CONTRIBUTIONS REGARDING THE EVOLUTION AND FIGHTING OF FIELD CROP PESTS IN BIHOR COUNTY

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Abstract

The following paper contains new data regarding pests of significant economical importance for agricultural crops; the data was collected over the past two years in the north-western part of the country. The paper presents results obtained in the prevention and fighting of the following species: Agriotes sp. in wheat and maize crops, Tetranychus urticae in soya crops and Aphis fabae in bean crops. The chemical treatment of the seed was applied in the case of wheat and maize crops, while for the other species, treatment was applied during the vegetation period, paying attention to the moment chosen for application in order to diminish the number of treatments and the necessary doses and also to respect other measures meant to reduce pollution.

Key words: wireworms, treatment, dose, efficiency.

INTRODUCTION

The production of crop plants represents the main source of human existence. But pests are among the limiting factors of this production. Although pest fighting has soared in recent years, the damages they cause continue to be significant, both globally and nationally. Baicu T. estimated, as far back as 1987, that while in developed countries losses caused by pests are 5%, in underdeveloped or developing countries such losses can reach and even surpass 50%.

RegarLSDess of their way of feeding, pests cause damages and losses; any of the cultivated plant's vegetative organs can serve as food to one or several pest species, therefore both the normal development of the plant as well as production can be directly or indirectly influenced.

Concerning the methods of prevention and control, it is generally believed that chemical fighting has been used too much, this method being sometimes applied exclusively, thus leading to some organisms' resistance to certain chemical substances and also to the phenomenon of environmental pollution (Borcean I., 2005). Reasons such as these have lead to the creation of integrated systems; however it must be mentioned that chemical fighting has been, is and will remain the basis of the integrated control concept.

Artificial agricultural areas, that is agricultural crops, are under the constant surveillance of humans, who intervene whenever necessary to

restore the balance between the components of that specific area and plants (Roşca I., 2009). However, in some cases related to climate or crop technologies, the balance shifts in favour of one pest or another, leading to serious attacks that result in production loss. In order to prevent such attacks, it is necessary to study the pest fauna in every crop, the population's evolution in time and space and to apply the most efficient methods of control in due time.

This paper presents some data obtained in 2013 and 2014 regarding the control of wireworms (*Agriotes spp*) in wheat and maize crops, of the red spider mite (*Tetranychus urticae*) in soy and of the black bean aphid (*Aphis fabae*) in field bean crops.

MATERIAL AND METHOD

The larvae of click beetles, commonly known as wireworms, are extremely frequent in the soil of this area, due to its acid reaction. It is estimated that over 8000 species of *Agriotes* are known worldwide and 250 in Europe (Manole et al., 1999). These pests attack during rainy cool springs, and the conditions for attack were favourable in the studied years, but the damages were not significant. Chemical treatment remains the main method of fighting this pest, which attacks germinating grains and the collet of young plants and in the case of high pest density, other methods such as crop rotation, soil work and fertilising do not have the best results.

The seed was treated in a laboratory, respecting the recommended dosage, then sewed in the field during the optimal period for wheat and maize and placed according to the method of the Latin rectangle (number of variants multiplied by four repetitions).

Efficiency of the treatment was established after the springing of the plants, both in wheat and maize crops. It must be mentioned that observations to determine frequency in wheat crops were made in both autumn and early spring, and the obtained results are rendered in average numbers. For maize crops, however, observations were made after the complete rise of the plants, monitoring the gaps in the lots as well, in order to determine seed attack.

In wheat crops, the attack appears in small or larger groups, that is why notes were made diagonally using the 50/50 metric frame.

In the case of the red spider mite, treatment was applied five days after the appearance of the first mobile forms on the leaf. Therefore the leaves were analysed with a binocular eyeglass in order to correctly establish the moment of appearance. Moreover, ten leaves out of each lot were analysed after treatment, recording the number of live spiders left, and the obtained data was used in calculating efficiency.

As to the black aphid, it was extremely widespread in 2013 and 2014, with a large population and causing significant damage in both field and garden bean crops. It was also noticed in courgette, cucumber and beetroot crops. Treatment was applied when colonies appeared on the plants, but this is a particularly difficult pest to control, due to its large populations and their ability to quickly grow back.

RESULTS AND DISSCUSIONS

In wheat crops, plant density was recorded after emergence in all eight treatment variants in order to determine the phytotoxicity of the products and their influence on germination, the frequency of attack and the number of plants attacked by wireworms per surface unit, all the above data being used to establish efficiency. The frequency of attack oscillated from 1.2 and 5.6% compared to the reference lot, where the attack reached 19.7%. The Crișana variant was used in the experiment.

Table 1

Results obtained in fighting wireworms (*Agriotes spp*) in wheat crops

Variant	Dose kg,l/t	Density/m²	Frequency of attack %	Efficiency %	Production kg/ha
Signal ES	2.5	512	3.8	90.4	+4395**
Nuprid 600 FS	0.7	546	5.6	88.3	4370*
Seedoprid 600 FS	0.7	521	1.2	95.2	4680***
Imidaseed 70 WS	0.7	495	1.7	96.0	4725***
Palisade 600 FS	0.7	552	2.6	92.5	4490***
Force 20 CS	1.0	490	2.1	94.7	4470***
Cruiser 350 FS	1.0	502	2.9	93.8	4510***
Reference lot	-	471	19.7	-	4125

LSD 5%-180 kg/ha LSD 1%-251 kg/ha LSD 0.10%-327 kg/ha

The statistic processing of production data revealed that positive differences compared to the reference lot were obtained in all the variants.

In maize crops, wireworms cause damage during the germination-emergence period; the frequency of attack to the grain and collet was recorded to establish efficiency. In 2013 the attack was rather low compared to previous years in which such experiments were conducted.

Table 2

Efficiency of products used in fighting wireworms (*Agriotes spp*) in maize crops

Variant	Dose kg,l/t	Emergence	Non-germinated grains %	Frequency of attack %		Efficiency
				grain	collet	
Poncho 600 FS	4.0	91	9	3.0	4.3	84.5*
Cosmos 250 FS	5.0	93	7	1.7	2.7	89.7**
Gaucho 600 FS	6.0	92	8	2.4	3.9	91.9**
Seedoprid 600 FS	6.0	95	5	3.6	2.0	85.8*
Force 20 CS	2.0	97	3	1.6	1.8	95.3 **
Cruiser 350 FS	9.0	93	7	2.8	1.9	95.6**
Cruiser Force SC	10.0	95	5	2.4	1.3	96.2***
Reference lot	-	85	15	9.1	25.6	-

LSD 5%-5.0, LSD 1%-11.7, LSD 0.1%-15.8

The table reveals that plant protection after treating the seed was good, efficiency ranging between 84.5% (Poncho) and 96.2% (Cruiser Force), and the differences were statistically ensured as significant (Poncho, Seedoprid), distinctly significant (Cosmos, Gaucho) and very significantly positive (Cruiser 350 and Cruiser Force).

The red spider mite is a phytophagous mite with a polyphagous diet, that can be found in annual legumes (beans, soy) as well as in fruit trees, grapevines, vegetables (aubergines, cucumbers) and greenhouse plants. The attack is strong during hot dry summers, when plants can lose their leaves because of the physiological disruptions of the assimilation processes in the leaves. Infestation with red spider mites in soya appeared in isolated areas, one area consisting of 2-3 plants. After treatment, the average number of mites per leaf was reduced from 25.6 in the reference lot to 1.2-3.6 in thhe variants in which specific treatment was used.

Table 3

Results obtained in fighting the red spider mite (*Tetranychus urticae*) in soya crops

Variant	Dose %	F% of attacked leaves	Average number of mites/leaf	Efficiency
Memento SC	0.3	20	2.8	91.8^{oo}
Omite 570 EW	0.1	24	3.2	92.3^{-}
Torque 50 WP	0.1	12	3.6	98.1**
Demitan 200 SC	0.5	8	1.6	98.7**
Vertimec 1.8%	0.1%	14	1.2	100.0***
Nissorun 10 WP	0.04%	17	1.2	99.0***
Apollo 50 SC	0.04	28	2.4	96.8*
Reference lot	-	97	25.6	-

LSD 5%-2.2, LSD 1%-4.7. LSD 0.1%-6.5

Efficiency rose from 91.8% to 100%, while the percentage of attacked leaves was reduced from 97% to 12-28 in the variants, which proves that it is of the utmost importance to apply at least one treatment in order to reduce the population of this pest species.

The control of red spider mites especially in vegetables requires some phytosanitary measures of protection, such as autumn ploughings, in order to bury plant remains that might contain evolution stages of mites, repeated hoeing works because this is a polyphagous pest with several host plants (Roman T. et al., 1999), treatments with nettle maceration extract, repeated irrigations of the inferior part of the plant with cold water, favouring the appearance of predators and parasites, limiting the input of nitrogen, fertilisation with compost, good aeration of crops and others (Teodorescu Georgeta et al., 2003).

In 2013, due to excessive drought, there was a massive attack of the black bean aphid (*Aphis fabae*), both in garden green beans and in beans cultivated for consumption after drying. Several insecticides were tested in

fighting the pest, results being shown in table 4. Although aphid populations grow back quickly, mortality was still high compared to the reference lot, in which there was basically no yield. Statistic processing was performed through variance analysis, the standard product being Decis 2.5 EC.

Table 4

Results obtained in fighting the black bean aphid (*Aphis fabae*) in bean crops

Variant	Dose %	Efficiency %			Average efficiency %
		24 hours	48 hours	72 hours	
Mospilan 20 SP	0.025	90.4	97.6	98.1	95.4**
Actara 25 WG	0.02	95.7	98.7	97.0	97.1**
Fury 10 EC	0.02	79.8	84.5	90.1	84.8*
Confidor Energy	0.06	100.0	100.0	100.0	100.0**
Karate 25 EC	0.04	59.1	60.7	70.1	63.3⁻
Mavrik F	0.05	78.5	79.2	81.3	79.7⁻
Decis 2.5 EC	0.04	57.5	76.8	80.9	71.7
Reference lot	-	0.0	0.8	1.2	-

LSD 5%-12.1, LSD 1%-23.6, LSD 0.1%-34.5

Confidor Energy proved that it is efficient in fighting this pest, and natural mortality was recorded in the reference lot. Synthetic pyrethroids were less efficient, partly due to the extremely high temperatures during the period of treatment. Concerning the control of this pest, it must be once again noted that its population grows back very quickly, so treatment must be repeated.

CONCLUSIONS

In order to fight wireworms (*Agriotes spp*) in wheat crops, the chemical treatment of the seed leads to the best results; we are referring to the fact that the product works in the soil, at seed level, efficiency is maintained until after twinning, when plants become more resistant and the fauna above the ground is protected from the toxic action of insecticides. Signal ES, Seedoprid 600 FS, Force 20 CS and Cruiser 350 FS can be recommended for the treatment of the seed.

In maize crops, seed treatment leads to an efficient protection during the germination-emergence period; moreover, in soils infested with wireworms, this method of prevention and control is absolutely necessary, all the products presented in this paper being effective and, more importantly, having low recommended dosages.

The optimal moment for applying the treatment against the red spider mite must be carefully established in order to eliminate production losses: five days after the appearance of mites and, if the population is numerous, treatment must be repeated after ten days, but one treatment is sufficient.

The black bean aphid (*Aphis fabae*) is of tremendous economical importance in this area, its colonies being more and more numerous on a

considerable number of plants. The best results were obtained using the following products: Confidor Energy, Actara 25 WG and Mospilan 20 SP.

The fact that this paper presents results obtained after the chemical fighting of pests is motivated by the belief that this method is and will continue to be a component of integrated pest management. Hopefully, in the nearest future, the focus will shift more and more to the intensive use of non-polluting methods, to the use of integrated crop protection, slowly reducing or even eliminating the use of pesticides and paving the way to "eco-agriculture".

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