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BIOLOGICAL AND CHEMICAL PROTECTION PRODUCTS FOR ORCHARDS

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Abstract: His study explores the application of biological and chemical protection products in orchard management, focusing on their roles in controlling pests, diseases, and weeds. Biological protection methods, including biopesticides, beneficial microorganisms, and natural predators, offer environmentally friendly alternatives that enhance ecological balance and sustainability. In contrast, chemical protection products such as fungicides, insecticides, and herbicides provide rapid and effective control of harmful organisms, ensuring crop productivity and quality. The paper emphasizes the importance of integrating both approaches within an Integrated Pest Management (IPM) framework to achieve optimal results. Special attention is given to reducing environmental impact, minimizing chemical residues, and improving long-term orchard health. The findings suggest that a balanced use of biological and chemical methods can significantly increase yield, maintain fruit quality, and support sustainable agricultural practices.

Keywords: Biological protection; Chemical protection; Orchard management; Biopesticides; Integrated Pest Management (IPM); Sustainable agriculture; Pest control; Fungicides; Insecticides; Herbicides; Crop productivity

Introduction. Orchards play a vital role in global agriculture by supplying fruits essential for human nutrition and economic development. However, orchard systems are highly

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susceptible to a wide range of pests, diseases, and weeds. Traditionally, chemical protection products have been widely used to control these threats due to their immediate effectiveness. Nevertheless, excessive reliance on chemical inputs has raised concerns regarding environmental pollution, human health risks, and the development of resistance in pests.

In recent years, biological protection methods have gained increasing attention as sustainable alternatives. These approaches utilize natural organisms and substances to suppress harmful species while maintaining ecological balance. The integration of biological and chemical methods represents a promising strategy for modern orchard management.

To effectively combat garden pests, it is first necessary to take into account their number and level of danger. To do this, at least 30 trees are inspected in each garden during the summer and winter (15 along the diagonal). The branches of each tree are carefully observed, and the number of sucking and gnawing insects and mites on them is counted. To count the apple worm, the main trunk of at least 10 trees is cleaned of loose bark, and the number of worms and larvae that have settled in the cracks is determined. The collected bark is burned. It is under these trees that soil samples are taken from 4 sites at a depth of 5-10 cm and an area of 50 cm, sieved, and the larvae and larvae of the pests in them are counted. The number of sucking insects (aphids, scale insects, etc.) is counted in cuttings cut 20-30 cm long.

Based on the information obtained, the economically dangerous number (IXS) of pests for the current year is determined and a plan to combat them is drawn up.

Main chart. Biological Protection in Orchards. Biological protection involves the use of living organisms or natural compounds to control pests and diseases. Key components include:

Biopesticides: Derived from natural materials such as plants, bacteria, and minerals. Examples include Bacillus thuringiensis and neem-based products.

Beneficial insects: Predators and parasitoids, such as lady beetles and wasps, that naturally reduce pest populations.

Microbial agents: Fungi, bacteria, and viruses that target specific pathogens or pests.

Advantages of Biological Protection:

- Environmentally safe and biodegradable;

- Reduced risk of resistance development;

- Minimal impact on non-target organisms.

Limitations:

- Slower action compared to chemical products;

- Sensitivity to environmental conditions;

- Higher cost in some cases.

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In production, treatment should be carried out according to the average economic number (ECN). For example, when 2-3% of apple fruit is damaged by maggots or 5 maggots are found on one tree; when 2-5 mites or their eggs are found on one leaf; when 5 aphids are found on one leaf; when 2-3% of fruit is damaged by California scale insects; when 200-300 apple maggot eggs are found on 2 m of apple tree trunk; when chemical control measures are urgently needed.

Figure-1. Biological and chemical protection products for orchards

Garden pest control measures are carried out during the development periods of fruit trees.

1. After harvesting, when the air temperature drops to 10 ^{0}C, the tied belts are collected and dried in boiling water to collect and count the apple worm and other pests. The thick branches and main trunk of the trees are cleaned of loose bark and whitewashed with 20% lime water. The orchards are cleaned of dead trees and varieties severely damaged by pests. The land is cultivated and plant residues are removed.

2. In the spring, before the worms awaken, when the average daily air temperature is not lower than +4 ^{0}C. To destroy aphid eggs, California and other scale insects, mites, apple aphids, and overwintering worms of fruit sheath moths, fruit trees are sprayed on clear, rainless days with a 2-3% working solution of 60% nitrofen paste, or, if not, with the use of petroleum emulsion No. 30 at the rate of 40-100 l per hectare.

All boxes used during harvesting and fruit storage facilities are wet disinfected or disinfected with sulfur dioxide.

3. Measures to be taken during the budding period. As a mechanical control measure, tying retaining belts to the main trunk and thick branches of trees against apple worms and moths is effective. Phosphorus organophosphates and peritroid preparations are used against leaf-eating moths, aphids, shield larvae, and overwintering spider mites and fruit mites.

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Discussion. The comparison between biological and chemical protection methods shows that neither approach alone is sufficient for sustainable orchard management. Biological methods are environmentally friendly but may lack immediate effectiveness, while chemical methods provide quick results but pose ecological risks.

Therefore, a balanced integration of both approaches is essential. Farmers should adopt IPM strategies tailored to local conditions, crop types, and pest dynamics. Education and access to modern technologies are also critical factors for successful implementation.

Conclusion. Biological and chemical protection products play complementary roles in orchard management. The integration of these methods within an IPM framework ensures effective pest control, reduces environmental risks, and promotes sustainable agriculture. Future research should focus on improving the efficiency of biological agents and developing safer chemical alternatives. The adoption of innovative technologies will further enhance orchard productivity and environmental protection

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