

NEW PLANT INTRODUCTIONS WITH STRESS TOLERANCE TO CONDITIONS IN THE SOUTHERN GREAT PLAINS¹

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Abstract. Plants of the Great Plains are exposed to a wide variety of environmental stresses. The most demanding of these stresses is the often harsh and variable continental climate. A number of plants that are tolerant of these stresses and are of ornamental value have been recently introduced in the trade. Some of these plants are improved native plant selections; others are the products of years of breeding programs or from plant exploration trips to regions of the world with similar soil and climatic conditions. This paper emphasizes plants that can be propagated commercially.

INTRODUCTION

Plant hardiness zone maps indicate only minimum winter temperatures, whereas plants must endure many other stresses of the climate in the often-arid Great Plains region, including summer heat, drought, and wind, plus desiccation of cold and dry winters. Ornamental and windbreak species have been evaluated extensively for this region at the southern Great Plains Field Station since its establishment in 1914 at Woodward, Oklahoma. Although ornamental research has been discontinued at the site, this station was instrumental in introducing a host of hardy, drought-tolerant species still in prominent use today. Included in the early plantings were numerous species of *Celtis*, *Cercis*, *Juniperus*, *Pinus*, *Pistacia*, *Prunus*, *Quercus*, *Ulmus*, and many others (4). Examples of plants still in prominent use today as a result of early testing are the Chinese pistache, *Pistacia chinensis*, goldenraintree, *Koelreuteria paniculata*, and lacebark elm, *Ulmus parvifolia*.

In recent years many plants that will tolerate the extremes in environmental stress associated with the Great Plains have become available to the nursery industry. The following list is not all-inclusive but enumerates many selections that have performed well at the KSU Horticulture Research Center at Wichita, Kansas. Temperature extremes range from -15°F (-26°C) to 110°F (43°C) with annual rainfall of 28 to 30 inches per year. Irrigation is supplied for establishment and, in many cases, continually for the best performance of some of these ornamentals, but all the species have tolerated severe extremes in climate. Where feasible, the methods of propagation are indicated.

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TREES

Acer ginnala 'Compactum', compact amur maple: A very dense and compact form with consistent wine-red fall color that is propagated from softwood cuttings in June using 1,000 ppm IBA (1). A recent cultivar introduced by SCS is 'Flame', which has brilliant fall color and is propagated by stratified seed. The color varies with seedlings.

Acer saccharum, sugar maple: Although leaf scorch affects many cultivars, greater tolerance has been observed on Caddo maples (from Caddo County) and the Wichita mountain maples in Oklahoma. Promising new selections of hard maple include *A. s.* 'Legacy', 'Commemoration' and *A. nigrum* 'Green Column'. Propagation is by seed or budding on seedling understock.

Acer truncatum, shantung or purpleblow maple: An Asiatic species reaching 30 ft. that performs well under heat and drought stress; resistant to leaf scorch, insects, and disease. Propagation is by seed or softwood cuttings (9).

Celtis sinensis, Chinese hackberry: One of three attractive, smooth-barked species with orange fruit. It is of borderline hardiness north of zone 7. Plants grown from seed collected on the University of California campus, Davis, California, have been surprisingly hardy at Wichita, Kansas, and have shown no gall or witches-broom. Another smooth-barked species, sugar hackberry, *C. laevigata*, also appears to be resistant to witches-broom. The cultivar 'All Seasons' is an improved selection from Illinois with a dense crown and small leaves having greater luster. Propagation is difficult but possible by both budding and softwood cuttings.

Crataegus phaenopyrum, the Washington hawthorn: Ornamental features include reddish-orange fall color, persistent orange-red fruit, and moderate resistance to rusts. Often grown in natural, clump form, it can be easily trained to a single trunk. Improved tree-form selections, grafted on seedling understocks, are 'Manbeck' and 'Vaughn', a reported hybrid with *C. crus-galli* having larger fruit. Two excellent thornless species are cockspur hawthorn, *C. crus-galli* var. *inermis* with crisp, glossy foliage and oakleaf hawthorn, *C. pinnatifida*, although the latter has been obscure in the trade. Summer and winter seed stratification have been more successful for breaking seed dormancy than acid scarification in our trials.

Maclura pomifera, Osage-orange, also called bois d'arc: This tree has proven to be a good plant for the Great Plains due to its extensive use as a windbreak species. Recent interest in the species as an urban tree for difficult sites has produced numerous male and usually thornless cultivars, such as 'Altamont', 'Fan D'Arc', 'Park' and 'Wichita'. Propagation is by budding, softwood or hardwood cuttings (8).

Malus species and cultivars, flowering crabapple: Numerous

recent introductions offer exciting new forms and flower colors with resistance to scab and other diseases plus good winter fruit retention (3). Species and cultivars performing well in our trials are 'Adams', *M. baccata* 'Jackii', 'Donald Wyman', *M. sargentii*, *M. sieboldii*, var. *zumi* 'Colocarpa' and 'Snowdrift'. Promising new cultivars include 'Brandywine', 'Christmas Holly', 'Molten Lava' and 'Sugartyme'. Propagation was formerly by budding or whip-and-tongue grafting on seedling or clonal understock. It is now achieved by rooting hardwood and softwood cuttings (1, 11).

Pistacia chinensis, Chinese pistache: Although grown at Woodward, Oklahoma since 1933 and proven hardy in Wichita, Kansas for 30 years, this tree is still under-utilized. Its extreme drought tolerance, pest resistance, and dependable fall color make this dioecious species a welcome addition to contemporary landscapes. Propagation has been primarily from stratified seed, although spring sowing requires less chilling (5). Germination is erratic. Opportunities exist for improved cultivars, both male and female, but limited success has been reported by both budding and softwood cuttings (7).

Quercus acutissima, sawtooth oak: A native of China, Korea, and Japan, this fast growing, drought-tolerant oak has shown considerable promise even in western Kansas in recent tests. Its tolerance to heavy, clay soils has also been extremely good. Shingle oak, *Q. imbricaria*, also shows promise throughout Kansas but is scarcely available in the trade. Acorns of both species should be sown as soon as ripe or stratified 60 to 90 days.

Ulmus parvifolia, lacebark elm: This tree is a more desirable elm than the name implies. As a true Chinese elm it is often confused with the Siberian elm, *U. pumila*. Although introduced to the Plains states in 1928, the lacebark elm with attractive mottled, orange and gray bark, has not been widely used. It is resistant to Dutch elm disease and moderately resistant to elm leaf beetle and hardy to zone 5. Much seedling variation occurs but there have been few improved selections made. *U. parvifolia* var. *koreana* has smaller leaves than the species. A recent Oklahoma introduction, 'Prairie Shade', is propagated by softwood cuttings in June (12). Seed viability is usually poor; seeds should be collected in late October and sown soon after harvest. The low germination percentage prevents this elm from being a "weed tree".

SHRUBS

Aronia melanocarpa, black chokeberry: Similar to *A. arbutifolia* but with less leaf scorch. Primarily a wildlife species, it doubles as a large shrub or hedge plant 6 to 7 feet tall with glossy green foliage, which turns a rich burgundy fall color. This aronia has purplish to black, grape-size fruit. It tolerates a wide variety of

soils from sandy and dry to wet, clay sites. Cuttings taken in early summer root readily without hormones, or it can be propagated from seed stratified for 90 days at 40°F (1).

Ilex × *meserveae* (*I. aquifolium* × *I. rugosa*), blue hollies: Probably the most exciting, hardy, holly hybrid introduced in recent years. This group is not as heat-tolerant as most Asiatic holly. Very hardy and most fruitful is 'Blue Princess'. The male, 'Blue Prince' is a hardy and attractive pollen parent. Somewhat more tender is the female cultivar 'Blue Angel' with dark purplish winter foliage.

Ilex decidua, deciduous holly or possumhaw: This large shrub or small tree is a native of southeast Kansas and Oklahoma. It has very persistent winter fruits and is adaptable for naturalizing. Improved cultivars include a vigorous upright Oklahoma selection, 'Warren's Red', and numerous introductions from Illinois with superior fruiting such as 'Council Fire', 'Pocahontas' and 'Sundance'. The species has shown better growth and less leaf scorch than *I. verticillata*, which is more popular in the northeast; however, *I. verticillata* cultivars 'Afterglow', 'Cacapon', and 'Winter Red' exhibit very attractive winter fruit. Deciduous hollies have a deep seed dormancy and are also difficult to propagate from cuttings. They seem to root best when taken after frost or by mid-October and treated with Hormodin 3 (2, 10).

Ilex cornuta × *I. ciliospinosa*: Hybrids with somewhat greater hardiness than 'Burford' holly. The two best cultivars at Wichita have been 'William Cowgill' (female) and 'Harry Gunning' (male). *I. 'China Girl'* [*I. cornuta* × *I. rugosa*] combines the heat tolerance of Chinese holly with the hardiness of a hardy Japanese species. It has performed very well in recent years under a variety of conditions (6).

Lagerstroemia indica, crapemyrtle: Normally a southern plant, the species performs as an herbaceous perennial in zone 6, usually killing to the ground but blooming on new growth from July to frost. Of dwarf cultivars evaluated, hardiest have been 'Centennial', 'Dwarf Blue', 'Hardy Lavender', 'Royalty', and 'Victor'. Softwood cuttings root in three weeks under mist without the aid of hormone. Two promising new Oklahoma introductions are 'Prairie Lace' and 'Centennial Spirit'.

Rhododendron species, evergreen azaleas: Although requiring special soil amendments such as sulfur and sphagnum peat moss to acidify planting beds, several selections with more cold hardy flower buds that bloom consistently at Wichita include 'Hino-crimson' and Gable hybrids such as 'Fuchsia', 'Herbert', and 'Purple Splendor'. Softwood cuttings placed under mist in June treated with 1,000 ppm IBA root quite successfully. Evergreen rhododendrons and hybrids such as *R. cardinianum* × *clauricum* 'PJM' and 'Olga' have very hardy flower buds. Buds may blast in August if not protected from intense heat.

Viburnum species and hybrids: New U.S. National Arboretum introductions of semi-evergreen selections such as 'Chesapeake' and 'Eskimo' have performed quite well. They have sturdy white inflorescences and attractive foliage. *V. × rhytidophylloides* 'Allegheny' has shown superior heat tolerance and excellent foliage characteristics in full sun. Propagation is easily accomplished by softwood cuttings using a 5,000 ppm IBA dip. Allow cuttings to break dormancy the following year before lifting from outdoor beds.

In warmer regions this list could be expanded to include more tender species and cultivars. The diversity of plant materials has greatly increased available species for use in the southern Great Plains. Even greater success can be achieved by proper site selection and improvement of the planting environment. Some otherwise borderline selections will then perform satisfactorily.

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