

# ORCHIDACEAE

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A cosmopolitan family of herbaceous perennials, terrestrial, epiphytic or rupicolous, rarely subterranean, semiaquatic or root-climbing vines. There are 728 recognized genera and ~29,000 species of Orchidaceae worldwide, with 488 genera and ~12,983 species in the Neotropics (Ulloa-Ulloa et al. 2017). Of these, only 73 species are vine-like plants, most of which belong to the genus *Vanilla* in the subfamily Vanilloideae. These orchids occupy a broad range of habitats from dry to wet forests and from near sea level to montane cloud forests.

**Diagnosics:** Plants herbaceous with velamentous roots; flowers epigynous, bilaterally symmetrical, androecium of 1 stamen (in ours) fused to the style and stigma to form a column (gynostemium), pollen of sticky monads, or aggregated into pollinia, often with secondary structures that serve to attach the pollinia to pollinators, fruits dehiscent or indehiscent, berries (rare) or capsules; seeds 100–3,000,000 per capsule, lack endosperm.

## General Characters

1. **ROOTS.** Adventitious, thick and velamentous, villous where in contact with substrate; aerial roots white to grey green; some cortical cells infected by fungal pelotons from the form genus, *Rhizoctonia* (Basidiomycota, mostly of the families Ceratobasidiaceae, Tulasnellaceae, and Sebacinaceae).
2. **STEMS.** Stems are cylindrical, bright green to olive green, herbaceous, succulent though they can be very tough, and growth is either monopodial or sympodial. Stems may be leafy or leafless. *Vanilla* are vines in the traditional sense and can be many meters long. Shoots of sympodial species often have pseudobulbs (swollen stems) comprised primarily of either one internode (heteroblastic), or of several more or less equal internodes (homoblastic).

3. EXUDATES. The presence of exudates is unknown, although there is some evidence that seeds may produce them to attract mycorrhizal fungi. The stems of some species of *Vanilla* are known to produce conspicuous watery sap, which sometimes can be caustic.
4. CLIMBING MECHANISM. Most climbing Orchids have adventitious roots (root-climbers) that help them climb and affix to a supporting structure or phorophyte (Figure 28C); these are either produced at the nodal area of stems or along elongate rhizomes. A few species climb through the aid of twining rhizomes (considered by some as twining inflorescences) that produce leafy shoots at some nodes.
5. LEAVES. Leaves are early deciduous or persistent, sessile or petiolate, sheathing or not, simple, entire, coriaceous, thin to thick, plicate to conduplicate; exstipulate
6. INFLORESCENCES. Inflorescences are indeterminate, racemose.
7. FLOWERS. Flowers have bilateral symmetry, are epigenous and 3-merous; the three sepals are usually similar, the lateral sometimes connate; lateral petals are similar, the median petal modified to form a lip (labellum) which is usually lowermost due to 180° twisting of the ovary, often differently colored from the other perianth parts and adorned with ridges, callosities and/or hairs; the column can be very short to elongate, the anther may be stalked or sessile, extending beyond the stigma and separated from it by a sterile stigma lobe, the rostellum; pollinia are monads, and sticky in *Vanilla*, while other genera have pollen in tetrads and aggregated into hard pollinia with accessory structures (viscidium, caudicles, and/or stipe) that are involved in pollinia attachment to a pollinator. The entire pollinia attachment apparatus is a pollinarium.
8. FRUITS. Fruits are dehiscent capsules or elongate berries in some *Vanilla*.

9. SEEDS are minute and numerous, lack endosperm, embryo globular to somewhat ellipsoidal. In *Vanilla*, the seeds are black, having a sclerotic seed coat and are somewhat globose. Other genera have dust-like, wind-dispersed seeds that vary in color from yellow to orange, and light to dark brown with a transparent seed coat revealing the embryo within, easily seen under 40× magnification.

## USES

*Vanilla planifolia* Andrews is renowned for the production of vanilla extract. Madagascar is the leading producer globally, but southern Mexico has been the traditional region for vanilla production since pre-Columbian times. The extracts are made from cured fruits, which are commonly referred to as "beans" and vary in flavor profile by region. Extracts from Mexico are most compatible for blending with chocolate and cinnamon, as well as coffee-flavored liqueurs. In Mexico, cured vanilla beans are woven into figurines, sold in local markets, and placed in closets, drawers, or hung in homes as insect repellents and deodorizers. The species was used as an herb for the treatment of hysteria, fevers, impotence, rheumatism and to increase muscular energy. *Vanilla dilloniana* Correll in the Dominican Republic has been used medicinally for anorexia (Teoh 2019).

### Key to genera of climbing Orchidaceae

1. Monopodial growth habit; stems uniformly thick, non-pseudobulbous, leafy or leafless; leaves when present, distichous, distant, lacking sheaths ..... ***Vanilla***
1. Sympodial growth habit; shoots leafy and associated with pseudobulbs; leaves apical, 1 or 2. .2

2. Plants terrestrial, when mature, rhizome elongates, climbing up by twining; leaves 1, foliaceous, long-petiolate, blade somewhat plicate ..... *Koellensteinia*

2. Plants epiphytic, root-climbers; leaves sessile, blades conduplicate ..... *Otoglossum*

**KOELLENSTEINIA** H. G. Reichenbach, Bonplandia 2: 17. 1854.

Terrestrial to epiphytic herbs or rarely vine-like with twining rhizomes with adventitious



*Koellensteinia spiralis*, photo by A. Popovkin.

roots. Shoots pseudobulbous, often rudimentary. Leaves petiolate; blades membranous to subcoriaceous, plicate. Inflorescence racemose, rarely branched. Flowers mostly resupinate, sepals and petals free, lip articulate with the column foot, trilobed, mid lobe the largest, disc with a retrorse bilobed callus. Column strait with a distinct foot; pollinia 4, of 2 unequal pairs, attached to a stipe and a cordiform viscidium. Fruits capsular.

**Distinctive features:** Terrestrial with vine-like twining rhizomes which occasionally produce shoots at nodes, flowering occurring in the canopy. Pseudobulbs small, partially concealed by bracts.

**Distribution:** A genus of 19 species distributed from southern Mexico to Colombia, Venezuela, Guyana, Suriname, French Guiana and Brazil. However, only one species has vine-like traits, *K. spiralis* Gomes Ferreira & L.C. Menezes, a species of Bahia, Brazil.

**OTOGLOSSUM** (Schlechter) Garay & Dunsterville, Venezuelan Orchids Illustrated 6:41. 1976.

Epiphytic, sympodial herbs securing to tree branches by their roots. Roots velamentous,



*Otoglossum globuliferum*, photo by D. Haelterman.

from base of pseudobulbs.

Rhizomes elongate; pseudobulbs distant, ancipitous. Leaves apical and lateral, 3, sessile, articulate and eventually deciduous, blades conduplicate, coriaceous.

Inflorescences 1–2, lateral, single-flowered or racemose with few to many flowers. Flowers resupinate, spurless, yellow with reddish

brown spots; sepals and petals similar, free, obovate; lip trilobed, lateral lobes smaller than mid lobe, callus tuberculate, glistening pad; column strait, wings flanking the stigma; anther with 2 ovoid pollinia attached to a stipe and viscidium. Ovary glabrous; capsule triangular in cross section.

**Distinctive features:** Rhizome elongate, often wiry. Shoots distant, pseudobulbs laterally compressed, small. Leaves arranged fan-like. Flowers with yellow to reddish brown sepals and lateral petals, lip mostly yellow, flabellate with a multi-pronged callus.

**Distribution:** A genus of ~25 epiphytic species, ~12 of which have a vine-like habit. Some authors segregate these species into the genus *Brevilongium* E.A. Christenson. *Otoglossum* ranges from Costa Rica to South America (Venezuela, Colombia, Ecuador, Peru, Bolivia and Brazil).



**Figure 28.** *Vanilla*. **A.** Inflorescence of *V. poiteae*. **B.** *Vanilla* sp. root-climbing with long hanging branches. **C.** *Vanilla* sp. root-climber, adventitious roots produced at the nodal area. Photos: A. by J. Ackerman; B, C by P. Acevedo.

**VANILLA** Plumier ex Miller, Gardener's Dictionary Abridged, ed. 4, 28. 1754.

Herbaceous, monopodial, terrestrial, hemi-epiphytic vines, commonly reaching 10 or more m in length and securing to woody substrates by their aerial roots. Roots solitary from each node (Figure 28C), often villous when in contact with the substrate. Stems green to ochre colored, wiry to thick and fleshy, sparsely branched. Leaves bract-like and early deciduous, or persistent and fleshy to coriaceous, linear to broadly elliptical. Inflorescences short-pedunculate, racemose. Flowers produced in succession, large, showy, ephemeral, resupinate, sepals and petals free, lip adnate to the base of the column, disc variously ornamented. Column elongate, footless, pollinia soft, composed of monads, lacking accessory structures. Fruits fleshy berries or capsules, elongate; seeds black, numerous, minute, seed coat sclerotic.

**Distinctive features:** Succulent vines many meters long, leafy or leafless, rooting from the nodes. Flowers ephemeral, large, showy, sepals and petals similarly colored, lip differently colored, at least in the throat, gullet-shaped, often with tuberculate hairs or a tuft of stiff scales. Fruits fleshy, elongated. Seeds black.

**Distribution:** A pantropical genus of ~130 species, 70 of which are in the Neotropics; dry to wet forest; 0–500 (2,500) m. *Vanilla planifolia* Jackson is commercially grown as a source of vanilla “beans” and extract.