# Evalutation of “P-recovery” toolkit

# based on Wetsus research

wetsus
european centre of excellence
for sustainable water technology

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# PHOSPHORUS recovery

we tested the feasibility of recovery phosphorus from synthetic urine as

STRUVITE $NH_4MgPO_4.6H_2O$

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# SYNTHETIC URINE RECIPE

| compound | FORMULA | MM | Concentration g/L | g for 500mL |
|---|---|---|---|---|
| Urea | $CH_4N_2O$ | 60,062 | 25 | 12,5 |
| Sodium chloride | NaCl | 58,44 | 4,6 | 2,3 |
| Potassium dihydrogen phosphate | $KH_2PO_4$ | 136,086 | 4,2 | 2,1 |
| Potassium chloride | KCl | 75 | 1,6 | 1,3 |

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# PHOSPHORUS recovery

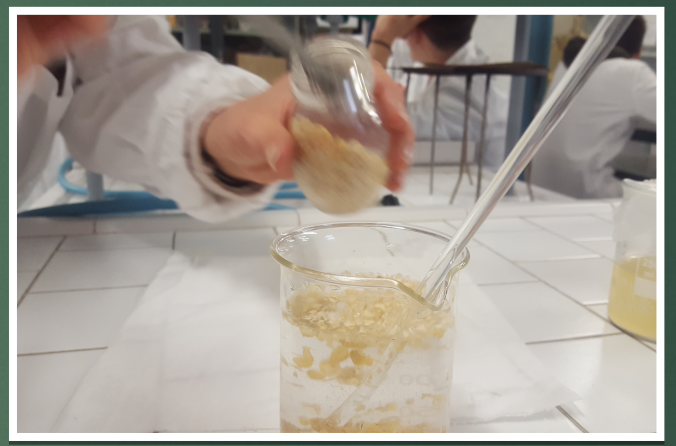
- When enzyme urease is added to the urine causes the conversion of urea into ammonia with increasing of the pH of the solution

$$(NH_2)_2CO(aq) + H_2O(l) \rightarrow CO_2(g) + 2NH_3(g)$$

$$NH_3(g) + H_2O(l) \rightarrow NH_4^+OH^-(aq)$$

# enzyme urease from soybeans

- Hydrated soybeans were mashed with a pestle and a mortar

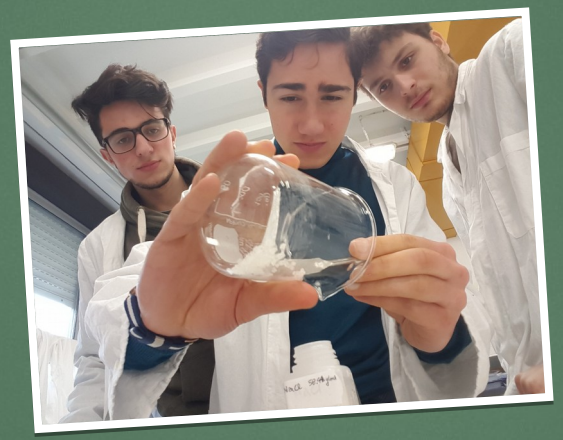


- added to the solution

- The pH of the solution become more than 10

# Struvite precipitation

- The solution was filtered and $MgSO_4$ was added to the solution



- the suspension obtained was filtered and air dried

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# Struvite as fertilizer

1 week

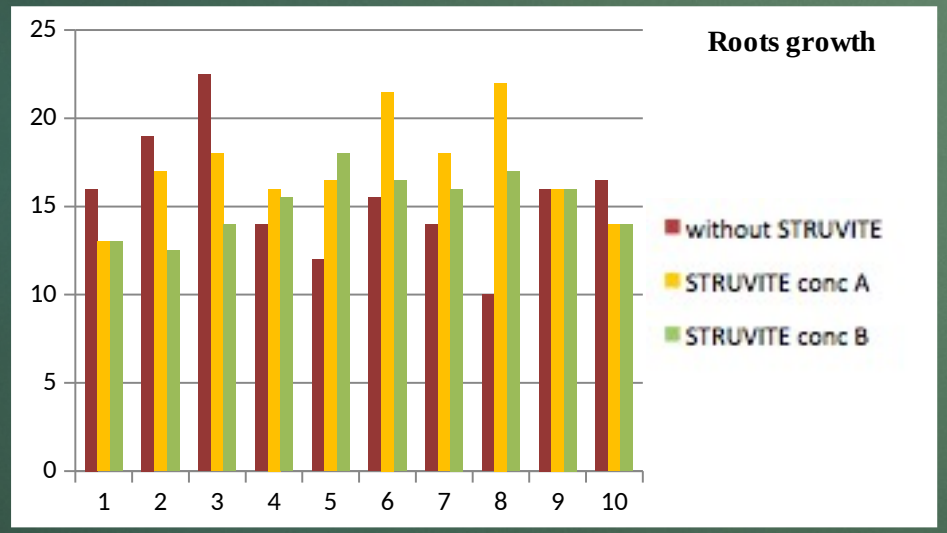
2 week

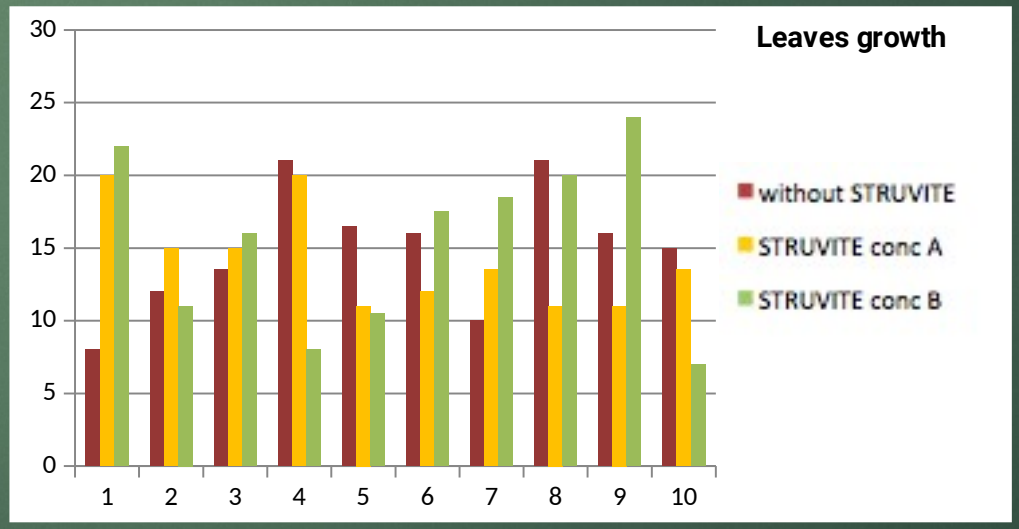
3 week

4 week

# Struvite as fertilizer: results

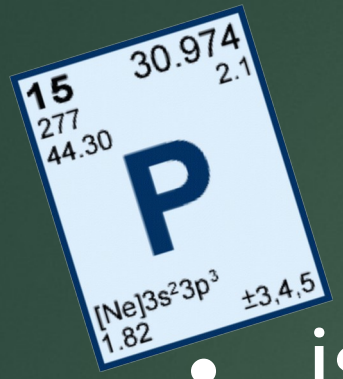
- We studied the growth of roots and the growth of leaves with two concentration of struvite and without struvite as control
- there isn't a significative difference in the plants growth but plants with struvite grew a little more



# What we have learnt:

- waste products contain valuable and useful compounds
- importance  of nutrients recovery from urine: phosphate and nitrogen




# PHOSPHORUS

- is an indispensable element for plants and animal life
- is a part of the DNA and RNA
- is important for energy transfer in cells as part of ATP (adenosine triphosphate)
- is found in Nature as phosphate in mineral rocks

# PHOSPHORUS

- in the 2014  phosphate rocks were included in Critical Raw Materials by EC
- stocks will run out in about 100 years
- recovering from mines is finite
- demand will increase by the strong growth of the world population

# Conclusion

Increased efficiency in nutrient capture

- will reduce nutrient load in the environment,

- reduce the costs of wastewater treatment and

- promote recycling of nutrients.

# Thanks!

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