
Alteration potential of Propylene microplastic on soil toxicity: impact of organic matter and aging of microplastics

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Abstract

Plastics occupy a large place in our daily life products and have also brought various environmental problems with their widespread use. Polypropylene (PP) is the dominant plastics that is used in the products. Cadmium and nickel occur in agricultural lands like microplastics and pose risk. The application of biosolids as organic fertilizers can lead to microplastics and heavy metals reaching agricultural lands. While microplastics are toxic on their own, due to their small size, high surface area, and hydrophobicity; they become more toxic to the environment as they are combined with metals that contribute to the bioaccessibility of the heavy metal. Also, aging causes the modification of surface characteristics and results a change in physicochemical properties and ecotoxicological effect of microplastics. This is the first study examining the ecotoxic effects of Cd and Ni metals on *E. crypticus* in the presence of PP microplastic, UV-aged PP microplastic, and biosolid application. The results show that the presence of aged PP microplastics in Ni EC50 is found 52 mg/L, and reproductive toxicity is found 75 mg/L of virgin PP and Ni together. Also, the combined toxicity of virgin PP + Cd is 139 mg/L and EC50 value of aged PP+Cd is found 122 mg/L. Also, it is proven that biosolid addition decreases toxicity for Cd and Ni sets together with PP microplastic. It has been suggested that the size of the microplastics may be appropriate for ingestion by the organism that increased toxicity with aged PP MPs and heavy metals together. The surface area of microplastic increases with aging, and this rough surface area also contributes to the increase in the adsorption capacity. The results of this study can support the rewarding strategies to accelerate the studies to understand possible ecotoxic effects of aged MPs with heavy metals in different ecosystems.

Keywords: polypropylene microplastic, soil ecotoxicology, degradation of plastics, *E. crypticus*

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