The Laurales are an order of flowering plants comprising seven families that contain some 2500–2800 species in 100 genera. Most Laurales are tropical trees or shrubs, often with scented wood of great durability. Besides being a source of high quality timber, the Laurales also include the avocado tree (*Persea americana*), a native of Mexico and Central America, the cinnamon tree and the camphor tree (*Cinnamomum* species), native in Southeast Asia, and the bay laurel (*Laurus nobilis*), native in the Mediterranean region. The earliest lauraceous fossils are from the early Cretaceous, and within flowering plants, the order is among the oldest groups to diversify. The presently accepted classification of the seven families is based on molecular sequence data.

**Introduction**

The order Laurales is part of the earliest radiation of flowering plants and is the sister group of the Magnoliales. Lauralean fossils date back to the early Cretaceous. This article presents each family, followed by the few morphological characters that unite subgroups of families within the order. The absence of a character that would unite all Laurales historically has led to much controversy about the order’s circumscription, with several basal angiosperm families, such as Amborellaceae, Trimeniaceae and Chloranthaceae, variously being included or excluded in Laurales. The monophyly of the seven families now considered to form the Laurales first became apparent based on molecular data (Renner, 1999). See also: *Flowering Plants, Evolution*.

**Families Included**

**Lauraceae**

By far the largest lauralean family is the Lauraceae, with 2200–2500 species in 55 genera (Rohwer, 1993). Lauraceae generally are large trees with highly typical flowers that have tepals and stamens arranged in three-part whorls and stamens with valvate anthers. In terms of species richness and morphological diversity, the family is centred in tropical America and Australasia; it is poorly represented in continental Africa, but species-rich in Madagascar (Chanderbali *et al*., 2001). Relatively few species, such as spice bush, *Lindera benzoin*, sassafras, *Sassafras albidum*, and true or bay laurel, *Laurus nobilis*, now survive in temperate zones, but during Palaeocene and Eocene warmer climates Lauraceae were abundant in the northern landmass of Laurasia. The fossil record of the family goes back 110 Ma, and at least 500 species of Lauraceae are known from the early Cretaceous through to the late Tertiary (e.g., Eklund, 2000; Balthazar *et al*., 2007). See also: *Dispersal: Biogeography; Fossil Record*.

A genus whose membership in the family was unclear before the advent of molecular data is the herbaceous parasite *Cassyttha*. *Cassyttha* comprises 16–20 species in tropical Australia, Southeast Asia and Africa that have leafless twining stems linked to the host by small haustoria. Molecular data show that *Cassyttha* is a part of the core Lauraceae (Rohwer and Rudolph, 2005). See also: *Molecular Phylogeny Reconstruction*.

The family’s great economic importance has three sources. One is the high content of ethereal oils in the wood and leaves of many Lauraceae, which are sources of perfumes, spices and flavourings, such as camphor and cinnamon. Another is their hard wood, which makes them one of the most valuable sources of tropical timber. Third is the avocado, the oil-rich fruit of *Persea americana*, domesticated several thousand years ago in Central America and now cultivated in tropical and subtropical climates worldwide. The other species traditionally placed in the genus *Persea* do not all derive from a common ancestor, requiring an improved classification (van der Werff, 2002; Rohwer *et al*., 2009). See also: *Crop Plants: Evolution*.

**Monimiaceae**

Monimiaceae comprises about 200 in 28 genera, many of them comprising but one species. They are shrubs or treelets occurring in the tropics and subtropics of the southern hemisphere. Until 1999, the family appeared morphologically unusually heterogeneous owing to the inclusion of extraneous elements, such as Amborellaceae, Atherospermataceae, Siparuanaceae and Trimeniaceae. Molecular data have revealed a monophyletic family Monimiaceae in which the oldest divergence is between a group formed by the South American *Peumus boldus*, the Australia genus...
Palmeria, and the Réunion endemic genus Monimia on the one hand, and the remaining genera on the other hand (Renner et al., 2010). Africa has only a single species, Xymalos monospora, which occurs in tropical Africa. South America has relatively few and species-poor genera; Madagascar and the Mascarene Islands harbour the largest genus, Tambourissa with some 50 species (Lorence, 1985); and New Zealand, New Caledonia, Australia and tropical Australasia are the centre of the family’s diversity. The wood of a few species is used for timber and the leaves for medicinal teas.

Hernandiaceae

Hernandiaceae consists of about 60 species in five genera of shrubs, treelets and lianas (Kubitzki, 1993a; Michalak et al., 2010). The largest genus, Hernandia, occurs throughout the tropics, and several of its species are extremely widespread owing to transoceanic dispersal of their floating fruits. Hazomalania contains a single species that is endemic to Madagascar. Illigera has about a dozen species in China, Indochina and Malaysia, three in mainland Africa, and one that occurs in East Africa as well as Madagascar (Figure 1). In China, a drug derived from Illigera is used widely to treat arthritis. Gymnocarpus has five species, of which one, Gymnocarpus americanus, may occur in tropical coastal vegetation worldwide. Sparattanthelium occurs in the Guyana and Brazilian shield regions and the Amazon basin. See also: Dispersal: Biogeography

Atherospermataceae

The southern sassafrases or Atherospermataceae are a family of trees and shrubs with two species in Chile and 12 in Australasia (Renner et al., 2000). Atherosperms are an important element of temperate forests of the southern hemisphere, where they are consistent ecological associates of the southern beeches (Nothofagus, Nothofagaceae). Their wood, especially that of Atherosperma moschatum or Tasmanian sassafras, is exploited commercially. The family is known from fossil wood and pollen from the Cretaceous of Antarctica.

Gomortegaceae

Gomortegaceae consists of a single species in Chile, Gomortega nitida, a tree in danger of extinction because of overharvesting and anthropogenic forest fires. The family’s earliest record is fossil wood from late Oligocene–early Miocene deposits in Chilean Patagonia.

Siparunaceae

Siparunaceae consists of two genera, Glossocalyx with one species in West Africa and Siparuna with about 65 species in the neotropics, mostly in the Andes (Renner and Hausner, 2005). The family has no confirmed fossil record and no commercial interest but the lemon-scented leaves play a role in indigenous healing ceremonies of many South America tribes.

Calycanthaceae

Calycanthaceae contains three genera and 10 species (Kubitzki, 1993b; Zhou et al., 2006). Calycanthus (including Sinocalycanthus) comprises the frequently cultivated ornamental, Carolina allspice, Calycanthus floridus, the Californian allspice, Calycanthus occidentalis, and a Chinese species. Chimonanthus comprises six species in China of which wintersweet, Chimonanthus praecox, is a widely cultivated ornamental. Finally, Idiospermum consists of one species in Queensland. This last species, first discovered in 1912 and morphologically very different from the other Calycanthaceae, is sometimes placed in a separate family, Idiospermaceae.

General Characters and Relationships of Laurales

Although molecular data have shown that the seven families described above descended from a common ancestor, no single morphological character is known that reliably distinguishes the order Laurales from all other orders. Part of the reason for this may be that the Laurales diverged from their sister group, the Magnoliidae, sometime in the Lower Cretaceous and have since lost their ancestral morphological characters. Two examples of this process are given below. Another reason may be that Laurales are predominantly tropical trees; the morphology, anatomy and embryology of which is poorly known. A character seen in most Laurales is a well-developed floral cup, or cupule, that initially encloses the stamens and carpel (or numerous carpels) and later plays a role in seed dispersal by supporting and displaying the single-seeded fruits (Figure 2). See also: Cladistics
A phylogeny of the Laurales (Figure 3) has Calycanthaceae as forming the first branch, followed by two clusters of families, Lauraceae, Monimiaceae and Hernandiaceae, and atherosperms, Gomortega and Siparunaceae. This phylogeny agrees with the distribution of several morphological characters. For example, Calycanthaceae have two ovules, whereas all other Laurales have solitary ovules. Lauraceae, Monimiaceae and Hernandiaceae all have apical ovules, whereas Atherospermataceae, Gomortega and Siparunaceae ancestrally had basal ovules, a condition lost in Gomortega. Calycanthaceae lack floral nectaries, whereas most other Laurales have paired nectar glands on the filaments. These glands were lost in Siparunaceae and in higher Monimiaceae concomitant with a change in pollinators away from nectar-foraging flies and bees to non-nectar-feeding beetles and gall midges (Endress, 1980; Endress and Lorence, 1983; Feil, 1992). Finally, most Laurales, except Calycanthaceae and Monimiaceae, have stamens with anthers dehiscing by two or four apically hinged valves. Depending on the correct placement of a Calycanthaceae-like fossil flower with laterally hinged valves (Friis et al., 1994), valvate anther dehiscence of some form may be ancestral in Laurales and lost in modern Calycanthaceae and Monimiaceae. See also: Molecular Phylogeny Reconstruction; Phylogeography

References


**Further Reading**