

# Trees in the landscape, Part 6:

## *Sapindus saponaria*

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### *Sapindus saponaria* L.

*Sapindus saponaria* is a distinctive, splendid, highly adaptable, and useful small to medium ornamental tree for the urban forest and landscape (Fig. 1). Tolerant of a wide variety of harsh conditions, including heat, aridity, wind, salt, poor soil, and drought once established, this handsome tree is noted for its attractive, often glossy and dark green, pinnate foliage and showy, shiny orange- or yellow-brown, marble-like fruits. With few or no cultural problems, it makes a superb specimen for use as a park, shade, lawn, and street tree, and also as a screen or fruiting and tropical accent.

#### Taxonomy and history

**Synonyms:** TROPICOS (2012) lists 24 synonyms of which *Sapindus inaequalis* DC. and *S. thurstonii* Rock are the most common. Another synonym is *S. marginatus* Willd., which some

workers consider a separate species; it ranges from northern Florida into Georgia and South Carolina.

**Common names:** soapberry; Florida soapberry; soap seed; wing-leaf soapberry; *jaboncillo* (Puerto Rico); Hawaiian soapberry, *mānele*, *a'e* (Hawai'i)

**Etymology:** The genus name *Sapindus* is derived from the Latin *sapo*, meaning soap, and *indicus*, meaning Indian, and alludes to the soapy lather produced when the saponin-rich fruits are cut or rubbed and mixed with water, a process much used by Indians and other indigenous peoples throughout the tree's range in the Americas and the South Pacific. The specific epithet *saponaria* is also derived from the Latin *sapo* and alludes to the saponin-rich fruits.

**History:** The famous Swedish naturalist Carolus Linnaeus (Carl von Linné) (1707-1778) named and described this species in 1753.



Figure 2. In habitat in Hawai'i *Sapindus saponaria* can sometimes become a large forest tree to 80 feet tall (Kīpuka Kī on the Big Island).

Figure 1. (Left) . *Sapindus saponaria*, a distinctive, highly adaptable, useful, and splendid, small to medium ornamental tree for the urban forest and landscape, is noted for its attractive, often glossy dark green, pinnate foliage and showy, shiny orange- or yellow-brown, marble-like fruits (Lili'uokalani Botanical Garden, Honolulu, HI).

Figure 3. (Right) The canopy of *Sapindus saponaria* growing in more exposed situations is typically rounded (Kīpuka Kī on the Big Island).





Figure 4. (Left) Trunks of old, large forest specimens of *Sapindus saponaria* are often enlarged or buttressed at base (Kīpuka Kī on the Big Island).



Figure 5. (Center) Bark of young trees of *Sapindus saponaria* is light brown to gray and smooth (Lili'uokalani Botanical Garden, Honolulu, HI).



Figure 6. (Right) Bark of young trees of *Sapindus saponaria* sometimes becomes granular or wartish (719 Hawthorne St., Anaheim, CA).

*With few or no cultural problems, it makes a superb specimen for use as a park, shade, lawn, and street tree.*

#### Description

The description is from several sources (Felger et al. 2001, Gilman and Watson 2011, Little and Skolmen 1989, Little and Wadsworth 1964, Muller and Haller 2005, Rock 1974, Shreve and Wiggins 1964, Staples and Herbst 2005, Wagner et al. 1990) and from cultivated and wild trees in Hawai'i.

**Habit/conformation:** small to medium, sometimes large (forest trees) (Fig. 2), solitary, slow-to-moderate growing, long-lived, broad-leaf, evergreen or briefly deciduous, unarmed tree, 15-40(-80) feet tall, 15-40(-60) feet wide, canopy mostly rounded on trees in the open (Fig. 3), dense, irregularly branched, of medium texture.

**Trunk:** straight, cylindrical, typically with clean, unbranched bole, often enlarged or buttressed at base on large forest specimens (Fig. 4), to 1.5(-6) feet DBH.

**Bark:** light brown to gray, smooth (Fig. 5) or sometimes granular or wartish when young (Fig. 6), with age becoming finely fissured and shedding in large (12-inch-wide) scales or flakes exposing young smooth bark (Fig. 7).

**Leaves:** pinnately compound (Figs. 8-9), alternate, typically glossy dark green adaxially but sometimes dull light green, paler abaxially, 8-18 inches long; petiole to 3 inches long; rachis

Figure 7. (Below right) Bark of large, older trees of *Sapindus saponaria* becomes finely fissured and sheds in large (12-inch-wide) scales or flakes exposing young smooth bark (Kīpuka Kī on the Big Island).







Figure 8. (Left) Leaves of *Sapindus saponaria* are pinnately compound (Kīpuka Kī on the Big Island).



Figure 9. (Right) Leaves of *Sapindus saponaria* are pinnately compound (719 Hawthorne St., Anaheim, CA).

to 12 inches long; rachis and petiole sometimes winged (Figs. 10, 25), especially in young leaves; 4-6 pinnae per each side of rachis (sometimes with an additional terminal pinna), these subopposite, 2-8 × 0.6-2.4 inches, elliptic-lanceolate to elliptic-oblong, falcate, thin to +/- leathery, without hairs adaxially, densely soft hairy abaxially, margins entire, tip long- or short-pointed, base short-pointed to blunt or rounded, sometimes strongly unequal with side toward apex broader; twigs stout, light gray with raised, reddish brown lenticels, densely fine-hairy when young.

**Flowers:** in terminal or sometimes lateral, somewhat compact, conspicuous,

triangular clusters 4-12 inches long and wide on current year's growth (Fig. 11); individual flowers to 0.12 inch wide, greenish white to white or yellowish (Fig. 12), on short pedicels 0.04-0.14 inch long, mostly unisexual and mostly staminate (male) but some pistillate (female) or bisexual flowers present; sepals 5, unequal, outer two 0.06-0.07 inch long, ovate, inner three to 0.1 inch long, suborbicular, both densely soft hairy near base; petals subequal, to 0.08 inch long, obovate to suborbicular-obovate, as wide as long, strongly concave, fringed with minute hairs; stamens 8, 0.06 inch long or slightly more, filaments 0.04 inch long, densely soft hairy at base, anthers yellowish; pistil 0.06 inch long or more, ovary without hairs, style slender, stigma lobes blunt; staminate flowers with a minute, brown pistillode (rudimentary, non-functional

pistil); pistillate flowers with short staminodes (rudimentary, non-functional stamens).

**Fruits:** in open to dense clusters (Figs. 13-14), a drupe, 1-3-lobed, each lobe 0.65-0.75 inch diam., ball-like, glossy yellowish brown to orange- or dark brown (Fig. 15), aging to black (Fig. 16), skin leathery, flesh clear or translucent, persistent for up to a year or more; one seed per lobe, 0.4-0.5 inch diam., round, reddish brown to black, hard; both fruit and seed are poisonous but not as toxic as *Nerium* (oleander) for example.

#### Distribution and ecology

Soapberry is widely distributed, ranging from warm temperate, subtropical, and tropical South America to northern Mexico, the Caribbean, Florida, Georgia, South Carolina, and in the Pacific from Hawai'i southward to French Polynesia, the Cook Islands, Fiji, and New Caledonia (Little and Skolmen 1989, Staples and Herbst 2005). It is widely cultivated in tropical Asia and Africa (Staples and Herbst 2005). Soapberry naturally occurs from near sea level to 4,800 feet elevation, mostly in dry to moist forests. In exceedingly dry areas of northern Mexico it is typically restricted to riparian habitats in canyons and arroyos and along streams in desertscrub, thornscrub, and tropical deciduous forest although it is



Figure 10. (Left) Sometimes leaves of *Sapindus saponaria*, especially on young plants, have a winged rachis (Kīpuka Kī on the Big Island).

Figure 11. (Center) Flowers of *Sapindus saponaria* occur in somewhat conspicuous, compact, triangular, terminal clusters (719 Hawthorne St., Anaheim CA).

Figure 12. (Right) Flowers of *Sapindus saponaria* are greenish white to white or yellowish (719 Hawthorne St., Anaheim CA).





Figure 13. (Upper left) Fruits of *Sapindus saponaria* can occur in open clusters (Lili'uokalani Botanical Garden, Honolulu, HI).



Figure 14. (Upper right) Fruits of *Sapindus saponaria* can occur in dense clusters (334 N. Alisos St., Santa Barbara, CA).

Figure 15. (Lower left) The ball-like, marble-sized fruits of *Sapindus saponaria* are glossy yellowish brown to orange- or dark brown (Lili'uokalani Botanical Garden, Honolulu, HI).

Figure 16. (Lower right) Fruits of *Sapindus saponaria* persist on the tree and age to black (334 N. Alisos St., Santa Barbara, CA).



sometimes found on dry hillsides and slopes (Felger et al. 2001). In Hawai'i soapberry is restricted to the Big Island near Kīlauea, Mauna Loa, and Hualālai volcanoes in dry to moist forests (Wagner et al. 1990).

Annual rainfall over the range of soapberry varies greatly and ranges from 10 inches in exceedingly dry areas of northern Mexico (Shreve and Wiggins 1964) to 50 to 75 inches in moist areas of Hawai'i (UH2 2012). The wide range of soils upon which soapberry grows is remarkable, and includes well drained, rocky soils and sandy alluvium to heavier loams and clays. Soil pH ranges from slightly acidic to slightly alkaline. Frosts are uncommon over the range of soapberry but they typically occur at higher elevations and higher latitudes.

#### Propagation and growth rate

Soapberry is easily propagated by seeds, which germinate readily within

a week or two if handled correctly (Bornhorst 2005, Culliney and Koebele 1999, UH2 2012). Remove seeds from their fruit by cutting or clipping the fruit, a process that can be made easier, especially if the fruits are dry, by soaking the fruit for several days in water, changing the water daily. Scarify the seeds by carefully nicking or filing the seed coat, and then soak for 24 hours in a warm-water bath (Bornhorst 2005, Culliney and Koebele 1999). Another method, which avoids scarification and the warm-water bath, is to soak the seeds in water for a week or more, changing water daily, until the outer seed coat becomes soft and can be removed along with the papery brown inner coat, leaving the embryo and endosperm exposed. Germination following this method occurs in about one week and is nearly 100% (Culliney and Koebele 1999).

The growth rate of soapberry is

slow to moderate. Growth is faster in Hawai'i, and trees can attain about 25 to 50 feet in height and width in about 15 to 20 years with proper care (Fig. 17), so selecting the appropriate place in the landscape in the Islands is critical. Growth is much slower in California; street trees 20 to 35 feet tall and wide are estimated to be 40 to 60 years of age (Fig. 18).

#### Environmental tolerances

Lack of cold hardiness is likely the most limiting environmental tolerance of soapberry. Depending on provenance of seeds or other propagative material, soapberry appears well adapted to nearly all of Hawai'i, but especially drier areas; the coastal plains and valleys of southern and central California; and perhaps the low deserts of California and eastern Arizona. It is not listed in *Sunset* (Brenzel 1995) but appears adapted to Sunset Zones 18 through 24 in southern California and Zone 13 in southern California and eastern Arizona. In northern California hard

Figure 17. Growth of *Sapindus saponaria* is faster in Hawai'i, and trees can attain about 25 to 50 feet high and wide in about 15 to 20 years with proper care (Ho'omaluhia Botanical Garden in Kāne'ohe, HI).







Figure 18. Growth of *Sapindus saponaria* is slower in California, and street trees 20 to 35 feet tall and wide are estimated to be 40 to 60 years of age (622 W. Ortega St., Santa Barbara, CA).

freezes and/or lack of summer heat might restrict growth but it should be evaluated in Zones 15 through 17 in the Bay Area. It might also perform adequately for many years in Zones 11 and 12 in southern Nevada and eastern Arizona, gaining sufficient size before a hard freeze, like the one of 2011, seriously damages or even kills it. Much of this area in the southwestern United States falls within USDA Zones 9 to 11. Gilman and Watson (2011) listed soapberry for U.S.D.A Hardiness Zones 10A-11.

Despite its tropical origins, soapberry is amazingly cold tolerant, and has withstood temperatures in the high 20s F with little or no damage in the December 1990 and January 2007 freezes in southern California. However, it appears to be intolerant of lower temperatures and this extreme cold will likely limit where it can be grown successfully. Its slow to moderate growth rate might result in relatively slow recovery during the growing season if damage does occur. Based on Peter Riedel's undated statement published in his notes after his death in 1954, Randy Baldwin (per. comm.) surmises that street trees in Santa Barbara, which were likely planted in the late 1940s, were severely damaged by a cold event prior to 1954, probably January 4, 1949 when temperatures hit an all-time low of 20

F in the city. The trees, probably not very old or large at the time, were severely damaged but resprouted from near the base of the trunk. These trees today range from 20 to 35 feet high and wide and several have multiple trunks (Fig. 18).

Soapberry of Hawaiian and, perhaps to some extent, Floridian provenance might not have sufficiently high heat or aridity tolerance for the hot, arid low deserts of southern California and eastern Arizona; a better choice for these areas would be soapberry from the hot, arid Sonoran desert of northwestern Mexico. Soapberry of Hawaiian and Floridian provenance, though, are likely better adapted to coastal areas of southern and central California. However, in areas with extremely hot summers and cold winters, the best choice might be the related species, *S. drummondii* (which see page 45 under Notes).

Although largely undocumented, soapberry, once established, might tolerate extended periods with little or no water, a notion extrapolated from its natural, dry to moist forest habitats where little or no rain falls for several months. A fairly tough and rugged species, it appears to tolerate harsh conditions, including heat, wind, smog, aridity, salt, drought (except in hot desert areas), wind, and restricted

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root space (Floridata 2012, Gilman and Watson 2011, Staples and Herbst 2005, UH 2012). It tolerates a variety of substrates, including clay, sand, and loams; acid or alkaline pH; and poor, nutritionally deficient soils (Floridata 2012, Gilman and Watson 2011).

## Uses

Soapberry is an exceptional ornamental and has numerous features that make it a prized and splendid small to medium tree for the landscape and urban forest. Its showy, glossy brownish fruits and handsome, pinnate leaves are especially appealing and lend a tropical motif to its character. Some appropriate uses include park tree, shade tree, lawn tree (Fig. 19), street tree (Fig. 20), screen, specimen, and fruiting accent (Floridata 2012, Gilman and Watson 2011, Staples and Herbst 2005, UH 2012). For street tree use it would do best in at least a six-foot median, parkway, or cutout (Gilman and Watson 2011) and trees must have lower branches removed to raise the canopy for vehicular and pedestrian clearance. Soapberry street trees in Santa Barbara, though, are in slightly narrower parkways and show little or no hardscape damage. Although its showy fruits persist on the tree for months or even a year or longer, some eventually fall and can be a nuisance on paved areas and

other hardscapes; thus, care must be taken when using it as a parkway, median, or patio tree. Its handsome nature and tolerance of a wide variety of adverse conditions make soapberry a good choice for a low-maintenance, low-input landscape (Gilman and Watson 2011).

Landscape experience shows that, while soapberry can grow as fast or faster in cultivation than in the wild, cultivated trees typically are smaller than their wild forest counterparts, especially those in Hawaiian forests, and typically grow 15 to 30 feet tall and wide. Its slow to moderate growth rate, while a disadvantage for growers, is an advantage once the plant is in the landscape because it would reduce maintenance pruning and generate less green waste. Its relatively small size makes it a wise choice for ever-diminishing residential yards.

In addition to its exceptional ornamental merit and tolerance of adverse conditions, soapberry attracts birds and bees and is known as a honey plant (Little and Skolmen

1989). Its sapwood is whitish while its heartwood is yellow or light brown. Although a heavy, hard wood (Record and Hess 1943), it is not durable when exposed (Little and Skolmen 1989). Soapberry finds numerous local uses wherever it occurs. *Sapindus* means “soap of the Indians” and the most common and widespread use for soapberry is to cut or crush the fruits and mix them briskly with water to produce the sudsy lather that finds use as a soap substitute for clothes and shampoo (Felger et al. 2001). The hard, black, handsome seeds are used as beads for necklaces, rosaries, buttons, and other jewelry in the Americas and Africa (Little and Skolmen 1989, Staples and Herbst 2005) and to make leis in Hawai’i (McDonald 1989, Neal 1965). Fruits and seeds are poisonous, and crushed seeds are sprinkled into streams as a fishing aid to stun fish in tropical America (Gunn and Dennis 1976, Turner et al. 1995). Several parts of the plant are used medicinally (Morton 1981), including to treat arthritis, fevers, rheumatism, and kidney ailments (Felger et al.

2001), and lice. Ground seeds yield medicinal oil (Uphof 1968) while an infusion of roots and leaves is used for several home remedies (Little and Skolmen 1989).

### Pruning/management

Judicious pruning and training in the nursery might be necessary to produce proper trunk and branch structure in soapberry (Gilman and Watson 2011). Provide adequate space in the nursery and retain lower branches to encourage maximum trunk caliper. However, for street or other use where a single trunk is desired, removal of competing lateral trunks or upright basal branches, if any, is likely necessary in nursery production or early in the landscape. To encourage a broader, more rounded canopy, reduction pruning and/or heading back of the upright leaders and selection of lateral scaffold branches are probably necessary.

Staking is probably mostly unnecessary if trees are given adequate nursery space. Nursery trees might only need light pruning to reduce canopy density and, when nearing readiness for sale, to remove lower branches to elevate the canopy if desired. Once in the landscape only judicious thinning out to reduce canopy density, if desired, and pruning to encourage or maintain structure might be required.

Trees would benefit from regular irrigation in California, Arizona, and Nevada, and drier areas of Hawai’i. However, once established, trees are considered drought tolerant in all areas except the hot deserts. Mulch and judicious use of controlled-release or organic fertilizers are likely beneficial in the landscape.

### Problems/litter

Soapberry is largely problem free. Persistent fruits with an extended ripening period tend to minimize large quantities of fruits dropping simultaneously. However, it does produce moderate fruit and leaf litter. Its hard wood makes branches and trunks resistant to breakage (Gilman

**Figure 19.** (Left) *Sapindus saponaria* makes a fine shade tree for lawns (719 Hawthorne St., Anaheim, CA).

**Figure 20.** *Sapindus saponaria* makes a fine street tree (698 N. Alisos St., Santa Barbara, CA).





and Watson 2011). Its slightly toxic but attractive fruits (not nearly as toxic as *Nerium*) might warrant its placement away from areas where young children are likely to congregate, such as around schools, parks, and playgrounds. Its major limitation might be its slow to moderate growth rate, which, as mentioned earlier, has its landscape advantages.

**Pests and diseases**

There are no serious pests and diseases although its fruit attracts the boxelder bug (Gilman and Watson 2011). Also, spider mites sometimes attack trees in California, reducing the color and glossy sheen of the leaves but otherwise not much damaging the tree.

**Weed/invasive species risk**

Soapberry does not appear to be an invasive species risk (HEAR-PIER 2012, Gilman and Watson 2011).

**Availability**

Unfortunately, soapberry is uncommon in the nursery trade. However, its ease of propagation from seeds and the ready availability of fruits from cultivated landscape specimens in Hawai'i and California should encourage nurseries and others to grow this handsome and worthy species.



Figure 21. Arborist and horticulturist Heidi Bornhorst finds protection from the sweltering mid-day sun under an attractive *Sapindus saponaria* (Lili'uokalani Botanical Garden, Honolulu, HI).

**Trees in California and Hawai'i**

Despite being a Hawaiian native, soapberry is still not used as extensively as it should be in the Island landscape. The best place to see the nicest soapberry in the landscape in Hawai'i is at Lili'uokalani Botanical

Garden along Nu'uuanu Stream near Foster Botanical Garden in Honolulu (Figs. 1, 21). There are several handsome, if not, exceptional specimens at this public garden, each with dense, rounded canopies, striking, shiny, dark green leaves, and showy clusters of glossy, brown, marble-sized fruits. Specimens can also be seen at Waimea Valley Historical Nature Park on the North Shore, Ho'omaluhia Botanical Garden in Kane'ohe (Fig. 17), Lyon Arboretum in Mānoa Valley, the urban garden next to the Home Depot in Pearl City, Ala Moana Beach Park, Moanalua Gardens, and the park at the Hawai'i Department of Agriculture on King Street at Young Street. The provenance of the cultivated trees on O'ahu is mostly unknown and most might be from imported seeds from the Americas and not from the Big Island (Staples and Herbst 2005).

In Hawai'i, tall, large forest trees of soapberry, the tallest and largest in the world (Staples and Herbst 2005), can be easily seen in habitat in Hawai'i Volcanoes National Park on the Big Island at Kīpuka Puauulu and Kīpuka Kī along the road north from Kīlauea Volcano to Mauna Loa (Figs. 2-3). Indeed, a national champion tree 106 feet tall, 84 feet wide, and 10 feet DBH was recorded in 1968 in Kīpuka Puauulu (Little and Skolmen 1989).

Figure 22 (Left). *Sapindus saponaria* often has a rounded, dome-shaped canopy and makes an excellent street tree (712 N. Alisos St., Santa Barbara, CA).

Figure 23. (Right) This small *Sapindus saponaria* has been somewhat wind-shaped by the prevailing ocean breezes (1110 Del Sol Ave., Santa Barbara, CA).





**Figure 24 (Left).** This large *Sapindus saponaria* at the Los Angeles County Arboretum & Botanic Garden in Arcadia, California was accessioned in 1954 (1954-0042-P\*1).

**Figure 26. (Right)** The *Sapindus saponaria* in Figure 25 is also unusual in its longer, more diffuse inflorescences.

In California, the 300-700 blocks of Alisos St. (Figs. 20, 22), 600 block of W. Ortega St. (Fig. 18), and the 1200 block of Del Sol Ave (Fig. 23). in Santa Barbara have soapberry as street trees (Muller and Haller 2005). Another street planting of soapberry is in the 700 block of Hawthorne St. in Anaheim. Pearson Park, also in Anaheim, has three specimens of soapberry but two of them suffer from shading and encroachment from other nearby trees.

A large soapberry at the Los Angeles County Arboretum & Botanic Garden in Arcadia, California, received as a plant in 1954, is now about 40 feet tall, spreads for 50 feet, and has a short trunk two feet tall and wide above which three main branches (or trunks) arise, each 12 to 15 inches DBH (Fig. 24). This tree is unusual in that all the leaves have winged rachises and petioles (Fig. 25) and the inflorescences are longer and more diffuse than those of trees in Hawai'i and others in California (Fig. 26). In contrast to trees in Hawai'i and especially California, which were in heavy fruit in late summer and fall, the Arboretum tree had no mature fruits in early fall, only a few green fruits, but was in heavy flower, with the flowers appearing to emerge from the ends of old, bare inflorescence stalks, as if they were reblooming, rather than from current

year's growth. Perhaps this flowering scheme is in response to the horrific wind storm of November 30-December 1, 2011 that struck the Arboretum and surrounding areas or perhaps the plant is simply a variant from a different part of the species's range.

#### Notes

*Sapindus*, a member of the Sapindaceae or soapberry family (genera include *Acer*, *Aesculus*, *Cupaniopsis*, *Dodonea*, *Harpullia*, *Koelreuteria*, and *Litchi* among others), includes about 10 species of shrubby or well developed trees: six species in Asia; two in the Americas; and two in Hawai'i. All have saponin-rich fruits (up to 37%, Felger et al. 2001) that, when cut or rubbed and mixed with water, produce a soapy lather, which gives them their common name of soapberry. The second Hawaiian species, *S. oahuensis*,

occurs in dry to moist forests on Kaua'i and O'ahu, where it is known as *āulu*, *kaulu*, or *lonomea* (Staples and Herbst 2005). A handsome tree in its own right and worthy of wider cultivation in Hawai'i and trial in coastal areas of southern California, *S. oahuensis* is readily distinguished from *S. saponaria* by its large, simple, ovate to elliptic leaves to 11 inches long and 6 inches wide (Fig. 27); longer, more open, diffuse, and sparsely branched panicles to 15 inches long; larger flowers; and ellipsoid, flattened fruits with oblong seeds (Staples and Herbst 2005, Wagner et al. 1990).

The second American species, *Sapindus drummondii* or western soapberry, is sometimes treated as a variety of *S. saponaria* (Shreve and Wiggins 1964, Wildflower 2012). However, this winter-deciduous, frost-hardy, temperate, large shrub to small tree, which occurs from extreme northern Mexico into Arizona and as far east as Missouri, Kansas, and Louisiana, is easily distinguished by its smaller, often more shrubby habit; leaves with up to 24, more slender and long-pointed pinnae (1.6-3.25 × 0.4-0.8 inches) (Fig. 28); leaf rachis nearly always winged; larger flowers (0.15-0.2 inch wide); longer-than-wide petals (0.1 × 0.04-0.08 inch); and larger fruits (0.5-0.6 inch diam.) (Felger et al. 2001, Wildflower 2012). In northwestern Mexico the more cold tolerant

**Figure 25. The *Sapindus saponaria* in Figure 4 in unusual in that all its leaves have winged rachises and petioles.**





and winter deciduous *S. drummondii* replaces the more cold sensitive and mostly evergreen *S. saponaria* as one moves from south to north. However, ranges of the two species do not overlap, there are no intermediate forms, and *S. saponaria* never reaches the U.S. border in western North America (Felger et al. 2001). Considering the cold hardiness of *S. drummondii*, it would be a more reliable choice for cold-winter areas of eastern Arizona, southern Nevada, and inland areas of California where *S. saponaria* is marginal.

Mostly evergreen, soapberry only becomes deciduous due to drought in exceedingly dry areas, such as northwestern Mexico, or cold at the far northern limit of its range in northern Florida, Georgia, and South Carolina. Strangely, the Hawaiian plants are also deciduous although it is unknown if it is cold or drought that induces seasonal leaf drop.

Soapberry is an unusually variable species, especially in number of pinnae, presence or absence of the winged rachis and petiole, size of flowers and fruits, and degree of hairiness of flowers (Wagner et al 1990). It is also variable in pinnae shape, size, color, and glossiness. This variability comes as no surprise when considering the vast geographical range and

ecological zones where soapberry occurs. Also, because it is an ethnobotanically important and useful plant, humans have likely long cultivated it, made selections of it, and much affected its distribution.

The late Joseph Rock, famous Hawaiian botanist and student of Chinese culture, felt that the deciduous, native Hawaiian soapberry, which he noted attained a much larger size in height and trunk diameter than its mostly evergreen American counterparts, was actually distinct from those American trees and from cultivated trees of the same name in Honolulu. Thus, in 1911 he published a new name for the native Hawaiian trees, *Sapindus thurstonii*. However, he rather quickly changed his mind and in 1913 concluded that the native Hawaiian trees were the same as those from the Americas (Rock 1974).

The separate, disjunct populations in the Pacific and the Americas are somewhat perplexing. However, fruits have air space between the outer wall and seed and half of any given seeds will float. Thus, long-distance ocean dispersal is possible. Indeed, seeds are often found in beach drift (Little and Skolmen 1989) and, as mentioned above, humans could have aided in its distribution.

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**Figure 27. (left) Handsome, large, simple leaves a longer, more open, diffuse, and sparsely branched panicle distinguishes the Hawaiian endemic *Sapindus oahuensis* from its close relative *S. saponaria* (Ho'omaluhia Botanical Garden in Kāne'ohe, HI).**

**Figure 28. *Sapindus drummondii*, which is sometimes treated as a variety of *S. saponaria*, differs, among other ways, in its longer, narrower leaves with up to 24, more slender and long-pointed pinnae (Arizona-Sonora Desert Museum, Tucson, AZ).**



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