

## TROPHIC CONNECTIONS OF ENTOMOFAUNA-DENDROBIONTS IN FOREST-STEPPE AGROLANDSCAPES OF UKRAINE

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Визначено втрати різноманіття ентомофауни агроландшафтів Лісостепу України, які становлять біля 40% відомих раніше видів, що в минулому мали статус константних і домінуючих, внаслідок дії несприятливих екологічних чинників стали малочисельними та є першим кроком до їх зникнення. Отримані дані свідчать, що під впливом змін клімату та антропогенного навантаження на довкілля в ентомофауні дендробіонтів Північного Лісостепу відбуваються істотні зміни. Досліджено трофічні зв'язки комах-дендробіонтів з видами деревних та чагарникових насаджень агроландшафтів Лісостепу. Проведена оцінка щільності ентомокомплексу в різних за флористичним складом біотопах.

**Ключові слова:** біорізноманіття, ентомофауна, дендробіонти, трофічні зв'язки, агроландшафти.

It is known that agrolandscapes make up about 80% of Ukraine. That's because biodiversity countries represented mainly agricultural biodiversity in general, which is dominated by insects. Insects account for up to 75% of biota species, their total biomass exceeds the biomass of all other animals, and therefore they have a major role in maintaining ecological stability of agro-landscapes. Only 1% of insects are considered by humanity to be pests and for nearly 100 years they are conducting a crushing chemical struggle with them. However, almost all of the entomofauna of agrolandscapes falls under the chemical press, which leads to further depletion of biodiversity and environmental degradation [1].

According to the estimation in the scientific literature the insect fauna of Ukraine in the twentieth century counted from 25 to 35 thousand species. Real kind of the biodiversity of fauna of Ukraine is unknown because the register of the defined species has not been created yet. Nowadays it is unknown how many insect species are there in the agricultural landscapes left [2].

The aim of research was to study trophic relations of entomofauna of dendrobionts in agricultural landscapes of forest-steppe zone of Ukraine.

The research was carried out in the agrolandscapes of the forest-steppe zone of Ukraine in certain areas of Vasylkivsky and Fastivsky districts of the Kyiv region.

Places of records were areas of ecosystems of different nature: agrocenoses of winter wheat,

rape, clover, trees and bushes, herbal vegetation in semi-natural ecotones, soil environment.

The collection of entomofauna was carried out according to the recommended methods once in 7–10 days in stationary areas. The most common method of collecting insects was mowing with entomological slash. For exhausting small insects (for example, aphids and other herbivores) an exhaustor or suction device was used. There were analyzed the species richness, abundance of populations of different types of insects-dendrobionts and their trophic bonds. There was determined the taxonomic membership of biological assemblies by using entomological determinants [3–7].

The study of the entomological diversity of agrolandscapes was carried out on the vital form of dendrobionts of constant and dominant insect species. There were used proven and recommended methods for field and laboratory research [8].

The analysis of the status of entomological diversity showed that the number of insects-herbivores of woody and shrub plantages decreased from 854 to 480 species. Such data indicate that impoverishment is 374 species or 44% of insects-dendrobionts in the agrolandscapes of the Northern Forest-steppe of Ukraine, which in the past had the status of constants and dominant, as a result of adverse environmental factors became small, which is the first step towards their disappearance. The obtained data testify that because of the influence of climate change and anthropogenic loading on the environment there are

significant changes in the entomofauna of the dendrobionts of the Northern Forest-steppe. Against the background of the restructuring of the taxonomic structure of the entomocomplex, the species richness has decreased markedly.

The species composition of the entomofauna of forest bands is very diverse and is larger compared with adjacent fields. This is due to the large variety of food objects, a milder and more stable microclimate, etc. In the forest bands and their grassland plots, there are species that poorly tolerate soil plowing [9–13].

The study of the connection between botanical families of tree and shrub plantations with the number of insects-dendrobionts is presented in the Figure 1. The given data indicate that the existing diversity of species of wood species is not able to fully ensure the types of agricultural biodiversity presented in the literature by place of residence and trophic resources [14]. Of the 854 presented in the literature, only 325 species can live here, which is 38% of the total. This is a very low indicator, on the basis of which we can

speak about the necessary forest logging not only to preserve biodiversity and prevent further loss of it, but also to reproduce it.

According to route studies, among family trees and shrubberies for trophic bonds with different types of insects, in the agrolandscapes of the Forest-Steppe of Ukraine, there are 14 dominated plant families. The structure of families of tree and shrub landings associated with trophic chains with the number of insects-dendrobionts species is presented on the Figure 2. The most of species were found in such families as: Fagaceae (*Quercus robur* L., *borealis* Michx (*Q. rubra* Du rei) — 96 species of insects), Betulaceae (*Betula pendula* Roth, *pubescens* Ehrh., *Alnus incana* L. Moench — 91), Salicaceae (*Populus italica* (Du Roi) Moench, *Nigra* L., *Salix alba* L., *Caprea* L. — 82), Rosaceae (*Pyrus communis* L., *Ussuriensis* Maxim, *Malus sylvestris* Mill., *Padus serotina* Ehrh. Ag., *Cerasus avium* (L.) Moench — 72 species of insects).

The connection of botanical families of woody and shrub plantations with the number of species of insects-dendrobionts of the agrolandscapes of the forest-steppe is shown in Fig. 2.

From the given data it is seen that four botanical families were found to be dominant, which in total provide food for about 341 species of insects. It is established that the number of species exceeds the total number of species found by us because many types of insects from different families are associated with trophic chains with several botanical families. For example, the species of insects of the family *Lepidoptera* are fed by plants of the family *Aceraceae*, *Betulaceae*, *Corylaceae*, *Fagaceae*, *Salicaceae*, *Ulmaceae*, *Hippocastanaceae*, *Elaeagnaceae*, *Tiliaceae*, *Olaeaceae*, *Rosaceae*, and others.

In the course of our research, we evaluated the entropy of the density of dendrobionts in different habitats of the agrolandscape. The obtained data is presented in the Table. 1. It has been established that the diversity of tree and shrub plantings in combination with herbaceous vegetation positively influence the number of entomocomplexes.

In agrolandscapes, migratory flows of entomofauna are in close correlation with the structure of facies. It means that the seasonal migrations of ladybugs, buck bugs, leaf beetles and other insects begin and end in the fall.

Quantity of species of insects

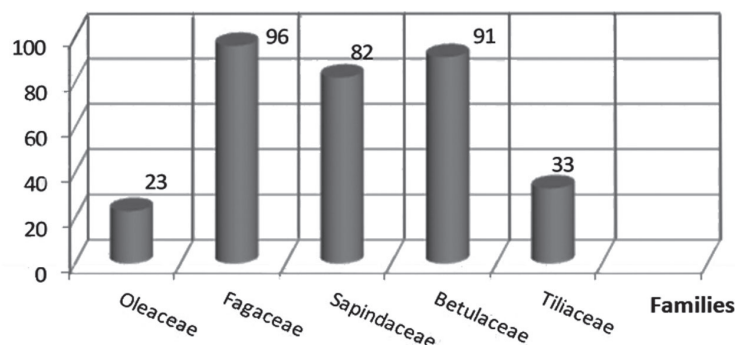


Fig. 1. Connection of botanical families of woody and shrub plantations with the number of insects-dendrobionts

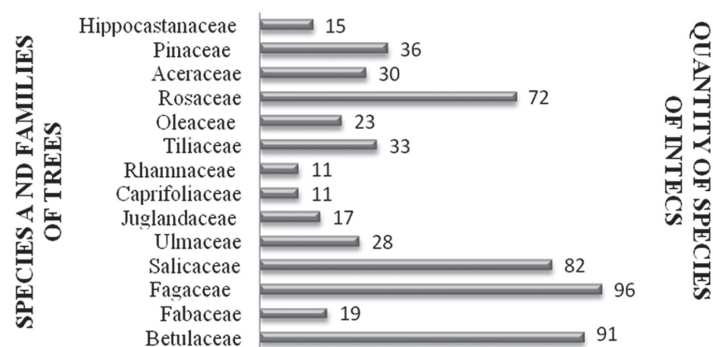


Fig. 2. How botanical family tree and shrub plantings of the number of species of insects-dendrobionts of Kyiv region

Table 1

**Density of entomofauna of dendrobionts in the studied agrolandscape  
of Danylivka, Vasylkivsky District**

<b>Biotopes</b>	<b>Insects-dendrobionts, individuals</b>
The forest stripes are planted with oak, hazel, hawthorn, wild rose, poplar	85±1,8
The white forest strip (oak, willow) is covered with bean grass	120±5,5
Oak wood strip with wide edges	55±1,5
Abandoned garden	80±2,2
Birch forest belt	60 ± 2,0
Seeds: – Clover – Wheat winter – Tymofiyivka (seed field)	60±2,2 20±1,6 25±2,1
Fell around the young oak stripe	40 ± 1,6
Fell near the old, white forest strip with oak	35 ± 1,5
Natural phytocenosis	200 ± 17.5

In the blooming variety of germs entomofauna finds additional nutrition, as well as nesting of insects pollinators. The plundering of natural cenosis leads to the complete destruction of ecotope data and, as a consequence, the suppression of the number of useful biota.

Therefore, the search of the necessary feed makes the insects distributed in the territory in accordance with the distribution of feed resources and occupies different ecological niches in the biotopes. The placement of insect species on the territory is largely due to the nature of the chains and feeding cycles. Certain plants attract certain types of insects, and the latter in turn — their parasites and predators. Trophic bonds of insects can cause not only the density of their placement, but also the nature of migrations beyond the habitat.

Consequently, in order to prevent further loss of agrobiodiversity, it is necessary to bring the floristic biodiversity of afforestation to the recommended level. Forest bands will be able to fully ensure the existence, development, migration of insects, if their species composition is brought to a scientifically grounded level of diversity of tree and shrub breeds and to combine them among themselves into a single system. For this purpose, the forest belt needs to be transformed into connecting territories that can provide links between different habitats, which will result in the integrity of the ecological network. Their main function will be to support the processes of reproduction, exchange of gene pools, migration of species, distribution

of species in adjacent territories, experience of unfavorable conditions, hiding, maintaining ecological balance.

### CONCLUSIONS

1. It is analyzed that the existed variety of species of wood species is not able to fully provide the types of agricultural biodiversity presented in the literature by place of residence and trophic resources. Of the 854 presented in the literature, only 325 species can live here, which is 38% of the total. This is a very low indicator, on the basis of which we can speak about the necessary forest logging not only to preserve biodiversity and prevent further loss of it, but also to reproduce it.

2. As a result of the research, it was found that four botanical families were found to be the dominant ones, which in total provide food for about 341 species of insects. It is established that the number of species exceeds the total number of species found by us because many types of insects from different families are associated with trophic chains with several botanical families.

3. In order to preserve the entomological diversity, it is expedient to replenish agrolandscapes with a network of semi-natural ecosystems — anthropogenic ecotones created by the elimination of low-yielding land cultivation. In order to increase the ecological efficiency, local networks of anthropogenic ecotones with the help of beltland ecotones should be combined with the elements of the National Ecological Network of Ukraine.

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## АНАЛІЗ УПРОВАДЖЕННЯ ПРОЦЕДУРИ СЕРТИФІКАЦІЇ ЛІСІВ НА ТЕРИТОРІЇ УКРАЇНИ

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Нині лісова сертифікація вирішує значно ширший спектр питань розвитку лісового сектора у світі. Йдеться не тільки про запобігання незаконному вирубуванню лісів, а й про гармонізацію екологічних, економічних та соціальних аспектів ведення лісового господарства, що є складовою частиною організації лісового господарства. Для України це є об'єктивною необхідністю. Тому сертифікація має бути обов'язковим інструментом державного регулювання цієї сфери для поліпшення лісокористування, економічного розвитку лісового господарства, зміцнення лісових підприємств на внутрішніх ринках продукції і проникнення на зовнішні.

**Ключові слова:** лісове господарство, лісокористування, сертифікація, організація, лісове підприємництво.

Погіршення стану лісів в Україні є однією з найбільших еколого-економічних проблем. Окрім того, що ми є чи не найбільшим експортером деревини в Європі, в зелених зонах регулярно працюють браконьєри, які вирубують ліси та незаконно їх продають. За 2016 рік лісова охорона виявила 6565 випадків незаконних рубок. Сума заподіяної шкоди лісу становить

84,7 млн грн, які зафіксовані в державних лісгоспах [1]. Через брак коштів держава не може відновити зруйновані та знищені території лісових земель. Вирубки лісів та недосконале управління лісгосподарською діяльністю призводять до катастрофічного зменшення площі лісів.

Проблемами сертифікації лісових земель займалися Г.В. Бондарчук, П.В. Кравець,