

Phosphorus recycling with biochar and hydrochar produced from different feedstocks

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Rock phosphate is considered as a critical resource. Therefore, the production of phosphorus fertilizers, one of the main uses of rock phosphate, needs to include waste materials as secondary resources for phosphorus (P). A gradual closure of the phosphorus cycle by recycling a significant proportion of this element could slow down the rapid depletion of the primary phosphate resources, reduce the dependencies of supply from politically unstable regions, decrease the losses of phosphate to non-target ecosystems and avoid the eutrophication of rivers and lakes.

The carbonization of waste materials (pyrolysis and hydrothermal carbonization) may recover phosphorus from Prich feedstocks like sewage sludge, slurries, food processing residues, and agricultural residues. The bioavailability of P from the carbonized materials is an equally important indicator for fertilizer products as total P concentration. We tested different carbonization conditions, e.g. pyrolysis temperatures and feedstock modifications, with respect to the effect on P concentration and P availability for plant uptake. Apart from chemical extraction methods, a modified Neubauer test with rye plants was used for studying P uptake and translocation. Addition of Na2CO₃ increased the plant available fraction of P in the carbonized materials.