying results were obtained through treatments with tested insecticides. From this four insecticides the best efficacy had Cruiser force which presented values of the root attack by 2,32, Cruiser 350 FS with values by 2,42.

Authors like (Turpin T.,1972) established that value on the scale (1-6) where the losses begin to have importance and other authors (Olesan and Tollefson, 2000) considered the economical threshold control it's established at 0 value, value of 0,25 represents the fourth part from the roots with one node destroyed, the notation was made with 0,25; 0,5; 0,75; 1 etc.

In generally the insecticides which are applied at soil or in seed treatments are efficient in maize roots protection, but the benefit are exaggerated. For the decreasing of damages produced by larvae, the agrophytothenical measures are situated on the first place in the pest control. The crop rotation and introduction of maize in the three or four years rotation contribute to the interruption of biological cycle of the pest, because the eggs are lodged exclusively in the maize crop and the larvae can eat the maize crop or rarely can eat some species of cultivated grass or monocotyledonous weeds.

## CONCLUSIONS

- The treatments with insecticides for *Diabrotica virgifera virgifera* Le Conte larvae control is indicate to be applied in the case of maize monoculture year after year a long period.

- The appears of western root maize larvae is very echeloned and the attack are taking place much later after the maize plant rising after 30-40 days from maize seeding in optimum period.

- The chemical control of larvae is assured through chemical seed treatments and through insecticides application at soil during the seeding.

- The efficacy of insecticides was appreciated trough the weight of the characteristic curved plants (goose neck) and trough destroyed root degree (1-6 scale).

- The best results was registered trough soil treatment with insecticide Force 1,5 G when is registered a significant decreasing of attacked plants weight, respectively the root degree attack being 2,16 comparative with the value registered at untreated control (4,77).

- The seed treatment with Gaucho 600 FS, Cruiser force, Poncho 600 FS gave good results determining a significant decreasing of dropped plants (6,65-7,65%), being the most efficacy. The insecticides Nuprid AL 600, Picus, Cruiser 350 FS, contribute to decreasing of attacked plants weight, with smaller values but very important in maize crop protection against larvae attack.

- The chemical maize seeds treatment assure a satisfactory protection of maize crops but for a short time period because of decreasing of the reserve from soil of chemical product applied and because of developing of maize roots outside of influence area of insecticide.

- The method of larvae control with applied insecticides at soil, during seeding and with insecticides applied in seed treatments was demonstrated in field experiments and constitute a specific measure in maize crop technology cultivated in monoculture are in the first year after a strong attack by *Diabrotica virgifera virgifera* Le Conte.

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