CONTROL OF WIREWORMS (*AGRIOTES SPP.*) BY CHEMICAL SEED TREATMENT

Bucurean Elena*, Bunta Gheorghe**

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea, Romania, e-mail: elena_bucurean@yahoo.com
**Agricultural Research and Development Station Oradea, 5 Calea Aradului St., Oradea, Romania, e-mail: scdaoradea@yahoo.com

Abstract

The results presented in the study refer to the prevention and fighting of wireworms (Agriotes spp.) through the method of chemical corn seed treatment. The newest chemical products have been selected in order to analyze their efficiency against attacks on both the germinating seed and the underground stem. The results obtained in the field, both those regarding efficiency as well as production were compared to those obtained in the untreated reference lot, as well as to a standard product, and the final data was statistically processed through the method of variance analysis.

Key words: wireworms, seed, efficiency, chemical treatment, corn.

INTRODUCTION

Among pests that attack corn crops, the larvae of click beetles (*Agriotes spp. Coleoptera Elateridae*), commonly known as wireworms, are considered especially dangerous, due to the fact that they are polyphagous insects that cause significant damages in corn crops during the germination – yielding period. (Pălăgeşiu I. et al., 2000) The critical period of attack is when the seed is in germination, as the pests are attracted by the carbon dioxide eliminated during this time, but also by the amino acids contained in the corn seeds up to the phase of 2-3 leaves.

Their attack is favoured by the soil's degree of humidity, the larvae moving vertically or horizontally depending on this particular element (humidity) as well as on the reaction of the soil, as these larvae grow in soils having an acid or a slightly acid reaction. However, on a global scale, they can be found in all kinds of soils: light or heavy, acid, neutral or basic, richer or poorer in organic substances, but always in soils with a high degree of humidity (Borcean I. et al., 2005).

MATERIAL AND METHOD

Several new insecticides were employed for the present study, all of which belong to the third and fourth levels of toxicity; their required dosage is between 2 and 10 l/t of seed. They were preferred not only for these obvious advantages, but also because carbamic insecticides, which have been greatly used in the past despite their toxicity and required dosages

(between 25-30 l/t), are no longer used in the chemical seed treatment. (Ianoşi S.I., 2001).

Seed treatment was performed in a laboratory and the recommended dosage for each product was observed. The placement of the experiments was done according to the method of the Latin rectangle in three repetitions, each containing 12 variants and a reference lot; the distance between rows was 70 cm and the distance between plants within a single row was of 30 cm, 25 seeds being sown on each row.

After the sprouting of the plants, in the 2-3 leaves stage, the attack of wireworms on the underground portion of the plant's stem was noticed and the seeds that had not yet emerged were controlled by recording how many of them had been attacked by wireworms. At this time, other elements were also recorded, such as the frequency of emergence and possible phytotoxicity phenomena caused by the products.

The resulted data was then used to calculate the efficiency of the products on the seed and on the underground stem, depending on the attack recorded in the reference lot, which received no treatment at all. Cruiser 350 FS was the standard product used for the statistical processing of all the data.

RESULTS AND DISSCUSIONS

The results presented in the table were obtained in 2010. The density after sprouting was of 240 plants in the reference lot and 281 plants in the Nuprid variant. Wireworms attack was reduced in the treated variants compared to the reference lot, these results further confirming the need to protect seeds and young plants.

The attack was not as strong as initially expected, mainly due to the fact that the spring of 2010 was particularly dry, thus the low levels of humidity in the soil did not favour the attack. Therefore, the obtained data reveals that in the reference lot only 5.6% of the seeds were attacked, higher levels being recorded in previous years. (Bucurean E., 2007)

The products employed in the chemical treatment of the corn seed were thiamethoxam based (Cruiser), tefluthrin based (Force) or imidacloprid based (Nuprid). The dosage was 6 l/t, except for the Cruiser, Force and Dacseedin products, which required a different dosage.

It is important to point out that no phytotoxicity phenomena have been recorded, neither during the plant's first stage of development nor during its maturity phase.

The frequency of attack on the underground stem of the plants ranged between 12.1% in the reference lot and 0.4 – 2.7% in the treated variants, while the attack on the seed reached values between 5.6% in the reference lot and 0.1- 1.6% in the treated variants. The efficiency of the products

differed from one variant to the next, mortality ranging from 75.4% (Palisade) and 96.2% in the case of the Toreador product.

Table 1

Results obtained in 2010 regarding the fighting of wireworms in corn crops

Variant	Dosage l/t	F% stem	F% seed	E% stem	E% seed	E% average
Cruiser 350 FS	9,0	2,7	1,0	77,7	82,1	79,9
Picus 600 FS	6,0	1,3	0,6	89,3	89,3	89,3
Sentinel 70 WS	6,0	0,9	0,5	92,6	91,1	91,9*
Palisade 600 FS	6,0	2,5	1,6	79,3	71,4	75,4
Seedoprid 600 FS	6,0	1,9	1,1	84,3	80,4	82,4
Toreador 600 FS	6,0	0,7	0,1	94,2	98,2	96,2**
Force 20 CS	2,0	0,5	0,3	95,9	94,6	95,3*
Force Zea SC	6,0	0,4	0,3	96,7	94,6	95,6**
Sentinel Syn 600 SC	6,0	0,7	0,2	94,2	96,4	95,3*
Nuprid AL 600 FS	6,0	1,1	0,8	90,9	85,7	88,3
Dacseedin Forte 70 WS	10,0	1,6	1,0	86,8	82,1	84,5
Dalila 600 FS	6,0	0,8	0,7	93,4	87,5	90,5*
Reference lot	-	12,1	5,6	-	-	-

DL 5% - 9,9 DL1% - 15,7 DL 0,1% - 20,8

The results presented in the table show that after statistically processing the data regarding efficiency, the differences between the standard product, Cruiser, and most of the other variants were insignificant, except for the Toreador and Force Zea products, which showed distinctly significant differences and the Sentinel, Force 20 CS, Sentinel Syn şi Dalila variants, which had significant differences.

Table 2

Production results obtained in 2010

Variant	Dosage	Production		Diff. compared to reference lot	Significance
		Kg/ha	%		
Cruiser 350 FS	9,0	5506	108	418	***
Picus 600 FS	6,0	5314	104	226	*
Sentinel 70 WS	6,0	5780	114	692	***
Palisade 600 FS	6,0	5411	106	323	**
Seedoprid 600 FS	6,0	5389	105	301	**
Toreador 600 FS	6,0	5726	112	638	***
Force 20 CS	2,0	6014	118	926	***
Force Zea SC	6,0	6067	119	979	***
Sentinel Syn 600 SC	6,0	5727	113	639	***
Nuprid AL 600 FS	6,0	5466	107	378	**
Dacseedin Forte 70 WS	10,0	5752	113	664	***
Dalila 600 FS	6,0	5810	114	722	***
Reference lot	-	5088	100	-	-

LSD 5%-220 kg/ha LSD 1%-299 kg/ha LSD 0,1 %-401 kg/ha

The differences regarding the production obtained in treated variants compared to the reference lot were positive, ranging between 226 kg/ha and 979 kg/ha, thus statistically proving most of the differences as very significant.

CONCLUSIONS

The products used for the treatment of the seed have been created in recent years, their main characteristic being the reduced required dosage per tone of seed. All the employed products have shown high levels of efficiency, protecting both the germinating seed and young plants up to the 2-3 leaves stage.

The most remarkable results were obtained when treating the seed with Force, Signal, Toreador, and Sentinel, but the other products can also be recommended for protecting crops against pest attacks.

REFERENCES

1. Borcean I., Tărău D., Borcean A., David Gh., Borcean E., 2005, Fitotehnia şi protecţia culturilor de camp în vestul Romaniei, Editura de Vest, Timişoara, pp. 175-182.
2. Bucurean E., 2008, Entomologie agricolă, Editura Universităţii din Oradea, pp. 137-140
3. Bucurean E., 2007, New Results Regarding the Fighting of Wireworms (Agriotes spp.) in the Crişana Plain Corn Crops, Simpozionul Ştiinţific Internaţional „Factori de risc pentru agricultură", Editura Universităţii din Oradea, pp. 68-74.
4. Chaton P.F., Lemperiere G., Tissut M., Ravanel P., 2008, Biological traits and feeding capacity of Agriotes larvae (Coleoptera: Elateridae) : A trial of seed coating to control larval populations with the insecticide fipronil, Pesticide biochemistry and physiology, v. 90, no.2 pp. 97-105.
5. Ianoşi S. I., 2001, Ghidul pentru utilizarea pesticidelor omologate în Romania în combaterea dăunătorilor animali la plantele de cultură şi în silvicultură vol. II (Dăunători), Ed. Phoenix, Braşov, 160-165.
6. Paşol P., Dobrin I., Frasin L., 2007, Tratat de entomologie specială, Ed. Ceres, Bucuresti, pp. 301-309.
7. Pălăgeşiu I., Sanea N., Petanec I.D., Grozea Ioana, 2000, Entomologie agricolă şi horticolă, Ed. Mirton, Timişoara, pp. 210-213.
8. Popov C., Bărbulescu A., Trotuş E., Vasilescu S., Bucurean E., 2001, Control of wireworms by seed treatment in Romania, Romanian Agricultural Research, INCDA Fundulea, nr. 15, pp. 1-12.
9. Rosca I., Rada Istrate, 2009, Tratat de entomologie (agricultura, horticultura, silvicultura), Ed. Alpha MDN, Bucuresti, pp. 471-475
10. Teodorescu Georgeta, Roman T., Sumedrea Mihaela, 2003, Entomologie horticolă; Dăunători specifici şi metode de combatere, Ed. Ceres, Bucureşti, pp. 38-43.