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Recycling of organic waste (OW) as fertilizers on farmlands is a common practice as it provides a cost effective and sustainable way of managing OW. However, it represents a major source of contaminants such as copper (Cu) and zinc (Zn) that may pose potentially negative environmental impacts (Lavado et al., 2005).

To limit the environmental impact of OW spreading on farmlands, agronomical doses are calculated based on the nitrogen, phosphorus and potassium requirements of crops. Consequently, lower quantities of Cu and Zn are introduced in soil following OW application (López-Rayo et al., 2016). However, the long-term impacts of OW spreading at the set agronomical doses on the accumulation and fate of Cu and Zn in soils are scant. This study was designed to fill this gap by using a combination of Cu and Zn speciation characterization and isotopic compositions in OW and soils. We studied four soils with contrasting physicochemical properties (luvisols, nitisols, calcisols and arenosols) and the OW used in four long-term field experiments.

We observed, in agreement with published literature, that in OW, Cu and Zn speciation is affected by the OW treatment (anaerobic digestion and composting) and by the physicochemical conditions during storage. In the studied OW samples, Cu and Zn occurred mainly or entirely as sulfides in raw and anaerobically digested pig slurries whereas only oxidized species were present in composted household wastes (Zn-phosphate, Cu bound to organic matter).
In two field experiments selected for this study, little or no change in Cu and Zn speciation was observed between control and amended soil due to OW application at agronomical doses. Thus, the interest in analyzing the isotopic signatures to investigate whether Cu and Zn originating from OW application can be traced in such cases.

Keywords: copper, zinc, organic waste, agricultural recycling, spectroscopy, isotopes

References

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