

SAPINDACEAE SOAPBERRY FAMILY

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Trees, shrubs, or vines, evergreen or deciduous, monoecious, dioecious, or polygamodioecious (occasionally with only perfect flowers). LEAVES alternate or very rarely opposite, pinnately (sometimes bipinnately) compound or trifoliolate, rarely simple, exstipulate (except in climbing species). INFLORESCENCES terminal and/or axillary, bracteate, racemose, panicle or unilateral cymes, rarely uniflorous and axillary. FLOWERS actinomorphic or slightly zygomorphic, small; sepals 4 or 5, distinct or sometimes connate below, usually unequal, imbricate (rarely valvate); petals 0, 3-5, distinct, imbricate, clawed, often with internal scaly- or hair-tufted-appendages near the claw; nectar-disc commonly present; stamens 4-10 (rarely many); filaments distinct, often hairy; pistil 1, the ovary superior, usually (1-)3(-4)-loculed, the placentation axile (or parietal), the style simple or trid. FRUIT various; ovules 1 or 2 per locule (rarely many). SEEDS often with an aril or fleshy testa; endosperm usually absent. --Ca. 150 genera, ca. 2000 spp.; mainly tropical and subtropical. Tropical species with edible fruits include *Blighia*, (akee), *Euphoria* (longan), *Litchi*, (lychee or litchi), *Nephelium*, (rambutan), and *Paullinia*, (guarana). The stem and/or fruit tissues often contain saponins, many of which have detergent properties, form stable foams in water and are toxic to fish. Brizicky, G. K. 1963. *J. Arnold. Arbor.* 44:462-501.

1. Leaves simple, usually viscous; petals wanting; fruit a dry, (2-)3-4 winged capsule . *Dodonaea*
- 1' Leaves compound, not viscous; petals present; fruit not winged.
 2. Climbing vines with tendrils; flowers slightly zygomorphic; leaflet margins coarsely serrate or crenate; fruit an inflated, bladder-like capsule *Cardiospermum*
 - 2' Trees without tendrils; flowers actinomorphic; leaflet margins entire; fruit drupe-like, with amber-colored, translucent pulp *Sapindus*

Cardiospermum L. Balloon Vine

Herbaceous or suffruticose vines, monoecious, dioecious or polygamodioecious. LEAVES biternate or trifoliolate, petiolate, with minute stipules. INFLORESCENCES axillary, corymbose or racemose-paniculate, the peduncle on an axis just above two opposing tendrils. FLOWERS white, yellow or light pink, slightly zygomorphic; sepals 4(-5), the 2 outer ones smaller; petals 4, with petaloid scales; nectar-disc zygomorphic with a gland opposite each of the two upper petals; stamens 8, unequal in length, the anthers sterile in pistillate flowers; ovary 3-loculed, rudimentary in staminate flowers; the placentation axile, with 1-ovule per locule, stigmas 3; style short. FRUIT a membranaceous, inflated, 3-angled capsule. SEEDS globose, black except for a light-colored, ovate, reniform to semicircular hilum. $2n = 20, 22$ --Ca. 15 spp. throughout the Neotropics. (Greek: *cardia* = heart + *sperma* = seed, referring to the heart-shaped hilum on the seed).

Cardiospermum corindum L. Balloon Vine --Suffruticose, often climbing over other vegetation; stems villous, 6 ribbed. LEAVES highly variable, once to twice pinnately compound, 3-11 cm long, 4-11(-15) cm wide, subglabrous-villous, crenate to serrate, the apices acute, acuminate to mucronate (rarely obtuse), the bases truncate; leaflets 3-9; rachis usually narrowly winged; petiole 1-3 cm. INFLORESCENCES racemose-paniculate, 1-3(-5) cm long, generally with 3-5 main branches, bracteate, the axis 2-10 cm long or more. FLOWERS 6-10 mm wide, 4-6 mm long; sepals 4, glabrous to pubescent, the outer two 1-2.5 mm long, the others 3-5 mm long; petals 4, white, 4-6 mm long;

scales 2.5-3 mm long, generally villous on the inner surface; filaments 3-4 mm long, with long pubescence, basally connate, slightly flattened; anthers 0.4-0.8 mm long; ovary villous; style 0.7-1 mm long. FRUIT 2.5-4.5 cm long, somewhat wider in diameter, strongly veined, glabrous-pubescent, reddish-brown, the base attenuate. SEEDS 4-5 mm in diameter; hilum 3 mm long, tan, heart-shaped. --Coyote Mountains, Pima Co., erroneously reported in the supplement to Kearney and Peebles as *C. halicacabum* L. Probably flowering year round with suitable conditions. FL, TX; Mex. to S. Amer.

Dodonaea Miller Hopbush

Shrubs and small trees, dioecious, monoecious, polygamodioecious or with only perfect flowers, the young growth usually viscous. LEAVES usually alternate, simple or pinnately compound, sessile or petiolate, exstipulate, usually viscous, with resinous glands, glabrous to pubescent, the midvein usually prominent. INFLORESCENCES a corymb or a solitary to compound panicle, axillary and/or terminal, with small leafy bracts. FLOWERS pedicellate, actinomorphic; sepals 3-6 (-7), deciduous or persistent in fruit; petals 0; stamens 6-12 (-16) in staminate flowers, absent or only rudimentary in pistillate flowers; nectar-disc stipe-like in perfect and pistillate flowers, rudimentary or absent in staminate flowers; ovary borne on a short gynophore, rudimentary in staminate flowers, usually viscous; style 1, filiform; stigmas (2-)3(-4); ovary (2-)3(-6) loculed, the placentation axile. FRUIT a 2-6 -angled or -winged capsule, chartaceous, coriaceous or membranous. SEEDS 2 or 1 (by abortion) per locule. $2n = 28$. 67 spp., primarily an Australian genus, 7 extra-Australian in New Guinea, Madagascar, Hawaii, and 1 sp. worldwide in the tropics and subtropics. (For R. Dodoens, Dutch physician and botanist.) West, J. G. 1984. *Brunonia* 7:1-194.

Dodonaea viscosa Jacq. Hopbush, Switch-sorrel. --In AZ, shrubs 1-3 m high, dioecious or rarely polygamodioecious; bark rough; young branches sparsely puberulent. LEAVES simple, essentially sessile, linear to oblanceolate, 3.5-10 cm long, 0.3-1.5 cm wide, gradually tapering to the base, coriaceous, subglabrous, with flat glands, the margins with scattered short straight hairs, very slightly revolute; midvein prominent; lateral veins obscure above, weakly evident below. INFLORESCENCES usually racemose, sparsely puberulent, 6-14 mm long; bracts 2-5 mm long. FLOWERS pale yellow, 3-5 mm wide; pedicels 5-12 mm long; sepals 4-5, 1-3 mm long, lanceolate, elliptic-ovate, acute, glabrous or the margins ciliate; ovary in pistil-bearing flowers viscid, the gynophore 1 mm long; stamens in stamen-bearing flowers (5-)8-10(-12), the filaments 0.5 mm long, the anthers 1.5-2 mm long with a few setose hairs at the apex. FRUIT a (2-)3-4-winged capsule, light yellow-green to light golden to purple, 1-2.5 cm long, 1.4-2.2 cm wide, glandular, viscous, the wings radiating laterally, reniform, the locules central, about half as long and wide as the fruit. SEEDS dark reddish black to dark brown, smooth, oval, somewhat flattened, 0.3-0.5 mm wide. $2n = 28$. --Drainages, canyonsides, and rocky slopes from Upper Sonoran Desert to desert grassland and chaparral: Gila Maricopa, Pima, Pinal, Santa Cruz, Yavapai cos.; 500-1300 m (1700-4200 ft); (Jan.) Feb-Oct. (-Dec.). FL, Mex. to n S. Amer., West Indies, China, India, S. Africa to Middle East, Aust., worldwide in the tropics and subtropics. West recognizes five subsp. on the basis of leaf characters, which can be variable. If accepted, only subsp. *angustifolia* (L. f.) West. occurs in AZ, differing from others in having linear-lanceolate leaves with narrowly tapering bases and apices.

Sapindus Juss. Soapberry

Trees and shrubs, basically monoecious but often with some perfect flowers (perhaps occasionally dioecious). LEAVES alternate, exstipulate, petiolate, even-pinnately compound (rarely odd-pinnately compound or simple); leaflets entire; rachis winged or wingless. INFLORESCENCES terminal racemes or panicles with minute deciduous bracts. FLOWERS actinomorphic; sepals 4 or 5, deciduous, the two outer ones smaller than the inner ones; petals 4 or 5, clawed, white or greenish; nectary disc annular, fleshy, lobed; stamens 8 (-10), inserted on the disc; ovary (2-)3(-4)-loculed and -lobed; ovules solitary in each locule. FRUIT drupe-like, arising from one carpel, the others usually

aborting, the flesh resinous. $2n = 56, 60$. --Ca. 11 spp., the Americas (1 sp.), E and SE Asia (6 spp.), Pacific Islands (3 spp.) and Hawaii (1 sp.). (Latin: *sapo* = soap + *indicus* = Indian, i.e., Indian soap, referring to the use of the fruits as a substitute for soap in tropical countries).

Sapindus saponaria L. Soapberry --In AZ, trees mostly to 6(-15) m high, deciduous, monoecious, or sometimes with perfect flowers, the bark rough, fissured, gray to gray-brown; buds, young leaves, and young twigs densely pubescent. LEAVES mostly even-pinnately compound, 10-28 cm long; leaflets (4-) 6-19, lanceolate-obovate, falcate, 4-12 cm long, 0.5-2 cm wide; acuminate to obtuse, mainly subglabrous above, thinly pubescent on the veins, margins, and lower surface, more densely pubescent along the base of the midvein below and along the 1-2 mm long petiolules. INFLORESCENCES 15-26 cm long, racemose to panicle, villous, many-flowered; pedicels 0.5-2 mm long; bracts 1 mm long, yellowish green to reddish brown, subulate. FLOWERS 2-6 mm long, 5-8 mm wide; sepals 5, obtuse to apiculate, 1-3 mm long, the margins usually ciliate, often pubescent externally; petals 5, 3-4 mm long, white, obtuse to apiculate, most with 2 usually linear scales above the claw, the scales glabrous to pubescent, the claw mostly with long pubescence internally, the margins ciliate (at least at the base); stamens 8, the filaments 1-3(-5) mm long (shorter in pistillate flowers), with long hairs on the lower 1/2-3/4, the anthers ca. 0.5 mm long; pistil glabrous or with a few hairs, the ovary ca. 1 mm long, the style ca. 1 mm long, the stigma 3-lobed. FRUITS 1-1.5 cm in diam., with 2 rudimentary aborted mericarps at the base (rarely more than one mericarp matures); pulp yellow-amber, translucent, turning reddish brown to black when dry. SEEDS globose, 8-10 mm long, smooth, reddish black. [*S. drummondii* Hooker & Arnott, *S. marginatus* Willd., *S. saponaria* var. *drummondii* (Hook. & Arn.) L. D. Benson]. $2n = 28$. --Riparian, canyonsides, desert-grassland, and oak-woodland: all cos. except Apache, Coconino, La Paz, and Yuma; 760-1710 m (2500-5600 ft); May-July; ne to KS and se to FL; Mex. to n Argentina and Caribbean.

Opinions vary as to how many taxa of *Sapindus* in the Americas should be recognized and a detailed study of the American material is much needed. A conservative view proposed by Standley (1922), that it is one variable species, is followed here.

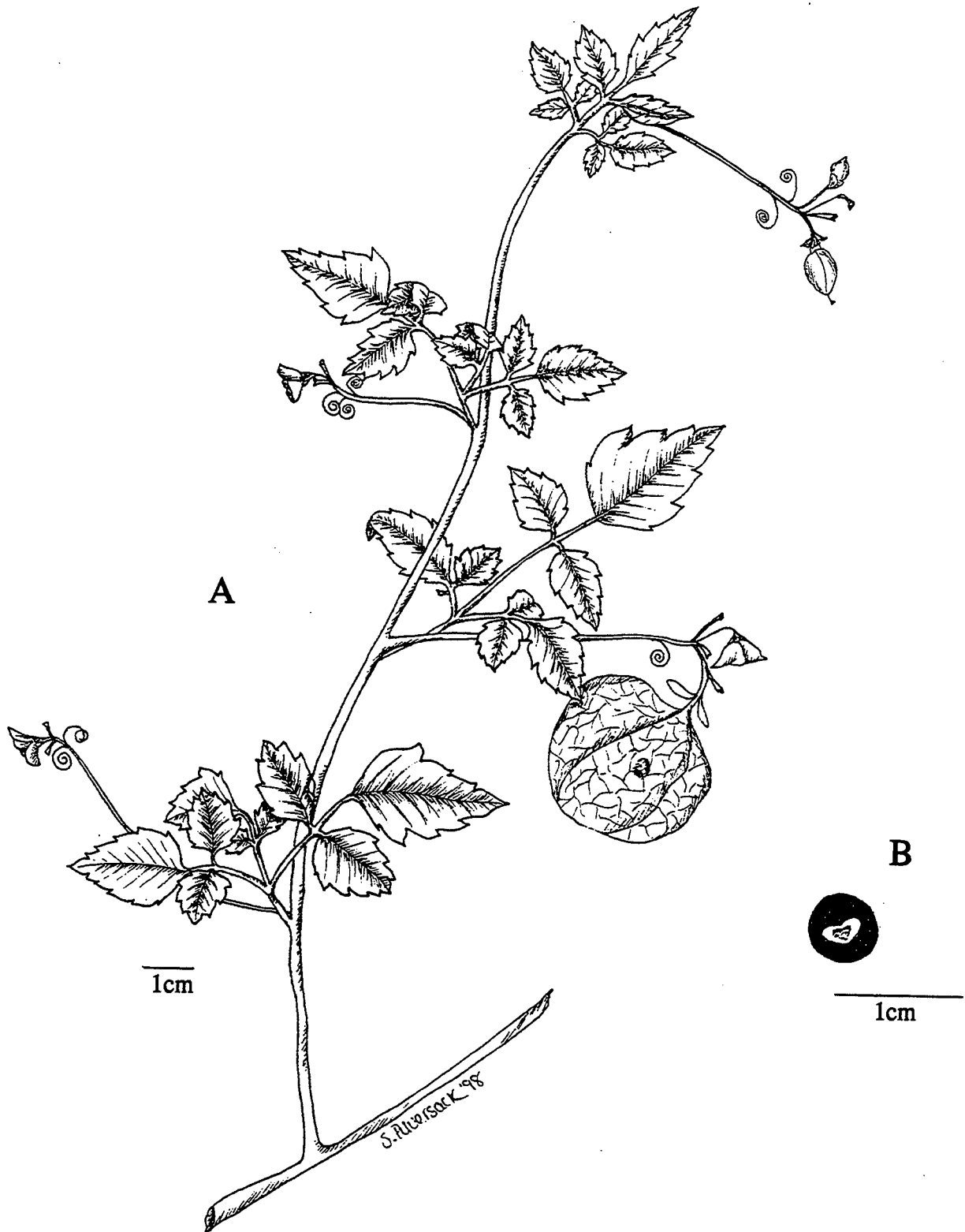
Benson (1943) accepted for n. Mexico and the s. U.S., including AZ, a variety based on *S. drummondii* Hook. & Arn. with the typical variety occurring in tropical and subtropical America. If one accepts his division, var. *drummondii* would seem unacceptable since its type comes from Tepic, in s. c. Mexico.

ACKNOWLEDGMENTS

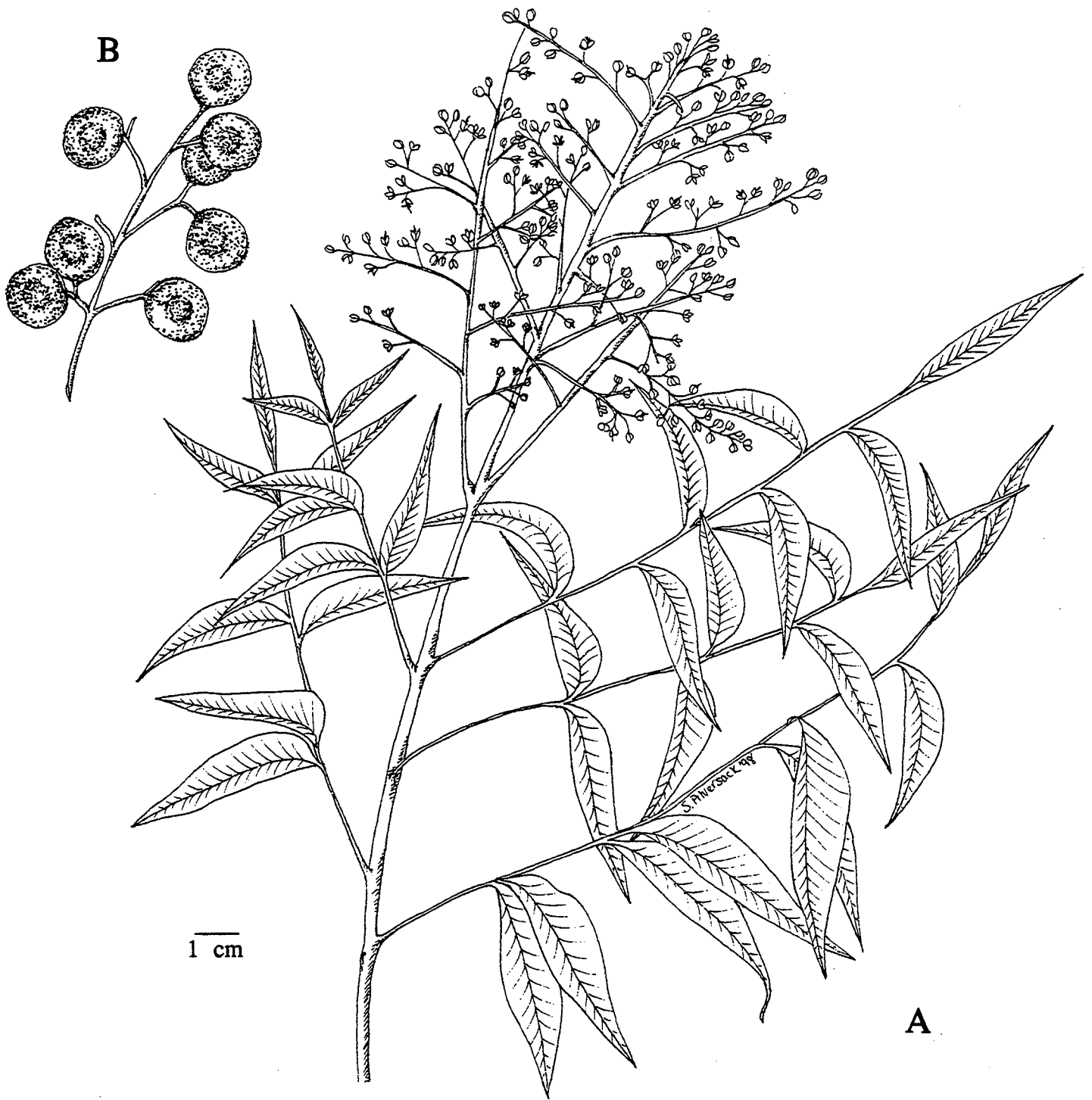
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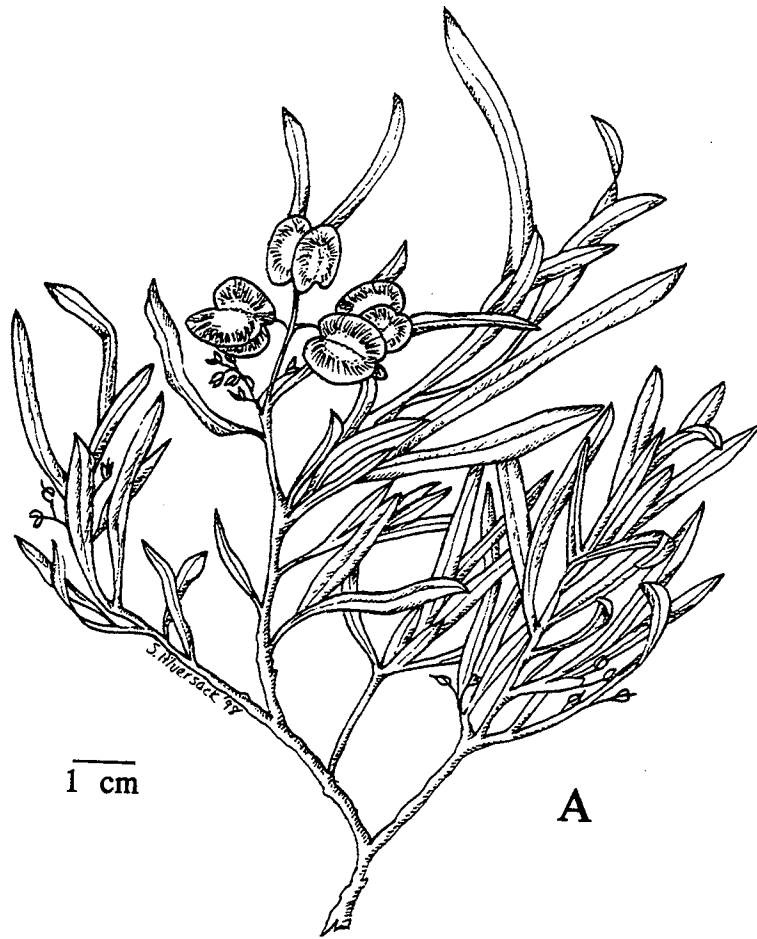
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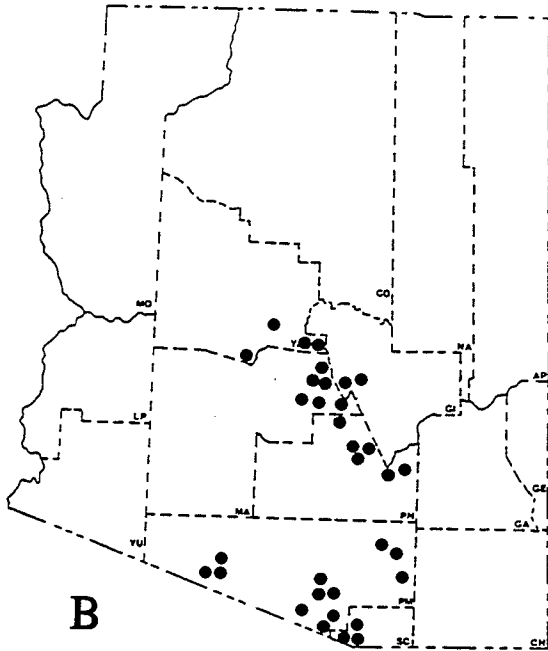
Sapindaceae Fig. 1. *Cardiospermum corindum*. A, flowering and fruiting branch; B, seed.



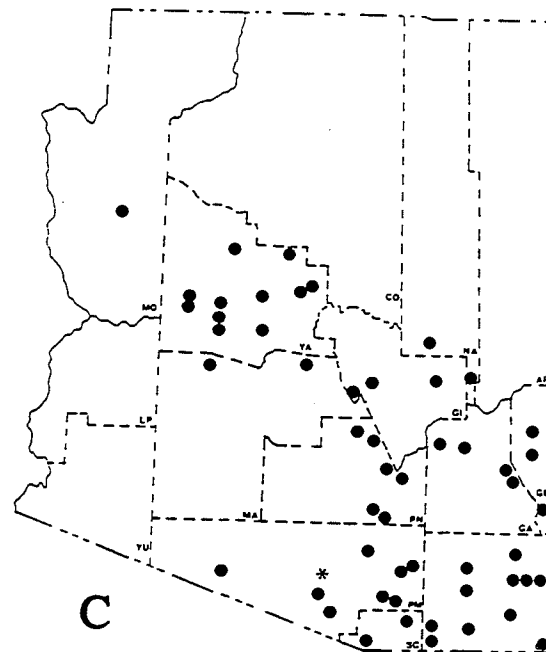
Sapindaceae Fig. 2. *Sapindus saponaria*. A, flowering branch; B, infructescence with translucent yellow-amber fruits.



A



B



C

Sapindaceae Fig. 3. A. *Dodonaea viscosa*. Pistillate branch with fruits. Distribution of: B. *Dodonaea viscosa*. C. *Cardiospermum corindum* (star); *Sapindus saponaria* (dots).