

## Cauliflory: Flowers that Bloom on Tree Trunks



Buds and flowers of *Herrania* sp.

Most woody flowering plants produce inflorescences on new growth and or young leafy shoots. A few, however, flower and fruit directly on their trunks or main branches. This unusual botanical trait is called cauliflory and the plants themselves are considered cauliflorous. The term is derived from the Latin *caulis*, meaning stem, and *flor*, meaning flower. (Although the vegetable cauliflower (*Brassica oleracea*) has the same name, it is not cauliflorous – the dense cluster of unopened flower buds that we eat arises from a main flower stalk.)

Cauliflory is widespread in the plant world, with more than one hundred species of cauliflorous plants distributed in dozens of different plant families. But what is the adaptive advantage of cauliflory? Some trees might have become cauliflorous because they produce large, heavy fruits which would be difficult to support on the branches alone (but no one is really sure – maybe they developed the large, heavy fruits only after they started growing them from the trunk).

Another possible reason to have developed cauliflory is to facilitate cross-pollination or seed dispersal by large animals which would be unable to reach the flowers or fruits if they were borne in the canopy. In rainforests, the insect fauna are distributed in horizontal layers at various heights above the ground and many cauliflorous species are pollinated by those that live near the ground level. Accessibility seems to be one reason pollinators and frugivores (fruit-eating animals) are attracted to the flowers and seed-bearing fruits on the trunks. There are many different animal species including birds, bats, climbing mammals and insects that visit the flowers, but there don't seem to be any groups that specialize in cauliflorous plants. Making the fruit more accessible to a variety of animals is a good strategy for ensuring survival of the species. This is the case with cacao (*Theobroma cacao*, family Sterculiaceae), a cauliflorous understory tree in the rainforest from which chocolate is made. The flowers are believed to be pollinated by small ceratopogonid midges, although other small moths and beetles may be involved. Cacao pods do not drop when ripe. The large seeds inside the oblong fruits are dispersed by small mammals and monkeys when they chew into the pods to eat the sugary pulp, leaving the seeds behind.



Flowers (L) and fruit (C) of cacao, *Theobroma cacao*, from which chocolate is made. R: The fruit and flowers of the related monkey cacao, *T. simiarum*

Many tropical trees have flowers that grow abruptly from the wooded trunk. In addition to cacao, some other trees you may be familiar with – at least from their fruit – include papaya, breadfruit, and jackfruit. Papaya (*Carica papaya*) fruits hang in clusters from the trunk of this common pantropical tree. Jackfruit (*Artocarpus heterophyllus*) and its close relative, breadfruit (*A. altilis*), belong to the mulberry family (Moraceae). Both are grown throughout the tropics for their edible fruits, borne on the trunk and lower branches.



Fruits of papaya, *Carica papaya*, hanging from trunk (R); jackfruit, *Artocarpus heterophyllus*, and closeup of fruit (C) and the fruit of the related, but non-cauliflorous breadfruit, *A. altilis* (R).

Other examples include:

- Calabash trees and their relatives (family Bignoniaceae) grow wild in Mexico, Central and South America. The calabash, *Crescentia alata*, often placed in the genus *Parmentiera* is pollinated by small bats. The fruits develop along the trunk and limbs, with numerous large, green, gourd-like spheres on the tree for up to seven months. Eventually they turn yellow-green and fall to the ground. There aren't any native herbivores that can break open the large, hard-shelled gourds, so rotting fruits cover the ground beneath old calabash trees. There are several other species in the genera *Crescentia* and *Parmentiera* with cauliflorous flowers and fruit. *C. cujete* has simple leaves and much larger fruits (up to ten inches in diameter). Guajilote or guachilote (*P. edulis* or *P. aculeata*) is a spiny central American tree that produces sweet, elongate, banana-shaped fruits which are eaten raw, cooked, roasted, or made into pickles and preserves. The candle tree, *P. cerifera*, also has edible fruits and seeds, but is more commonly grown as an ornamental.



Candelo or candle tree, *Parmentiera cerifera*, a Central American species related to calabash.



- The cannonball tree (*Couroupita guianensis*) is native to the Guiana in northeastern South America. The large, fragrant blossoms develop on woody stalks and are followed by spherical, cannonball-like fruits up to 8" in diameter. This unusual tree is in the tropical family Lecythidaceae.

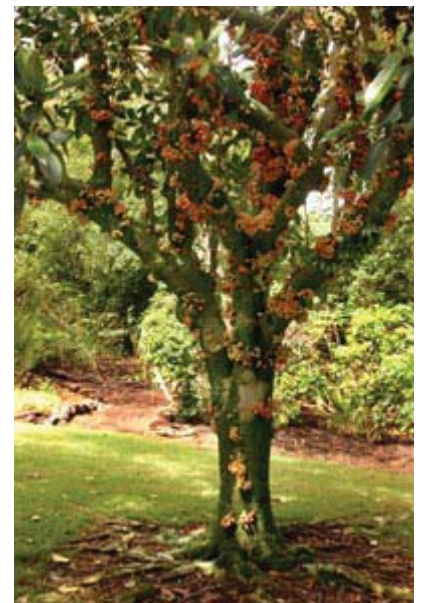


Cannonball tree, *Couroupita guianensis*, has spectacular flowers and impressive spherical fruit.

- *Napoleona imperialis* is another tree in the Lecythidaceae which develops large, showy blossoms on the trunk. It is native to tropical West Africa.
- Some species of figs, such as *Ficus auriculata* and *F. capensis* (family Moraceae) develop fruit directly on the trunk and large branches.
- *Brownea macrophylla* is a tropical leguminous shrub with large, showy orange flowers that develop on the main trunk and limbs.



*Brownea macrophylla* and closeup of flower (R).



A cauliflorous *Ficus* tree.

- *Halleria lucida*, a shrub from South Africa, is in the family Scrophulariaceae. It produces showy tubular orange, red or yellow flowers in clusters, giving rise to the common names African Honey-suckle or Fuchsia Tree. The flowers are followed by spherical green berries that turn juicy and black when ripe.



- *Stelechocarpus burahol*, or kepel or kepel apple, is an endangered tree from Southeast Asia in the family Annonaceae. The thick-skinned, apple-sized fruit, eaten fresh, supposedly has a spicy, mango-like flavor (but is also described as an acquired taste).



*Stelechocarpus burahol* (kepel apple) flower buds (L) and fruit (R).

- Palanco (*Sapranthus palanga*, family Annonaceae), native to the Guanacaste Province of Costa Rica, produces large, purple flowers and large, thick-walled fruits directly from its main trunk. The flowers smell like a rotting carcass and are pollinated by carrion beetles and flies.

- *Averrhoa bilimbi*, related to star fruit or carambola (family Oxalidaceae), is cultivated throughout Indonesia and is planted extensively on Zanzibar. The acidic fruit is used mainly in chutneys.



*Averrhoa bilimbi* with fruits on the trunk (L) and flower cluster (R).

Outside the tropics cauliflory is not as prevalent, but one cauliflorous tree from temperate climates most gardeners know is redbud. The North American redbud (*Cercis canadensis*, family Fabaceae) occurs in the eastern United States. The western redbud (*C. occidentalis*) grows in California, Arizona and Utah



American redbud, *Cercis canadensis*, is one cauliflorous tree that occurs outside the tropics.

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