INTERACTIONS BETWEEN TREES AND GROUND COVERS[1]

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The popularity of ground covers continues to increase. With the exception of some general observations, there have been few, if any, studies to determine if there are beneficial relationships that could be exploited between specific ground covers and trees. In addition to determining what ground cover will grow best beneath a particular tree species, it seems plausible that some ground covers might aid in the establishment and growth of a tree if the two are planted at the same time.

Methods

In this study cottonwood (*Populus deltoides*) and silver maple (*Acer saccharinum*) were used to study their interaction with ground covers. We obtained 6-8 ft. (2-2.7 m) bareroot trees with at least 4 roots and grew them using the connecting pot technique developed by Whitcomb et al. (1).

Trees were planted on March 17, 1978 in 18.9 L (5 gal.) poly bags with 4 root tips extending outside the bag and into the drainhole of 3.8 L (1 gal) plastic containers. Ground covers were planted into 3 of the 4 smaller containers. The remaining small container was kept free of ground covers and weeds and was used as a control. Additional small containers were planted to ground covers without the presence of tree roots to also serve as controls. All treatments were replicated 6 times in a randomized complete block design.

The growing medium consisted of ground pine bark, peat and sand in a 2:1:1 ratio amended with slow release fertilizers suitable for good plant growth. The ground covers were dwarf bamboo, *Sasa pigmaea,* planted April 14, 2 liners/pot, liriope, *Liriope muscari,* planted March 27, 3 liners/pot, and English ivy, *Hedra helix,* planted March 24, 2 liners/pot. The growth of the ground covers was evaluated by measuring length of new growth and top and root weights when the study was terminated in late October, 1978. The competition effect on the trees was evaluated by weight of root development in the small containers with or without ground cover.

Results and Discussion

Roots of cottonwood trees reduced English ivy top and root weight by 44% and 60% and liriope top and root weight by 38% and 32% (Table 1). By contrast, dwarf bamboo top weight was not affected but root weight was reduced 20% by presence of cottonwood roots.

Roots of silver maple trees had no effect on top and root weight of English ivy or liriope, however, liriope tuber production increased 28% when the silver maple roots were present (Table 1). By contrast, dwarf bamboo top and root weight and number of rhizomes were reduced 0, 43 and 50%, respectively, when silver maple roots were present.

The contrasting roles of the two tree species is intriguing. Both tree species are vigorous growers with fibrous root systems, yet cottonwood roots depressed the growth of English ivy and liriope but had no effect on dwarf bamboo while silver maple reduced the growth of dwarf bamboo but had no effect on English ivy and liriope.

It is also interesting to note the effect of the ground covers on root development of the trees. Cottonwood root development was reduced 32% by English ivy, 19% by liriope and 24% by dwarf bamboo, while silver maple roots were reduced 64, 49 and 0% by the English ivy, liriope and dwarf bamboo respectively (Table 2). The fact that both cottonwood roots and ground cover development were reduced to varying degrees by the presence of the other suggests a difference between the compatibility and competitiveness of some species. This is further supported by the

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Table 1. Effects of cottonwood and silver maple roots on growth of ground covers.

		With cottonwood	*Control without tree roots*	*% Change*	*with silver maple*	*Control without tree roots*	*% Change*
English ivy	Tops g	46	83	−44%	68	86	−21% NS
	Roots g	5	13	−60%	9	11	−18% NS
Liriope	Tops	37	61	−38%	63	68	−7% NS
	Roots	23	33	−32%	42	50	−16% NS
	Tubers				14	5	−28%
Dwarf bamboo	Tops	6	8	25% NS	4	4	No Change
	Roots	14	17	−20% NS	16	29	−43%
	Rhizomes				18	35	−50%

Table 2. Root growth of trees with and without ground covers.

	No competition	*English ivy*	*Liriope*	*Dwarf bamboo*
Cottonwood	35 g	23 g	28 g	26 g
% reduced		−32%	−19%	−24%
Silver maple	77 g	27 g	40 g	72 g
% reduced		−65%	−40%	5% NS

dramatic reduction of silver maple root weight by the English ivy while English ivy growth was not affected by the silver maple. The reverse occurred with the dwarf bamboo in that the silver maple suppressed the dwarf bamboo but the bamboo did not restrict root development of the silver maple.

It remains to be seen how other tree-ground cover combinations will perform. Whatever the outcome, much can be gained from further studies to aid our understanding of the complex relationships that exist between two plants in close association in the landscape.

Literature Cited

1. Whitcomb, Carl E., Eliot C. Roberts and Roger Q. Landers. 1969. *A connecting pot technique for root competition investigations between woody plants or between woody and herbaceous plants.* Ecology 50:326-329.

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ABSTRACT

Chapman, Douglas. 1980. **Aesculus and Carya trees deserve second consideration.** Weeds, Trees & Turf 19(6): 62-63.

In general, common horsechestnut, Ohio buckeye, and shagbark hickory are most effectively used in large area or golf course landscapes, while Ruby Red horsechestnut and, in some instances, Ohio buckeye fit into residential landscapes. All of these trees thrive in fertile, well drained soil. In native situations, hickory and oak are climax forests. They require only corrective pruning when young; therefore, are relatively low maintenance. For urban conditions, Ruby Red horsechestnut is most tolerant, followed by common horsechestnut, Ohio buckeye, and lastly, shagbark hickory. These trees can be outstanding additions/variations to the landscape, while requiring relatively little maintenance.