Supporting Information

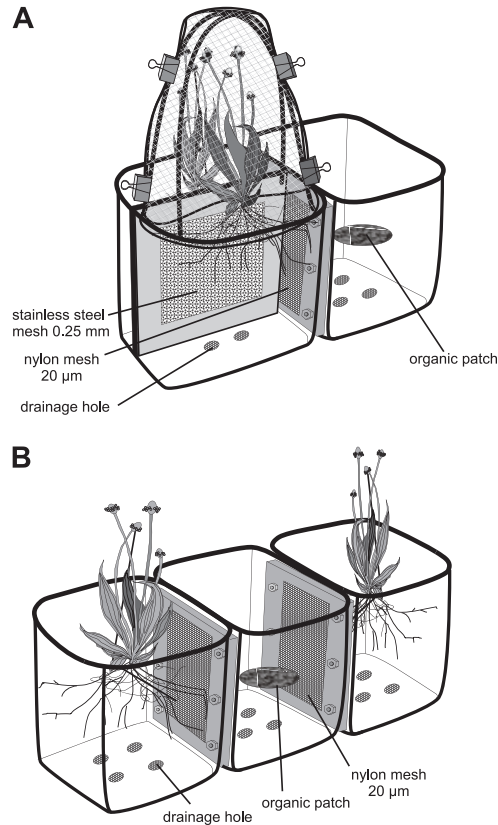## Hodge and Fitter 10.1073/pnas.1005874107

Fig. S1. The microcosm units used in experiments A (*A*) and B (*B*). In experiment A in half of both the AM and non-AM units one of the two plants was enclosed in horticultural shading mesh to reduce the PAR flux to the plant as shown by *A*. In the other half of the units both plants were unshaded. The 0.25-mm stainless steel mesh allowed the roots of the two seedlings to be separated each in one half of the planted compartment and aided recovery of roots from the individual seedlings at harvest. In experiment B microcosm units with three compartments in series were used (*B*). One of the end compartments contained a single *Plantago lanceolata* L. plant with an AM inoculum of either *G. hoi* or *G. mosseae,* whereas the other end compartment contained a single *P. lanceolata* plant without an AM inoculum. One plant was therefore inoculated, whereas the other became colonized by AM hyphal extension from the first host plant. The middle compartment contained an organic patch (milled *L. perenne* L. shoot material) as shown in *B*, whereas controls contained no organic patch in the middle compartment. In both experiments only the AMF was permitted access to the organic patch compartment (or middle compartment in *B*) by use of a 20-μm nylon mesh that permits AM hyphae to cross but prevents root penetration.
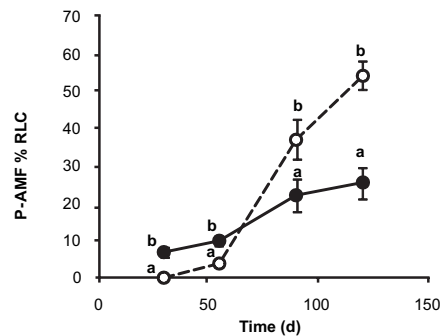

Fig. S2. Root length colonization (% RLC) by *G. hoi* (filled symbols) and *G. mosseae* (open symbols) for the plants initially without the AMF inoculum with time. Differences were analyzed for each time point separately. Different letters represent significant differences ($P < 0.05$) between treatments at each time point. Data shown are means ± SE bars ($n = 16$ except at day 30 for *G. hoi* when $n = 15$).
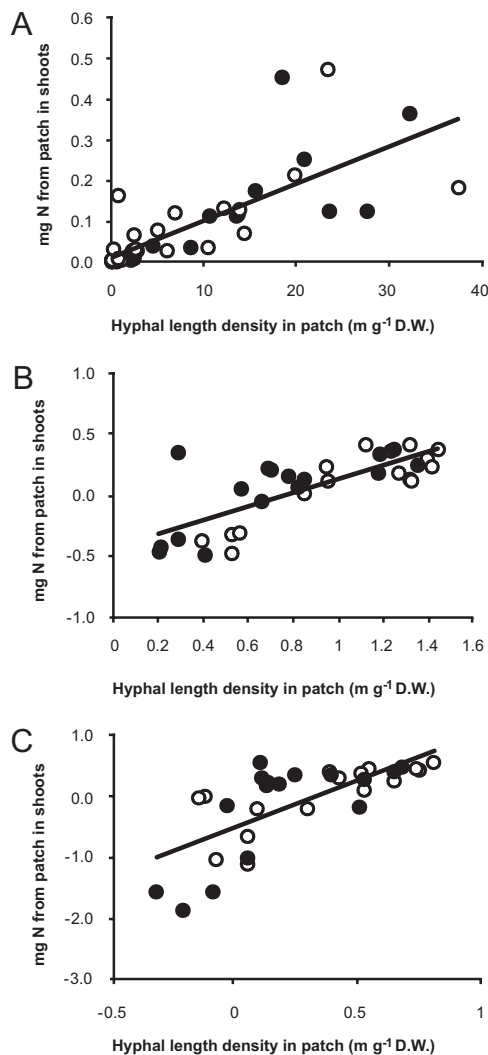
Fig. S3. The relationship between hyphal length density in the patch and N (mg [14]N + [15]N) from the patch in the shoots (circles) of both plants (*A–C*) over the entire experimental period. (*A*) Units where plants were partially shaded are shown by the closed symbols, whereas those where both were unshaded are shown by the open symbols. (*B–C*) units where plants received high N are shown by the closed symbols, whereas those receiving low N are shown by the open symbols. *C* shows the data from *G. mosseae* colonized plants and *A–B* are plants colonized by *G. hoi*. The data are fitted by significant regressions (*A*) mg N from patch = 0.0119 + 0.00906 m hyphae g^{-1} soil; $P < 0.001$, $F_{1,48} = 70.88.5$, $r^2 = 60\%$; B $\log_{10}$ mg N from patch = (−)0.435 + 0.565 $\log_{10}$ m hyphae g^{-1} soil; $P < 0.001$, $F_{1,30} = 42.03$, $r^2 = 58\%$; C $\log_{10}$ mg N from patch = (−)0.511 + 1.54 $\log_{10}$ m hyphae g^{-1} soil; $P < 0.001$, $F_{1,30} = 30.09$, $r^2 = 50\%$). Note data in *B–C* are $\log_{10}$ transformed. In *A–C* regression lines were found not to differ significantly ($P < 0.05$) between treatments as determined by the *F*-ratio method for statistically comparing fitted lines (1).

1. Potvin C, Lechowicz MJ, Tardif S (1990) The statistical analysis of ecophysiological response curves obtained from experiments involving repeated measures. *Ecology* 71:1389–1400.

Table S1. Differences between unshaded and shaded plant pairs (U/S) and the two unshaded plants (U/U) for arbuscule frequency and root length colonized (% RLC)

	% RLC	% Arbuscules
U/S	13.0 ± 3.0[a]	3.7 ± 0.9[a]
U/U	−1.5 ± 2.4	−0.8 ± 0.4

Letters indicate were the difference data differed significantly from zero using a *t* test (*n* = 25). U/U values were calculated as described in *Materials and Methods*.

Table S2. Analysis of the extracted *G. hoi* hyphae from experiment A at the end of the experiment (day 63)

	% N		% C		Atom % ^{15}N		Atom % ^{13}C		C:N ratio		Patch N as a % of AMF total N	
	U/U	U/S	U/U	U/S	U/U	U/S	U/U	U/S	U/U	U/S	U/U	U/S
G. hoi	5.48 ± 0.15	5.17 ± 0.21	37.9 ± 1.6	40.6 ± 0.9	6.10 ± 1.06	7.88 ± 1.43	1.084 ± 0.002	1.083 ± 0.001	6.9 ± 0.2	7.9 ± 0.4	27.0 ± 5.0	35.4 ± 6.7

Data are means ± SE (*n* = 5). U/U represents where both plants were unshaded and U/S where one plant of the two was shaded. There were no significant differences due to the shading treatment as determined by an independent *t* test.

*Atom % ^{13}C values were never higher than natural background levels (1.11 atom%).

Table S3. Analysis of the extracted AMF hyphae from experiment B

	Time (d)	% N		% C		Atom % ^{15}N		Atom % ^{13}C*		C:N ratio		Patch N as a % of AMF total N
		With patch	No patch	With patch	No patch	With patch	No patch	With patch	No patch	With patch	No patch	With patch
G. mosseae	55	3.07 ± 0.17	3.10 ± 0.12	34.2 ± 1.6	37.7 ± 1.5	**3.31 ± 0.36**	**0.372 ± 0.001**	**1.079 ± 0.0009**	**1.076 ± 0.0001**	**11.2 ± 0.3**	**12.2 ± 0.3**	12.4 ± 1.5
	90	**3.34 ± 0.09**	**3.73 ± 0.14**	36.8 ± 1.5	38.9 ± 1.1	**4.79 ± 0.16**	**0.374 ± 0.001**	**1.078 ± 0.0003**	**1.076 ± 0.0003**	11.0 ± 0.3	10.5 ± 0.3	18.3 ± 1.0
	120	**2.75 ± 0.13**	**3.27 ± 0.20**	32.7 ± 1.7	37.8 ± 2.3	**4.90 ± 0.36**	**0.373 ± 0.001**	**1.077 ± 0.0002**	**1.076 ± 0.0005**	11.9 ± 0.4	11.6 ± 0.2	18.9 ± 1.3
G. hoi	55	5.28 ± 0.35	5.07 ± 0.49	35.5 ± 2.4	37.9 ± 3.2	**2.70 ± 0.31**	**0.368 ± 0.008**	**1.083 ± 0.0022**	**1.078 ± 0.0003**	**6.8 ± 0.2**	**7.6 ± 0.2**	9.8 ± 1.3
	90	5.85 ± 0.23	5.58 ± 0.25	38.9 ± 0.9	39.7 ± 1.1	**3.73 ± 0.13**	**0.375 ± 0.001**	**1.081 ± 0.0011**	**1.077 ± 0.0003**	6.8 ± 0.3	7.1 ± 0.3	14.1 ± 0.7
	120	**4.72 ± 0.13**	**4.65 ± 0.14**	39.7 ± 1.5	41.5 ± 0.9	**3.28 ± 0.30**	**0.373 ± 0.001**	**1.080 ± 0.0005**	**1.077 ± 0.0002**	8.5 ± 0.3	9.0 ± 0.4	12.1 ± 1.3

Data are means ± SE (*n* = 8). Significant differences with or without a patch were tested by a *t* test if the data were normally distributed or by a Mann-Whitney U nonparametric test if not normally distributed for each harvest time separately and are indicated by bold font.

*Atom % ^{13}C values were never higher than natural background levels (1.11 atom%).

Table S4. Biomass (g), N content (mg), and N from organic patch as a percent of total tissue N in the root and shoot (including stem and flowers) material of arbuscular and nonarbuscular mycorrhizal plants at day 63 in experiment A for unshaded plants (n = 10)

	Biomass/g		N content/mg		N from patch/μg		N from patch/%	
	Root	Shoot	Root	Shoot	Root	Shoot	Root	Shoot
AM	0.86 ± 0.05[a]	0.95 ± 0.06[b]	4.8 ± 0.2[b]	8.0 ± 0.5[b]	203 ± 23[b]	140 ± 31[b]	4.5 ± 0.74[b]	1.7 ± 0.35[b]
Non-AM	0.89 ± 0.09[a]	0.60 ± 0.06[a]	3.9 ± 0.4[a]	6.1 ± 0.3[a]	4 ± 1[a]	6 ± 1[a]	0.1 ± 0.03[a]	0.1 ± 0.01[a]

Data for the unshaded plants represent the mean of both plants in the unshaded units only and the unshaded plants in the unshaded-shaded (U/S) treatment. Different letters indicate significant differences between AM and nonmycorrhizal treatments

Table S5. Biomass (g), N content (mg) and N from organic patch as a percent of total tissue N in the root and shoot (including stem and flowers) material of arbuscular and nonarbuscular mycorrhizal plants at day 63 in experiment A for shaded plants (n = 5)

	Biomass/g		N content/mg		N from patch/μg		N from patch/%	
	Root	Shoot	Root	Shoot	Root	Shoot	Root	Shoot
AM	0.75 ± 0.06[a]	0.60 ± 0.12[a]	4.6 ± 0.5[a]	6.0 ± 1.0[a]	212 ± 31[b]	82 ± 33[b]	4.7 ± 0.56[b]	1.3 ± 0.45[b]
Non-AM	0.83 ± 0.12[a]	0.76 ± 0.06[a]	3.7 ± 0.5[a]	7.3 ± 0.5[a]	6 ± 1[a]	9 ± 2[a]	0.2 ± 0.05[a]	0.1 ± 0.03[a]

Different letters indicate significant differences between AM and nonmycorrhizal treatments.

Table S6. Total root and shoot DW and N content for plants initially grown with (P+AMF) and without (P-AMF) the AMF inoculum in Experiment B (high/low N treatment)

	Time (d)	Root Patch	Root No Patch	Shoot Patch	Shoot No Patch	Root Low N	Root High N	Shoot Low N	Shoot High N	Root G. hoi	Root G. mosseae	Shoot G. hoi	Shoot G. mosseae
P+AMF Biomass/g	30	0.70 ± 0.07[a]	0.55 ± 0.07[a]	1.88 ± 0.09[a]	1.79 ± 0.11[a]	0.57 ± 0.05[a]	0.68 ± 0.09[a]	1.63 ± 0.08[a]	2.03 ± 0.09[b]	0.74 ± 0.08[b]	0.52 ± 0.05[a]	1.79 ± 0.12[a]	1.87 ± 0.07[a]
	55	1.28 ± 0.13[a]	1.20 ± 0.12[a]	2.84 ± 0.17[a]	2.83 ± 0.16[a]	1.09 ± 0.11[a]	1.39 ± 0.13[a]	2.42 ± 0.12[a]	3.25 ± 0.13[b]	1.35 ± 0.15[a]	1.13 ± 0.09[a]	2.76 ± 0.19[a]	2.92 ± 0.13[a]
	90	2.63 ± 0.23[a]	2.59 ± 0.23[a]	3.50 ± 0.14[a]	3.39 ± 0.15[a]	2.51 ± 0.20[a]	2.71 ± 0.25[a]	3.07 ± 0.09[a]	3.83 ± 0.11[b]	2.56 ± 0.20[a]	2.67 ± 0.26[a]	3.34 ± 0.12[a]	3.55 ± 0.16[a]
	120	4.82 ± 0.43[a]	4.61 ± 0.25[a]	4.27 ± 0.35[a]	4.01 ± 0.16[a]	4.30 ± 0.23[a]	5.13 ± 0.42[a]	3.53 ± 0.18[a]	4.75 ± 0.26[b]	4.61 ± 0.35[a]	4.82 ± 0.36[a]	4.01 ± 0.26[a]	4.28 ± 0.28[a]
P+AMF N/mg	30	7.0 ± 0.9[a]	5.6 ± 0.6[a]	29.0 ± 2.1[a]	25.3 ± 1.9[a]	5.3 ± 0.5[a]	7.3 ± 0.9[a]	21.2 ± 1.4[a]	32.8 ± 1.4[b]	8.1 ± 0.8[b]	4.7 ± 0.4[a]	25.5 ± 2.4[a]	28.8 ± 1.6[a]
	55	12.9 ± 1.1[a]	10.8 ± 0.8[a]	35.4 ± 2.4[a]	30.7 ± 2.0[a]	10.4 ± 0.9[a]	13.2 ± 1.0[b]	27.6 ± 1.7[a]	38.6 ± 1.8[b]	13.7 ± 1.1[b]	9.9 ± 0.7[a]	31.5 ± 2.1[a]	34.7 ± 2.4[a]
	90	17.9 ± 1.1[a]	15.7 ± 1.3[a]	41.1 ± 2.5[a]	35.2 ± 2.1[a]	15.5 ± 1.0[a]	18.1 ± 1.3[a]	31.1 ± 1.5[a]	45.2 ± 1.7[b]	19.2 ± 1.0[b]	14.4 ± 1.1[a]	36.9 ± 2.3[a]	39.3 ± 2.6[a]
	120	24.7 ± 2.1[a]	24.2 ± 1.5[a]	34.2 ± 2.8[a]	35.5 ± 2.8[a]	20.9 ± 1.3[a]	28.0 ± 1.7[b]	26.6 ± 2.0[a]	43.1 ± 1.6[b]	28.0 ± 1.7[b]	20.9 ± 1.3[a]	35.2 ± 3.3[a]	34.5 ± 2.3[a]
P-AMF Biomass/g	30	1.12 ± 0.09[a]	1.14 ± 0.10[a]	2.09 ± 0.07[a]	2.07 ± 0.07[a]	1.12 ± 0.08[a]	1.13 ± 0.11[a]	1.97 ± 0.05[a]	2.17 ± 0.08[b]	0.92 ± 0.07[a]	1.32 ± 0.09[b]	2.03 ± 0.03[a]	2.12 ± 0.09[a]
	55	1.73 ± 0.17[a]	1.80 ± 0.19[a]	3.37 ± 0.14[a]	3.29 ± 0.17[a]	1.56 ± 0.14[a]	1.97 ± 0.20[a]	2.98 ± 0.14[a]	3.69 ± 0.10[b]	2.01 ± 0.17[b]	1.52 ± 0.16[a]	3.38 ± 0.14[a]	3.29 ± 0.17[a]
	90	2.89 ± 0.36[a]	3.74 ± 0.28[a]	4.14 ± 0.27[a]	4.10 ± 0.22[a]	2.94 ± 0.36[a]	3.69 ± 0.29[a]	3.47 ± 0.13[a]	4.76 ± 0.21[b]	3.81 ± 0.29[b]	2.83 ± 0.35[a]	4.25 ± 0.25[a]	3.98 ± 0.23[a]
	120	5.07 ± 0.39[a]	4.20 ± 0.32[a]	4.67 ± 0.25[a]	4.83 ± 0.23[a]	4.16 ± 0.38[a]	5.11 ± 0.33[a]	3.96 ± 0.09[a]	5.55 ± 0.15[b]	5.25 ± 0.32[b]	4.02 ± 0.36[a]	4.62 ± 0.23[a]	4.88 ± 0.25[a]
P-AMF N/mg	30	9.8 ± 0.6[a]	8.3 ± 0.6[a]	33.5 ± 1.4[a]	30.3 ± 1.3[a]	9.4 ± 0.6[a]	8.8 ± 0.6[a]	27.5 ± 0.9[a]	36.1 ± 0.9[b]	8.8 ± 0.7[a]	9.3 ± 0.5[a]	32.8 ± 1.4[a]	31.1 ± 1.5[a]
	55	11.0 ± 1.0[a]	11.0 ± 1.0[a]	40.2 ± 2.6[a]	35.2 ± 2.0[a]	9.1 ± 0.7[a]	12.8 ± 1.1[b]	30.8 ± 1.5[a]	44.6 ± 1.7[b]	12.5 ± 1.0[b]	9.5 ± 0.9[a]	37.1 ± 2.6[a]	38.3 ± 2.2[a]
	90	16.2 ± 2.0[a]	11.1 ± 0.8[a]	41.9 ± 3.5[a]	38.3 ± 2.3[a]	10.7 ± 0.9[a]	16.7 ± 1.8[b]	31.2 ± 1.5[a]	49.0 ± 2.3[b]	15.1 ± 2.0[a]	12.3 ± 1.1[a]	38.9 ± 3.2[a]	41.3 ± 2.7[a]
	120	18.5 ± 1.2[a]	17.4 ± 1.3[a]	37.2 ± 2.8[a]	43.3 ± 3.4[a]	15.5 ± 0.9[a]	20.4 ± 1.2[b]	29.9 ± 1.6[a]	50.6 ± 2.1[b]	18.8 ± 0.8[a]	17.2 ± 1.5[a]	37.7 ± 3.5[a]	42.8 ± 2.8[a]

Data are means ± SE (n = 16 except for day 30 when one P+ G. hoi low N treatment without a patch died thus this unit (including the P-AMF partner plant) were excluded from the analysis).

Table S7. Differences between plants initially grown with (P+AMF) or without (P-AMF) the AMF inoculum (experiment B)

Treatment	n	Shoot DW/ g	Root DW/ g	Shoot N/ mg	Root N/ mg
G. hoi	63	**−0.6 ± 0.1**	**−0.7 ± 0.2**	**−4.3 ± 1.1**	**+ 3.5 ± 0.9**
G. mosseae	64	**−0.4 ± 0.1**	−0.1 ± 0.2	**−4.0 ± 1.0**	+ 0.4 ± 0.7
Low N	63	**−0.4 ± 0.1**	−0.3 ± 0.2	**−3.2 ± 1.1**	**+ 2.0 ± 0.7**
High N	64	**−0.6 ± 0.1**	**−0.5 ± 0.2**	**−5.1 ± 1.0**	**+ 2.0 ± 0.9**
With patch	64	**−0.4 ± 0.1**	−0.3 ± 0.2	**−3.3 ± 1.3**	+ 1.8 ± 0.9
Without patch	63	**−0.6 ± 0.1**	**−0.5 ± 0.2**	**−5.1 ± 0.8**	**+ 2.2 ± 0.8**

Values in bold indicate were the difference data differed significantly from zero using a *t* test.