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Agro-environmental Potential of Novel Organic Fertilizers Derived from Fishery Waste

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The application of novel organic fertilizers derived from secondary raw materials has emerged as a promising sustainable agricultural practice in recent years. This study investigates the potential of organic fertilizers produced from fishery waste to be applied as alternatives for synthetic nitrogen (N) fertilizers through comprehensive soil incubation and pot experiments. The N content of eight selected organic fertilizers ranged from 1.9% to 9.8%, in which some of them were rich in labile N such as protein fractions and amino acids. In a 120-day incubation trial, six of these labile N-rich organic fertilizers demonstrated a superior mineralization rate of 49-66% compared to 10-35% for the other fertilizing products, showcasing a high concentration of readily degradable N fractions. This increased mineralization led to enhanced N availability for crop, which is crucial for short-term agricultural productivity. Remarkably, when applied to spinach at a fertilization rate of 170 kg N ha□¹, the tested organic fertilizers performed comparably to the synthetic fertilizer, resulting in similar yields and statistically non-significant differences in N use efficiency over two months of spinach growth. Additionally, a follow-up experiment assessed greenhouse gas emissions, especially N□O, from soils amended with the fertilizers under high-water condition. Notably, solid organic fertilizers exhibited lower N□O emissions (0.5%-2.0%) compared to the liquid ones (2.6%-4.5%) even when soil moisture content reached 70% of water-filled pore space, which in line with the previous field studies (Aguilera et al., 2013), where solid organic fertilizers emitted less N_2O than the liquid organic fertilizers). Overall, these circular fertilizers matched the N-supplying efficacy of synthetic fertilizers, offering a sustainable alternative. Notably, solid organic fertilizers outperformed the liquid ones in terms of N_2O emissions, highlighting their potential for more environmentally friendly agricultural practices.

Keywords: fishery waste; organic fertilizer; nitrogen mineralization; greenhouse gas emissions

Reference

Aguilera, E., Lassaletta, L., Sanz-Cobena, A., Garnier, J., Vallejo, A., 2013. The potential of organic fertilizers and water management to reduce N2O emissions in Mediterranean climate cropping

systems. A review. Agriculture, Ecosystems & Environment 164, 32-52.https://doi.org/10.1016/j.agee.2012.09.006.