PROJECT FACTSHEET

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Xpress

Identification of mechanisms induced by heavy metals in resistance of plants to frost.

Inspiration

In 2008, as part of a previous research project dedicated to the reclaiming and phytoremediation of river banks, researchers from the Luxembourg Institute of Science and Technology (LIST) planted willow cuttings in two different soil types, 'clean' soil and soil heavily polluted by heavy metals. This project ended and over the years they were able to observe an interesting phenomenon. Whilst the plants planted in unpolluted soil all died after several winters, almost all of those planted in contaminated soil were still alive eight years later.
Both groups of plants were identically treated for the last few years, and researchers deduced therefore that exposure of plants to heavy metals provided them better resistance to extreme weather conditions. One of the most harmful pollutants for ecosystems and human health are heavy metals which seem to have a clear protective effect.
Frost in the plants' roots is a major cause of economic loss in the agriculture and horticultural sectors, and researchers naturally wanted to understand and analyse how heavy metals protect the plant, so as to seek inspiration to implement future innovations in the sector.

Innovation

With Xpress, researchers will focus on research into plant molecules. Their aim is to identify the mechanisms induced by heavy metals allowing for the protection of plants against frost. Consequently, either in vitro or in a greenhouse, they will grow plants in their Belvaux laboratories. By using the latest analytical tools and following an integrated biological approach, they will identify the molecular mechanisms offering such protection.
This controllable system, unique in its kind, will allow researchers not only to study the observations in more detail, but also to induce root frost resistance in plants. Researchers will firstly describe the structural and molecular condition of roots exposed to metals before their exposure to cold. Subsequently, after adding frost as a secondary constraint to these same plants, they will study, from a microscopic and molecular perspective, the cross-protection offered by heavy metals.
The molecular analyses undertaken and mechanisms identified will then allow researchers to attempt to discover how to reproduce the protective effect of heavy metals on plants without using this pollutant. The expected discoveries will enrich previous studies on the subject and may lead towards the development of more frost tolerant plants for agricultural and horticultural production.

Impact

By the end of the project, researchers hope to discover the specific property(ies) of the structural or molecular composition of plant roots exposed to the metals which allow them to resist frost. Once the protective mechanisms of heavy metals are identified, researchers will promote these findings and reproduce them so as to protect plants against frost, and to do so without using heavy metals.
Solving this mystery could be of great importance to the agricultural and horticultural sectors, but also for all companies responsible for reclamation and value creation from land. The project results will pave the way towards the selection and creation of frost resistant plants.

Partners

Hasselt University (BE)

Financial Support

Fonds National de la Recherche

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