Amphipods as a potential bioindicator of microplastic pollution: occurrence of small microplastics (5-100 μm), additives and plasticizers in Monocorophium insidiosum

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Abstract

Microplastics < 100 μm (small microplastics, SMPs) are often overlooked. Invertebrates can ingest microplastics of the size equal to that of their mouthparts, i.e., particles < 100 μm. Since invertebrates can ingest these particles at the bottom of the food web, SMPs can enter the food web and be transferred to its higher level, giving rise to bioaccumulation and biomagnification. Among the most widespread invertebrates are amphipods (Crustacea, Malacostraca). This is a most typical and diversified group. Amphipods are planktonic and benthic invertebrates living in marine, estuarine, and freshwater ecosystems. They can be omnivores, herbivores, detritivores, scavengers, or predators. Amphipods are employed as test organisms for marine and estuarine sediment quality because living at or below the sediment-water interface causes them to be continuously exposed to contaminants and pollutants, i.e., regulated and emerging pollutants such as microplastics. Several species of amphipods, e.g., *Monocorophium insidiosum*, are frequently and widely used for toxicological assays. Because of their ecological importance, abundance, and sensitivity to various toxicants and pollutants, amphipods have long been known as sensitive environmental indicators. Amphipods are considered potential bioindicators in many environments. This research aims to quantify and simultaneously identify SMPs (5-100 μm), additives, plasticizers, and other components of microlitter ingested by organisms of *Monocorophium insidiosum* collected in the north basin of the Venice Lagoon in late fall 2018 and spring 2019. Organisms were pseudodigested without further denaturation/degradation of the particles and analyzed via Micro-FTIR Polymers in a wide range of densities were identified in all the samples. Some of the additives and plasticizers are related to specific polymers. Hence, they can be good proxies of the presence of SMPs. Besides, non-plastic synthetic fibers, such as rayon, and natural fibers, i.e., cellulose, were identified. Statistically significant differences were observed among the various samplings in abundance and particle composition.

Keywords: Monocorophium insidiosum, small microplastics, additives, plasticizers, Micro, FTIR, bioindicator

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