



Center for Landscape and Urban Horticulture

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EVALUATION OF *PYRUS* INTERSPECIFIC HYBRIDS FOR LANDSCAPE USE

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Project Summary

Members of the genus *Pyrus*, notably *P. calleryana* and *P. kawakamii*, have been widely used medium-sized landscape trees, but each has serious defects making them undesirable choices for new or renovated sites. The potential exists for these defects to be overcome through breeding within the genus. Ideally, this procedure could provide new small- to medium-sized, well-adapted, high quality landscape trees for use in California's growing urban and suburban areas. In this project, six interspecific hybrids from *Pyrus* crosses, made by the Landscape Plant Development Center, will be established at U.C. Riverside for long-term evaluation of their potential as high-quality landscape trees. If one or more new high quality selections are identified, the palette of good small to medium trees for use in California will be expanded.

Project Description

Introduction, Background and Objectives

The genus *Pyrus*, a member of the subfamily Pomoideae in the Rosaceae, contains 22 primary species and at least 6 naturally occurring interspecific hybrids. *Pyrus* is believed to have arisen in the mountainous regions of western China and now is indigenous to Europe, temperate Asia, and the mountainous regions of North Africa (Bell et al. 1996). Today pears are second only to apples as the most important deciduous tree fruit crop in the world, with the major species of commerce being *P. communis* L., the common European pear, and *P. pyrifolia* (Burm.) Nak., the Asian or Oriental pear.

Several members of the genus *Pyrus* are valued as medium-sized, widely adapted landscape trees. Cultivars of *P. calleryana* Decne. (Dirr 1990) and the species *P. kawakamii* Hayata are the most notable of these used in Southern California. The *P. calleryana* cultivar, 'Bradford', was introduced by the U.S. Department of Agriculture in the early 1960's and remains the most widely used of the *P. calleryana* cultivars. 'Bradford' and the other *P. calleryana* cultivars have desirable landscape qualities including attractive spring flowering, outstanding fall color, adaptation to varieties of climate and soil conditions, and some degree of fireblight resistance. Unfortunately, 'Bradford' and many of the newer *P. calleryana* cultivars suffer from narrow branch angles that result in severe splitting of the tight, upright branch crotches. *P. kawakamii* exhibits attractive winter flowering, nearly evergreen foliage, adaptation to varieties of climate and soil



conditions, and acceptable branch structure, but it is highly susceptible to fireblight. Although the *P. calleryana* cultivars and *P. kawakamii* offer many desirable qualities and their mature sizes are appropriate in scale to many urban landscape sites, their defects severely limit their use as landscape trees.

Fortunately, there is considerable genetic diversity in the genus *Pyrus* for landscape traits, climatic and edaphic adaptation, and disease and pest resistance. The gene pool available to fruit breeders is well-documented (Bell et al. 1996), but the potential of *Pyrus* for landscape use has been largely unexplored until recently (Hummel 2000). Evidence indicates that all species of *Pyrus* are diploid ($2n=34$, $x=17$) and no major interspecific crossing barriers appear to exist in the genus (Zielinski and Thompson 1967; Westwood and Bjornstad 1971; Bell and Hough 1986; Bell et al. 1996). Self-fertility is rare because *Pyrus* has a gametophytic incompatibility system that insures outcrossing (Crane and Lawrence 1952), but sterility of the interspecific hybrids is generally not a problem for *Pyrus* breeders (Zielenski and Thompson 1966, 1967; Bell et al. 1996).

In 1990, the Landscape Plant Development Center (LPDC) collected open pollinated (OP) seeds from Melvin Westwood's interspecific *Pyrus* hybrids growing at the National Clonal Germplasm Repository in Corvallis, Oregon. The first controlled crosses of selected *Pyrus* accessions in the Repository's collection were made in 1991 (Pellett and Hunt 1992). Additional crosses were made in 1992. The *Pyrus* species involved in the crosses and their indigenous geographical distribution are as follows: *P. amygdaliformis* Vill. and *P. elaeagnifolia* Pall. have a circum-Mediterranean distribution; *P. regellii* Rehd. and *P. salicifolia* Pall. are mid-Asian species; *P. betulaeifolia* Bunge, *P. calleryana* Decne., *P. dimorphophylla* Mak., *P. fauriei* Schneider, *P. pyrifolia* (Burm.) Nakai, and *P. ussuriensis* Maxim. are East Asian species; while *P. nivalis* Jacq. is of European origin (Bell et al. 1996). These species were chosen because they represent a diversity of tree forms, foliage characteristics and climatic adaptations with the potential for recombination through breeding.

OP seeds and seeds from *Pyrus* crosses made in 1991 and 1992 were sent to the Washington State University Research Center in Puyallup, WA where there is currently a field planting of 503 interspecific *Pyrus* hybrids under evaluation for their potential as landscape trees (Hummel 2000, 2003). Several interspecific hybrids have demonstrated wide-angled branch structure, good flowering, attractive fall color, and fireblight resistance (Hummel 2003), plus their parentage may confer adaptation to warm arid climates like those of Southern California. In addition, previous studies at U. C. Riverside determined ornamental pears are well watered at 55% to 70% of reference ET (Pittenger, et al. 2002), which indicates that *Pyrus* has a moderate water requirement that meets water conservation expectations for landscape plants in this region.

The objectives of this study are to determine the performance and horticultural characteristics of 6 interspecific hybrid pear selections in cooperation with the Landscape Plant Development Center – Washington State University *Pyrus* evaluation project under climate and soil conditions typical of inland Southern California. Tree attributes that will be evaluated include:

1. horticultural characteristics including growth, foliage (fall color, chlorosis, marginal burn, etc.), flowers, and fruit.
2. angle of branch attachment.
3. incidence of fire blight.

Plan of Work

Bare root whips of six advanced *Pyrus* interspecific hybrid selections were received at U.C. Riverside from an Oregon wholesale nursery in March 2003. The 20 trees were immediately planted in standard plastic 15-gal. containers using U.C. Mix #2 media, placed in a nursery yard in the U. C. Riverside Agricultural Operations center to grow on, and will be suitable for transplanting in summer 2004 in the U. C. Riverside Botanic Gardens for long-term evaluation of their landscape qualities. Selections may be added to the study in future years as new pear hybrids are developed and planting space allows. The parentage of the 6 accessions in this study follows:

- P. amygdaliformis* X *P. dimorphophylla*
- P. (calleryana* X *fauriei*) X *P. elaeagnifolia*
- P. elaeagnifolia* X *P. ussuriensis*
- P. [amygdaliformis* X (*ussuriensis* X *calleryana*)] OP
- P. amygdaliformis* X *P. calleryana* 'Chanticleer'



P. (calleryana 'Kings Road Late Red' X fauriei) OP

Trees will be spaced at 15 ft. x 15 ft., and planting holes will be prepared in accordance with current UCCE recommendations. Soil at the evaluation site is a sandy loam with pH about 7.5. Soil chemical properties (pH, EC_e, P, K, Ca, Mg, Na) will be analyzed prior to planting to document actual conditions trees encounter. Trees will be kept well watered with drip irrigation through the first 9 to 12 months after transplanting, and then they will be irrigated at 60% to 65% reference ET. Trees will be fertilized with surface-applied ammonium sulfate about one month after transplanting.

The following horticultural characteristics will be rated four times per year (i.e. seasonally, and some will be rated weekly in critical periods):

1. Vigor on a 0 to 5 scale with 0 = dead and 5 = extreme vigor, rank growth.
2. Overall quality/attractiveness on a 0 to 5 scale with 0 = undesirable and 5 = outstanding.
3. Canopy density on a 0 to 5 scale with 0 = no foliage and 5 = nearly 100% shade.
4. Flower number/showiness on a 0 to 2 scale with 0 = no flowers, 1 = flowers present but not showy, and 2 = flowers present and showy.
5. Fruit number will rated on a 0 to 5 scale, where 0 = no fruit and 5 = tree densely covered with fruit; fruit size will be rated on a 0 to 5 scale with 0 = no fruit and 5 = large, apple-like fruit.
6. Fall foliage quality will be documented by actual color; color quality will be rated on a 0 = 5 scale with 0 = no fall color (essentially green) and 5 = excellent color display.
7. Incidence of fireblight will be rated on a 0 to 5 scale with 0 = no evidence of disease and 5 = heavy infestation/serious dieback.

The height, caliper (15 cm above the soil) and crown width of each tree will be measured annually to document growth and tree size.

Expected Outcomes

The study will determine the landscape quality and the tolerance to heat, aridity, and conservation irrigation levels of several new tree selections. Ideally, one or more new medium-sized, flowering landscape trees with good fall color will be identified for use in intensely growing Southern California. Thus, the plant palette for this region will be expanded.



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