The role of mycorrhizal symbiosis in plant intraspecific competition and population structure

Evelina Facelli

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Abstract

The role of mycorrhizal symbiosis in plant intraspecific competition and population structure

The overall objective of this project was to investigate the effects of the symbiotic association of plants with vesicular-arbuscular mycorrhizal fungi on the intensity of intraspecific competition and its consequences on population structure

I performed four main glasshouse experiments using a non-cultivated species, *Rhodanthe chlorocephala* ssp *rosea*, or a cultivated species, *Trifolium subterraneum* I grew the plants at different plant densities, under different levels of resources (phosphorus and/or light), in environments with homogeneous and/or patchy distribution of phosphorus (P)

In pots with homogeneous distribution of P, the addition of P to *R. chlorocephala* and mycorrhizal infection in *T. subterraneum* increased plant biomass of single plants However, these beneficial effects were reduced by increasing plant density Shading of plants of *T. subterraneum* did not generally alter these effects. Mycorrhizal symbiosis and the addition of P always increased the intensity of plant intraspecific competition

In trays with patchy or homogeneous distribution of P, mycorrhizal infection and patchy distribution of P increased the total biomass and size inequality of populations of plants of *T. subterraneum*. Individual biomass was determined by the local soil P concentration in patchy environments and by mycorrhizal infection in low density treatments Mycorrhizal infection, but not patchy P distribution, increased relative competition intensity.

My results emphasise that the main effects of mycorrhizas at the individual level cannot be expected to be apparent at the population level, because of the influence of density-dependent processes. However, infected individuals with a strong response to the symbiosis would have an advantage in situations of competition. This scenario can explain the maintenance of the symbiotic ability even under conditions such as dense populations, where there is no obvious advantage of the symbiosis at the population level.

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