

## Growth and Survival of 'Whitespire' Birch Grafted on Five Species of Birch Rootstocks

Everett P. Whitman II and Thomas G. Ranney  
North Carolina

**Nature of Work:** Among the genus *Betula* are arborescent species native to a broad range of latitudes, climates and habitats with variations in site hydrology ranging from upland and alpine sites to wet bottomlands. These differences in species origin and their adaptability to varied environments may provide a opportunity for enhancing growth and resistance to environmental stresses by selecting rootstocks that are better adapted to a given environment.

'Whitespire' birch was originally selected for its chalky white bark and narrow, pyramidal form, and is purportedly resistant to bronze birch borer, *Agilus anxius* (Gory), a major pest of white-barked birches. 'Whitespire' birch has also been found to be relatively tolerant to heat and drought (2, 4), though intolerant of poorly drained soils (1). Research with container grown trees has shown that grafting 'Whitespire' birch on river birch and, to a lesser extent, on European birch rootstocks can enhance flood tolerance over trees on 'Whitespire' rootstock (3). The objectives of this study were to evaluate survival, growth, rootstock suckering and short-term graft compatibility of 'Whitespire' birch scions on five species of rootstocks under field conditions.

Ten trees of 'Whitespire' birch on each of the 5 rootstocks were planted at a spacing of 4.5 m by 6.1 m in a randomized complete block design, with trees assigned to blocks according to tree size in Spring 1991.

**Results and Discussion:** The field soil was classified as a sandy clay loam (49% sand, 26% silt, and 25% clay), with a mean percolation rate of 2.3 cm·hr<sup>-1</sup>, and an initial pH of 6.6.

No signs of graft union incompatibility (e.g. mechanically weak unions) were observed. However, occasional death of trees on some rootstocks occurred throughout the study (Table 1). Trees grafted onto river, European, paper and 'Whitespire' rootstocks had similar (not significantly different) survival rates of 100, 80, 80, and 60%, respectively. Trees on Szechuan rootstocks had a low survival rate of only 30%, significantly lower than all other rootstocks except 'Whitespire' birch.

Trees on European birch had one of the greatest trunk diameters and tree heights at the end of the 1993 growing seasons (Table 1). Trees on river birch had trunk diameters and heights similar to trees on European birch. Trees on paper, 'Whitespire', and Szechuan birch had three of the smallest trunk diameters and heights. Tree width was similar for all trees with the exception of trees on European birch rootstocks that were significantly wider than trees on all rootstocks but Szechuan birch.

Frost cracks occurred in March 1993 on the lower trunk of the 'Whitespire' scion on some rootstocks. Trees on river birch had the greatest incidence of cracking, while trees on European and Szechuan birch rootstock had no cracking (Table 2). The greater incidence of frost cracks on scions grafted on river birch rootstock suggests that the rootstock may be influencing cold hardiness of the scion. However, frost cracks did not contribute to tree mortality, for trees on river birch had one of the highest survival rates (Table 1).

Rootstock suckers are a potential problem with all grafted plant species. Unless suckers are removed or suppressed they can become secondary tree trunks with distinctly different and often undesirable characteristics. 'Whitespire' birch rootstocks had a mean of 11.1 cumulative rootstock suckers, significantly greater than all other rootstocks. The remaining rootstocks had a similar number of mean cumulative rootstock suckers of 3.5, 1.4, 1.1, and 0.2 for European, river, Szechuan, and paper birch, respectively.

Trees on river birch rootstock showed interveinal foliar chlorosis on young leaves, typical of iron deficiency, during the first two growing seasons. Soil applied  $\text{FeSO}_4$  and foliar spray of chelated iron effectively relieved this problem. Foliage appeared normal the third growing season and the above materials were not applied. River birch grown on its own roots can develop leaf chlorosis in soils with  $\text{pH} > 6.5$ . Results from our study indicate that this is a characteristic retained by the river birch rootstock. Thus, use of river birch rootstock is probably best reserved for acidic soils, i.e.  $\text{pH} < 6.0 - 6.5$ .

**Significance to Industry:** At the end of the experiment, trees of 'Whitespire' scion grafted onto European and river birch rootstocks had two of the greatest survival rates, trunk diameters, and tree heights of all graft combinations and significantly greater trunk diameter than trees on 'Whitespire' rootstock. These results are specific to the rootstock genotypes included in this experiment and the potential exists for considerable variation within these species. However, this study demonstrated that growth of certain birches, e.g. 'Whitespire', can be enhanced by grafting this cultivar on rootstocks of other birch species including European and river birch.

#### Literature Cited

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**Table 1.** Mean tree survival, trunk diameter, height, and width of *B. platyphylla* var. *japonica* 'Whitespire' grafted on five rootstocks.

Rootstock	Survival (%)	Trunk Diameter (cm)	Height (m)	Width (m)	Frost cracks (no.)	Cumulative rootstock suckers (no.)
river	100 a	6.2 ab	3.27 ab	1.29 b	1.0 a <sup>2</sup>	1.4 b
European	80a	7.6a	3.50a	1.93 a	0.0 bc	3.5b
paper	80a	4.8 bc	3.32 ab	1.37 b	0.3 b	0.2 b
'Whitespire'	60 ab	4.4 c	2.90 b	1.46 b	0.6 b	11.1 a
Szechuan	30 b	5.8 abc	2.92 b	1.55 ab	0.0 bc	1.1 b

<sup>2</sup>Means followed by the same letter within a column are not significantly different,  $t_{0.05}$ .