

## Vasconcellea CARICACEAE

U. Eggli

**Vasconcellea** A. St. Hilaire (Deux. Mém. Réséd., 12, 1837). **Type:** *Vasconcellea quercifolia* A. St. Hilaire [lectotype according to A. F. Carvalho, Molec. Phylog. Biogeogr. e-monograph Papaya family, 92, 2013]. – **Lit:** Badillo (1971: 60–159, monograph, as *Carica* p.p.); Badillo (1983: Flora Ecuador, as *Carica* p.p.); Badillo (2000: systematics); Kyndt & al. (2005: molecular & morphological phylogeny); Scheldeman & al. (2011: use, synopsis, distribution maps). **Distr:** Mexico, C & S America (to Uruguay, Ecuador, Peru, and C Chile). **Etym:** For Simão de Vasconcelos [also as Vasconcellos] (1597–1671), Portuguese jesuit and historian in Bahia and Rio de Janeiro, Brazil.

**Incl.** *Hemipapaya* Missouri BG (Tropicos) (*nom. inval.*, ICN Art. 29.1). **Type:** not typified.

**Incl.** *Vasconcella* A. St.-Hilaire (1837) (*nom. inval.*, ICN Art. 61.1). **Type:** *Vasconcellea quercifolia* A. St. Hilaire.

**Incl.** *Vasconella* Walpers (1843) (*nom. inval.*, ICN Art. 61.1). **Type:** *Vasconcellea quercifolia* A. St. Hilaire.

**Incl.** *Vasconcellia* Bentham & Hooker (1867) (*nom. inval.*, ICN Art. 61.1). **Type:** *Vasconcellea quercifolia* A. St. Hilaire.

**Incl.** *Vasconcellosia* Caruel (1876). **Type:** *Carica hastata* Brignoli.

Usually dioecious (rarely monoecious or polygamous) mostly evergreen trees or shrubs, or rarely evergreen lianas (*V. horovitziana* (V. M. Badillo) V. M. Badillo), stem simple or generally few-branched, sometimes basally thickened and  $\pm$  pachycaulous, bark smooth, interior tissue soft and pith-like; **Br** sometimes armed with spiny stipules; **L** large to very large, simple and entire or palmatilobed, pinnatilobed or palmatifid with up to 7 lobes, lobes simple or shallowly to deeply lobed; **male Inf** many-flowered and congested, or few-flowered; **male Fl** 5- or sometimes 4-merous; **Sep** alternating with the petals; **Pet** white, yellow or red, or greenish, forming a tube, glabrous or pubescent in the throat; **St** 5 + 5, shorter (sub-) sessile, longer with free filaments; **Fil** glabrous or hairy; **female Inf** few- to 1-flowered; **Ov** 5-locular in the lower part; **Sty** present or absent; **Fr** berries, variously shaped.

This is the largest genus of the family, comprising 20 species plus the naturally occurring hybrid *V.  $\times$ pentagona* (Heilborn) Mabberley (= *V.  $\times$ heilbornii* (V. M. Badillo) V. M. Badillo). It is most diverse in NW South America (esp. Ecuador, Colombia and Chile), with a centre of diversity in the Andean valleys of Ecuador, where 16 species occur and locally form fertile hybrids (Kyndt & al. 2005: 1034). The ecology of the species spans the continuum from wet to

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U. Eggli (✉)  
Sukkulanten-Sammlung Zürich, Grün Stadt Zürich,  
Zürich, Switzerland  
e-mail: [Urs.Eggli@zuerich.ch](mailto:Urs.Eggli@zuerich.ch)

seasonally dry habitats. According to the molecular phylogeny of Carvalho & Renner (2012), *Vasconcellea* comprises 2 clades, a small clade of 4 species (incl. *C. chilensis*, *C. quercifolia*) and a larger clade with the remaining species (incl. *V. parviflora*).

For a long time, *Vasconcellea* was treated as synonym of *Carica* (as Sect. *Vasconcellea* (A. St. Hilaire) Hooker 1867), but Badillo (2000) accepted the taxon at generic rank, and subsequently also resolved the question of the correct spelling (Badillo 2001). Kubitzki (2002) supported this reclassification on morphological grounds, and the molecular studies of Kyndt & al. (2005), Carvalho & Renner (2012) and Sun & al. (2016: 380) confirmed a position completely separate from *Carica*, as sister to *Jacaratia*.

The majority of the species of *Vasconcellea* have comparatively massive trunks in relation to the crown, and at least minimal water storage capacity is probably universally present, esp. since flowering in the leafless state is reported for several species. A stem dry mass of 0.22 g/cm<sup>3</sup> is reported for *V. quercifolia* by Zanne & al. (2009) (cited from Kempe & al. 2013). In the treatment below, only the most clearly water-storing species are covered by way of example.

The flowers of most species of *Vasconcellea* correspond to the sphingophilous syndrome. Cerino & al. (2015) found species from the hawkmoth families *Arctiidae*, *Noctuidae* and *Pyrilidae* as flower visitors of the self-incompatible *V. quercifolia*. Only the male flowers offer nectar as a reward, while female flowers do not offer any reward and are pollinated by deceit. According to the results of Cerino & al. (2015), fruit set under natural conditions is low in this species, likely due to pollinator limitation, which is typical for deceit pollination systems.

The fruits of several species are used on a local level, and are eaten fresh, cooked or processed as juices, jam or preserves. The only species that currently are of commercial importance are *V. cundinamarcensis* V. M. Badillo, *V. pubescens* A. De Candolle (“Highland Papaya”, “Mountain Papaya”, “Papayuelo”) and esp. *V. ×pentagona* (“Babacao”; usually still referred to as *V. ×heilbornii*, but the former name has

nomenclatural priority; = *V. pubescens* × *V. stipulata* (V. M. Badillo) V. M. Badillo). The hybrid as well as *V. pubescens* and *V. cundinamarcensis* are cultivated throughout N South America. *V. pubescens* is esp. seen as extensive plantations in Chile, where its fruits are mostly marketed in the form of preserves or candies. Other species might also have potential for novel exotic fruit production (Scheldeman & al. 2011). Since at least *V. quercifolia* can be crossed with *Carica papaya* Linné, producing vigorous intergeneric hybrids, *Vasconcellea* could be used in *Carica* cultivar breeding (Drew & al. 2006, Scheldeman & al. 2011).

**V. chilensis** Planchon ex A. De Candolle (in De Candolle, Prodr. Syst. Regni Veg. 15(1): 416, 1864). **Type** [lecto]: Chile (Gay s.n. [P]). – **Lit**: Serra & al. (1986: conservation); Carrasco & al. (2014: conservation, genetics). **Distr**: C Chile (Región de Atacama, Región de Coquimbo, Región de Valparaíso: Huasco to Valparaíso); coastal cordillera, semi-arid stony valleys and hillsides, infrequent, to 700 (–1100) m. **I**: Muñoz Pizarro (1966: t. XLVI); Badillo (1971: t. 19); both as *Carica*; Scheldeman & al. (2011: 219).

≡ *Carica chilensis* (Planchon ex A. De Candolle) Solms (1889) ≡ *Papaya chilensis* (Planchon ex A. De Candolle) Kuntze (1891) (*incorrect name*, ICN Art. 11.4); **incl.** *Carica microcarpa* Gay (1846) (*nom. illeg.*, ICN Art. 53.1).

Deciduous shrubs to 1.5 (–4) m, stem somewhat pachycaul, to 8 cm Ø, with thickish branches with greyish to reddish smooth bark with conspicuous slightly raised leaf scars; **L** glabrous, petiole slender, 3–5 cm, lamina broadly triangular-ovate to suborbicular in outline, 2.5–8 cm Ø, with 3–5 main lobes which are irregularly lobed giving a total of 10–18 uneven rounded lobes; **Inf** contracted shortly pedunculate few-flowered racemes (male), or 1-flowered (female); **Fl** green to reddish; **male Fl** tubular, 6–11 mm, corolla tube 3.5–6 mm, outside sparsely pubescent to subglabrous, lobes 3–6 mm; **female Fl** tubular, ± 11 mm, glabrous; **Sty** indistinct; **Sti** ± 2 mm; **Fr** 1.8–2.4 (–4) × 1.2–1.8 cm, shortly pedunculate, obovoid,

pendent, dirty green to wine-red to violet; **Se** ellipsoid-fusiform, 5–6 (–7) × ± 2–3 mm, dirty yellowish with white blotches, smooth.

Individuals of *V. chilensis* occur highly scattered in coastal scrub, but it is unclear whether the low population densities are natural, or the result of grazing (Serra & al. 1986). According to Carrasco & al. (2014), only 3 populations remain due to relatively recent fragmentation.

**V. parviflora** A. De Candolle (Prodr. Syst. Regni Veg. 15(1): 417, 1864). **Type** [lecto]: Peru

(Ruiz & Pavón s.n. [G, FI, MA]). – **Distr**: W & SW Ecuador (Manabí, Los Ríos, Guayas, El Oro, Lojas), NW Peru (Tumbes, Piura, Lambayeque, La Libertad, Cajamarca, Huánuco, San Martín); Pacific Andean slopes, semi-arid and arid places, 100–1500 (–2000) m. **I**: Badillo (1971: t. 13); Badillo (1983: 35); both as *Carica*; Scheldeman & al. (2011: 222). – Fig. 1.

≡ *Carica parviflora* (A. De Candolle) Solms (1889) ≡ *Papaya parviflora* (A. De Candolle) Kuntze (1891) (*incorrect name*, ICN Art. 11.4); **incl.** *Carica paniculata* Spruce (1869) ≡ *Papaya*

**Fig. 1** *Vasconcellea parviflora* (cult. Sukkulanten-Sammlung Zürich; without known wild origin). (Copyright: U. Eggli)



*paniculata* (Spruce) Kuntze (1891) (*incorrect name*, ICN Art. 11.4); **incl.** *Carica leptantha* Harms (1922).

Deciduous shrubs or small trees to 3 m, frequently flowering when leafless, young plants with globose-elongate swelling at the stem base, bark greyish, smooth; **L** glabrous, petiole 8–20 cm, lamina 10–30 × 6–25 cm, narrowly ovate to suborbicular in outline, basally cordate, irregularly 3-, 5-, 7- or 9-lobed, the lower lobes sometimes overlapping, all lobes entire or again 3-lobed to pinnatlobed, acute to acuminate; **male Inf** lax or contracted, 1–12 cm pedunculate, often pinkish; **male Fl** rose-coloured, sessile to shortly pedicellate; **Pet** forming a tube 13 × 1 mm, lobes 4 × 1.7 mm; pistillode 3 mm; **female Inf** 2–4 cm pedunculate; **female Fl** rose-coloured, 4–7 mm pedicellate; **Pet** 20–25 mm, ascending-spreading; **Ov** narrowly ovoid, with 10 low ridges, 12 × 1–3.2 mm; **Fr** small, porrect, narrowly ovoid, 2–2.5 × 1–1.2 cm Ø, yellowish to orange or reddish, edible but taste sweet-sour; **Se** ovoid, 5–6 mm.

**V. quercifolia** A. St. Hilaire (Deux. Mém. Réséd., 13, 1837). **Type** [neo]: Argentina, Jujuy (Horovitz 1111 [MY, B, BH, G, MO, SI, VEN, W]). – **Lit**: Carlquist (1998: wood anatomy, as *Carica*); Cerino & al. (2015: reproductive biology). **Distr**: SE Peru (Apurimac, Cusco), C Bolivia (La Paz, Potosí, Chuquisaca,

Cochabamba, Santa Cruz, Tarija), Paraguay (Central, Alto Paraguay, Nueva Asunción, Paraguari, San Pedro), E to S Brazil (Bahia, Minas Gerais, Goiás, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul), Uruguay (Cerro Largo), N Argentina (Misiones, Corrientes, Formosa, Chaco, Santa Fé, Jujuy, Salta, Tucumán, N Catamarca); humid to semi-arid forests and esp. forest margins, lowlands to 3000 (–3600) m. **I**: Badillo (1971: t. 16); Novara (1992: 8–10); both as *Carica*; Scheldeman & al. (2011: 223). – Figs. 2 and 3.

≡ *Carica quercifolia* (A. St. Hilaire) Hieronymus (1882) ≡ *Papaya quercifolia* (A. St. Hilaire) Kuntze (1891) (*incorrect name*, ICN Art. 11.4); **incl.** *Carica hastata* Brignoli (1862) ≡ *Vasconcellosia hastata* (Brignoli) Caruel (1876); **incl.** *Vasconcellea lanceolata* A. De Candolle (1864) ≡ *Carica lanceolata* (A. De Candolle) Bentham & Hooker ex Hieronymus (1882) ≡ *Papaya lanceolata* (A. De Candolle) Kuntze (1891) (*incorrect name*, ICN Art. 11.4); **incl.** *Carica hastaefolia* hort. ex Solms (1889); **incl.** *Carica bonplandii* Hort. Paris ex Solms (1889) (*nom. inval.*, ICN Art. 36.1a); **incl.** *Papaya tunariensis* Kuntze (1898) (*incorrect name*, ICN Art. 11.4) ≡ *Carica tunariensis* (Kuntze) K. Schumann (1900); **incl.** *Carica acuta* Heilborn (1936).

Deciduous shrubs or little-branched trees, 3–8 (–15) m, trunk 10–35 (–60) cm Ø, often conically

**Fig. 2** *Vasconcellea quercifolia* (Bolivia; Potosí, Tupiza, Yana Orkho, 3300 m). (Copyright: M. Giorgetta)





**Fig. 3** *Vasconcellea quercifolia* (Bolivia; Potosí, Tupiza, Quebrada Palala, 3325 m; young fruits). (Copyright: M. Giorgetta)



tapering, rarely remaining short and lump-shaped, sometimes extending into thickened storage roots, bark smooth, peeling in small greenish-yellow, yellowish or ochre-coloured thin pieces; **Br** with well-visible closely-spaced leaf scars which become slightly raised; **L** very variable, glabrous, petiole 2–15 cm, lamina simple, to 30 (–40) × 4–15 (–22) cm, elongate-hastate, narrowly elliptic to variously rhombic, margin entire or lobed or serrate to dentate or variously incised, main vein well-developed, lateral veins inconspicuous; **male Inf** pendent, contracted-corymbiform, many-flowered, peduncle 5–15 cm; **male Fl** yellowish-green; **Pet** forming a tube ±12 mm long, lobes ±10 mm, recurved; pistillode sublute, 3–5 mm; **female Inf** 1- to 3- (to 4-) flowered, 3–6 cm; **female Fl** with rapidly caducous sepals; **Pet** ascending-spreading, to 15 × 3 mm, slightly thickish, greenish-yellow; **Ov** oblong, 5-costate, 7–8 × 3–4 mm; **Sti** lobes 2–5 mm; **Fr** obovoid, slightly apiculate, 2–5 (–8) × 2–3 cm, obtusely pentagonal, yellow to orange; **Se** ovoid, 4–5 × 2–3.5 mm.

This is an extremely variable taxon, esp. as to leaf form. Plants from lowland habitats have broad and lobed leaves reminiscent of oak leaves, hence the epithet. Plants from dry upland habitats, however, have leaves with much reduced lamina. The flowers appear towards the end of the dry season or early in the rainy season. They correspond to the

sphingophilous syndrome, and hawkmoths from the families *Arctiidae*, *Noctuidae* and *Pyrilidae* were found as flower visitors by Cerino & al. (2015). As for other taxa, only male flowers offer nectar as reward, and the female flowers are visited by deceit and do not offer any reward. The species can be successfully crossed with *Carica papaya* and the hybrids are vigorous and resistant against papaya ringspot virus (Drew & al. 2006).

The fruits are edible and are consumed fresh or made into preserves, or are used to produce a fermented beverage, at least in rural N Argentina (Novara 1992: 9).

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