Microplastics in the Field: Hidden Drivers of Soil and Plant Change

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Abstract

Micro plastics (MPs, <5 mm) are increasingly accumulating in agricultural soils, potentially affecting soil health and crop performance. This study assessed short-term impacts of polypropylene (PP) and polyethylene (PE) fragments, introduced via mulch films at 0.05–0.5%, on soil properties and the growth of *Fagopyrum esculentum* (buckwheat) in carbonate-rich Cambisol. Low PP levels (notably 0.1%) promoted shoot and root elongation, while higher doses reduced biomass and leaf number. PE showed predominantly negative effects, significantly suppressing root growth and leaf development from 0.3%. Both plastics increased soil pH (up to + 0.67), without major effects on soil macro elements or nutrient uptake, except for nitrogen trends under PE. Microbial biomass declined at early stages, though PP stimulated microbial activity at flowering. These results demonstrate that MPs rapidly alter soil–plant interactions, with effects varying by polymer type and concentration, highlighting the need to evaluate plastic use under real agricultural conditions.

Keywords

Buckwheat, Endocalcari-Epihypogleyic Cambisol, Microplastics, Plastic Mulch Films, Polyethylene, Polypropylene, Soil