

CACTI

Wonder of the Americas

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Cacti are particularly plentiful in Mexico's arid, warm, dry regions. Over the last several decades, important floristic, systematic and ecological studies, and others which look into sustainable management of natural resources, have made cacti one of their research priorities. Because of their strange shapes and colorful flowers, many cacti are also used for decoration. This has made them increasingly important items on the ornamental plant market, which has expanded considerably in recent years.

WHAT IS A CACTUS?

Cacti are distinguished from other groups of plants or botanical families by the particular morphology of their stems and flowers. Without going into great technical detail, they are practically without leaves, although there are some notable exceptions like the *Pereskia lychnidiflora* (*matiare*) and the *Pereskopsis aquosa* (water prickly pear). They usually have spines (there are exceptions to this also, such as the *Lophophora williamsii* [peyote]), and their fleshy stocks take many different shapes. For example, some are flat and shaped like tennis rackets,



Photos by Fidel Ugarte

Cacti come in a myriad of shapes and sizes.

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such as the *Opuntia* spp. (*nopal*).¹ Others have cylindrical stocks of different widths and heights, like the *Cephalocereus semilis* (the *viejito*, or “old man”), which can grow to as high as 8 meters and is typically shaped like a column, or the *Echinocereus schmollii* (known as the “sheep’s tail”), which grows no larger than 10 centimeters and is just a tiny reed no thicker than a pencil. Several kinds of cacti, like the *Echinocactus* (the “burro *biznaga*”) and the *Mammillaria* (the “little *biznaga*”), are spherical.

However, the most distinctive feature of cacti is that they have little pads covered with tiny, light-colored hairs called areolas. The spines and flowers sprout from the areolas: they are structures similar to lateral buds in other flowering plants.

“Cactus” comes from the Latin word for “thistle”; it is a broad term applied to any spiny plant. Today, however, the Latin word “cactus” (plural “cacti”) applies only to the genus we have described above.

CLASSIFICATION

The cactus family (*Cactaceae*) includes more than 1,500 species. Taxonomically, it is divided into three sub-families: the *Pereskioideae*, with only two genera, one of which has leaves in the shape of sheets; *Opuntioideae*, with five genera and over 200 species, including *nopales* and *chollas*; and *Cactoideae*, the largest group, which is found throughout the Americas and includes tree- and bush-like plants, vines and epiphytes,² with cylindrical, spherical or flat stocks.

ADAPTING TO DROUGHT

Arid and semi-arid zones are characterized by minimum and irregular annual availability of

humidity, low atmospheric humidity (with a few exceptions, like the arid region of Baja California), high daytime air temperatures and abundant sunlight, which can raise the ground temperature as high as 60°C. These physical characteristics make it easy to suppose that, to adapt, plants and animals native to these areas must make efficient and economical use of water. Cacti’s thickened stems, roots or leaves do just that: they store water to survive during dry periods.

Thickened plants are known as succulents, of which there are a wide variety, but practically all species of cacti are included.

The evolution into cacti of some not particularly succulent South American plants was basically the result of a process of adaptation to seasonal periods of drought. Today, cacti grow in all the main natural regions of the Americas, from damp tropical forests to the bush areas of the arid zones. In tropical forests, the only cacti



Spines and flowers sprout from the cacti’s areolas.

¹ A common Mexican cactus which is eaten grilled or boiled and cut up in a salad. [Translator’s Note.]

² Non-parasitical plants that grow on other plants and derive their nutrients and water from rain, the air, dust, etc. [Editor’s Note.]

species are creepers or epiphytes on the trunks of large trees; in arid zones, they are trees, bushes or vines. However, most of the species grow in intermediate areas, in what are called dry tropical forests, with both a dry and a rainy season. They flourish in these areas because they are specialized in absorbing, storing and conserving humidity with maximum efficiency developed during gradual, profound changes in their anatomy, morphology and physiology.

The change and reduction of the leaves are part of this evolution. At first, primitive cacti tended to increase storage of water in their leaves and reduce the vascular system to minimum functional structures. However, a new evolutionary phase was needed to reduce transpiration to a minimum: the surface of the leaves gradually diminished to microscopic size. Today, the majority of cacti have only this kind of "leaves" and only during the earliest stages of growth. Simultaneously, the stocks also had

to change to take on the functions of storing water, breathing and photosynthesis. Besides becoming a succulent, the stock has taken on whimsical forms that give cacti maximum volume with minimum surface area: they are flat, cylindrical, column-shaped and spherical.

In order for the cactus to change its volume without affecting its internal form and structure, the stock had to change: the base of its leaf pads became tubers which expand when water is available or contract in the dry season. Genuses like *Mammillaria* and *Coryphantha* have this kind of tuber. In other cacti, these tubers are fused in the form of lengthwise ribs, forming a sort of accordion which expands or contracts depending on the amount of water stored. The *Pachycereus*, the *Ferocactus* and the *Acanthocereus*, among others, have this kind of structure.

Another important part of the survival of cacti in arid and semi-arid regions is their relationship with animals and other plants. One important form of biotic interaction

in these areas is the interdependency during the first stages of seedling development, particularly in the phase of initial formation (germination and early survival). Some ecological analyses point to the importance of trees and bushes which beneath their canopies provide a micro-habitat favorable to the growth of cactus seedlings and other vegetation.

The longevity of some tree- or column-like cacti is significant for these biological systems. In Mexico there are almost 60 species of this sort. Among those already researched are the *Neobuxbaumia tetetzo* (*teteche*) in the Tehuacán Valley in the state of Puebla, reported to live up to 400 years, and the *Carnegiea gigantea* (saguaro) from the desert of Sonora, estimated at up to 500 years of age.

100 PERCENT MEXICAN
MEXICO'S DIVERSITY

Mexico boasts approximately 850 species of the slightly more than 1,500 reported in



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Cacti stems, roots or leaves store water to survive during dry spells.

recent literature about all of the Americas. Estimates classify almost 700 species (nearly 80 percent of all the cacti in the country) as endemic to Mexico; that is, they originate here exclusively.

This means that Mexico has the greatest floristic diversity of cacti of any country in the world. In Brazil and the United States, for example, floristic inventories on cacti show less than half the number of species to be found in Mexico.

In addition, Mexico has been the seat of the evolution of some taxonomic groups of cacti. For example, the column- and tree-like cacti (*Pachycereeae* group) and the spherical ones, better known colloquially in Mexico as *biznagas* (*Cacteae* group) originated and diversified in Mexico. One

of the groups of creepers and epiphytes (*Hylocereeae* group) diversified mainly in southern Mexico and Central America. Clearly, the reasons for this wealth of vegetation are to be found in the complex and intricate edaphic, climatic and orographic conditions and in the geographical location of Mexico throughout its geological history.

CURRENT AND POTENTIAL USES

Today, sustainable use of natural resources is a priority, above all in countries with high biodiversity like Mexico, which also has a considerable gamut of economically exploitable flora.



One of the most common uses of cacti is ornamental.

These plants were used by men as far back as the first inhabitants of the Americas. Anthropological evidence of their use as food by primitive man has been found at archeological digs in Tehuacán, Puebla, and in the state of Tamaulipas. Cactus stocks, fruit and seeds were part of the diet of the people who inhabited these areas as long ago as 6,500 B.C.

During the rise of the great Mesoamerican cultures, some cacti were already quite an important part of the diet and the culture. Today, ethnobotany has provided us with proof of the value of cacti to different human groups in Mexico. For example, the Seris³ use 12 species

of cacti for food, herbal medicines, construction, hunting and religious rites.

Another important use of cacti has been the selection and cultivation of their edible fruit, harvested both from wild and semi-cultivated plants. This is the case of the *pitayo* (*Stenocereus pruinosus*, *S. queretaroensis*), *xoconostle* (*Stenocereus stellatus*, *Opuntia joconostle*), *garambullo* (*Myrtillocactus geometrizans*), *pitahaya* (*Hylocereus undatus*), *jiotilla* (*Escontria chiotilla*) and, above all, the prickly pear cacti (*Opuntia amyclaea*, *O. hyptiancantha*, *Opuntia megacantha* and a great many hybrids).⁴ Among the cultivated edible stocks, the most important

³ An indigenous group which lives in Mexico's northern state of Sonora.

⁴ All common fruits in Mexico.



Little pads covered with tiny, light-colored hairs called areolas are cacti's most distinctive feature.

is the *nopal* (*Opuntia ficus-indica*, *Opuntia megacantha* and many hybrids).

Other ways of utilizing these plants include: a) medicinal uses: as a diuretic, a laxative, antispasmodic and to treat fevers, ulcers and hypoglycemia; b) as roughage; c) as a secondary food source (for cool or fermented drinks, as a condiment or snack, and ground into flour); d) as a color additive (*nopal* cochineal seeds, etc.).

One of the best known uses of cacti is ornamental, particularly the more rare species with limited distribution, like the majority of those endemic to Mexico (in some cases this is the reason for their dwindling numbers.) The

largest markets are the United States, Europe and Japan, where cacti are intensively cultivated and marketed.

THE IMPORTANCE OF MAINTAINING DIVERSITY

Integral research on cacti is clearly central to their conservation and the management of their natural and cultural diversity. It is a way to define strategies for their preservation at a time when “the crisis of biodiversity”—the disappearance of animal and plant species—is of great concern and interest in countries like ours. ❧