

Piperaceae

Perennial or rarely annual herbs, shrubs or small trees, prostrate, erect, or scandent, terrestrial or epiphytic, often fleshy, aromatic (generally with globose ethereal oil cells in the parenchymatous tissue); **L** simple, alternate, opposite or whorled, entire, generally distinctly petiolate, rarely peltate, glabrous or pubescent, green or variously whitish or reddish patterned, stipules adnate to the petiole (*Piper*) or absent (*Peperomia*); **Inf** terminal, axillary or opposite the **L**, simple or compound fleshy spikes; **Ped** absent; **Fl** minute, bisexual or unisexual, each subtended by a small peltate bracteole; **Per** absent; **St** usually 2 - 4 or 6; **Fil** free or adnate to the base of the **Ov**, erect; **Anth** dehiscing laterally by longitudinal slits; **Ov** superior, sessile or stipitate, unilocular with a single basal ovule; **Sty** absent, 1, or as many as **St**; **Sti** 1 - 4; **Fr** drupaceous, fleshy or dry; **Se** with a tiny poorly differentiated embryo and with copious perisperm.

Distribution: Widespread in the tropics worldwide with centres of diversity in N South America, C America and Malaysia.

Literature: Miquel (1846); Candolle (1923); Trelease & Yuncker (1950); Tebbs (1993).

A large family of 2000 or more species, consisting of 2 ± equal-sized subgroups often treated as subfamilies *Piperoideae* and *Peperomioideae* (the latter occasionally treated as separate family *Peperomiaceae*). The majority of the species are placed in the genera *Piper* and *Peperomia*, respectively. Various satellite genera are recognized by different authors, resulting in a total of 8 - 15 genera.

Various species of *Piper* and *Peperomia* are cultivated as house-plants for their attractive, fleshy and often patterned foliage. The flowers are very insignificant. *Piper nigrum* is the source of white and black pepper.

The *Piperaceae* are noteworthy from a botanical viewpoint for various features that they share with the monocotyledons and which are rare in other dicotyledons. These are a basically 3-merous flower architecture, a vascular system in 2 circles or with scattered bundles, and inaperturate or monosulcate pollen (Burger 1977). [R. Nyffeler]

PEPEROMIA

R. Nyffeler & G. D. Rowley

Peperomia Ruiz & Pavón (Fl. Peruv. Prodr., 8, 1794). **T:** *Peperomia secunda* Ruiz & Pavón [Lectotype, designated by Britton, Fl. Bermuda, 94, 1918.]. – **Lit:** Dahlstedt (1900); Hill (1906); Hill (1907); Trelease (1922); Rauh (1960); Düll (1973);

McKendrick (1987); Argent (1989); Jaarsveld (1993); Verdcourt (1996); Rauh (1997). **D:** Pan-tropical but principally in the New World with centres of diversity in N South America and C America. **Etym:** Gr. 'peperi', pepper; and probably from Gr. 'homos, homoios', similar to; for the similarity to the genus *Piper* (*Piperaceae*).

Incl. *Troxirum* Rafinesque (1838). **T:** not typified.

Incl. *Micropiper* Miquel (1839). **T:** not typified.

Incl. *Tildenia* Miquel (1842). **T:** *Tildenia mexicana* Miquel.

Incl. *Verhuellia* Miquel (1843). **T:** not typified.

Perennial or rarely annual herbs, terrestrial or usually epiphytic, erect, prostrate, or scandent, sometimes geophytic with a tuberous rhizome; **R** fibrous, mostly weakly developed; stem elongate with distinct **Int**, often somewhat fleshy, or an underground tuber, with numerous scattered vascular bundles; **L** alternate, opposite or whorled, simple, usually petiolate, occasionally peltate, exstipulate, thin-textured to fleshy or distinctly succulent, glabrous or pubescent; **Inf** axillary, terminal, or opposite the **L**, simple or compound, with **Fl** scattered or densely crowded upon and partly sunken into the fleshy spike; **Fl** bisexual, subtended by 1 peltate glabrous bracteole; **St** 2; **Fil** short, erect, from the base of the **Ov**; **Anth** with 1 theca only, dehiscing laterally by longitudinal slits; **Ov** superior, sessile or rarely stipitate, unilocular with a single basal ovule; **Sti** sessile, apical or subapical, often fimbriate; **Fr** sessile or stipitate, variously shaped from globose to subcylindrical, smooth or more often verrucose, often viscid.

The genus is characterized by the herbaceous and often epiphytic habit, the exstipulate leaves with a multilayered upper epidermis, 2 stamens and 1-theous anthers, commonly inaperturate pollen, a 1-carpellate ovary with a single stigma, and unitegmic ovules. *Peperomia* comprises some 1000 species, but many are poorly known.

Many species have been introduced to cultivation in the course of time but have quite often soon again disappeared into obscurity. Most species of *Peperomia* grow in humid or moist areas, but a few are found in seasonally dry habitats, such as rocks and cliffs. Probably all species of *Peperomia* have a multiple epidermis on the upper face of the leaves. 2 trends in relation to adaptations to more xeric conditions are to be found in leaf morphology: Elaboration of the multiple epidermis to make up as much as 80% of the leaf volume and a reduction of the surface/volume ratio by producing subglobose windowed leaves (Kaul 1977). Several species adapted to dry habitats are grown as succulents.

For practical reasons, the species are arranged in 3 informal groups based on the shape of the lower leaf surface and the presence or absence of underground tubers:

[1] **L** thicker than wide and windowed on top (lower face convex)

- [2] Geophytes with the stem as underground tuber or globular rhizome; **L** peltate, deciduous.
 [3] **L** flat, at least as wide as thick:
 [3.1] **L** alternate.
 [3.2] At least some **L** opposite or whorled.

P. 'Cactusville' G. D. Rowley (Brit. Cact. Succ. J. 9(4): 98, ill., 1991).

[1] = *P. columella* × *P. nivalis* (?). Similar to a giant *P. columella* in habit, carpet-forming with decumbent **Br** ≥ 6 mm Ø, initially hidden by the **L** and to 5 cm Ø overall; **L** vertically compressed, hatchet-shaped to almost semiglobose, acuminate, densely packed, petiole to 3 mm, lamina to 2 cm, reflexed, pale green with darker window; **Inf** to 6 cm with up to 5 spikes subtended by minute **Bra**.

A vigorous chance hybrid favoured as indoor pot plant and for bowl gardens.

P. 'Werner Rauh' Hort. ISI ex L. Davis & al. (CSJA 58(2): 78, 1986).

[1] Chance hybrid between 2 Peruvian window-leaved species, *P. asperula* × *P. dolabriformis* (?), and intermediate in characters between them.

P. asperula Hutchison & Rauh (CSJA 47(5): 205, ill., 1975). **T**: Peru (*Hutchison & al.* 6121 [HEID]). – **D**: N Peru (Otuczo and Saña valleys); 700 - 2000 m. **I**: Rauh (1997: 30).

[1] Terrestrial sparsely branched upright shrublets 20 - 30 cm tall; **Br** ascending or erect, to 3 cm Ø; **L** alternate, somewhat congested near the **Br** tips, covered with papillate cells resulting in a distinct warty surface, petiole to 3 mm, lamina longitudinally folded to form a linear or narrowly elliptic window, 3.2 - 4.5 × 0.7 - 1 cm, 8 - 12 mm high, obovate in cross section, elliptic to obovate in lateral view, apically acute, basally rounded; **Inf** terminal, densely branched, to 20 cm; peduncle distinct; spike to 9 cm, ± 5 mm Ø, densely flowered; bracteoles rhomboidal; **Ov** sessile, ovoid, apically truncate; **Sti** sessile.

P. balansana C. De Candolle (Mém. Soc. Phys. Genève 27: 313, t. 10, 1882). – **D**: S Brazil, Paraguay, Argentina, Bolivia.

[3.1] Moderate-sized suberect glabrous herbs; **Br** 3 - 5 mm Ø, **Int** 2 - 6 cm; **L** alternate, petiole slender, 1.5 - 3 cm, lamina orbicular to ovate, 2.5 - 5.5 × 2.5 - 5 cm, tip obtuse, palmately 5- (to 7-) veined; **Inf** terminal or more rarely opposite the **L**; peduncle 2 - 3 cm; spike laxly flowered, 5 - 8 cm, 1 - 3 mm Ø; bracteoles round-peltate; **Fr** ovoid, to 0.8 mm long, with a subpedicellate base, apiculate, persistent **Sti** subapical.

P. carneifolia Yuncker (Lilloa 27: 193, 1953). **T**: Bolivia, Cochabamba (*Steinbach* 9587 [GH]). – **D**: Bolivia (Cochabamba).

[3.2] Glossy epiphytic herbs; **Br** lax, to 10 × 0.5

cm Ø, **Int** 1 - 3 cm, later to 10 cm, covered with **Ha** of different lengths to 1 mm; **L** in whorls of mostly 3 or 4, petiole 1 - 2 mm, lamina elliptic to obovate, 1 - 2 × 0.8 - 1.4 cm, 3 - 5 mm thick, obtuse or submarginate, with acute base, palmately 3-veined, loosely subvillous to glabrescent, with bristly **Ha** on margin near tip; **Inf** axillary; peduncle ± 8 mm, slender; spike 15 mm, 2 mm Ø.

Notable for the elongated stems, overall pubescence and the flat fleshy leaves.

P. claytonioides Kunth (Index Sem. Hort. Berol. 1847: 11, 1847). – **D**: Guatemala, El Salvador.

Incl. *Peperomia ovato-peltata* C. De Candolle (1866); **incl.** *Peperomia pinulana* C. De Candolle (1889) = *Peperomia claytonioides* var. *pinulana* (C. De Candolle) C. De Candolle ex Trelease (1922); **incl.** *Peperomia sciaphila* C. De Candolle (1896); **incl.** *Peperomia peltata* C. De Candolle (1898); **incl.** *Peperomia pedicellata* Dahlstedt (1900) (*nom. illeg.*, Art. 52.1); **incl.** *Peperomia claytonioides* var. *longiscapa* C. De Candolle ex Trelease (1922); **incl.** *Peperomia schizostachya* Trelease (1922).

[2] Small acaulescent herbs with a usually globose underground tuber; tuber 1 - 2 cm Ø; **R** from the upper part of the tuber near the **L**-bases; **L** clustered near the apex of the tuber, rather few (2 - 7), erect, peltate, petiole 4 - 15 cm, filiform, lamina 3 - 9 × 2 - 6.5 cm, ovate, apically acuminate, basally round or subcordate, 7- to 9-veined, glabrous; **Inf** compound or rarely simple, with 2 - 3 spikes borne close together at the apex; peduncle 6 - 20 cm, glabrous; spikes 1 - 6 cm, rather few-flowered; bracteoles 0.5 - 1 mm, oblong, acuminate; **Fr** sessile, ellipsoid or narrowly ovoid, tapering above, smooth.

Closely related to *P. gracillima* but differing in the larger and slightly differently shaped leaves and larger and compound inflorescences.

P. columella Rauh & Hutchison (CSJA 45(4): 152-156, ill., 1973). **T**: Peru, Amazonas (*Hutchison & Wright* 4015 [UC, USM]). – **D**: C Peru. **I**: Rauh (1997: 14-15). **Fig. LV.a**

[1] Terrestrial densely branched bushy subshrubs to 20 cm tall; **Br** ascending, round, fleshy, to 1 cm Ø; **L** alternate, sessile, densely packed along the **Br**, lamina peltate below the middle and folded longitudinally to form a broad linear window, 8 - 12 × 5 - 8 mm, 6 mm high, depressed-obovate in cross section, ovate in lateral view, apically acuminate or acute, basally rounded, glabrous, smooth, margin with bladder cells; **Inf** short with 2 - 3 (-5) **Br**; spike subsessile, 10 - 18 × to 3 mm Ø, densely flowered; bracteoles round; **Ov** obovoid; **Sti** sessile.

P. pruinosa appears to be very similar and would have priority should it be necessary to combine the two.

P. congesta Kunth (in Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 1: 68, t. 14, 1815). **T**: Peru,

Piura (*Bonpland* s.n. [P]). – **D:** Peru (Piura: Río Chuchancanao to Huancabamba); vertical cliffs in full sun. **I:** Rauh (1997: 8). **Fig. LV.c**

Incl. *Peperomia rauhii* Hort. Heidelberg (s.a.) (*nom. inval.*, Art. 29.1).

[3.2] Robust erect subshrubs sparingly branched near ground-level, glabrous, to 60 cm tall; **Br** to 2 cm Ø at base, tapering to 5 mm, pale green, leafy throughout; **Int** ± 2 cm; **L** in whorls of (3-) 4 (-7), petiole 5 mm, lamina ovate to lanceolate, 2.5 - 4 × 1.5 - 2 cm, ± 2 mm thick, cup-shaped or crescent-like in cross-section, firm, leathery, dark green, minutely white-waxy spotted; **Inf** terminal, subpaniculate, much branched, 5 - 8 cm; peduncle 5 mm long; spikes verticillate, spreading, 25 mm, 1 mm Ø.

P. cotyledon Benth (Pl. Hartw., 148, 1844). **T:** Ecuador, Pichincha (*Hartweg* 833 [P, G, K]). – **D:** Ecuador.

[2] Moderately small glabrous acaulescent herbs with a short scaly tuberous rhizome; **L** alternate, basally clustered, peltate, petioles to 9 cm, minutely puberulent, lamina round or ovate, 3 - 5 × 3 - 5 cm, 3- to 7-veined; **Inf** mostly compound, paniculate; peduncles 10 - 30 cm tall with few subverticillate **Bra**; spikes to 1 cm, ± 1 mm Ø, densely flowered; bracteoles round-peltate; **Ov** obovoid; **Sti** apical.

P. doellii Philippi (Fl. Atacam., 49, 1860). – **D:** N-C Chile; coastal fog-dependent scrub. **I:** Prickly Paragraphs 70: 20, 1984.

[3.2] Erect or spreading subshrubs to 45 cm tall, sparingly branched, finely velvety; **Br** to 20 cm; **L** in whorls of 3 - 4 (-5), petiole ± 1 mm, lamina ovate to obovate or almost spatulate, 7 - 14 × 3 - 8 mm, thick and fleshy, tip ± rounded, base acute, 3- to 5-veined, reddish below; **Inf** terminal and from upper **L** axils; peduncle 1 - 2 cm, glabrous; spike 6 - 14 cm, 1 mm Ø; bracteoles round-peltate; **Fr** subglobose, to 0.8 mm Ø, apex oblique; persisting **Sti** subapical.

P. dolabella Rauh & Kimmach (CSJA 59(1): 3-8, ill., 1987). **T:** Peru, Cajamarca (*Kimmach & al.* 2895b [HEID, HNT]). – **D:** N Peru (Cajamarca). **I:** Rauh (1997: 24). **Fig. LV.b**

[2] Small acaulescent or subacaulescent herbs with a usually globose or flattened underground tuber; tuber 2 - 3 (-5) cm Ø; **R** from the basal ½ of the tuber; **L** in clusters near the apex of the tuber, rather few, erect, asymmetrically peltate and folded longitudinally to form a narrow linear window of 7 × 1.5 mm, petiole 1 - 2.5 cm, filiform, lamina 7 × 5 mm in lateral view, ovate, apically truncate or rounded, basally tapering into the petiole, glabrous; **Inf** simple; peduncle 2.5 - 3 cm, 1.5 mm Ø, glabrous; spike 1.5 - 3 cm, 2 - 4 mm Ø, few-flowered; bracteoles ovate, distinctly acuminate; **Fil** very short;

Ov sessile, globose, smooth, with a cushion-like **Sty**; **Sti** sessile.

P. dolabriformis Kunth (in Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 1: 60, pl. 4, 1815). **T:** Peru, Piura (*Bonpland* s.n. [not located]). – **D:** N Peru; 600 - 1200 m. **I:** Rauh (1997: 4, 14, 20, 22).

≡ *Piper dolabriforme* (Kunth) Poir (1816); **incl.** *Peperomia dolabriformis* var. *velutina* Trelease (1936); **incl.** *Peperomia dolabriformis* var. *confertifolia* Yuncker (1961); **incl.** *Peperomia dolabriformis* var. *brachyphylla* Rauh (1978).

[1] Terrestrial upright laxly branched shrublets to 60 cm tall; **Br** to 2.5 cm Ø, glabrous, at first green, later brownish with horizontal **L** scars; **L** alternate, sessile, somewhat crowded near the **Br** tips, lamina longitudinally folded with a narrowly oblong window, 2.8 - 5 × 0.6 - 1.2 cm, 1 - 1.4 cm thick, narrowly obovate in lateral view, cross-section elliptic to almost circular but apically mucronate, glabrous, smooth, pale green; **Inf** terminal, to 40 cm, branched, with scattered small **Bra**; peduncle to 1.2 cm, partly branched; spike to 6 cm, 1.5 - 2 mm Ø, densely flowered; bracteoles peltate, round; **Ov** immersed into the rachis.

P. ferreyrae Yuncker (Amer. J. Bot. 43: 168, 1956). **T:** Peru, Amazonas (*Ferreyra* 7592 [US]). – **D:** Peru (Amazonas).

[1] Epiphytic erect uniformly pale green shrublets to 30 cm tall; **Br** stiffly erect, to 1.5 cm Ø at base, with large brownish **L** scars; **Br** scattered, 3 - 5 mm Ø, leafy in upper ½; **L** alternate, petiole indistinct, lamina longitudinally folded with a shiny grooved window, 4 - 7 cm × 3 - 4 mm, 4 - 6 mm high, linear in lateral view; **Inf** narrow elongated terminal panicles to 15 cm; peduncle 2 - 4 mm long; spike 20 - 35 cm, 1 mm Ø, in groups of 1 - 3; bracteoles round-peltate; **Ov** ovoid; **Sti** subapical.

Similar to *P. dolabriformis*, but with much shallower leaves with a grooved upper face.

P. flexicaulis Wawra (Österr. Bot. Zeitschr. 12: 240, 1862). **T:** Brazil, Bahia (*Anonymus* s.n. [not located]). – **D:** Brazil (Bahia). **I:** Prickly Paragraphs 70: 20, 1984.

Incl. *Peperomia flexicaulis* var. *microphylla* Wawra (1866).

[3.1] Erect herbs, stoloniferous and laxly branching from the base, glabrous; **Br** to 25 cm, 2 - 4 mm Ø, zigzag, purple; **L** alternate, petiole to 5 mm, lamina oblanceolate, 15 - 30 × 8 - 15 mm, fleshy, crescent-shaped in cross-section, acute, dark green above, purple and 3- to 5-veined beneath; **Inf** terminal or axillary, solitary, 15 - 18 cm; peduncle ± 8 cm; spike ± 3 mm Ø, pale reddish; bracteoles round-peltate. – *Cytology*: 2n = 44.

The zigzag stems and the purple colouring are distinctive.

Illustrated Handbook of Succulent Plants:

Monocotyledons

Eggli, U. (Ed.)

2001, XIV, 354 p. 32 illus. in color., Hardcover

ISBN: 978-3-540-41692-0