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Nitrogen availability as result of interaction between fertiliser and soil properties

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Abstract

Scientific studies as well as observations and experiences in gardening practice have shown that soils have a highly varied ability to release nutrients, especially nitrogen. Organic fertilisers can exhibit very different rates of nitrogen release at different locations. Understanding nitrogen release from organic fertilisers and its interaction with soil properties is essential for estimating nitrogen mineralisation potential, adapted fertilisation and reducing negative environmental impacts. We conducted incubation and greenhouse experiments with agricultural and horticultural soils to study the impact of clay content and carbon to nitrogen ratios of organic fertilisers on nitrogen mineralisation and plant nitrogen availability. Results showed soil and fertiliser nitrogen mineralisation varying by site, with management history and clay content as significant factors, whereas no soil-fertiliser interaction across sites could be observed. Soil clay content influenced the magnitude and course of nitrogen release, but this was inconsistent across the different farms. Agricultural soils had higher nitrogen mineralisation and plant nitrogen uptake, whereas fertiliser effects were greater in horticultural soils. The higher the carbon to nitrogen ratio of the fertiliser, the lower the nitrogen release, with differences in magnitude and timing as well as location-specific variations. This study suggests that plant-based fertilisers with carbon to nitrogen ratios greater than 10 may not suit short cultivation periods and thus applicability in organic vegetable production. Site-specific management history influences nitrogen mineralisation greater than soil clay content and fertiliser carbon to nitrogen ratio. These findings highlight the importance of the specific investigation of management history for further understanding and improving of fertilisation efficiency.

Keywords: Clay content, CN-ratio, N-mineralisation, soil-fertiliser-interaction

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