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BIOLOGICAL AND CHEMICAL CONTROL OF CINARA JUNIPERI (JUNIPER APHID) INFESTING JUNIPERUS VIRGINIANA

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Abstract

This study provides a scientific analysis of biological and chemical control methods against Cinara juniperi, the main pest of Juniperus virginiana (Juniper aphid). The ecology of the pest, the damage it causes to trees, and the advantages and application methods of effective biological and chemical control measures are discussed in detail. The results highlight the importance of selecting environmentally safe and effective strategies for pest management, emphasizing the value of integrated approaches in controlling C. juniperi.

Keywords: Juniperus virginiana, Cinara juniperi, juniper aphid, biological control, chemical insecticides, pest management.

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Introduction

When addressing the issues of establishing green areas, parks, and avenues in urban and rural regions of the republic, it is essential to take into account the natural and geographical conditions of the area. Since each region is characterized by different environmental conditions, proper selection and placement of plant species used in landscaping are required. Considering the natural and geographical conditions of Uzbekistan, coniferous trees such as Juniperus virginiana, Juniperus sabina, pine, cypress, oriental arborvitae (Platycladus orientalis), western thuja (Thuja occidentalis), and spruce are widely used in landscaping. These coniferous trees are distinguished from other ornamental trees and shrubs by their high tolerance to heat, cold, and drought. In addition, coniferous trees and shrubs absorb noise, which is especially important in urban environments. Parks, gardens, and green spaces provide aesthetic pleasure and contribute to calming the human nervous system, a fact that has been scientifically confirmed by medical studies.

Juniperus virginiana is a tree species naturally widespread in North America and is extensively used in ornamental gardens and urban green spaces. However, this species is negatively affected by a number of pests, particularly Cinara juniperi (Juniper aphid). This pest damages the needles by sucking plant sap, leading to reduced growth rates and deterioration of the overall physiological condition of the trees. Therefore, identifying effective control methods against this pest and implementing them in practice is of great importance.

Bioecology and Damage Symptoms of (Cinara juniper). Cinara juniperi is an aphid species inhabiting juniper trees. During the egg and larval stages, it feeds on the sap of needles, causing significant damage. As a result, yellowing, drying, and shedding of needles are observed. Severe infestation reduces the resistance of trees to various environmental stress factors, which negatively affects their growth and development.

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Juniper Aphid – Cinara juniper. The juniper aphid (Cinara juniperi) primarily infests juniper branches and feeds on the sap of tree tissues. Female aphids are wingless, dark-colored, and reproduce parthenogenetically. Two dark longitudinal stripes are visible along the siphunculi. The body is pear-shaped, measuring 1.75–3.05 mm in length. The species overwinters in the egg stage. During the vegetation period, from April to September, it produces 3–4 parthenogenetic generations. In September–October, sexual forms (males and females) develop and lay overwintering eggs. From late April onward, juniper trees may suffer severe infestation. The presence of the pest can be identified based on the symptoms described above.

Research Methods

The studies were conducted using general entomological research methods. Pest population assessments were carried out before insecticide application and 1, 3, 7, 14 and 21 days after treatment. The efficacy of chemical preparations was calculated using the W.S. Abbott (1925) formula:

$$E = \frac{Ab - Ba}{Ab} x100$$

Where:

E – biological efficiency (%);
A – number of pests in the treated variant before application;
a – number of pests in the treated variant after application;
B – number of pests in the control variant before application;
b – number of pests in the control variant after application.
During observations conducted in 2025–2026 in the city of Tashkent.

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Results

Qibray district of Tashkent region, inspections of cultivated Juniperus virginiana trees revealed infestation by three aphid species. These included Cinara juniperi, the peach large trunk aphid (Pterochloroides persicae Chol.), and the poplar aphid (Chaitophorus populet L.). As a result of damage caused by these pests, yellowing, darkening, and shedding of juniper needles were observed.

Early spring control of aphids, during the initial stage of plant growth, was found to be the most effective approach. High efficacy was achieved when appropriate protective agents were applied. Experiments on the use of the entomophagous insect Chrysopa carnea Steph. against aphids were conducted using specialized biological control methods.

Table 1 Efficiency of the green lacewing entomophage (Chrysopa carnea Steph.) against juniper aphids (Cinara pinea Mordv.)

(Laboratory experiments, 2025–2026)

Treatments	Entomophage ratio	Average number of aphids per 10 cm shoot (ind./shoot)				Biological efficiency, %		
		Before release	After release (days)					
			3	7	14	3	7	14
Chrysopa carnea Steph.	1:5	1427,5	470,1	437,3	398,2	75,2	82,3	86,6
	1:10	1340,8	711,3	670,2	517,6	60,1	71,1	81,5
	1:15	1052,7	605,6	456,2	472,1	56,7	67,4	78,5
	1:20	2596,1	2300,3	2145,5	1874,1	33,3	52,3	65,4
Confidor, 20% EC	0,3 l/ga	3956,5	1720,5	1222,4	390,5	67,3	82,1	95,2
Control (untreated)	-	1651,4	2196,3	2861,3	3451,4	-	-	-
$LCD_{05=}$						4,8	3,6	3,4

Based on experiments carried out under laboratory conditions, the date are shown in Table 1, the release of green lacewing larvae (Chrysopa carnea Steph.) at a ratio of 1:5 (entomophage: aphid) resulted in a biological efficacy of 75.2% on day 3, 82.3% on day 7, and 86.6% on day 14 compared to the control. When released at

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a 1:10 ratio, efficacy reached 60.1% on day 3, 71.1% on day 7, and 81.5% on day 14. At a 1:15 ratio, biological control achieved 56.7% on day 3, 67.4% on day 7, and 78.5% on day 14. The lowest efficacy was observed at a 1:20 ratio, with 33.3% on day 3, and 52.3–65.4% on days 7 and 14, respectively.

In the standard chemical treatment with Confidor 20% EC applied at 0.3 L/ha, biological efficiency reached 67.3% on day 3 and 82.1–95.2% on days 7 and 14.

Similarly, in additional trials, various microbiological and chemical control agents were tested against juniper aphids. The microbiological agent Fitoverm 5% (Avetsectin C) was applied at two doses (0.3 and 0.4 L/ha) compared to the control. At 0.3 L/ha, efficacy was 53.5% on day 7 and 68.3–81.3% on days 14 and 21, respectively. At 0.4 L/ha, efficacy reached 40.3% on day 7, 73.6% on day 14, and 90.3% on day 21.

The chemical agent Enjio 24.7% EC was applied at two rates (0.3–0.4 L/ha) and evaluated over 14 days. At 0.3 L/ha, efficacy was 48.1% on day 3, 88.4% on day 7, and 87.0% on day 14. At 0.4 L/ha, efficacy reached 58.9% on day 3, 83.8% on day 7, and 93.2% on day 14. For Confidor 20% EC, two doses (0.2–0.3 L/ha) were tested. At 0.2 L/ha, efficacy was 71.5% on day 3 and 90.3–92.3% on days 7 and 14, while at 0.3 L/ha, efficacy reached 85.3% on day 3 and 93.0–98.3% on days 7 and 14. Finally, in the standard treatment with Bagira 20% EC at 0.3 L/ha, biological efficiency was 64.6% on day 3 and 92.3–96.2% on days 7 and 14 (see Table 2).

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Table 2 Biological efficacy of Fitoverm 5% against juniper aphids on Juniperus virginiana

(Qibray District, Tashkent Region; working solution 1000 L/ha, applied using Rubin MM-909 motorized sprayer, 2025–2026)

Treatment (preparation)	Dose, L(kg)/ha	Average number of aphids per 10 cm shoot, (ind./shoot)				Biological efficiency, %		
		Before application	After application (days)					
			7	14	21	7	14	21
Control	-	13,2	14,4	15,1	15,4	-	-	-
Fitoverm, 5% (Avetsectin C)	0,3	13,8	7,0	5,0	3,0	53,5	68,3	81,3
	0,4	16,9	11,0	5,1	1,9	40,3	73,6	90,3
Treatment (preparation)	Dose, L(kg)/ha	Before application	After application (days)			Biological efficiency, %		
			3	7	14	3	7	14
Enjio, 24,7% EC,	0,3	10,6	6,0	1,4	1,6	48,1	88,4	87,0
	0,4	11,4	5,1	2,1	0,9	58,9	83,8	93,2
Confidor, 20% EC.	0,2	10,0	3,1	1,1	0,9	71,5	90,3	92,3
	0,3	10,0	1,6	0,8	0,2	85,3	93,0	98,3
Bagira, 20% EC (standard)	0,3	20,5	7,9	1,8	0,9	64,6	92,3	96,2
$LCD_{05=}$						1,0	2,11	0,7

Field experiments conducted in Tashkent city during 2025–2026 evaluated the efficacy of the microbiological preparation Fitoverm, 5% (Avermectin C) against aphids in virgin arch crops at two application rates, compared to an untreated control. When applied at 0.3 L/ha, the preparation exhibited 38.0%, 55.4%, and 77.5% efficacy at 7, 14, and 21 days after treatment, respectively. At a higher rate of 0.4 L/ha, efficacy increased to 42.3% on day 7, 63.6% on day 14, and 89.3% on day 21. In the standard treatment, Tayfun Plus, 10% WP, applied at 0.6 kg/ha, demonstrated 61.3% efficacy on day 3 and 87.9–95.7% on days 7 and 14 (Table 3).

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Table 3. Effect of Microbiological Preparation Fitoverm 5% on Aphids
(Tashkent city, using Rubin MM-909 motorized sprayer, working solution 1000 L/ha, 2025–2026)

Treatment (preparation)	Dose,L (kg)/ha	Average number of aphids per 10 cm shoot, (ind./shoot)				Biological efficiency, %		
		Before application	After application (days)					
			7	14	21	7	14	21
Control	-	35,2	24,7	29,4	32,9	-	-	-
Fitoverm, 5% (Avetsectin C)	0,3	43,8	19,1	16,3	9,2	38,0	55,4	77,5
	0,4	56,9	23,0	17,3	5,7	42,3	63,6	89,3
Treatment (preparation)	Dose, L(kg)/ ha	Before application	After application (days)			Biological efficiency, %		
			3	7	14	3	7	14
Tayfun plyus, 10 % WP (standard)	0,6	47,5	12,9	4,8	1,9	61,3	87,9	95,7
LCD_{05}=						4,2	3,11	3,7

Chemical Control Methods

Chemical insecticides allow for rapid and effective reduction of pest populations. The chemical preparations used against Cinara juniperi on Juniperus virginiana include:

– **Neonicotinoids:** Preparations such as imidacloprid are considered effective in reducing aphid infestations.

– **Pyrethroids:** Insecticides based on permethrin and cypermethrin are widely used.

– **Botanical Insecticides:** Juniper oil and other plant extracts with insecticidal properties are being applied and are considered a potential alternative to conventional chemical insecticides worldwide.

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When using chemical preparations, it is recommended to carefully determine the dose and timing of application. Additionally, to prevent pest resistance, rotational use of different modes of action is advised.

Conclusion

The integrated application of biological and chemical methods is effective in controlling the main pest of Juniperus virginiana, Cinara juniperi. Biological methods provide environmentally safe and long-term protection, while chemical insecticides help to quickly and precisely reduce pest populations. The results of the study indicate that an integrated pest management approach represents the most optimal strategy for pest control in this case.

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