Are aquatic fungi able to evaluate microplastic impacts on leaf litter decomposition process?

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Microplastics (MPs) have been recognized as a threat, and an ecotoxicological risk for aquatic ecosystems. MPs toxicity is determined by their physical and chemical properties, including particle size, shape, surface area or polymer type. Aquatic hyphomycetes are a group of fungi that have the greatest ecological effects on freshwater ecosystems, as they are involved in a key process on these ecosystems, the decomposition of plant litter in streams. These fungi have the ability to degrade and consequently transform leaf material into a more suitable food source for stream detritivores, being important mediators in the energy and nutrient transfer to higher trophic levels. The knowledge on the impacts of MPs on aquatic fungi and the processes they driven is very scarce, so the main goal of this study was to assess the impacts of different sizes of MPs (fragments, FR; and pellets, PE) on the leaf litter decomposition, measuring functional aspects such as leaf mass loss, fungal reproduction and activity of plant litter degrading enzymes. A microcosm experiment was used with monocultures and combinations up to three aquatic hyphomycetes species (*Articulospora tetracladia*, *Tricladium splendens*, and *Heliscus lugdunensis*), where concentrations of FR (0.5 and 2 g L^{-1}) and PE (2 g L^{-1}) were added. We expected that: i) the presence of FR could negatively affect all functional aspects; ii) the impacts of the PE could not be so strong as FR impacts, as PE has a bigger size than FR; iii) the traits of the fungal species would matter to face MP exposure because the traits of certain fungal species may be of greater importance than species number to maintain ecological processes. FR or PE led to a stimulation of leaf mass loss especially in combinations of two aquatic hyphomycetes. Consequently, the activity of degrading enzymes increased in the presence of 0.5 g L^{-1} FR and PE. Fungal sporulation rate increased in the presence of FR, especially for monocultures and combinations of three aquatic hyphomycetes, while the presence of PE decreased fungal sporulation in combinations of the three aquatic hyphomycetes. Our results showed the MPs influence in the activity and diversity of microbial decomposers, putting at risk the processes they drive in freshwaters. This suggest the aquatic hyphomycetes as potential microorganisms to be used to evaluate the MPs impacts on leaf decomposition process.

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