Agricultural impact of multi-contaminant exposures on bioplastic degrading *Bacillus pumilus* B12 metabolomes

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The impact of contamination on agriculture lands can't be ignored as the need for both food and non-food crops grows and the use of marginal land for biomass crops increases. The rhizosphere microbiome is one of the most diverse communities in the environment and will adapt to changes, or stressors, of the surrounding soils, and therefore can modify plant health and, in response, overall plant biomass. Soil contamination is an unfortunate situation that people everywhere deal with regularly. Furthermore, most scientific studies focus only on a single contaminant, however these contaminants don't exist isolated from each other in the environment. This work focuses on two widespread toxic contaminant types, microplastics and per- and polyfluoroalkyl substances (PFASs). Microplastics are of continued concern in agricultural soils as low-density polyethylene (LDPE) plastic is a commonly used component and while the switch to biodegradable plastics such as polybutylene adipate terephthalate (PBAT) is thought to be more environmentally friendly, little is known about the effects of the residual microplastics in the soils. PFASs are anthropogenic compounds used for their unique properties of heat and water resistance and have been termed forever chemicals due to their ability to resist breakdown and accumulate in the environment, including soils. The two PFASs used in these data are perfluorobutane sulfonic acid (PFBS) and perfluorooctanoic acid (PFOA) chosen due to their differences associated with water partitioning.

The work presented uses mass spectrometry-based metabolomics to analyze the metabolic perturbations associated with LDPE, PBAT, PFBS, PFOA, and a combination thereof, exposure to *Bacillus pumilus* B12. *B. pumilus* B12 was isolated from agricultural soils in east Tennessee and has been shown to degrade bioplastics. *B. pumilus* B12 maintained in a complex minimal media supplemented with 0.05% *w/v* glucose and incubated at 30 °C with shaking at 220 rpm. Preliminary studies showed no growth kinetic changes in this species after short-term exposure to environmentally relevant concentrations of microplastics (0.02% *w/v* LDPE or PBAT), or PFASs (1 ppb PFBS or PFOA) as compared to a no contaminant control. However, mass spectrometry-based metabolomics revealed shifts in metabolism when grown in the presence of these contaminants. Further analyses of these data will provide an understanding of the impact of multi-contaminant exposures on carbon and nitrogen flow in the rhizosphere of biomass crops therefore providing valuable data for determining optimal land management strategies.