

## WESTERN CONIFER SEED BUG (*LEPTOGLOSSUS OCCIDENTALIS* H.) – A THREAT TO CONIFER PLANTATIONS IN UKRAINE

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### Stiurko M. Western conifer seed bug (*Leptoglossus occidentalis* H.) – a threat to conifer plantations in Ukraine

Coniferous plants play a vital role in park and forest plantations, both in our country and around the world. However, the areas dedicated to these plants are decreasing each year. They face numerous environmental threats and human activities, such as deforestation, destruction of parks and reserves, and the impact of pests and diseases, all of which diminish their quality. Harmful insects are among the biggest threats to both natural and artificial plantings, as their mass reproduction can lead to significant damage to the flora. Invasive insect species, in particular, pose a serious risk due to their adaptability, rapid reproduction, and ability to invade new territories, which can harm existing plant species.

One such invasive pest is the western conifer seed bug (*Leptoglossus occidentalis*), which was introduced to Eurasia from the Americas. Unfortunately, it is not listed as a harmful organism in Ukraine's quarantine regulations concerning plant health. This pest is atypical for coniferous vegetation in our region, yet it has managed to establish itself across the entire country due to its remarkable adaptability. The western conifer seed bug feeds on more than 40 species of coniferous plants, targeting young and mature cones and causing complete or partial destruction of seeds. Access to high-quality, viable seeds is crucial for establishing young plantations and ensuring the ability of forests to self-renew. A shortage of healthy seedlings can negatively impact the ecological functions of forest and park areas. The aim of our research was to document the presence of the western conifer seed bug in Lviv region and to determine the number of productive generations it has each year. We found that the pest has expanded its habitat and feeding range into the western Forest Steppe of Ukraine, and it had not been previously recorded in Lviv region. Currently, studies on the characteristics and impacts of the western conifer seed bug are insufficient, and there are no established recommendations for measures to prevent its mass proliferation. Therefore, the challenge of protecting and preserving productive coniferous tree plantations remains unresolved.

**Keywords:** pest, insect, invasive species, damage, western conifer seed bug, *Leptoglossus occidentalis* H., pine, coniferous plants, forest, biodiversity.

### Стюрко М. Сосновий насіннєвий клоп (*Leptoglossus occidentalis* H.) як загроза для хвойних насаджень України

Хвойні рослини – незамінна частина паркових та лісових насаджень нашої країни й усієї планети. Та з кожним роком території під їх розміщення зменшуються. Вони постійно підлягають впливу різних факторів навколишнього середовища і людської діяльності: вирубка лісів, знищення парків та заповідників, а шкідники і хвороби знижують якість рослин. Виявлено, що шкідливі комахи суттєво впливають на кількість та видовий склад рослин. Вони, мабуть, одні з найбільших ворогів природних і штучних насаджень. Так, у період масового розмноження шкідливих комах пошкодження рослин може становити значну частину насаджень. А інвазійні види комах особливо шкідливі. Інвазійні види відрізняються високою адаптацією та пристосованістю до умов навколишнього середовища та активно розмножуються, захоплюючи нові території й завдаючи шкоди існуючим видам рослин.

Зауважено, що сосновий насіннєвий клоп (*Leptoglossus occidentalis* H.) є інвазійним шкідником, який завезли на континент Євразія з американських континентів. На жаль, він не зарахований до переліку шкідливих організмів України «Про карантин рослин», які становлять загрозу для рослинних насаджень. Це нетиповий шкідник для хвойної рослинності нашої території. Але за рахунок високої здатності до адаптації він уже заселив усю площу країни. Сосновий насіннєвий клоп завдає шкоди більше ніж 40-ка видам хвойних порід рослин. Комаха харчується молодими і зрілими шишками, знищуючи повністю або частково насіння. Отримання якісного, повноцінного насіння є важливою складовою у створенні молодих насаджень та самовідновлювальній здатності лісів. Неотримання одночасних і повноцінних сходів негативно впливає на опірну функцію лісових і паркових масивів. Метою наших досліджень було зафіксувати наявність соснового насіннєвого клопа на території Львівської області та визначити кількість продуктивних поколінь, які комаха дає за рік. Встановлено, що шкідник розширив свій ареал проживання та харчування до західного Лісостепу України. У Львівській області сосновий насіннєвий клоп не фіксували раніше. Сьогодні вивчення особливостей та характеру шкодочинності комахі недостатні. З огляду на це немає рекомендацій щодо заходів захисту для запобігання масового розмноження шкідника. Тому проблема захисту й збереження продуктивних насаджень хвойних порід дерев залишається невирешеною.

**Ключові слова:** шкідник, комаха, інвазивний вид, пошкодження, сосновий насіннєвий клоп, *Leptoglossus occidentalis* H., сосна, хвойні рослини, ліс, біорізноманіття.

**Problem statement.** Parks and forests are constantly exposed to various environmental factors, which in turn lead to significant reductions in the areas they cover: people cut down forests, parks, and nature reserve areas of our country, while pests and diseases reduce the quality of plants. This negatively affects the biodiversity of natural ecosystems, leading to a direct reduction in biodiversity. Harmful insects are a significant factor affecting the number and species composition of plants; they are among the biggest enemies of both natural and artificial plantings. During periods of mass reproduction of harmful insects, plant damage can account for a large percentage of the total volume of plantings. Invasive insect species are particularly harmful, as native plants are not adapted to these pests, and people lack experience in combating them when protecting plantations [8].

#### Analysis of recent research and publications.

An invasive species is an alien species of plants or animals that was introduced to a given area accidentally or intentionally, has adapted to environmental conditions, and actively reproduces, capturing new territories and causing harm to existing native species [3; 12]. To date, no more than 40 % of the planet's natural ecosystems have survived as a result of the spread of species recognized as invasive. The biodiversity of ecosystems is declining, and natural, typical plant species for each region are being lost [5].

Neighboring countries within the European Union have established regulations to prevent and manage the introduction and spread of invasive alien species, which includes a designated list of such species [19]. Our country is actively monitoring harmful organisms [18]. At the state level, there exists an approved list of regulated pests that comprises over 200 species [13]. Unfortunately, there is currently no legislative framework addressing invasive harmful insects that significantly impact plants and the overall biodiversity of Ukraine.

In recent decades, Ukraine has witnessed the emergence and rapid spread of a new pest affecting coniferous plantations. The western conifer seed bug (*Leptoglossus occidentalis* H.), belonging to the *Coreidae* family, was first identified and described in California, USA. Its original habitats spanned from Mexico to Canada [4]. However, the bug's area of impact has continued to expand year by year. It entered Eurasia from the Americas at the close of the 20th century and was first recorded in northern Italy in 1999.

The spread of the bug was facilitated by passive dispersal due to uncontrolled transportation of lumber without proper phytosanitary control; the use of uncertified planting material without adequate inspec-

tion; and various residues of coniferous plants. Additionally, the insect's ability to cover long distances by flight contributes to its spread [17]. Such pest dispersals are very difficult to control, especially for insects that are highly prolific.

**Setting the task.** Based on a review of literature sources and the results of our own research, the author aims to record the presence of the western conifer seed bug (*L. occidentalis* H.) in Lviv region and determine the number of productive generations that the insect has per year.

*Presentation of the main material.* In 2010, the pest was first recorded in Ukraine near the city of Simferopol and in the neighboring Zaporizhzhia region. In 2011, the bug expanded its range to Dnipropetrovsk and Donetsk regions [4].

In Lviv region, the pest was recorded for the first time during an inspection of garden, park, and forest plantations for the presence of insect pests in 2023. In the area of Zhovkva Forestry Department in Lviv region, the presence of the western conifer seed bug (*L. occidentalis* H.) was detected in Scots pine plantations. The pest was found in a mass population (imago and nymphs), which may indicate the expansion of this species in this area in previous years (Fig. 1, 2).

The western conifer seed bug typically completes its life cycle in one generation per year within its original habitats. However, as it expands its range into warmer regions such as Mexico, it is capable of developing in three generations annually. In southern Europe, the western conifer seed bug has been observed to undergo two generations per year [4].



Fig. 1. Larva, that conifer seed-eating

For overwintering, the western conifer seed bug favors old buildings, unoccupied spaces, balconies, attics, as well as fallen bark, dead wood, and bird nests.

This preference significantly enhances its ability to survive winter. The adults, or imagos, hibernate in aggregations and can emerge on sunny, warm winter days to feed as early as January. Notably, on January 28, 2025, when daytime temperatures reached +13 °C, active western conifer seed bugs were sighted in Zhovkva district of Lviv region (Fig. 3). Therefore, on such warm days, these insects leave their winter sites to feed, thereby prolonging their detrimental impact on plants.



*Fig. 2. Imago and larva, that conifer seed-eating*



*Fig. 3. Imago*

The female lays eggs in rows on pine needles, attaching them with adhesive substances from her secretions (fig. 4). Development lasts 5 weeks. Nymphs resemble the imago and go through five stages of development (fig. 5). Egg-laying by the insect does not occur simultaneously but over a period of two to three weeks. Therefore, during the development of

the pest in one generation, one observes different stages of its development [16]. Imago, the western conifer seed bug, size is 14–20 mm (fig. 6).



*Fig. 4. Oviposition (eggs rind after larvae hatch)*



*Fig. 5. Larva*



*Fig. 6. Imago*

Both adult insects and nymphs feed on young and mature cones. While feeding, the bug pierces the cone shells with its proboscis to reach the seeds. Enzymes secreted by the bug dissolve the contents of the seed's endosperm, which the bug then consumes. Feeding on seeds during their early development can lead to their loss, while in mature seeds, it can result in hollowness and deformity. This ultimately results in a decrease in the seed material necessary for producing young seedlings or the creation of malformed seeds that fail to germinate. Germination is a critical indicator of seed quality, and pest feeding can severely diminish it [2]. Securing high-quality, viable seeds is essential for the successful establishment of young plantations and the production of healthy, robust seedlings [7; 9]. Breeders focused on developing new plants or enhancing the characteristics of existing ones cannot work with low-quality, poorly filled seeds [1;15]. Without viable, healthy seeds in these plants, the self-renewing function of coniferous plantations and self-seeding forests could be entirely lost [10; 11].

Seed losses due to bug damage can reach 70 % or more [6]. Scientists have calculated that one western conifer seed bug can destroy 310 seeds in its lifetime. Thus, with mass reproduction of the pest, seed losses account for a significant percentage, affecting subsequent young plantings. The bug also transmits the pathogen illness diplodia of the pine, caused by a fungus of the genus *Diaporthe* (*Diaporthe pinea*) and of the genus *Lecanosticta* (*Lecanosticta acicola*).

To control reproduction of the western conifer seed bug and its destruction, it is necessary to fully study the biology of the insect, understanding that there are complications of distribution in nature that favorably affect the spread of the pest in this habitat. It is essential to remember that harmful organisms have a high adaptive capacity to adjust to environmental conditions due to mutations caused by the exchange of genetic material with related species living in the area.

However, information on monitoring the presence and development of the pest in Ukraine by state authorities is currently unavailable. Information about the spread of the western conifer seed bug is obtained through monitoring conducted by specialists from educational and scientific institutions in Ukraine, specifically from the Department of Genetics, Breeding, and Plant Protection at Lviv National Environmental University. It is crucial to understand that timely detection of the pest is an integral component in developing methods and measures for the successful protection of plantations from this pest, which will allow for controlling or minimizing its mass development.

When monitoring the spread of the pest in the Western Forest-Steppe of Ukraine, in Zhovkva district of Lviv region, the development of the insect was recorded as occurring in one generation per year.

The study of the characteristics and nature of the harmfulness of the western conifer seed bug is currently insufficient. Consequently, there are no recommendations for implementing protective measures to prevent mass reproduction. The question arises as to how to control the development of the pest in forest plantations, given that the area of coniferous forests can reach tens of square kilometers or more.

In forest plantations, some scientists believe that a biological method of protection against the western conifer seed bug will be the most promising [14]. In the world, researchers are studying and testing natural enemies, entomophages, and parasitic egg-laying wasps – *Gryon pennsylvanicum*, *Anastatus pearsalli*, and *Ooencyrtus johnsoni*, which are known parasites of the imago and larvae of the bug, such as the tachinid fly – *Ectophasia crassipennis*.

**Conclusions.** Ongoing control of the development and spread of the western conifer seed bug (*L. occidentalis* H.) is crucial. It is imperative to establish pest protection measures at the state level to safeguard productive coniferous tree plantations. Collaborating with scientists from various countries would greatly enhance our ability to gather knowledge and expand information resources in this field. Without decisive action to manage or potentially eradicate pest populations in specific areas, the risk of losing a wide array of coniferous tree species - extending beyond national borders - remains a significant concern.

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