

Taxodiaceae—Cypress family

Sciadopitys verticillata (Thunb.) Sieb. & Zucc.

umbrella-pine

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Growth habit, occurrence, and use. Native to the mountains of central and southern Japan at elevations of 200 to 1,500 m, the umbrella-pine (or parasol-pine)—*Sciadopitys verticillata* (Thunb.) Sieb. & Zucc.—is a pyramidal conifer from 20 to 40 m tall. It is most commonly grown in the United States for ornamental purposes, but it is also planted for erosion control. In Japan, the decay-resistant wood is used for lumber and the bark provides oakum for calking boats (Bailey 1939; Dallimore and Jackson 1967; McClintock 1992; Rehder 1940). Umbrella-pine is the only species in its genus.

Flowering and fruiting. Flowers of both sexes occur at the ends of branchlets in the spring. The male flowers are in clusters and the female flowers, which develop into ovoid cones, are solitary. When the cones ripen in the fall of the second season, they become gray-brown and are about 76 to 127 mm long and 38 to 51 mm wide. Each cone scale bears 5 to 9 ovoid, compressed, narrowly winged seeds about 13 mm long (Dallimore and Jackson 1967; McClintock 1992; Rehder 1940).

Collection of fruits; extraction and storage of seeds. Ripe cones may be picked in the fall from the trees and placed in a warm, dry place to open; seeds are removed by shaking and then de-winged. Numbers of cleaned seeds per weight ranged from 32,600 to 42,800/kg (14,800 to 19,400/lb) and averaged about 38,150/kg (17,300/lb) in more than 30 samples. Purity averaged 96% in 10 samples (Rafn and Son (nd); Swingle 1939). Seeds stored at moisture contents of 10% or less in sealed containers at temperatures of 5 EC or lower will probably retain good viability for at least 2 years. Long-term storage data are not available, but the seeds appear to be orthodox in storage behavior.

Pregermination treatments. The existing literature is somewhat contradictory. Some authors report reasonable success with 100 days of stratification in moist sand at 17 to 21 EC (Swingle 1939); 90 days of stratification in moist, acid peat at 0 to 10 EC (Barton 1930); and 1 month of stratification at 25 EC followed by 4 to 5 months at 2 EC or a constant 2 EC for 5 to 6 months (Asakawa 1973). Asakawa (1973) also obtained germination rates between 56 and 70% of filled seeds without prechilling. He concluded that their dormancy is not deep.

Hatano (1972), on the other hand, states that it is "well known" that the seeds are deeply dormant and that the dormancy is difficult to break with stratification. He tried a number of pretreatments, including pre-chilling and seed-coat treatments. The only success he had was with 24 hours of pretreatment with 0.02 to 0.10% silver nitrate before stratification, and that success was partial and varied (from 1 to 65% germination).

Germination tests. Germination of umbrella-pine seeds seems to require 2 months or more, even after pretreatment (Asakawa 1973). Germination of pretreated seeds can be tested in

germinators or sand flats at a temperature of about 20 EC (night) to 30 EC (day) for 60 to 75 days. Average germination in 14 early tests was 45% (Barton 1930; Rehder 1940; Waxman 1957). Waxman (1957) obtained best results (76% in 77 days) when seeds were germinated on a sand surface under mist with 9 hours of light daily. In a later test, Asakawa (1973) obtained up to 76% germination on agar with 8 hours of light. Germination is poor in continuous light (Asakawa 1973; Hatano 1972).

Nursery practice. The seeds should be sown in the fall or stratified for sowing in the spring. Umbrella-pine is not easy to grow and is extremely slow-growing when propagated from seed (Halladin 1991). It has a tendency to form several leaders. Field planting has been done with 3+2 and 4+2 stock (Dallimore and Jackson 1967). Umbrella-pine can also be propagated by layers or by cuttings of half-ripened wood in summer (Bailey 1939). A nursery in Oregon propagates solely by cuttings because of faster results; Halladin (1991) describes the technique in detail.

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Figure 1— *Sciadopitys verticillata*, umbrella-pine: fruit and seed, H 2.