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Effects of nitrogen fertilization on soil fauna – A meta-analysis

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The impact of agricultural activities on soil fauna can be highly variable, depending on the management options adopted. High-input agricultural practices can promote a reduction in diversity of soil microarthropod communities but, at the same time can also favor bacterial-feeding fauna through the increase of bacterial foodweb pathways. In contrast, low-input practices can increase the dominance of fungal-feeding fauna through the promotion of fungal pathways. Responses also vary with time after fertilizer application and are strongly dependent on crop species or shifts in plant species composition due to fertilization.

The type of fertilizer, organic or inorganic, can also have diverse effects on soil organisms. Organic fertilizers can increase the population of soil decomposers serving as nutrient sources for other soil organisms. Inorganic fertilizers can indirectly affect the soil organisms by increasing crop growth, potentially leading to higher soil organic matter generation. However, inorganic fertilizers can also reduce species richness and abundance of microarthropods and earthworms due to acidification. Other soil fauna such as collembolan may not be particularly sensitive to nitrogen fertilization types. Nitrogen fertilization may disturb soil organisms in a manner that affects ecosystem functioning, but the links are not yet well quantified. Therefore, a compilation of available experimental field data on the effects of nitrogen fertilization on taxonomic and functional groups of soil fauna is needed to clarify the patterns and mechanisms of responses.

We are currently working on a quantitative review based on a global meta-analysis that will use paired observations from studies published across several countries. With this review, we aim to synthesize and discuss the current global knowledge on the effects of nitrogen organic and inorganic fertilization on soil fauna. Depending on data availability, we aim to quantify the responses of several groups of soil organisms to synthetic and organic nitrogen inputs, considering factors such as application rate or crop type. Our findings will be used for the development of modeling tools for the prediction of the impacts of agricultural management practices on soil functions.