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Commentary

Implication of Strateries for Reduction of Microplastic and Nitrogen Deposition to Maintain Soil Health

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ABOUT THE STUDY

Soil multifunctionality refers to the ability of soil to perform multiple ecological functions, including nutrient cycling, carbon storage, and water regulation. These functions are critical for maintaining soil health and ecosystem sustainability. However, human activities such as the use of fertilizers and plastic pollution have been shown to impact soil multifunctionality. In this commentary, we will discuss the effects of microplastics and nitrogen deposition on soil multifunctionality, with a focus on carbon and nitrogen cycling.

Microplastics are small plastic particles that have become a pervasive environmental pollutant. These particles are often found in soil, where they can interact with soil microorganisms and impact soil health. Recent studies have shown that microplastics can have a significant impact on soil multifunctionality, particularly carbon and nitrogen cycling. The study found that the presence of microplastics in soil reduced carbon and nitrogen mineralization rates, which can impact soil fertility and overall ecosystem productivity. Similarly, another study found that microplastics in soil can also impact soil microbial community structure and diversity, which can further impact soil multifunctionality.

Nitrogen deposition, which is the addition of nitrogen to the soil from human activities such as fertilizer use and combustion, is another major factor that can impact soil multifunctionality. Excess nitrogen deposition can cause soil acidification, which can impact soil microbial activity and nutrient cycling. In addition, nitrogen deposition can also impact soil carbon sequestration, which is the process of storing carbon in the soil. The study found that nitrogen deposition reduced soil carbon sequestration rates, potentially by reducing the activity of soil microorganisms involved in carbon cycling.

The combined effects of microplastics and nitrogen deposition on soil multifunctionality can be particularly concerning. Studies have shown that the presence of microplastics in soil can increase the negative impacts of nitrogen deposition on soil health. For example, a study conducted found that the combined effects of microplastics and nitrogen deposition led to a reduction in soil microbial biomass and diversity, as well as a reduction in carbon and nitrogen mineralization rates. These effects can have significant implications for soil fertility, carbon storage, and overall ecosystem productivity.

One potential mechanism for the impacts of microplastics and nitrogen deposition on soil multifunctionality is through their impacts on soil microbial communities. Microplastics and excess nitrogen can both impact the diversity and abundance of soil microorganisms, which can impact the overall functioning of the soil ecosystem. For example, nitrogen deposition can favour the growth of certain microbial taxa, such as ammonia-oxidizing bacteria, which can impact nitrogen cycling in the soil. Similarly, microplastics can impact the abundance and diversity of soil microorganisms, potentially by providing a surface for attachment and colonization.

The impacts of microplastics and nitrogen deposition on soil multifunctionality are concerning, as they can have significant implications for ecosystem sustainability and human well-being. Soil multifunctionality is critical for supporting plant growth and providing essential ecosystem services, such as carbon storage and nutrient cycling. Therefore, understanding the impacts of these environmental stressors on soil multifunctionality is essential for developing effective strategies for soil management and conservation.

In conclusion, microplastics and nitrogen deposition are two major environmental stressors that can impact soil multifunctionality, particularly carbon and nitrogen cycling. These stressors can impact soil microbial communities, which can in turn impact soil fertility, carbon storage, and overall ecosystem productivity. Therefore, it is critical to develop effective strategies for reducing micro plastic pollution and excess nitrogen deposition in order to protect soil health and ensure the sustainability of ecosystems.

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