UDC 633.63:595.70:632.768.23
SABLUK V.T., Doctor of Agricultural Sciences, professor
GRYSHCHENKO O.M., Candidate of Agricultural Sciences
VOROZHKO S.P.
Institute of Bioenergy Crops and Sugar Beet NAAS of Ukraine
e-mail: vdss@hr.ck.ua

ADVANCED INSECTICIDES FOR SEED TREATMENT AGAINST BEET WEEVIL

The article presents results on the efficiency of advanced insecticide compositions for seed treatment against beet weevils. Advanced preparations are recommended to use.
Keywords: *stand density; efficiency; beet root weevil; insecticides; beet stem weevil; yield; sugar beet*

Introduction. Sugar beet plants are the most vulnerable to damage caused by phytophages at the stage of emergence, i.e. from the beginning of germination to appearance of four-six leaves. Therefore, plant protection against pests is an important element in the crop agrotechnics. Providing application of highly efficient insecticides, it becomes possible.

The most environmentally friendly way to protect coming up sprouts is sowing seeds treated with a protective and stimulating preparation. Numerous studies and practical experience obtained at the Institute of Bioenergy Crops and Sugar Beet proved the fact that applying insecticides for seed treatment provides effective protection of sugar beet sprouts against pests [1-3]. This measure can provide phytophage control (including beet weevil) at the early stages of plant development [4, 5].

Insecticides used widely for sugar beet seed treatment belong to the neonecotinoid group. Among them is Gaucho 70% WP, Cruizer 350 FS and Cruizer 600 FS. These insecticides feature a low application rate, they are less toxic, have a wider range of insecticide action. When the number of beet weevil overcomes the economic threshold of harmfulness 2-3 times as much, a full rate of Gaucho and Cruizer applied to seed makes it possible to keep more than 75 % of the plants and to obtain close to optimal plant density at harvesting, leading to the fairly high root yield (48.6 t/ha) [6].

Advanced seed treaters of contact and systemic action like Magna Force and Poncho Beta combine two active ingredients, which make them to produce strong and double effect against pests. Magna Force is a mixture of tiamethoxam (15 g ai per seed unit) and tefluthrin (6 g ai per seed unit). Poncho Beta combines two active ingredients of chloro-nicotinyl group (clothianidin 400 g/l) and pyrethroid (beta-cyfluthrin, 53.34 g/l).

Therefore, we carried out an experiment to determine the efficiency of advanced insecticides for seed treatment against beet weevils (beet root weevil and beet stem weevil) that are the most harmful phytophages to sugar beet.

Materials and methods. The study was carried out in fields with 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 – 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 [7, 8]. 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 Dospiehov analysis of variance [9].

Results and discussion. Analysis of the data on damaged by beet root weevil and beet stem weevil crops at Verkhniaky EBS showed that the best plant protection ensures Poncho Beta at the rate of 30 and 60 ml/seed unit. In these variants weevil damage to sprouts at the stage of two leaves was 8.3 and 6.6 %, respectively, which is 27.5-29.2 % less than in standard variant. Damage factor in these variants was also the lowest and made up 0.07 and 0.08, respectively, which is 0.35 - 0.36 less than in the standard variant and 0.04 - 0.10 less as compared with other insecticides (Force Magne and Cruizer 350 ST TN). At the same time, the stand density of sugar beet plants was almost equal to the normal sowing rate (Table 1).

Table 1

Efficiency of insecticides for seed treatment of sugar beet against beet root weevil and beet stem weevil (VEBS), 2012-2013

No	Variants	Rate, ml/seed unit	Stand density in a row, pcs./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, Poncho Beta used at the recommended rate ensures the most complete preservation of stand density from the moment of cotyledon appearance to four-six leaf stage as well as good seed management. Minor damage of sprouts caused by beet weevils did not cause thickening of crops, but slightly affected the sugar content in roots.

More affected by beet weevil crops were observed when seeds were treated with composition of Cruizer and Force (60 + 8 ml/seed unit) and Magna Force (Cruizer and Force (15 + 6 ml/seed unit)). When applied these insecticides showed a slight increase in damage of plants and reduce in their efficiency against phytophages, as compared to Poncho Beta at the rate of 60 ml/seed unit. Damage factor in this variant was 0.11 and 0.17, respectively, and the efficiency of the action calculated for its deviation to standard variant was 74.4 and 60.5 %.

It should be noted, that along with field experiments we studied the effect of insecticides on beet weevil at a laboratory placing the insects in the garden-insulators twice. Poisoned weevils were counted on 1, 3, 5 and 7 day after each placing.

The efficiency of seed treatment in controlled conditions appeared to be higher than in the field experiment (Table 2). Low-density populations of weevils on beet fields during the years of research can explain this fact.

When placing insects at the two-leaf stage, from 71.8 % to 100 of beet root weevils died. In addition, the highest starting efficiency of insecticides against these insects marked when using the compositions of Cruizer and Force at the application rate of 60 +8 ml/seed unit and Poncho Beta at 30 and 60 ml/seed unit. At the second placing of insects, a high efficiency against weevils was observed for Poncho Beta at both application rates. In the standard variant (without application of insecticides), this pest lived until all the crops had been eaten.

Table 2

Efficiency of insecticides and their compositions for sugar beet seed treatment against beet root weevil and beet stem weevil (laboratory and field experiments, VEBS), 2012-2013

Variants	Rate, ml/seed unit	Efficiency (%)since…days after placing of weevils							
		first placing				second placing			
		1 day	3 days	5 days	7 days	1 day	3 days	5 days	7 days
Standard (without insecticide treatment)	–	0	0	0	0	0	0	0	0
Magna Force (Cruiser+Force)	15+6	71.8	95.6	100	100	68.9	85.7	94.4	100
Cruiser+Force	60+8	100	100	100	100	83.7	95.9	100	100
Poncho Beta	30	100	100	100	100	86.8	100	100	100
Poncho Beta	60	100	100	100	100	91.6	100	100	100

When using advanced insecticides for seed treatment we obtained a substantial increase in root yield (Table 3).

Table 3

Productivity of sugar beet subject to application of insecticides for seed treatment (VESS), 2012-2013

Variants	Rate, ml/seed unit	Root yield		Sugar content		Sugar yield, t/ha
		t/ha	+ to standard	%	+ to standard	
Standard (without insecticide treatment)	-	54.2	-	14.6	-	7.9
Magna Force (Cruiser+Force)	15+6	55.6	+1.4	15.2	+0.6	8.5
Cruiser+Force	60+8	57.7	+3.5	14.9	+0.3	8.6
Poncho Beta	30	58.1	+3.9	15.1	+0.5	8.8
Poncho Beta	60	61.5	+7.3	15.2	+0.6	9.3
$LSD_{0.5}$		4.9		0.6		

Thus, on average over the period of research, when using Poncho Beta at the application rate of 60 ml/seed unit, root yield made up 61.5 t/ha, that is by 15.2 t/ha more than in the standard variant.

A reliable increase in sugar yield as compared to the standard variant was obtained in all the variants with advanced chemicals, mainly due to significant increase in root productivity keeping the desired plant stand density.

Conclusions. In recent years, the number of beet root weevil and beet stem weevil increased significantly. Taking into consideration disequilibrium in the "plant – environment" system and sowing to the final stand density, there is a large risks of plant damage and reduce in root yield. At the current phytophage population density, application of insecticides of the complex action (Magna Force and Poncho Beta) at recommended application rates provides reliable control of these pests.

Application of the insecticides of complex action (Magna Force and Poncho Beta) for sugar beet seed treatment provides reducing in damage to plant and their keeping, resulting in a significant increase in root yield and sugar yield per hectare, so they could be recommended for use in sugar beet production.

References

1. Саблук В.Т. Шкідники сходів цукрових буряків / В.Т. Саблук. – К.: Світ, 2002. – С. 23-35.

2. Саблук В.Т. Надійний захист сходів / В.Т. Саблук, Н.М. Запольська // Цукрові буряки. – 2001. – № 1. – С. 14-15.

3. Саблук В.Т. Звичайний буряковий довгоносик – що нас чекає завтра / В.Т. Саблук, В.П. Федоренко, В.М. Смірних // Цукрові буряки. – 2001. – №2. – С. 10.

4. Федоренко В.П. Інсектициди проти бурякових довгоносиків / В.П. Федоренко, М.М. Дем'янюк // Захист і карантин рослин : міжвід. темат. наук. збірник. – К., 2003. – Вип. 49. – С. 3-9.

5. Грищенко О.М. Поширення та шкідливість бурякових довгоносиків / О.М. Грищенко // Цукрові буряки. – 2010. – № 4. – С. 15-17.

6. Суслик Л.О. Звичайний буряковий довгоносик / Л.О. Суслик // Карантин і захист рослин. – 2010. – № 2. – С. 11-12.

7. Методика исследований по сахарной свекле / [В.Ф. Зубенко, В.А. Борисюк, И.Я. Балков и др.]. – К.: ВНИС, 1986. – 292 с.

8. Методика випробування і застосування пестицидів / [С.О. Трибель, Д.Д. Сігарьова, М.П. Секун, О.О. Іващенко та ін.]; за ред. проф. С.О. Трибеля. – К.: Світ, 2001. – 448 с.

9. Доспехов Б. А. Методика полевого опыта (с основами статистической обработки результатов исследований) / Б.А. Доспехов. – [5-е изд., доп. и перераб.]. – М.: Агропромиздат, 1985. – 351 с.

Анотація

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

Сучасні інсектициди для обробки насіння цукрових буряків проти бурякових довгоносиків

У статті наведено результати щодо ефективності дії сучасних композицій інсектицидів за обробки насіння цукрових буряків проти бурякових довгоносиків. Для розширення асортименту інсектицидів та застосування їх у виробництві рекомендуються нові сучасні препарати.

Ключові слова*: цукрові буряки, звичайний буряковий довгоносик, сірий буряковий довгоносик, густота рослин, інсектициди, ефективність дії, урожайність*

Аннотация

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

Современные инсектициды для обработки семян сахарной свеклы против свекловичных долгоносиков

В статье приведены результаты эффективности действия современных композиций инсектицидов для обработки семян сахарной свеклы против свекловичных долгоносиков. Для расширения ассортимента инсектицидов та применения их в производстве рекомендуются новые современные препараты.

Ключевые слова: *сахарная свекла, обыкновенный свекловичный долгоносик, серый свекловичный долгоносик, густота растений, инсектициды, эффективность действия, урожайность*