Introduction
The recovery of phosphorus (P) from P-rich residues could make a contribution to conserve global rock phosphate reserves. Against this background, different technologies have been developed within the last decades to produce new P fertilizers (secondary phosphates) by recovering P from municipal waste water and sewage sludge. However, in previous studies some secondary phosphates (sec-P) have shown a poor plant availability in peat based growing media. Till now the effect of different pH levels on the plant availability of sec-P is unknown.

Objectives of the study
- Does a low pH of the growing medium improve the plant availability?
- Are CAT and CAL suitable extractants for growing media to predict the plant availability of sec-P?

Conclusion
- In contrast to Mephrec, sewage sludge ash led to a significant higher P uptake of the plant at the lower pH level of the growing medium.
- A prediction of P uptake with CAL and CAT was not possible.

Material and Methods
treatments

ph (CaCl₂) of growing medium
- 4.5 - 5.0
- 5.5 - 6.0

P fertilizers
- CaP: water soluble Ca(H₂P₂O₇)₂
- rock-P: finely ground rock phosphate
- Struvite: precipitated magnesium ammonium phosphate from municipal waste water
- SSA: ash produced by mono incineration at ~800 °C of municipal sewage sludge
- Mephrec: cinder produced by thermal gasification at 1200 °C of sewage sludge

control fertilizers

Material and Methods

Additional experiment information
- model plant: Tagetes erecta x patula ‘Zenith Red F1’
- growing medium: white peat < 8 mm
- fertilization:
  - P as basic fertilization, 25 mg P(aqua regia) per pot
  - other nutrients as complete fertilizer (19 + 0 + 15), 70 mg N per pot as basic fertilization, during cultivation on demand
- extractants for P analysis of the growing media:
  - PCAL (calcium-acetate-lactate)
  - PCAT (0.01 M CaCl₂ + 0.002 M DTPA)
- design: two factorial block design with 4 replications

Results and Discussion
- ranking of fresh matter production (Fig. 2)
  - pH 4.5 - 5.5: CaP = Struvite = SSA = rock-P >> Mephrec
  - pH 5.5 - 6.0: CaP = Struvite > SSA > rock-P > Mephrec
- ranking of P uptake (Fig. 3 A)
  - pH 4.5 - 5.5: Struvite > CaP > SSA = rock-P >> Mephrec
  - pH 5.5 - 6.0: Struvite > CaP > SSA > rock-P > Mephrec
- no pH effect on fresh matter production and P uptake in case of Struvite, CaP and Mephrec (Fig. 2, Fig. 3 A)
- significant increase of fresh matter production and P uptake at pH 4.5 - 5.0 by SSA and rock-P (Fig. 2, Fig. 3 A)
- CAL extracted only a slightly higher amount of P than CAT at pH 5.5 - 6.0. No considerable pH effect was found (Fig. 3 B, Fig. 3 C). This is contrasting our expectations due to the fact that CAL is the stronger extractant. While CAL is buffered and extracts at pH level of 4.1, CAT is not buffered and extracts at the actual pH of the growing medium.
- the extracted P does not predict the increased P uptake from SSA and rock-P at pH 4.5-5.0 (Fig. 3)