

Celtis laevigata Willd.

Sugarberry

Ulmaceae -- Elm family

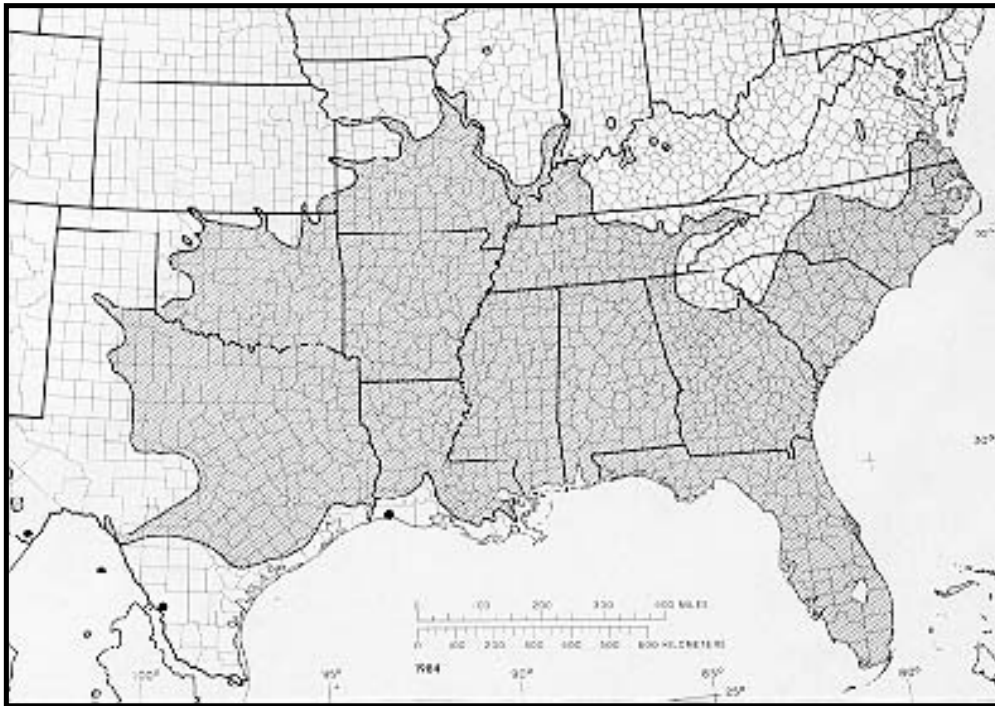
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Sugarberry (*Celtis laevigata*), a common medium-size tree of moderate to fast growth, is most often found on clay soils of broad flats or shallow sloughs within the flood plains of major southern rivers. It is also called sugar hackberry, hackberry, Texas sugarberry, southern hackberry, and lowland hackberry. Sugarberry is short lived, probably not living more than 150 years. The wood is of medium strength and hardness and much of the light yellow wood is used by furniture manufacturers. The abundant crops of fruits are eaten by wildlife, especially birds. The tree is planted as an ornamental and as a street tree in residential areas in the lower South.

Habitat

Native Range

Sugarberry ranges south from southeastern Virginia to southern Florida, west to central Texas and northeastern Mexico, and north to western Oklahoma, southern Kansas, Missouri, southern Illinois, southern Indiana, and western Kentucky. It is local in Maryland, the Rio Grande Valley, and northeastern Mexico. Its range overlaps the southern part of the range of hackberry (*C. occidentalis*).



-The native range of sugarberry.

Climate

Sugarberry grows in a humid climate except for part of its range in Oklahoma and Texas which lies west of a north-south line through Galveston Bay. There the climate is semihumid to semiarid. The average precipitation varies from 510 to 1520 mm (20 to 60 in) per year, the lightest being in central Texas and Oklahoma. An average of 380 to 760 mm (15 to 30 in) occurs during the frost-free period. Annual snowfall ranges from 0 to 51 cm (0 to 20 in).

Summer temperatures vary from an average of 27° C (80° F) to extremes of 46° C (115° F). Average winter temperatures are from -1° to 10° C (30° to 50° F), with an extreme of -29° C (-20° F).

The average length of the growing season varies from 150 to 270 days.

Soils and Topography

Sugarberry is most common on Inceptisols and Entisols found in broad flats or shallow sloughs within flood plains of major southern rivers (9), but will grow under a considerable range of soil and moisture conditions. It is widely distributed on bottom lands except in deep swamps and is found to a minor extent on upland sites. It is also common on deep moist soils derived from limestones, notably in the Black Belt of Alabama (10).

Associated Forest Cover

Sugarberry appears with the following forest cover types (11): Cottonwood (Society of American Foresters Type 63), Sweetgum-Willow Oak (Type 92), Sugarberry-American Elm-Green Ash (Type 93), Sycamore-Sweetgum-American Elm (Type 94), Black Willow (Type 95), and Overcup Oak-Water Hickory (Type 96).

Other tree associates are cedar elm (*Ulmus crassifolia*), winged elm (*U. alata*), water oak *Quercus nigra*), blackgum (*Nyssa sylvatica*), persimmon (*Diospyros virginiana*), honeylocust (*Gleditsia triacanthos*), red maple (*Acer rubrum*), and boxelder (*A. negundo*). Some important noncommercial tree and shrub associates are swamp-privet (*Forestiera acuminata*), roughleaf dogwood (*Cornus drummondii*), and hawthorn (*Crataegus spp.*).

Life History

Reproduction and Early Growth

Flowering and Fruiting- The small, greenish flowers appear with the leaves in the early spring—from mid-March to May, depending on latitude (1). Sugarberry is polygamo-monoecious. The fruit ripens in September and October, and often remains on the trees until midwinter. Sugarberry fruits are spherical drupes 6 to 13 mm (0.25 to 0.5 in) in diameter with a thin pulp enclosing a single bony nutlet. Late spring frosts sometimes kill the flowers and reduce the seed crop.

Seed Production and Dissemination- Seed production starts when trees are about 15 years old (7). Optimum seed-bearing age is from 30 to 70 years old. Sugarberry bears good seed crops in most years and some nearly every year. There are between 4,400 and 5,300 cleaned seeds per kilogram (2,000 to 2,400/lb). The seed is widely dispersed by birds and water.

Mature fruits can be picked by hand from trees as late as midwinter. Collection is easier after trees have completely dropped their leaves. Branches of sugarberry can be flailed to knock the fruits onto sheets of plastic or other suitable material spread under the trees.

If seeds are to be used for seedling production in a nursery, then both fall sowing of untreated seeds and spring sowing of stratified seeds are satisfactory. Seeds may be broadcast or drilled in rows and should be covered with 6 to 13 mm (0.25 to 0.5 in) of firmed soil. Beds

should be covered with bird screens until germination starts. Experience at the Southern Hardwoods Laboratory, Stoneville, MS, has shown that if spring sowing is used, the seeds should be depulped before storage, dried to 8 to 10 percent moisture content, and stored in 6-mil-thick plastic bags or equivalent storage containers until stratification. Seeds should be stratified in moist sand or other suitable media for 60 to 90 days before sowing in the nursery. The seeds can be depulped by wet maceration. Depulping is not essential, but it has been reported to aid germination (1). Average germinative capacity is reported to be 55 percent for sugarberry.

Seedling Development- Sugarberry seeds lie dormant over winter and germinate early in the spring. Germination is epigeal (1). The seedlings become established under most stands of southern bottom land hardwoods. Best natural conditions for germination are moist, loamy soil, but the species is found mostly on clay soils. First-year growth usually produces a very slender but tough stem, 20 to 46 cm (8 to 18 in) in height. Under shade, the young seedling develops a crooked, short stem, often forked within a few feet of the ground. In the open, it tends to be very limby and short boled. Sugarberry is considered intolerant of flooding, at least in the seedling stage (2,3,4).

Vegetative Reproduction- Sugarberry can be propagated by cuttings (7). Small stumps sprout readily, and there is some sprouting from root collars of fire-damaged seedlings and saplings.

Sapling and Pole Stages to Maturity

Growth and Yield- Sugarberry is a small- to medium-sized tree. It often attains a height of 24 to 30 m (80 to 100 ft) at maturity. On best sites, 10-year diameter growth can be in excess of 6 cm (2.5 in) for dominant trees (9). The overall average is about 2.5 to 5 cm (1 to 2 in) in 10 years. On average sites, mature forest-grown trees average about 46 cm (18 in) in diameter and 24 m (80 ft) in height, with trunks clear of branches for approximately 9 m (30 ft).

An accurate estimate of the total growing stock is available for only a limited portion of the sugarberry range. Because of its scattered occurrence, forest surveys usually include sugarberry in a group of other species with limited frequencies. The only region containing enough sugarberry of sawtimber size to list separately is the Mississippi Delta (10). The principal States producing commercial quantities of sugarberry are Louisiana, Mississippi, and Arkansas. These States contain about 16 million m³ (560 million ft³) and about 9.4 million m³ (1,650 million fbm) of sugarberry sawtimber. In 1965,

a rough estimate of the total sawtimber resource in the United States was in excess of 10.0 million m' (2,000 million fbm).

Rooting Habit- Sugarberry is a relatively shallow-rooted tree and does not develop a distinct taproot. The root system is saucer-shaped with good lateral root development. The tree is about average in resistance to windthrow.

Reaction to Competition- Sugarberry is classed as tolerant of shade. It grows fast when released and often outgrows more desirable forest species (5). Sugarberry becomes established in the understory and generally has very poor form in this situation. In dense, even-aged stands, however, it prunes itself well and produces a straight stem.

Damaging Agents- The bark is thin and easily injured by fire. A light burn kills back reproduction. Heavier burns may kill even the largest trees and wound others, making them subject to serious butt rot, which in sugarberry advances rapidly. Butt rot is a common name used to indicate the area of the decay in the butt log which may be caused by any one of 30 or more species of fungi belonging to the genera *Fomes*, *Polyporus*, *Hericium*, and *Plyeurotus*.

Ice also causes heavy damage to the crowns, breaking the main stem and branches which reduces growth and creates wounds that allow entrance of rot-causing fungi. There are some other diseases of the twigs and leaves, but none are of major importance.

Eastern mistletoe (*Phoraedendron flavescens*) may cause serious damage in the western part of its range (7). A number of scales attack the twigs, small branches, and sometimes the trunks, but none are considered very damaging. Leaf petiole galls caused by the hackberry petiole gall maker (*Pachypsylla venusta*) are common. In recent years, defoliation of large acreages in several Southern States by larvae of the hackberry butterfly (*Asterocampa celtis*) have been reported (12). No deaths or crown die-back among the trees was observed in the following years. Research has shown that the hackberry butterfly can be controlled by spraying trees with certain registered insecticides (8).

Special Uses

Sugarberry mixed with hackberry supplies the lumber known as hackberry. Small amounts are used for dimension stock, veneer, and containers, but the main use of sugarberry wood is for furniture. The

light-colored wood can be given a light- to medium-brown finish that in other woods must be achieved by bleaching.

The dry sweet fruit is eaten by at least 10 species of birds, as well as other game and nongame animals (13).

Sugarberry is often used for street planting in the lower South and is also used as an ornamental in residential areas. A problem in such use is that leachates from the leaves reduce germination and growth of a number of grasses under the trees (6). These leachates have been identified in the soil as ferulic acid, caffeic acid, and p-coumaric acid.

Genetics

Sugarberry seems to present a considerable number of local variations that have prompted some botanists to name a number of varieties, while other botanists feel the distinctions are too slight to warrant such status (13).

Some varieties listed are Texas sugar hackberry, *C. laevigata* var. *texana*; Uvalde sugar hackberry, *C. laevigata* var. *brachyphylla*; scrub sugar hackberry, *C. laevigata* var. *anomala*; small sugar hackberry, *C. laevigata* var. *smallii*; Arizona sugar hackberry, *C. laevigata* var. *brevipes*; net-leaf sugar hackberry, *C. laevigata* var. *reticulata*.

There are no known races or hybrids of sugarberry.

Literature Cited

1. Bonner, F. T. 1974. *Celtis L.* Hackberry. In *Seeds of woody plants of the United States*. p. 298-300. C. S. Schopmeyer, tech. coord. U.S. Department of Agriculture, Agriculture Handbook 450. Washington, DC.
2. Hosner, J. F. 1959. Survival, root and shoot growth of six bottomland tree species following flooding. *Journal of Forestry* 57(12):927-928.
3. Hosner, John F. 1960. Relative tolerance to complete inundation of fourteen bottomland tree species. *Forest Science* 6(3):246-251.
4. Hosner, John F., and Stephen G. Boyce. 1962. Tolerance to water saturated soil of various bottomland hardwoods. *Forest Science* 8(2):180-186.
5. Johnson, R. L. 1975. Natural regeneration and development of Nuttall oak and associated species. USDA Forest Service,

- Research Paper SO-104. Southern Forest Experiment Station, New Orleans, LA. 12 p.
6. Lodhi, M. A. K. 1975. Soil-plant phytotoxicity and its possible significance in patterning of herbaceous vegetation in a bottomland forest. *American Journal of Botany* 62(6):618-622.
 7. McKnight, J. S. 1965. Sugarberry (*Celtis laevigata* Willd.). *In* *Silvics of forest trees of the United States*. p. 144-145. H. A. Fowells, comp. U.S. Department of Agriculture, Agriculture Handbook 271. Washington, DC.
 8. Oliveria, F. L., and J. D. Solomon. 1978. Control of hackberry butterfly larvae on sugarberry trees. *Insecticide and Acaricide Tests*. vol. 4. Entomological Society of America, College Park, MD. p. 178.
 9. Putnam, John A., G. M. Furnival, and J. S. McKnight. 1960. Management and inventory of southern hardwoods. U.S. Department of Agriculture, Agriculture Handbook 181. Washington, DC. 102 p.
 10. Smalley, Glendon W. 1973. Hackberry, an American wood. U. S. Department of Agriculture, American Woods Series FS-238. Washington, DC. 7 p.
 11. Society of American Foresters. 1980. Forest types of the United States and Canada. F. H. Eyre, ed. Washington, DC. 148 p.
 12. Solomon, J. D., T. E. Vowell, Jr., and R. C. Horton. 1975. Hackberry butterfly, *Asterocampa celtis*, defoliates sugarberry in Mississippi. *Journal of the Georgia Entomological Society* 10(1):17-18.
 13. Vines, Robert A. 1960. Elm family (Ulmaceae). *In* *Trees, shrubs, and woody vines of the Southwest*. p. 203-205. University of Texas Press, Austin.