
Ecotoxicity of a biobased mulch film on the dipteran *Chironomus riparius* larvae

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Abstract

Every year, new biobased biodegradable plastics are released into the market, but little is understood about the risks these materials may pose to various ecosystems, especially freshwaters where they appear to remain longer. In this study, chironomid *Chironomus riparius* (in the 4th larval stage), was used as a model species to address the potential short-term ecotoxicity of microplastics (bio-MPs) derived from a commercially available biobased biodegradable agricultural mulch film, under ecologically relevant scenarios (field concentration and UV-aging).

The results demonstrate that after 48 hours of exposure, *C. riparius* larvae presented bio-MPs, UV-aged or not, in their gut, which content increased with increased concentrations (with a range of 1 to 2 particles per organism). The presence and ingestion of bio-MPs also resulted in variations in aerobic metabolism (via electron transfer system activity) and the activation of antioxidant defenses (catalase and glutathione-S-transferase) and neurotransmission (acetylcholinesterase). Such modifications did not result in oxidative damage, suggesting that this organism might counteract oxidative stress induced by the tested biobased biodegradable polymer (whether it is pristine or UV-aged).

Other antioxidant defenses must be addressed, for a deeper knowledge of the possible physiological and biochemical effects of bio-MPs on this model species. Future research must take a life cycle assessment into account to link these responses to the possible impacts at higher levels of biological organization (such as larval growth and imagoes emergence).

Keywords: Agricultural biofilms, microplastics, ecotoxicity, stress biomarkers.

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