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Nanomaterials for the Remediation of agriculture Metal contaminated soils surrounding the Estarreja chemical complex (NAMELESs)

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Overview

- Estarreja Chemical Complex (ECC) is the second largest chemical complex in Portugal and has been classified as a "site of priority actions in terms of rehabilitation".
- Previous studies found that potentially toxic elements (PTEs) in Estarreja agricultural soils are associated with labile fractions (risk of translocation, bioaccumulation, and a potential risk of transfer to the food web).

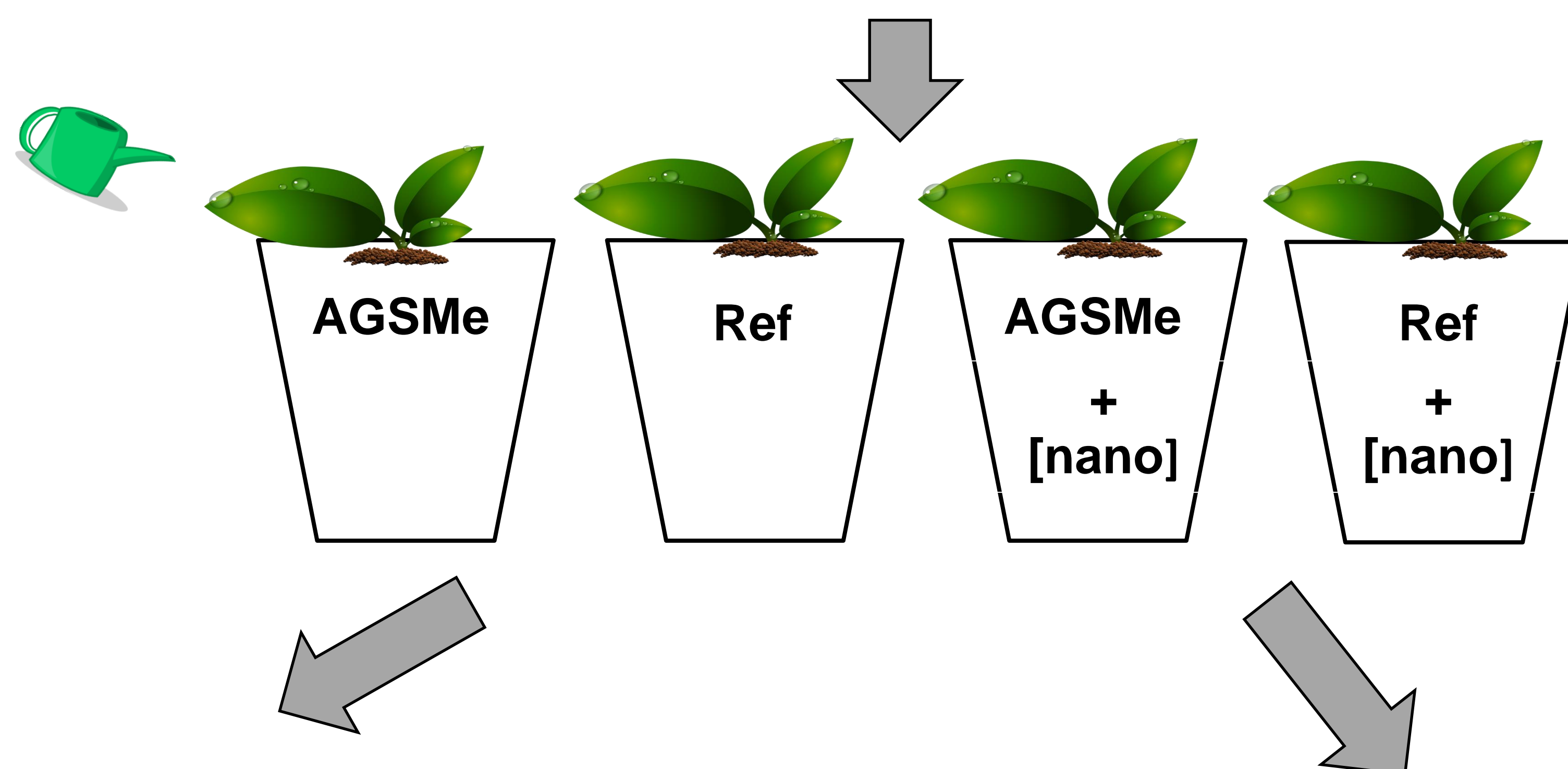


Main Goals

- This project aims at evaluating the ability of nanoparticles to reduce PTEs mobility and their uptake by plants.
- The ability of nanoparticles to reduce the mobility of PTEs will be assessed through selective chemical extractions and ecotoxicological assays.

Methodology

Data compilation and soil characterization



Proposed treatments

1. Agriculture soils contaminated with PTEs (AGSMe)
2. Reference soil (Ref)
3. AGSMe + nanoparticles at a given range of concentrations.
4. Ref + nanoparticles at a given range of concentrations.

Physical and chemical soil properties

- **Characterization of studied soils before nanoparticles application** (pH, organic matter %, water holding capacity, PTEs concentrations).
- **Soil extractions before and after nanoparticles application:** 0.01M CaCl₂, 0.05M DTPA, 10 mM LMWOAs (low molecular weight organic acids).
- **Changes in pore-water PTEs concentrations before and after nanoparticles application.**

Biological analysis

- **Plant analysis:** assessment of PTEs transfer and bioaccumulation soil-plant system.
- **Ecotoxicological aquatic tests** (*Daphnia magna* and the green algae *R. subcapitata*) for assessing the **soil retention function**.
- **Ecotoxicological terrestrial tests** (earthworms) for assessing the **soil habitat function:** reproduction and PTEs bioaccumulation.

Expected Results

- **Soil system:** Immobilization and reduction of available PTEs contents in studied soils after nanoparticles application.
- **Plant system :** Low translocation and bioconcentration of studied PTEs.
- **General results:** Assessment of the economic costs and ecotoxicological risk of nanoparticles application.