

# Canellaceae

The **Canellaceae** are a family of flowering plants in the order Canellales.<sup>[3]</sup> The order includes only one other family, the Winteraceae.<sup>[4]</sup> Canellaceae is native to the Afrotropic and Neotropic ecozones. They are small to medium trees, rarely shrubs, evergreen and aromatic.<sup>[5]</sup> The flowers and fruit are often red.

Several species of Canellaceae are important in herbal medicine or as a substitute for cinnamon. *Canella winterana* is the only species known in cultivation.<sup>[6]</sup>

The family is divided into five genera,<sup>[7]</sup> but studies of DNA sequences have indicated one of these genera should be split.<sup>[8]</sup> These genera together comprise about 25 species. In the Greater Antilles, many of these species are rare and restricted to small ranges. As of 2008, five of the species were newly recognized and not yet named.<sup>[8]</sup>

## 1 Description

The following description is almost entirely from three sources,<sup>[7][8][9]</sup> but with some information from previous versions of the article.

- These trees, rarely shrubs, are evergreen and glabrous.
- The stems have nodes with three (rarely two) leaf gaps and three leaf traces. The xylem has narrow rays. The bark is aromatic, with prominent and unusual appearing lenticels.
- The leaves have a peppery taste, are alternate, spiral, or distichous in arrangement, simple, entire, coriaceous, petiolate, pinnately nerved, without stipules, with translucent (pellucid) glands. The parenchyma is without palisade layer in *Pleodendron* and *Canella*. The stomata are paracytic in American genera, and anomocytic in the Old World.
- The inflorescences are terminal or axillary, in a panicle (*Canella*) or a raceme; otherwise, the flowers are solitary (by reduction) and axillary.
- The flowers are actinomorphic, hypogynous, and usually trimerous. The receptacles are barely excavated, and the hypogynous disc is absent.
- The three (rarely 2) sepals are thick, coriaceous, and imbricate.

- The petals number (4-)5-12, in 1-2 (–4) unlike whorls or spirally arranged, slender, imbricate in bud, usually free (connate at the base in *Canella* and halfway to the apex in *Cinnamosma*).
- The androecium is monadelphous, adnate to the ovary. Stamens number 6-12, apparently derived from the fusion of two whorls in *Warburgia* and *Canella*. Anthers are extrorse and bithecal, with two sporangia per theca, attached to the outside of the staminal tube, and sessile; dehiscence is by a longitudinal slit, connective not projecting beyond thecae or only slightly so.
- The gynoecium is syncarpous. The ovary has two to six carpels, unilocular and superior. The style is short and thick; the stigma is apical and capitate, with two to six lobes. Placentation is parietal. Ovules number from two to many in one or two rows on each of the two to six placentas; they are hemianatropous to campylotropous, bitegmic, and crassinucellate.
- The fruit is a berry with a persistent calyx, with two or more seeds. *Cinnamosma macrocarpa*, in the Madagascan genus *Cinnamosma*, has the largest fruit in the family, sometimes reaching 6 cm (2.4 in) by 9 cm (3.5 in).
- Seeds have exotestae (the outer layer of the testa) only; the tegmen (the inner layer of the testa) is collapsed. The seed coat has oily idioblasts; the endosperm is abundant and oily (ruminant in *Cinnamosma*). The embryo is small and straight to slightly curved, with two cotyledons.
- Pollen occurs in monads, and is delicate and monosulcate (usually with 10% of the grain trichotomosulcate); apertures are distal, exine, generally tectate, and granular, intectate, and reticulate in *Cinnamosma*; grains are small and hardly ornamented in *Cinnamodendron* and *Warburgia*, largest and most highly decorated in *Canella* and *Pleodendron*. The pollen is generally similar to that of the Myristicaceae, which had at one time caused some systematists to believe the two families were closely related.
- The chromosome number  $2n$  is 22, 26, or 28.<sup>[10]</sup>

Synapomorphies for Canellaceae include monadelphous stamens, parietal placentation, and campylotropous ovules.<sup>[8]</sup>

Other notable traits include the conspicuous lenticels, the aromatic bark, the peppery taste of the leaves, the three (rarely two) fleshy sepals, and the berry with reniform seeds.<sup>[8]</sup>

Some sources indicate *Cinnamodendron* has 20-40 stamens, contrary to the sources that are regarded here as reliable. The very large stamen numbers (20 to 40), are probably counts of thecae or microsporangia.

## 2 Ecology

Canellaceae has species in both xeric and wet forests.

In *Canella winterana*, the flowers are protogynous. The berries are usually red, and probably eaten by birds, which contribute to seed dispersal (ornithochory). The trees are attacked by larvae of different insects, including dipterans.

## 3 Phytochemistry



Fruit of *Canella winterana*, at Pointe des Châteaux, Guadeloupe, October 2008



Flowers of *C. winterana*, at Pointe des Châteaux, Guadeloupe, October 2008

Monoterpenes are common, as are drimane-type sesquiterpenes, including cinnafragrins, cinnamodial, and capsicodendrin. These three sesquiterpenes are shared with only the Winteraceae in angiosperms. Canellaceae also have alkaloids of the aporphine type, such as *N*-(cinnamoil)-tryptamine, lignans of the aryl-tetralin type, cinnamaldehydes, and allylphenols. Crystals of calcium oxalate are in the leaf mesophyll. Most species are cyanogenetic. Protocyanidins, flavonols, saponins, sapogenins, and ellagic acid are absent.

## 4 Uses

The saro, or green sandalwood, (also known locally as *mandravasarotra*), *Cinnamosma fragrans*, is native to Madagascar and is exported from there to India to be burned in ceremonies. It is not related to the true sandalwoods, which are in the family Santalaceae.

Most species of Canellaceae produce bark that is similar in odor and flavor to cinnamon, but they are not related to true cinnamons, which are in the family Lauraceae.

The white cinnamon, *Canella winterana*, a native of Florida and the Antilles, is used as a condiment, with tonic properties.

Commercial production of “white cinnamon” from *C. winterana* has ceased,<sup>[11]</sup> but small-scale, local production continues. The Canellaceae have long had local use as aromatic plants and as herbal medicines.

The bark of the red cinnamon or false Winter’s bark, *Cinnamodendron corticosum*, is used as a substitute for Winter’s bark (*Drimys winteri*, a member of Winteraceae) in Chile and Argentina, where it is called *canelo*, a name that is also applied to cinnamon. In Africa, several species of *Warburgia* have medicinal uses. The barks of *Warburgia salutaris* and *Warburgia ugandensis* are used to treat fevers, colds, and malaria. Other species are used for timber or in the production of resins used as glue.

## 5 Fossils

Fossil leaves of *Canella* are known from the Pliocene of Bahia (Brazil). Pollen of *Pleodendron* is known from the Oligocene of Puerto Rico.

## 6 Systematic position

Depending on the classification system and the characters considered, Canellaceae has been placed close to Annonaceae, Myristicaceae or Winteraceae.<sup>[5]</sup> In his last book, Armen Takhtajan defined the order Canellales as consisting of Canellaceae and Winteraceae.<sup>[9]</sup> This

circumscription is followed in the APG III system, in which the order Canellales is sister to another small order, the Piperales.

*Warburgia*  
Engl., 1895,  
eastern and  
southern Africa

## 7 Included taxa

### *Theoretical introduction to Taxonomy*

In this article, the genus *Capsicodendron* is maintained in synonymy with *Cinnamodendron*, although preliminary molecular phylogenetic studies separate *Capsicodendron* from *Cinnamodendron* and place *Capsicodendron* closer to *Cinnamosma* and *Warburgia* than to *Cinnamodendron*. This placement is not corroborated by morphology. The currently recognized genera in Canellaceae can be distinguished as follows:<sup>[8]</sup>

- Petals fused into a tube to the middle of their length

*Cinnamosma* Baill., 1867, Madagascar

- Petals free or slightly connate at the base

\* Petals 5, slightly connate at the base, inflorescence a terminal panicle

*Canella* P. Browne, 1757, Florida, Antilles, northern South America

\* Petals 6-12, free, flowers solitary, terminal or axillary, or in axillary inflorescences

\* Petals 12, in 3-4 whorls, stamens 12, carpels 6

*Pleodendron* Tiegh., 1899, Greater Antilles, Costa Rica

\* Petals 6-10, in two whorls, stamens 6-10, carpels 2-5(-6)

\* Petals 6-10, stamens 6-10, carpels 2-4(-6), leaves elliptic to obovate, ripe fruit up to 2 cm in length

*Cinnamodendron* Endl., 1840 (including *Capsicodendron* Hoehne, 1933), Greater Antilles to southern Brazil

\* Petals 10, stamens 10, carpels 5, leaves oblanceolate-spatulate to elongate, ripe fruit 3-6 cm long

## 8 History

*Canella winterana* was an important medicinal plant of the natives of the American tropics, and it was soon adopted as such by the Europeans, as well. Dr. Diego Álvarez Chanca accompanied Christopher Columbus on his second voyage, after which he wrote of a cinnamon (*canela* in Spanish) which was unlike any of the species of cinnamon used in Europe.<sup>[12]</sup> He had probably reported the use of *C. winterana*.<sup>[8]</sup>

In 1737, in his *Hortus Cliffortianus*, Linnaeus combined *Canella* with *Drimys*, a genus now in Winteraceae, and *Cinnamomum*, now in Lauraceae, to form a taxon which he called *Winterania*.<sup>[13]</sup> In 1753, in the first edition of *Species Plantarum*, Linnaeus divided *Winterania* into four species.<sup>[14]</sup> Three of these are now in *Cinnamomum*, and the fourth, which he called *Laurus winterana*, consisted of what are now *Canella winterana* and *Drimys winteri*. These four species were included in a broadly defined *Laurus*.

In 1756, Patrick Browne applied the name *Canella* to the species now known as *Canella winterana*.<sup>[15]</sup> He did not add a specific epithet to create a binomial.<sup>[16]</sup> The generic name is derived from *canela*, the Spanish word for cinnamon, but the Spanish word is derived from the Latin *canna*, meaning “a reed”, or from the related Greek *kanna*, which refers to a piece of rolled bark.<sup>[17]</sup>

The genus *Canella* was not adopted by Linnaeus, who resurrected *Winterania* in the second edition of *Species Plantarum* in 1762.<sup>[18]</sup> He assigned to *Winterania* a single species, *Winterania canella*, which was equivalent to the species he had previously called *Laurus winterana*.

In 1784, Johan Andreas Murray divided *Winterania* into two monospecific genera, the constituent species of which were *Canella alba* and *Wintera aromatica*.<sup>[19]</sup> The name *Canella alba* was validated by Murray in 1784,<sup>[15]</sup> but it had long been in use. Linnaeus attributed the name to Samuel Dale, who used it in his *Pharmacologia*,<sup>[13]</sup> the first edition of which was published in 1693.<sup>[20]</sup> Patrick Browne mentions its use by Mark Catesby.<sup>[16]</sup> *Canella alba* was renamed as *Canella winterana* by Joseph Gaertner in 1788 in his classic work *De Fructibus et Seminibus Plantarum (The Fruits and Seeds of Plants)*.<sup>[21]</sup> The name change was required by the rules of botanical nomenclature. *Wintera aromatica* is now known as *Drimys winteri* and is in the family Winteraceae.

The family Canellaceae was established by Carl von Martius in 1832 and was defined as consisting of only the genus *Canella*.<sup>[22][23]</sup> Stephan Endlicher divided *Canella* in 1840, creating the new genus *Cinnamodendron*. *Cin-*

*namosma* was erected in 1867, *Warburgia* in 1895, and *Pleodendron* in 1899. *Capsicodendron* was erected in 1933. Some authors accept *Capsicodendron* and assign to it two species, *Capsicodendron pimenteira* and *Capsicodendron dinisii*.<sup>[11]</sup> Other authors subsume *Capsicodendron* into *Cinnamodendron* and *C. pimenteira* into *C. dinisii*.<sup>[8]</sup>

Molecular phylogenetic studies of DNA sequences have shown *Cinnamodendron*, as traditionally circumscribed, is polyphyletic, consisting of two distinct groups.<sup>[8]</sup> These groups are morphologically different and their ranges do not overlap.

One of these groups is related to the African genera *Cinnamosma* and *Warburgia*, and might be paraphyletic over them. It consists of eight species, one of which was named in 2005.<sup>[24]</sup> Two other species in this group have not been formally named and described in the scientific literature.<sup>[8]</sup> This group is restricted to South America. Since it includes the type species, *Cinnamodendron axillare*, it will retain the name *Cinnamodendron*.

The other group of *Cinnamodendron* species is most closely related to *Pleodendron* and is restricted to the Greater Antilles. It consists of six species, two of which remain unnamed.<sup>[8]</sup> The name *Antillodendron* has been proposed for this group, but this name is considered by some to be invalid because it was not effectively published.<sup>[25]</sup>

## 9 References

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## 10 External links

### 10.1 Pictures

- Flowers of *Cinnamosma madagascariensis*
- Flowers of *Canella winterana*
- *Warburgia salutaris* in fruit
- Flowers of *Cinnamodendron ekmanii*

### 10.2 Words

- Neotropical Canellaceae At: Family Index At: Neotropikey At: Projects and Programmes At: Tropical America Project At: Kew in depth At: Scientific Research and Data At: Kew Gardens
- List of Genera in Canellaceae At: Dicotyledons At: List Genera within a Family At: Vascular Plant Families and Genera At: About the Checklist At: World Checklist of Selected Plant Families At: Data Sources At: ePIC At: Scientific Databases At: Kew Gardens
- List of Genera in Canellaceae At: Canellaceae At: List of families At: Families and Genera in GRIN At: Queries At: GRIN taxonomy for plants

- *Canella winterana* At: *Canella* At: Canellaceae At: Canellales At: Magnoliids At: Magnoliophyta (flowering plants) ... In: ... Embryophyta At: Streptophytina At: Streptophyta At: Viridiplantae At: Eukaryota At: Taxonomy At: UniProt
- Canellaceae In: Volume 3 At: Family List At: FNA (Flora of North America) At: eFloras
- Canellaceae In: Leslie Watson and Michael J. Dallwitz (1992 onwards), *The families of flowering plants*
- NCBI Taxonomy Browser: Cannellaceae
- Distribution Map And Genus List At: Canellaceae At: Canellales At: Trees At: APweb At: botanical databases At: About Science & Conservation At: Missouri Botanical Garden
- page xxxvii In: *Flowering Plants* (Takhtajan)
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- page 488 In: *Hortus Cliffortianus* At: View Record for title 2450 At: Titles/H At: Titles At: Biodiversity Heritage Library
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- page 636 In: *Species Plantarum* 2nd edition, volume 1 At: View Record for title 26 At: Titles by Carl von Linné (1707-1778) At: Authors / L At: Authors At: Biodiversity Heritage Library
- Canella on page 443 And Wintera on page 507 In: Systema Vegetabilium (1784) At: View Record At: Titles by Johann Andreas Murray Or Titles by Johan Anders Murray At: Authors/M At: Authors At: Biodiversity Heritage Library
- page 373 And page 374 In: *De Fructibus et Seminibus Plantarum* At: Joseph Gaertner At: Author List At: Botanicus Digital Library
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- page 168 Of *Nova genera et species plantarum*, vol. 3 At: [View Record for title 12](#) At: [Titles by Karl Friedrich Philipp von Martius](#) At: [Authors](#) At: [Biodiversity Heritage Library](#)
- *Antilodendron* (search exact) At: [Name Search](#) At: [Tropicos](#) At: [About Science and Conservation](#) At: [Missouri Botanical Garden](#)

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