UNIVERSIDAD DE LA FRONTERA

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales

ROLE OF SILICON IN PRODUCTION OF PHENOLIC COMPOUNDS AT DIFFERENT PHENOLOGICAL STAGES OF BARLEY PLANTS GROWN UNDER ALUMINIUM STRESS

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

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“Role of silicon in production of phenolic compounds at different phenological stages of barley plants grown under aluminium stress”

Esta tesis fue realizada bajo la supervisión de la directora de tesis, Dra. Paula Cartés del 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

Silicon (Si) offers multiple benefits to plants facing biotic and abiotic stress, including improved phenolic compound production linked to Si absorption. Si also mitigates aluminum (Al) toxicity, potentially enhancing both grain yield and quality in Al-sensitive species like barley. Screening barley cultivars based on phenol concentration and Al tolerance identified cv. Scarlett and cv. Sebastian for further investigation. EvaluatingAl-Si uptake kinetics and Si's impact on antioxidant and structural phenolic production in barley revealed positive effects in tolerant cultivars. A hydroponic study assessed Si's influence on phenols under Al stress.Si reduced Al toxicity by modulating uptake at various growth stages, enhancing antioxidant phenols to reduce oxidative stress, and altering structural phenol composition, particularly phenolic acids for lignin production, throughout barley's life cycle under Al toxicity.