PRACTICE ABSTRACT NO. 9

Bio-based P fertilisers perform as well as conventional ones under real field conditions

Main results / outcomes

Phosphorus is essential for crop growth, but Europe relies heavily on imported P fertilisers made from mined, non-renewable resources. New field trials in cereals and sunflower across Europe showed that several bio-based fertilisers performed just as well as conventional inorganic fertilisers. The best results came from products based on struvite, dicalcium phosphate, or phytate.

Practical recommendations

Farmers can use these bio-based fertilisers as reliable alternatives to conventional P products, especially on fields with low P levels. They offer a way to reduce dependence on imported phosphate while recycling valuable nutrients from organic waste. Struvite and dicalcium phosphate products showed the most consistent performance across sites. Regular use over time may also build up benefits. However, not all bio-based fertilisers work equally well in all conditions. As for any other P-fertiliser, soil tests (especially Olsen P) help predict whether a crop will respond to P application. Farmers should start by trialling bio-based fertilisers on a small area and comparing yields. Sharing field experiences at regional level can help build confidence and develop clear, locally adapted recommendations.

Figure 1: Phosphorite mine (CC0 1.0; Mark A. Wilson)

Figure 2: Readily dried struvite (CC 2.0; M. Winker)

Further information

Frick H et al. (2025) Bio-based fertilisers can replace conventional inorganic P fertilisers under European pedoclimatic conditions. Field Crops Research: 109803
https://doi.org/10.1016/j.fcr.2025.109803
Recena R et al. (2022) Assessing the phosphorus demand in European agricultural soils based on the Olsen method." Journal of Cleaner Production 379: 134749.
https://doi.org/10.1016/j.jclepro.2022.134749

About this abstract

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SEA2LAND project is a collaborative Innovation Action(IA) funded by the EU in the frame of the Horizon 2020 programme. The project aims to provide solutions to help overcome challenges related to food production, climate change and waste reuse. Based on the circular economy model, SEA2LAND promotes the production of large-scale fertilisers in the EU from own raw materials. This solution is expected to reduce the soil nutrient imbalance in Europe. The project is running from January 2021 to June 2025.
Website: www.sea2landproject.eu

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