Comunicazione Orale

MICROPLASTIC ABUNDANCE AND POLYMER PROFILES IN COMMERCIAL POLYFLORAL HONEY: A COMPARATIVE ANALYSIS OF SINGLE-ORIGIN HONEYS AND MULTI-COUNTRY BLENDS

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Aim. Microplastic contamination in food is a matter of growing concern, yet the influence of honey origin and industrial blending practices on the microplastic burden in honey remains under-investigated. This exploratory study investigated differences in microplastic abundance and polymer composition between single-origin honeys and multi-country polyfloral blends packaged in glass jars.

Methods. Microplastics were isolated from ten commercial honey samples under rigorous quality assurance/quality control procedures. To isolate potential microplastics, 150 g of each pre-homogenised honey sample was dissolved in filtered, heated distilled water, agitated at 30°C, and filtered through 1.2-µm nitrocellulose membranes. Filters were subsequently dried and examined via stereomicroscopy for MP counting, measurement, and classification by size, colour, and morphology. Polymer identification was performed using Attenuated Total Reflection Fourier-Transform Infrared spectroscopy.

Results. Multi-country blends exhibited a higher microplastic concentration (0.26 ± 0.11 MPs/mL) compared to single-origin samples (0.06 ± 0.02 MPs/mL), with a statistically significant difference (Wilcoxon rank sum test, $p < 0.001$). Multivariate analysis suggested distinct polymer profiles between the two categories (PERMANOVA, $R^2 = 0.166$, $p = 0.001$).
Furthermore, the chemical diversity of identified polymers was significantly higher in multi-country blends than in single-origin honeys, as demonstrated by individual Shannon diversity indices (Wilcoxon rank sum test, $p = 0.022$) and cumulative group scores (multi-country blends: $H' = 2.19$; single-origin honeys: $H' = 1.99$). Multi-country blends were characterised by a greater diversity of polymer types, including polyethylene derivatives (such as polyethylene:propylene:diene and oxidised polyethylene) and cellophane, suggesting that blending practices are associated with compositional variability. Whereas single-origin samples showed a more homogeneous polymer profile, primarily dominated by conventional polyethylene, consistent with fewer or less diverse contamination sources.
Conclusions. These findings provide preliminary evidence that differences in honey microplastic profiles may be associated with cumulative interactions during industrial processing and logistical operations related to multi-country sourcing. Indeed, the observed differences may suggest that multi-country blends undergo a greater number of handling, transport, blending and packaging steps, potentially increasing opportunities for microplastic contamination. Conversely, single-origin honeys may be exposed to fewer aggregation and handling steps, potentially reducing the likelihood of contamination.
Despite its exploratory nature, this study contributes to the growing body of literature on microplastic contamination in food and highlights the need for larger-scale investigations incorporating detailed supply chain characterisation to disentangle environmental, processing and packaging contributions, together with harmonised analytical methodologies to improve comparability across studies. Finally, although the implications for consumer health remain to be established, improved characterisation of microplastic contamination in honey may contribute to more comprehensive food safety and dietary exposure assessments.