# Microbial Interactions in the plant-soil continuum: Research results presented at the Workshop "Mycorrhizal Symbiosis in the Southern Cone of South America"

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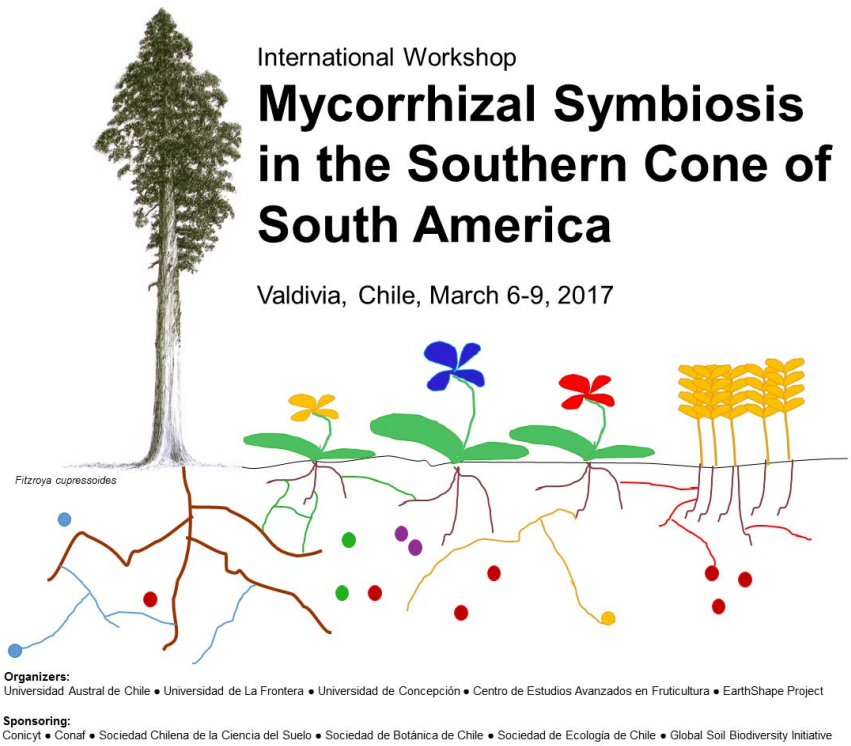

The Southern Cone of South America sustains several types of ecosystems such as old-growth temperate rainforests, Mediterranean woodland and scrub forests, Pampa, and many others. These ecosystems are of global importance; for example, the temperate rainforests in this region account for more than half of all southern hemisphere temperate rainforests. Furthermore, Chilean Mediterranean ecosystems, which are unique to South America, are one of only five Mediterranean regions in the world. Also, and despite the harsh conditions, agroecosystems on this region sustain a great amount of productivity. Since the Holocene, the floristic composition of all ecosystems found in the Southern Cone of South America has been stable and is marked by high endemism resulting from Pleistocene glaciations and postglacial climatic fluctuations. Specifically, the Chilean Coastal Range served as a glacial refugium for plants, causing this area to have high plant diversity at the family level and isolated monotypic genera. The Coastal Range bedrock is highly weathered, and oceanic atmospheric nutrients have a significant influence. In contrast, nutrient inputs to steep slopes of the Andes Range are mostly generated by young volcanic ash deposits and weathered basaltic volcanic scoria. Overall, these ecosystems have extreme environmental, edaphic, and orographic conditions that are enhanced by earthquakes and volcanic activity. Furthermore, the soil of these ecosystems is characterized by a high retention of organic matter, low plant available phosphorus, and phytotoxic aluminum levels. As a consequence of the unique conditions of these ecosystems, several floristic types can be found in the Coastal and Andes Ranges, for example: native conifer-dominated forests, e.g. *Fitzroya cupressoides*, angiosperm dominated forests *Nothofagus* spp., Valdivian forests, and others.

One important trait of almost all plants of the Southern Cone of South America is their mycorrhizal association type. For example, ectomycorrhizal (EM) forms are dominant in *Nothofagus* forests, and arbuscular mycorrhizal (AM) associations are usually found with subordinate plants, though the contrary pattern is seen in native coniferous forests. Additionally, AM associations are dominant in Mediterranean forests, though EM associations are found with few tree species. Overall, however, soil fungal communities, and specifically mycorrhizal associations, have been poorly studied in the Southern Cone of South America. The first mycorrhizal studies in Chile determined the mycorrhizal dominance of conifer trees and *Nothofagus* species as well as the mycotrophic status of the vascular flora of several vegetation types. Some recent molecular studies have been focused on the study of soil fungal assemblages in North-Patagonia, specifically AM and EM fungi in Chilean (Coast and Andes) and Argentinean *Nothofagus* and coniferous forests. Other molecular studies have sought to characterize AM and orchid mycorrhizal (OM) fungi of the Mediterranean forests of Central Chile. Recent global studies have also included Chilean and Argentinean coniferous forests, comparing all fungal associations, or specifically AM fungal communities.

This Special Issue of the Journal of Soil Science and Plant Nutrition, contains research results presented at the Workshop: "Mycorrhizal Symbiosis in the Southern Cone of South America," as well as research within the general topic of microbial-plant-soil interactions. The workshop aimed at establishing the status of research of mycorrhizal symbiosis in the Southern Cone of South America. Furthermore, the workshop aimed to facilitate collaboration between researchers, students, and the mycorrhizal scientific community of Argentina, Chile, and other countries.

The workshop had seven key lectures by: Álvaro G. Gutiérrez (Universidad de Chile, Chile), Andrea Premoli (Universidad Nacional del Comahue, Argentina), Götz Palfner (Universidad de Concepción, Chile), Fernando Borie and Pablo Cornejo (Universidad de La

Frontera, Chile), Maarja Öpik (University of Tartu, Estonia), C. Guillermo Bueno (University of Tartu, Estonia), and Jens Boy (Leibniz Universität Hannover, Germany). The key lectures covered topics such as temperate rainforest plant biodiversity (A.G. Gutiérrez and A. Premoli), EM fungal diversity patterns (G. Palfner), the effects of AM fungi on soil properties and on agriculture and bioremediation (F. Borie – P. Cornejo), molecular community ecology of AM fungi from local to global scales (M. Öpik), plant mycorrhizal traits across different scales (C.G. Bueno), and biogenic weathering by mycorrhiza (J. Boy). Overall, there were over 70 participants for this workshop, coming from eight countries (Argentina, Brazil, Chile, Estonia, Germany, Spain, United Kingdom, and Uruguay), and 26 institutions (including universities, research centers, companies, foundations and public entities). Besides the seven key lectures, 14 oral presentations and 28 posters were presented at the workshop with topics ranging from agriculture and agroforestry — with a strong emphasis on wine and wheat production, bioremediation, ecological restoration and land use, plant invasions and their mycorrhizas, mycorrhizal biodiversity at different scales, public management and outreach, and mycorrhizal interactions with soil nutrients and with biogeochemical cycles. Research groups from Universidad Austral de Chile (Chile), Universidad de La Frontera (Chile), Universidad de Concepción (Chile), and Universidad Nacional del Comahue (Argentina) contributed with numerous presentations. Both experimental and descriptive approaches were presented, using both morphological and molecular methods to study AM, EM and OM fungi.

As this workshop was the first of its kind for the southern part of South America and for South America overall, it can be concluded that its aims were far surpassed since it became evident that South American mycorrhizal research is more relevant than previously though. Imitating mycorrhizal networks, which can occupy hundreds of hectares, hopefully the mycorrhizal researchers' network facilitated by this workshop will cover the South American continent and extend abroad. Finally, we are conscious that there is still much to do regarding mycorrhizal research in South America; however this workshop was the first inoculum for the future of an incipient South American mycorrhizal research network.

**Acknowledgements**

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