Platanaceae—Sycamore family

Platanus L.

sycamore

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Growth habit, occurrence, and uses. Sycamores—genus *Platanus*— are deciduous trees that range from 24 to 43 m tall at maturity. Two native and 1 introduced species are included in this manual (table 1). American sycamore is a large and valuable timber species in the eastern United States and has been widely planted in the Southeast for fiber production, wetlands restoration, and mine spoil reclamation (Haynes and others 1988; Wells and Schmidtling 1990). California sycamore is valued for watershed protection and wildlife food, whereas oriental planetree is primarily planted for ornamental purposes. London plane—*P.* H *acerifolia* (Ait.) Willd.—a hybrid between sycamore and oriental planetree, is also widely planted as an ornamental in the United States because of its tolerance of air pollution and alkali (Little 1961; Dirr and Heuser 1987). No geographic races of these species are recognized, but there is sufficient variation within American sycamore for growth (Ferguson and others 1977) and disease resistance (Cooper and others 1977) to justify tree improvement programs.

Flowering and fruiting. The minute monoecious flowers of sycamores appear in the spring (table 2). The dark red staminate flower clusters are borne on branchlets of the previous year's growth, and the light green pistillate flowers are found on older branchlets (Vines 1960; Wells and Schmidtling 1990). Sycamore fruiting heads are usually solitary, but California sycamore may have 2 to 7 heads grouped on a single stem (Bonner 1974) (figure 1).

Fruit heads are greenish brown to brown at maturity in the autumn (table 2). Those of sycamore are 25 to 40 mm in diameter, and those of the other species are closer to 25 mm. The true fruits are elongated, chestnut-brown, single-seeded achenes with a hairy tuft at the base (figure 2). They are closely packed, with their bases anchored in a hard central core. The elongated embryo is surrounded by a thin endosperm (figure 3). Sycamore usually bears good seedcrops every 1 to 2 years and light crops in the intervening years. Open-grown trees of this species as young as 6 years have produced seeds, but trees in dense natural stands are usually much older (25 years) before large crops are evident (Briscoe 1969; Wells and Schmidtling 1990). Fruit heads persist on the trees through the winter and break up the following spring. The hairy tufts at the base of the fruits act as parachutes for dissemination by wind. Sycamore fruits float easily and are therefore widely distributed by moving water (Wells and Schmidtling 1990).

Collection of fruits. Fruit heads of sycamore can be collected any time after they turn brown, but the job is easiest if done after leaf-fall. Because the heads are persistent, collections can be made into the next spring, usually making sycamore the last fall-maturing species to be collected in the East. This additional time on the tree after full maturity apparently does not harm seed quality (Briscoe 1969). Picking fruit heads by hand from the tree is the most common method of collection. At the northern and western limits of the range of sycamore, intact heads can sometimes be collected from the ground late in the season. As fruit heads begin to fall apart in the early spring, the seeds may sometimes be shaken loose

by tapping the branches (Briscoe 1969). Once collected, fruit heads should be spread in single layers and dried in well-ventilated trays until they can be broken apart, no matter how dry they look at collection. This step is essential with fruit heads collected early in the season, as their moisture contents can be as high as 70% (Bonner 1972b).

Extraction and cleaning of seeds. Seeds should be extracted by crushing the dried fruit heads and removing the dust and fine hairs that are attached to the individual achenes. Small lots can be broken up in small mechanical scarifiers or by hand-rubbing through hardware cloth (2 to 4 wires/cm) (Briscoe 1969). Medium-sized lots of up to 2 hl can be quickly broken up in mechanical macerators. Larger lots can be broken up in fertilizer distributors, hammer mills, or centrifugal disks (Briscoe 1969; Bonner 1979). No matter which method is used, some method of dust removal should be provided and **dust masks should be worn by workers!** The fine hairs that are dislodged during extraction and cleaning are a danger to respiratory systems. The fertilizer distributor method is widely used, and the dust problem is lessened when operation is in the open. The distributor can be loaded with fruits and pulled along with ejection gates closed, or a powered belt can be attached to a jacked-up wheel. With the jacked-up wheel arrangement, clean seeds will work out through the gates, while fruit cores and fluffs of the hairs will collect at the top.

Dust, fine hairs, and large trash can also be removed from seedlots with air-screen cleaners or aspirators. Studies with sycamore have shown that a 3 H 19 mm (7/64 H 3/4 in) oblong screen will remove twigs, leaves, and fruit cores, while dust, hairs, and small trash can be removed with 1/21 round-hole screens (Bonner 1979). If the seedlot is especially trashy, 2 runs through the air-screen cleaner may be needed. The smaller cleaners can clean 5 to 7 kg of seeds/hour, and purities of greater than 99% are possible. Electrostatic seed cleaners can also do a good job cleaning sycamore. In one test, purity was increased from 88 to 99% (Karrfalt and Helmuth 1984). Louisiana and Mississippi collections of sycamore yielded 9 to 14 kg of seed/hl of fruitheads, and 55 to 66 kg of seeds/100 kg of fruitheads (Briscoe 1969). Some representative seed weight data for sycamore are listed in table 3.

Sycamore is noted for its low proportion of filled seeds, a condition due to poor cross-pollination and self-incompatibility in isolated trees (Beland and Jones 1967). Effective control of bed density in nurseries can be severely hampered by this condition, so upgrading of seedlots by mechanical means is highly desirable. Such operations are possible with gravity separators, aspirators, and electrostatic separators (Bonner 1979; Karrfalt and Helmuth 1984). For exmaple, a single pass on a gravity separator upgraded a sycamore seedlot from 27% filled seeds to 56% (Bonner and Switzer 1974).

Storage of seeds. Seeds of all sycamore species are orthodox in storage behavior and can be easily stored for long periods in cold, dry conditions. Storage tests with sycamore have shown that seed moisture contents of 5 to 10% and temperatures of 0 to 5 EC are suitable for short-term storage of up to 5 years. For longer storage periods, sub-freezing temperatures (! 18 EC) at the same moisture content are recommended (Bonner 1979). The upper limit of storage potential for sycamore is not yet known, but current research suggests that it will be far beyond 10 years under optimum conditions (Bonner 1994). To maintain low seed moisture in moist surroundings, the dried seeds must be stored in moisture-proof containers, such as polyethylene bags or fiber drums with plastic liners (Bonner 1979). Several species of *Aspergillus* fungi have been identified as pathogens that harm viability of sycamore seeds in storage (Fakir and others 1971), but they have never been a major problem.

Pregermination treatments. Moist stratification for 60 to 90 days at 5 EC in sand, peat, or sandy loam has been reported as beneficial for germination of California sycamore (Bonner 1974). The other sycamores have no dormancy, and pregermination treatments are usually not required for prompt germination (Bonner 1972a; Webb and Farmer 1968). Germination rate of sycamore can be increased by treating with gibberellin (GA_3) at 100 to 1,000 mg/l, but this increase seems to be simple growth

stimulation that is not involved in seed dormancy (Bonner 1976).

Germination tests. Germination can be easily tested on wet paper or sand or even in shallow dishes of water (table 4). Official testing prescriptions call for alternating day/night temperatures of 30/20 EC on the top of moist blotters for 14 days (AOSA 1993). A large percentage of the sound seeds will usually germinate, but the great variation in number of sound seeds among lots will result in varied germination percentages. Surface sterilization of the seeds with a 30-second dip in a 1% commercial bleach solution is often beneficial to laboratory germination (Mullins 1976). Rapid viability tests can also be made on sycamore with tetrazolium staining and X-radiography (Bonner 1974).

Nursery practice. Sycamores are usually sown in the spring by broadcasting or by mechanically drilling. For drilling, seeds should be placed no deeper than 3 mm (1/8 in) in rows 15 to 20 cm (6 to 8 in) apart. If sown on the surface of the beds, they should be covered with no more than 6 mm (¼ in) of light mulch (Williams and Hanks 1976). Seedling density will depend on the intended use of the stock. For those wanting small seedlings, 110 seedlings/m^2 (10/ft^2) is recommended; for larger stock, 55/m^2 (5/ft^2)(Vande Linde 1960; Williams and Hanks 1976).

Bed surfaces must be kept moist through germination, and shading, while not necessary, can be helpful for the first month (Briscoe 1969; Engstrom and Stoeckler 1941). On neutral to slightly alkaline soils, damping-off may be a problem. Root pruning in midsummer is recommended to promote growth of smaller roots, and some nurseries prune seedling tops in late July or August to reduce size. Seedlings should not be both root- and top-pruned during the growing season (Briscoe 1969). Sycamore is usually outplanted as 1+0 stock, and oriental planetree is often planted as 1+1 or 2+0 seedlings in Europe (Bonner 1974). The sycamores are easy to propagate vegetatively by dormant or greenwood cuttings (Dirr and Heuser 1987), and many plantations of sycamore have been established in the South by these techniques. Some tests show no difference in growth after 1 year between seedlings and cuttings (Garrett 1975).

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Table 1—*Platanus,* sycamore: nomenclature and occurrence

Scientific name & synonym	Common name	Occurrence
***P. occidentalis* L.** *P. occidentalis* var. *glabrata* (Fern.) Sarg.	**American sycamore,** American planetree, buttonwood, planetree, buttonball-tree	Maine to Iowa, S to central Texas & NW Florida; also in NW Mexico; planted in South Dakota, Colorado, Nebraska, & Kansas
***P. orientalis* L.**	**oriental planetree** an ornamental	SE Europe, W Asia to India; planted in US as
***P. racemosa* Nutt.**	**California sycamore,** California planetree, western sycamore, aliso	Central to S California & into NW Mexico; below 1,200 m elevation

Sources: Little (1961, 1979).

Table 2—*Platanus,* sycamore: phenology of flowering and fruiting

Species	Location	Flowering dates	Fruit ripening dates	Seed dispersal dates
P. occidentalis	E US	Mar–May	Sept–Nov	Jan–Apr
P. orientalis	NE US	May	Sept–Oct	—
P. racemosa	—	—	June–Aug	June–Dec

Sources: Bonner (1974), Wells and Schmidtling (1990).

Table 3—*Platanus,* sycamore: seed data

Species	Place of collection	No. of cleaned seeds Range /kg	Range /lb	Average /kg	Average /lb	Samples
P. occidentalis	Louisiana–Mississippi*	294,370–589,620	133,500–267,400	426,160	193,270	100+
	SE US	192,340–500,100	87,2330–226,800	330,530	149,900	28
P. orientalis	Denmark	178,600–357,200	81,000–162,000	282,240	128,000	8
	United States	249,160–370,440	113,000–168,000	308,700	140,000	2+

Sources: Bonner (1974), Briscoe (1969), Swingle (1939).

* These sources averaged 1,765 seeds/fruit and ranged from 804 to 3,050.

Table 4—*Platanus*, sycamore: germination test conditions and results

Species	Germination test conditions				Germination		Germination rate		Percentage Germination	
	Daily light period (hr)	Medium	Temp (EC) Day	Night	Days	%	Days	Ave.	Samples
P. occidentalis	8	Blotter paper	30	20	28	72*	10	80*	20
	—	Water	24	21	30	—	—	19	8
	—	Sand	30	21	60	34	14	35	15+
P. orientalis	—	—	22	20	30+	—	—	38	8
P. racemosa	—	Sand	30	21	60	—	—	12	1

Source: Bonner (1974).

* Percentages based on sound seed only.