

BEES AS BIOINDICATORS OF THE ENVIRONMENTAL QUALITY: ASSESSMENT OF POLLUTION AND ECOLOGICAL RISK

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ABSTRACT

Honey bees (*Apis mellifera*) represent reliable bioindicators of environmental quality due to their role as pollinators, wide foraging range, and continuous interaction with various ecosystem components. The aim of this paper is to examine the significance of bees as bioindicators through the analysis of pollutant accumulation mechanisms and their application in ecological risk assessment. During the collection of nectar, pollen, water, and resinous materials, bees come into contact with contaminants from air, water, and soil, including heavy metals, pesticides, and microplastic particles, which can be detected in their tissues and bee products. In addition to chemical analyses, changes in behavior, physiological condition, and mortality of bee colonies represent important indicators of environmental pollution. Particular attention is given to pesticides, especially neonicotinoids, due to their pronounced toxic and sublethal effects. Although research on the presence of microplastics in bee products is still developing, current findings indicate their potential in biomonitoring. Overall, bees can serve as an efficient and cost-effective tool for environmental biomonitoring, with significant implications for ecological risk assessment and biodiversity protection.

Keywords: Bees, bioindicators, biomonitoring, environment, ecological risk.