

CALLERY PEAR CULTIVARS TESTED AS STREET TREES: SECOND REPORT

Henry D. Gerhold

Abstract. Nine Callery pear (*Pyrus calleryana*) cultivars were planted under utility wires in 11 communities for evaluation as street trees. In most communities, 2 cultivars were alternated within each of several plots. Cooperators in the Municipal Tree Restoration Program used standardized methods to measure them annually at the end of the growing period for 3 years, and periodically afterwards until the ninth year in some cases. Significant differences were found in growth rate, height, crown width, and trunk diameter, but growth patterns and dimensions of most cultivars that were evaluated for 9 years were similar, with some notable exceptions. The height growth of 'Autumn Blaze' seems to have stalled at 5.6 m (18.5 ft) 9 years after transplanting, whereas most other cultivars exceeded 7.2 m (23.7 ft) and were still growing about 0.4 m (1.3 ft) per year. 'Cleveland Select' and 'Whitehouse' had narrower crowns and smaller trunks than others. All cultivars were in very good health except 'Whitehouse', whose foliage and twigs were injured somewhat in most years by unidentified insects and disease, possibly anthracnose or fireblight.

Key Words. Callery pear, *Pyrus calleryana*, Aristocrat™, 'Autumn Blaze', 'Bradford', 'Capital', Cleveland Pride®, 'Cleveland Select', 'Redspire', 'Whitehouse', Valiant®, street trees, performance testing.

Callery pear (*Pyrus calleryana*) cultivars are being evaluated as part of the Municipal Tree Restoration Program. MTRP encourages municipalities to improve their tree programs and provides information to help decision makers select appropriate cultivars for planting under utility wires. Free trees purchased with utility funds serve as an incentive for communities to participate. Initial results of Callery pear performance tests were reported previously (Gerhold and McElroy 1994).

Earlier research comparing landscape trees (Reisch et al. 1971; Ticknor 1971; Mower 1973; and Kozel 1974) led to the proposal of a cooperative performance testing system for street tree cultivars (Gerhold and Bartoe 1976; Gerhold 1985). The statistical design was based on measurements of 23 cultivars supplied by

municipal arborists in Iowa, Michigan, Ohio, Pennsylvania, Vermont, and Washington (Bartoe 1977).

METHODS

Eleven communities in Pennsylvania planted the trees represented in this report. Community representatives chose the planting sites with assistance by utility foresters, service foresters, and Extension urban foresters; 2 of these usually assisted each community.

Each test planting consisted of 2 cultivars, except in Tioga where there were 3. A typical test consisted of 2 cultivars planted alternately within 4 to 10 plots that could contain 4 to 16 trees each—a total of 50 trees. All test trees were planted along streets and under electric conductors; the utility company arranged for removal of large trees that interfered with utility lines. Both cultivars for a community were ordered B&B from the same nursery, with a caliper of 4.4 or 5.1 cm (1.75 or 2 in.). Initial heights ranged from 2.8 to 5 m (9.3 to 16.5 ft); this wide range could be explained only partly by cultivar differences, so presumably growing conditions at the nurseries had a strong influence. 'Redspire' typically was 0.2 to 0.6 m (0.6 to 2 ft) taller than its companion cultivar; 'Cleveland Select' tended to be shorter, but not in all cases.

The cultivar tests were planted between 1988 and 1993. A trained cooperator inspected and measured the trees annually during the first 3 years, and then at 3-year intervals. During September or October, a service forester or Extension urban forester used standardized methods to measure tree height, trunk diameter, and crown width, and to classify foliage health, branch health, trunk health, maintenance needs, and an overall quality rating (Table 1*). Causes of damage such as disease, insects, drought, and mechanical injuries also were recorded.

An analysis of variance (MINITAB General Linear Model) was conducted on each type of quantitative data from the 2 (or 3) cultivars in a test planting to

*Tables and figure for this article begin on page 58.

calculate means and determine significance of differences. Each test location in every year was treated as a separate experiment with plots providing replication. These results, along with written comments of cooperators, were used to characterize performance of the cultivars.

RESULTS

The main differences found among the cultivars 6 to 9 years after transplanting were in trunk diameters, heights, and width of crowns (Table 1). Aristocrat™ was largest in diameter at breast height (dbh), and 'Cleveland Select' and 'Whitehouse' were smallest but sturdy enough. Heights differed among locations, but growth rates were quite similar especially from years 3 to 9 (Figure 1). The most notable exception was 'Autumn Blaze', whose height was 5.5 m (18 ft) in the sixth year and 5.6 m (18.5 ft) in the ninth year at the only location where it was evaluated. In comparison, heights of most other cultivars varied from 7.2 m (23.7 ft) to 8.5 m (27.7 ft) in the ninth year, and their growth rates of about 0.4 m (1.3 ft) per year showed no sign of slowing down. Most crown widths in the ninth year ranged from 4.9 m (16.2 ft) to 5.9 m (19.3 ft), except those of 'Cleveland Select' (3.8 to 4.6 m, 12.4 to 15.0 ft) and 'Whitehouse' (2.9 to 4.7 m, 9.6 ft to 15.5 ft).

All of the cultivars except 'Whitehouse' were very healthy throughout the evaluations, as indicated by foliage and branch ratings above 4.0. Insects, diseases, and drought injured the leaves of 'Whitehouse' according to observations; anthracnose or fireblight were suspected as causes but not verified. These injuries explained the 2 lower overall ratings of 'Whitehouse' compared to 'Bradford' and 'Cleveland Select'. 'Cleveland Select' was the only other cultivar whose overall ratings were more than 1.0 unit lower than comparison cultivars 'Capital' and Valiant® at 2 locations. The service forester who evaluated the trees at both of these locations regarded the branching habit and leaf color of 'Cleveland Select' to be somewhat inferior. At 5 other locations, 'Cleveland Select' was given high overall ratings similar to other cultivars.

CONCLUSIONS

Callery pear cultivars that grew well and remained healthy at several locations through the ninth year after transplanting included Aristocrat, 'Cleveland

Select', and 'Redspire'. Others that can be recommended based on less extensive evaluations are 'Autumn Blaze', 'Capital', Cleveland Pride®, and Valiant. 'Bradford' also performed well at 1 location, where it has not yet suffered limb breakage that has occurred frequently elsewhere.

Several cultivars have narrow crowns or lower mature heights that commend them for restricted spaces, for example under utility wires or near buildings. 'Autumn Blaze' apparently will not grow as tall as the others. 'Cleveland Select' and 'Whitehouse' have narrow crowns, but the latter has suffered foliage injuries and some twig dieback.

LITERATURE CITED

- Bartoe, D.W., II. 1977. Statistical designs for evaluating and comparing street tree cultivars. M.S. thesis, Penn State Univ., University Park, PA. 98 pp.
- Gerhold, H.D. 1985. Performance testing of street tree cultivars: A model project. *J. Arboric.* 11(9):263–271.
- Gerhold, H.D., and W.D. Bartoe, II. 1976. Performance testing tree cultivars in metropolitan environments. *J. Arboric.* 2(12):221–227.
- Gerhold, H.D., H.L. McElroy, and H.L.H. Rhodes. 1994. Street tree performance tests of crabapple cultivars: Initial results. *J. Arboric.* 20(2):87–93.
- Kozel, P.C. 1974. Shade trees for suburban and city arboriculture. *HortScience* 9(6):515–518.
- Mower, R.G. 1973. Some observations on street tree plantings. *Proc. Intl. Shade Tree Conf.* 49:49–55.
- Reisch, K.W., G. Hull, and H.M. Hill. 1971. Case histories of several street tree species and cultivars at selected sites in five Ohio cities. *Ohio Agric. Res. Dev. Ctr., Hort. Dept. Series 376.* 65 pp.
- Ticknor, R.L. 1971. Landscape tree performance. *Oregon State Univ. Agric. Exp. Sta., Circular of Information 633.* 11 pp.

Acknowledgments. Financial support for the Municipal Tree Restoration Program was provided by utility companies through the Pennsylvania Electric Energy Research Council and by donations of arboricultural firms: ACRT, Allegheny Power Systems, Asplundh Tree Expert Co., Baltimore Gas & Electric Co., Bartlett Tree Expert Co., Davey Tree Expert Co., Duquesne Light, Environmental Consultants Inc., GPU Energy, Hazlett Tree Service, Penn Power, Pennsylvania Power & Light, and UGI Corporation. Service Foresters of the Pennsylvania Bureau of Forestry and the Maryland Department of Natural Resources, and Extension Urban Foresters of Penn State University assisted with community liaison and tree measurements.

*Professor of Forest Genetics
School of Forest Resources
Penn State University
109 Ferguson Building
University Park, PA 16802*

Resumen. Se plantaron nueve cultivares de pera Callery (*Pyrus calleryana*) bajo líneas de conducción eléctrica en once comunidades, con el fin de ser evaluados como árboles urbanos. En la mayoría de las comunidades se alternaron dos cultivares dentro de varias parcelas. Los cooperadores del Programa Municipal de Restauración de Árboles usaron métodos estándar para medirlos anualmente, al final del período de crecimiento, durante tres años, y periódicamente después hasta el noveno año en algunos casos. Se

encontraron diferencias significativas en la tasa de crecimiento en altura, amplitud de la copa y diámetro del tronco. Sin embargo, los patrones de crecimiento y las dimensiones de la mayoría de los cultivares evaluados por nueve años, fueron similares con notables excepciones. El crecimiento en altura de 'Autumn Blaze' parece culminar a los 5.6 m (18.5 pies), nueve años después del trasplante; mientras la mayoría de los otros cultivares excedieron de 7.2 m (23.7 pies) y aún siguieron creciendo cerca de 0.4 m (1.3 pies) por año. 'Cleveland Select' y 'Whitehouse' tuvieron copas estrechas y troncos más pequeños que otros. Todos los cultivares estuvieron en muy buenas condiciones de salud, excepto 'Whitehouse', cuyo follaje y brotes fueron de alguna manera atacados en la mayor parte de los años por insectos y enfermedades no identificados, posiblemente antracnosis o tizón de fuego.

Table 1. Size, health, and overall ratings of Callery pear cultivars, derived from data collected until the sixth year to the ninth year after planting. Average trunk diameter, tree height, and crown width are in the most advanced year; foliage health, branch health, and overall ratings are averaged over all years.

Cultivar	Location	Year	Dbh (cm)	Height (m)	Width (m)	Foliage ^z 1 to 5	Branches ^z 1 to 5	Overall ^y 1 to 9
Aristocrat™	Warren	9	16.3 ^x	7.6	5.9	4.9	4.9	8.2
	Tioga	9	19.8 ^x	8.5 ^x	5.1 ^x	4.2	4.4	8.2
	Union City	9	18.2 ^x	7.3	5.2 ^x	4.1	4.5	6.7
	Waterford	6	11.0 ^x	6.5	4.6 ^x	4.1	4.8	7.0
'Autumn Blaze'	Titusville	9	15.6	5.6 ^x	5.7	4.6	4.3	7.4
'Bradford'	Saegertown	9	15.1 ^x	7.5 ^x	4.9 ^x	4.6 ^x	4.6 ^x	7.6 ^w
'Capital'	Red Lion	7	14.6 ^x	6.1 ^x	4.7	4.9	4.6	7.6 ^w
Cleveland Pride®	Mt. Holly Spngs	6	10.4	5.5	3.2 ^x	4.9	5.0	8.4
'Cleveland Select'	Franklin	9	14.3	8.1	4.6	4.6 ^x	4.7	7.5 ^w
	Tioga	9	11.3 ^x	7.7 ^x	3.8 ^x	4.4	4.7	8.2
	Union City	9	15.8 ^x	7.2	3.9 ^x	4.2	4.5	7.1
	Red Lion	8	10.7 ^x	5.5 ^x	4.2	4.8	4.4	6.4 ^w
	Hanover	7	8.4	5.1	3.7	4.7	4.9	6.3 ^w
	Waterford	6	9.4 ^x	6.2	3.1 ^x	4.2	4.9	6.9
	Mt. Holly Spngs	6	10.8	5.5	2.3 ^x	5.0	5.0	8.9
'Redspire'	Titusville	9	15.4	7.3 ^x	5.4	4.5	4.2	7.3
	Tioga	9	15.3 ^x	7.6 ^x	5.3 ^x	4.4	4.5	8.9
	Warren	9	12.9 ^x	8.0	5.9	4.8	4.8	8.0
	Southmont	6	7.8 ^x	6.0 ^x	2.3	4.5	4.8	8.8
'Whitehouse'	Franklin	9	14.9	7.8	4.7	3.5 ^x	4.0	5.8 ^w
	Saegertown	9	10.2 ^x	6.8 ^x	2.9 ^x	3.5 ^x	4.1 ^x	5.5 ^w
Valiant®	Hanover	7	8.8	5.2	4.0	4.7	4.8	7.8 ^w
	Southmont	6	6.2 ^x	5.5 ^x	2.4	4.2	4.7	8.7

^zFoliage and branch injury ratings: 1 = 65 to 100%, 2 = 45 to 60%, 3 = 25 to 40%, 4 = 5 to 20%, 5 = less than 5% of leaf surface area or of branches injured.

^yOverall quality ratings: 0 = unsuitable, 5 or 6 = reasonably good appearance and performance, 9 = ideal for the site conditions in adaptation, appearance, and health.

^xSignificantly different at the 95% level from the other cultivar(s) at the same location.

^wOverall quality ratings at the same location differ by at least 1.0.

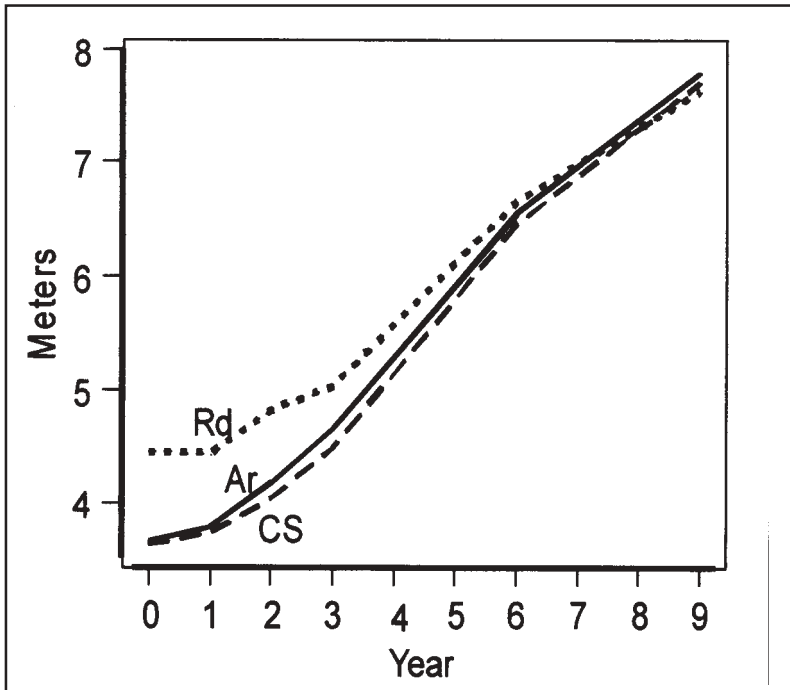


Figure 1. Average height growth of Aristocrat™ (Ar), 'Cleveland Select' (CS), and 'Redspire' (Rd) Callery pears.