10.1071/BT22061

Australian Journal of Botany

Supplementary Material

Identifying limitations for invasion: the effect of phosphorus availability on the growth of the non-native tree, *Tipuana tipu*

Melinda S. Trudgen[A,B,*], *John K. Scott*[A,B], *Hans Lambers*[A], *and Bruce L. Webber*[A,B,C]

[A]School of Biological Sciences, The University of Western Australia, 35 Stirling Highway, Crawley, WA 6009, Australia.

[B]CSIRO Health and Biosecurity, 147 Underwood Avenue, Floreat, WA 6016, Australia.

[C]The Western Australian Biodiversity Science Institute, 133 St Georges Terrace, Perth, WA 6000, Australia.

[*]Correspondence to: Melinda S. Trudgen School of Biological Sciences, The University of Western Australia, 35 Stirling Highway, Crawley, WA 6009, Australia Email: melinda.trudgen@csiro.au

Supplementary information

Supplementary Table S1: Harvest composition ANOVA results.

Parameter	Term	Sum of squares	Degrees of freedom	f.value	p.value
Biomass	Row	0	1	0.0960	0.7579
	Ptreat	301	7	114.5894	<0.0001
	Row:Ptreat	5	7	1.7528	0.1176
	Residuals	19	51	-	-
Leaf area	Row	18016846	1	0.6189	0.4351
	Ptreat	12987114908	7	63.7292	<0.0001
	Row:Ptreat	341511194	7	1.6758	0.1360
	Residuals	1484725873	51	-	-
Nodule dry mass/plant mass	Row	4941	1	1.0172	0.3179
	Ptreat	127963	7	14.2225	<0.0001
	Row:Ptreat	48993	7	2.8430	0.0140
	Residuals	124907	51	-	-

Supplementary Table S2: Height and number of mature leaves ANOVA results.

Parameter		Term	Chi-squared	Degrees of freedom	Pr(>Chisq)	p-value	pseudo R-squared
Height	Pot is included as a random variable	Ptreat	403	7	< 2.2e-16		
		Week	1755	1	< 2.2e-16		
		Ptreat:week	433	7	< 2.2e-16		
	Pot not included as a random variable	Ptreat	510	7	< 2.2e-16		
		Week	1907	1	< 2.2e-16		
		Ptreat:week	474	7	< 2.2e-16		
	Comparison between models					0.0653	
	Nagelkerke analysis					0.0000	0.9054
Leaf number	Pot is included as a random variable	Ptreat	315	7	< 2.2e-16		
		Week	941	1	< 2.2e-16		
		Ptreat:week	335	7	< 2.2e-16		
	Pot not included as a random variable	Ptreat	345	7	< 2.2e-16		
		Week	913	1	< 2.2e-16		
		Ptreat:week	325	7	< 2.2e-16		
	Comparison between models					0.8417	
	Nagelkerke analysis					0.0000	0.8352

Supplementary Table S3: Chemical composition ANOVA results.

Parameter	Organ	Term	Sum of squares	Degrees of freedom	f.value	p.value
Nitrogen	Dropped leaves	Row	0.3	1	1.284	0.2664
		Ptreat	22.7	7	15.0445	<0.0001
		Row:Ptreat	0.7	7	0.4853	0.8373
		Residuals	6.2	29	-	-
	Leaves	Row	0.2	1	1.2524	0.2714
		Ptreat	28.0	7	31.1233	<0.0001
		Row:Ptreat	1.8	7	2.0448	0.0796
		Residuals	4.1	32	-	-
	Roots	Row	0.0	1	0.0673	0.7970
		Ptreat	3.0	7	20.7902	<0.0001
		Row:Ptreat	0.1	7	0.6851	0.6836
		Residuals	0.7	32	-	-
	Stem	Row	0.0	1	0.1272	0.7237
		Ptreat	8.4	7	81.3353	<0.0001
		Row:Ptreat	0.4	7	3.7606	0.0044
		Residuals	0.5	32	-	-
Phosphorus	Dropped leaves	Row	0.1	1	0.0136	0.9079
		Ptreat	1463.1	7	43.4506	<0.0001
		Row:Ptreat	38.3	7	1.1362	0.3666
		Residuals	149.1	31	-	-
	Leaves	Row	0.3	1	0.1871	0.6683
		Ptreat	503.3	7	40.1036	<0.0001
		Row:Ptreat	3.8	7	0.3019	0.9478
		Residuals	57.4	32	-	-
	Roots	Row	0.6	1	1.6668	0.2059
		Ptreat	488.8	7	192.2958	<0.0001
		Row:Ptreat	2.3	7	0.9237	0.5016
		Residuals	11.6	32	-	-
	Stem	Row	0.4	1	0.8838	0.3542
		Ptreat	633.4	7	204.5338	<0.0001
		Row:Ptreat	4.5	7	1.4441	0.2226
		Residuals	14.2	32	-	-

Supplementary Table S4: Mean (± SE) phosphorus (P) and nitrogen (N) content of *Tipuana tipu* seedlings, harvested 15 weeks after sowing. Root nodules were excluded from the chemical analysis, as there were insufficient material available for testing.

P treatment (μg P g^{-1} dry soil)	P concentration (mg)	N concentration (mg^{1})
0	0.64 ± 0.04	25.67 ± 2.3
5	1.64 ± 0.1	54.66 ± 2.8
10	9.61 ± 0.2	201.05 ± 4.5
40	48.86 ± 2.1	206.60 ± 7.9
80	52.48 ± 5.6	285.30 ± 56.4
160	85.49 ± 5.7	183.59 ± 6.7
320	77.14 ± 5.2	145.05 ± 9.1
640	78.89 ± 10.3	100.06 ± 7.8

Supplementary Table S5: Mean (± SE) mass and phosphorus (P) concentration and content of *Tipuana tipu* germinants, harvested at thinning approximately three weeks after sowing. Young germinants were used in lieu of seeds, as it was not possible to safely remove the seeds from the woody fruit.

Germinant weight (mg)	Germinant P concentration (mg g^{-1})	Total germinant P (mg)
17.0 ± 0.7	16.6 ± 0.3	0.3 ± 0.0