

## Palm tree

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Coconut palm tree

### Scientific classification

Kingdom:	Plantae
Clade:	Angiosperms
Clade:	Monocots
Clade:	Commelinids
Order:	Arecales Bromhead <sup>[1]</sup>
Family:	Areaceae Schultz Sch. <sup>[1]</sup>

Subfamilies
Arecoideae
Calamoideae
Ceroxyloideae
Coryphoideae
Nypoideae <sup>[2]</sup>
Diversity

Palms are among the best known and most extensively cultivated plant families. They have been important to humans throughout much of history. Many common products and foods are derived from palms, and palms are also widely used in landscaping for their exotic appearance, making them one of the most economically important plants. In many historical cultures, palms were symbols for such ideas as victory, peace, and fertility. Today, palms remain a popular symbol for the tropics and vacations.

Whether as shrubs, trees, or vines, palms have two methods of growth: solitary or clustered. The common representation is that of a solitary shoot ending in a crown of leaves. This monopodial character may be exhibited by prostrate, trunkless, and trunk-forming members. Some common palms restricted to solitary growth include *Washingtonia* and *Roystonea*. Palms may instead grow in sparse though dense clusters. The trunk develops an axillary bud at a leaf node, usually near the base, from which a new shoot emerges. The new shoot, in turn, produces an axillary bud and a clustering habit results.

Exclusively sympodial genera include many of the rattans, *Guihaia*, and *Rhapis*. Several palm genera have both solitary and clustering members. Palms which are usually solitary may grow in clusters, and vice versa. These aberrations suggest the habit operates on a single gene.

Palms have large, evergreen leaves that are either palmately ('fan-leaved') or pinnately ('feather-leaved') compound and spirally arranged at the top of the stem. The leaves have a tubular sheath at the base that usually splits open on one side at maturity.<sup>[6]</sup> The inflorescence is a spadix or spike surrounded by one or more bracts or spathes that become woody at maturity. The flowers are generally small and white, radially symmetric, and can be either uni- or bisexual. The sepals and petals usually number three each, and may be distinct or joined at the base. The stamens generally number six, with filaments that may be separate, attached

to each other, or attached to the pistil at the base. The fruit is usually a single-seeded drupe (sometimes berry-like)<sup>[7]</sup> but some genera (e.g. *Salacca*) may contain two or more seeds in each fruit.

Palms are a monophyletic group of plants, meaning the group consists of a common ancestor and all its descendants.<sup>[11]</sup> Extensive taxonomic research on palms began with botanist H.E. Moore, who organized palms into 15 major groups based mostly on general morphological characteristics. The following classification, proposed by N.W. Uhl and J. Dransfield in 1987, is a revision of Moore's classification that organizes palms into six subfamilies. A few general traits of each subfamily are listed.

The Coryphoideae are the most diverse subfamily, and are a paraphyletic group, meaning all members of the group share a common ancestor, but the group does not include all the ancestor's descendants. Most palms in this subfamily have palmately lobed leaves and solitary flowers with three, or sometimes four carpels. The fruit normally develops from only one carpel. Subfamily Calamoideae includes the climbing palms, such as rattans. The leaves are usually pinnate; derived characters (synapomorphies) include spines on various organs, organs specialized for climbing, an extension of the main stem of the leaf-bearing reflexed spines, and overlapping scales covering the fruit and ovary. Subfamily Nypoideae contains only one species, *Nypafruticans*, which has large, pinnate leaves. The fruit is unusual in that it floats, and the stem is dichotomously branched, also unusual in palms. Subfamily Ceroxyloideae has small to medium-sized flowers, spirally arranged, with a gynoeceium of three joined carpels. The Arecoideae are the largest subfamily, with six diverse tribes (*Areceae* - *Caryoteae* - *Cocoeae* - *Geomeae* - *Iriarteae* - *Podococceae*) containing over 100 genera. All tribes have pinnate or bipinnate leaves and flowers arranged in groups of three, with a central pistillate and two staminate flowers. The Phytelephantoideae are a monoecious subfamily. Members of this group have distinct monopodial flower clusters. Other distinct features include a gynoeceium with five to 10 joined carpels, and flowers with more than three parts per whorl. Fruits are multiple-seeded and have multiple parts.

Currently, few extensive phylogenetic studies of *Arecaceae* exist. In 1997, Baker et al. explored subfamily and tribe relationships using chloroplast DNA from 60 genera from all subfamilies and tribes. The results strongly showed the Calamoideae are monophyletic, and Ceroxyloideae and Coryphoideae are paraphyletic. The relationships of Arecoideae are uncertain, but they are possibly

related to Ceroxyloideae and Phytelephantoideae. Studies have suggested the lack of a fully resolved hypothesis for the relationships within the family is due to a variety of factors, including difficulties in selecting appropriate outgroups, homoplasy in morphological character states, slow rates of molecular evolution important for the use of standard DNA markers, and character polarization.<sup>[15]</sup> However, hybridization has been observed among *Orbignya* and *Phoenix* species, and using chloroplast DNA in cladistic studies may produce inaccurate results due to maternal inheritance of the chloroplast DNA. Chemical and molecular data from non-organelle DNA, for example, could be more effective for studying palm phylogeny.

Palms inhabit a variety of ecosystems. More than two-thirds of palm species live in tropical forests, where some species grow tall enough to form part of the canopy and shorter ones form part of the understory. Some species form pure stands in areas with poor drainage or regular flooding, including *Raphiahookeri* which is common in coastal freshwater swamps in West Africa. Other palms live in tropical mountain habitats above 1000 m, such as those in the genus *Ceroxylon* native to the Andes. Palms may also live in grasslands and scrublands, usually associated with a water source, and in desert oases such as the date palm. A few palms are adapted to extremely basic lime soils, while others are similarly adapted to extreme potassium deficiency and toxicity of heavy metals in serpentine soils.





Coconut palm trees in Boracay, Philippines



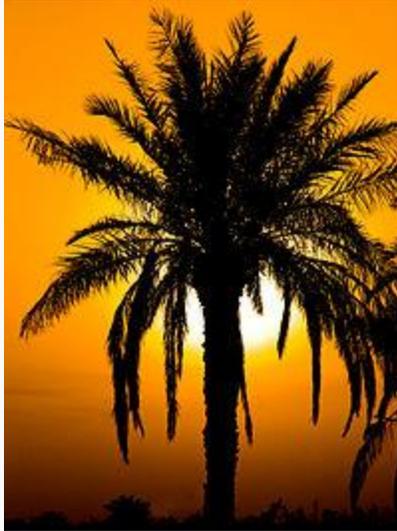
Palmyra palm fruit at Guntur, India

The Arecaceae are notable among monocots for their height and for the size of their seeds, leaves, and inflorescences. *Ceroxylon quindiuense*, Colombia's national tree, is the tallest monocot in the world, reaching up to 60 meters tall.<sup>[8]</sup> The coco de mer (*Lodoicea maldivica*) has the largest seeds of any plant, 40–50 cm in diameter and weighing 15–30 kg each. Raffia palms (*Raphia* spp.) have the largest leaves of any plant, up to 25 m long and 3 m wide.

The *Corypha* species have the largest inflorescence of any plant, up to 7.5 m tall and containing millions of small flowers. Calamus stems can reach 200 m in length.



Coconut palm trees in Mumbai, India



 Palm and sunset in Minoo Island (Persian Gulf)



 Palm trees in Cannes, France

Taxonomy

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 Walsh River palms



 A queen palm



A young *Beccariophoenix madagascariensis* palm

