

CONCLUSIONS

Some trends can be established from this study. Brown bark birches in general root better than white-bark birches. Tip cuttings are preferable with the undeveloped apical tips left intact. Wounding, mist, and bottom heat are a given. Forcing in a greenhouse is an effective tool for the production of cuttings that root easily. Seedlings are of course useful due to their juvenility. Root hormones although necessary can be quite varied provided the dosage is high enough. Here, 1000 to 5000 ppm of auxin seem to be sufficient. Timing does seem important with late spring to early summer being the most effective time plus it allows for a much longer period of time for the rooted cuttings to develop before the onset of fall and winter.

In general it seems that most in not all birches can be rooted in acceptable numbers provided certain steps are taken to accentuate the process.

LITERATURE CITED

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Potential for Grafting Evergreen *Ilex*: A Preliminary Investigation[©]

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On a visit to the Rutgers University Horticultural Farm Dr. Elwin Orton showed me some *Ilex* grafts using *Ilex xmeserveae* cv., Blue Princess[®] as an understock. This stirred up more than a bit of interest as I wanted to try grafting an experimental hybrid on to *I. xmeserveae* 'Blue Princess' as Dr. Orton had showed me. That combination was successful and allowed for further growing on the hybrid. Encouraged by those results this study was undertaken to see what possible graft combinations might work and were there differences in grafting to *I. xmeserveae* cv., 'Blue Princess[®]' or *I.* 'Nellie R. Stevens'. This was further encouraged by comments from Mr. Jim Berry from Plant Development Services, Loxley, Alabama who suggested that both *I. aquifolium* and the "Blue Hollies" are poor performers in the Southeastern portions of the U.S.A. He thought a suitable rootstock might make those plants more available to the Southern nursery trade.

MATERIALS AND METHODS

One-year-old potted rooted cuttings of *I. xmeserveae* cv., Blue Princess[®] holly, and *I.* 'Nellie R. Stevens' were obtained as the potential rootstocks. A range of scion material (Table I) was chosen to see what the scion/understock interaction might be. Understocks were kept in a cool greenhouse with a minimum of bottom heat set at 45°F until grafted. Scions were grafted to the understock using a side graft and wrapped with a rubber strip and sealed with Parafilm[™]. The completed grafts

Table 1. *Ilex* grafting statistics.

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<i>Ilex xmeserveae</i> cv. Blue Princess® holly understock.	Take (%)	Actual
<i>Ilex</i> Lorax Experimental	100	11/11
<i>Ilex</i> Foster yellow fruit	36	4/11
<i>Ilex opaca</i> 'Satyr Hill'	45	5/11
<i>Ilex opaca</i> 'Steward's Silver Crown'	100	4/4
<i>Ilex aquifolium</i> 'Angustifolium'	100	5/5
<i>Ilex pedunculosa</i>	9	1/11
<i>Ilex opaca</i> f. <i>xanthocarpa</i> 'Boyce Thompson'	27	3/11
<i>Ilex</i> 'Nellie R. Stevens' understock		
<i>Ilex opaca</i> 'Farage'	100	8/8
<i>Ilex opaca</i> f. <i>xanthocarpa</i> 'Morris Arboretum'	100	9/9
<i>Ilex opaca</i> 'Jesrsey Princess'	100	9/9
<i>Ilex opaca</i> f. <i>xanthocarpa</i> 'Goldie'	44	4/9
<i>Ilex perado</i>	44	4/9
<i>Ilex aquifolium</i> 'Limsi', Siberia® English holly	90	9/10
<i>Ilex</i> 'Doctor Kassab'	33	3/9
<i>Ilex xmeserveae</i> cv. Blue Princess® holly	44	4/9
<i>Ilex aquifolium</i> unnamed	55	5/9
<i>Ilex xmeserveae</i> cv. Blue Princess® holly understock with no take or less than 10%		
<i>Ilex xattenuata</i> 'Hume #1'; <i>Ilex</i> 'Samantha'; <i>Ilex opaca</i> 'Chief Padhuca', 'Gaylean Gold', 'Delwin Bradley', 'Swarthmore', 'Gold Rush', 'Jeanette Anderson'; <i>Ilex pedunculosa</i>		
<i>Ilex</i> 'Nellie R. Stevens' understock with no take or less than 10%		
<i>Ilex opaca</i> 'Old Heavy Berry', <i>Ilex opaca</i> 'Manig'		

were laid upon a bed of moist perlite at a 45° angle in a wooden frame over bottom heat pipes set at 70°F. Arches made of poly pipe were suspended above the grafts to form a structure which allowed for a clear plastic curtain to be drawn over the grafts and form a tent. An ultrasonic cool water vaporizer was placed in the sealed tent and kept full so that there was a constant fog of cool water vapor. Periodically the grafts were syringed with water so that the roots did not dry out. After 1 month the grafts were gradually vented and finally removed from the tent. Table 1 shows the individual statistics and outcomes for the various combinations.

RESULTS AND DISCUSSION

As a practical matter, 'Nellie R. Stevens' is easier to work with than Blue Princess® holly. Stems are thicker and the rooting is heavier on the same age of rooted cutting. Table 1 reports the success but the failure rate is perhaps as revealing as the success rate if not more so. Most *I. opaca* do not graft to Blue Princess® holly. Only one *I. opaca*, 'Steward's Silver Crown', grafted with a 100% take on Blue Princess® holly, two others were low percentages of 27 % and 45% and some six others failed to perform at all with a 10% or less take.

Several cultivars of *I. opaca* such as 'Jersey Princess', f. *xanthocarpa* 'Morris Arboretum', and 'Farage' performed very well on 'Nellie R. Stevens' at 100% each. But *I. opaca* f. *xanthocarpa* 'Goldie' did not measure up, with only a 44% take and two *I. opaca* cultivars failed to knit with *I.* 'Nellie R. Stevens'. *Ilex aquifolium* 'Limsi', Siberia® English holly* did well on 'Nellie R. Stevens' although another *I. aquifolium*, an unnamed cultivar, did only marginally well at 55%. The Blue Princess® holly grafts that took on 'Nellie R. Stevens' grew well but the overall take was low, 44%. It should be noted that suckering of the rootstock is a problem initially and may prove to be a significant debilitating factor for the future growth of the 'Blue Princess® holly grafts. However, this might be offset by grafting as low as possible and burying the graft union below the soil surface so that light can not initiate bud break on the understock.

Theory would suggest that *I. aquifolium* cultivars would graft well on either Blue Princess® holly *I. meserveae* (*I. rugosa* × *I. aquifolium*) or 'Nellie R. Stevens' (*I. aquifolium* × *I. cornuta*) and the two cultivars would be compatible with each other. Neither presumption seems to be true. Instead it appears that successful combinations with either rootstock is scion cultivar specific as evidenced by the poor take of the unnamed clone of *I. aquifolium* when compared with the 100% take of *I. aquifolium* 'Limsi', Siberia® English holly. The wide variations of graft results that are in the 40% to 50% range indicate that some compatibility is achievable but the total extent is not known. This is further enhanced by the low 44% take of Blue Princess® holly on 'Nellie R. Stevens' with both being closely related to one another having *I. aquifolium* as a common parent. Another combination, 'Doctor Kassab' (*I. cornuta* × *I. pernyi*) should have theoretically grafted well onto 'Nellie R. Stevens' as both have *I. cornuta* in common, but this is not the case. Since it is evident that cultivar distinctions are noteworthy it may be insufficient to assign kinship to various hybrids based merely on parental origins. Not all *I. aquifolium* are created equal as parents nor as scions. The same seems to be true of *I. opaca* with some cultivars grafting well to Blue Princess® holly but a large number of others that do not.

Ilex Lorax Experimental (thought to be an 'Nellie R. Stevens' seedling) is a special hybrid under investigation at Lorax Farms. Cuttings root easily but perform poorly

with devastating losses during overwintering. Graft combinations done 2 years ago on Blue Princess® holly have not suffered the overwintering damage and have grown as well as some *I. aquifolium* planted nearby that are not grafted. Grafting does eliminate this overwintering problem and might prove to be an asset for those wishing to propagate this plant.

The results stipulated here suggest that for some cultivars grafting might be a suitable method of propagation but a more advanced study directly comparing Blue Princess® holly to 'Nellie R. Stevens' is in order. Adding to the argument that 'Nellie R. Stevens' might be the logical choice as an understock for more Southern regions is a paper by Ruth et al (1995). Their research suggests that 'Nellie R. Stevens' is very tolerant of wet soils and situations that would inevitably kill Blue Princess® holly. Tom Ranney (pers. comm.), one of the authors of that paper, commented that 'Nellie R. Stevens' could be placed in the category of a "water" plant for its ability to withstand flooding with little or no apparent damage. No other *Ilex*, except for *I. cornuta* (one of the parents of 'Nellie R. Stevens') can tolerate such saturated conditions. This tends to point the research effort toward the direction of 'Nellie R. Stevens'. A more direct comparison of 'Nellie R. Stevens' to that of 'Blue Princess' might indicate even more differences than what were noted here.

* *Ilex aquifolium* 'Limsi', Siberia® English holly is a patented plant of the Conard-Pyle Co., West Grove, Pennsylvania, and was used for experimental purposes only. Thanks are due to the Conard-Pyle Co. for use of this plant.

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