

**UNIVERSIDAD DE LA FRONTERA**

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales



**ARBUSCULAR MYCORRHIZAL FUNGAL  
COMMUNITIES FROM THE ATACAMA DESERT AND  
THEIR EFFECT ON THE IMPROVEMENT OF SALINITY  
STRESS TOLERANCE OF *LACTUCA SATIVA* PLANTS**

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**DOCTORAL THESIS IN FULFILLMENT OF  
THE REQUIREMENTS FOR THE  
DEGREE DOCTOR OF SCIENCES IN  
NATURAL  
RESOURCES**

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**CASTRO**

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**“ARBUSCULAR MYCORRHIZAL FUNGAL COMMUNITIES FROM THE ATACAMA DESERT AND THEIR EFFECT ON THE IMPROVEMENT OF SALINITY STRESS TOLERANCE OF LACTUCA SATIVA PLANTS”**

Esta tesis fue realizada bajo la supervisión del Director de tesis, Dr. Pablo Enrique Cornejo Rivas perteneciente al Departamento de Ciencias Químicas y Recursos Naturales de la Universidad de La Frontera y ha sido aprobada por los miembros de la comisión examinadora.

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## **Thesis summary**

"Soil salinization threatens agricultural sustainability, causing water stress, ion toxicity, and cellular damage in plants. To counter these effects, plants employ osmotic stress tolerance, ion exclusion, and tissue tolerance mechanisms. One strategy involves symbiotic relationships between arbuscular mycorrhizal fungi (AMF) and plant roots. This study focuses on AMF from arid ecosystems, exploring their impact on *Lactuca sativa* (lettuce) salinity stress tolerance. Different AMF species vary in efficacy, with those from limiting ecosystems often more effective. The research shows AMF enhances lettuce growth by reducing toxic Na<sup>+</sup> ions, improving nutrient uptake, and boosting antioxidant responses. AM symbiosis affects gene expression, improving K<sup>+</sup>/Na<sup>+</sup> balance and aquaporin abundance, enhancing water status and stress tolerance. This study highlights AMF's potential to mitigate salinity stress in crops, guiding strain selection for sustainable agriculture."