



Heavy Metals in Honey and Pollen Collected in Different Ecological Areas

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INTRODUCTION AND AIM

Honey and pollen are natural products valued for their nutritional and medicinal properties, but environmental contamination can affect their quality and safety. Urban areas, with higher industrial and vehicular emissions, may contribute to increased heavy metal deposition, potentially leading to unsafe honey products or pollen. Heavy metal accumulation in honey and pollen raises concerns regarding consumer health and apiculture sustainability. This study aims to assess and compare the levels of heavy metals in honey and pollen samples collected from forest, agriculture field and urban areas, providing insights into potential contamination sources and risks.

METHODS

Honey and pollen samples were collected during flowering season from urban apiaries, representing pollution sources, along with control samples from an agriculture field and forest (Fig. 1 - 2). Cd, Cr, Cu, Ni, Pb, Mn, Fe, Zn were analyzed in the collected samples. Inductively Coupled Plasma Mass Spectrometry with optical emission spectrometer (ICP-OES) was used to quantify heavy metal concentrations (Fig. 3).



Figure 1. Pollen samples.



Figure 2. Honey samples.



Figure 3. ICP-OES Avio 220 max, PerkinElmer, USA.

RESULTS AND CONCLUSION

All heavy metals tested were detected in the honey and pollen samples, except Cd which was not detected in samples (LOD = 0.01 mg/kg). The concentrations of heavy metal in honey and pollen (Fig. 4 - 5) differed significantly, with higher concentrations of heavy metals detected in pollen than in honey.

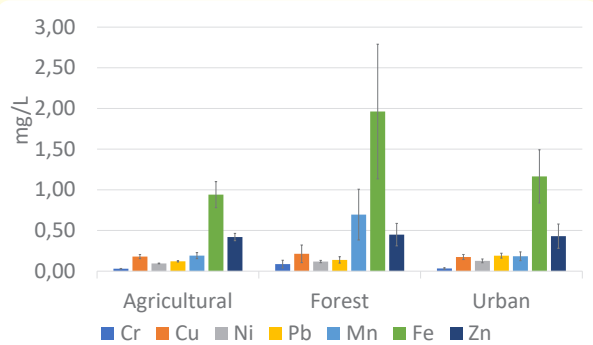


Figure 4. Concentrations of heavy metals in honey collected from three different agricultural areas.

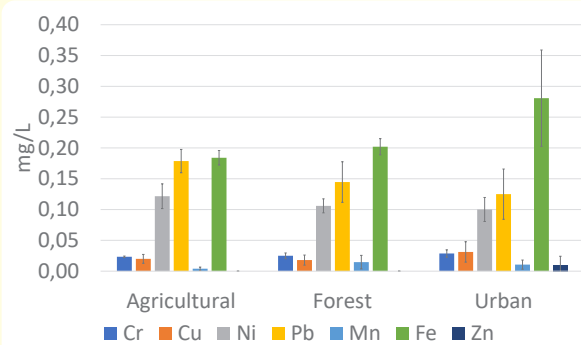


Figure 5. Concentrations of heavy metals in pollen collected from three different agricultural areas.

The largest differences in honey samples were found for Cr, with 47% lower concentration in honey collected in the city center compared to the agriculture field site. Cu and Ni concentrations were also lower in the urban honey samples. Although Pb is usually considered to be a major source of urban pollution due to heavy traffic, its concentration was lower in urban honey samples compared to the agriculture honey samples. The most significant variation in pollen samples was observed for Mn, with its concentration being 51% lower in pollen collected from the city center compared to that from the forest. However, one pollen sample from an urbanized area contained significantly higher amounts of Fe, as well as increased levels of Zn and Pb. Analysis revealed that pollen always contains higher concentrations of heavy metals than honey.

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All heavy metals tested were detected in the honey and pollen samples, except Cd which was not detected in samples (LOD = 0.01 mg/kg). The concentrations of heavy metal in honey and pollen differed significantly, with higher concentrations of heavy metals detected in pollen than in honey. The largest differences in honey samples were found for Cr, with 47% lower concentration in honey collected in the city center compared to the agriculture field site. Cu and Ni concentrations were also lower in the urban honey samples. Although Pb is usually considered to be a major source of urban pollution due to heavy traffic, its concentration was lower in urban honey samples compared to the agriculture honey samples. The most significant variation in pollen samples was observed for Mn, with its concentration being 51% lower in pollen collected from the city center compared to that from the forest. However, one pollen sample from an urbanized area contained significantly higher amounts of Fe, as well as increased levels of Zn and Pb.

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