

SOLANACEAE Part Seven:
***BROWALLIA* L., *CALIBRACHOA* CERV., *CAPSICUM* L., *JALTOMATA* SCHLTDL.,
AND *SALPICHROA* MIERS**

Courtney M. Currier, Kariah Slagel, and Elizabeth Makings
Elizabeth.Makings@asu.edu
School of Life Sciences, Arizona State University
Tempe, AZ 85287-4501

John Anderson
jlatravelguy@gmail.com
925 America St, Wickenburg, AZ 85390

Jonathan Maranville
jemaranv@asu.edu
The Design School, Arizona State University
Tempe, AZ 85287-1605

This paper completes the treatment of Solanaceae for the Vascular Plants of Arizona. All contributions can be found at https://canotia.org/vpa_project.php. A key to the genera appears in Solanaceae Part Two. The only change in the key that is required is incorporating *Margaranthus* into *Physalis*. *Margaranthus solanaceus* Schldtl. is now recognized as *Physalis solanacea* (Schldtl.) Axelius.

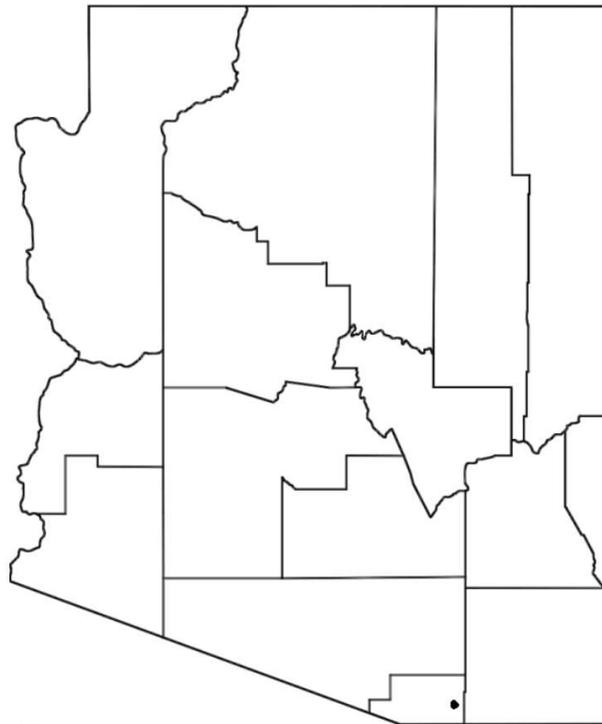
***Browallia* L. Bush-violet**

Courtney M. Currier and Elizabeth Makings

Herbaceous annuals, with glabrous to pubescent surfaces. LEAVES simple, sessile in ours (elsewhere sometimes petiolate), alternate, lanceolate to rhombic or ovate, glabrous, the margins entire. INFLORESCENCES uniflorous. FLOWERS solitary, axillary, perfect, pedicellate; calyx deeply lobed; corolla salverform, zygomorphic, white to yellow in ours (elsewhere white to blue or purple); stamens 4, of two distinct kinds, the upper pair with flattened, curved, pilose filaments, bearing one abortive and one fertile theca, the lower pair with S-shaped filaments, smaller, with two fertile thecae. FRUITS 2-valved capsules, included within calyx; seeds many. —Ca. 22 spp. worldwide with center of diversity in northern S. Amer. (Colombia, Ecuador, and Peru) (named for J. Browallius, Finnish and Swedish theologian, botanist, and physicist, by his friend C. Linnaeus).

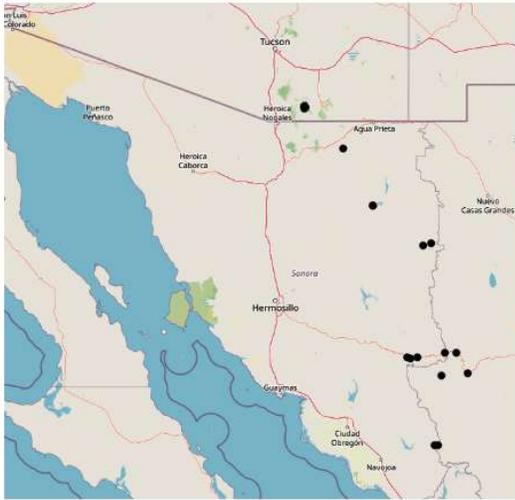
Browallia eludens R. Van Devender & P. D. Jenkins (of ephemeral or elusive nature). —Herbs, typically unbranched, to 20 cm tall, the surfaces glabrous to minutely pubescent, the hairs multicellular and sometimes glandular. LEAVES sessile, entire, narrowly lanceolate, to 3 cm long, 2–6 mm wide, the margins with glandular trichomes. FLOWERS: pedicels 7–15 mm long; calyces accrescent, not inflated in fruit, about one-half length of corolla; calyx in flower 11–15(–17) mm long, 2–5 mm wide, in fruit 7–11 mm long, 5–6 mm wide, the lobes acute; corolla slightly reflexed, 17–22 mm long, 5–8(–11) mm wide, whitish to pale yellow, the tube exerted beyond the calyx; upper anthers ca. 4 mm long, lower anthers ca. 2 mm long; pistil ca. 12 mm long; ovary glabrous, green; style S-shaped, narrow proximally, wider and convoluted distally; stigma two-lobed, flattened. FRUITS globose, ca. 5 mm long (Van Devender & Jenkins 1993). —Rare in wooded canyons, seasonally riparian or mesic areas; Santa Cruz Co.; 1400–2100 m (4600–6900 ft); Aug; Chih. and Son., Mex.; endemic to s AZ, n Son., and w Chih., Mex. In all spp. of *Browallia*, upper anthers curve downward, thus elevating the dense, multicellular hairs and effectively closing the very small mouth of the corolla (D'Arcy 1973). Figs. 1–3.

Browallia eludens is distinguished from other spp. of *Browallia* by its unbranched habit, sessile leaves, relatively smaller calyx, and well-exserted corolla tube. The corolla is declined obliquely to the tube, creating a unique appearance compared to other spp. The flowers of *B. eludens* are white, whereas blue to violet are more common in other spp. Seeds of *B. eludens* are specifically characterized by their prominent keel, whereas others in the genus are more prismatic in appearance (Van Devender & Jenkins, 1993).

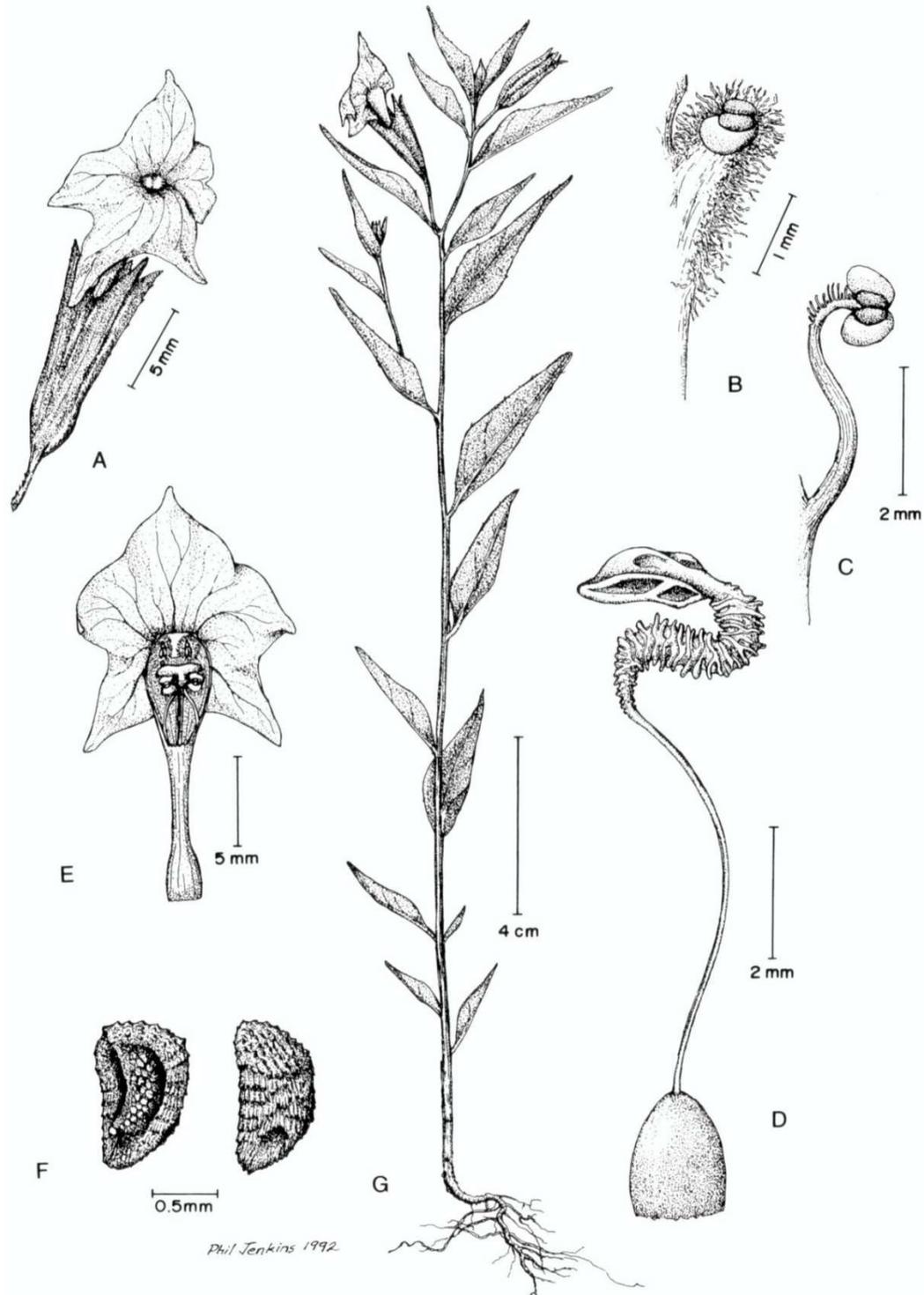


Solanaceae part 7. Figure 1. Distribution of *Browallia eludens* in AZ.

VASCULAR PLANTS OF ARIZONA



Solanaceae part 7. Figure 2. Left: Distribution of *Browallia eludens* in AZ and n Mex. Right: Photo by E. Makings taken in Sierra Juriquipa, Son., Mex., Aug 2017.



Solanaceae part 7. Figure 3. *Browallia eludens*. A, flower. B, upper stamen. C, lower stamen. D, ovary, style and stigma. E, top view of flower with section of corolla removed to show position of stamens and stigma. F, seed: ventral surface with keel and hilum (left); dorsal surface (right). G, entire plant. Illustration by Phil Jenkins; reproduced from *Madroño* with permission of the editor.

VASCULAR PLANTS OF ARIZONA

Calibrachoa Cerv. Trailing Petunia

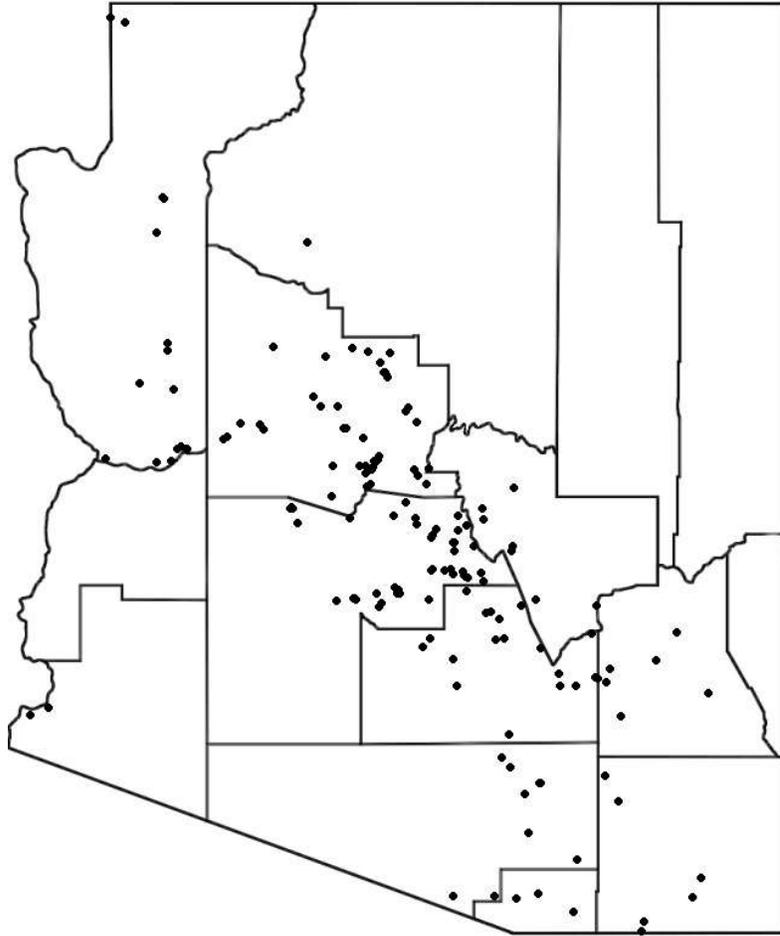
John Anderson and Elizabeth Makings

Annuals to small shrubs, glabrous to glandular-pubescent; stems erect to prostrate. LEAVES simple, sessile, often borne in fascicles, linear to lanceolate, entire. INFLORESCENCES solitary flowers, axillary, pedunculate. FLOWERS perfect, actinomorphic, funnelform to rotate; calyx 5-lobed, the lobes linear to subulate, the apices obtuse to acute; corollas white, yellow, orange, or purple with a pale or yellowish tube; anthers yellow. FRUITS ovoid capsules; seeds many. —Ca. 28 spp., mostly S. Amer. (Argentina, Brazil, Paraguay, and Uruguay), 1 sp. (*Calibrachoa parviflora*) in N. Amer. (for Mexican botanist and apothecary Antonio de la Cal y Bracho (1764–1833)).

The name *Calibrachoa* was proposed by Cervantes in a book by La Llave and Lexarda (Tropicos.org 2021); the latter botanists are sometimes given credit for the name.

Calibrachoa parviflora (Juss.) D'Arcy (small-flowered). Streamside Petunia, Seaside Petunia. —Annual herbs, rooting along the stem, forming mats, glandular pubescent. LEAVES linear oblanceolate to spatulate, 4–15 mm long; fleshy. INFLORESCENCES: peduncles elongating in fruit 1–10(–15) mm long. FLOWERS 4–7 mm long and wide; calyx lobes 3–6 mm long in flower, increasing to 6–11 mm in fruit; corollas funnelform, purple to violet, with white to yellow tube; stamens five, unequal; filaments epipetalous at base of corolla. FRUITS 3–4 mm wide. SEEDS rounded to blocky, ca. 50 or more. $2n=18$. [*Petunia parviflora* Juss.] —Sandy washes in dry or moist soil in riparian zones: all AZ cos. except Apache, Greenlee, La Paz, and Navajo; 300–1600 m (1000–5200 ft); Apr–Sep; CA to FL, occasional elsewhere in U.S.; Mex.; an amphitropical disjunct also found in S. Amer.; annual habit and self-compatibility may have facilitated long-distance dispersal from S. Amer. Considered naturalized in N. Amer. by Fregonezi et al. (2012); listed in USDA Plants Database (2021) as introduced and as a facultative wetland sp. Figs. 4–5.

Petunia parviflora was the first selected type of the genus *Petunia* Juss., which was subsequently divided into two genera: *Petunia* and *Calibrachoa*. To retain the name *Petunia* for the cultivated garden petunias, Wijnands et al. (1986) proposed conserving the generic name, with a new type species, for the $2n=14$ group, which includes the cultivated garden species and hybrids. Their proposal was considered and approved by nomenclature committees and officially accepted by the XIV International Botanical Congress in Berlin, Germany, in 1987. The acceptance of this proposal necessitated the transfer of *Petunia parviflora* to *Calibrachoa parviflora* (Kartesz & D'Arcy 1989; Wijsman 1990).



Solanaceae part 7. Figure 4. Distribution of *Calibrachoa parviflora* in AZ.



Solanaceae part 7. Figure 5. *Calibrachoa parviflora*. A. Habit (photo by Gene Sturla). B. Close-up of flowers (photo by Neal Kramer, CalPhotos).

Capsicum L. Chili Pepper, Bell Pepper

Jonathan Maranville and Elizabeth Makings

Herbaceous annuals to frutescent perennials. STEMS ascending, divergent. INFLORESCENCES with a few or only one flower per node. LEAVES simple, pinnately veined; margins entire to undulate. FLOWERS perfect, actinomorphic, 5-merous; perianth explanate to campanulate; corolla white, yellowish, or violet. FRUITS berries, not enclosed by the calyx, the calyx not inflated in fruit. SEEDS flat and circular. —Ca. 36 spp. Native to the w hemisphere, especially diverse in Mex. and S. Amer., ca. 5 spp. cultivated, some widely distributed in subtropical regions of the world (from Latin *capsa* “case” or Greek *kapto* “to bite”).

Capsicum annuum L., *C. baccatum* L., *C. chinense* Jacq., *C. frutescens* L., and *C. pubescens* Ruiz & Pav. are grown worldwide for culinary and medicinal uses (Heiser and Pickersgill 1969). The fruits have varying concentrations of capsaicin and capsaicinoids, which do not deter birds, but are perceived as localized heat (spicy) by humans and other mammals (Jordt & Julius 2002). Only one species is found wild or volunteering in AZ.

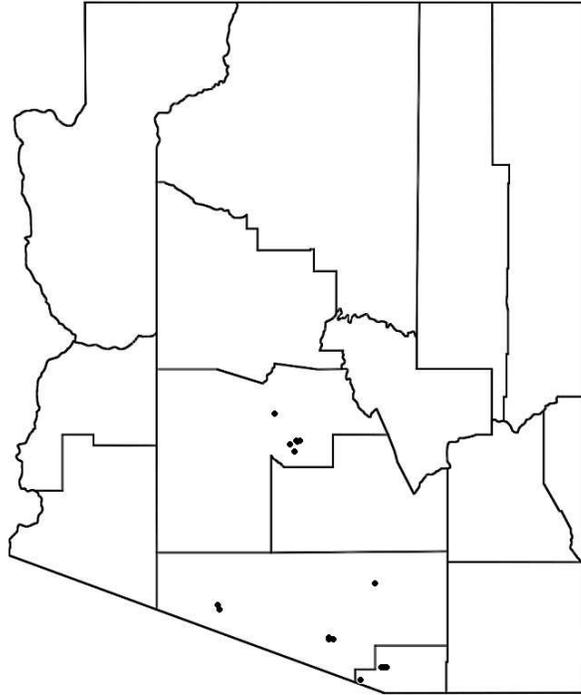
Capsicum annuum L. (for typical annual growth habit). Chiltepin, Chili, Chilli (from Náhuatl *chilli*). —Annual herb or short-lived perennial. LEAVES 5–35 mm wide; blades 1–6 cm long; petioles 0–16 mm long. FLOWERS nodding, usually only one per node, 3–4 mm wide, the pedicels becoming erect as the fruit matures; filaments white; anthers white, dark blue or dark green, 1–2 mm long; style and stigma white, light green or yellow. FRUITS berries, becoming dry at maturity, indehiscent but easily broken, held erect on pedicels up to 4 cm long; seeds few to numerous, especially rich in spicy heat-mimicing chemicals. —Wild plants widely distributed in subtropical America and perhaps elsewhere; origin of cultivated plants believed to be Mex. (Kraft et al. 2014). Notable cultivars include the bell pepper and various hot peppers. *Capsicum annuum* belongs to a complex of spp. including *C. chinense*, *C. frutescens*, and *C. galapagoense* (González-Pérez et al. 2014). Most authors accept at least a few varieties of the sp. Our wild growing plants belong to a single variety.

Capsicum annuum* var. *glabriusculum (Dunal) Heiser & Pickersgill (for smooth, glabrous fruit). Chiltepin, bird pepper. —Up to 2 m tall when growing through and structurally supported by other plants, as in *Makings & Maranville 6466* (ASU). LEAVES ovate or lanceolate; bases cuneate (occasionally hastate); apices acuminate; blades 1–2 cm long. FRUITS globose, 4–7 mm wide. SEEDS from two to ten or more per berry. Canyons, disturbed areas: Maricopa, Pima and Santa Cruz cos.; 300–1,800 m (1,000–6,000 ft); fl. Aug–Sep (fr. Nov–Jan); AZ, CA, FL, LA, TX s to Mex, Caribbean, C. Amer., and S. Amer. Wild specimens have been collected in Arizona in canyons south of 32°10' N in Pima and Santa Cruz counties. One such population, located in the Tumacacori Mountains of the Coronado National Forest in Santa Cruz County, gained protection in 1999 as the Wild Chile Botanical Area. The primary associated spp. at this site are the hackberries, *Celtis pallida* and *C. reticulata*; these woody plants may have co-evolved with this variety of *Capsicum annuum* to produce fruit that is very similar in appearance (Tewksbury et al. 1999). Figs. 6–7.

VASCULAR PLANTS OF ARIZONA

Two other Arizona populations occur in Pima County: one in the Baboquivari Mountains and one in the Ajo Mountains. An additional population can be found in the vicinity of El Sásabe, Son., Mex., within 5 km of the Arizona border.

Wild-type volunteers have been collected in the Phoenix and Tucson metropolitan areas.



Solanaceae part 7. Figure 6. Distribution of *Capsicum annuum* var. *glabriusculum* in AZ. Dots in urban areas of Phoenix and Tucson probably indicate volunteer escapes from cultivation.



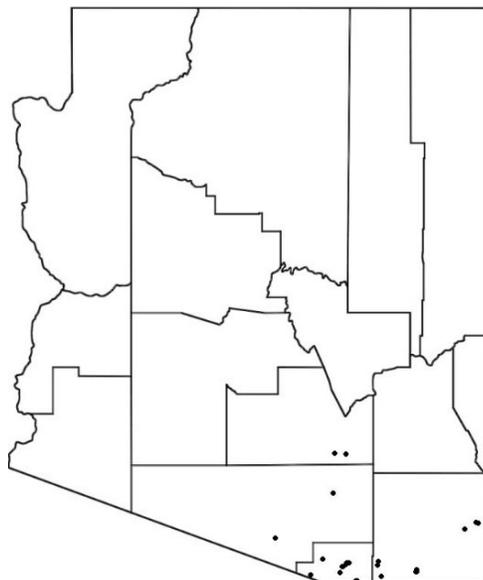
Solanaceae part 7. Figure 7. *Capsicum annuum* var. *glabriusculum*, (A) flower (B) fruit (photos by L. R. Landrum).

Jaltomata Schlechtendahl False Holly

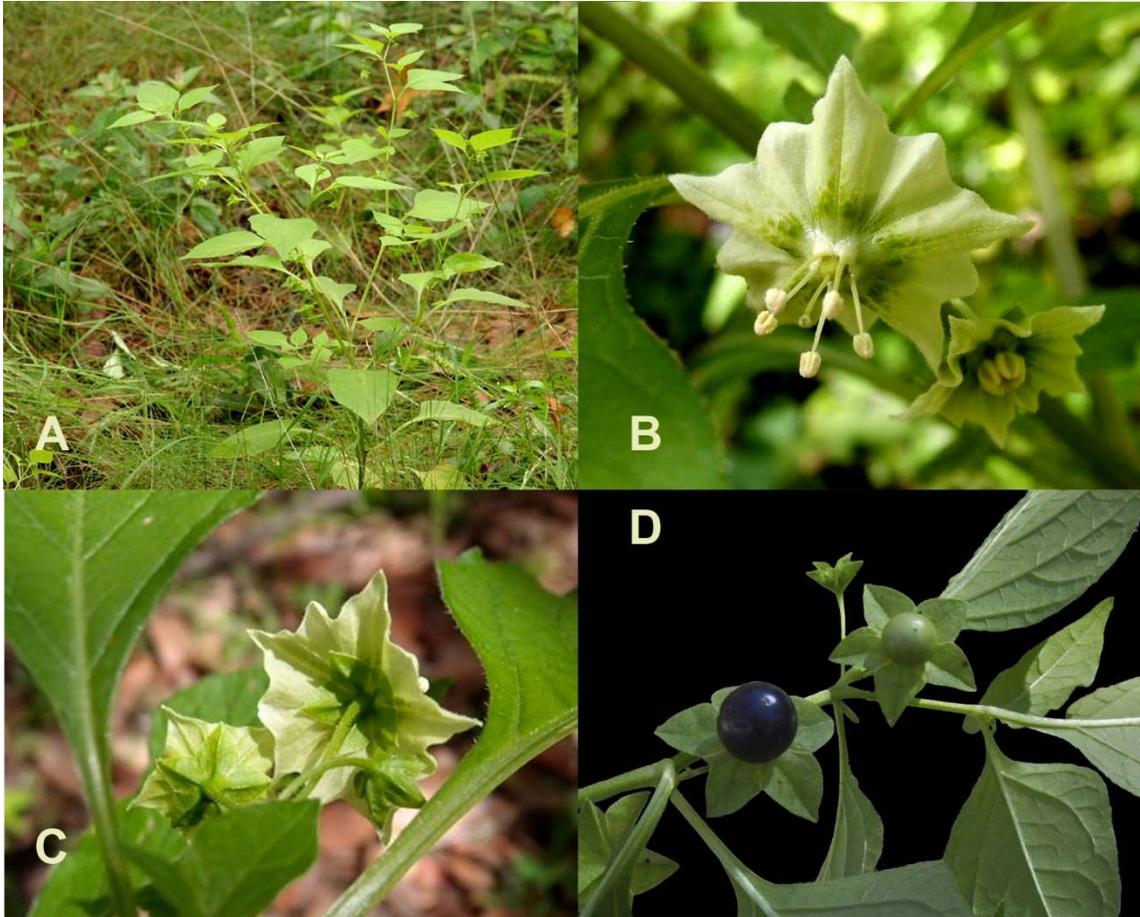
John Anderson, Kariah Slagel, and Elizabeth Makings

Herbaceous perennials to shrubs, with stems erect to procumbent, glabrous to pubescent. LEAVES simple, petiolate, alternate, ovate to lanceolate, entire or toothed. INFLORESCENCES umbellate, axillary, pedunculate. FLOWERS perfect, actinomorphic, rotate or campanulate; calyx deeply 5-lobed, accrescent (increasing in size) but not enclosing the fruit; corollas pale green, whitish, blue or purple; anthers dehiscing longitudinally. FRUITS globose berries, orange to black. —Ca. 60 spp., 1 sp. in AZ, from se AZ s to W. Ind. and n S. Amer. including the Galapagos Islands (possibly a variant of Jaltomate, the name of a small pueblo in Zacatecas, Mex.; *jaltomata*, a Mexican vernacular name for false holly; Nahuatl: *xalli* for “sand” and *tomatl* for “tomato”).

Jaltomata procumbens (Cav.) J. L. Gentry (spreading over the surface of the ground). Creeping False Holly. —Perennial herb from tuberous roots, erect to procumbent, with stems 4–5 angled, to 80 cm high, glabrous, plants poisonous except for mature berries. LEAVES ovate, 8.5 cm wide by 13 cm long, membranous, glabrous; apex acuminate; base cuneate; margins entire to repand; petioles winged, to 4.5 mm long. INFLORESCENCES umbellate, with 6–18 flowers, axillary; peduncle with longitudinal ridges, to 3 cm long. FLOWERS 20–30 mm wide; calyx 9–13 mm wide, green at flowering, at fruiting 18–25 mm wide, purple (partially accrescent); corollas rotate, pale green to whitish; filaments equal, epipetalous at base of corolla, 4.5–7 mm long; anthers yellow, protogynous. FRUITS berries, 18–25 mm in diameter, dark purple to black, edible (gathered and eaten uncooked in Mex.). $2n = 24$. [*Atropa procumbens* Cav., *Saracha procumbens* (Cav.) Ruiz & Pavon, *S. sessilis* Greene]. —Canyon bottoms and hillsides in rich soil under shade of trees and occasionally in oak savannah: Cochise, Pima, Pinal, and Santa Cruz cos.; 1050–1500 m (3500–5000 ft); Jul–Sep; se AZ to n S. Amer. (Mione 2021). Figs. 8–9.



Solanaceae part 7. Figure 8. Distribution of *Jaltomata procumbens* in AZ.



Solanaceae part 7. Figure 9. *Jaltomata procumbens*. A. Habit. B, C. Flowers. D. Fruit. Photo credits: A. Patrick Alexander; B–C. Sue Carnahan; D. Frank Rose.

Salpichroa Miers

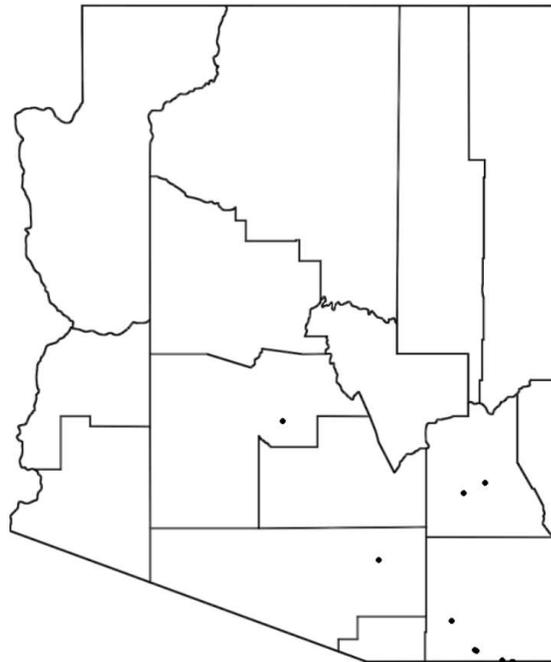
Courtney M. Currier and Elizabeth Makings

Herbaceous perennials, unarmed, the surfaces often pubescent. LEAVES simple, petiolate, alternate and/or opposite, ovate to obovate to rhombic, glabrous to hairy, the margins entire. INFLORESCENCES axillary, uniflorous. FLOWERS 5-merous, actinomorphic, perfect, short-pedicellate, pendent, visited by hummingbirds, moths, and bees; calyx deeply lobed, not inflated in fruit; corolla urceolate in ours (elsewhere sometimes tubular), with lobes rotate to reflexed, creamy white to yellow to yellow-green to reddish orange; stamens 5, equal. FRUITS ovoid berries, white to pale yellow; calyx not inflated in fruit; seeds many. —Ca. 21 spp., 1 in AZ, native to S. Amer. with center of diversity in Peru; our sp. widely naturalized. (Greek: *Salpinx*, “trumpet” and *chroa*, “skin” or “complexion,” referring to flower or corolla).

Salpichroa organifolia (Lam.) Thell. (leaves like oregano). Cock’s eggs, lily-of-the-valley vine, pampas lily-of-the-valley. —Herbaceous perennial vine or shrub, to 2 m tall, arising from a rhizome. Surfaces pubescent, more densely so on new growth, the hairs multicellular, sometimes uncinat. LEAVES to 3.5 cm long, 1.5–25(–27) mm wide, minutely

glandular; petioles 2–20 mm long. INFLORESCENCES uniflorous. FLOWERS on slender pedicels 4–6(–8) mm long; calyces 2–4 mm long, about one-quarter to one-third length of corolla, the lobes acute; corolla urceolate, with reflexed lobes, 8–10 mm long, 2–5 mm wide, white to creamy yellow; anthers ca. 2 mm long, longitudinally dehiscent, dorsifixed, slightly exserted; pistil pubescent with multicellular hairs, especially at base, the ovary dark red-brown at base, the style slightly exserted. FRUITS globose, ca. 2 mm long. —Uncommon in irrigated environments, canyons, seasonally riparian areas; Cochise, Graham, Maricopa, and Pima cos.; 750–1400 m (2500–4500 ft); Aug–Oct; AL, AZ, CA, CT, FL, GA, LA, MO, NC, SC, TX; BC, Can; Son., Mex.; native to S. Amer.; naturalized in N. Amer., Europe, Africa, Australia, New Zealand. Figs. 10–11.

Salpichroa organifolia is the most widespread sp. of the genus, sometimes considered an ornamental or a weed. Recent research suggests that fruits of *S. organifolia* may have antimicrobial properties (Díaz et al. 2018). A group of steroids termed “withanolides” naturally occur as secondary compounds in *Salpichroa* and among other genera of the *Solanaceae*. Withanolides isolated from *S. organifolia* exhibit inhibitory effects on insect pests and other herbivores (Bado et al. 2004); thus, pesticide uses for these compounds are being explored from this plant. *Salpichroa* is related to *Nectouxia*, and merging the genera is being considered. *Nectouxia* is the older name and thus has priority but preserving the name *Salpichroa* through nomenclatural conservation would be possible (Carrizo García et al. 2018).



Solanaceae part 7. Figure 10. Distribution of *Salpichroa organifolia* in AZ.



Solanaceae part 7. Figure 11. *Salpichroa organifolia* in flower (Photo by Elizabeth Makings).

ACKNOWLEDGMENTS

We thank the curators and staff at the University of Arizona and Arizona State University who made specimens available for study. We also thank Daryl Lafferty for use of the Plant Map programs. Mark Porter provided copies of pertinent literature and assisted with specimen access at Rancho Santa Ana Herbarium. Sue Carnahan and Les Landrum offered many helpful comments on early versions of this manuscript.

LITERATURE CITED

- BADO, S., G. MAREGGIANI, N. AMIANO, G. BURTON, and A. S. VELEIRO 2004. Lethal and sublethal effects of withanolides from *Salpichroa organifolia* and analogues on *Ceratitis capitata*. *Journal of Agricultural and Food Chemistry* 52 (10): 2875–2878.
- CARRIZO GARCÍA, C., A. V. BASSO, S. L. GONZÁLEZ, P. GONZÁLES, and G. E. BARBOZA. 2018. Unraveling the phylogenetic relationships of *Nectouxia* (Solanaceae): Its position relative to *Salpichroa*. *Plant Systematics and Evolution* 304: 177–183.

- D'ARCY, W. G. 1973. *Solanaceae*. Pp. 573–780. In: Flora of Panama. Woodson, R. E., Schery, R. W., & D'Arcy, W. G. (eds.). Flora of Panama. Part IX. Family 170. *Annals of the Missouri Botanical Garden*, 60(3), 573–780. <https://doi.org/10.2307/2395139>
- DÍAZ, M.E., *et al.* 2018. Antimicrobial activity of an aspartic protease from *Salpichroa originifolia* fruits. *Letters in Applied Microbiology* 67 (2): 168–174.
- FREGONEZI, J. N., L. BRANDÃO DE FREITAS, S. L. BONATTO, J. SEMIR and J. R. STEHMANN. 2012. Infrageneric classification of *Calibrachoa* (Solanaceae) based on morphological and molecular evidence. *Taxon* 61: 120–130.
- GONZALEZ-PEREZ, S. A., A. GARCES-CLAVER, C. MALLOR, L. E. SAENEZ de MIERA, O. FAYOS, F. POMAR, F. MERINO, and C. SILVAR 2014. New insights into *Capsicum* spp. relatedness and the diversification process of *Capsicum annuum* in Spain. *PLOS ONE* 9(12): e116276. <https://doi.org/10.1371/journal.pone.0116276>
- HEISER Jr., C. B. and B. PICKERSGILL. 1969. Names for the cultivated *Capsicum* species (Solanaceae). *Taxon* 18 (3): 277–283.
- JORDT, S. E. and D. JULIUS. 2002. Molecular basis for species-specific sensitivity to “hot” chili peppers. *Cell* 108 (3): 421–430. [https://doi.org/10.1016/S0092-8674\(02\)00637-2](https://doi.org/10.1016/S0092-8674(02)00637-2).
- KARTESZ, J. T. and W. G. D'ARCY, W. 1989. Nomenclatural notes for the North American Flora I. *Phytologia* 67 (6): 464–465.
- KEARNEY, T. H. and R. H. PEEBLES and collaborators. 1960. *Arizona Flora* (with supplement) 2nd ed. University of California Press, Berkeley.
- KRAFT, K. H., C. H. BROWN, G. P. NABHAN, E. LUEDELING, J. de J. LUNA-RUIZ, G. C. D'ECKENBRUGGE, R. J. HIJMANS, and P. GEPTS. 2014. Multiple lines of evidence for the origin of domesticated chili pepper, *Capsicum annuum*, in Mexico. *PNAS* 111 (17): 6165–6170. <https://doi.org/10.1073/pnas.1308933111>.
- MIONE, T. 2021. <https://web.ccsu.edu/faculty/mione/procumbe.htm> (accessed September 2021).
- TEWSKBURY, J. J., G. P. NABHAN, D. NORMAN, H. SUZAN, J. TUXILL, and J. DONOVAN. 1999. In Situ Conservation of Wild Chiles and their Biotic Associates. *Conservation Biology* 13: 98—107. <https://doi.org/10.1046/j.1523-1739.1999.97399.x>.
- TROPICOS.ORG. 2021. Missouri Botanical Garden. Accessed May 24, 2021.
- USDA, NRCS. 2021. The PLANTS Database (<http://plants.sc.egov.usda.gov/home>). National Plant Data Team, Greensboro, NC, USA. Accessed Dec. 15, 2018.

VASCULAR PLANTS OF ARIZONA

- VAN DEVENDER, R.K, JENKINS, P.D. 1993. A new species of *Browallia* (Solanaceae) from the southwestern United States and northwestern Mexico. *Madroño* 40 (4):214–223.
- WIJNANDS, D. O., J. J. BOS, H. J. W. WIJSMAN, F. SCHNEIDER, C. D. BRICKELL, and K. ZIMMER. 1986. Proposal to conserve 7436 *Petunia* with *P. nyctaginiflora* as typ. cons. (Solanaceae). *Taxon* 35: 748–749.
- WIJSMAN, H. J. W. 1990. On the inter-relationship of certain species of *Petunia* VI. New names for the species of *Calibrachoa* formerly included into *Petunia* (Solanaceae). *Acta. Bot. Neerl.* 39: 101–102.