

Analyzing Particulate Matter found on Honeybee Body Surfaces using SEM-EDS

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An unconventional method to get an overlook on aerosol particles deposited in the environment is to analyze particles attached on the bodies of honeybees (*Apis mellifera*). During foraging, other particles than pollen accumulate on the bee surface. Based on the chemistry and the morphology of these particles obtained by Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS), a rough source appointment can be made (Negri et al. 2015).

To get an overview of particles collected by bees, specimens were sampled around beehives in autumn 2019 at four sites in the Canton of Fribourg with different background settings (rural, urban, close to a highway and close to a shooting range). All particles found at the surfaces are in a size range between 1 and 50 μm and have been divided into five classes. Due to carbon coating and the bee's body composition, organic particles like pollen or carbon particles (soot) are difficult to be distinguished chemically from the underlying body, but in most cases could be distinguished based on morphology. In addition to pollen and soil-derived (dust) particles, which were always present, the particles contained site specific elements. Heavy metal rich particles containing Pb, Ba, Cu, Hg, Zn and Sn, typical for the composition of gunshot residue, were found on bees from the beehive close to the shooting range. A second sampling campaign has been undertaken at this site in spring/summer 2020. At every beehive, an active filter-based air sampling has been conducted for comparison purposes.

The results show that the analysis of particles found on the surface of bees are a quick and convenient tool to monitor the predominant sources of aerosol in the vicinity of beehives.

REFERENCES

Negri, I. et al. 2015: Honey Bees (*Apis mellifera*, L.) as Active Samplers of Airborne Particulate Matter, PLOS One, 10(7), 1-22.

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