

Investigating the Effect of a Mixed Mycorrhizal Inoculum on the Productivity of Biomass Plantation Willows Grown on Marginal Farm Land

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Supplementary Material

1. Additional height analyses

Table S1. 2010 Height ANOVA results (LOG transformed)

Source	Nparm	DF	DFDen	F Ratio	Prob > F
field	2	2	32	63.3900	<.0001*
inoculation	1	1	32	0.2956	0.5904
field*inoculation	2	2	32	0.0614	0.9406
species	1	1	32	4.4930	0.0419*
field*species	2	2	32	0.7960	0.4598
inoculation*species	1	1	32	0.3374	0.5654
field*inoculation*species	2	2	32	0.8143	0.4519

All combinations of the block treatment, by itself and with the other treatment variables were part of the model, but block was treated differently since it was nested in the field variable and labeled as a random attribute. It therefore does not appear in this table. An asterisk (*) next to the p-value denotes a 5% statistical significance.

Table S2. 2010 Height (cm) ANOVA predicted values and test results

	Least Squares Mean	Standard Error	Test
Panel A: Field			Tukey's test
Dry	102.18433	4.7197366	B
Rocky	84.01693	4.7193538	C
Sandy	161.26136	4.9292043	A
Panel B: Inoculation			Student's T-test
Not inoculated	114.28638	3.8472487	A
Inoculated	117.35537	3.8474574	A
Panel C: Cultivar			Student's T-test
SX64	121.10819	3.3643152	A
SX61	110.53356	3.3643152	B

Different letters indicate better than 0.05 p-value difference between means. Data transformed for the analysis but not before generating this table, to allow comparison with other agricultural and forestry work.

Table S3. 2011 Height ANOVA results (LOG transformed)

Source	Nparm	DF	DFDen	F Ratio	Prob > F
field	2	2	33	44.0406	<.0001*
inoc	1	1	33	0.7392	0.3961
field*inoc	2	2	33	0.0904	0.9138
fert	1	1	33	40.6618	<.0001*
field*fert	2	2	33	0.9828	0.3849
inoc*fert	1	1	33	0.0969	0.7575
field*inoc*fert	2	2	33	0.3688	0.6944
cultivar	1	1	33	0.2922	0.5924
field*cultivar	2	2	33	4.5066	0.0186*
inoc*cultivar	1	1	33	0.2426	0.6256
field*inoc*cultivar	2	2	33	0.5059	0.6076
fert*cultivar	1	1	33	0.1325	0.7182
field*fert*cultivar	2	2	33	1.1733	0.3219
inoc*fert*cultivar	1	1	33	0.3443	0.5614
field*inoc*fert*cultivar	2	2	33	1.5840	0.2203

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Table S4. 2011 Height (cm) ANOVA predicted values and test results

	Least Squares Mean	Standard Error	Test
Panel A: Inoculation¹			Student's T-test
Not inoculated	255.52951	3.7838672	A
Inoculated	258.10764	3.7838672	A
Panel B: Nitrogen fertilization			Student's T-test
Fertilized	268.02257	3.7049795	A
Unfertilized	245.61458	3.7049795	B
Panel C: Field, by SX64			Tukey's test
Dry	252.03646	7.8390971	B
Rocky	230.96354	7.8390971	B
Sandy	290.61458	7.8390971	A
Panel D: Field, by SX61			Tukey's test
Dry	241.98958	5.8055002	B
Rocky	217.35938	5.8055002	C
Sandy	307.94792	5.8055002	A
Panel E: Cultivar, by Dry			Student's T-test
SX64	252.03646	7.6478295	A
SX61	241.98958	7.6478295	A
Panel F: Cultivar, by Rocky			Student's T-test
SX64	230.96354	3.7392427	A
SX61	217.35938	3.7392427	B
Panel G: Cultivar, by Sandy			Student's T-test

SX64	290.61458	8.3822240	B
SX61	307.94792	8.3822240	A

Different letters indicate better than 0.05 p-value difference between means. Data transformed for the analysis but not before generating this table, to allow comparison with other agricultural and forestry work.

Table S5. 2012 Height ANOVA results (LOG transformed)

Source	Nparm	DF	DFDen	F Ratio	Prob > F
field	2	2	29	69.0521	<.0001*
inoc	1	1	29	0.0321	0.8590
field*inoc	2	2	29	1.7677	0.1886
fert	1	1	29	34.4261	<.0001*
field*fert	2	2	29	0.3813	0.6863
inoc*fert	1	1	29	1.7255	0.1993
field*inoc*fert	2	2	29	0.5438	0.5863
cultivar	1	1	29	1.3861	0.2486
field*cultivar	2	2	29	1.9688	0.1578
inoc*cultivar	1	1	29	0.1091	0.7436
field*inoc*cultivar	2	2	29	0.3310	0.7209
fert*cultivar	1	1	29	3.9326	0.0569
field*fert*cultivar	2	2	29	1.9303	0.1633
inoc*fert*cultivar	1	1	29	0.6383	0.4308
field*inoc*fert*cultivar	2	2	29	1.2489	0.3018

All combinations of the block treatment, by itself and with the other treatment variables were part of the model, but block was treated differently since it was nested in the field variable and labeled as a random attribute. It therefore does not appear in this table. An asterisk (*) next to the p-value denotes a 5% statistical significance.

Table S6. 2012 Height cm ANOVA predicted values and test results

	Least Squares Mean	Standard Error	Test
Panel A: Field			Tukey's test
Dry	355.32292	4.6853161	A
Rocky	287.23958	4.6853161	A
Sandy	358.76563	5.7383168	A
Panel B: Inoculation			Student's T-test
Not inoculated	333.22917	4.5282070	A
Inoculated	334.32292	4.5282070	A
Panel C: Nitrogen fertilization			Student's T-test
Fertilized	268.02257	3.7049795	A
Unfertilized	245.61458	3.7049795	B
Panel D: Cultivar			Student's T-test
SX64	330.07639	4.2739418	A
SX61	337.47569	4.2739418	A

Different letters indicate better than 0.05 p-value difference between means. Data transformed for the analysis but not before generating this table, to allow comparison with other agricultural and forestry work.

3. Additional mass analyses

Table S7. 2011 Oven dry tons /ha ANOVA results (LOG transformed)

Source	Nparm	DF	DFDen	F Ratio	Prob > F
field	2	2	33	18.6140	<.0001*
inoc	1	1	33	0.9277	0.3425
field*inoc	2	2	33	0.0934	0.9110
fert	1	1	33	58.7500	<.0001*
field*fert	2	2	33	4.3614	0.0208*
inoc*fert	1	1	33	0.0399	0.8429
field*inoc*fert	2	2	33	0.2666	0.7676
cultivar	1	1	33	1.8588	0.1820
field*cultivar	2	2	33	0.5180	0.6005
inoc*cultivar	1	1	33	1.9361	0.1734
field*inoc*cultivar	2	2	33	0.2127	0.8095
fert*cultivar	1	1	33	1.0404	0.3153
field*fert*cultivar	2	2	33	0.2383	0.7893
inoc*fert*cultivar	1	1	33	3.8483	0.0582
field*inoc*fert*cultivar	2	2	33	0.5025	0.6096

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Table S8. 2011 Oven dry tons /ha ANOVA predicted values and test results

	Least Squares Mean	Standard Error	Test
Panel A: Inoculation			Student's T-test
Not inoculated	3.2559861	0.18766585	A
Inoculated	3.3419896	0.18759477	A
Panel B: Cultivar			Student's T-test
SX64	3.3655104	0.19033297	A
SX61	3.2324653	0.19026289	A
Panel C: Field, by fertilized			Tukey's test
Dry	2.9263348	0.34074839	B
Rocky	2.8243854	0.34030058	B
Sandy	5.7627500	0.34030058	A
Panel D: Field, by unfertilized			Tukey's test
Dry	2.5881667	0.25714174	B
Rocky	1.8655000	0.25714174	B
Sandy	3.8195625	0.25714174	A
Panel E: Nitrogen fertilization, by Dry			Student's T-test
Fertilized	2.9287531	0.27895837	A
Unfertilized	2.5881667	0.27869378	A
Panel F: Nitrogen fertilization, by Rocky			Student's T-test
Fertilized	2.8243854	0.17892886	A
Unfertilized	1.8655000	0.17892886	B
Panel G: Nitrogen fertilization, by Sandy			Student's T-test

Fertilized	5.7627500	0.40362255	A
Unfertilized	3.8195625	0.40362255	B

Different letters indicate better than 0.05 p-value difference between means. Data transformed for the analysis but not before generating this table, to allow comparison with other agricultural and forestry work.

Table S9. 2012 Oven dry tons /ha ANOVA results (LOG transformed)

Source	Nparm	DF	DFDen	F Ratio	Prob > F
field	2	2	29	18.7248	<.0001*
cultivar	1	1	29	4.5113	0.0423*
field*cultivar	2	2	29	3.1593	0.0574
fert	1	1	29	24.2716	<.0001*
field*fert	2	2	29	0.3974	0.6757
cultivar*fert	1	1	29	0.0001	0.9921
field*cultivar*fert	2	2	29	1.1389	0.3341
inoc	1	1	29	0.1710	0.6823
field*inoc	2	2	29	0.9470	0.3996
cultivar*inoc	1	1	29	0.0881	0.7688
field*cultivar*inoc	2	2	29	0.1770	0.8387
fert*inoc	1	1	29	0.0401	0.8426
field*fert*inoc	2	2	29	0.7959	0.4608
cultivar*fert*inoc	1	1	29	0.2776	0.6023
field*cultivar*fert*inoc	2	2	29	0.0050	0.9950

All combinations of the block treatment, by itself and with the other treatment variables were part of the model, but block was treated differently since it was nested in the field variable and labeled as a random attribute. It therefore does not appear in this table. An asterisk (*) next to the p-value denotes a 5% statistical significance.

Table S10. 2012 Oven dry tons /ha ANOVA predicted values and test results

	Least Squares Mean	Standard Error	Test
Panel A: Field			Tukey's test
Dry	9.146802	0.42706946	A
Rocky	6.755115	0.42706946	B
Sandy	10.650906	0.52305114	A
Panel B: Inoculation			Student's T-test
Not inoculated	9.1420208	0.43277771	A
Inoculated	8.5598611	0.43277771	A
Panel C: Nitrogen fertilization			Student's T-test
Fertilized	9.8563368	0.34441827	A
Unfertilized	7.8455451	0.34441827	B
Panel D: Cultivar			Student's T-test
SX64	9.3320451	0.37632919	A
SX61	8.3698368	0.37632919	A

Different letters indicate better than 0.05 p-value difference between means. These values represent two seasons of growth. Data transformed for the analysis but not before generating this table, to allow comparison with other agricultural and forestry work.

2. Additional diameter analyses

Table S11. 2010 Stem basal area ANOVA results (LOG transformed)

Source	Nparm	DF	DFDen	F Ratio	Prob > F
field	2	2	32	71.3478	<.0001*
inoc	1	1	32	0.2942	0.5913
field*inoc	2	2	32	0.2974	0.7448
cultivar	1	1	32	6.8584	0.0134*
field*cultivar	2	2	32	1.5426	0.2293
inoc*cultivar	1	1	32	0.2683	0.6080

All combinations of the block treatment, by itself and with the other treatment variables were part of the model, but block was treated differently since it was nested in the field variable and labeled as a random attribute. It therefore does not appear in this table. An asterisk (*) next to the p-value denotes a 5% statistical significance.

Table S12. 2010 Stem basal area per hectare (m²/ha) ANOVA predicted values and test results

	Least Squares Mean	Standard Error	Test
Panel A: Field			Tukey's test
Dry	2.6053323	0.38832364	B
Rocky	2.1631002	0.38830761	B
Sandy	7.5695565	0.40557407	A
Panel B: Inoculation¹			Student's T-test
Not inoculated	4.0063284	0.28720369	A
Inoculated	4.2189976	0.28721333	A
Panel C: Cultivar			Student's T-test
SX64	4.5770967	0.25273457	A
SX61	3.6482293	0.25273457	B

¹ These least squares mean values were used to generate the 2010 bars for Figure 1.

Different letters indicate better than 0.05 p-value difference between means. Data transformed for the analysis but not before generating this table, to allow comparison with other agricultural and forestry work.

Table S13. 2012 Stem basal area ANOVA results (LOG transformed)

Source	Nparm	DF	DFDen	F Ratio	Prob > F
field	2	2	29	11.4172	0.0002*
cultivar	1	1	29	0.1088	0.7439
field*cultivar	2	2	29	3.9184	0.0312*
fert	1	1	29	10.1083	0.0035*
field*fert	2	2	29	0.2931	0.7481
cultivar*fert	1	1	29	0.2028	0.6558
field*cultivar*fert	2	2	29	1.7832	0.1860
inoc	1	1	29	0.6511	0.4263
field*inoc	2	2	29	1.2736	0.2950
cultivar*inoc	1	1	29	0.2813	0.5999
field*cultivar*inoc	2	2	29	0.2105	0.8114
fert*inoc	1	1	29	1.6048	0.2153

field*fert*inoc	2	2	29	0.5363	0.5906
cultivar*fert*inoc	1	1	29	0.3318	0.5690
field*cultivar*fert*inoc	2	2	29	0.0610	0.9409

All combinations of the block treatment, by itself and with the other treatment variables were part of the model, but block was treated differently since it was nested in the field variable and labeled as a random attribute. It therefore does not appear in this table. An asterisk (*) next to the p-value denotes a 5% statistical significance.

Table S14. 2012 Stem basal area per hectare (m²/ha) ANOVA predicted values and test results

	Least Squares Mean	Standard Error	Test
Panel A: Inoculation¹			Student's T-test
Not inoculated	28.559201	1.0040098	A
Inoculated	27.488155	1.0040098	A
Panel B: Nitrogen fertilization			Student's T-test
Fertilized	30.177806	0.97665161	A
Unfertilized	25.869550	0.97665161	B
Panel C: Field, by SX64			Tukey's test
Dry	34.709104	1.8646605	A
Rocky	26.283434	1.8646605	B
Sandy	24.899135	2.2837334	B
Panel D: Field, by SX641			Tukey's test
Dry	29.489316	1.3162810	A
Rocky	23.258381	1.3162810	B
Sandy	29.502699	1.6121084	A
Panel E: Cultivar, by Dry			Student's T-test
SX64	34.709104	2.1116928	A
SX61	29.489316	2.1116928	A
Panel F: Cultivar, by Rocky			Student's T-test
SX64	12.486569	0.44855227	A
SX61	12.381127	0.44855227	A
Panel G: Cultivar, by Sandy			Student's T-test
SX64	24.899135	1.4917259	B
SX61	29.502699	1.4917259	A

¹ These least squares mean values were used to generate the 2012 bars for Figure 1.

Different letters indicate better than 0.05 p-value difference between means. Data transformed for the analysis but not before generating this table, to allow comparison with other agricultural and forestry work.

	B1		B2		B3		B4		B5		B6		
0.9m	9m	9m	9m	9m	9m	9m	9m	9m	9m	9m	9m	9m	
	F-	F+	F-	F+	F+	F-	F-	F+	F-	F+	F+	F-	SM (3 rows)
9m													
	M+	M+	M-	M-	M+	M+	M+	M+	M-	M-	M-	M-	SS (3 rows)
1.8m													
	F-	F+	F+	F-	F-	F+	F+	F-	F+	F-	F-	F+	SS (3 rows)

9m														
	M-	M-	M+	M+	M-	M-	M-	M-	M+	M+	M+	M+	SM (3 rows)	
1.8m														
	F+	F-	F+	F-	F-	F+	F+	F-	F-	F+	F-	F+	SM (3 rows)	
9m														
	M-	M-	M-	M-	M+	M+	M-	M-	M+	M+	M+	M+	SS (3 rows)	
1.8m														
	F+	F-	F-	F+	F+	F-	F-	F+	F+	F-	F+	F-	SS (3 rows)	
9m														
	M+	M+	M+	M+	M-	M-	M+	M+	M-	M-	M-	M-	SM (3 rows)	
0.9m	B7		B8		B9		B10		B11		B12			

Figure S1. Experimental design (each field randomized according to the schema, rocky field shown as an example). Widths compressed substantially compared to heights to fit on page; actual measurements given on side and top of plan. B refers to block; F to fertilization; M to inoculation. + sign means the subplot was fertilized or inoculated; – sign that it was not. SM stands for cultivar *Salix miyabeana* ‘SX61’, SS for cultivar ‘SX64’.