

Diospyros L.

persimmon

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Growth habit, occurrence, and use. Nearly 200 species of persimmons (*Diospyros* L.) are widely distributed, mostly in tropical regions. Only 2 persimmons (common persimmon and Texas persimmon) are native to the 48 contiguous states. Two others are grown in mild regions: Japanese persimmon for fruit and date-plum for root stock (table 1). Other persimmons are native to the tropical regions of the United States (*Diospyros hillebrandii* (Seem.) Fosberg and *D. sandwicensis* (A. DC.) Fosberg in Hawaii (Little and Skolman 1989) and *D. revoluta* Poir. and *D. sintenisii* (Krug & Urban) Standl. in Puerto Rico (Little and others 1974).

Common persimmon is a small to medium-sized deciduous tree, normally attaining a height of 9 to 18 m at maturity (Sargent 1965). It occurs in open woods and as an invader of old fields from Connecticut, west through southern Ohio to eastern Kansas, and south to Florida and Texas (Sargent 1965). Common persimmon develops best in the rich bottom lands of the Mississippi River and its tributaries and in coastal river valleys. In these optimum habitats, common persimmon trees often attain heights of 21 to 24 m and diameters of 51 to 61 cm (Morris 1965).

In past years, persimmon wood was used extensively for weaver's shuttles, golf club heads, and other products requiring hard, smooth-wearing wood (Olson and Barnes 1974). At present, such uses have diminished because of the use of laminates and other substitute materials.

The fruits are exceedingly astringent when green, but delicious when thoroughly ripe (Harlow and Harrar 1958); they are eaten by humans, animals, and birds. The common persimmon is a valuable honey plant and has been cultivated for its handsome foliage and fruit since 1629. Several varieties have been developed for fruit production (Harlow and Harrar 1958).

Texas persimmon is a shrub or small tree of south Texas and northeast Mexico, usually 1.8 to 3 m tall but sometimes reaching 12 m, with 4-cm-long leaves (Everitt 1984; LHBH 1976). The fruits are important wildlife food, but the shrub is considered as undesirable in rangelands of the Southwest (Everitt 1984).

Japanese persimmon (*kaki*) and date-plum are small oriental persimmons grown commercially in the milder regions of the United States. Japanese persimmon grows to 14 m with 18-cm-long leaves and large delicious fruit. Many varieties are listed. Date-plum grows to 14 m with leaves 13 cm long. Date-plum is often used as a rootstock for Japanese persimmon (LHBH 1976).

Flowering and fruiting. Male and female flowers are borne on different plants, but a few plants have bisexual flowers. The female flowers are solitary, with 4 to many staminodes. The male flowers are in cymes or clusters with 4 to many stamens. The fruits are juicy, 1- to 10-seeded berries

with enlarged, persistent calyxes at the base (LHBH 1976).

Common persimmon has small, dioecious, axillary flowers borne after the leaves from March to mid-June, depending on the latitude (Little and Delisle 1962; Morris 1965; Olson and Barnes 1974; Radford and others 1964). Flowers are most common in April and May and are pollinated by insects.

The fruits are green before ripening and may vary in color when ripe from green, yellow, orange, and yellowish brown to dark reddish purple and black (Olson and Barnes 1974; Sargent 1965) (figure 1). The fruit is a plumlike berry 2 to 5 cm in size that is glaucous, with a conspicuous, persistent calyx. It contains 3 to 8 seeds (Olson and Barnes 1974; Sargent 1965). The fruits ripen from September to November; the flat, brown seeds, about 15 mm long, are dispersed from the time of ripening until late winter (Little and Delisle 1962; Olson and Barnes 1974; Morris 1965; Radford and others 1964) (figures 1 and 2). The seeds are disseminated by birds and animals that feed on the fruits, and to some extent, by overflow water in low bottom lands (Morris 1965).

Seed bearing may begin at age 10, but the optimum seed-bearing age is 25 to 50 years (Little and Delisle 1962; Morris 1965; Olson and Barnes 1974). Good seed crops are borne about every 2 years, with light crops in intervening years (Olson and Barnes 1974).

The small Texas persimmon flowers have 5 lobes. The black, globe-shaped fruits are 2.54 cm in diameter and have dark flesh (LHBH 1976). Animals and birds eat the fruits and disseminate the seeds (Everitt 1984).

Japanese persimmon flowers are yellowish white, about 2 cm long. Male flowers have 16 to 24 stamens and female flowers have 8 staminodes. The orange to reddish fruits are variable in shape, to 7.6 cm in diameter, with orange flesh (LHBH 1976).

Date-plum flowers are reddish to greenish, 7.5 mm long, with 4 lobes. Male flowers have 16 stamens. The small, yellow, globe-shaped fruits are 12.5 mm in diameter and turn blackish as they ripen (LHBH 1976).

Collection of fruits, extraction, and storage of seeds. The fruits of common persimmon may be collected by picking or shaking from the trees as soon as the fruits are ripe and soft in texture. They may also be picked from the ground after natural fall. If the fruits have started to dry, they should be softened by soaking in water (Myatt and others 1988). The seeds are easily removed by running the fruits with water through a macerator and allowing the pulp to float away or by rubbing and washing the pulp through 6.4-mm-mesh hardware cloth (Olson and Barnes 1974). For small quantities, ripe fruits can be placed in plastic bags and left until the pulp turns to juice, which can then be drained away before drying the seeds (Dirr and Heuser 1987).

After being cleaned, the seeds should be spread out to dry for a day or two. Spreading the seeds on screens to dry is common (Myatt and others 1988). Prolonged storage requires thorough drying. After the seeds are dried, they should be passed over a #25 screen on an air-screen cleaner to remove trash and twigs. Use of a gravity table with high air may also be necessary (Myatt and others 1988). The seeds can then be safely stored in sealed dry containers at 5 °C (Engstrom and Stoeckler 1941).

One hundred kilograms (220 pounds) of fruit of the common persimmon will yield 10 to 30 kg (22 to 66 lbs) of cleaned seeds (Olson and Barnes 1974); the number of seeds per weight ranges from 1,460 to 3,880/kg (665 to 1,764/lb), with an average of 2,640 seeds/kg (1,200/lb) (Aroeira 1962; Engstrom and Stoeckler 1941; Olson and Barnes 1974). Seedlots of 96%

purity and 90% soundness has been obtained (Olson and Barnes 1974).

Japanese persimmon has about 3,400 seeds/kg (1,550/lb). Seeds stored at 0 °C at 45% moisture content retained the greatest viability after 18 months. Viability decreased rapidly as the seeds were dried, regardless of the speed of drying, with almost no germination at moisture contents below 10% (Kotobuki 1978). Date-plum has about 8,910 seeds/kg (4,040/lb).

Pregermination treatments. Natural germination of common persimmon usually occurs in April or May, but 2- to 3-year delays have been observed (Blomquist 1922; Olson and Barnes 1974). The main cause of the delay is the seed covering, which caps the radical, restricts the embryo, and causes a decrease in water absorption (Blomquist 1922). After removal of this cap, 100% germination was secured with mature seeds collected in the autumn (Blomquist 1922). Seed dormancy also can be broken by stratification in sand or peat for 60 to 90 days at 3 to 10 °C (Aroeira 1962; Crocker 1930; Olson and Barnes 1974; Thornhill 1968). Sulfuric acid scarification for 2 hours proved to be less effective in breaking dormancy than stratification (Aroeira 1962).

Japanese persimmon does not have strong dormancy. Oh and others (1988) have shown that, although stratification was not essential, it improved germination. Rate of germination of date-plum increased as the stratification length increased to 10 weeks (Oh and others 1988). No pretreatment is needed to germinate Texas persimmon seed (Vora 1989).

Germination tests. Germination of stratified common persimmon seeds was tested in sand or peat flats at diurnally alternating temperatures of 20 to 30 °C. Germinative energies ranging from 54 to 94% were obtained in 20 to 34 days; and germinative capacities at 60 days varied from 62 to 100% (Olson and Barnes 1974). Payne achieved 90% uniform germination on common persimmon and date-plum by stratifying the seeds 60 to 90 days in wet vermiculite after lightly dusting them with a fungicide. Scratching the seedcoat can shorten the stratification period (Payne 1996).

Fresh Japanese persimmon seeds taken from ripe fruits and sown immediately germinate best. Germination ranged from 20 to 77% in a study of 18 cultivars with fresh seed sown immediately (Dirr and Heuser 1987). Date-plum seeds germinated best without light at alternating 18 to 30 °C with 10 weeks stratification at 5 °C. Germination of seeds stratified for 2 weeks was increased by treating them with 500 ppm gibberellin(GA_3) (Oh and others 1988). Fresh Texas persimmon seed sown immediately after extraction germinated 33%. Germination was reduced with all other treatments (Dirr and Heuser 1987).

The tetrazolium chloride staining test is often used to estimate the viability of common persimmon and date-plum seeds due to the long stratification period needed to overcome dormancy. Clipping the radicle end of a seed with toenail clippers and soaking the seed for several days in water or 500 ppm GA_3 will soften the seed. Then the seed may be cut lengthwise to expose the embryo and storage tissue for staining.

Nursery practice. Common persimmon seeds may be fall-sown or stratified and sown in the spring. In Missouri, fall-sowing at a depth of 5 cm (2 in) is the normal practice, and seedbeds are mulched. Steavenson (Olson and Barnes 1974) reported a tree percent of 50%; an average tree percent of 25 to 33% is easily attainable. Seedlings of this species have a strong taproot (figure 3) and should be field-planted at the end of the first season. Root wrenching will cause the seedlings to form a compact, fibrous root system (Myatt and others 1988).

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Figure 1C *Diospyros virginiana*, common persimmon: mature fruit and a single seed, × 2.

Figure 2C *Diospyros virginiana*, common persimmon: longitudinal section through a seed, × 2.

Figure 3C *Diospyros virginiana*, common persimmon: Seedling development at 4, 6, and 8 days after germination.