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ZEUZERA PYRINA: THE THREATENING LEOPARD MOTH DAMAGING FRUIT TREES

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Summary. This article provides a comprehensive overview of *Z. pyrina*, including its life cycle, behavior, impact on fruit tree health, and management strategies. Through a thorough review of credible sources and scientific research, this article highlights the destructive nature of *Z. pyrina* larvae, which burrow into the wood, disrupting the flow of water and nutrients and weakening the tree's structure. The article emphasizes the importance of early detection, cultural practices, biological control, and judicious use of chemicals in managing *Z. pyrina* infestations. By presenting a concise summary of relevant information, this article aims to enhance understanding and support effective strategies for combating the detrimental effects of *Z. pyrina* on fruit tree cultivation.

Keywords: *Zeuzera pyrina, leopard moth,wood-boring moth, fruit tree pests.*

Purpose. The purpose of this article is to provide a concise review of *Z. pyrina*, commonly known as the leopard moth or wood-boring moth, and its impact on fruit trees. By examining its life cycle, behavior, and the damage it causes, this article aims to raise awareness about the threat posed by *Z. pyrina* to fruit tree cultivation. Additionally, the article discusses management strategies and control methods that can be employed to mitigate the negative effects of this invasive pest. By presenting information based on credible references and scientific research, this article serves as a valuable resource for farmers, researchers, and agricultural professionals seeking to understand and address the challenges posed by *Z. pyrina* infestations.

Materials and Methods. Research was conducted in scientific databases such as PubMed, Web of Science, and Google Scholar. This search helped identify relevant research articles, review papers, and authoritative sources.

The obtained articles were carefully evaluated based on their relevance, quality, and scientific rigor. References from the selected articles were also examined for additional relevant sources. Pertinent information on *Z. pyrina*'s life cycle, behavior, impact on fruit trees, and management strategies was extracted from the selected references. Key findings, and notable examples were included to provide a comprehensive overview of the topic.

Zeuzera pyrina L. (Lepidoptera: Cossidae), commonly known as the leopard moth or wood-boring moth, is an invasive pest that poses a significant threat to fruit trees worldwide (CABI, 2021). Female moths lay eggs on the bark of susceptible fruit trees, primarily apple, pear, cherry, and other stone fruit trees (Plantwise Knowledge Bank, 2021).

According to the phenological calendar (Вердеревский, 1968), the pupa emergence period lasts from the III decade of May to the III decade of July. Butterflies appear from the II decade of Junesean and last until the I decade of August.The larvae of *Z. pyrina* are highly adaptable and can infest both healthy and weakened trees, creating extensive tunnels within the tree (Plantwise Knowledge Bank, 2021).

Studies have shown that *Z. pyrina* has the potential to cause significant damage to a wide range of tree species, particularly fruit trees such as apple, olive, pear, plum, and cherry, as well as various ornamental trees (Pureswaran et al., 2007). The larvae of *Z. pyrina* bore into the wood of host trees, creating extensive tunnels and galleries that can reach up to 50 cm (Demirel 2018). This tunneling disrupts the flow of water and nutrients, leading to wilting, reduced growth (CABI, 2021), and making it more susceptible to other diseases, pests, and eventually tree death.

The infestation rate of *Z. pyrina* can vary from year to year and from region to region. Factors such as temperature, humidity, and the availability of suitable host trees can influence the population density of this pest. Research made by Demirel N., has shown that from 3345 walnut trees 16% was infested (Demirel, 2018), and in apple orchard 17,83%/ha of trees was death(Abd EL-Raheem M. et. al. 2019). In general, the infestation rate tends to be higher in areas where suitable host trees are abundant and climatic conditions are favorable for the moth's development.

Effective management strategies for *Z. pyrina* involve a combination of cultural, biological, and chemical control methods (University of California Statewide Integrated Pest Management Program, 2021).

Cultural practices include regular monitoring of fruit trees for early detection of infestations, and infested branches and twigs should be pruned and destroyed to minimize the spread of the pest (University of California Statewide Integrated Pest Management Program, 2021).

Biological control agents such as parasitic wasps and predatory insects can also help reduce the population of *Z. pyrina* (Aluja & Sivinski, 2003). In order to obtain databases on the triple trophic links of parasites and predators it is necessary to carry out surveys through round-trip threading.

In the world practice, 7 species of pathogens from 4 genera (*Bacillus*, *Beauveria*, *Hirsutella* and *Metarhizium*) and 12 species of arthropods (parasitic insects and spiders) together with nematodes are known, they regulate the pest at different ontogenetic stages. The parasite species *Elachertus nigritulus* Zett (Hymenoptera: Eulophidae), is frequently used as a biological agent (Hegazi, 2010; Iordosopol, 2021).

Chemical control options are available but should be used judiciously and in accordance with integrated pest management practices (University of California Statewide Integrated Pest Management Program, 2021), but we must bear in mind that like any insect, it has a very high adaptive capacity and that three decades ago, organophosphorus preparations products were used against it during the mass flight of butterflies, the egg-laying and the hatching of the larvae periods. Poisoning of the larvae in the galleries was carried out with the products carbofos, antio, metafos and cidial (Савковский, 1990) and now many researches in which chemicals are tested, come to the conclusion that they do not have a considerable effect.

Conclusions. In conclusion, *Z. pyrina* is a highly damaging pest that poses a serious threat to fruit tree cultivation (EPPO, 2019). Continued research and the development of sustainable pest management approaches are essential to protect fruit trees from the destructive impact of *Z. pyrina* (Semizer-Cuming et al., 2021).

The article provides a concise review of Zeuzera pyrina, commonly known as the leopard moth or wood-boring moth, and its impact on fruit trees (CABI, 2021). The leopard moth is an invasive pest that poses a significant threat to fruit tree cultivation worldwide. Female moths lay eggs on the bark of susceptible fruit trees, and the adaptable larvae of Z. pyrina can infest both healthy and weakened trees, creating extensive tunnels within the tree (Plantwise Knowledge Bank, 2021). This tunneling disrupts the flow of water

and nutrients, leading to wilting, reduced growth, and increased susceptibility to other diseases and pests, ultimately resulting in tree death.

The infestation rate of Z. pyrina can vary depending on factors such as temperature, humidity, and the availability of suitable host trees. Research by Demirel has shown infestation rates of 16% in walnut trees (Demirel, 2018) and 17.83% per hectare of death in apple orchards (Abd EL-Raheem et al., 2019). In apple varieties, the maximum number of larval entrance holes (11.0±3.1) and maximum amount of larval feces (7.0±1.3 tablespoons) were recorded on 'Richard Delicious'. 'Northern spy', 'Jonathan', 'Prime Gold' and 'Red spur cooper' varieties received the least damage (near zero) compared to the other varieties and they are recommended for further studies (Gharalari & Kolyai, n.d.). Effective management strategies for Z. pyrina involve a combination of cultural, biological, and chemical control methods (University of California Statewide Integrated Pest Management Program, 2021).

Cultural practices include regular monitoring of fruit trees for early detection of infestations and the pruning and destruction of infested branches and twigs (University of California Statewide Integrated Pest Management Program, 2021), use of delta and similar trap. Biological control agents such as parasitic wasps and predatory insects can help reduce the population of Z. pyrina (Aluja & Sivinski, 2003; Hegazi, 2010; Iordosopol, 2021). Additionally, several species of pathogens and arthropods have been identified as regulators of the pest at different stages of its life cycle (Hegazi, 2010).

Chemical control options are available but should be used judiciously and in accordance with integrated pest management practices (University of California Statewide Integrated Pest Management Program, 2021). However, it is important to note that Z. pyrina has a high adaptive capacity, and some previously used chemical preparations have shown limited effectiveness against the pest (Савковский, 1990). Ongoing research is being conducted to develop more effective control methods.

Overall, this article serves as a valuable resource for farmers, researchers, and agricultural professionals by providing information on the life cycle, behavior, impact on fruit trees, and management strategies for dealing with Z. pyrina infestations. By raising awareness about this invasive pest, the article contributes to the understanding and addressing of the challenges it poses to fruit tree cultivation.

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