



Bamboo

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Far East

"Wood of the poor" in India, "brother" in Vietnam, and "friend of the people" in China- these are common names for bamboo, a plant that millions of people depend on for their livelihood. Bamboo has over 1,500 documented uses and can be found in North and South America, Africa, Australia, and southern Asia, with the highest diversity in China.

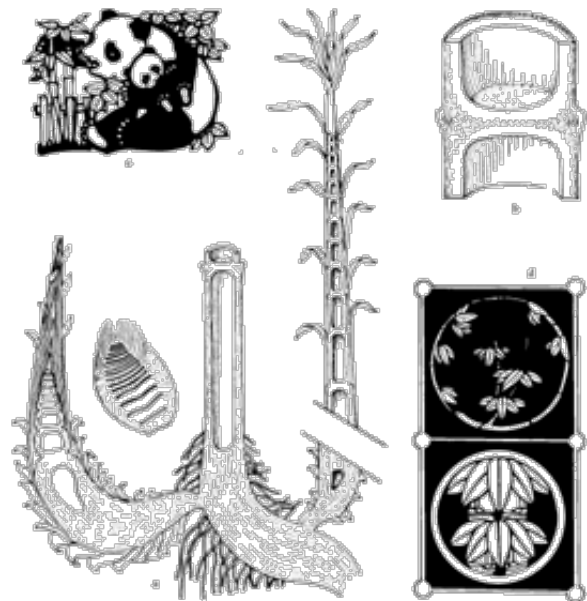
Bamboo is also a common name for 60 genera and 1,000 species in the grass or Poaceae family, a family of monocots. Bamboos can all be found within the subfamily Bambusoideae, one of the most diverse groups within Poaceae and the most primitive. The different species of bamboo range in height from the smallest at 6 inches to the giant variety at 130 feet. Bamboo is fast-growing; depending on the species, the stems, called culms, can grow up to 1 foot in a day.



Tourist posing in front of cultivated giant bamboo.

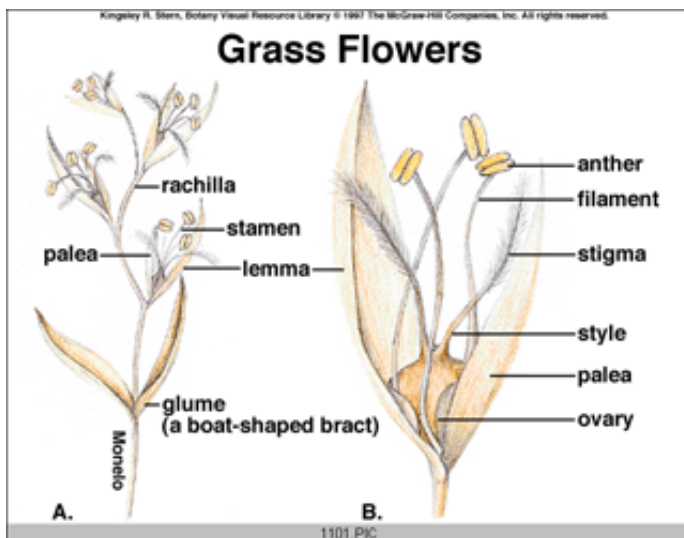
These perennial plants produce the photosynthetic culms from rhizomes. The strength of the culms is

due largely to their morphology, which consists of a series of hollow internodes separated by solid nodes. Each node sheaths a bud containing either additional branch or floral material. As is characteristic of monocots, there is no vascular cambium and therefore no increase in girth and no secondary growth. Consequently, the diameter of the culm is determined at the time of sprouting, reaching full thickness in 6 to 12 weeks and up to 1 foot in diameter in the giant bamboo. Young bamboo can be collected and consumed as a vegetable, but bamboo should not be harvested for use in building until after 4 years of age because new culms are largely water.



Culms growing from rhizome and Solid node between two hollow internodes. Note the buds at the site of the node.

More astounding than bamboo's 1-foot potential growth per day is the understudied life cycle of the plant. For example, most grasses have three stamens and two stigmas emerging from an ovary, but bamboos have six stamens and three stigmas.



They flower once in their lifetime and produce seed, depending on the species, in 12 to 120 years. The seed, a typical grass grain, is a food source for local people. In 1988, Indian scientists reported that they had been able to artificially induce flowering in two species of bamboo by germinating seeds in tissue culture, thereby accomplishing in a few weeks what in nature would have taken decades. More recently, with advances in molecular biology, the nature of this internal "genetic clock" is being investigated.

Labeled grass flower: (a) Entire grass spikelet; (b) enlargement of a single flower.

Bamboos of the same species flower and produce fruit on the same schedule, regardless of their geographic location. Therefore, groups of pandas, which feed exclusively on bamboo, migrate to different species according to their flowering schedule. Because the panda's digestive system is inefficient at digesting plant material, an adult panda needs to consume 85 pounds of culms and leaves per day to sustain itself. Due to mass clearing of bamboo grasslands for agriculture and overharvesting of the plant by humans, the panda now exists mainly on reserves and in zoos, where a limited number of bamboo species are available.

The International Network for Bamboo and Rattan (INBAR) groups the uses of bamboo into the following categories: construction, agriculture, household, industry, transportation, and fishery. Bamboo is used for roofing, rafts, bridges, flooring, and drainage pipes, and about 73% of the population in Bangladesh lives in bamboo houses. Agricultural uses include fodder for cattle, grain, irrigation pipes, baskets, dams, stakes, and windmills. Household uses are innumerable; these include beds, bookcases, and other furniture; flutes, xylophones, and other musical instruments; barrels; fans; and firewood. Bamboo is used to make acupuncture needles and fermented to brew beer. Bamboo pulp is used in papermaking. Carts, boats, wheelbarrows, and wagons are popular transportation items made from bamboo, as are nets, sails, and traps at fisheries.

Furthermore, bamboo has the potential for reducing soil erosion, absorbing water from heavy rains that would otherwise cause flooding, and providing shelter and protection for a variety of animals, especially in the face of increasing deforestation. Bamboo is an indispensable plant from the viewpoint of the insect, the rodent, the bird, the panda, and the people.

References, Websites, and Further Reading

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Related Reading in Stern, Introductory Plant Biology, 8th Edition

Chapter 4: Tissues Meristematic Tissues: Lateral Meristems, including vascular cambium, pp. 52-53

Chapter 6: Stems

External Form of a Woody Twig, including node and internode, p. 83

Monocotyledonous Stems, pp. 93-95

Specialized Stems: Rhizomes, pp. 96-97

Chapter 8: Flowers, Fruits, and Seeds

Perennials, p. 128

Differences Between Dicots and Monocots, including Table 8.1, pp. 129-30

Structure of Flowers, pp. 129-32

Seeds: Structure, p. 143

Germination, pp. 143-45

Chapter 10: Plant Metabolism

Photosynthesis, pp. 166-70

Chapter 14: Plant Propagation and Biotechnology

Stem Cuttings; Leaf Cuttings, pp. 238-40

Tissue Culture, p. 244

Chapter 16: Plant Names and Classification

Common Names, pp. 268-69

Classification of Major Groups, pp. 272-74

Chapter 24: Flowering Plants and Civilization

Monocots: The Grass Family (Poaceae), p. 454

Chapter 26: Biomes

Grassland, pp. 484-85

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