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INSECTICIDES EFFICIENCY AGAINST PESTS WHEN TREATING SUGAR BEET SEEDS

The article presents research results on establishing the efficiency of insecticides and their combinations for sugar beet seed treatment against ground and soil pests. It was found that control of major pests in crops could be provided subject to using Poncho Beta preparation for seed treatment, resulting in proved increase in root yield and sugar yield per hectare as compared with the control.

Keywords: *sugar beet; beet psylla; beet weevils; beet beetle; insecticides; efficiency; yield.*

Introduction. Application of chemicals to protect sugar beet sprouts from pests is an important element of the crop cultivation technology [1]. In modern sugar beet production it is mandatory to use seeds treated with protective-stimulating substances which include one or more insecticides for sowing [2, 3].

Given that the range of chemicals used for coating the seed is constantly updated, and the fact that more and more widespread becomes use of combined insecticides for expansion of action spectrum against complex soil and ground pests, there is always a need to determine the efficiency of the pesticides and the optimum application rate.

Therefore, the aim of research was to establish the efficacy of insecticides belonging to different chemical groups for sugar beet seeds treatment against pests of sprouts.

Materials and methods. The study was carried out in fields of unstable humidity at Verkhniaky Experimental Breeding Station (Cherkasy region) of the Institute of Bioenergy Crops and Sugar Beet in 2012–2013. Soil was silty clay loamy podzolic chernozem. Agrochemical indicators of 0–30 cm layer: pH_{sal} 5.8–6.2; hydrolytic acidity (by Kappen) 2.2–3.8 mg/equivalent per 100 g of soil; amount of absorbed alkali (by Kappen – Gilkovitz) 28.0–30.0 mg/equivalent per 100 g of soil; humus content (by Tiurin) 3.0–3.6%; mobile phosphorus and potassium (by Chirikov) 90–140 and 70–100 mg/kg of soil, respectively; high-hydrolized nitrogen (by Tiurin and Kononov) 100–120 mg/kg of soil.

We determined each insecticide action as well as their combined action when treating against beet weevils in the field environment by the degree of plant damage at two-leaf stage according to conventional methods [4-6]. We determined the efficiency of the treatrers in laboratory and field conditions with the aid of placing beet weevil to the crops. Economic efficiency of advanced insecticides for seed treatment was established for the root yield and sugar content per area unit. The results obtained have been processing by Dospehov analysis of variance [7].

Results and discussion. The study found that all insecticides and their compositions were equally effective against beet beetle (*Table 1*).

Table 1

Efficiency of insecticides for seed treatment of sugar beet against beet beetle (VEBS), 2012–2013

no	Variants	Application rate, ml/seed unit	Stand density in a row, plant/m	Damaged plants, %	Mean damage score	Damage factor	Efficiency, %
1	Standard (without insecticide treatment)	–	11.3	35.8	1.2	0.43	0
2	Magna Force (Cruiser + Force)	15+6	11.4	16.7	1.0	0.17	60.5
3	Cruiser + Force	60+8	11.7	10.6	1.0	0.11	74.4
4	Poncho Beta	30	11.8	8.3	1.0	0.08	81.4
5	Poncho Beta	60	12.5	6.6	1.0	0.07	83.7
$LSD_{0.5}$			0.8				6.7

Thus, the least sugar beet plants were damaged by this pest in variants where the seed were treated wirh Poncho Beta (60 and 30 ml/seed unit) and composition Cruiser + Force (60 + 8 ml/seed unit). When applying in the two-leaf stage, efficacy of these formulations against beet beetle amounted to 83.3, 80.3 and 81.8%. The lowest efficacy against this pest was observed when treating seed with insecticide Magna Force (Cruiser 350FS + Force 200 CS) – 72.7%.

Sugar beet sprouts were the lest damaged by beet weevils with formulation Poncho Beta FS 453 at an application rate of 30 and 60 ml/seed unit. The percentage of damaged sprouts in the two-leaf stage was 8.3 and 6.6%, and the average score and injury rate were lower compared to the other options under the study (*Table 2*).

Table 2

Efficiency of insecticides and their compositions for the treatment of sugar beet seeds against beet weevils (average of 2012–2013)

no	Variants	Application rate, ml/seed unit	Stand density in a row, plant/m	Damaged plants, %	Mean damage score	Damage factor	Efficiency, %
1	Standard (without insecticide treatment)	–	11.3	35.8	1.2	0.43	0
2	Magna Force (Cruiser + Force)	15+6	11.4	16.7	1.0	0.17	60.4
3	Cruiser + Force	60+8	11.7	10.6	1.0	0.11	74.4
4	Poncho Beta	30	11.8	8.3	1.0	0.08	81.4
5	Poncho Beta	60	12.5	6.6	1.0	0.07	83.7
$LSD_{0.5}$			2.1	8.7			

Some more damaged sugar beet plants were in variants of seed treatment with insecticide composition Cruiser 350 FS and Force 200 CS (60 + 8 ml/seed unit) and Magna Force (Cruiser 600 FS + Force CS) (15 + 6). Plant damage ratio in these variants was 0.11 and 0.17, and efficiency against pests calculated for its decline to the control – 74.4 and 60.4%, respectively.

Given the increasing number and harm done by beet psylla in recent years, particular attention is being paid to effective formulations and their compositions to protect sugar beet crops (*Table 3*).

Table 3

Efficiency of insecticides and their compositions for the treatment of sugar beet seeds against psylla beetles (average of 2012–2013)

no	Variants	Application rate, ml/seed unit	Stand density in a row, plant/m	Damaged plants, %	Mean damage score	Damage factor	Efficiency, %
1	Standard (without insecticide treatment)	–	11.3	98.0	1.94	1.9	0
2	Magna Force (Cruiser + Force)	15+6	11.4	22.4	1.0	0.22	88.4
3	Cruiser + Force	60+8	11.7	20.6	1.0	0.21	88.9
4	Poncho Beta	30	11.8	20.0	1.0	0.20	89.5
5	Poncho Beta	60	12.5	18.8	1.0	0.19	90.0
$LSD_{0.5}$					2.1	12.3	

The highest starting efficiency against beet psylla was noted in the variant with Poncho Beta (60 ml/seed unit) – 90%. The high efficacy against these pests was provided by Poncho Beta (30 ml/seed unit) and insecticide compositions Cruiser 600 FS + Force 200 CS, 60 + 8 and Magna Force (Cruiser 350 FS + Force), 15 + 6 ml/seed unit – 89.5, 88.9 and 88.4% at the average plants damage ratio made up 1.0. Plants damage ratio in these variants was significantly lower as compared with the control.

According to the effective protection of sugar beet crops from herbivores by seed treatment with insecticides and their compositions we obtained the correspondent crop productivity.

In particular, the best results were obtained in variants with insecticide Poncho Beta (60 ml/seed unit). The roots yield of the same options with the protectant was significantly higher (by 7.3 t/ha) as compared to control (*Table 4*).

The yield of sugar beet root at using Poncho Beta for seed treatment (30 ml/seed unit) and Cruiser 350 FS + Force 20 FS, (60 + 8 ml/seed unit) was higher than the control by 3.9 t/ha and 3.5 t/ha, respectively.

Sugar content in the variant with Poncho Beta (60 ml/seed unit) was also higher by 0.6% compared with the control. Accordingly, sugar yield was 1.4 t/ha higher than the control.

Table 4

Productivity of sugar beet by applying insecticides for seed treatment against pests (average of 2012–2013)

no	Variants	Application rate, ml/seed unit	Root yield		Sugar yield		Sugar yield, t/ha
			t/ha	± to check	%	± to check	
1	Standard (without insecticide treatment)	–	54.2	–	14.6	–	7.9
2	Magna Force (Cruiser + Force)	15+6	55.5	+1.3	15.2	+0.6	8.4
3	Cruiser + Force	60+8	57.6	+3.4	14.9	+0.3	8.6
4	Poncho Beta	30	58.1	+3.9	15.1	+0.5	8.8
5	Poncho Beta	60	61.5	+7.3	15.2	+0.6	9.3
$LSD_{0.5}$			4.9		0.7		

Conclusions. The highest efficiency of protecting sugar beet sprouts against ground and soil pests was provided by the use of insecticide Poncho Beta for seed treatment (60 ml/seed unit). In the field, the efficiency against beet beetle was 83.3%, beet weevils (common and grey) 83.7% and psylla beetles 90.0%.

The use of this formulation in recommended application rate guarantees control of major pests of sugar beet, saving stand density of plants and providing higher root yield (7.3 t/ha) and sugar yield higher by 1.4 t/ha as compared with the control.

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Анотація

Саблук В. Т., Грищенко О. М., Ворожко С. П.

Ефективність інсектицидів проти шкідників за обробки ними насіння цукрових буряків

У статті наведено результати досліджень щодо встановлення ефективності інсектицидів та їх композицій для обробки насіння цукрових буряків проти наземних і ґрунтових шкідників. Встановлено, що контроль основних шкідників сходів у посівах культури забезпечується за використання для обробки насіння препарату Пончо Бета, що дає достовірну прибавку врожайності коренеплодів і збору цукру з гектару площі порівняно із контролем.

***Ключові слова**: цукрові буряки, бурякові блішки, бурякові довгоносики, бурякова крихітка, інсектициди, ефективність, урожайність.*

Аннотация

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Эффективность действия инсектицидов при обработке семян сахарной свеклы

В статье приведены результаты исследований по определению эффективности инсектицидов и их композиций для обработки семян сахарной свеклы против наземных и почвенных вредителей. Установлено, что контроль основных вредителей всходов в посевах сахарной свеклы обеспечивается при использовании для обработки семян препарата Пончо Бета, что дает достоверную прибавку урожайности корнеплодов и сбора сахара с гектара посева по сравнению с контрольным вариантом.

***Ключевые слова**: сахарная свекла, свекловичные блошки, свекловичные долгоносики, свекловичная крошка, инсектициды, эффективность, урожайность.*

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