Abstract

Plastic waste has accumulated in the environment by means of extensive use of plastic products without the implementation of sustainable waste management practices. The study focuses on the qualitative and quantitative analysis of microplastics above 50 µm in five different finished composts including compost from a mixed municipal solid waste processing facility and an Integrated resource recovery center and compost from the commercial market. The methodology includes laboratory analysis by stereomicroscopic quantification and Attenuated Total reflectance-Fourier Transform Infrared Spectroscopy (ATR-FTIR). According to the current study, the highest microplastic abundance was found in municipal solid waste processed compost: 14382 ± 104 particles/ kg followed by Integrated Resource Recovery center (IRRC) compost that contained 12492 ± 82 particles/ kg. Microplastic abundance in Green waste compost and food waste compost was 5645 ± 113 particles/ kg and 3828 ± 184 particles/ kg respectively. While Bio-waste (mixed food and green waste compost) compost contained 8520 ± 125 particles/ kg. Microplastics of < 1 mm accounted for 85- 95% of all microplastics, which indicates the need to restrict both large and small-sized microplastics in organic waste fertilizers in order to prevent soil pollution. The dominant shape of microplastics were fragments up to 46% followed by films and fibers. A little percentage of beads and clusters were also observed. Based on colors, transparent particles were the most common microplastics observed in all types of compost samples. The morphological and FTIR analysis shows the most common plastic polymers were polyethylene terephthalate, polypropylene, and polystyrene. The majority of the microplastics found in all compost samples were considered the remains of plastic bags and food packaging materials. The results of the study highlight the need for research focusing on microplastics effects on the environment and how they transfer into the food chain. There is a need for the implementation of threshold limits to regulate microplastic contamination.