SOME ASPECTS REGARDING THE FIGHT AGAINST CEREALS BEETLE IN THE CONDITIONS OF THE REPUBLIC OF MOLDOVA

UNELE ASPECTE PRIVIND LUPTA ÎMPOTRIVA DĂUNĂTORILOR DIN CULTURILE DE CEREALE ÎN CONDIŢILE REPUBLICII MOLDOVA

PANUTA S.[1]*, CROITORU N. [1], BODESCU C.[2], LACATUSU Oana [2]
*Corresponding author e-mail: s_panuta@yahoo.com

Abstract. *Scientific research over several years has shown that the productivity of grain crops declines considerably both quantitatively and qualitatively under the influence of various harmful organisms, the population often outweighing the economic threshold of harm.Of the entire range of insect pest species, a special place and a primordial economic importance have the grubby beetle of grain. It is considered the most dangerous pest of autumn paws. Attacks numerous cultivated and spontaneous grasses, causing greater damage to wheat, barley, rye. It attacks both the adult and the larva, but produces particularly large damage to the larvae. Adults attack all the spinal organs. The biggest damage is caused by the larvae attacking the leaves, especially in the winter wheat, with a characteristic attack. They do not rotate the leaves, but chew them in the mouthpiece, extracting cellulite juice. The larval attack at first occurs in the form of winds, which gradually increase and encompass the entire culture. In large invasions, the sowing can be completely destroyed.*
Key words: wheat, pests, *Zabrus tenebrioides* Goeze, testing, insecticides

Rezumat. *Cercetarea ştiinţifică de-a lungul mai multor ani a demonstrat că productivitatea culturilor de cereale scade considerabil atât cantitativ cât şi calitativ sub influenţa diferitelor organisme dăunătoare, populaţia depăşind adesea pragul economic al dăunătorilor. Din întreaga gamă de specii de insecte dăunătoare, un loc special şi o importanţa economică primordială are gandacul ghebos al cerealelor. Acesta este considerat cel mai periculos dăunător al cerealelor. Acesta atacă numeroase ierburi cultivate şi spontane, provocând daune mai mari grâului, orzului şi la secară. Daunătorul atacă atât adultul, cât şi larva, dar produce daune deosebit de mari în stadiul de larvă. Adulţii atacă toate organele plantei. Cele mai mari daune sunt cauzate de larvele care atacă frunzele, în special la grâul de toamnă, cu un atac caracteristic. Atacul larvelor apare la început sub forma de vetre, care cresc treptat şi cuprind întreaga cultură. La invazii mari, răsărirea poate fi complet distrusă.*
Cuvinte cheie: grâu, dăunători, *Zabrus tenebrioides* Goeze, testare, insecticide

[1] State Agrarian University of Moldova, Republc of Moldova
[2] Univerity of Agricultural Sciences and Veterinary Medicine from Iasi, Romania

INTRODUCTION

The development and introduction of various intensive agricultural production technologies has positively influenced the significance and role of plant protection of diseases and weeds, which ensure that high yields are obtained. Scientific research over several years has shown that the productivity of grain crops declines considerably both quantitatively and qualitatively under the influence of various harmful organisms, the population often outweighing the economic threshold of harm.

Of the entire range of insect pest species, a special place and a primordial economic importance have the grubby beetle of grain. It is considered the most dangerous pest of autumn paws. Attacks numerous cultivated and spontaneous grasses, causing greater damage to wheat, barley, rye. It attacks both the adult and the larvae, but produces particularly large damage at a larvae.

Chemical combat of the grubby beetle can be achieved by applying seed and plant treatments. Seed treatment is applied before sowing when the numerical density of females exceeds 0.5 ex./m^2 and larvae 2 ex./m^2.

Chemical treatments against larvae are carried out according to climatic conditions, plant development phase, plant and larva density. At the occurrence of the plants, in the phase of 1-2 leaves, at an optimal level (450-600 plants/m^2) chemical treatments apply when the larval density exceeds PED (2 larvae/m^2) and in dry time at 1.0 larvae/m^2; in rare crops (250-300 plants/m^2) chemical treatments are applied at 0.5-0.7 larvae/m^2. In the third leaf-twinning phase, chemical treatments are applied in outbreaks when PED is exceeded (2-3 larvae /m^2), and if the larvae have a diffuse spread, the treatments apply to 3-4 larvae/m^2.

MATERIAL AND METHOD

The experience was assembled on fields with autumn wheat in "VALENAGRO COM" in Ciutuleşti village, Floresti district. The crop was sown in the second half of September 2015, with the space between narrow rows. In selecting the appropriate batch for experiments, we considered the methodical requirements for insecticide research, which imply a pest density of 3-4 specimens per 1 m^2. The experience included 4 variants: blank, untreated; standard - Superkill 440 EC insecticide, with consumption standard 1.0l/ha; preparation CHC/53-I EC, with consumption standard - 1.0L/ha; preparation CHC/53-I EC, with consumption standard - 1.2L/ ha.

The experience was mounted in 4 rehearsals. The dimensions of a plot were 10x10 m, so the area of 100 m^2. Between the parcels a strip of insulation with a width of 1 m was left. The area of the parcels was 1600 m^2 and the total area including the insulation strips was 1720 m^2. The location of the plots was compact randomized.

RESULTS AND DISCUSSIONS

Recordings on wheat fields for the purpose of launching experiments began on 1 April. In order to correctly determine the start-up period, account was taken of the fact that, in combating the grubby beetle, the effectiveness of insecticides is much higher if they are used against larvae of age 1-2, which are more sensitive. Therefore, efforts have been made in the spring records to determine the age of larvae of the cereal beetle. The results obtained in Table 1 show that 9.5 larvae per 1 m^2 were found in the parcels on 1 April, of which 7.0 were 73.68% larvae age 2 and only 2.5 copies/ m^2 or 26.32% were larvae at the age of 3.

Records made on April 15 gave us the opportunity to track the development of the grubby beetle. It was found that the larval density was increased by 4 specimens in 8 polls, constituting 23 copies. Analyzing the evolution of the larval stage, it is seen that within 14 days of the total number of larvae, 6.0 ex/m^2, representing 52.17%, were 2 years of age and 5.5 ex/ m^2, or 47.83% passed age 3.

Table 1

Evidence of the development of the grubby beetle in the spring, 2016

Period	Number of pests									
	Total		of these							
			Larvae						Pupae	
	ex./8 sond.	ex./m^2	Including stage a							
			II			III				
			ex./8 sond.	ex./m^2	%	ex./8 sond.	ex./m^2	%	ex./m^2	%
1.04.16	19.0	9.5	14	7.0	73.68	5	2.5	26.32	0.0	0.0
15.04.16	23.0	11.5	12	6.0	52.17	11	5.5	47.83	0.0	0.0

Based on the evidence, it was found that in the first and second decades of April, the grubby beetle is active, being in the larval stage of age II and III. In favor of this conclusion are also the freshly attacked plants. So setting up experiences during spring is rational.

As noted above in the first and second decades of April, most of the grub beetle larvae were aged 2 and 3, were very active and resumed their nutrition. As a testimony to this conclusion, it serves in crops, alongside healthy plants and freshly attacked plants. In connection with this, it was considered rational to set up the experiences related to the determination of the biological effectiveness of the CHC/53-I EC insecticide in combating cereal beetle larvae in autumn wheat cultures. That's why chemical treatment was done on April 14th. In order to determine the biological efficacy of the preparations, the numerical density of the larvae in the soil and the attack of

the plants on the treated sectors were compared, as compared to the untreated ones.

It can be seen from the table that the numerical density of larvae before treatment in the experimental group was quite uniform and varied from 3.75 ex./m² in variant 3 to 5.00 ex./ m² - in the 4th and in the blank. Evidence on the third day after treatment gave us the possibility to find that the larvae of the cereal beetle beetle were found in all experimental variants but the lowest value was scored in the 4th variant (0.25 ex./m^2) and in the standard (0.50 ex./m^2), the deviations between them being nonessential.

In 3rd variant this index was 0.75 ex/ m^2, which is 1.5 and 3.0 times higher than in the standard and the 4th variant. In the control variant, the larvae density has been prolonged and increased during this period of 5.25 ex/m^2, which essentially exceeds all experimental variants. Evidence on the seventh day after treatment showed that the lowest density of the larvae of the cereal grubby beetle was marked in the 4th variant and in the standard, comparing respectively 0.50 and 0.75 ex./m^2 .

In order to record the numerical density of the larvae, soil surveys were conducted. For this, four samples were placed in the center of each plot, placed in 2 rows, with a size of 0.25 m^2, 50x50 cm, and a depth of 20-25 cm. Soil polls were put on a film and thoroughly scrutinized. Parallel with the evidence of larvae of the grueling beetle beetle, there was also evidence of worms, false snakes, saplings, and other insect species. Recordings were made until treatment at the 3rd, 7th, and 14th days after the treatments. The results of the research are shown in Table 2.

Table 2

Biological Efficacy of CHC / 53-I EC Insecticide in Combating Grubby Beetle Larvae (Springtime Experiments, 2016)

No	Variants	Consumption norm L/ha	Density of larvae, ex./m^2				Reduction of larval density relative to control in %% at ..... day after treatment		
			Until trated	on day 3 after treatment	on day 7 after treatment	on day 14 after treatment	3	7	14
1.	Control	untreated	5.00	5.25	5.50	5.50	0.0	0.0	0,0
2.	Etalon, Superkill 440 EC	1.0	4.50	0.50	0.75	1.50	90.48	86.36	72.73
3.	CHC/53-I EC	1.0	3.75	0.75	1.00	1.75	85.00	81.00	68.00
4.	CHC/53-I EC	1.2	5.00	0.25	0.50	0.75	95.00	91.00	86.00
DEM P 5%				0.31	0.43	0.67	4.98	5.47	4.65

In 3rd variant this index was 1.00 ex./m^2. The statistical processing of the results showed that between the third and the standard deviations the deviations are not essential, and in the 4th version this index constituted 0.50 ex/m^2 and is at the level of the standard. In the blank version this index constituted 5.5 ex/m^2.

In the 14 days after treatment, it was found that the lowest density of the larvae of the cereal grubby beetle was reached in the 4th variant and in the standard, where this index constituted 0.75 and 1 respectively, 50 ex / m^2. In the control, the larval density was maintained at the level of the 7th day after treatment (5.5 ex / m^2). The statistical processing of the experimental results showed that only between the 4th and the standard deviations are nonessential.

The calculation of the larvae density reduction of the cereal beetle compared with the control shows that on the 3rd day after treatment in the 4th and the standard version this index exceeded more than 90%, corresponding to 95.00 and 90.48%. In 3rd variant, this index accounted for 85.00% and essentially yields both the fourth and the standard.

On the 7th day after treatment, the highest reduction was also reached in the 4th and the standard, respectively, representing 91.00 and 86.36%. In 3rd variant this index reached only 81.00%. The statistical processing of the results has shown that deviations are essential, only between the 3rd variant and the standard. The 4th variant essentially exceeds both the 3rd and the standard. The results received on the 14th day after treatment testify to the fact that only in the 4th variant the reduction of the larval density reached the value above 80.00%, making up 86.00% which essentially exceeds both the standard (72.73 %) and the third variant. In 3rd variant, this index reached only 68.00% and yielded essentially to the 4th and the standard.

Simultaneously with the evidence of larvae, in the experimental group, the evidence of attacked plants was also made. The attack level of the plants was determined by counting the healthy ones and those attacked on a part of the row with a total length of 5 m. For this plot, 10 samples of 0.5 m were taken. in the same days when the larvae records went.

Taking into account the fact that the experience was assembled in the spring, during the recording, the plants were divided into two groups: freshly attacked plants; plants attacked autumn (old). The results obtained are shown in Table 3. It can be seen from the table that the total number of plants at 5 m linear lines consisted of 128.50 plants - in the 3rd variant, up to 133,25 - in the variant a 4th.

The total number of plants at 1m linear ranged from 25.70 in the 3rd variant to 26.65 in the 4th variant. Density of healthy plants ranged from 57.25 to 5 m linear - in the control variant to 76.00 plants in the 4th variant. The same legality was marked in healthy plant counts at 1 m linear. The smallest number of plants attacked at 5 m linear was marked in variant 4 (57.25) and in variant 3 (64.75).

It is known that the main criterion is the presence of freshly attacked plants demonstrating also the presence of the larvae of the grueling beetle of the cereal.

Evidence in the experimental group gave us the possibility to find that the lowest number of freshly attacked at 5 m linear plants was scored in the 4th (4.00) and the 5.00th version. The ratio of freshly attacked plants at 1 m linear was 0.80 in the 4th and 1.0 in the standard.

The calculation of the density reduction of freshly attacked plants relative to the control gave us the possibility to find that the highest index was reached in the 4th variant and in the standard, corresponding to 85.19 and 81.00%. In third variant, the reduction of the attacked plants was 79.00% and this index is at the level of the standard.

Based on the researches carried out and the results obtained it can be ascertained that the best results were received in the 4th variant, where the reduction of the beetle larvae was 95.00 - 91.00% and the reduction of the attacked plants reached 85.19% and essentially exceeds the benchmark. The 3rd variant yields the 4th variant and is at the level of the standard.

It is well known that in the fight against the larvae of the grubby beetle larvae, the more effective treatments are the autumn, against larvae of age I and II because they are more sensitive. That's why research on plant protection products has been repeated and autumn. Experiences were installed in the fields of Cazangic, Leova district.

In autumn wheat was sown in the second decade of October. For the record of larvae, soil surveys were carried out with a surface of 0.25 m^2 and a depth of 20-25 cm diagonally in 10 places. The chemical treatment of parcels in the experimental group was completed on November 12, 2016. The larval density in the experimental group was determined by conducting 4 polls at the center of each plot, in the plant phase. The data of Table 4 testify to the fact that the larvae density of the beetle beetle before the treatment was quite uniform and ranged from 3.50 ex / m^2 in the control variant to 4.50 ex / m^2 in the 4th variant.

The evidence on the third day after treatment showed that in the 4th variant the larvae of the cereal beetle were not found, and in the third and the standard version, this index constituted 0.25 ex / m^2.

The 7th day after treatment showed that the pest was detected in all experimental variants, but the lowest density was scored in the 4th variant. The same legality was also marked on the 14th day after treatment.

The calculation of the reduction in larval density in relation to the control showed that only in the 4th variant a 100% reduction was achieved on the 3rd day after treatment. In the third and the third version this index constituted 94.44%.

On the seventh day after treatment in all variants, the reduction constituted more than 90%, but the 4th variant essentially exceeded both the third and the standard. The same trend was marked on the 14th day after treatment.

Based on the researches carried out in the autumn and the results obtained, it can be seen that the best indices were received in the 4th variant, where the reduction of the larvae of the beetle made 100.0-95.65%, which exceeds the standard. The 3rd variant yields the 4th variant and is at the level of the standard.

Table 3

The results of the reduction of the plants attacked by the grubby beetle larvae in the experimental group for testing the CHC / 53-I EC insecticide (Spring, 2016)

Variants	Consumption norm l/ha	Number of plants										Reducing Density of plants attacked against the control ,%
		total		of these								
				healthy		attaked						
						total		inclusive				
								freshly attacked		attacked in autumn		
		la 5 m liniars	la 1 m liniars	la 5 m liniars	la 1 m liniars	la 5 m liniars	la 1 m liniars	la 5 m liniars	la 1 m liniars	la 5 m liniars	la 1 m liniars	
Control	un-treated	129.00	25.80	57.25	11.45	71.75	14.35	27.00	5.40	44.75	9.95	0.0
Etalon, Superkill 440 EC	1.0	131.75	26.35	65.50	13.10	66.25	13.25	5.00	1.00	61.25	15.25	81.00
CHC/53-I EC	1.0	128.50	25.70	67.5	12.75	64.75	12.96	5.50	1.10	59.25	11.85	79.00
CHC/53-I EC	1.2	133.25	26.65	76.00	15.20	57.25	11.45	4.00	0.80	53.25	10.65	85.19
DEM P 5%		-	-	-	-	-	-	-	-	-	-	2.93

Table 4

Biological Efficiency of CHC / 53-I EC Insecticide in Combating Beetle Larva in Cereals (Autumn, 2016)

No	Variants	Consumption norm L/ha	Density of larvae, ex./m^2				Reduction of larval density relative to control in %% at ..... day after treatment Until trated		
			Until trated	on day 3 after treatment	Until trated	on day 3 after treatment	3	7	14
1.	Control	untreated	3.50	4.50	5.75	6.50	0.0	0.0	0.0
2.	Etalon, Superkill 440 EC	1.0	3.75	0.25	0.50	1.25	94.44	91.30	80.77
3.	CHC/53-I EC	1.0	4.00	0.25	0.50	1.00	94.44	91.30	84.62
4.	CHC/53-I EC	1.2	4.50	0.00	0.25	0.50	100.0	95.65	92.31
DEM P 5%			-	-	-	-	4.94	4.07	5.27

CONCLUSIONS

1. The climatic conditions of the spring and autumn of 2016 have positively influenced the development of the larval stage of the grubby beetle.

2. In the 2nd and 3rd decades of April and autumn in November, favorable conditions were created for carrying out chemical treatments and determining the biological effectiveness of insecticides.

3. The CHC / 53-I EC preparation, with a 1.0 L/ha consumption standard, provides an efficacy in combating the galloping beetle at the standard level.

4.The most effective in combating larvae of the cereal chick beetle is the CHC / 53-I EC insecticide with a consumption standard of 1.2 L/ha, which provides an efficacy of 95.00 - 91.00% and 100.0 - 95.65%.

5. Based on the above, the CHC/53-I EC insecticide at a dose of 1.0-1.2 L/ha can be included in the integrated wheat beetroot protection system.

REFERENCES

1. **Croitoru N., Timuş Asea, Panuța S., Gavdiuc E., 2009** - *Eficacitatea unor produse cu conținut de Valsaciper 250 EC în combaterea dăunătorilor mazării pentru conservat.*, *„Protecția Plantelor – Realizări şi Perspective”,* Chişinău, 1, p. 280-283.
2. **Timuş Asea, Croitoru N., Busuioc M., Panuța S.**, **2005** - *Îndrumar metodic pentru lucrările de laborator la disciplina „Prognoză şi avertizare” – pentru studenții anului IV,* specialitatea 2804 - Protecția Plantelor. Universitatea Agrară de Stat din Moldova. Chişinău, 14, p.62.
3. **Кроитору Н., Пануца С., Тимуш Ася.** *Эффективность новых препаратов против комплекса вредителей гороха*, Lucrări ştiințifice, UASM. Chişinău, 24, p. 411-417.
4. **Пануца С., Кроитору Н. Биологическая Эффективность Инсектицида, 2012 -** *Triumph 250 EC в борьбе с основными вредителями на горохе*. „Protecția plantelor – probleme şi perspective”, Chişinău,1, p. 411-414.,
5. **Тимуш А., Кроитору Н., Пануца С**., **2010** - *О результатах испытания препарата Engeo K 247 SC против комплекса вредителей гороха, в условиях Республики Молдова. В:Материалы Международной научно-практической конференции, посвященной 65-летию кафедры защиты растений* «Актуальные проблемы в защите растений», Горки, 23-25 июня, p. 25–27.
6. ****** 2002** - *Îndrumări metodice pentru testarea produselor chimice şi biologice de protecție a plantelor de dăunători, boli şi buruieni în Republica Moldova*. Tipografia Centrală, Chişinău