ABSTRACT

The excessive synthesis of plastics and poor management of plastic waste disposal have contributed to "white pollution," which is a pressing global environmental issue. The degradation of large polymers through physical, chemical, and biological processes in the environment leads to the formation of microplastics (0.1 μm – 5 mm) in size. Agricultural lands are particularly vulnerable to microplastic pollution due to exposure to wastewater irrigation, fertilizers, mulching, and other plastic products. These microplastics accumulate in the soil, disrupting the soil ecosystem and impacting crop health, ultimately posing a threat to ecosystems and public health. This study aimed to extract and characterize microplastics from agricultural soil and *Solanum tuberosum* var. Kuroda and to evaluate their genotoxic potential on *Allium cepa* root tips. The extracted microplastics were observed under a stereomicroscope and analyzed using FTIR and SEM. FTIR analysis identified the presence of polyvinyl chloride and polyamide in both soil and potato samples. SEM analysis revealed the size of microplastics, with average particle dimensions ranging 0.1068μm, 0.09454μm, and 0.08858μm, and highlighted surface features such as, irregular shape and rough textures indicating environmental degradation. The microplastics detected included fibers, fragments, and sheets, with colors such as transparent, black, red, and violet. Furthermore, the genotoxicity of synthetic PVC, PET and PP microplastics were assessed using *Allium cepa* root tips. The mitotic index decreased significantly, indicating mitotic inhibition. These findings highlight the critical need for implementing effective soil remediation strategies and adopting sustainable agricultural practices to mitigate microplastic contamination and reduce its potential toxicological impacts on plant health and human well-being.