Agronomic use of “struvite” in crop fertilization

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Struvite and crop production

- Phosphorus (P) is essential for crop growth and food production, and most of the phosphorus applied to agricultural land, comes from phosphate rock (PR) in specific areas of the world
- P is a non-renewable resource, Europe import > 88% of the P requirement
- Excess of P dispersed in the soil is one of the causes of water eutrophication
- The use of Struvite (as source of N and P) is becoming an increasingly competitive alternative to traditional fertilizers
- Struvite is one of the processes that can be used to recover phosphorus from animal waste.

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Struvite and advantages in agriculture

- It is a slow-release fertilizer (the delivery of nutrients takes place gradually and the plant consumes them according to its needs)
- In this way, the risk of N and P leaching is mitigated
- Lower frequency of application is required and there is no roots burning even at high doses of applications

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Agronomic protocol for struvite assessment

The agronomic protocol was originated from the integration of difference compenteces and expertises provided by the project partner's

Advantages:

- Integration of different compentence
- Elaboration of a unique reproducible agronomic protocol (greenhouse)
- Goal: comparable plant-struvite respose results among different countries using different type of Struvite

Difficulties:

-With the pandemic condition the installation and test of some facilities required more time then was supposed

-delay in the struvite production

-delay in the agronomic test

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Agronomic protocol for struvite assessment

Test 2 crops with different edible organ:

1) Baby leaf lettuce: is a crops that in 30 days are able to develop the edible part that can be cut and analyzed.

1) Radish: the choice of this crop is linked to the fact that the edible portion is underground, therefore directly in contact with the treatment.

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Agronomic protocol for struvite assessment

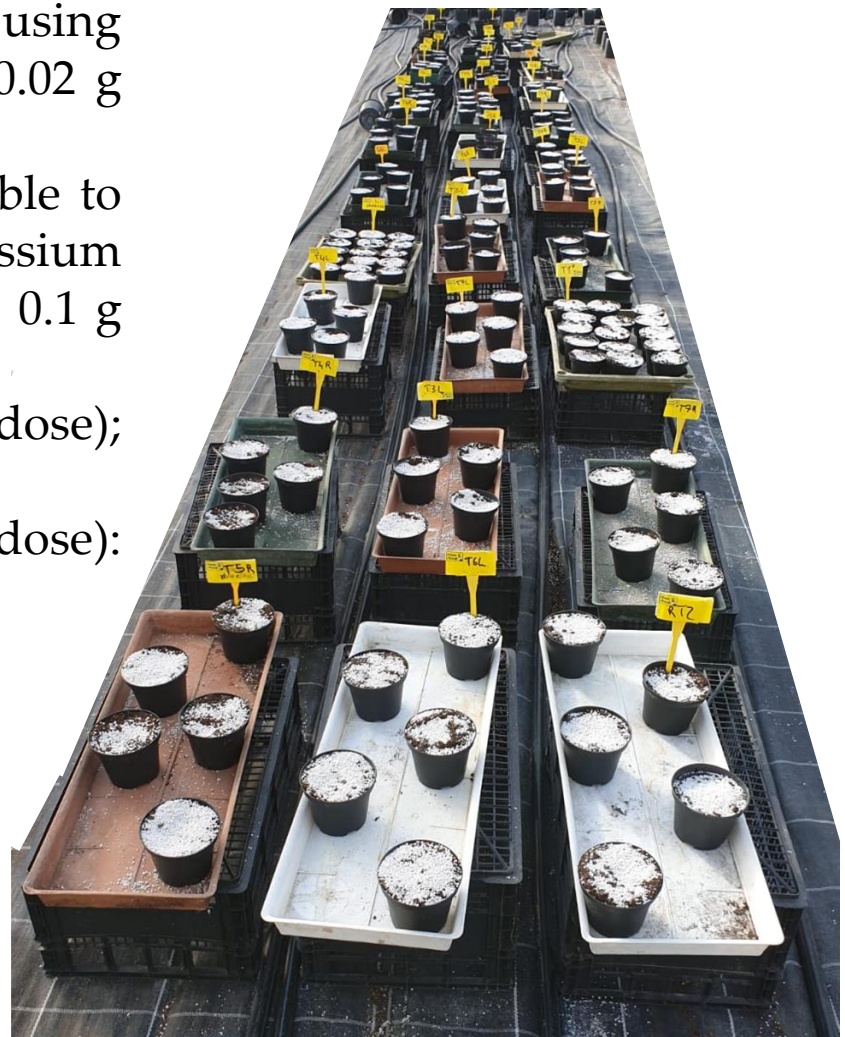
T1: crop on growing medium without fertilization

T2: crop on growing medium with traditional fertilization using the N-P-K commercial fertilizer (amount: 0.03 g N pot^{-1}, 0.02 g P_2O_5 pot^{-1}, 0.05 g K_2O pot^{-1})

T3: crop on growing media + fertilizer as similar as possible to treatment 5 (ENTEC 46, simple superphosphate, potassium sulphate); N-P-K amount: 0.06 g N pot^{-1}, 0.04 g P_2O_5 pot^{-1}, 0.1 g K_2O pot^{-1})

T4: crop on growing media + struvite at level 1 (lower dose); same N-P-K amount that Treatment 2

T5: crop on growing media + struvite at a level 2 (normal dose): same N-P-K amount that Treatment 3



Testing crops: Baby lettuce and radish

Duration: 30 days

Agronomic protocol for struvite assessment

Growing media analysis:

- Analysis of growing media structure and mineral composition at the beginning of the experiment (nutrient composition)
- Analysis of growing media structure and mineral composition at the end of the experiment (nutrient composition)
- Growing media humidity

Parameters:

- Plant health (presence of biotic and abiotic stresses)
- SPAD, DUALEX
- Phenology
- Productivity (marketable and total yield, fresh and dry weight of the different organs)
-Nutrient composition in different plant organs (polyphenols, flavonoids, carotenoids, N, P, K, Mg, Ca….)
- Shelf life of the edible product