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**ECOLOGICAL ANALYSIS OF THE INTRODUCTION AND DISTRIBUTION OF
DOMINANT AND INVASIVE INSECT SPECIES IN THE ZIZIPHUS BIOCECENOSIS**

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Abstract. This article provides an ecological analysis of the distribution of dominant and invasive species in the agrocenosis of the *Ziziphus jujuba* plant. The dominant and invasive species found in the *Ziziphus jujuba* agrocenosis are classified into three ecological groups based on their introduction and adaptation characteristics, and their distribution is analyzed.

Keywords: *Ziziphus jujuba*, insect, pest, ecology, group, *Carpomyia vesuviana*.

Introduction. Studying the patterns of insect introduction and adaptation in gardens and other biocenoses created by humans serves as a basis for preventing various problems in fruit and vegetable cultivation. The primary factor in the ecological adaptation of insects in the *Ziziphus* biocenosis depends on the species' specific internal and external characteristics. For example, feeding in the biocenosis under particular climatic conditions, using plants as habitat and food, and, for some species, using soil at certain developmental stages are of particular importance. According to ecological patterns, the introduction of new insect species that have not previously occurred in the *Ziziphus* biocenosis results in the migration of other organisms in the food chain, including microorganisms (pathogens), mites, and insects. Observations show that with the acclimatization of the *Ziziphus* plant, many local phytophagous insects migrated from other biocenoses and adapted to this plant. For example, in *Ziziphus* biocenoses imported from China, polyphagous and monophagous insects, including armored scales, leaf chewers, *Ziziphus* fruit flies, and other phytophages, gradually appeared, which in turn contributed to the formation of populations of predators feeding on them, such as green lacewings (*Chrysopidae*), syrphid flies (*Syrphidae*), ladybird beetles (*Coccinella septempunctata*), mites (*Phytoseiulus persimilis*, *Amblyseius swirkii*, *Amblyseius ackenziei*, *Neoseiulus californicus*), and parasitoid entomophages of the southern warehouse moth during *Ziziphus* fruit storage, belonging to the *Braconidae* family (*Bracon hebetor* Say, *Bracon yuglandis* Ashm) [1; p.132].

From this point of view, dominant and invasive species occurring in the *Ziziphus* biocenosis can be conditionally divided into the following ecological groups based on their introduction and adaptation characteristics.

The first ecological group consists of monophagous insects that feed exclusively on *Ziziphus*, such as the *Ziziphus* fruit fly and incomplete *Ziziphus* fruit fly. These species form highly stable populations in the *Ziziphus* biocenosis because they feed only on *Ziziphus* fruit. Therefore, they quickly enter new *Ziziphus* biocenoses in their distribution areas and exhibit phytophagous adaptation characteristics. The first of these insects, the *Ziziphus* fruit fly (*Carpomyia vesuviana* A Costa), is distributed in Uzbekistan, Tajikistan, Turkmenistan, the Caucasus region, Italy, Yugoslavia, Turkey, Afghanistan, Pakistan, India, China, and Thailand. Multiple larvae can develop in a single *Ziziphus* fruit. The second species, *Carpomyia* incomplete, is found in Italy, Spain, Egypt, Sudan, and Ethiopia but does not occur in Uzbekistan [2; p.37, 3; p.312]. Both species belong to the order *Diptera* and feed exclusively on *Ziziphus* fruit during the larval stage. Therefore, they enter the *Ziziphus* biocenosis after the plant begins to flower and fruit, forming strong populations and causing significant yield damage. These species are considered dominant.



They expand their range naturally and can spread via rooted *Ziziphus* seedlings and infested fruits.

The second ecological group consists of polyphagous insects that feed on *Ziziphus* and several other plant species, forming stable populations. This group includes insects of the order Hemiptera, family Diaspididae (armored scales) in Uzbekistan, such as California red scale (*Diaspidiotus perniciosus*), purple scale (*Parlatoria oleae* Colvee), Turon scale (*Diaspidiotus prunorum*), apple-shaped scale (*Lepidosaphes ulmi* Lin.), and jiyda-shaped scale (*Lepidosaphes turanica* Arch.). These species form more stable populations compared to other scales.

These scales damage stems, branches, fruits, and leaves of dozens of plant families besides *Ziziphus*, including apple, date, walnut, olive, pomegranate, rose, apricot, cherry, peach, and many others. Predation by ladybirds and green lacewings on scale larvae has been observed.

Worldwide, pest species of the order Diptera, family Tephritidae, cause significant damage to *Ziziphus* orchards, both in natural and cultivated conditions. Globally, six phytophagous Diptera species have been recorded in the *Ziziphus* biocenosis. Two of these are monophagous, as mentioned above. The remaining four are polyphagous and have not been recorded in Uzbekistan, but there is a risk of their introduction. Among polyphagous species, the most widespread is the Mediterranean fruit fly (*Segatatis saritata* Wiedemann), native to southern Morocco, now spread to Yugoslavia, Greece, Austria, Australia, Switzerland, Italy, Portugal, France, Czechoslovakia, Germany, Africa, Australia, South America, and Oceania [4; pp.251-285, 5; pp.231-252].

These six insect species belong to the order Diptera, family Tephritidae – fruit flies, and enter the *Ziziphus* biocenosis after the plant begins flowering and fruiting. Five species – guava fruit fly (*Bactrocera correcta*), oriental fruit fly (*Bactrocera dorsalis*), Mediterranean fruit fly (*Ceratitis capitata*), Natal fruit fly (*Ceratitis rosa*), and incomplete *Ziziphus* fruit fly (*Carpomyia incompleta*) – do not occur in Uzbekistan, but their introduction and polyphagous nature could form large and stable populations in different biocenoses, posing a serious risk as invasive species in plant quarantine and threatening agricultural stability.

The second ecological group also includes quarantine insects of plants not found in Uzbekistan, such as two armored scales (Diaspididae, Hemiptera): red citrus scale (*Aonidiella orientalis*) and mulberry scale (*Pseudaulacaspis pentagona*); three soft scales (Coccidae): Japanese wax scale (*Ceroplastes japonicus*), Indian wax scale (*Ceroplastes ceriferus*), and large eulecanium scale (*Eulecanium gigantea*); the brown marmorated stink bug (*Halyomorpha halys* Stal, Miridae, Hemiptera); Japanese beetle (*Popillia japonica*, Scarabaeidae, Coleoptera); and moths (Lepidoptera), such as the false codling moth (*Thaumatotibia leucotreta*, Gelechiidae) and fall webworm (*Hyphantria cunea* Drury, Arctiidae).

The third ecological group consists of polyphagous insects that use *Ziziphus* and several other plants for food and habitat, forming unstable populations and not harming biocenosis formation. This group includes some soft scales in Uzbekistan, the white rose chafer (*Oxythyrea funesta*), bees, squash bees, ants, root feeders, and leaf feeders.

Conclusion. Thus, dominant and invasive species occurring in the *Ziziphus* biocenosis can be divided into three ecological groups based on their introduction and adaptation characteristics. The first group consists of monophagous insects feeding only on *Ziziphus*. The first of these is the *Ziziphus* fruit fly (*Carpomyia vesuviana* A Costa), which occurs in Uzbekistan and other countries where *Ziziphus* grows. Multiple larvae can develop in a single fruit. The second species, *Carpomyia incompleta*, does not occur in Uzbekistan, and its introduction must be prevented.

The second ecological group includes polyphagous insects feeding on *Ziziphus* and many other plant species. Many species in this group are not present in Uzbekistan, belong to plant



quarantine, and their introduction would pose a serious threat to the biocenosis. These species also expand their range naturally and can spread via rooted *Ziziphus* seedlings and infested fruits during import and export processes. Therefore, compliance with plant quarantine regulations is required to prevent their introduction and spread.

The third ecological group includes insects that do not harm the formation of *Ziziphus* and other plant biocenoses.

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