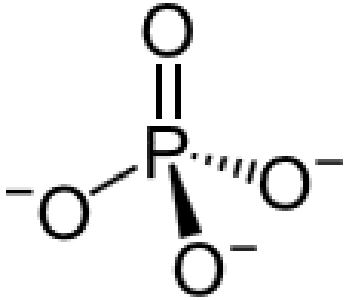
Surface-modified apricot pits as biochar feedstock and phosphate sorbent



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Background

- Fruit pits from apricots, peaches, cherries, plums etc. are frequently left to rotting or are burnt inefficiently

- **The pyrolytic carbonisation of fruit pits produces an excellent sorbent for phosphate in waste water or surface runoff**

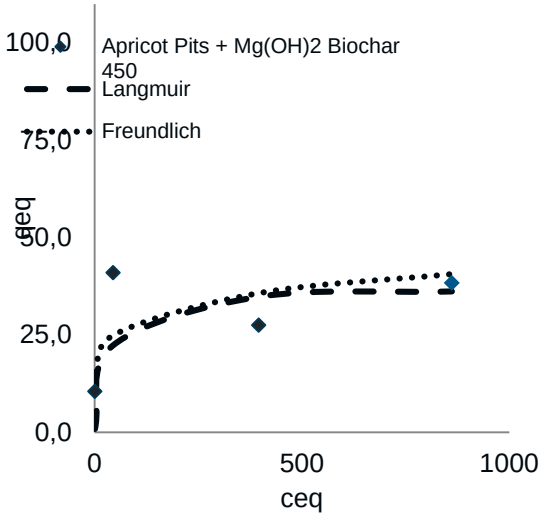
- Biochar from fruit pits offers several benefits:
  - Recycling of phosphorus from liquid phases (e.g. from waste water treatment runoff)
  - Production of a fertilizer enriched with recycled phosphorus
  - Carbon sequestration → „negative emission technology“

Preparation of Mg-modified biochar

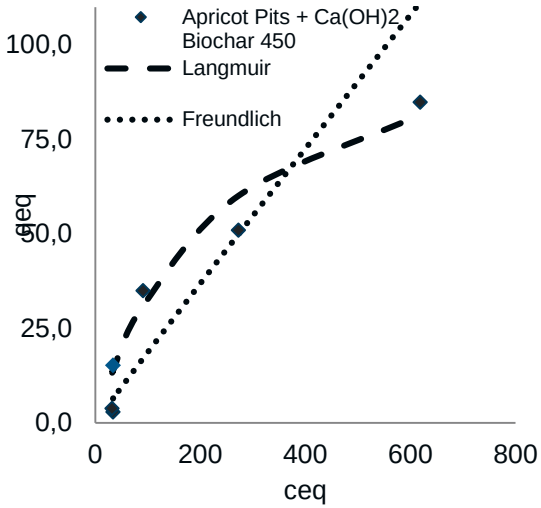
Mg-impregnated apricot pits

before pyrolysis → after pyrolysis

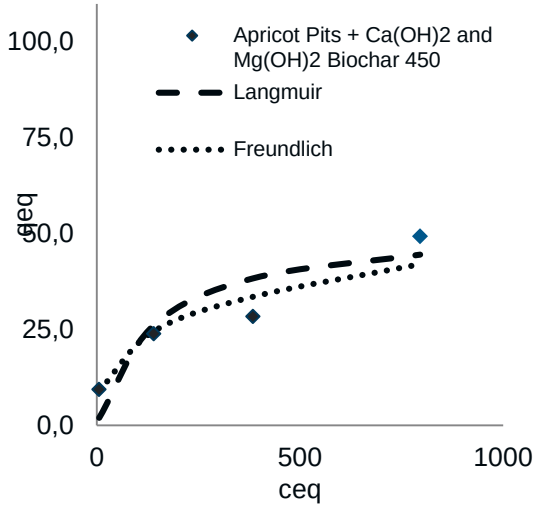
Sorption analysis for phosphorus to biochars made from **differently modified apricot pits**



Mg-modification
(q_{max} = 37 mg/g phosphate-P)



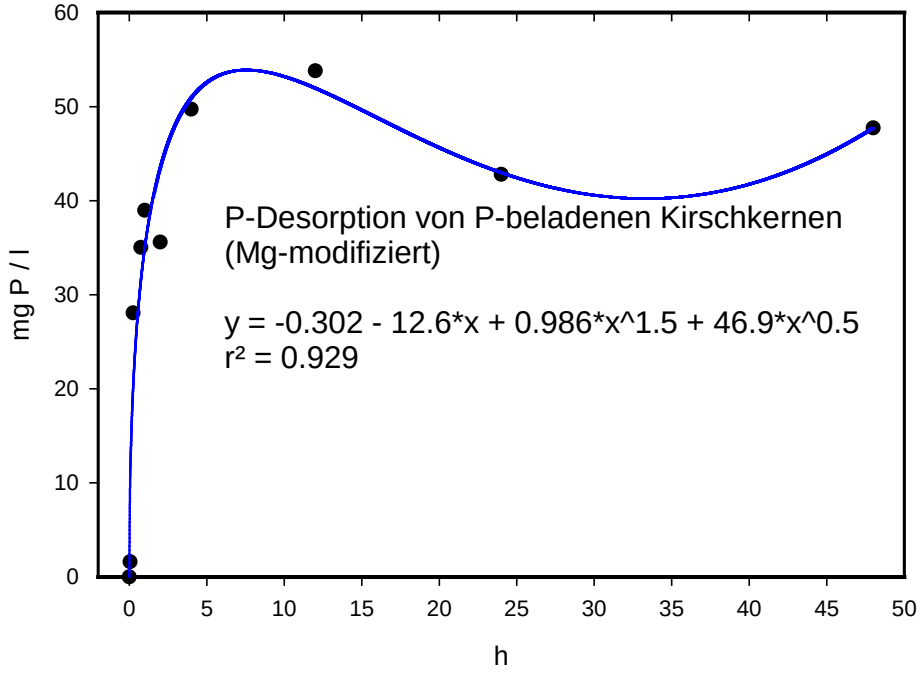
Ca-modification
(q_{max} = 113 mg/g phosphate-P)

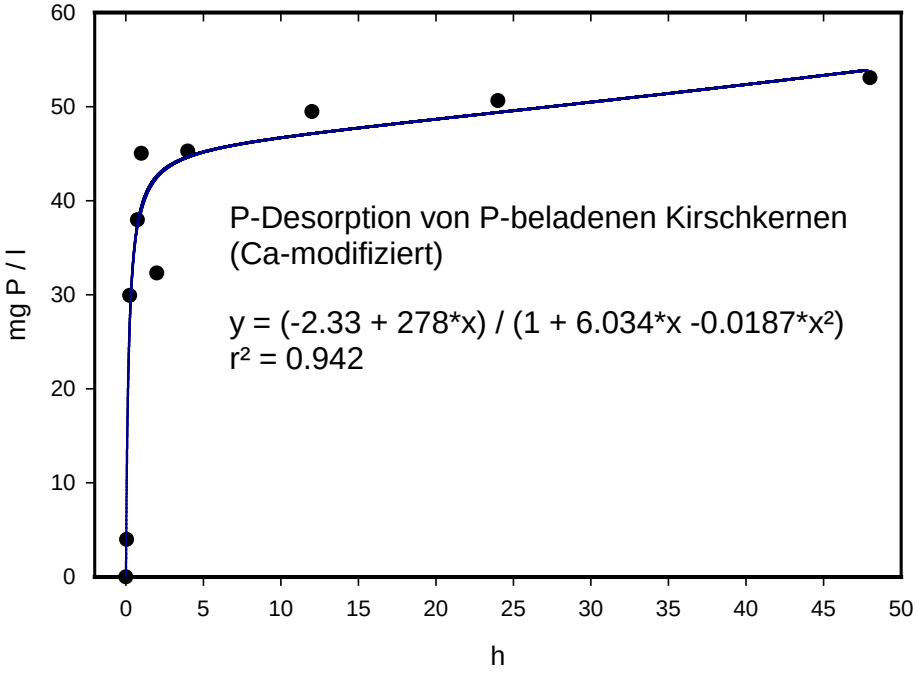


Mix of Mg- and Ca-modification
(q_{max} = 52 mg/g phosphate-P)

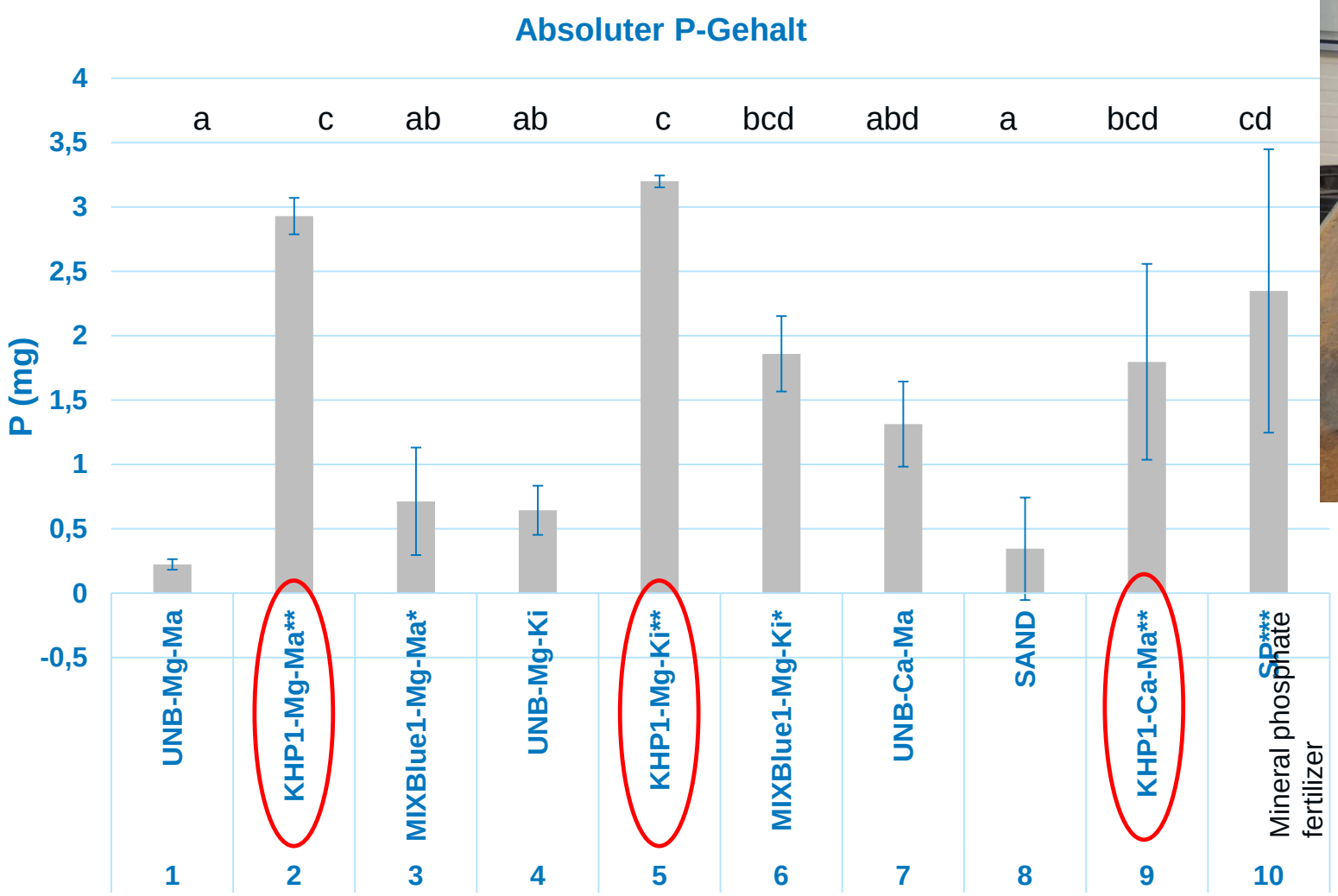
Desorption of phosphorus after sorption to modified and pyrolyzed cherry pits

Majority of P was desorbed within 2 h





Plant growth test for analysing bioavailability of the P sorbed to the pyrolyzed fruit pits



= biochars from pyrolyzed fruit pits, enriched with sorbed P

Conclusions

- **Pyrolyzed fruit pits** are useful **sorbents for phosphate**, if their surface has been modified
- Differences between apricot and cherry pit sorption was mainly due to different particle sizes
- **Mg-modification** showed not always the highest but more reliable P-sorption than Ca-modification
- Sorbed phosphate-P could easily be desorbed in an aqueous medium
- **Plant growth tests**: Fertilizer effect of P-enriched apricot pit biochars was similar to mineral P-fertilizer
- Follow-up tests for use as P-sorbent in constructed wetlands and in mobile toilets are under way