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

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List of Contents

List of Figures iv
List of Tables xi
List of Plates xiv
Abstract xv
Declaration xvii
Acknowledgments xviii

Chapter 1. General introduction

1.1. Introduction 1

1.2. Background

1.2.a Resources and plant competition 1
1.2.b Resources and mycorrhizal symbiosis

1.2.b.1. Overview of mutualisms involving plants 7
1.2.b.2. Brief description of the symbiosis 8
1.2.b.3. Experimental difficulties 8
1.2.b.4. Effect of VAM on plant populations 9
1.2.b.5. Effect of VAM on plant communities 11
1.2.b.6. Cultivated vs non-cultivated species 13

1.3. The project 14

Chapter 2. Preliminary experiments

2.1. Selection of soil and determination of available P 16

2.2. Selection of host species 21

2.2.1 Germination trials 21
2.2.2 Response of Bracteantha bracteata and Rhodanthe chlorocephala ssp. rosea to inoculation with mycorrhizal fungi 23
Chapter 3. Effects of P availability, mycorrhizas and plant density on the performance of *Rhodanthe chlorocephala* ssp. *rosea* 27

Chapter 4. Interactive effects of mycorrhizal symbiosis, intraspecific competition and resource availability on *Trifolium subterraneum* 52

Chapter 5. Interactive effects of mycorrhizal symbiosis, plant density and nutrient heterogeneity on *Trifolium subterraneum* 90

Chapter 6. General discussion and future research 129

References 135
List of Figures

Figure 3.1. Percentage of infection of plants of *Rhodanthe chlorocephala* ssp *rosea*, inoculated (shaded bars) or not (clear bars) with the mycorrhizal fungus *Gigaspora margarita*. Plants were grown at different densities, 1, 6 and 18 plants per pot, and at three levels of added P, P0, P1 and P2 (no added P, 5 ppm and 15 ppm of added P, respectively). Different letters indicate significant differences between means (Tukey, p ≤ 0.05). Data are means and SE, n = 5.

Figure 3.2. Shoot P concentration (a) and shoot P content of individual plants (b) of *Rhodanthe chlorocephala* ssp *rosea*, grown at different densities, 1, 6 and 18 plants per pot, and at three levels of added P, P0, P1 and P2 (no added P, 5 ppm and 15 ppm of added P, respectively). Different letters indicate significant differences between means (Tukey, p ≤ 0.05). Data are means and SE, n = 5.

Figure 3.3. Biomass of individual plants of *Rhodanthe chlorocephala* ssp *rosea*, grown at different densities, 1, 6 and 18 plants per pot, and at three levels of added P, P0, P1 and P2 (no added P, 5 ppm and 15 ppm of added P, respectively). Different letters indicate significant differences between means (Tukey, p ≤ 0.05). Data are means and SE, n = 5.

Figure 3.4. Root shoot ratio of plants of *Rhodanthe chlorocephala* ssp *rosea*, grown at different densities, 1, 6 and 18 plants per pot, and at three levels of added P, P0, P1 and P2 (no added P, 5 ppm and 15 ppm of added P, respectively). Different letters indicate significant differences between means (Tukey, p ≤ 0.05). Data are means and SE, n = 5.

Figure 3.5. Number of shoots per plant (a) and number of buds per plant (b) of plants of *Rhodanthe chlorocephala* ssp *rosea*, grown at different densities, 1, 6 and 18 plants per pot, at three levels of added P, P0, P1 and P2 (no added P, 5 ppm and 15 ppm of added P, respectively). Different letters indicate significant differences between means (Tukey, p ≤ 0.05). Data are means and SE, n = 5.
Figure 3.6. Relative competition intensity (RCI, see formula on text) of plants *Rhodanthe chlorodephala* ssp *rosea*, grown at different densities, 1, 6 and 18 plants per pot, at three levels of added P, P0, P1 and P2 (no added P, 5 ppm and 15 ppm of added P, respectively). Different letters indicate significant differences between means (Tukey, p ≤ 0.05). Data are means and SE, n = 5.

Figure 4.1. Percentage of root length infected of plants of *Trifolium subterraneum* grown at different densities. Different letters indicate significant differences between means (REGWQ, p ≤ 0.05). Data are means and SE, n = 5.

Figure 4.2. P concentration (a) and P content (plant P content per pot/number of plants per pot) (b) of shoots and roots of individual mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities. Different letters indicate significant differences between means (REGWQ, p ≤ 0.05). Shoot and root data were analysed separately (different set of letters). Data are means and SE, n = 5.

Figure 4.3. Individual shoot and root biomass (shoot or root biomass per pot/number of plants per pot) of mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities. Different letters indicate significant differences between means (REGWQ, p ≤ 0.05). Shoot and root data were analysed separately (different set of letters). Data are means and SE, n = 5.

Figure 4.4. Root shoot ratio (R S) of mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities. Different letters indicate significant differences between means (REGWQ, p ≤ 0.05). Data are means and SE, n = 5.

Figure 4.5. Relative biomass response (RBR) of mycorrhizal plants of *Trifolium subterraneum* grown at different densities (see text for calculations, formula (1)). Different letters indicate significant differences between means (REGWQ, p ≤ 0.05). Stars indicate means significantly different from zero (Student's *t*, p ≤ 0.05). Data are means and SE, n = 5.
Figure 4.6  Relative competition intensity (RCI) of mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities (see text for calculations, formula (2))  Different letters indicate significant differences between means (REGWQ, p ≤ 0.05)  Stars indicate means significantly different from zero (Student’s *t*, p ≤ 0.05)  Data are means and SE, n = 5.

Figure 4.7. Percentage of root length infected of plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade: 180 μm m⁻² s⁻¹), harvested at 4 weeks (Harvest 1)  Different letters indicate significant differences between means (REGWQ, p ≤ 0.05)  Data are means and SE, n = 4.

Figure 4.8. Relative biomass response to mycorrhizal infection (RBR) (a) and relative competition intensity (RCI) (b) of mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade: 180 μm m⁻² s⁻¹) (see text for calculations, formula (1) and (2)), harvested at 4 weeks (Harvest 1)  Stars indicate means significantly different from zero (Student’s *t*, p ≤ 0.05)  Data are means and SE, n = 4.

Figure 4.9. Percentage of root length infected of plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade: 180 μm m⁻² s⁻¹), harvested at 8 weeks (Harvest 2)  Different letters indicate significant differences between means (REGWQ, p ≤ 0.05)  Data are means and SE, n = 4.

Figure 4.10. Shoot and root P concentrations (a) and P content (plant P content per pot/number of plants per pot) (b) of shoots and roots of individual mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade: 180 μm m⁻² s⁻¹), harvested at 8 weeks (Harvest 2)  Different letters indicate significant differences between means (REGWQ, p ≤ 0.05)  Shoot and root data were analysed separately (different set of letters)  Data are means and SE, n = 4.
Figure 4.11. Individual shoot and root biomass (shoot or root biomass per pot/number of plants per pot) of plants per pot) (b) of shoots and roots of mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light 400 μm m⁻² s⁻¹ and Shade 180 μm m⁻² s⁻¹), harvested at 8 weeks (Harvest 2). Different letters indicate significant differences between means (REGWQ, p ≤ 0.05). Shoot and root data were analysed separately (different set of letters). Data are means and SE, n = 4.

Figure 4.12. Root:shoot ratio (R:S) of mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light 400 μm m⁻² s⁻¹ and Shade 180 μm m⁻² s⁻¹), harvested at 8 weeks (Harvest 2). Different letters indicate significant differences between means (REGWQ, p ≤ 0.05). Data are means and SE, n = 4.

Figure 4.13. Relative biomass response to mycorrhizal infection (RBR) of plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade 180 μm m⁻² s⁻¹), harvested at 8 weeks (Harvest 2). Different letters indicate significant differences between means (REGWQ, p ≤ 0.05). Stars indicate means significantly different from zero (Student's t, p ≤ 0.05). Data are means and SE, n = 4.

Figure 4.14. Relative competition intensity (RCI) of mycorrhizal (shaded bars) and non-mycorrhizal (clear bars) plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade 180 μm m⁻² s⁻¹) (see text for calculations, formula (2)), harvested at 8 weeks (Harvest 2). Stars indicate means significantly different from zero (Student's t, p ≤ 0.05). Data are means and SE, n = 4.

Figure 4.15. Array of the relative frequency distributions of plants of *Trifolium subterraneum* grown at different densities and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade 180 μm m⁻² s⁻¹), harvested at 8 weeks (Harvest 2), in the space determined by two principal components (PC1 and PC2).
Figure 4.16. Relative frequency distributions of individual plant sizes (biomass) of mycorrhizal (M) (shaded bars) and non-mycorrhizal (NM) (clear bars) treatments under full light at densities 6 and 24. Different letters in parentheses indicate distributions are significantly different (Kolmogorov-Smirnov test, n=12, p ≤ 0.05, corrected by Bonferroni’s formula for number of comparisons = 6). Symbols in parentheses correspond to Fig. 4.13 (PC).

Figure 5.1. Percentage root length infected of plants of *Trifolium subterraneum* grown at low or high density (1 and 4 plants per patch, respectively) in patches with high (H) or low (L) soil P in patchy trays (Pa, shaded bars) or in average (A) soil P in homogeneous trays (Ho, clear bars). Data are means and SE, n = 5. Different letters indicate significant differences between the means of treatments with different local P (Tukey, p ≤ 0.05). (Density had a negative and independent effect, Table 5.1).

Figure 5.2. Effect of neighbourhood (the number of adjacent patches with high P) on the percentage root length infected of plants of *Trifolium subterraneum* grown at low density (1 plant per patch), in patches with high or low soil P (1MH and 1ML, respectively) or at high density (4 plants per patch), in patches with high or low soil P (4MH and 4ML, respectively). Lines with elevations significantly different are labelled with different letters. = 0 indicates slope does not significantly deviate from zero (p ≤ 0.05, (Prism 1994)).

Figure 5.3. Relative biomass response to mycorrhizal infection (RBR, see text for calculations, formula (1)) of plants of *Trifolium subterraneum* grown at low or high density (1 and 4 plants per patch, respectively) in patches with high (H) or low (L) soil P in patchy trays (Pa, shaded bars) and with average (A) soil P in homogeneous trays (Ho, clear bars). Data are means and SE, n = 5. Stars indicate means significantly different from zero (Student’s *t*, p ≤ 0.05). Different letters indicate significant differences between means (Tukey, p ≤ 0.05) a) RBR_tray, calculated to evaluate the effect of patchiness on RBR and b) RBR_patch calculated to evaluate the effect of local P on RBR.

Figure 5.4. Shoot biomass per tray a) total shoot biomass and b) individual shoot biomass (total shoot biomass per tray/number of plants per tray) of mycorrhizal (M, shaded bars) and non-mycorrhizal (NM, clear bars) plants of *Trifolium subterraneum* grown at low or high density (1 and 4 plants per patch, respectively), in homogeneous (Ho) or patchy (Pa) trays. Data are
means and SE, n = 5  Different groups of letters used to indicate significant differences between means (Tukey, p ≤ 0.05) within density (x, y, z) and patchiness (a, b) (factors with independent effects).

Figure 5.5. Individual size distributions of mycorrhizal (M, shaded bars) and non-mycorrhizal (NM, clear bars) plants of *Trifolium subterraneum*, grown at low (a-d) or high (e-h) density (1 and 4 plants per patch, respectively) in homogeneous (Ho) or patchy (Pa) trays, and the corresponding values of Gini coefficient  (Graphs show distribution of sizes of all the individuals from same treatments pooled together, Gini coefficient was calculated for each tray individually, and means are shown). Different letters indicate significant differences between means (Tukey, p ≤ 0.05), n = 5

Figure 5.6. Effect of neighbourhood (the number of adjacent patches with high P) on the individual shoot biomass of plants of *Trifolium subterraneum*. a) mycorrhizal plants grown at low density in patches with high (1MH) or low (1ML) soil P, b) mycorrhizal plants grown at high density, in patches with high (4MH) or low (4ML) soil P, c) non-mycorrhizal plants grown at low density, in patches with high (1NMH) or low (1NML) soil P, d) non-mycorrhizal plants grown at high density, in patches with high (4NMH) or low soil (4NML) soil P  Lines with elevations significantly different are labelled with different letters  = 0 indicates slope does not significantly deviate from zero, ≠ 0 indicates slope significantly deviates from zero (p ≤ 0.05, (Prism 1994))

Figure 5.7. Effect of neighbourhood (the number of adjacent patches with high P) on the individual root biomass of plants of *Trifolium subterraneum*. a) mycorrhizal plants grown at low density in patches with high (1MH) or low (1ML) soil P  b) mycorrhizal plants grown at high density, in patches with high (4MH) or low (4ML) soil P  c) non-mycorrhizal plants grown at low density, in patches with high (1NMH) or low (1NML) soil P  d) non-mycorrhizal plants grown at high density, in patches with high (4NMH) or low soil (4NML) soil P  Lines with elevations significantly different are labelled with different letters  = 0 indicates slope does not significantly deviate from zero, ≠ 0 indicates slope significantly deviates from zero (p ≤ 0.05, (Prism 1994))

Figure 5.8. Shoot biomass per patch  a) total shoot biomass and b) individual shoot biomass (total shoot biomass per patch/number plants per patch) of mycorrhizal (M, shaded bars) and non-mycorrhizal (NM, clear bars) plants of
*Trifolium subterraneum* grown at low or high density (1 and 4 plants per patch, respectively) in patches with high (H) and low (L) soil P in patchy trays (Pa), and in patches with average (A) soil P in homogeneous (Ho) trays. Data are means and SE, n = 5. Different letters indicate significant differences between means (Tukey, p ≤ 0.05).

**Figure 5.9.** Root biomass per patch a) total root biomass and b) individual root biomass (total shoot biomass per patch/number plants per patch) of mycorrhizal (M, shaded bars) and non-mycorrhizal (NM, clear bars) plants of *Trifolium subterraneum* grown at low or high density (1 and 4 plants per patch, respectively) in patches with high (H) and low (L) soil P in patchy trays (Pa), and in patches with average (A) soil P in homogeneous (Ho) trays. Data are means and SE, n = 5. Different letters indicate significant differences between means (Tukey, p ≤ 0.05).

**Figure 5.10.** Relative competition intensity (RCI) of mycorrhizal (M, shaded bars) and non-mycorrhizal (NM, clear bars) plants of *Trifolium subterraneum*, grown at low or low density (1 and 4 plants per patch, respectively) in patches with high (H) or low (L) soil P in patchy trays (Pa), and in patches with average (A) soil P in homogeneous (Ho) trays. Data are means and SE, n = 5. Stars indicate means significantly different from zero (Student’s *t*, p ≤ 0.05) and different letters indicate significant differences between means (Tukey, p ≤ 0.05). a) RCI\textsubscript{tray}, calculated to evaluate the effect of patchiness on RCI and b) RCI\textsubscript{patch} calculated to evaluate the effect of local P on RCI.

**Figure 5.11.** Effect of neighbourhood (the number of adjacent patches with high P) on relative competition intensity, RCI\textsubscript{neigh}, (see text for calculations, formula (2)) of mycorrhizal (M) and non-mycorrhizal (NM) plants of *Trifolium subterraneum*, grown in patches with high (H) or low (L) soil P.
List of Tables

Table 2.1. Summary of the results of the comparison of three soils from different undisturbed native vegetation areas. Different letters indicate significant differences between means within each row (SNK, p ≤ 0.05), GLM analysis, n = 5. P₀, extractable P measured before planting. P₁, extractable P measured after harvest. Labile P, extracted with calcium chloride. Available P, extracted with sodium bicarbonate.

Table 2.2. Summary of the results from the germination trials (percentage of germination). Species are from Ferries McDonald Conservation Park (F), from Waite Hills Face (H) or suggested by growers (G). Treatments: legumes were always scarified; S seeds surface sterilised with sodium hypochlorite, 15 minutes; N seeds no surface sterilised; B seeds immersed in boiling water; H seeds heated in oven 105 °C, 15 minutes. Results: C seeds contaminated, slow emergence interval >6 days, fast emergence interval ≤ 5 days. Nomenclature of the species follows Black (1974) unless authority is specified in the table.

Table 3.1. Results of ANOVA testing the effects of mycorrhizal infection, addition of P and plant density on percentage of infection, shoot P concentration and individual shoot P content of plants of Rhodanthe chlorocephala ssp rosea, inoculated or not with the mycorrhizal fungus Gigaspora margarita. Plants were grown at three different densities, and at three different levels of added P.

Table 3.2. Results of ANOVA testing the effects of mycorrhizal infection, addition of P and plant density on individual plant biomass, root shoot ratio, number of shoots per plant and number of buds per plant of plants of Rhodanthe chlorocephala ssp rosea, inoculated or not with the mycorrhizal fungus Gigaspora margarita. Plants were grown at three different densities, and at three different levels of added P.

Table 3.3. Results of ANOVA testing the effects of mycorrhizal infection, addition of P and plant density on the relative competition intensity (RCI, see formula on text) of plants of Rhodanthe chlorocephala ssp rosea, inoculated or not with the mycorrhizal fungus Gigaspora margarita. Plants were grown at three different densities and at three different levels of added P.
Table 4.1. ANOVA of shoot and root P concentrations and individual P content (plant P content per pot/number of plants per pot) of mycorrhizal and non-mycorrhizal plants of *Trifolium subterraneum* grown at different densities (1-18 plants per pot)

Table 4.2. ANOVA of the individual whole plant, shoot and root biomass (plant biomass per pot/number of plants per pot) and root shoot (R:S) ratio of mycorrhizal (M) and non-mycorrhizal (NM) plants of *Trifolium subterraneum* at different densities (1-18 plants per pot). Mean squares (MS) and F values given. Degrees of freedom in parentheses * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001; **** p ≤ 0.0001, ns, not significant n = 5

Table 4.3. ANOVA of shoot and root P concentrations and individual P content (plant P content per pot/number of plants per pot) of mycorrhizal and non-mycorrhizal plants of *Trifolium subterraneum* at different densities (1-24 plants per pot) and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade: 180 μm m⁻² s⁻¹) Means and SE, n=4 Different letters indicate significant differences between means (REGWQ, p<0.05) ANOVA mean squares (MS) and F values given Degrees of freedom in parentheses * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001; **** p ≤ 0.0001, ns, not significant

Table 4.4 ANOVA of individual whole plant, shoot and root biomass (plant biomass per pot/number of plants per pot), and root shoot (R:S) ratio of mycorrhizal and non-mycorrhizal plants of *Trifolium subterraneum* at different densities (1-24 plants per pot) and at two light intensities (Light: 400 μm m⁻² s⁻¹ and Shade: 180 μm m⁻² s⁻¹). Means and SE, n=4. Different letters indicate significant differences between means (REGWQ, p<0.05). ANOVA mean squares (MS) and F values given. Degrees of freedom in parentheses. * p ≤ 0.05, ** p ≤ 0.01, *** p ≤ 0.001, **** p ≤ 0.0001; ns, not significant

Table 4.5. First five principal components (A), their corresponding eigenvalues and the variation and accumulated variation explained by each principal component, and eigenvectors (B) corresponding to the modal class (0) and to three ranges to the left (L50, L100, L150) and to the right (R50, R100, R150) of the modal class
Table 4.6. Different statistical measures of size inequality: coefficient of variation (CV), kurtosis, skewness and Gini coefficient, of the distributions of sizes shown in Fig. 8, corresponding to mycorrhizal (M) and non-mycorrhizal (NM) plants of *Trifolium subterraneum* grown under full light (L) at 6 or 24 plants per pot.

Table 5.1. Results of ANOVA testing the effect of plant density and local soil P on the percentage infection and the root length infected of mycorrhizal plants of *Trifolium subterraneum*, grown in patches with high, low or average soil P, at high or low densities, n = 5.

Table 5.2. Results of ANOVA testing the effects of mycorrhizal infection, plant density and patchiness, on shoot biomass (total and individual) and Gini coefficient of the size distributions of mycorrhizal and non-mycorrhizal plants of *Trifolium subterraneum*, grown in trays with homogeneous or patchy soil P distribution, at high or low densities, n = 5.

Table 5.3. Results of GLM analysis testing the effects of mycorrhizal infection, plant density and local soil P on shoot biomass (total and individual) of mycorrhizal and non-mycorrhizal plants of *Trifolium subterraneum*, grown in patches with high, low or average soil P, at high or low densities, n = 5.

Table 5.4. Results of ANOVA testing the effects of mycorrhizal infection, plant density and local soil P on root biomass (total and individual) and root length (total and individual) of mycorrhizal and non-mycorrhizal plants of *Trifolium subterraneum*, grown in patches with high, low or average soil P, at high or low densities, n = 5.

Table 5.5. a) Results of ANOVA testing the effects of mycorrhizal infection and patchiness on RCI (relative competition intensity) of mycorrhizal and non-mycorrhizal plants of *Trifolium subterraneum*, grown in trays with homogeneous or patchy soil P distribution. b) Results of GLM analysis testing the effects of mycorrhizal infection and local soil P on RCI of mycorrhizal and non-mycorrhizal plants of *Trifolium subterraneum*, grown in patches with high, low or average soil P, n = 5.
List of Plates

Plate 3.1. "Fine endophyte". a) External and internal hyphae and b) arbuscules, in roots of *Rhodanthe chlorocephala* ssp *rosea* stained with trypan blue (see Materials and methods for procedures) Images from compound microscope at magnifications of x 200 (a) and x 400 (b) 32

Plate 3.2. a) Internal hyphae and arbuscules of *Gigaspora margarita*. b) Internal hyphae of “fine endophyte” (f) and *G. margarita (Gi. m)* in roots of *Rhodanthe chlorocephala* ssp *rosea* stained with trypan blue (see Materials and methods for procedures) Images from compound microscope under x 400 magnification 33
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 *rosa*, 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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