Sapindaceae\textsuperscript{c} Soapberry family

\textit{Koelreuteria paniculata} Laxm.

panicled golden raintree

Charles H. Michler and Paul O. Rudolf

Dr. Michler is the director of the Hardwood Tree Improvement and Regeneration Center of the USDA Forest Service\textsuperscript{f} North Central Research Station and Purdue University, West Lafayette, Indiana; Dr. Rudolf (deceased) retired from the USDA Forest Service\textsuperscript{f} North Central Forest Experiment Station.

\begin{flushleft}
\textbf{Growth habit, occurrence, and use.} Native to China, Korea, and Japan, the panicled golden raintree also called Pride-of-India, China tree, and varnish tree is a small deciduous tree ranging from 5 to 11 m tall that has been cultivated since 1763, chiefly for ornamental purposes (Rehder 1940).
\end{flushleft}

\begin{flushleft}
\textbf{Flowering and fruiting.} The irregular (or apparently polygamous) yellow flowers occur in broad, loose, terminal panicles and bloom from July to September (Krüssmann 1960; Ohwi 1965; Plouvier 1946). The fruits are bladdery, triangular, 3-celled capsules about 3 to 5 cm long (figure 1); when they ripen in September and October they change from a reddish color to brown. Within the papery walls of ripe fruit are 3 round, black seeds (figure 2) (Rehder 1940; Rudolf 1974). The seeds are naturally dispersed from fall to the next spring (Pammel and King 1930). Good seed crops are borne almost annually (Rudolf 1974).
\end{flushleft}

\begin{flushleft}
\textbf{Collection of fruits; extraction and storage of seeds.} Capsules should be collected from trees in September and October for extraction and cleaning the seeds. The yield from 46 kg (100 lb) of fruits is about 32 kg (72 lb) of cleaned seeds (Plouvier 1946). Cleaned seeds per weight ranged from 5,700 to 7,700/kg (2,600 to 3,500/lb), and averaged 6,394/kg (2,900/lb) for 3 samples. Four samples of commercial seedlots averaged 99% in purity and 95% in soundness (Rudolf 1974; Swingle 1939; Zentsch and Kaul 1968). One sample stored in fruit jars with loosely fastened lids and exposed to temperatures ranging from about 4 to 32 °C showed 50% germination at the end of 10 years (Toumey 1921).
\end{flushleft}

\begin{flushleft}
\textbf{Pregermination treatments.} Dormancy in seeds appears to be caused by an impermeable seedcoat and possibly by an internal condition of the embryo. In a series of tests, soaking seeds in sulfuric acid for 1 hour plus stratification in moist sand for 90 days at 4.5 °C gave the best results (Rudolf 1974). In another series of tests, mechanically scarified seeds germinated promptly and well (Zentsch and Kaul 1968). Mechanical scarification followed by stratification for 90 days produced complete germination in 9.7 days (Garner 1979; Garner and Lewis 1980). Seed exposure to an electromagnetic field of 100 gauss for 4.3 seconds increased germination after scarification from 56 to 97% (Maronek 1975).
\end{flushleft}

\begin{flushleft}
\textbf{Germination tests.} Germination is epigeal (figure 3). Germination should be tested in sand flats or germinators for 5 to 10 days at 20 (night) to 30 °C (day), using 200 to 400 seeds that were acid treated and then stratified for each test. One test of untreated seeds gave a germination
rate of only 2% in 29 days, whereas seeds of the same sample gave 52% after the acid plus-stratification treatment recommended above (Rudolf 1974). In another test, 74% of untreated seeds germinated in 54 days, compared with 91% of mechanically scarified seeds in 23 days (Zentsch and Kaul 1968). Official seed testing agencies recommend tetrizolium staining for germination tests of panicled golden raintree. The suggested procedure is to soak the seeds in water for 18 hours, then remove the seedcoat before staining for 24 hours at 30 °C in a 1% solution (ISTA 1993).

**Nursery practice.** Untreated seeds may be sown in the fall, or scarified seeds sown in the spring (some seedlots may require stratification after scarification) and covered with 6 to 13 mm (3 to 2 in) of soil. Seeds sown immediately after collection in fall usually gives reasonably good results (Swingle 1939). A target bed density is about 300 to 315 seedlings/m²(30/ft²). Tree survival is about 70% (Jack 1969). Seedlings should be lifted as 2+0 stock (Jack 1969).

This species should be planted only in sunny locations, but it is not particular as to soil type (Bailey 1939). It may also be propagated by layers, cuttings, or root cuttings (Bailey 1939).

**References**

Figure 1 Koelreuteria paniculata, panicked golden raintree: capsules, × 1; seeds, × 2.

Figure 2 Koelreuteria paniculata, panicked golden raintree: longitudinal section through a seed, × 6.

Figure 3 Koelreuteria paniculata, panicked golden raintree: seedling development at 1, 3, and 5 days after germination.