

**UNIVERSIDAD DE LA FRONTERA**

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales



**GYPSUM EFFECTS ON PHOTOSYNTHETIC PERFORMANCE,  
METABOLITES, AND MORPHOLOGICAL FEATURES IN  
VACCINIUM CORYMBOSUM L. CULTIVARS UNDER  
ALUMINUM TOXICITY IN AN ANDISOL.**

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

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**EDITH DEL PILAR ALARCON POBLETE**

**TEMUCO-CHILE**

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**“GYPSUM EFFECTS ON PHOTOSYNTHETIC PERFORMANCE, METABOLITES,  
AND MORPHOLOGICAL FEATURES IN VACCINIUM CORYMBOSUM L.  
CULTIVARS UNDER ALUMINUM TOXICITY IN AN ANDISOL”**

Esta tesis fue realizada bajo la supervisión de la Dra. Marjorie Reyes Díaz, perteneciente al Departamento de Ciencias Químicas y Recursos Naturales de la Universidad de La Frontera y es presentada para su revisión por los miembros de la comisión examinadora.

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## **Thesis summary**

"This thesis focuses on the interactions between sulfate and aluminum in plants, particularly in acidic soils. It investigates how the application of calcium sulfate (gypsum) to soils with toxic aluminum can impact photosynthetic performance, metabolic responses, and leaf characteristics in highbush blueberry cultivars. The hypothesis posits that gypsum application increases the availability of sulfur and calcium in the soil, which can counteract the toxic effects of aluminum. The thesis encompasses several objectives, including analyzing plant response mechanisms to aluminum toxicity, evaluating changes in leaf morphology and photosynthetic performance due to gypsum amendment, and studying the effects of gypsum on blueberry metabolites and metabolic profile in the presence of toxic aluminum. The results indicate that gypsum application has positive effects in mitigating aluminum toxicity, especially in aluminum-sensitive cultivars. Improvements in leaf morphology, photosynthetic efficiency, and blueberry metabolic profile are observed. The positive effects of gypsum seem to be linked to increased sulfur and calcium availability in both leaves and soil solution."