



Dissipation behavior and dietary risk assessment of acetamiprid, boscalid, and pyraclostrobin applied individually and in mixtures in sweet cherries

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ABSTRACT

This study investigates the dissipation behavior of acetamiprid, boscalid, and pyraclostrobin applied individually and in mixtures to cherries under open-field conditions in Tokat and Niksar, Türkiye. The research highlights how application methods (recommended vs. double dose, individual vs. mixture) and environmental factors influence residue persistence. Results showed that dissipation was slower under double-dose and mixture treatments, particularly in Niksar, where lower humidity levels may have contributed to extended half-lives. These findings underscore the importance of evaluating pesticide fate under realistic agricultural practices and variable field conditions. In addition to dissipation analysis, a dietary risk assessment was conducted. Hazard quotient values for both chronic (HQc) and acute (HQa) exposures were below the safety threshold of 1 in all scenarios, indicating no immediate health risk. However, children exhibited the highest HQc values, especially under mixture and double-dose applications, highlighting the need for cautious management practices. Overall, this study contributes valuable data for refining preharvest interval recommendations and promoting safer pesticide use in cherry cultivation.

1. Introduction

Cherries (*Prunus avium* L.) are among the most widely consumed and commercially significant stone fruits worldwide. According to more recent data, approximately 2.96 million tons of cherries were produced worldwide in 2023. Turkey accounted for around 736,791 tons of this production, representing 24.86 % of global cherry production (FAO, 2025). Cherries are appreciated for their appealing color, flavor, and nutritionally beneficial compounds (Lara et al., 2020). Global production of sweet cherries has increased significantly in recent years, primarily driven by consumer demand for fruits with health-promoting properties. The presence of bioactive compounds, such as phenolics with antioxidants and anti-inflammatory effects, has attracted growing interest (Blando and Oomah, 2019). Nonetheless, cherry cultivation is subject to multiple pests (e.g., fruit flies and moths) as well as fungal pathogens such as *Botrytis cinerea*, which can cause severe losses if not effectively controlled (Hauschildt et al., 2020; Gormez et al., 2022). Consequently, growers routinely use a variety of pesticides, including insecticides and fungicides, to maintain yield and fruit quality

(European Commission, 2008; Gormez et al., 2022).

Among the commonly applied insecticides is acetamiprid, a systemic neonicotinoid highly effective against sap-feeding insects such as aphids and whiteflies (Zuščková et al., 2023; Shareefdeen and Elkamel, 2024). Due to its systemic nature, acetamiprid is absorbed and transported throughout the plant, providing prolonged pest protection. However, this same characteristic contributes to its persistence in plant tissues and the environment, raising concerns over its long-term ecological impacts, such as toxicity to non-target organisms and potential residue accumulation in food crops and aquatic systems (Naumann et al., 2022; Svoboda et al., 2023). Recent studies have raised significant concerns regarding the human health implications of acetamiprid exposure. Witwicka et al. (2025) identified potential neurodevelopmental risks in children due to chronic low-level dietary intake, mediated through interactions with nicotinic acetylcholine receptors. Their risk assessment based on MOE and NOAEL values concluded that long-term exposure may impair cognitive function in vulnerable populations.

Boscalid (a carboxamide fungicide) and pyraclostrobin (a strobilurin fungicide) are widely used to control key fungal diseases in cherry such

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