Intergeneric Graft Compatibility within the Family Araliaceae

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Additional index words. *Aralia*, Ginseng, *Panax* family, propagation

Summary. Novelty Araliaceae potted plants were created by a wide variety of interspecific and intergeneric graft combinations. Twenty-four species of 10 genera were tested, of which 20 species of eight genera resulted in 85 graft combinations that grew. Intergeneric graft combinations with *Schefflera arboricola* included eight species in five other genera. Intergeneric graft combinations with *x Fatshedera lizei* included 11 species in five other genera. *Schefflera arboricola* scions grew more vigorously on *Nothopanax* and *Polyscias* rootstocks than on *Schefflera* rootstocks. The highest intergeneric graft compatibility scores for each genera included combinations with *Schefflera*. Plant propagation instructors may find these results useful in designing grafting exercises.

The Araliaceae is an important plant family in the commercial foliage plant industry. Species and cultivars of *Aralia*, *x Fatshedera*, *Fatsia*, *Hedera*, *Panax*, *Polyscias*, *Pseudopanax*, *Schefflera*, and *Tupidanthus* are popular decorative plants for interior use. Plants commonly known in the trade as *Brassaia actinophylla* and *Dizygotheca elegantissima* have been reclassified into *Schefflera* but retain the same species epithet (Lowry et al. 1989). Aralias are also popular for landscapes in areas with mild winters. "Ivy Trees" made by grafting cultivars of *Hedera helix* onto rootstocks of the intergeneric hybrid *x*

Fatshedera (*Fatsia* $\times$ *Hedera*) that have been grown erect are sold as novelty specimens. Growers usually get a high percentage of successful grafts with healthy plant material and good grafting technique.

Variegated forms of *Aralia elata* do not root from cuttings and produce nonvariegated seedlings. The variegated forms are propagated by budding onto seedling or vegetatively produced nonvariegated rootstocks of *A. elata* (Leiss, 1977). One variegated form of *A. elata* also has been cleft-grafted successfully onto a rootstock of *A. spinosa* (Raulston, 1985.)

The relative ease of the *Hedera* $\times$ *Fatshedera* graft raised the possibility of graft compatibility of *Hedera* with other relatives, particularly those growing tall rapidly or having other desirable characteristics. Preliminary attempts to graft *Hedera* onto *Polyscias* and *Schefflera* were promising. Our study was undertaken to determine graft compatibility between other species and genera in the Araliaceae and to determine if scion growth was affected by the choice of rootstock.

Materials and methods

Twenty-three cultivars of Araliaceae representing six genera and 16 species were obtained from commercial sources. Two species each of two genera native to Hawaii, *Cheirodendron* and *Tetraplasandra*, were collected in the Koolau Mountains on Oahu (Table 1).

Rootstocks propagated from tip cuttings rooted in equal parts vermiculite and perlite under intermittent mist and full sun were grown in 15-cm plastic pots containing equal parts peat moss, perlite, and field soil (by volume). Lime and a slow-release granular fertilizer were incorporated. Rootstocks were established in a greenhouse under 25% shade cover until grafted.

A wide assortment of rootstock-scion combinations were tested for interspecific and intergeneric compatibility. One-hundred and one test combinations and seven control combinations were tested. Twelve cultivars (five genera, nine species) were used as rootstocks and 22 cultivars (six

Table 1. *Araliaceae* cultivars used in graft compatibility studies.

Genus species	Variety or cultivar	Used as:	
		Rootstock	Scion
<i>Cheirodendron</i> sp.	a		X
	b		X
<i>x Fatshedera lizei</i> ²		X	X
<i>Hedera helix</i>	Hahn's		X
<i>Nothopanax scutellarius</i>		X	
<i>Polyscias balfouriana marginata</i>			X
<i>P. balfouriana</i>	Pennockii ²	X	X
<i>P. filicifolia</i> ²		X	X
<i>P. filicifolia</i>	Golden Prince ²	X	X
<i>P. fruticosa</i>	Elegans		X
<i>P. guilfoylei</i>	Crispa ²	X	X
	Quinquefolia		X
	Variegata	X	
<i>P. guilfoylei victoriae</i>			X
	Variegata		X
<i>P. paniculata</i>	Variegata		X
<i>Schefflera actinophylla</i>		X	
<i>S. arboricola</i> ²		X	X
<i>S. arboricola</i>	Variegata ²	X	X
<i>S. elegantissima</i>			X
<i>S. polybotrya</i>		X	
<i>S. sp.</i>	Big Leaf		X
	Manila Ruffle		X
	Star Shine		X
<i>Tetraplasandra kauaiensis</i>			X
<i>T. meianandra</i>			X
<i>Tupidanthus calyptratus</i>		X	

²Cultivars used as scions grafted onto the same cultivar to serve as controls for the benchmark compatibility rating of 4 = vigorous scion growth.

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	Scions																						
	X F. lizei	Hedera helix 'Hahn's'	P. balfouriana marginata	P. balfouriana 'Pennockii'	P. filicifolia	P. filicifolia 'Golden Prince'	P. fruticosa 'Elegans'	P. guilfoylei 'Crispa'	P. guilfoylei 'Quinquifolia'	P. guilfoylei victoriae	P. guilfoylei 'Variegata'	S. arboricola	S. arboricola 'Variegata'	S. elegantissima	S. sp. 'Big Leaf'	S. sp. 'Manila Ruffle'	S. sp. 'Star Shine'	Cheirodendron sp. 'a'	C. sp. 'b'	Tetraplasandra kauaiensis	T. melandra		
Rootstocks																							
x Fatschedera lizei	4	3		2			1			1		4	3		2	3		0			0		
Nothopanax scutellarius	4			3		3	3			3		5	3	2	2	3	3	0			0		
Polyscias balfouriana 'Pennockii'	3			4	3			3															
P. filicifolia		3		3	4		3		3	3	3		2			3		0			0		
P. filicifolia 'Golden Prince'		3	3		4	4	3	3					3					0	0		0		
P. guilfoylei 'Variegata'					2	3						5			2				0	0	0		
P. guilfoylei 'Crispa'	4			3	3	3	3	4				4		2	2				0	0			
Schefflera actinophylla		1					1					1		2	1		2						
S. arboricola		3	3			3			2			4	4	2		3	3						
S. arboricola 'Variegata'	3									1		4	4			3							
S. polybotrya	3	2	1			1		1	1			3	2	1	1	3	2		0		0		
Tupidanthus calyptratus	1	1							1	1		2				1	1						
Graft Compatibility Index																							
0 failure of scion																							
1 very stunted scion growth																							
2 stunted scion growth																							
3 reduced but acceptable scion growth																							
4 vigorous scion growth																							
5 very vigorous scion growth																							

Fig. 1. Mean scored for rootstock–scion compatibility for selected Araliaceae. Scores for control combinations are underlined.

genera, 16 species) were selected as scions (Table 1). Side veneer grafts were used for *Hedera* because of the small diameter of the scions. Cleft grafts were used when scions were much smaller in diameter than stocks. Standard whip and tongue grafts were used for all others (Hartmann et al., 1990). Two to six replications were made of each graft combination. One or two small leaves or parts of leaves were retained on each scion. The graft unions were wrapped with raffia and sealed with an asphalt-based grafting compound. Grafted plants were placed under 73% shade for 2 to 4 weeks. When vegetative buds on the scions began to grow, plants were transferred to full sun. The raffia was cut after 6 weeks to avoid girdling. Suckers that appeared on the rootstocks were removed.

All replications of graft combinations were made on the same day and were evaluated 6 months later. A rating system based on scion growth (0 =

failure of scion to 5 = very vigorous scion growth) was used to assess graft combination compatibility. Seven cultivars of three genera were used as scions on their own rootstocks as a control. Their compatibility rating of 4 denotes vigorous scion growth (Fig. 1). Aesthetic appeal of combinations was not considered in evaluating compatibility of rootstocks and scions.

Results and Discussion

Eighty-five graft combinations, including all combinations, except those involving a native *Cheirodendron* or *Tetraplasandra* species, grew.

Nothopanax and *Polyscias* proved to be suitable rootstocks for *Polyscias* and *Schefflera* scions. The hybrid genus *x Fatschedera* also was a suitable rootstock for *Schefflera* scions, but less suitable for *Polyscias* scions (Table 2). *x Fatschedera* also was a suitable rootstock for *Hedera*, one of its parental genera.

Schefflera arboricola was a better

Table 2. Mean graft compatibility scores for *Polyscias* and *Schefflera* scions on four rootstock genera. The number of different test combinations is in parentheses.

Stocks/scions	<i>Polyscias</i>	<i>Schefflera</i>
<i>x Fatschedera</i>	1.3 (3)	3.0 (4)
<i>Nothopanax</i>	3.0 (4)	3.0 (6)
<i>Polyscias</i>	3.0 (17)	2.9 (8)
<i>Schefflera</i>	1.5 (10)	2.4 (15)
Mean	2.4 (34)	2.7 (33)

rootstock than *S. polybotrya* for *Hedera*, *Polyscias*, and *Schefflera* scions. Fourteen species or cultivars were grafted on *S. polybotrya*, but only *x Fatschedera* and two *Schefflera* species performed acceptably. Grafts of four cultivars of three *Polyscias* species on *S. polybotrya* resulted in very stunted scion growth, but each *Polyscias* cultivar grew acceptably when grafted onto *S. arboricola*, *Nothopanax*, or other *Polyscias* rootstocks (Fig. 1).

Six reciprocal graft combinations using three genera were made (Table

Table 3. Performance of six reciprocal graft combinations.

Stock	Scion	Compatibility score	Compatibility score of reciprocal graft
<i>P. balfouriana</i> 'Pennockii'	<i>x F. lizei</i>	3	2
	<i>P. filicifolia</i>	3	3
	<i>P. guilfoylei</i> 'Crispa'	3	3
<i>P. filicifolia</i> 'Golden Prince'	<i>P. guilfoylei</i> 'Crispa'	3	3
<i>S. arboricola</i> 'Variegata'	<i>x F. lizei</i>	3	3
	<i>S. arboricola</i>	4	4

Table 4. Summary of highest intergeneric graft compatibility scores as either rootstocks, scion, or both.

Genus	Highest score	Most compatible genera
<i>Schefflera</i>	5	<i>Nothopanax</i> , <i>Polyscias</i>
<i>Nothopanax</i>	5	<i>Schefflera</i>
<i>Polyscias</i>	5	<i>Schefflera</i>
<i>x Fatshedera</i>	4	<i>Nothopanax</i> , <i>Polyscias</i> , <i>Schefflera</i>
<i>Hedera</i>	3	<i>x Fatshedera</i> , <i>Polyscias</i> , <i>Schefflera</i>
<i>Tupidanthus</i>	2	<i>Schefflera</i>
<i>Cheirodendron</i>	0	None
<i>Tetraplasandra</i>	0	None

3). There were no appreciable differences among reciprocal grafts of five of the combinations, but the combination of *x Fatshedera lizei* on *Polyscias balfouriana* 'Pennockii' resulted in a stronger union and better scion growth than the reciprocal combination.

Schefflera arboricola was unsurpassed as a scion and gave vigorous to very vigorous growth when grafted on its own variegated cultivar, *x Fatshedera*, *Nothopanax*, or *Polyscias*. It grew less vigorously on *S. polybotrya* and *Tupidanthus* but was equal to or better than other scions tested on these two rootstocks. When grafted onto *Nothopanax* and *P. guilfoylei* 'Variegata', *Schefflera arboricola* grew more vigorously than on its own roots. This was the only example of a control combination outperformed by a test combination (Fig. 1).

Tupidanthus was a poor rootstock for *Hedera*, *Polyscias* and *Schefflera*. *x Fatshedera* on *Tupidanthus* also resulted in very stunted scion growth.

All 16 combinations using four species of two Hawaiian native genera of Araliaceae on *x Fatshedera*, *Nothopanax*, *Polyscias*, and *Schefflera* failed (Fig. 1). The environmental conditions at a 2000-foot elevation where the *Cheirodendron* and *Tetraplasandra* scions were collected was quite different from the near sea-level greenhouse conditions in which they were tested and may have contributed to the failures.

These results indicate that a wide variety of intergeneric graft combinations are possible in the Araliaceae. Table 4 lists the genera tested, the highest intergeneric graft compatibility score achieved as either rootstock or scion, and the genera combined for that score. The highest intergeneric graft compatibility scores achieved for each genera included combinations with *Schefflera*.

This information on graft compatibility within some Araliaceae may be useful to nurserymen in creating novelty potted plants for decorative use. The ready compatibility and ease of grafting for many combinations also may be useful in designing grafting exercises for propagation classes.

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