Novel Bioremediation of Plastic Straws and Cigarette Filters by Wax Worms (Galleria mellonella)

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Cigarette filters (CF) and plastic straws are the number one pollution source because they are not biodegradable. It could take up to 25 years to degrade CF and straws under UV light, but the leached chemicals are dangerous to the environment (De Granda-Orive et al., 2016). Polyethylene (PE) could biodegrade by worms (Yang et al., 2014). In 2015, it was reported that 100 Galleria mellonella (wax worms) consumed 92 mg of polyethylene (produce plastic bag) in 12 hours (Bombelli and Howe, 2015). This research investigated the novelty of wax worms as possible bioremediators for straws, cellophane, cigarette filters, and other unstudied plastics. Worms in an aerobic and anaerobic environment were exposed for 24 days and 21 days to different plastic samples, including plastic straws and cigarette filters cellulose acetate (CA). Chewing was noted on all samples, and different amounts of fecal matter (frass) were recorded. Channeling was evident on Ziploc (LDPE). Six worms ate 35 mg smoked CF, 9 mg CF, 63 mg LDPE, and 16 mg HDPE. Ten worms ingested 26 mg of LDPE in 21 days and generated 37 mg fecal matter. This novel showed that Galleria mellonella are suitable for plastic and CA bioremediation. Moreover, regardless of the source of food, the predominant FTIR on all frass samples including control was azlon, a synthetic fiber from casein, a protein found in milk.