Unearthing the effect of cropping systems on soil biodiversity: indicators to describe disturbances caused by agricultural practices Oral

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Oral

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Abstract

Soil organisms are key actors of agroecosystem functioning, especially as they drive soil physical and chemical fertility (Brussaard et al., 2007). In intensively cropped soils, their density and diversity are particularly low due to a wide range of physical and chemical disturbances caused by management practices (Christel et al., 2021). Thus, it is crucial to understand the consequences of various practices on soil organisms in order to develop alternative cropping systems that will rely on soil biodiversity. However, we still lack understanding on the agronomic levers that could promote soil organisms. Indeed, most studies on agricultural soils assess biodiversity by distinguishing between the main cropping systems, usually conventional, organic and no-till systems. Under real conditions, even within these broad categories of systems, there is a wide diversity of practices. This actual gradient of practices may be responsible for a large part of the observed variability and can lead to a misinterpretation of their effects on soil biodiversity.
Indicators have been developed by agronomists in order to better characterize cropping systems and to overcome the usual system classification. In this study, we use those indicators, not only to describe cropping systems more finely, but also to assess the effect of physical and chemical disturbances on the soil community. We rely on a recent methodology to select indicators belonging to three categories: soil disturbance and protection, organic matter inputs and nitrogen fertilization, and crop protection.
Soil macrofauna, mesofauna and microorganisms were sampled in 21 fields during autumn 2020 and 2021. We sorted organisms by groups, and identified earthworms, collembola, fungi and bacteria at the species level. Management practices on all fields were collected by conducting exhaustive farmer surveys. Resulting indicators revealed gradients of disturbance intensity among fields. The relationship between these indicators and the density and diversity of the sampled soil organisms enable us to evaluate the intensity of soil community disturbance. Overall, the variability of soil biodiversity among fields remains high. Therefore, future studies are necessary to fully assess the potential of those indicators to describe the effect of various cropping systems on soil biodiversity.