THE ROLE OF COCCINELLIDS IN AGRICULTURE

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Abstract:

This article analyzes the ecological and economic importance of insects belonging to the Coccinellidae family (lady beetles) in agriculture. Coccinellids serve as natural bioagents against plant pests such as aphids, thrips, and other small insects. The paper highlights their biological characteristics, reproductive cycles, and potential applications in biological pest control systems. Recommendations for maintaining and increasing their populations in agroecosystems are also provided.

Keywords:

Coccinellids, biological control, natural enemies, plant pests, aphids, thrips, bioagents, agroecosystem, entomophages, agriculture, beneficial insects, ecological balance.

Introduction:

Protecting agricultural crops from pests, diseases, and weeds plays a crucial role in preserving yield and producing high-quality products.

At present, global scientific and technological advances, along with best agricultural practices, have proven that high biological and economic efficiency in plant protection can only be achieved through the application of integrated pest management systems.

In our region alone, during the growing season of cotton, 217 species of insects and mites cause damage. To combat the main types of these pests, biological control measures are implemented annually on an average of 5.5 million hectares of cotton fields. The area protected by biological methods is increasing year by year. For example, between 1999 and 2002, biological control methods covered 6.7 million hectares, including the use of Trichogramma against eggs of autumn cutworms and cotton bollworms on 11 million hectares, Bracon against cotton bollworms on 2 million hectares, and lacewings against aphids and spider mites on 700 thousand hectares, all with high effectiveness.

These measures not only limit the damage caused by pest insects and spider mites but also help preserve beneficial organisms in nature, promote their mass reproduction, and protect the environment from chemical pollution. Nevertheless, chemical pesticides still play a significant role in controlling major pests of cotton and other agricultural crops.

Main Part:

Alongside the advantages of commonly used chemical preparations, they also have notable drawbacks. In particular, most pesticides destroy beneficial organisms along with harmful insects and spider mites, negatively affect human health, and cause environmental pollution. Currently, it is possible to treat cotton, cereal crops (wheat, maize), vegetables, and melon fields 2–2.5 times using such products. By utilizing mechanized production lines for rearing entomophages, the volume of produced biological agents can be increased by 5–10 times.

When discussing beneficial insects in agriculture, it should be noted that biological pest control methods are based on the use of natural enemies of harmful organisms and microbiological preparations. Natural enemies of arthropods are classified according to their feeding habits into entomophages (insect feeders) and acariphages (mite feeders). In practice, the biological method is applied by artificially rearing and releasing specific predators and parasites in areas where pest outbreaks are likely to occur.

There are two main approaches to the large-scale use of entomophages: the first involves identifying and effectively utilizing local species, while the second involves introducing aggressive species from other regions (introduction) and adapting them to local conditions.

Natural enemies of pests may exhibit parasitic or predatory behavior. Parasites may be internal (endoparasites), such as Trichogramma and Apanteles, which develop inside their hosts, or external (ectoparasites), whose larvae feed externally on the host. Predatory entomophages, such as lacewings, coccinellids, and parasitic wasps, differ from parasites in that they kill their prey quickly rather than gradually.

As mentioned above, by mass-rearing local species of parasites and predators in laboratory conditions (biofactories) and releasing them into infested fields, it is possible to maintain pest insect and mite populations at economically harmless levels. In Uzbekistan's biological laboratories, three main biological control agents are produced: Trichogramma, Bracon, and lacewings. Trichogramma is used against noctuid moth eggs, while Bracon, as a polyphagous predator, is used against both sucking and chewing pests.

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Trichogramma is an insect belonging to the order Hymenoptera, the superfamily Chalcidoidea, and the family Trichogrammatidae. Approximately 100 species of Trichogramma are known worldwide, of which 12 species have been identified under the conditions of Uzbekistan. Trichogramma survives by laying its eggs inside the eggs of insects belonging to various families.

The adult Trichogramma is about 0.5 mm in size, and females are larger than males. The development period from egg to adult lasts on average 10–15 days. Therefore, while a pest insect produces one generation, Trichogramma can produce 2–3 generations.

Trichogramma is mainly mass-reared on the eggs of the grain moth, as this pest reproduces very rapidly and is convenient for use in 14–15 continuous (flow) production cycles per year. Trichogramma can lay one or several eggs into a single moth egg. The entire developmental cycle of the parasite takes place inside the host egg until the winged adult emerges.

The parasite is released into fields either in the form of parasitized eggs or as adults, usually by manual labor. In the future, this process may be carried out using special

devices such as tractors or deltplanes; research in this direction is ongoing. Due to its high reproductive capacity, good adaptation to ecological conditions, and high effectiveness, attempts to mass-rear this parasite artificially were already made in the 1930s. After the 1970s, with the establishment of biological laboratories and biofactories, it became possible to use this method against noctuid pests infesting cotton and other crops.

At present, Trichogramma is successfully used in biological control programs against the eggs of various noctuid moths. For this purpose, species of Trichogramma that are well adapted to the extreme climatic conditions of Uzbekistan are selected and mass-produced.

An industry for mass production of Trichogramma has been established in Uzbekistan. Currently, more than 700 biological laboratories and biofactories operate across the regions of the republic. The products manufactured in these facilities are sufficient to treat all protected crop areas 7–7 times (repeated applications) during a single growing season.

Application of Green Lacewings (Family Chrysopidae):

Green lacewings belong to the order Neuroptera and the family Chrysopidae. Species of this family are widely distributed in Europe, Asia, Africa, and the Americas. At present, 24 species have been identified in Central Asia, 33 species in Azerbaijan, and 15 species in Kazakhstan.

Under the conditions of Uzbekistan, the species composition of lacewings, as well as the bioecological characteristics of the most widespread and promising species, have been studied by A. K. Mansurov, F. M. Uspenskiy, O. Sh. Yuzbashyan, and others.

Conclusion:

Ladybird beetles (Coccinellidae) have a rounded body shape with a dome-shaped dorsal surface; the underside and elytra are smooth and convex. Their eggs are yellow, relatively large, and elongated in shape. Beetles of the family Coccinellidae lay their eggs in clusters on various parts of plants near aphid colonies.

The predatory larvae that hatch from the eggs feed primarily on aphids. Newly hatched larvae remain for a short time clustered on the egg shells and, once they locate aphids, immediately begin feeding on them.

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