POTENTIAL TOXICITY OF BIODEGRADABLE MICROPLASTIC (POLYLACTIC ACID) TO THE MARINE COPEPOD TIGRIOPUS FULVUS

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Plastic pollution is a major global issue. The ever-increasing need to reduce the environmental impact of growing plastic production has led to the adoption of biodegradable plastics (BPs) as a promising alternative to petrochemical-based polymers. However, not all BPs fully degrade in natural environments; instead, they produce biodegradable microplastics (BMPs) in the marine environment, which have recently attracted significant attentionto understand the potential impacts ofBMPs on marine biota. Currently, information on the toxicity of BMPs to marine organisms is limited.

This study aimed to assess ecotoxicity of biodegradable polylactic acid (PLA) MPs (<38µm) in themarine copepod Tigriopus fulvus. Organisms wereexposed for 26 days at25 mg/Lto evaluate the long-term effects of PLAon some traits of the life cycle of T. fulvus.

For this purpose, copepod mortality,naupliardevelopment, sex ratio and fecundity (offspring production)were assessed. After 26 d exposure, the survival of T. fulvus was very high although significantly higher in the control(seawater without PLAMPs).

The results showed significant effects of PLAMPs exposure on reproductive traits ifcompared to the control.At 96 hours the first copepodite appeared in the exposed organisms.After 5d the percentage of copepodites in the exposed organisms was significantly higher (56.4%) compared with control (17.5%) ($p<0.05$). In both treatments sex ratio (female/male) was in favour of female with 1.47 and 1.21 in the control and PLA- exposed group, respectively.

Female became ovigerous around the 13th day, although with different percentages in the treatments.The PLA- exposed group showed a percentage of ovigerous female lower (43%) than that observed in the control (54%).Fecundity (number of nauplii/female)in the PLA-exposed group (24 ± 8.8) did not differ from that of the control (25 ± 7.7). However, since there were more ovigerous females in the control group, the total number of nauplii at the end of the test, was significantly lower in the PLA-exposed group (2406 in the control vs 1800 in the PLA treatments).PLA exerted a significant effect on the number of non-viable eggs per female, that was significantly higher in exposed group.

This study evidenced a quite toxicity of PLA to T. fulvus and demonstrated that sublethal effects, such as reduced individual and overall reproductive capacity, can be used as a potential signal of chronic effects, difficult to obtain with acute lethality tests.Given the high ecological relevance of copepods in the marine environment the comprehension of the impact of this kind of pollutant on these organisms is essential.