

## Supplementary Materials

<b>Table 1.</b> [CO <sub>2</sub> ] and mycorrhizal effects on fungal growth, plant physiology, and plant growth in <i>T. ceratophorum</i> .							
<b>Trait</b>	<b>Model</b>	<b>CO<sub>2</sub></b>	<b>C×C</b>	<b>Myc</b>	<b>C×M</b>	<b>C×C×M</b>	<b>ΔAIC<sub>c</sub></b>
<b>Overall growth</b>							
Total biomass (g)	linear	51.07****	-	0.08	0.48	-	10.47
	quadratic	59.24****	4.30*	2.4	0.54	3.81*	0.00
Leaf biomass (g)	linear	43.14****	-	0.00	0.65	-	38.30
	quadratic	46.71****	3.87*	1.63	0.49	3.05 <sup>a</sup>	0.00
Total root biomass (g)	linear	48.05****	-	0.28	0.25	-	37.90
	quadratic	55.11****	3.51 <sup>a</sup>	2.66	0.43	3.56 <sup>a</sup>	0.00
Fine root biomass (g)	linear	35.07****	-	0.02	0.67	-	16.80
	quadratic	35.12****	1.25	1.08	0.98	1.87	0.00
<b>Root growth</b>							
Total root length (m)	linear	36.72****	-	0.42	4.59*	-	0.52
	quadratic	39.62****	5.44*	0.19	2.70 <sup>a</sup>	0.02	0.00
SRL (m g <sup>-1</sup> )	linear	29.97****	-	0.73	1.9	-	0.00
	quadratic	48.79****	9.13**	0.02	3.38 <sup>a</sup>	1.39	225.93
<b>Leaf growth</b>							
Total leaf area (cm <sup>2</sup> )	linear	20.55****	-	0.19	7.64**	-	0.00
	quadratic	17.67****	1.07	0.86	2.96 <sup>a</sup>	0.41	3.51
SLA (cm <sup>2</sup> g <sup>-1</sup> )	linear	46.69****	-	3.15 <sup>a</sup>	0.09	-	9.80
	quadratic	59.37****	14.10***	0.05	0.01	0.62	0.00
Leaf production (#)	linear	24.56****	-	0.21	4.72*	-	0.00
	quadratic	20.56****	0.44	0.004	2.48	0.13	4.37
Growth rate (Δleaf #/day)	linear	14.32***	-	0.09	4.45*	-	0.00
	quadratic	16.29****	2.52	0.08	1.98	0.27	2.17
Growth rate (Δleaf length/day)	linear	37.73****	-	0.06	3.91*	-	1.40
	quadratic	41.28****	5.47*	0.50	1.05	1	0.00
<b>Leaf stoichiometry</b>							
Leaf N content (mg cm <sup>-2</sup> )	linear	3.55 <sup>a</sup>	-	1.73	0.23	-	15.64
	quadratic	11.63***	18.65****	0.24	0.06	2.61	0.00
Leaf P content (mg cm <sup>-2</sup> )	linear	0.24	-	1.57	0.80	-	0.00
	quadratic	0.38	0.85	0.57	0.87	0.01	4.32
N:P (mg mg <sup>-1</sup> )	linear	1.09	-	2.94 <sup>a</sup>	0.05	-	0.00
	quadratic	1.54	2.51	0.6	0.05	0.08	2.60
C:N (mg mg <sup>-1</sup> )	linear	19.34****	-	0.48	0.22	-	0.00
	quadratic	4.57*	1.05	1.18	0.15	0.68	4.58
<b>Leaf gas exchange</b>							
Photosynthetic rate (A, μmol m <sup>-2</sup> s <sup>-1</sup> )	linear	23.00****	-	0.02	1.04	-	2.06
	quadratic	24.86****	3.26 <sup>a</sup>	1.99	3.35 <sup>a</sup>	2.77 <sup>a</sup>	0.00
Stomatal conductance (g <sub>s</sub> , mmol m <sup>-2</sup> s <sup>-1</sup> )	linear	37.14****	-	0.90	1.60	-	0.00
	quadratic	35.56****	2.76 <sup>a</sup>	0.99	2.40	0.42	2.04
Water-use efficiency (A/E)	linear	45.07****	-	0.05	0.00	-	0.00
	quadratic	24.78****	0.65	0.12	0.1	0.12	4.09
<b>Fungal growth</b>							
Mycorrhizal colonization rate (%)	linear	0.99	-	113.33****	0.61	-	17.45
	quadratic	0.70	0.03	18.70****	0.05	0.29	0.00
Mycorrhizal root length (m)	linear	3.61 <sup>a</sup>	-	101.46****	1.26	-	0.00
	quadratic	3.04 <sup>a</sup>	0.31	18.04****	0.63	0.09	142.34

\*Asterisks indicate the level of significance (\* $P \geq 0.05$ , \*\* $P \geq 0.01$ , \*\*\* $P \geq 0.001$ , \*\*\*\* $P \geq 0.0001$ )

<sup>a</sup>Response shows a marginal trend (0.1 >  $P$  > 0.05)

**Table 2.** [CO<sub>2</sub>] and mycorrhizal effects on fungal growth, plant physiology, and plant growth in *T. officinale*.

Trait	Model	CO <sub>2</sub>	C×C	Myc	C×M	C×C×M	ΔAIC <sub>c</sub>
<b>Plant biomass</b>							
Total biomass (g)	linear	32.74****	-	0.12	2.61	-	4.60
	quadratic	37.80****	5.91*	1.84	1.61	3.42 <sup>a</sup>	0.00
Leaf biomass (g)	linear	29.54****	-	0.00	1.39	-	6.73
	quadratic	36.64****	8.04**	2.46	0.81	3.42 <sup>a</sup>	0.00
Total root biomass (g)	linear	29.64****	-	0.01	3.16 <sup>a</sup>	-	2.97
	quadratic	25.71****	6.64**	0.81	1.50	0.85	0.00
Fine root biomass (g)	linear	51.05****	-	0.06	0.53	-	0.00
	quadratic	55.51****	5.94*	0.10	2.48	0.79	6.38
<b>Root growth</b>							
Total root length (m)	linear	33.39****	-	0.01	1.74	-	8.22
	quadratic	43.53****	11.74***	1.07	1.77	1.22	0.00
SRL (m g <sup>-1</sup> )	linear	19.59****	-	0.01	0.55	-	1.10
	quadratic	14.83****	9.19**	0.47	0.41	0.10	0.00
<b>Leaf growth</b>							
Total leaf area (cm <sup>2</sup> )	linear	11.83***	-	1.05	0.28	-	1.43
	quadratic	16.58****	6.12*	1.07	0.45	0.22	0.00
SLA (cm <sup>2</sup> g <sup>-1</sup> )	linear	33.05****	-	0.79	0.10	-	9.23
	quadratic	42.93****	11.02***	0.51	0.29	2.17	0.00
Leaf production (#)	linear	1.15	-	0.91	1.70	-	0.00
	quadratic	0.20	0.98	3.74 <sup>a</sup>	0.26	2.89 <sup>a</sup>	1.50
Growth rate (Δleaf #/day)	linear	2.99 <sup>a</sup>	-	1.16	1.34	-	0.00
	quadratic	1.40	0.48	4.20*	0.14	3.08 <sup>a</sup>	1.72
Growth rate (Δleaf length/day)	linear	31.95****	-	0.06	2.70 <sup>a</sup>	-	1.69
	quadratic	35.37****	4.55*	1.73	1.92	1.89	0.00
<b>Leaf stoichiometry</b>							
Leaf N content (mg cm <sup>-2</sup> )	linear	0.01	-	3.93*	0.03	-	0.00
	quadratic	0.17	0.23	0.00	0.43	1.76	3.00
Leaf P content (mg cm <sup>-2</sup> )	linear	0.87	-	0.02	0.24	-	0.00
	quadratic	0.82	0.37	0.57	0.04	1	3.68
N:P (mg mg <sup>-1</sup> )	linear	5.47*	-	4.80*	0.97	-	0.00
	quadratic	8.38**	3.32 <sup>a</sup>	0.8	1.65	0.18	1.54
C:N (mg mg <sup>-1</sup> )	linear	29.96****	-	0.45	0.35	-	6.79
	quadratic	33.42****	9.36**	0.47	1.20	2.24	0.00
<b>Leaf gas exchange</b>							
Photosynthetic rate (A, μmol m <sup>-2</sup> s <sup>-1</sup> )	linear	40.90****	-	0.23	6.48**	-	1.24
	quadratic	46.91****	6.04*	0.10	3.70 <sup>a</sup>	0.58	0.00
Stomatal conductance (g <sub>s</sub> , mmol m <sup>-2</sup> s <sup>-1</sup> )	linear	47.00****	-	0.00	0.26	-	15.39
	quadratic	63.24****	19.77****	0.16	0.00	0.41	0.00
Water-use efficiency (A/E)	linear	54.22****	-	0.08	0.37	-	44.96
	quadratic	102.23****	47.34****	0.67	0.79	0.84	0.00
<b>Fungal growth</b>							
Mycorrhizal colonization rate (%)	linear	0.01	-	75.67****	0.04	-	6.44
	quadratic	0.00	0.08	9.56**	0.01	0.40	0.00
Mycorrhizal root length (m)	linear	0.88	-	62.30****	0.73	-	0.00
	quadratic	0.75	0.00	14.27***	0.30	0.37	42.80

\*Asterisks indicate the level of significance (\**P* ≥ 0.05, \*\**P* ≥ 0.01, \*\*\**P* ≥ 0.001, \*\*\*\**P* ≥ 0.0001)<sup>a</sup>Response shows a marginal trend (0.1 > *P* > 0.05)

**Table 3.** Comparison of structural equation models for *T. ceratophorum* and *T. officinale*

Model*	<i>T. ceratophorum</i>			<i>T. officinale</i>		
	Fisher's C	P	$\Delta$ AICc	Fisher's C	P	$\Delta$ AICc
<b>(1) [CO<sub>2</sub>] affected plant traits and <math>R_{\text{Bio}}</math> via changes in fungal growth (no direct [CO<sub>2</sub>] pathways)</b>						
1.1	160.03	0.003	81.77	165.38	0.001	83.53
1.2	85.64	0.85	22.66	94.34	0.69	16.00
1.3	99.45	0.93	32.76	118.15	0.72	24.07
<b>(2) [CO<sub>2</sub>] directly affected plant traits and <math>R_{\text{Bio}}</math> (no fungal pathways)</b>						
2.1	172.77	0.001	93.27	182.56	0.00	93.83
2.2	109.37	0.39	41.65	109.4	0.34	25.85
2.3	125.74	0.54	52.85	120.29	0.76	23.48
<b>(3) [CO<sub>2</sub>] and fungal growth affected plant traits and <math>R_{\text{Bio}}</math></b>						
3.1	123.77	0.02	50.45	144.5	0.00	68.39
3.2	62.13	0.91	1.44	75.05	0.69	0.73
3.3	77.15	0.99	0.00	87.03	0.97	0.00

\*Models 1.3, 2.3, and 3.3 represented the simplest version of each model category that was not missing significant pathways based on Shipley's test of direction separation.

**Table 4.** Standardized pathway coefficients and submodel  $R^2$  values for the *T. ceratophorum* and *T. officinale* models with the lowest AICc values.

Response ratios	[CO <sub>2</sub> ]	Myc. length	SRL	Root length	N:P	C:N	A	$g_s$	WUE	SLA	GR#	GR <sub>length</sub>	Leaf area	$R^2$
<b><i>T. ceratophorum</i></b>														
Mycorrhizal root length	0.43**	-	-	-	-	-	-	-	-	-	-	-	-	0.19
Specific root length (SRL)	0.50**	-0.32 <sup>a</sup>	-	-	-	-	-	-	-	-	-	-	-	0.21
Total root length	-0.12	-	-0.81****	-	-	-	-	-	-	-	-	-	-	0.75
Leaf N:P	-	0.59**	-	0.38 <sup>a</sup>	-	-	-	-	-	-	-	-	-	0.31
Leaf C:N	-0.60 <sup>a</sup>	-	-	-0.47 <sup>a</sup>	-	-	-	-	-	-	-	-	-	0.20
Photosynthetic rate (A)	-0.08	-	-	0.42a	-	-	-	-	-	-	-	-	-	0.18
Transpiration rate (E)	-0.36 <sup>a</sup>	-	-	-0.21	-	-	-	-	-	-	-	-	-	0.23
Water-use efficiency (WUE)	0.14	-0.64**	-	-	0.36 <sup>a</sup>	-	-	-	-	-	-	-	-	0.29
Specific leaf area (SLA)	-	-	-	0.34*	-	-	-	-	-	-	-	-	-	0.11
Growth rate (#/day)	-	-	-	0.59**	-0.41*	-	-	-	-	-	-	-	-	0.35
Growth rate (length/day)	-	-0.22 <sup>a</sup>	-	0.54***	-	-	-	-	-	0.20	-	-	-	0.45
Total leaf area	-	-0.14 <sup>a</sup>	-	0.21*	-	-	-	-	-	-	0.37***	0.46***	-	0.86
Total biomass ( $R_{Bio}$ )	-	-	0.15*	0.50****	-	-	-	-	-	-0.12**	0.09 <sup>a</sup>	-	0.69****	0.97
<b><i>T. officinale</i></b>														
Mycorrhizal root length	0.28	-	-	-	-	-	-	-	-	-	-	-	-	0.08
Specific root length (SRL)	-0.38*	-	-	-	-	-	-	-	-	-	-	-	-	0.15
Total root length	0.20*	-	-0.82****	-	-	-	-	-	-	-	-	-	-	0.83
Leaf N:P	-	0.42****	-	-0.77****	-	-	-	-	-	-	-	-	-	0.58
Leaf C:N	-0.14	-	-	0.89****	-	-	-	-	-	-	-	-	-	0.64
Photosynthetic rate (A)	-0.17	-	-	-0.66***	-	-	-	-	-	-	-	-	-	0.58
Transpiration rate (E)	0.10	0.44*	-	-0.52*	-	-	-	-	-	-	-	-	-	0.31
Water-use efficiency (WUE)	-	-0.36**	-0.51***	-	-	-	-	-	-	-	-	-	-	0.54
Specific leaf area (SLA)	-	-	-	-	-	-0.61***	-	-	-	-	-	-	-	0.52
Growth rate (#/day)	-	-	-	-	-	-	-	-	-	-0.47**	-	-	-	0.22
Growth rate (length/day)	-	-	-	0.89****	-	-0.37*	-0.41***	-	0.20	-	-	-	-	0.84
Total leaf area	-	-	-	0.75****	-	-	-0.38**	-	-	0.72****	0.13	-	-	0.85
Total biomass ( $R_{Bio}$ )	-	-	-	0.17	-	0.20*	-	-	-	-0.49****	-	-	0.55****	0.97

\*Asterisks indicate the level of significance (\* $P \geq 0.05$ , \*\* $P \geq 0.01$ , \*\*\* $P \geq 0.001$ , \*\*\*\* $P \geq 0.0001$ )

<sup>a</sup>Response shows a marginal trend ( $0.1 > P > 0.05$ )