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The different behaviors of glyphosate and AMPA in compost-amended soil

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Highlights

- AMPA was detected in higher concentrations than glyphosate.

- Both glyphosate and AMPA decreased with soil depth.
- Compost dose alone did not cause significant differences among samples.
- Conductivity and moisture produced differences in the behavior of glyphosate and AMPA.

Abstract

The broad-spectrum herbicide glyphosate is one of the most widely used pesticides. Both glyphosate and its major metabolite, aminomethylphosphonic acid (AMPA), persist in waters; thus, their environmental fates are of interest. We investigated the influence of compost dose, sampling depth, moisture and saturated hydraulic conductivity (K_s) on the persistence of these substances. The amounts of AMPA quantified by triple quadrupole liquid chromatography-mass spectrometry (LC-QqQ-MS/MS) using isotopically labeled extraction standards were higher than those of glyphosate and differed among the samples. Both glyphosate and AMPA showed gradually decreasing concentrations with soil depth, and bootstrapped ANOVA showed significant differences between the contents of glyphosate and AMPA and their behavior related to different compost dosages and sampling depths. However, the compost dose alone did not cause significant differences among samples. Bayesian statistics revealed that the amounts of glyphosate and AMPA were both dependent on the sampling depth and compost dose, but differences were found when considering the physical factors of K_s and moisture. Glyphosate was influenced by moisture but not K_s, whereas AMPA was influenced by K_s but not moisture.

Importantly, we found behavioral differences between glyphosate and its major metabolite, AMPA, related to the physical properties of K_s and moisture.

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Keywords

glyphosate
Aminomethylphosphonic acid
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Saturated hydraulic conductivity
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