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"APPLICATION OF INNOVATIVE TECHNOLOGIES IN THE MANAGEMENT OF THE POMEGRANATE FRUIT MOTH

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Annotation. This article highlights the biological characteristics of the pomegranate fruit moth (*Euzophera punicaella* Mooz), the damage it causes, as well as traditional and advanced methods of control. Information is provided on the advantages of pheromone technologies, biological agents, and integrated protection systems. Research results indicate that the use of advanced technologies not only increases productivity but also ensures ecological safety.

Keywords. Fruiter, pest, *Ezophera punicaella*, pomegranate, entmophagus, IPM.

Introduction. Pomegranate (*Punica granatum* L.) is one of the valuable fruits that has long attracted the attention of mankind. In Uzbekistan, pomegranate cultivation has been developing rapidly in recent years and is becoming an export-oriented industry. However, in this process, pests, especially the pomegranate fruit fly (*Ezophera punicaella* MOOZ), have a significant negative impact on productivity. According to research, the pest sometimes causes up to 30-40 percent of crop losses. Therefore, the use of effective and environmentally friendly methods against pests is an urgent issue.

Pomegranate is one of the important export fruits in the agriculture of Uzbekistan. Although the volume of pomegranate cultivation has been increasing in recent years, its productivity is greatly damaged by pests, especially the pomegranate fruit fly (*Ezophera punicaella* MOOZ). The larvae of this pest develop inside the fruit, causing rot and a decrease in its quality.

Traditional methods include collecting and destroying infected fruits, maintaining gardens based on agrotechnical measures, and using chemical preparations. However,

since chemical control methods pose a threat to the environment and human health, advanced, environmentally friendly technologies are currently being introduced.

Among biological methods, the use of entomophages such as Trichogramma is effective. Also, entomopathogenic fungi such as Beauveria bassiana and Metarhizium anisopliae are used to reduce the pest population.

Pheromone technologies have become widespread in recent years. Effective control is carried out by monitoring with pheromone traps, determining population density, and disrupting the mating of insects through the mating disruption method.

An integrated pest management system (IPM) ensures high efficiency by combining biological, agrotechnical, and pheromone methods. As a result, the use of chemicals is reduced, and crop quality and export potential increase.

Many researchers (Tauber et al., 2000; Richards, 2018; Ibragimov, 2020) have noted the advantages of using these methods. In Uzbekistan, a number of research institutes are also conducting experiments on the practical implementation of biological and pheromone technologies against the pomegranate fruit fly. In general, the use of advanced technologies serves to protect pomegranate crops, ensure environmental safety, and increase competitiveness in international markets.

Using advanced technologies in the fight against the pomegranate fruit borer. Pest biology and damage. The larvae of the pomegranate fruit borer feed on the inside of the fruit. Their latent development makes it difficult to detect them early by external signs. The larvae eat the fruit seeds, accelerate the decay process and sharply reduce the consumer and export quality of the fruit. This not only increases the yield, but also increases economic damage.

Limitations of traditional control measures. For many years, agrotechnical measures (collecting and destroying damaged fruits, plowing the soil) and chemical preparations have been used in pomegranate cultivation. Although chemical methods provide short-term effectiveness, they have a number of disadvantages:

The formation of resistance in the pest. Accumulation of pesticide residues in the crop and the environment. Negative impact on the ecosystem and beneficial insects.

Therefore, in recent years, there has been increasing attention to new approaches based on biological and innovative technologies

(Table 1).

Advanced technologies

Fighting method	Application form	Advantages	Disadvantages
Agrotechnical activities	Collecting damaged fruits, plowing the soil	Simple, inexpensive, no additional tools required	Only partially effective, does not kill all larvae
Chemical agents	Spraying insecticides	Fast acting, highly biologically effective	Residues remain in the fruit, posing an environmental hazard
Biological methods	Trichogramma, entomopathogenic fungi	Provides environmentally safe, sustainable results	Effectiveness depends on climate and conditions
Pheromone technologies	Traps	Reduces population, allows monitoring	May require high cost
IPM (Integrated Pest Management)	Biological + pheromone + agrotechnology	Reduces the use of chemicals, is effective	Requires a systematic approach and constant monitoring

Biological agents: Entomophages: Insects of the Trichogramma genus parasitize the eggs of the pest and are its natural controllers.

Entomopathogenic fungi: microorganisms such as Beauveria bassiana, Metarhizium anisopliae infect larvae and significantly reduce the population.

Pheromone technologies

Pheromone traps - used to monitor population numbers, determine the flight period of the pest and assess the level of damage.

Mating disruption - using pheromones, it limits the meeting of male and female insects and stops the reproduction process.

Integrated pest management (IPM)

Agrotechnical measures, biological methods and pheromone monitoring give high results when used together. IPM dramatically reduces the use of chemicals and forms an environmentally friendly and sustainable protection system.

Post-harvest technologies, storage of fruits in cold storage, separation and processing of damaged fruits, these measures serve to preserve the quality of pomegranates for a long time and expand export opportunities.

Discussion. The advantage of using advanced technologies is that they increase the quality and quantity of the crop, ensure environmental safety and allow the production of products that meet international standards. For example, Tauber et al. (2000) emphasized the importance of using biological enemies in the IPM system. Richards (2018) notes that the widespread introduction of pheromone technologies is an important tool for sustainable control of insect populations. Uzbek scientists (Ibragimov, 2020; Karimov, 2019) are also conducting scientific research in this direction.

Conclusion. The use of advanced technologies in the fight against the pomegranate fruit borer pest gives effective results. The use of biological agents, pheromone technologies and the IPM system, along with crop protection, forms an environmentally friendly production system in pomegranate growing. This serves to expand not only the domestic market, but also international export potential.

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