Composted microplastics have contrasting effects on the compost worm E. fetida and the woodlouse P. scaber

Anja Holzinger*†[1], Darleen Lücker[1], Lisa Albert , Thomas Steiner[2], Ruth Freitag[2], and Heike Feldhaar[1]

[1]Animal Population Ecology, Animal Ecology I, University of Bayreuth – Universitätsstraße 30, Bayreuth, Germany

[2]Chair for Process Biotechnology – University of Bayreuth Faculty of Engineering Sciences Chair for Process Biotechnology D-95440 Bayreuth, Germany

Abstract

Composts are often highly contaminated with microplastic (MP) of different polymer types and shapes. Being used for various (agricultural) applications, composts are an entry pathway of MP in terrestrial ecosystems. Microplastic particles found in composts are coated with a biofilm due to previous exposure and treatment in biowaste plants. It has been shown that pristine microplastics impact terrestrial organisms on a sublethal level. Until now it remains unexplored how composted polymers affect organisms especially in contrast to pristine MP. Both the compost worm *Eisenia fetida* and the woodlouse *Porcellio scaber* encounter those composted MP during food uptake. As they differ in behaviour and diet the effect of MP can differ between organisms. Therefore, we studied the effect of composted and pristine MP in an environmentally relevant concentration on the life-history and oxidative stress levels of *E. fetida* and *P. scaber*. We tested three different polymer types (PS, PE and PLA) as fragments and fibres. To understand possible mechanisms behind the observed effects we also characterized the formatted MP biofilm composition via 16SrRNA (bacteria) and ITS (fungi) amplicon sequencing. Interestingly, we found contrasting effects on the organisms. Exposure to composted MP fragments induced a higher weight gain and reproductive output in *E. fetida*. Oxidative stress was higher for worms incubated in pristine MP while we found no effect for worms in the composted treatments. In contrast *P. scaber* gained less weight and had higher oxidative stress ingesting food with composted MPs while no effect was found for pristine MP.

Keywords: Compost, microplastic, biofilm, oxidative stress, Eisenia fetida, Porcellio scaber

*Speaker

†Corresponding author: anja1.holzinger@uni-bayreuth.de