

## BIOLOGICAL PREPARATIONS FOR APPLE PROTECTION FROM GREEN APPLE APHID IN SOUTH-WESTERN FOREST-STEPPE OF UKRAINE.

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**Abstract.** *The green apple aphids' biological peculiarities (Aphis pomi Deg.) were looked upon. The modern bioinsecticide's impact on the green apple aphid quantity was researched in South-Western Forest-Steppe of Ukraine. The efficiency of microbiological preparations against phytophag was set (65,0-89,7%). It was established that the preparation of Acharophyt had the highest efficiency against the green apple aphid, concentrate emulsion had the result 89,7% through 7 days after the third treating. The*

*The pesticides' multiyear usage came to the change of biological and ecological peculiarities and also the pests' etiology was the reason for the fundamental breach of agrocenosis' equilibrium. The insecticidal press impacts on the population's dynamics of pest and useful organisms, for the yield-forming and their quality. Simultaneously it comes to high level of soil's pollution, water sources, foods, which comes to the decrease state of health for population, infant mortality, decrease of life mortality [2].*

*The biological control is a way out of such situation. So the biological preparations have many advantages to the pesticides, so the choose of action and safety to entomofages and insects –*

*biological preparation's mix Koloradocide powder was in the norm 3 kg/ha and the solution Gaubsin was in the norm 10 l/ha. They have showed the excellent synergy and high impact on phytophag: 87,3% through 7 days after the third treating. The biological preparations' benefits were presented after their usage.*

**Keywords:** *protection, apple, green apple aphid, biological preparations, insecticides, environmentally friendly protection.*

*pollinators, small possibility for appearing insect's resistance to microorganisms, warm - blooded animals and man's safety, the absence of impact on product's quality, small term for waiting, the possibility for the different plant's vegetative stage, the absence for the saving of toxical matters in production and environment. That is why the biological preparations' areas usage against pests are constantly increased [4,8].*

*The biological preparations in comparison with chemical preparations have much lower efficiency, but they are more environmentally friendly, so their usage needs more attention. The biological preparations have been characterized by more delayed effect, but they have more medatacache effect and in some conditions*

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may cause the insect epizooty comparison with pesticides. It has also disadvantage that the biological preparations efficiency may be increased by the unfavourable weather conditions, rains, that can wash the preparation, lower temperature, which decrease the activity of pest's feeding, and by the ultraviolet ray which partly inactive bacterium [1,7,8].

The wide complex of biological preparations against pests are widely used, but they have different efficiency. So the range of biological preparations efficiency impacts on the green apple aphid (*Aphis pomi* Deg.) was researched, it's quantity is constantly increased and by the harmfulness takes one of the leading places among the pest of fruit plantations in South-Western Forest-steppe of Ukraine.

*The green apple aphid (Aphis pomi Deg.)* is the family *Aphididae*, order – *Hemiptera*. The larva and imago suck juice from the buds, populates the lower tip of leaves, green shoots and sometimes ovaries. The lesion leaves are curled and died. The shoots decrease in growth and bend. The fruits are shallow on the seriously damaged trees, the peel cracks on them very often. Parthenogenetic female is wingless with body length to 2mm, green, with yellow- black head, black cornicles, yellow antenna, 6-th segments, cornicles and black tail. The winged female distributor, dimension 1,8-2 mm, head, bosoms, antenna, legs and cornicles are dark colored, green abdomen with black spots, antennae 6 th segments yellow with dark top, with light brown-

blue. The oviparous female and wingless male, yellow- green or brownish- yellow color, tubules and tails are black, antennae 6-th segments, shin black legs are thickened, the female's length is 1,6 mm, male is 1,2 mm. The egg's length is 0,4-0,5 mm, viviparous are black, shine. The larva is green with red shine, eyes are red and cornicles are black. The impregnated eggs overwinter on the young shoots near the base of buds. The larvae resurrect and start to feed during the burst and budding. The winged female-distributors develop (since the third generation) during the summer period together with wingless females. They flew away and dwell new fodder plants. The female-sexupara appears in September-October. They resurrect from larva, which turns into oviparous females and males. The impregnated females gave 2-5 wintering eggs. The character of its development is minocyclic, monocyclic. It gives from 6 to 19 generations during the season [5,9].

**The purpose of researches** was to study the biological preparation's efficiency on the green apple aphid in South-Western Forest-steppe of Ukraine.

#### **Methods of research.**

The field researches for biological preparations against the green apple aphid (*Aphis pomi* Deg.) were made in 2014-2016 on the base of Ukrainian Scientific-Research Plant Quarantine Station Institute of Plant Protection National Academy of Agrarian Sciences of Ukraine, on the area of industrial garden by standard techniques [3,6].

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The area of research site is 0,4 ha. The record was made on 10 apple's leaves. The record was made on 5 recording trees. The action of insecticides effectivity was determined through 3,5 and 7 days. [6].

The insecticide's efficiency action was determined as per Henderson-Tilton calculations [6]:

$$E = 100 * (1 - (B * a / A * b));$$

where E – the preparation efficiency in the per cent decrease of pest's quantity;

A – the quantity of alive individuals on research site before treating;

B – the quantity of alive individuals on research site after treating;

a – the quantity of alive individuals in inspection before treating;

b – the quantity of alive in inspection after treating.

### **Research results.**

The system of apple's protection against green apple aphid is based upon three treatings by biological preparations in the following phenological phases: "mouse-ear", "rosebud" and fruit formation and development". The microbiological preparations impact was researched: Acharophyt (fungi *Streptomyces avermitilis*), concentrate emulsion in the scope 0,6 l/ha, Koloradocide (bacterium *Bacillus thuringiensis*, titer of viable cells not less than 7 billions CFU/g), powder (3kg/ha), Gaubsin (bacterium *Pseudomonas aureofaciens*, 5x10<sup>9</sup> cells/ml), solution (10 l/ha). The insecticide Kalipso 480 SC (thiacloprid), concentrate emulsion in the scope 0,3 l/ha was used as a reference.

The preparation Acharophyt (fungi *Streptomyces avermitilis*), concentrate emulsion in the norm 0,6 l/ha after first treating (the phenological phase "mouse-ear") through 3 days were low equals 54,4%. The following results were 64,4% through 5 days, 69,1 % were through 7 days. It is caused by the low day average air, temperature (6-8<sup>0</sup>C) and respectively microorganisms nonactivity. The efficiency after the second treatment consisted 64,7% through 3 days in phenological phase "rosebud". The following results were 74,8% through 5 days, 82,9% were through 7 days. As you see from the table, the preparation's activity impact on the population density of green apple aphid on the 7 th day after the second treating was higher on 13,8% by the corresponding indicators after the first treating, which confirms the much higher action with increasing of the average day temperature (to 15<sup>0</sup>C in average during the researcher's years). The efficiency of biological preparation consisted 73,8% through 3 days after the third treatment in the phenological phase "fruit formation and development". The following results were 89,3% through 5 days, 89,7% were through 7 days. These results were much higher than after the first treatment and on 6,8% higher than after the second treatment (table 1).

The preparation Koloradocide efficiency (bacterium *Bacillus thuringiensis*, titer of viable cells not less than 7 billions CFU/g), powder in the scope 3 kg/ ha after the first treating in the phenological phase "mouse-ear" was

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less 43.6% through 3 days. The following results were 56,9% through 5 days, 65,0% were through 7 days. The biological preparations efficiency consisted 57,8% through 3 days after the second spraying in the phenological phase “rosebed”. The following results were 67,9% through 5 days, 74,7% were through 7 days. They were on 9,7% higher than after the first

treating. The biological preparation activity efficiency consisted 51.2% through 3 days in phenological phase “fruit formation and development”. The following results were 62,1% through 5 days, 77,0% were through 7 days. It was much higher 12,0%, than after first treating and on 23% higher, than after second treating.

**The efficiency of microbiological preparations against the green apple aphid on the apple.  
(UkrSRSQP IPP NAAS, 2014-2016)**

Option	The quantity of treatments	Quantity of treatments*	Quantity, pcs/leaves (average by surfaces)				Technical efficiency, %			Yield, c/ha
			Before treating	Through 3 days	Through 5 days	Through 7 days	Through 3 days	through 5 days	through 7 days	
Inspection (water)		1	630	642	695	720	-	-	-	150
		2	286	295	310	320	-	-	-	
		3	231	253	269	280	-	-	-	
Etalon: Kalipso 480 SC, coefficient suspension	0,3	1	560	48	8	8	91,6	98,7	98,8	170
		2	280	29	15	15	90,0	95,1	96,8	
		3	230	37	6	6	85,3	97,8	97,8	
Achtarophyt, coefficient emulsion	0,6	1	280	130	110	99	54,4	64,4	69,1	167,2
		2	110	40	30	21	64,7	74,8	82,9	
		3	80	23	10	10	73,8	89,3	89,7	
Koloradocide, powder	3,0	1	400	230	190	160	43,6	56,9	65,0	163,5
		2	230	100	80	65	57,8	67,9	74,7	
		3	215	115	95	60	51,2	62,1	77,0	

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Gaubsin, solution.	10	1	660	370	290	250	45,0	60,2	66,9	164,3
		2	280	110	95	80	61,9	68,7	74,5	
		3	200	75	50	45	65,8	78,5	81,4	
Koloradocide, powder. + Gaubsin, solution.	3,0	1	820	450	310	249	46,1	65,7	73,4	166,5
	10	2	450	160	90	76	65,5	81,5	84,9	
		3	130	45	32	20	68,4	78,9	87,3	
L.S.D <sub>05</sub>										4,5

\*treatings were made in such phenological phases: 1-“mouse-ear”, 2-“rosebud” and 3-“fruit formation and development”

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Preparation Gaubsin (bacterium *Pseudomonas aurefaciens*,  $5 \times 10^9$  CFU/ml), solution in norm 10 l/ha after the first spraying in phenological phase “mouse-ear” showed the efficiency 45,0% through 3 days. The following results were 60,2% through 5 days, 66,9% were through 7 days. The biological preparations efficiency consisted 61,9% after the third spraying through 3 days in phenological phase “rosebud”. The following results were 68,7% through 5 days, 74,5% was through 7 days. It is more than 7,6 % higher than after first spraying. The biological preparation active efficiency consisted 65,8% through 3 days after the third spraying in the phenological phase “fruit formation and development”. The following results were 78,5% through 5 days, 81,4% was through 7 days. It was higher on 14,5 %, than after the first spraying and on the 6.9 % higher than after the second spraying.

The mix of preparations Koloradocide (bacterium *Bacillus thuringiensis*, titer of viable cells not less than 7 billions CFU/g) powder in norm 3 kg/ha and Gaubsin (bacterium *Pseudomonas auerofaciens*,  $5 \times 10^9$  CFU/ml), mixture in norm 10 l/ha were also mixed sprayed. The mix of the present biological preparations showed the synergy by the results of the proposed researches so the efficiency of the provided actions was consisted 46,1% through 3 days during the period of “mouse-ear”. The following results were: 65,7% through 5 days, and 74,3 % through 7 days. It is the highest indicator

among the biological preparations during the present period of vegetation. The efficiency of the present biological preparations mix consisted 65,5% through 3 days in the phenological phase “rosebud”. The following results were: 81,5% through 5 days, 84,9 % through 7 days. It is much higher on 11,5% than after the first spraying. The treating efficiency consisted 68,4% through 3 days in phenological phase “fruit formation and development”. The following results were 78,9% through 5 days, 87,3% was through 7 days. It is much higher on 2.4% than after first spraying and it is much higher on 13,9% than after second spraying.

The Kalipso insecticide’s effectivity action, coefficient suspension in the norm 0,3 l/ha against green apple aphid consisted 91,6% through 3 days. The following results were: 98,7% through 5 days, 98,8% through 7 days. The preparation efficiency consisted 90,0% through 3 days in phenological phase “rosebud”. The following results were 95,1% through 5 days, 96,8% through 7 days. It is lower on 2,0% than after the first sprayings. The insecticide’s effectivity action consisted 85,3% through 3 days in phenological phase fruit formation and development. The following results were 97,8% through 5 days, 97,8% through 7 days. It is higher on 1,0 % than after the first spraying and on 1,0% lower than after second spraying.

### Conclusions.

1. The preparation Acharophyt (fungi *Streptomyces avermitilis*),

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coefficient emulsion in the scope 0,6 l/ha showed the highest result in comparison with other biological preparations, the action's efficiency 89,7% through 7 days after third treatment and it consisted 82,9% after second treatment.

2. The preparation's Koloradocide efficiency (bacterium *Bacillus thuringiensis*, titer viable cells were not less than 7 billions CFU/g), powder in the scope 3 kg/ ha consisted 65,0% through 7 days after first spraying. The following results were 74,7% after second treating, 77,0% was after the third treating.

3. The preparation's Gaubsin efficiency (bacterium *Pseudomonas aureofaciens*,  $5 \times 10^9$  CFU/ml), solution in the norm 10l/ha through 7 days after the first treating consisted 66,9%. The

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following results were 74,5% after the second treating, 81,4% was after the third treating.

4. The biological preparations mix Koloradocide (bacterium *Bacillus thuringiensis*, titer viable cells not less 7 billions CFU/g) powder in the scope 3 kg/ha and Gaubsin (bacterium *Pseudomonas aureofaciens*,  $5 \times 10^9$  CFU/ml) in norm 10 l/ha showed the highest efficiency among the biological preparations during the “mouse-ear”. It happened during the decrease of protective measures 73,4% through 7 days after spraying at the low average air temperature (6-8<sup>0</sup>C). The preparation's efficiency action consisted 84,9% through 7 days after the second treatment and 87,3% after the third treating.

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## БИОЛОГИЧЕСКИЕ ПРЕПАРАТЫ ДЛЯ ЗАЩИТЫ ЯБЛОНИ ОТ ЯБЛОНЕВОЙ ТЛИ В ЮГО- ЗАПАДНОЙ ЛЕСОСТЕПИ УКРАИНЫ

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### Аннотация.

Приведены биологические особенности яблонево́й тли (*Aphis pomi* Deg.) и исследовалось влияние современных биоинсектицидов на её численность в юго-западной лесостепи Украины. Установлена эффективность микробиологических препаратов против фитофага (65,0-89,7%). Установлено, что наивысшую эффективность против яблонево́й тли показал препарат Актарофит, к.э., 89,7% – 7 дней спустя после третьей обработки. Смесь биопрепаратов Колорадоцид, п. в норме 3 кг/га и Гаубсин р. в норме 10 л/га показала синергетический эффект и высокое воздействие на фитофага: 87,3% после 7 дней спустя после третьей обработки. Предложены преимущества использования биологических препаратов.

**Ключевые слова:** защита, яблоня, яблонево́я тля, биологические препараты, инсектициды, экологически безопасная защита

## БІОЛОГІЧНІ ПРЕПАРАТИ ДЛЯ ЗАХИСТУ ЯБЛУНІ ПРОТИ ЗЕЛЕНОЇ ЯБЛУНЕВОЇ ПОПЕЛИЦІ В ПІВДЕННО-ЗАХІДНОМУ ЛІСОСТЕПУ УКРАЇНИ

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### Анотація.

Наведено біологічні особливості зеленої яблунево́ї попелиці (*Aphis pomi* Deg.) та досліджено вплив сучасних біоінсектицидів на її чисельність в Південно-Західному Лісостепу України. Встановлено ефективність микробиологічних препаратів проти фітофага (65,0-89,7 %). Встановлено, що найбільшу ефективність проти зеленої яблунево́ї попелиці показав препарат Актарофит, к.е.: 89,7% через 7 діб після третьої обробки. Суміш біопрепаратів Колорадоцид, п. у нормі 3 кг/га та Гаубсин, р. у нормі 10 л/га показала синергетичний ефект та високу дію на фітофага: 87,3% через 7 діб після третьої обробки. Наведено переваги від використання біологічних препаратів

**Ключові слова:** захист, яблуня, зелена яблунево́я попелиця, біологічні препарати, інсектициди, екологічно безпечний захист