

## Bamboo

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### Bamboo



Bamboo forest in Kyoto,  
Japan

### Scientific classification

Family: Poaceae

Subfamily: Bambusoideae

Supertribe: Bambusodae

Tribe: Bambuseae  
Kunth ex Dumort

Subtribes
<ul style="list-style-type: none"> <li>• Arthrostylidiinae</li> <li>• Arundinariinae</li> <li>• Bambusinae</li> <li>• Chusqueinae</li> <li>• Guaduinae</li> <li>• Melocanninae</li>   <li>• Nastinae</li> <li>• Racemobambodinae</li> <li>• Shibataeinae</li> </ul> <p>See the full Taxonomy of the Bambuseae.</p>
Diversity
<p>Around 92 genera and 5,000 species</p>

#### description

Bamboos are some of the fastest-growing plants in the world,<sup>[2]</sup> due to a unique rhizome-dependent system. Bamboos are of notable economic and cultural significance in South Asia, Southeast Asia and East Asia, being used for building materials, as a food source, and as a versatile raw product. Bamboo has a higher compressive strength than wood, brick or concrete (on an ounce for ounce basis) and has a tensile strength that rivals steel. Bamboo is one of the fastest-growing plants on Earth, with reported growth rates of 250 cm (98 in) in 24 hours.<sup>[2]</sup> However, the growth rate is dependent on local soil and climatic conditions, as well as species, and a more typical growth rate for many commonly cultivated bamboos in temperate climates is in the range of 3–10 centimeters (1.2–3.9 in) per day during the growing period. Primarily growing in regions of warmer climates during the late Cretaceous period, vast fields existed in what is

now Asia. Some of the largest timber bamboo can grow over 30 m (98 ft) tall, and be as large as 15–20 cm (5.9–7.9 in) in diameter. However, the size range for mature bamboo is species dependent, with the smallest bamboos reaching only several inches high at maturity. A typical height range that would cover many of the common bamboos grown in the United States is 4.6–12 metres (15–39 ft.) depending on species. Anji County of China, known as the "Town of Bamboo", provides the optimal climate and soil conditions to grow, harvest, and process some of the most valued bamboo poles available worldwide.

Unlike all trees, individual bamboo stems, or culms, emerge from the ground at their full diameter and grow to their full height in a single growing three to four months. During these several months, each new shoot grows vertically into a culm with no branching out until the majority of the mature height is reached. Then, the branches extend from the nodes and leafing out occurs. In the next year, the pulpy wall of each culm slowly hardens. During the third year, the culm hardens further. The shoot is now considered a fully mature culm. Over the next 2–5 years (depending on species), fungus begins to form on the outside of the culm, which eventually penetrates and overcomes the culm. Around 5–8 years later (species and climate dependent), the fungal growths cause the culm to collapse and decay. This brief life means culms are ready for harvest and suitable for use in construction within about three to seven years. Individual bamboo culms do not get any taller or larger in diameter in subsequent years than they do in their first year, and they do not replace any growth lost from pruning or natural breakage. Bamboos have a wide range of hardiness depending on species and locale. Small or young specimens of an individual species will produce small culms initially. As the clump and its rhizome system mature, taller and larger culms will be produced each year until the plant approaches its particular species limits of height and diameter.

Many tropical bamboo species will die at or near freezing temperatures, while some of the hardier or so-called temperate bamboos can survive temperatures as low as  $-29\text{ }^{\circ}\text{C}$  ( $-20\text{ }^{\circ}\text{F}$ ). Some of the hardiest bamboo species can be grown in places as cold as USDA Plant Hardiness Zones 5–6, although they typically will defoliate and may even lose all above-ground growth, yet the rhizomes will survive and send up shoots again the next spring. In milder climates, such as USDA Zone 8 and above, some hardy bamboo may remain fully leafed out year-round

Genus and geography

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More than 10 genera are divided into about 1,450 species.<sup>[5]</sup> Bamboo species are found in diverse climates, from cold mountains to hot tropical regions. They occur across East Asia, from 50°N latitude in Sakhalin through to Northern Australia, and west to India and the Himalayas. They also occur in sub-Saharan Africa,<sup>[7]</sup> and in the Americas from the mid-Atlantic United States south to Argentina and Chile, reaching their southernmost point at 47°S latitude. Continental Europe is not known to have any native species of bamboo.<sup>[9]</sup>

Recently, some attempts have been made to grow bamboo on a commercial basis in the Great Lakes region of east-central Africa, especially in Rwanda. Companies in the United States are growing, harvesting and distributing species such as Henon and Moso.<sup>[10]</sup>

Bamboo grows in two main forms: the woody bamboos (Arundinarieae and Bambuseae) and the understory herbaceous bamboos (Olyreae). Molecular analysis suggests that there are 3–5 major lineages of bamboo. Four major lineages are currently recognized: temperate woody, paleotropical woody, Neotropical woody and herbaceous.<sup>[11]</sup>

## Ecology



Bamboo forest in Taiwan



Bamboo forest in Kwa-Zulu Natal



 Closeup of bamboo stalk



 Bamboo forest in New Jersey.

 *Phyllostachys Pubescens* in Batumi Botanical Garden

### Mass flowering[edit]



 Most bamboo species flower infrequently. In fact, many bamboos only flower at intervals as long as 65 or 120 years. These taxa exhibit mass flowering (or gregarious flowering), with all plants in a particular species flowering worldwide over a several-year period. The longest mass flowering interval known is 130 years, and it is for the species *Phyllostachys bambusoides* (Sieb. & Zucc.). In this species, all plants of the same stock flower at the same time, regardless of

differences in geographic locations or climatic conditions, and then the bamboo dies. The lack of environmental impact on the time of flowering indicates the presence of some sort of “alarm clock” in each cell of the plant which signals the diversion of all energy to flower production and the cessation of vegetative growth.<sup>[12]</sup> This mechanism, as well as the evolutionary cause behind it, is still largely a mystery.

One hypothesis to explain the evolution of this semelparous mass flowering is the *predator satiation hypothesis* which argues that by fruiting at the same time, a population increases the survival rate of their seeds by flooding the area with fruit, so, even if predators eat their fill, seeds will still be left over. By having a flowering cycle longer than the lifespan of the rodent predators, bamboos can regulate animal populations by causing starvation during the period between flowering events. Thus the death of the adult clone is due to resource exhaustion, as it would be more effective for parent plants to devote all resources to creating a large seed crop than to hold back energy for their own regeneration.<sup>[13]</sup>

Another, the *fire cycle hypothesis*, argues that periodic flowering followed by death of the adult plants has evolved as a mechanism to create disturbance in the habitat, thus providing the seedlings with a gap in which to grow. This argues that the dead culms create a large fuel load, and also a large target for lightning strikes, increasing the likelihood of wildfire.<sup>[14]</sup> Because bamboos can be aggressive as early successional plants, the seedlings would be able to outstrip other plants and take over the space left by their parents.

However, both have been disputed for different reasons. The predator satiation hypothesis does not explain why the flowering cycle is 10 times longer than the lifespan of the local rodents, something not predicted. The bamboo fire cycle hypothesis is considered by a few scientists to be unreasonable; they argue<sup>[15]</sup> that fires only result from humans and there is no natural fire in India. This notion is considered wrong based on distribution of lightning strike data during the dry season throughout India. However, another argument against this is the lack of precedent for any living organism to harness something as unpredictable as lightning strikes to increase its chance of survival as part of natural evolutionary progress.<sup>[16]</sup>

The mass fruiting also has direct economic and ecological consequences, however. The huge increase in available fruit in the forests often causes a boom in rodent populations, leading to increases in disease and famine in nearby human populations. For example, devastating consequences occur when

the *Melocannabambusoides* population flowers and fruits once every 30–35 years<sup>[17]</sup> around the Bay of Bengal. The death of the bamboo plants following their fruiting means the local people lose their building material, and the large increase in bamboo fruit leads to a rapid increase in rodent populations. As the number of rodents increases, they consume all available food, including grain fields and stored food, sometimes leading to famine. These rats can also carry dangerous diseases, such as typhus, typhoid, and bubonic plague, which can reach epidemic proportions as the rodents increase in number.<sup>[12][13]</sup> The relationship between rat populations and bamboo flowering was examined in a 2009 Nova documentary Rat Attack.

In any case, flowering produces masses of seeds, typically suspended from the ends of the branches. These seeds will give rise to a new generation of plants that may be identical in appearance to those that preceded the flowering, or they may produce new cultivars with different characteristics, such as the presence or absence of striping or other changes in coloration of the culms.

As animal diet[edit]



Bamboo is the main food of the giant panda, making up 99% of its diet.

Soft bamboo shoots, stems, and leaves are the major food source of the giant panda of China, the red panda of Nepal and the bamboo lemurs of Madagascar. Rats will eat the fruits as described above. Mountain gorillas of Africa also feed on bamboo, and have been documented consuming bamboo sap which was fermented and alcoholic;<sup>[7]</sup> chimps and elephants of the region also eat the stalks.

The larvae of the bamboo borer (the moth *Omphisafuscidentalis*) of Laos, Myanmar, Thailand and Yunnan Province, China, feeds off the pulp of live bamboo. In turn, these caterpillars are considered a local delicacy.

## Cultivation[edit]

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Bamboo foliage with yellow stems (probably *Phyllostachys aurea*)



Bamboo foliage with black stems (probably *Phyllostachys nigra*)

### Commercial timber

Timber is harvested from both cultivated and wild stands, and some of the larger bamboos, particularly species in the genus *Phyllostachys*, are known as "timber bamboos".

### Harvesting

Bamboo used for construction purposes must be harvested when the culms reach their greatest strength and when sugar levels in the sap are at their lowest, as high sugar content increases the ease and rate of pest infestation.