CHINESE AND SIBERIAN ELMS

by Donald J. Leopold

Abstract. Since the introduction of Siberian elm, *Ulmus pumila* L., into cultivation, much confusion has existed in the trade between this species and *Ulmus parvifolia*, the true Chinese elm. However, distinct vegetative, cultural, and aesthetic differences are apparent between these two Asiatic elms. Though Siberian elm has been used extensively in the past for urban planting, its future usefulness must be seriously questioned. Chinese elm has also shown tolerance to the urban environment but unlike the Siberian elm it does not experience the decline in vigor with increasing age. Common pathogens of both elms and the propagation of Chinese elm are also discussed.

Few urban trees seem as destined to a life of neglect or disparagement as *Ulmus parvifolia* Jacquin, the Chinese elm. With the introduction of another Asiatic elm, *Ulmus pumila* Linnaeus, the Siberian elm; arborists, nurserymen, foresters, educators, and others have mistakenly referred to *Ulmus pumila* as the Chinese elm. Fortunately, the two elms are very distinct trees. Unfortunately, however, the public erroneously views Chinese elm as a rapid growing, brittle, and temporary tree. It is not difficult to understand why many nurserymen sell only a few Chinese elm and even more refuse to grow it at all.

Part of this confusion in nomenclature may be traced back to the specific epithet coined by Linnaeus for *Ulmus pumila*, as *pumila* is derived from the Latin *pumilus* meaning dwarf. The literal translation of *Ulmus pumila* is dwarf Asiatic elm (Kelsey and Dayton, 1942). This may be a misnomer as this species can mature at sixty feet in height here in the United States, and reaches even greater heights where it occurs natively from Turkestan to eastern Siberia and northern China. But much variation occurs in the growth form of *Ulmus pumila*. According to Rehder (1940), Linnaeus could have based his nomenclature on a very dense, shrubby form of this species which is common to east Siberia and Mongolia; therefore the confusion in nomenclature exists still today.

Ulmus pumila (Zone 4, Arnold Arboretum) was introduced into the United States by Professor J.G. Jack of the Arnold Arboretum when he sent plants of this species to Boston in 1905 (Wilson, 1930). That same year Frank N. Meyer, an Agricultural Explorer for the Department of Agriculture, and Charles S. Sargent of the Arnold separately collected seeds of Siberian elm in Peking (Rehder, 1923). In 1910 E.H. Wilson, also of the Arnold, collected seeds from this species at the Temple of Pekin (Wilson, 1930). Later around 1914 Meyer introduced large qualtities of seed from near Peking, Chili, China. Some of the first trees from these seeds were received in March of 1917 by the forest nursery at the University of California at Berkeley (Metcalf, 1928). Because of Siberian elm's fast growth and tolerance to almost any site, nurserymen raved about this species and consequently through their zealous promotion were responsible for its immediate popularity and tremendous success.

Figure 1. Closeup of Ulmus parvifolia bark

Wilson (1927) remarked that Siberian elm was magnificent growing along streams in its native region, often becoming eighty feet tall and twelve feet around. The foliage on *Ulmus pumila* ranges from 1½ to 3½ inches long and 1 to 2 inches wide and creates a medium textured appearance on the very open, rounded frame of the tree. With age a pendulous habit is assumed by these branches. The dark green leaves appear two-ranked on silvery-gray twigs that are pubescent when young. Fall color tends toward a mediocre greenish-yellow. Flowers develop in short-stalked, crowded clusters briefly in early spring before the tree leafs out, and the apically notched seeds ripen as leaves mature. As summer progresses very conspicuous ovoid, purplish, pubescent flower and vegetative buds form. With age the bark becomes deeply ridged and furrowed and possesses a very rough, grayish-black and handsome appearance.

Ulmus parvifolia (Zone 5, Arnold Arboretum) natively resides in China, Korea, and Japan and was introduced into cultivation in the late 1700's. The foliage is deeply green colored, leathery, and matures from 1¼ to 2½ inches long and 1 to 1½ inches wide; the leaves are attached to the pubescent twig in a very distinctive fishbone pattern. The vegetative and flower buds are noticeably smaller than those of Siberian elm and are without the purplish coloration. From Oklahoma south and west to southern California the Chinese elm remains semi-evergreen to evergreen. In colder regions of the country deciduous foliage develops a deep red, purple or even yellow fall color. Eventually Chinese elm may approach forty to fifty feet in height with a broad, rounded crown and spreading branches. Flowering occurs rather inconspicuously in the fall and is immediately succeeded by fruit ripening. Only two other cultivated elms, *Ulmus serotina,* known as the September or red elm, and *U. crassifolia,* known as cedar elm, flower in the fall. One significant visual difference between *Ulmus parvifolia* and *U. pumila* is the bark: Chinese elm bark becomes flaky with age

Figure 2. Ulmus parvifolia bark

Figure 3. Ulmus pumila bark.

exposing very distinctive mottling of orange, green, brown, and gray.

Siberian elm has been utilized extensively in the Midwest shelterbelt region, performing better than most trees there since it endures drought, low fertility, and heavy shearing which allows for a dense hedge and windbreak. As an urban tree, though, one must scrutinize its use. Because Siberian elm often grows rampantly (which results in a weak-wooded tree), without judicious pruning narrow crotches develop that may literally fall apart in wind, snow, or ice. As Donald Wyman, of the Arnold Arboretum wrote, Siberian elm ". . . may not grow old gracefully . . ." as it becomes very loose and open (Wyman, 1965).

Siberian and Chinese elms are both known for being resistant to Dutch elm disease (Townsend, 1971; Went, 1938) and phloem necrosis (Sinclair, et. al. 1976) but Siberian elm cannot elude a number of other pathogens which have limited the planting of this species especially in the shelterbelt region of the United States. The most significant losses of *Ulmus pumila* in the shelterbelt could be attributed to *Botryodiplodia hypodermia,* which causes a canker. In a survey of four- and eight-year-old Siberian elms in each county of South Dakota nearly forty percent of the four-year-old and eighty percent of the eight-year-old trees in one county were found to be infected with this pathogen (Otta and Bode, 1972; Riffle, 1978). Dooling (1973) reported that out of forty-four windbreaks surveyed in North Dakota, seventy-two percent of the Siberian elms were cankered. Species of *Cytospora, Dothichiza,* and *Tubercularia* were isolated from these cankers but were not thought to be the primary cause of the decline. Otta (1974) suggests that herbicide injury, drought stress, winter injury, and fungal leaf and stem pathogens ultimately caused the decline of *Ulmus pumila.*

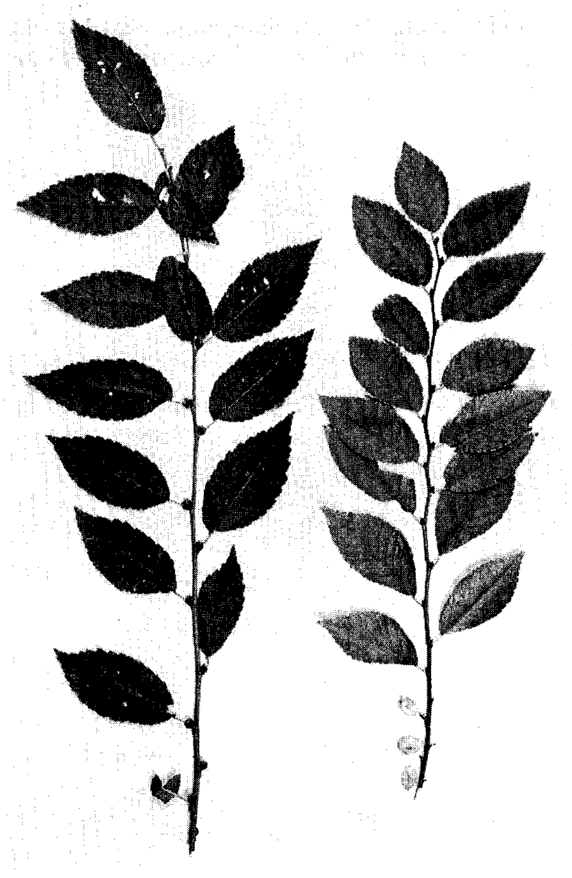


Figure 4. Foliage of Ulmus pumila on the left; Ulmus parvifolia on the right.

Wetwood caused by *Erwinia nimipressuralis* is often associated with Siberian elm. The fermentation of wetwood flux by fungi and bacteria lead to slime flux, and both fluxes are toxic to the cambium of the tree and cause a wilting and branch dieback (Carter, 1945; Davis and Beals, 1970). The pathogens *Thyrostroma compactum,* branch canker (Carter, 1936) and *Chalaropsis thielvioides,* a root rot on seedlings (Lamb, et. al., 1935) have been reported along with *Deuterophoma ulmi* causing Dothiorella wilt (Dr. John Hartman, University of Kentucky, personal communication).

Diseases are not the only drawback in planting Siberian elm; the foliage comes under annual attack by *Pyrrhalta luteola,* a leaf beetle. Though *Ulmus pumila* is very drought tolerant its root system is prone to invade tile sewers and heave pavements and curbs. Seeds are profusely produced in the spring which cause both a mess and also a potential weed problem. And the foliage is susceptible in some regions to late and early spring frost damage.

All of these problems may result in a tree that lives twenty-five to fifty years, certainly not a desirable situation for urban planting. Yet here is a tree species that may have been the most planted of any introduced tree in the United States (Wright and Bretz, 1949).

Conversely, Chinese elm has hard, heavy and tough wood (Chun, 1921) though it grows rapidly in the south and a bit slower in the north. Chinese elm likewise tolerates the poorest of growing conditions, including urban situations, and responds well to average cultural practices. Meyer, based on his personal observations of *Ulmus parvifolia* in China, stated that it "is very drought resistant and stands a fair amount of alkali. It is much planted by the Chinese for its lumber which is durable and tenacious" (Davy, 1929). Koller and Dirr (1979) note that Chinese elm shows good tolerance to parking lot environments, infertile soils, drought, and wind and is pH adaptable. Not only is the Chinese elm adaptable to a variety of sites, it also has much aesthetic value in the bark, foliage, form, and size.

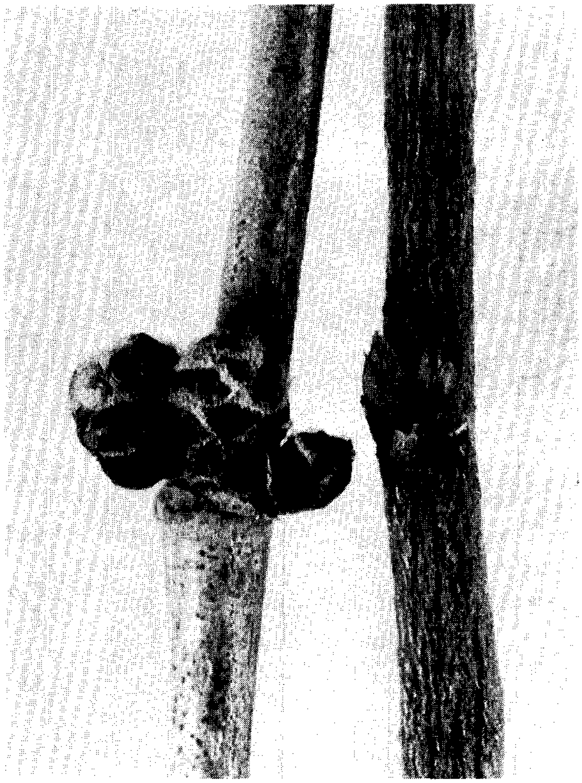
Few serious pests are associated with *Ulmus parvifolia.* A zonate leaf spot caused by *Cristulariella pyramidalis* has been noted in Florida (French, 1972). In Mississippi, the decline and death of nearly fifty Chinese elm was attributed to *Clitocybe tabescens* (Filer and McCracken, 1969). But reports of insects and fungi attacking *Ulmus parvifolia* seem rather uncommon in the literature, possibly due to relatively few numbers of Chinese elm planted in the United States. Nevertheless, Chinese elm is an asset to the urban environment and not the liability that Siberian elm frequently becomes.

More suitable cultivars of Siberian elm may exist for urban planting. These varieties boast a stronger wooded tree with other characteristics similar to the species. Some of these cultivars include 'X Coolshade' (*pumila* X *rubra*), 'Improved Coolshade' (*pumila* X *americana*). The long range effects of planting these varieties, though, may eventually be equal to planting the species.

According to Dr. Carl Whitcomb (Oklahoma State University, personal communication), propagating Chinese elm using either seeds or cuttings should prove successful with extra care. A high percentage of Chinese elm seeds are generally without an embryo or may be sterile, but viable seeds are still abundant. Whitcomb stresses that seeds must be collected before a hard freeze in the fall and stored in damp peat at 33° to 40°F. The seeds may begin sprouting by early March and therefore should be planted in the greenhouse if necessary. In taking softwood cuttings Whitcomb advises that one use only very soft wood along with auxin treatment for maximum rooting percentages. Cuttings taken even a few weeks later may be more difficult to root.

At least three Chinese elm cultivars exist in the trade which promise to be semi-evergreen to evergreen in the warmer portions of the south and California. Grafting is commonly done in propagating these three: *Ulmus parvifolia* 'Drake', *U.p.* 'True Green', and *U.p.* 'Sempervirens'.

Noteworthy specimens of Chinese elm may be located throughout the United States especially in some of the many arboretums. The author has viewed such specimens at Longwood Gardens (Kennett Square, Pa.), the Morton Arboretum (Lisle, Ill.), Mt. Airy Arboretum (Cincinnati, Ohio) and



Figuer 5. Buds of Ulmus pumila on the left; Ulmus parvifolia on the right.

the Morris Arboretum (Philadelphia, Pa.). Swartley (1970) mentions that the Chinese elm in the Morris Arboretum is probably the largest in the nation since this specimen is 4 feet in diameter at 18" above ground. One of the largest plantings in North America, in both size and quantity, surely must be the Chinese elms planted around the state capitol building in Frankfort, Kentucky. Many of these trees are 2 feet or greater in diameter.

The future of Chinese elm depends not only on its own merits but also on the arborists, nurserymen, educators, foresters, and others to remedy the unwarranted confusion between Siberian and Chinese elm in the trade. With Dutch elm disease still limiting the planting of our native elms, the resistant Asiatic elms, though not so graceful and large, have naturally been considered as replacements. A challenge exists to those of us interested in trees and our urban environment. If further confusion is not prevented, one fine promising shade tree may never be fully appreciated and used to our advantage.

Dr. Carl Whitcomb uses the appealing name, lace bark elm, as a common name for *U. parvifolia.* Perhaps the widespread acceptance of this name would not only eliminate name confusion but would also open up a future with greater promise for this disadvantaged elm.

Literature Cited

Carter, J.C. 1936. *Thyrostroma compactum on Ulmus pumila.* Phytopath. 26:801-804.

_________ 1945. Wetwood of elms. Illinois Nat. His. Survey Bull. 23:407-448.

Chun, W.C. 1921. Chinese Economic Trees. Commercial Press Ltd. Shanghai. 309 p.

Davis, T.C. and H.O. Beals. 1970. *Plastic tubing for draining wetwood trees.* Pl. Dis. Reptr. 54:66.

Davy, J.B. 1929. *Elms for the semi-arid regions of the Empire.* Empire For. Jour. 8:101-104.

Dooling, O.J. 1973. Cankers in North Dakota windbreak plantings survey and evaluation. U.S. Dep. Agric. For. Serv., Northern Reg. Insect Dis. Rep. No. 73-10. 6 p.

Filer, T.H. and F.I. McCracken, 1969. *Clitocybe tabescens associated with decline and death of Chinese elm and water oak.* Pl. Dis. Reptr. 53:840.

French, W.J. 1972. *Cristulariella pyramidalis in Florida: An extension of range and new hosts.* Pl. Dis. Reptr. 56:135-138.

Kelsey, H.P. and W.A. Dayton, ed. 1942. Standardized Plant Names. 2nd. ed. American Joint Committee on Horticultural Nomenclature. J. Horace McFarland, Harrisburg, Pa.

Koller, G.L. and M.A. Dirr. 1979. *Street trees for home and municipal landscapes.* Arnoldia 39:136-137.

Lamb, H., E. Wright, and R.W. Davidson. 1935. *A root rot of Chinese elms.* Phytopath. 25:652-654.

Metcalf, W. 1928. *The Chinese elm — a valuable tree.* Amer. For. & For. Life. 34:229.

Otta, J.D. 1974. *Effects of 2,4-D herbicide on Siberian elm.* For. Sci. 20:287-290.

_________ and F.L. Bode. 1972. *Siberian elm canker in South Dakota.* Pl. Dis. Reptr. 56:572-574.

Rehder, A. 1923. *Enumeration of the ligneous plants of northern China.* Jour. Arnold Arb. 4:167-168.

_________ 1940. Manual of Cultivated Trees and Shrubs. MacMillan Pub. Co. N.Y. 996 p.

Riffle, J.W. 1978. *Development of canker on Ulmus pumila related to month of inoculation with Botryodiplodia hypodermia.* Phytopath. 68:1115-1119.

Sinclair, W.A., E.J. Brawn, and A.O. Larson. 1976. *Update on phloem necrosis of elms.* Journ. of Arbor. 2:106-113.

Swartley, J.C. 1970. The big trees of southeastern Pennsylvania. Morris Arboretum Bulletin 21:23-40.

Townsend, A.M. 1971. *Relative resistance of diploid Ulmus species to Ceratocystis ulmi.* Pl. Dis. Reptr. 55:980-982.

Went, J.C. 1938. *Compilation of the investigations on the susceptibility of different elms to Caratostomella ulmi Buisman in the Netherlands.* Phytopath. Z. 11:181-201.

Wilson, E.H. 1927. Plant Hunting. Vol. 2. Stratford Co. Boston. 276 p.

_________ 1930. Aristocrats of Trees. Stratford Co. Boston 279 p.

Wright, E. and T.W. Bretz. 1949. IN Trees — Yearbook of Agriculture, 1949. U.S. Dep. Agric., U.S. Govt. Printing Office, Wash. D.C. 944 p.

Wyman, D. 1965. Trees for American Gardens. MacMillan Pub. Co. N.Y. 502 p.

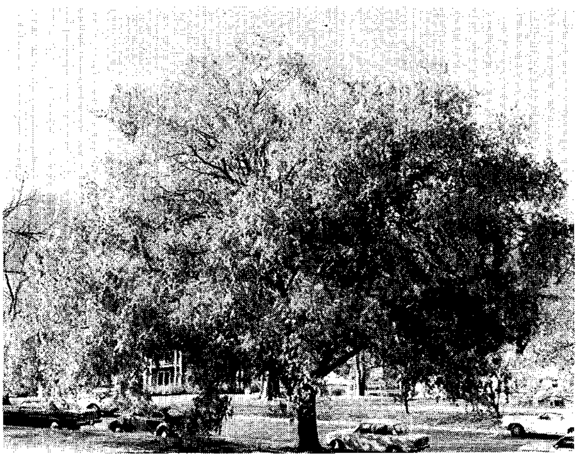


Figure 6. Ulmus parvifolia, mid-November, Frankfort, Kentucky.

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