Plants and Pollutants: Exploring salt and cadmium stress response in Sea Rocket

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Abstract

Anthropogenic factors such as climate change, harsh agricultural practices, and mining have contributed to increases in soil salinization and heavy metal contamination. Highly saline environments drastically lower yield for crop species and elevated levels of toxic metals like cadmium are carcinogenic in the environment. Some plants that have evolved in high-salinity habitats or in soils with heavy metals could be used to remediate contaminated soils. Halophytes are plants with various adaptations that allow them to survive and reproduce in saline conditions. General mechanisms for salt tolerance/uptake in halophytes are hypothesized to help deal with other stresses like heavy metals. Plants with these traits could be utilized to extract salt and heavy metals from affected soils in a process called phytoremediation. We plan to develop Sea Rocket (Cakile maritima) in the Mustard family as a model system to understand mechanisms of salt (NaCl) and cadmium uptake and tolerance, as it has been shown to accumulate both. As part of this study, we will hydroponically grow C. maritima in different stress treatments using salt and cadmium. As the plants uptake the pollutants, the conductivity of the solution will change. We will develop an automated pipeline to track these changes in real-time using conductivity sensors. In addition, we will sample root and leaf tissues at various time points to measure salt and cadmium uptake using ICP-OES elemental analysis. This data will provide insights into salt and cadmium uptake/tolerance and paves a path toward efficient and viable solutions improving phytoremediation approaches.

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