

# Succulents part 1: The wonderful world of cacti.

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# Succulent plants

Are plants with parts that are thickened and fleshy, capacity that helps to retain water in arid climates.

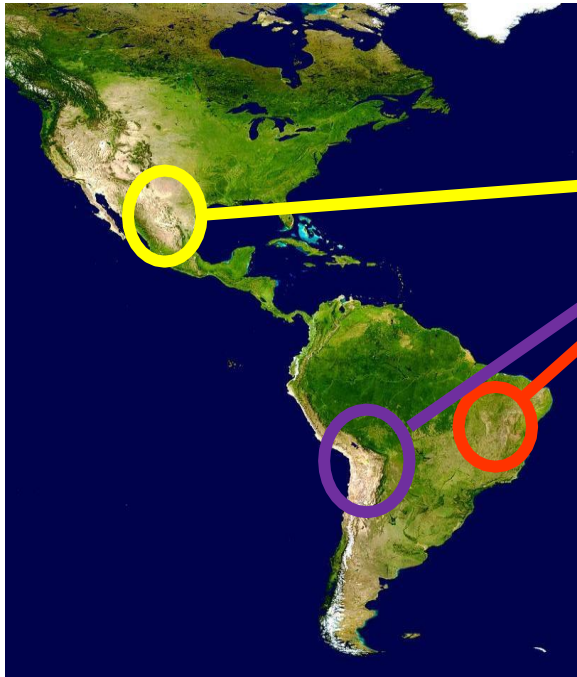
Over 25 families have species of succulents. The most representative families are: Crassulaceae, Agavaceae, Aizoaceae, Euphorbiacea and Cactaceae.



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The Cactaceae family is endemic to America and the distribution extends throughout the continent from Canada to Argentina, in addition to the Galapagos Islands and Antilles



Most important  
centers of  
diversification

(Bravo-Hollis & Sánchez-Mejorada, 1978;  
Hernández & Godínez, 1994; Arias-Montes, 1993;  
Anderson, 2001; Guzmán *et al.*, 2003; Ortega-  
Baes & Godínez-Alvarez, 2006)



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There is an exception — one of the 1,800 species occurs naturally in Africa, Sri Lanka, and Madagascar



*Rhipsalis baccifera*





The Cactaceae family includes between ~ 1,800 and 2,000 species whose life forms include climbing, epiphytic, shrubby, upright, creeping or decumbent plants, globose, cylindrical or columnar in shape

(Bravo-Hollis & Sánchez-Mejorada, 1978; Hernández & Godínez, 1994; Guzmán *et al.*, 2003).



Cacti are found in a wide variety of environments, however the greatest diversity of forms is found in arid and semi-arid areas, where they play an important role in maintaining the stability of ecosystems



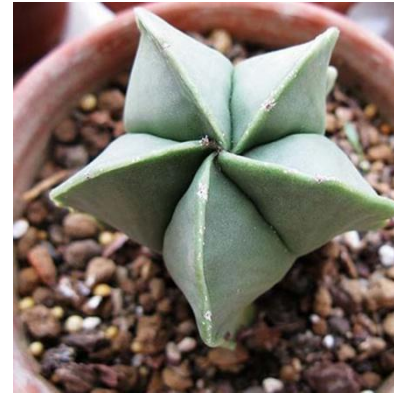
(Bravo-Hollis & Sánchez-Mejorada, 1978; Hernández & Godínez, 1994; Guzmán *et al.*, 2003).



# The Cactaceae family are dicotyledonous plants



2 cotyledons



*Astrophytum myriostigma*  
(common names: Bishop's cap cactus,  
bishop's hat or miter cactus)





# General Anatomy of a Cactus

Cactus spines are produced from specialized structures called areoles, a kind of highly reduced branch. Areoles are an identifying feature of cacti.



(Bravo-Hollis & Sánchez-Mejorada, 1978; Hernández & Godínez, 1994; Guzmán *et al.*, 2003).

# Areoles



# Spines

Spines are modified leaves, completely different from “thorns”. Thorns are modified branches. Cacti produces spines.

Pereskia, Pereskopsis and Maihuenia are leaving fossils from cacti plants, because these cacti plants have both types of leaves.



*Pereskia grandifolia*  
(Rose cactus)

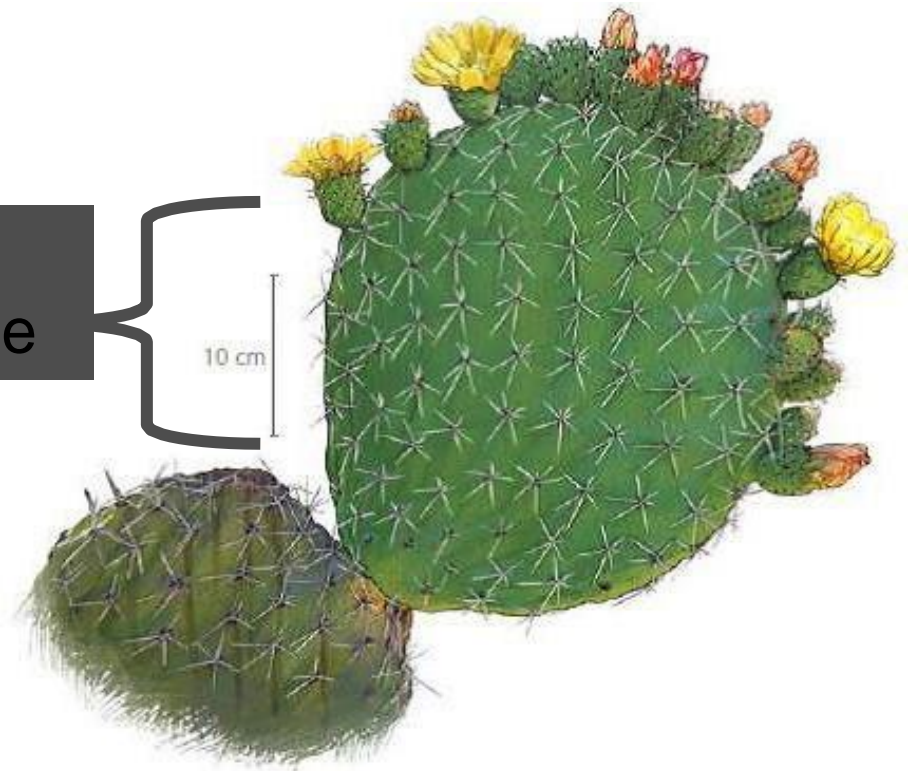


# Stem

The great majority of cacti have no visible leaves; photosynthesis takes place in the stems



Stem-  
Cladode





*Echinocactus grusonii* (common name: mother-in-law seat)



*Lophophora williamsii* (hikuri, peyote)

Stem



*Coryphantha elephantides* (elephant tooth)

Stem



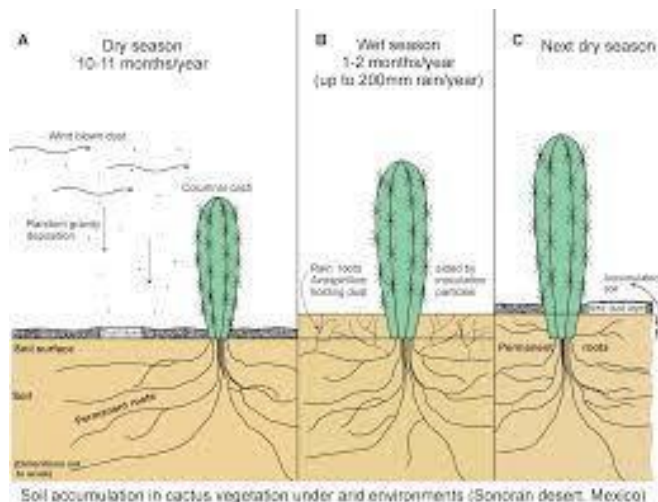
*Cephalocereus senilis* (Old man cactus)



# Roots

Epiphytic cacti may have only adventitious roots, produced along the stems where these come into contact with a rooting medium.

Some cacti have taproots, such as Copiapoa and also some larger columnar cacti. To aid in stabilizing the larger weight.

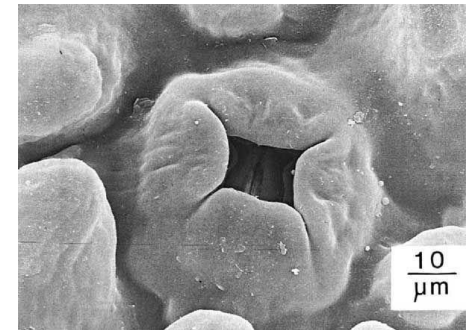
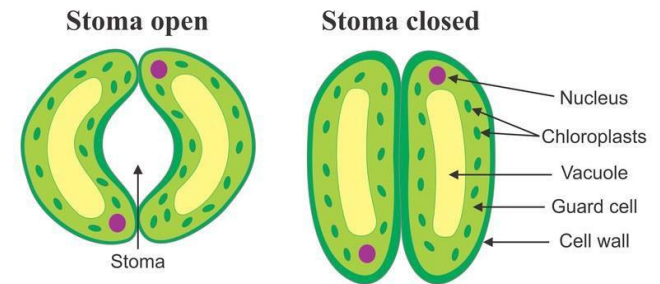
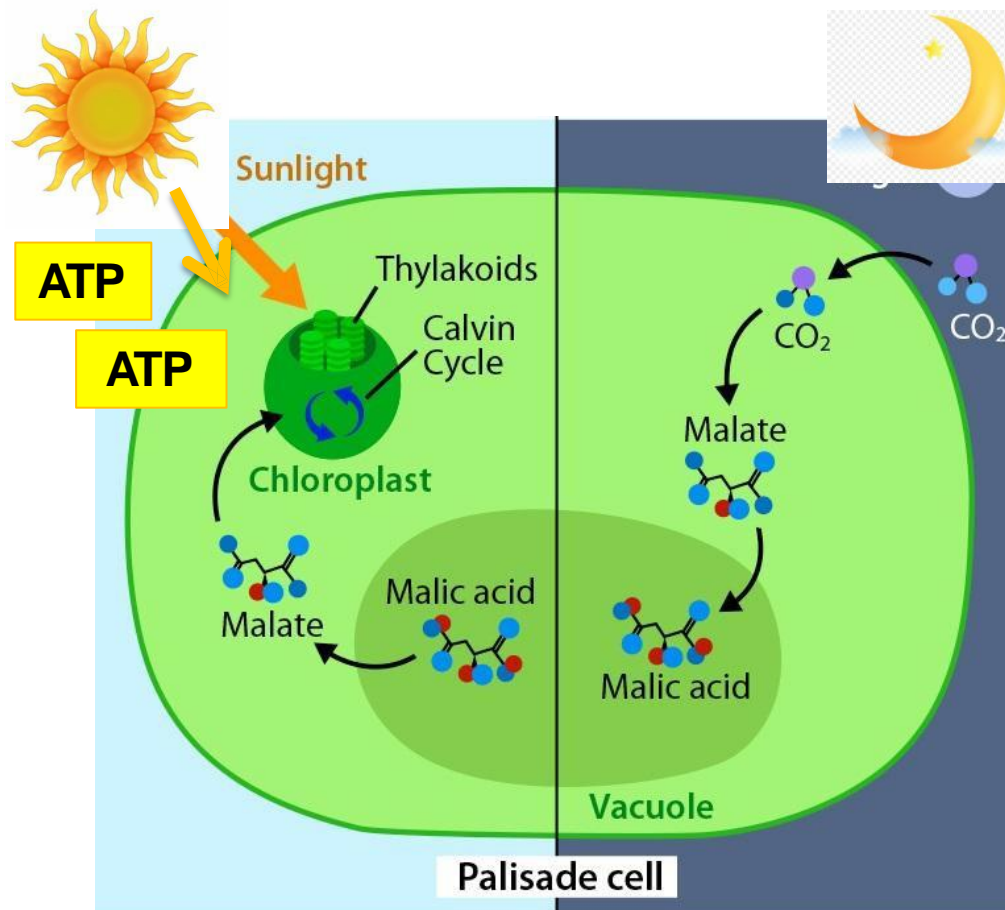


*Copiapoa atacamensis*  
(Copiapó)



# Photosynthesis

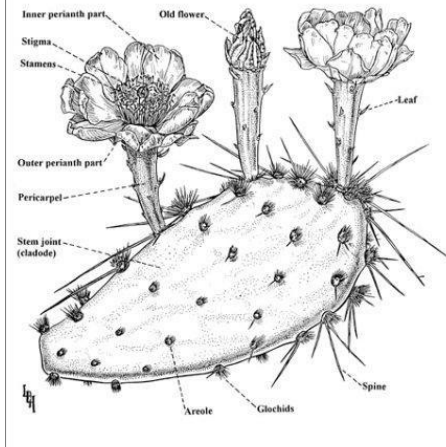
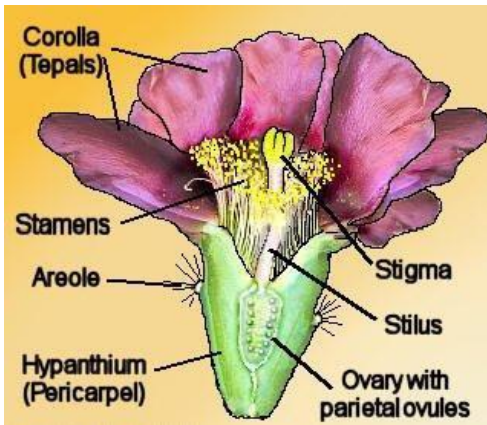
Crassulacean acid metabolism, also known as CAM Photosynthesis.



Herrera, A. *et al.* (2008);  
Lüttge, U *et al.* (2004).

# Flowers

Flowers with Tepals (with segments of the corolla that cannot be separated morphologically).



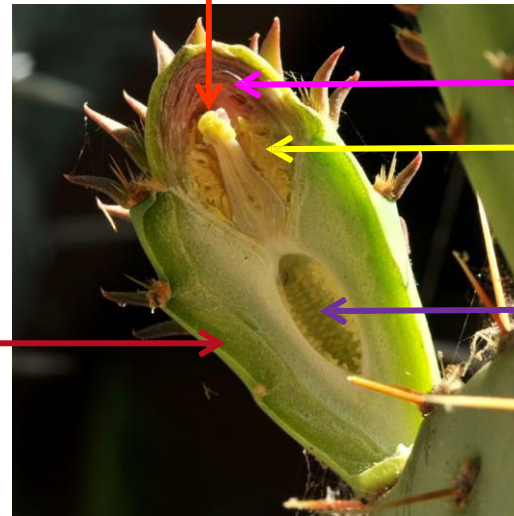
Pericarpel

Stigma

Corolla

Stamens

Ovary





# Flowers



*Mammillaria luethyi*



*Acanthocalycium  
violaceum*

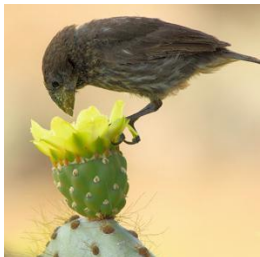


*Coryphantha ramillosa*





# Pollination

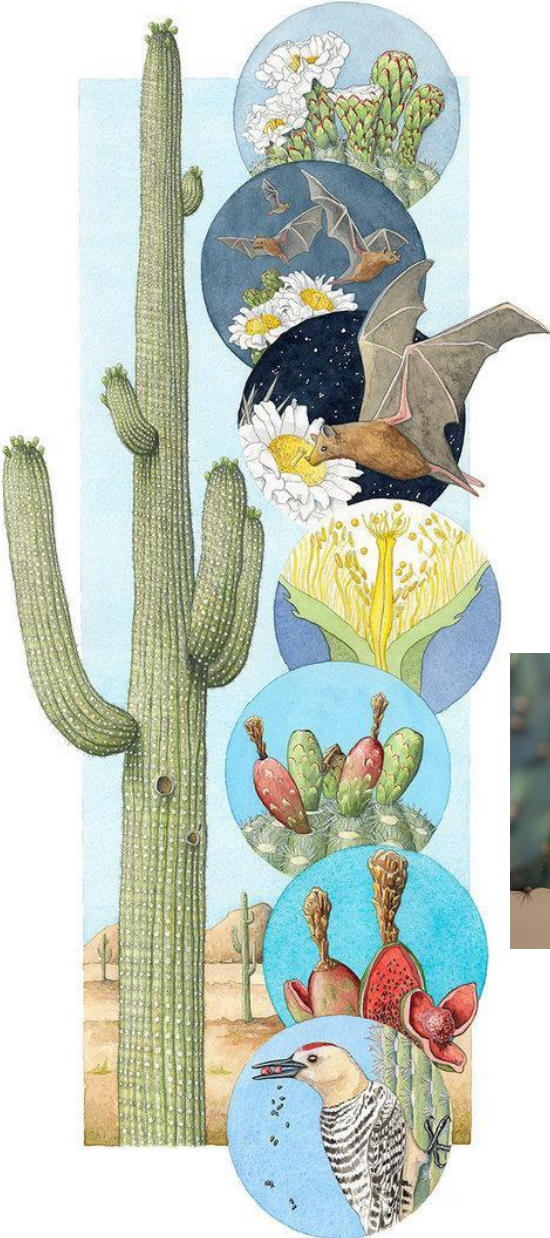




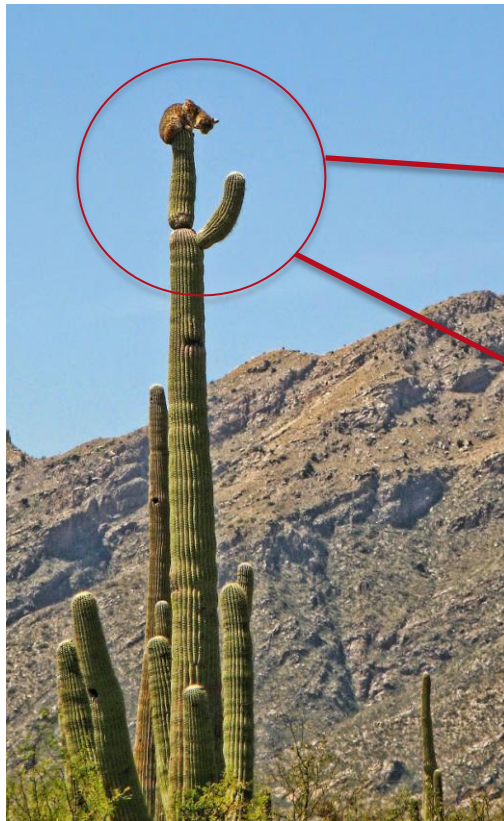


## Cacti ecological role

- Source: food, water and shelter for wildlife
- Nursery for other species of plants
- The roots of cacti prevent soil erosion





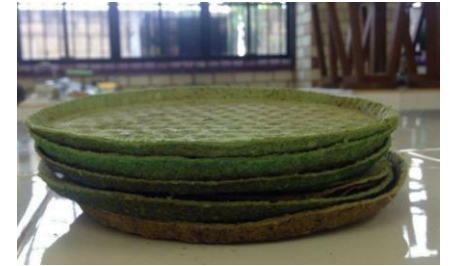


Bobcat (*Lynx rufus*)





# Etnobotany

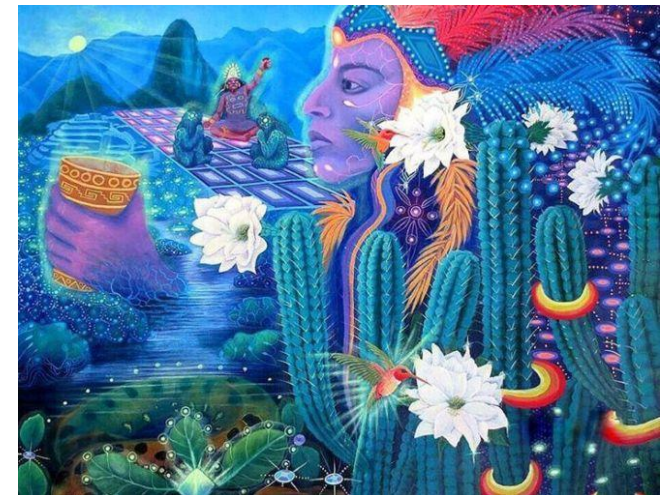
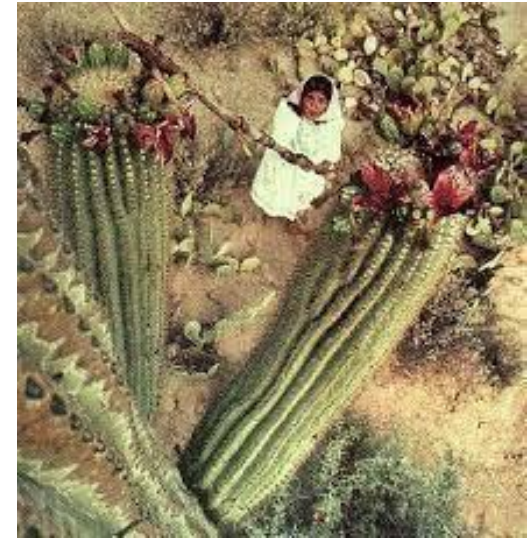


Bravo-Hollis & Sánchez-Mejorada,  
1978; Anderson, E. 2001.





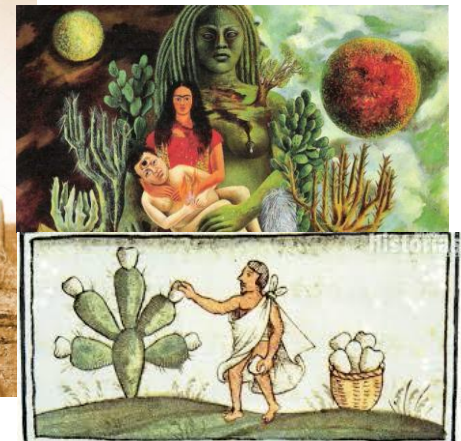
Fishing hook from spines of  
barrel cactus  
Chinchorro native  
americans- Peru - Chile



Bravo-Hollis & Sánchez-Mejorada,  
1978; Anderson, E. 2001.



# Cultural legacy



Bravo-Hollis & Sánchez-Mejorada,  
1978; Anderson, E. 2001.

# Recommendations

- 1) Natural origin of the species
- 2) Substrate and irrigation
- 3) Lighting and ventilation
- 4) Container / pot
- 5) Fertilization
- 6) Abiotic problems
- 7) Disease & Pest management



## 2. Substrate

A substrate with a mineral content: Tepojal (white rock high on Calcium), Tezontle (red rock high in Iron).

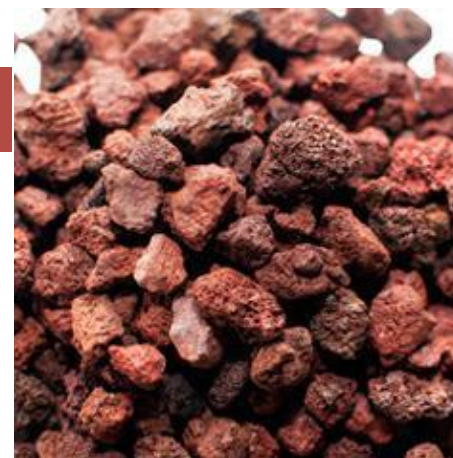
The rocks could be a 50% of the total substrate increasing the draining capacity

- 🌵 allows the roots to develop in an airy and relatively humid environment
- 🌵 prevents waterlogging

Ca +



Fe +





Organic soil 20-30%

Si +



Perlite 10-15%



Clay pebbles 10-15%

B Mix: volcanic rocks + organic soil 3:1



Depending on the species you can make your own mix!



## 3. Light and temperature

Lighting and ventilation will always be related to the first point (natural origin of the species).



Grow Light with “Daylight” spectrum



Sometimes we cannot fight against Nature but we can create a suitable area for our indoor plants!

## 4. Pots / containers

### Pros

- **Unglazed** pots (clay-ceramic) are porous (water and air)

- **Plastic** (light and flexible)
- Good drainage

### Cons

- ✂ Heavy
- ✂ Break easily
- ✂ Bad during winter
- ✂ More \$\$

- ✂ Toxic materials: #3PVC, #6PS, #7 polycarbonate
- ✂ Plastic pots heat up very quickly







Be creative  
and have fun!





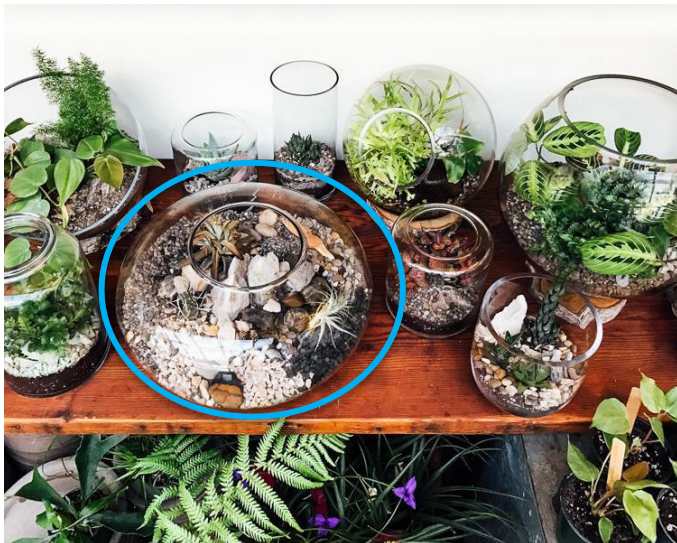
# Terrariums







- Too many plants in a small space
- Too much soil, no pores of air and water
- Started bacterial and fungal growth



- Different families with completely different requirements (poor prognosis)
- At the end some of these plants going to die



## 5. Fertilizers

- ✚ Peters 9-45-15 (for irrigation)
- ✚ Tricel-20 (for foliage or illness)
- ✚ Maxi- Grow Excel
- ✚ Aminocel 500 (post-treatment)

\* Depends of the species





## **6. Abiotic – non living problems**

In transplanted cacti, abiotic problems are probably the most common problems that growers and homeowners encounter.

### **1. Selecting the correct plant and planting location**

Choosing the right plant for the right place is the first step in successfully growing these unique plants.

## 2. Freeze Damage



Severe freeze damage  
in *Cereus peruvianus*



*Echinopsis peruvianus*



*Echinopsis peruviana*



Covering the plant with a cotton sheet will help on nights that are just at or slightly below freezing.



### 3. Sunburn

As the damage progresses, the epidermis turns straw yellow and dies



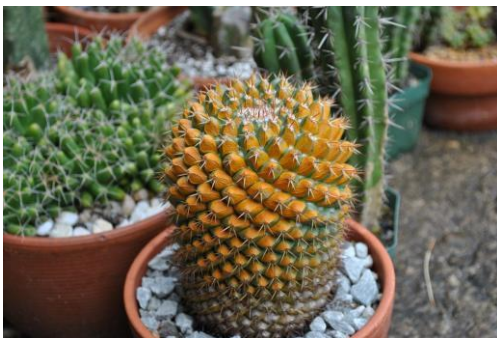
*Ferocactus latispinus*



*Peniocereus serpentinus*



*Astrophytum myriostigma*



*Mammillaria polythele*



## 4. Planting depth

Proper planting depth is essential for the survival of many succulents. In columnar cacti such as saguaro, green stem tissue should not be below ground.

- \* Do not attempt to 'match' plant sizes so that all the plants are identical in height by planting some deeper than others.
- Also if they are different species of plants.



## **5. Poorly-drained soils**

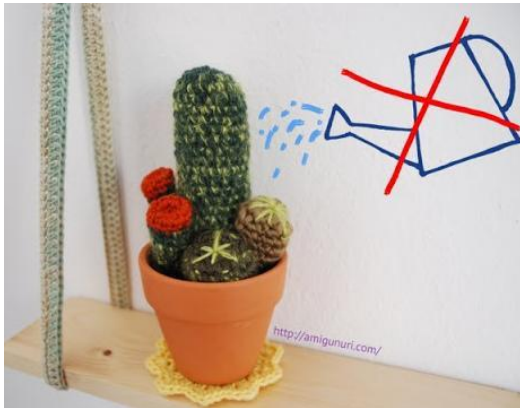
All succulents require fast-draining soils.

Careful irrigation management is critical in growing cactus

## **6. Irrigation**

One of the most serious abiotic problems is over-watering. This combined with poorly drained soils is a recipe for plant failure. It also depends of the type of species, environmental conditions, size and whether an indoor or outdoor plant.





*Schlumbergera* sp.

## 7. Diseases & Pest management

### 1. Fungal diseases on pads and leaves: *Phyllosticta* pad spot

Lesions are almost completely black because of the presence of small black reproductive structures called pycnidia produced on the surface of infected plant tissue.



*Phyllosticta* pad spot on *Opuntia*



- Fungal crown rot of *Echinocereus*

Soft rot of several species of *Echinocereus* is caused by a species of *Helminthosporium*, a fungal pathogen that produces airborne spores abundantly



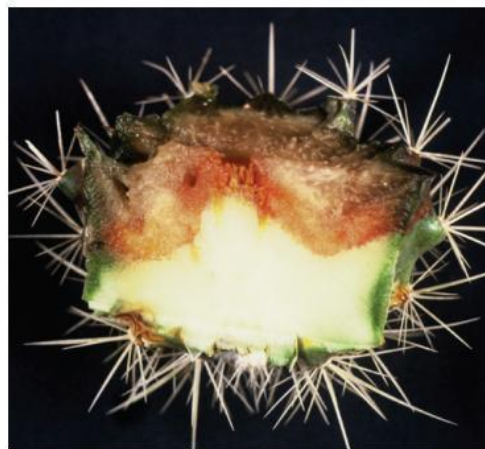
Crown rot of *Echinocereus* cactus causes dark sunken areas in which tissue has rotted.



Internal rot of *Echinocereus* cactus.

## Pythium rot of barrel cacti

A soil borne pathogen that is favored by moist conditions . Golden barrel (*Echinocactus grusonii*) is commonly affected. *Pythium* sp. can cause root and/or crown to rot.



Internal rot of barrel cactus caused by *Pythium*.

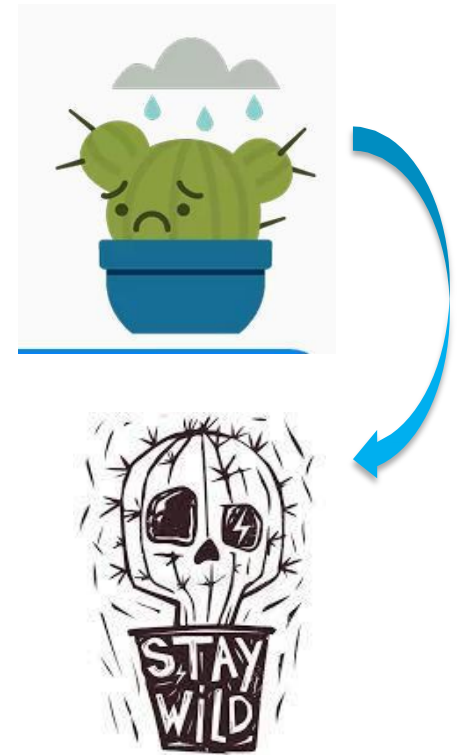




## 2. Protists: Oomycetes also known as “water molds”

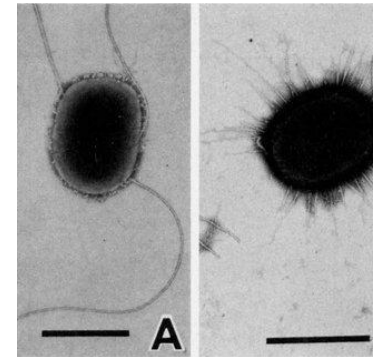


*Peniocereus serpentinus*



### 3. Bacteria -necrosis of saguaro

Caused by the bacterium *Erwinia cacticida*.





## 4. Virus.

- Opuntia Sammons' virus is common on Engelmann prickly pear (*Opuntia engelmannii*)

Use your mask  
don't be a prick!



# Insects

There are several insects that can potentially damage many cacti. Most do not require chemical treatment for adequate control.

Cactus longhorn beetle is controlled by hand picking the insects off infested plants.



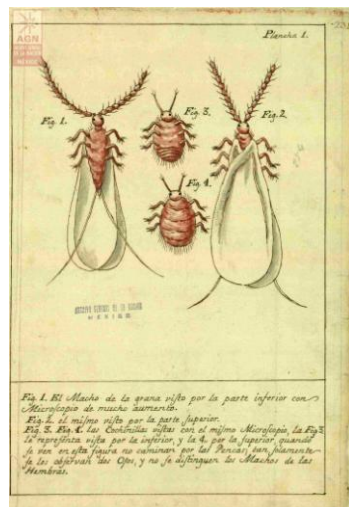
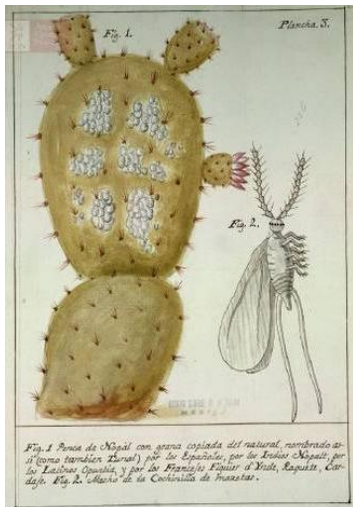


## Cochineal scale (*Dactylopius coccus*)

- Prickly pear (*Opuntia* species) and cholla cacti (*Cylindropuntia* species) are attacked by cochineal scale.









# Examples of cacti requirements

*Schlumbergera* sp.

Brazil

Perlite 20%

Bark 40 %

Organic soil 15%

Clay pebbles 10%

Activated charcoal 1 tb spoon





# Eastern prickly pear cactus

## (*Opuntia humifusa*)

State-listed as potentially-threatened

***O. humifusa*** in Ohio is restricted to the sandy dunes and savannas of the Oak Openings region in the northwest as well as scattered counties in the south. It grows well in areas of full sun on very well-drained sandy soils in dry, rocky fields and barrens

<https://bygl.osu.edu/node/1328>

Perennial of the Week  
- Prickly Pear Cactus

**Authors**


[Amy Stone](#)

**Published on**

June 27, 2019





The image is a collage of vintage botanical illustrations. On the right side, there is a large, detailed illustration of a green cactus with two large, vibrant red flowers. The rest of the image is filled with numerous smaller, rectangular vintage cards, each featuring a different illustration of a cactus or succulent. These include various species like barrel cacti, cholla, and different types of cactus flowers in colors like pink, yellow, and white. In the center, there is a light brown, torn-edge rectangular card with the text "Thanks! ¡Gracias!".

**Thanks!  
¡Gracias!**



Any questions?



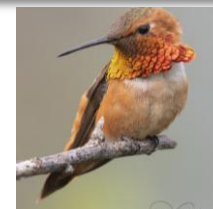


“In the end, we will conserve only what we love; we will love only what we understand and we will understand only what we are taught”

Baba Dioum



# Bibliography



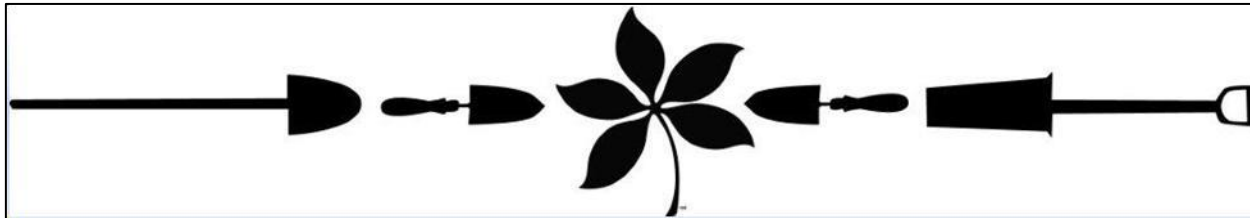
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