

Table 1. Characterization of soil analysis from 3 sites, *Sophora secundiflora* mycorrhizal infection, and presence of root nodules.

Site	Soil analysis					Endomycorrhizae					Root nodule
	pH	N (ppm)	P (ppm)	K (ppm)	Fe (ppm)	Chlamydo spores	Vesicles	Arbuscules	Hyalphalcoils	Ectomycorrhizae	
Native	8.5	Low	14	112	2.8	yes	round/oblong	yes	yes	no	no
Landscape	7.2	Low	66	128	4.0	yes	round/oblong	no	yes	yes	yes
Nursery	6.3	Low	3	328	6.8	yes	round/oblong	no	no	yes	yes

2), but there was no significant difference in root fresh weight.

At 1.19 kg/m³ fertilizer, growth responses increased after inoculation with both *G. mosseae* and *G. margarita*, as indicated by increased fresh and dry weights of shoots and roots (Table 2). These results agree with those of Bryan and Kormanik (3) who found an increase in both shoot and root fresh weight in mycorrhizal-inoculated sweetgum seedlings. Fresh weight increases in both roots and shoots of mycorrhizal plants may result from improved water and nutrient uptake (11, 14). *G. mosseae* at the intermediate fertility rate increased root quality, which was a measurement of visible root ball size and may indicate potential survivability following transplant of seedlings. Mycorrhizal infection of other woody plants have resulted in improved transplanting success (8). *Sophora* seedlings inoculated with *G. mosseae* also had greater leaf numbers than did noninoculated plants. Highest level of fertilization, 4.15 kg/m³, negated the beneficial effect of

G. mosseae and *G. margarita* on plant growth. Higher fertility influences root membrane integrity, which can suppress the mycorrhizal association (11). However, high soil fertility did not alter beneficial effects of *G. mosseae* in field microplots of sweetgum seedlings (7).

At both 0 and 1.19 kg/m³ increased P uptake occurred only in *G. mosseae* colonized seedlings (Table 3). There was no difference in tissue levels of N in mycorrhizal vs. noninoculated seedlings at all fertilizer rates, which may be due to faster growth rates diluting N concentration per unit of dry weight at higher fertility regimes (6) or to minimal influence of VA mycorrhizae on N uptake.

Osmocote at 4.15 kg/m³ 18N-6P-12K is the manufacturer's recommended level for an 8-9 month growth period, while 1.19 kg/m³ is 29% of the recommended rate. This study demonstrates that a lower than recommended slow-release fertilizer level in combination with either *G. mosseae* or *G. margarita* can lead to enhanced *Sophora* seedling growth

which is comparable in response to high-fertility regime nonmycorrhizal plants. Thus, mycorrhizae may find usefulness under conditions of minimal maintenance or where low fertility is dictated by economics, inaccessibility, or nursery environmental pollution runoff regulations.

Literature Cited

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Table 2. Effect of VA mycorrhizal development on *Sophora secundiflora* grown in sand and peat medium amended with 0, 1.2, and 4.2 kg/m³ Osmocote (18N-6P-12K) after 263 days.

Osmocote (kg/m ³)	Fungal species	No. leaves	Shoot wt (g)		Root wt (g)		Root quality ^y
			Fresh	Dry	Fresh	Dry	
0	Noninoculated Control	10.0a ^r	1.8a	1.0a	2.8a	1.6b	2.6a
	<i>Gigaspora margarita</i>	8.8a	1.5a	0.8a	3.0a	2.3a	2.6a
	<i>Glomus etunicatus</i>	9.2a	1.6a	1.5a	2.4ab	1.7b	2.2a
	<i>Glomus fasciculatus</i>	9.6a	1.8a	1.2a	1.8b	1.2b	2.4a
	<i>Glomus mosseae</i>	9.2a	1.5a	0.8a	3.0a	1.5b	2.2a
1.2	Noninoculated Control	11.6b	2.9bc	1.5bc	3.1cd	2.0b	2.4b
	<i>Gigaspora margarita</i>	12.1b	4.3a	2.3a	4.5b	2.7a	2.6b
	<i>Glomus margarita</i>	10.9b	2.6c	1.4c	2.7cb	1.9b	2.0b
	<i>Glomus fasciculatus</i>	11.6b	3.8ab	2.0bc	3.8bc	2.0b	2.4b
	<i>Glomus mosseae</i>	13.1a	4.3a	2.2a	7.4a	2.6a	3.3a
4.2	Noninoculated Control	12.8a	5.6a	2.8a	4.4ab	2.2a	2.8a
	<i>Gigaspora margarita</i>	12.9a	5.0a	2.5a	4.5ab	2.6a	2.9a
	<i>Glomus etunicatus</i>	12.8a	5.1a	2.6a	3.7b	2.4a	2.6a
	<i>Glomus fasciculatus</i>	13.3a	5.7a	2.7a	5.7a	2.3a	2.8a
	<i>Glomus mosseae</i>	13.2a	4.5a	2.2a	4.6ab	2.5a	3.2a

^rMean separation within columns by Duncan's multiple range test, 5% level.

^yScale from 1 (lowest) to 5 (greatest visible root ball).

Table 3. Phosphorus uptake after 263 days of growth of *Sophora secundiflora* inoculated with selected mycorrhizal fungi at 3 slow-release fertilizer levels (Osmocote 18N-6P-12K).

Mycorrhizal fungi	P uptake (% dry wt)		
	Osmocote level		
	0 kg/m ³	1.19 kg/m ³	4.15 kg/m ³
Noninoculated control	.053c ^r	.064b	.091a
<i>Gigaspora margarita</i>	.053c	.068b	.084a
<i>Glomus etunicatus</i>	.064b	.068b	.088a
<i>Glomus fasciculatus</i>	.060bc	.061b	.093a
<i>Glomus mosseae</i>	.078a	.088a	.092a

^rMean separation within columns by Duncan's multiple range test, 5% level.