

Diversity of Arbuscular Mycorrhizal Fungi in Cultivated Soils of the Canadian Prairie.

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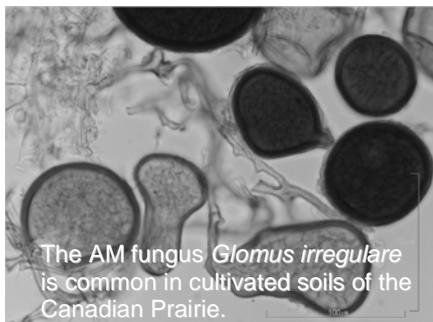
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Background:

The risks associated with Global Change are triggering questions about the way we live and feed ourselves. Crop plants' inefficiency at extracting soil nutrients is a primary cause of concern. Residual nitrogen fertilizer fuels denitrifying soil bacteria and the emissions of nitrous oxide, a potent greenhouse gas. Phosphorus fertilizers are used in such amounts as to pollute water ways and deplete world phosphate reserves that are now counted in decades. On this background, organic crop production emerges as a model for the development of sustainable agronomic practices based on ecological principles. Under the light of these ecological principles, crop plants appear as an ecosystems made of plant and microbial components among which the arbuscular mycorrhizal (AM) fungi have evolved as a device for efficient soil nutrient extraction.



Project Overview:

A main objective of Organic Science Cluster Project A2 is to model the contribution of AM fungi to wheat nutrition in cultivated soils of the Canadian Prairie. As a first step, the diversity of AM fungi living in Prairie soils had to be described, along with the soil environment where they were found, and fields in the main ecozones of the Prairie were surveyed. It soon appeared that the metagenomic methods used to describe AM fungal diversity, as cutting edge as they were would not reveal the identity of the AM fungal species living in the Prairie landscape. The AM fungal diversity encountered in the area surveyed far exceeded the information on AM fungi contained in GenBank, the collection of all publicly available DNA sequences, and the vast majority of the AM fungal sequences found in surveyed soils could not be identified. Because AM fungi only grow in association with living plant roots, trap-cultures of AM fungi were created by growing plants in soil from surveyed fields, and spores were collected through soil sieving and gradient centrifugation for AM species identification based on morphology. Two soil samples out of 38 did not produce any AM fungal growth, but 29 species were recovered from other soils. The most common species encountered were *Glomus irregulare*, *Glomus claroideum* and *Glomus monosporum*. Other species identified were *Diversispora spurca*, *Entrophosphora infrequens*, *Glomus clarum*, *Glomus cubense*, *Glomus eburneum*, *Glomus etunicatum*, *Glomus fasciculatum*, *Glomus geosporum*, *Glomus intraradices*, *Glomus luteum*, *Glomus microaggregatum*, *Glomus mosseae*, *Glomus viscosum*, *Kuklospora kentinensis*, *Paraglomus occultum*. Eleven morphotypes belonging to the genera *Glomus* (9), and *Pacispora* (2) could not be identified to the species level. Interestingly, a species of *Peridiospora*, a genera initially thought to belong to the AM fungi, was found in one trap-culture.

Conclusions:

This is one of very few reports on the diversity of AM fungi in the Canadian Prairie, and the most important. AM fungi is being discovered as a tool for sustainable food production.

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