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## Evaluating the efficacy of novel green fertilisers derived from combining carbon capture technology and organic waste materials

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Over-reliance and indiscriminate use of mineral fertilisers have contributed towards declining soil health. Further, mineral fertiliser production contributes close to 1% of UK's greenhouse gas emissions. Organo-mineral fertilisers (OMFs) are currently being investigated as a more environmentally sustainable alternative to conventional mineral fertilisers as they reduce the amount of mineral fertilisers needed by combining them with organic materials that would otherwise be destined for landfill or incineration, promoting a circular economy by returning recycled nutrients to the soil. Here, we evaluated the efficacy of a novel OMF that incorporates carbon captured from gaseous point sources into their production. This product demonstrates a potential tool for combating both climate change and soil fertility by promoting soil carbon sequestration. To assess the efficacy of these new fertilisers we conducted a field experiment consisting of three batches of OMF (5, 10 and 15%N) and compared them to a conventional mineral fertiliser and an unfertilised control in two soil types with two crops (winter barley and winter wheat).

We found that all fertilisers produced significantly more yield than the control ( $p < 0.05$ ) but that there was no significant or consistent difference between the fertilisers. There was no significant or consistent differences between the stimulated root growth for any treatments ( $p = 0.60$ ) and the same for organic matter, microbial biomass, pH, available nutrients (N, P, K), total nutrients (N, C, P), and metals. This leads to the conclusion that organo-mineral fertilisers can perform at least as well as conventional fertiliser. Though more seasons are needed to evaluate the benefits to the soil.

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