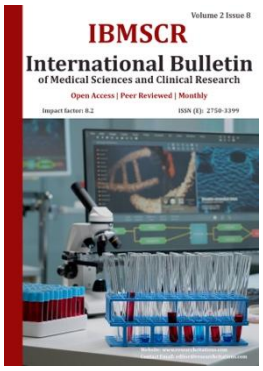

SELECTION OF EFFECTIVE INSECTICIDES FOR THE MANAGEMENT OF WILLOW LEAF BEETLE (PLAGIODERA VERSICOLORA LAICH.) AND EVALUATION OF THEIR EFFICACY

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Annotatsiya: Ushbu maqolada tol daraxtlarini zararlovchi asosiy zararkunandalardan biri hisoblangan tol bargxo‘ri (plagiodera versicolor laich)ning bioekologiyasi va fenologik rivojlanishi, zararkunandaga qarshi samarali insektisidlarni tanlash va ularning ta’sirchanligini aniqlash hamda ularning miqdorini boshqarish jihatlari o‘rganiladi, Tadqiqot natijasida ushbu zararkunandalarga qarshi kimyoviy preparatlarni qo‘llashning sarf me’yorlari va eng qulay qarshi kurashish davrini belgilash hamda bu borada zarur tavsiyalar ishlab chiqishga ilmiy asos yaratadi.

Kalit so‘zlar: Plagiodera versicolor, tol bargxo‘ri, tol biotsenozi, insektitsid, fenologiya, populyatsiya, manzarali daraxtlar.

Аннотация: В данной статье изучены биоэкологические особенности и фенологическое развитие ивового листоеда (Plagiodera versicolor Laich), являющегося одним из основных вредителей ивовых деревьев, а также вопросы подбора эффективных инсектицидов против данного вредителя, определения их биологической эффективности и регулирования численности популяции. По результатам исследования создана научная основа для определения оптимальных сроков борьбы, норм расхода химических препаратов против вредителя и разработки соответствующих практических рекомендаций.

Ключевые слова: Plagiodera versicolor, ивовый листоед, ивовый биоценоз, инсектицид, фенология, популяция, декоративные деревья.

Abstract: This article investigates the bioecological characteristics and phenological development of the willow leaf beetle (Plagiodera versicolor Laich), which is considered one of the major pests of willow trees. The study also focuses on the selection of effective insecticides against the pest, determination of their biological efficacy, and regulation of pest population density. The research findings provide a scientific basis for determining the optimal control period, application rates of chemical insecticides, and the development of practical recommendations for effective pest management.

Keywords: Plagiodera versicolor, willow leaf beetle, willow biocenosis, insecticide, phenology, population, ornamental trees.

Introduction. Willow trees (*Salix* spp.) are valuable ornamental, protective, and economically important tree species that play a significant role in both natural ecosystems and human activities. They contribute substantially to ecological stability by reducing soil erosion, conserving water resources, and supporting environmental sustainability. However, the

principal pests affecting willow plantations under the conditions of Uzbekistan have not been comprehensively studied. Therefore, research in this area is of considerable scientific and practical importance. Among the most destructive pests of willow plantations in Uzbekistan is the willow leaf beetle, *Plagiodera versicolora* Laich. In addition to Uzbekistan, this species is distributed throughout Central Asia, southeastern regions of Russia, Siberia, western China, and Iran. It is considered one of the most serious pests of willow trees and occurs not only in valley and oasis ecosystems but also in mountainous regions at elevations of up to 2,000 meters above sea level. The willow leaf beetle preferentially attacks physiologically weakened trees and causes severe damage to young seedlings and shrubs propagated from cuttings. Under heavy infestation, affected trees may decline and die within two to three years. Infested trees can be readily distinguished from healthy ones by the characteristic feeding traces and larval damage visible on the leaves.

Effective management of this pest requires the implementation of chemical control measures based on established economic threshold levels. The success of chemical control is influenced by several biological and ecological characteristics of the pest, including its life cycle, morphology, bioecology, adaptability to environmental conditions, and ability to produce multiple generations within a single growing season. In some cases, insecticides acting primarily through ingestion are ineffective against piercing-sucking pests, whereas systemic insecticides can provide effective control of both chewing and sucking insect species.Considering these challenges, the present study was conducted to evaluate the biological efficacy of selected chemical insecticides against the willow leaf beetle under the conditions of Uzbekistan and to identify effective options for its management.

Materials and Methods. The study was conducted during 2023–2025 in several regions of Uzbekistan, including the districts of O‘rtachirchiq, Qibray, and Ohangaron in Tashkent Region; Sirdaryo, Boyovut, and Sayxunobod in Sirdaryo Region; Kitob District in Kashkadarya Region; and the territory of the Botanical Garden in Tashkent City. Field observations were carried out in areas where willow (Salix spp.), poplar (Populus spp.), and elm (Ulmus spp.) trees were affected by leaf beetle infestations.The study sites were selected based on differences in climatic conditions and pest population densities. Observations covered the entire developmental cycle of the willow leaf beetle, beginning with emergence from overwintering sites and continuing through the egg, larval, pupal, and adult (imago) stages. Particular attention was given to assessing the influence of climatic factors on pest development and population dynamics. During the monitoring period, ecological conditions specific to each study area were taken into account, and separate assessments were conducted for each location.

Initially, a comprehensive survey was carried out to evaluate the distribution of host tree species and the extent of damage caused by the willow leaf beetle. Pest population density and economic threshold levels were determined, and an integrated management strategy was subsequently developed. In practical pest management, decisions regarding insecticidal applications were based on the established Economic Threshold Level (ETL), with chemical treatments being recommended when pest populations reached or exceeded the threshold capable of causing economically significant damage.

Results and Discussion. Under the conditions of the Republic, willow leaf beetles cause significant damage to willow plantations. Studying the bioecology of these pests and implementing control measures during their most favorable developmental stages provides

effective results. One of the key factors in improving the productivity of ornamental trees is the timely and high-quality implementation of protection measures against pests and diseases.

The abundance of pests on different willow species was found to be 2.2 and 2.0 times higher, respectively, compared to Salix fragilis (crack willow). By the end of the third ten-day period of June, corresponding to the completion of the first generation of the leaf beetle, the level of leaf damage on basket willow and rough willow reached up to 60.4%. In contrast, leaf damage on smooth willow under the influence of the first generation was relatively low, accounting for 5.0%. At the end of the development of the second generation, nearly all leaves in the upper parts of rough and elongated willow trees were damaged, with damage levels reaching 67.4% and 76.1%, respectively. In *Salix babylonica* (weeping willow), the proportion of damaged leaves was comparatively lower, recorded at 57.2%. In order to further expand the results of the study, comprehensive investigations were conducted in different biocenoses to assess the population dynamics and distribution levels of Plagiodera versicolora Laich., as well as the extent of plant damage caused by this pest.

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Figure 1. Damage caused by the willow leaf beetle (Plagiodera versicolora Laich.) on willow trees
(Botanical Garden of Tashkent City, 2023–2025)

In the conducted experiments, the insecticides SAFEGOR 40 EC (emulsifiable concentrate, dimethoate) at a rate of 0.8 L/ha and Espero SC (suspension concentrate, 200 + 120 g/L, imidacloprid + alpha-cypermethrin) at a rate of 0.2 L/ha were tested against Plagiodera versicolora Laich In the SAFEGOR 40 EC treatment, biological efficacy reached 36.3% on the 3rd day after application, 66.2% on the 7th day, and 81.8% on the 14th day.

In the Espero SC treatment, biological efficacy was 34.2% on the 3rd day, 62.2% on the 7th day, and 80.9% on the 14th day after application.

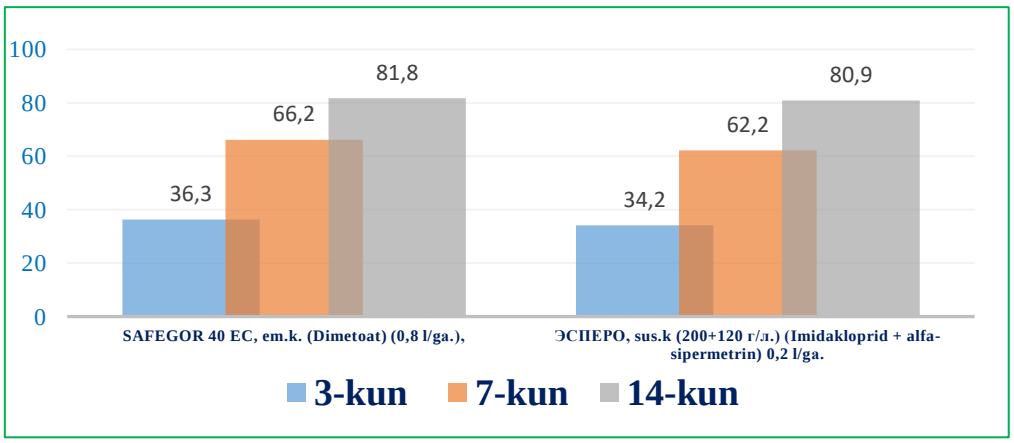

Figure 2. Biological efficacy of chemical insecticides against willow trunk pests under field conditions (Tashkent Region, 2023–2025).

Based on the obtained data, the economic threshold level (ETL) of pest populations was determined for 2023, and a pest management strategy was developed. In production practice, chemical treatments against pests are applied depending on the average ETL. For instance, when 2–3% of willow leaves are damaged by the willow leaf beetle, immediate chemical control measures are required.To identify effective control measures against the willow leaf beetle, field experiments were conducted during the vegetation period of willow trees. In order to monitor the abundance of overwintered adults, one branch (3–5 cm in width) from each of the four sides of 10 model trees in the experimental plot was selected, and adhesive tape (sticky side facing outward) was firmly attached to the branches. The adhesive tapes were replaced every two days. The number of willow leaf beetles trapped on the sticky tapes from each monitored branch was counted, and their population density was determined. The optimal timing for chemical application was identified as the period when oviposition occurred and hatching from eggs had begun.

In the experiment, the insecticides Avirmec EC (abamectin) at a rate of 1.0 L/ha, Aktinara 240 SC (thiamethoxam) at 0.15 L/ha, and Nurell-D 66% EC (cypermethrin + chlorpyrifos) at 0.6 L/ha were applied against the leaf beetles.he application of chemical insecticides against leaf beetles was carried out in accordance with the methodological guidelines published under the editorship of Sh.T. Khojaev.The experimental evaluation of chemical control agents against leaf beetles was conducted under field conditions. Observations and assessments were carried out on the 7th, 14th, and 21st days after treatment. Biological efficacy was calculated using Abbott's formula.

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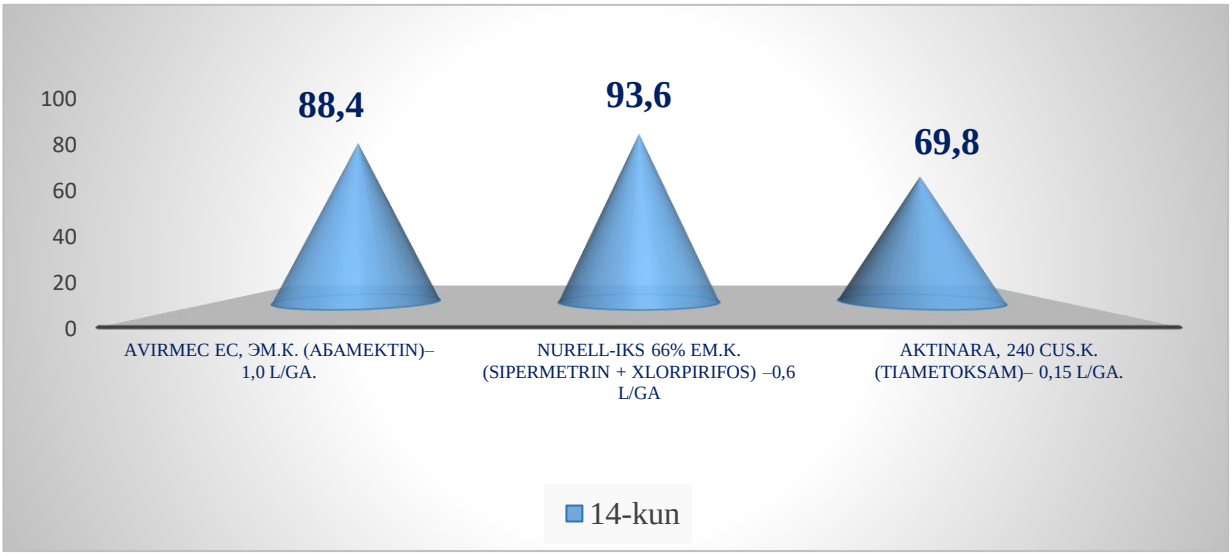

Figure 3. Biological efficacy of insecticides applied against leaf beetles (Kitob District, Kashkadarya Region, 2022–2023)

The application rates of the insecticides that showed high efficacy in small-plot field trials against the willow leaf beetle were selected and subsequently re-evaluated under large-scale production trials.

In conclusion, among the chemical insecticides tested against leaf beetles on willow trees, Avirmec EC and Nurell-D 66% EC demonstrated high efficacy, while Aktinara 240 SC showed comparatively lower effectiveness. It is recommended to apply Avirmec EC and Nurell-D 66% EC at the specified application rates.

Also, when chemical insecticides such as Safegor 40 EC (emulsifiable concentrate) at 0.8 L/ha and Espero SC (200 + 120 g/L) at 0.2 L/ha were applied against Plagiodera versicolora Laich. on willow trees at the above-mentioned application rates, a biological efficacy of 80.9–83.8% was achieved.

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