

The logo for the University of California, Riverside (UCR), featuring the letters "UCR" in a bold, white, sans-serif font. The letter "R" is stylized with a white sunburst or starburst design at its top right.

# Viruses and Viral Diseases of Cacti and Succulents

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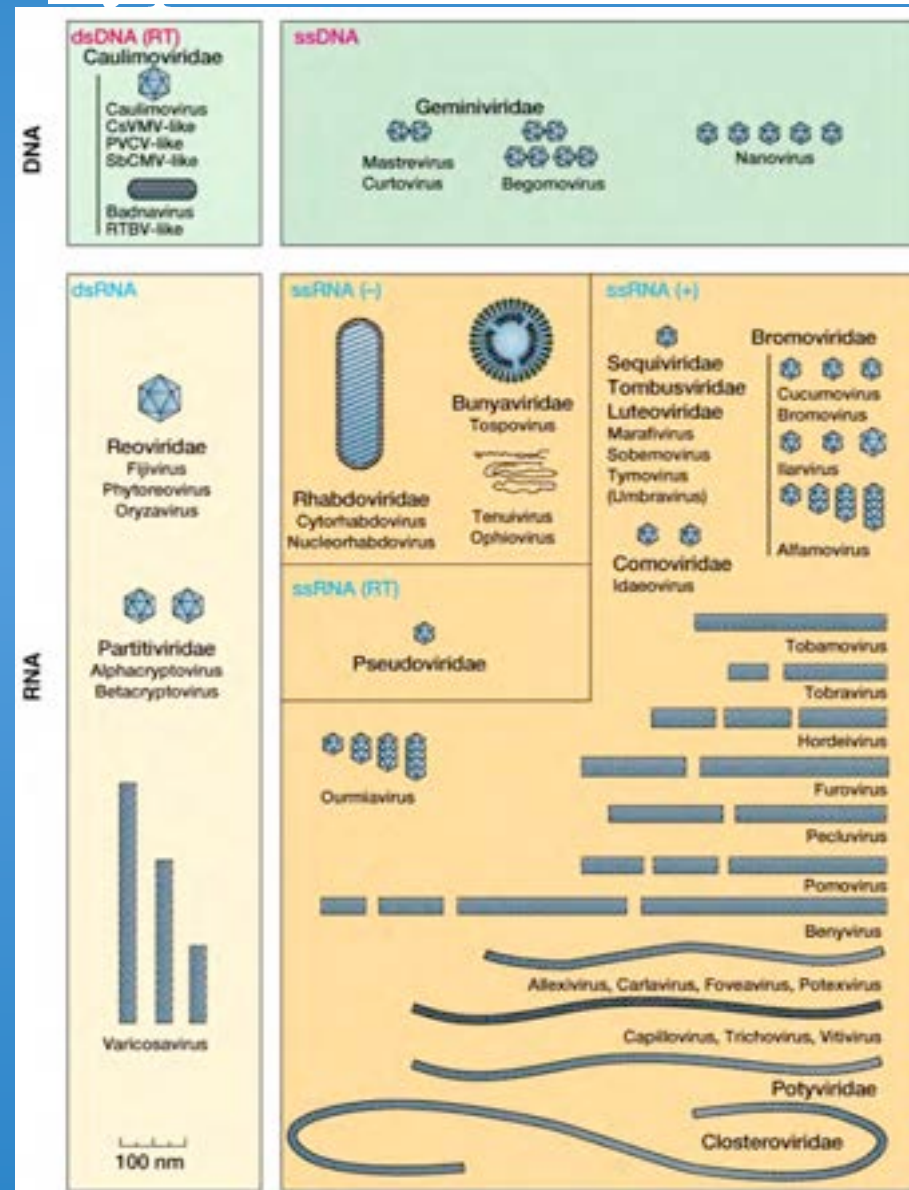
# Introduction

- Overview of viruses
- Common diseases and symptoms in plants
- Cactus/succulent specific diseases
- **Prevention and management**

## What are Viruses?

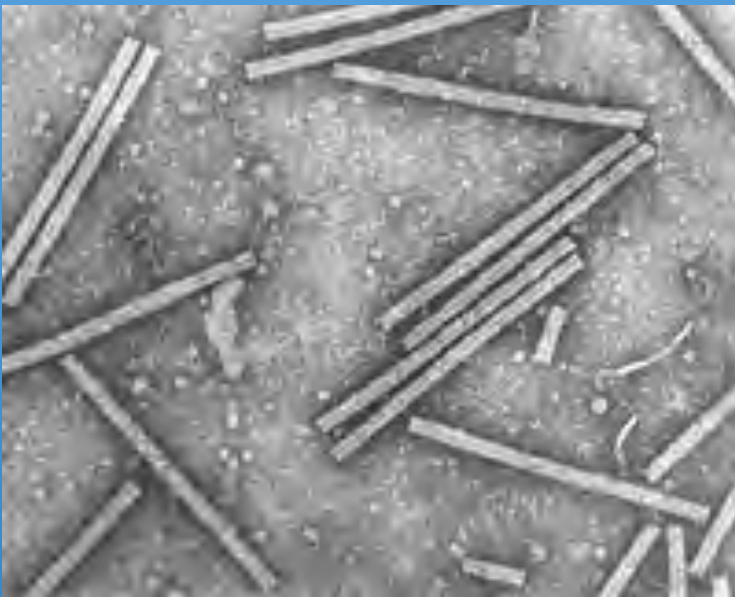
- Small plant pathogens, 20-2000 nm  
(1 nm=25 millionth of an inch)

# Types of Plant Viruses

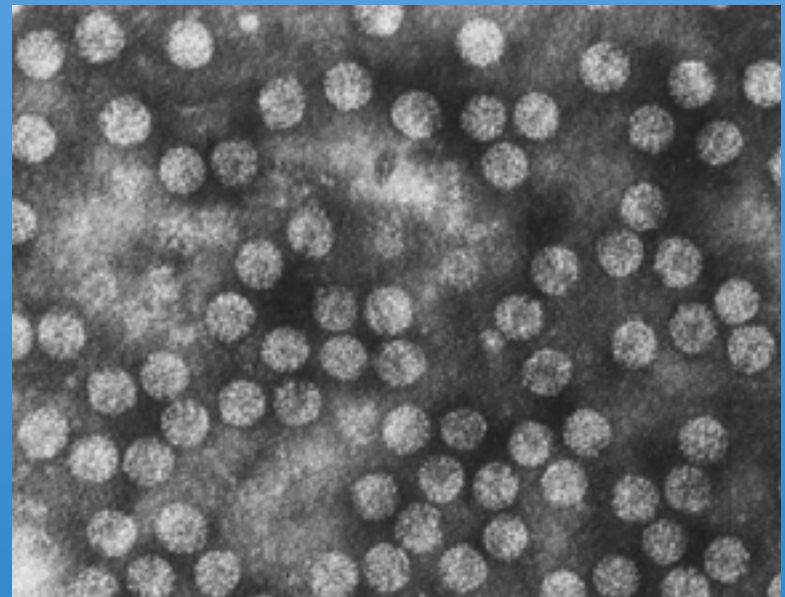


## Viruses

- Composed of nucleic acid (DNA or RNA) surrounded by a self made protective coat protein



*Tobacco mosaic virus*



*Cucumber mosaic virus*



# Viruses

- Require host components and living cells to multiply (=replicate)
- Can survive on surfaces for various times
- Enter through wounds or via vectors

insects

nematodes

fungi

HUMANS

- propagation
- tools
- any touching



## Viruses

- Over 1,000 species of plant viruses
- Each species may have many strains
- Named for first host and symptoms
  - Tobacco mosaic virus (tobamoviruses)
  - Tomato spotted wilt virus (tospoviruses)
- Host range may be narrow (few) or wide (many)

# Host range of Impatiens Necrotic Spot and Tomato Spotted Wilt Tospoviruses-over 1,000 total

## Ornamentals

ageratum	chrysanthemum	geranium	poppy
amaranthus	cineraria	gladiolus	primrose
amaryllis	coleus	gloxinia	ranunculus
anemone	columbine	hydrangea	salvia
aster	coreopsis	impatiens	sinningia
baby's breath	cosmos	lobelia	snapdragon
begonia	cyclamen	marigold	stock
calceolaria	dahlia	nasturtium	tiger lily
calendula	delphinium	N.G. impatiens	verbena
calla lily	exacum	peony	zinnia
campanula	forget-me-not	petunia	
china aster	gaillardia	phlox	



# Host range of Impatiens Necrotic Spot and Tomato Spotted Wilt Tospoviruses-over 1,000 total

## Vegetables

broad bean  
cauliflower  
celery  
eggplant  
lettuce  
pea  
pepper  
potato  
snap bean  
spinach  
tomato

## Weeds

beggar ticks  
black nightshade  
morning glory  
burdock  
chickweed  
galinsoga  
lamb's quarters  
shepherd's purse  
sowthistle  
purslane  
yellow clover

# Viruses

## Types of Symptoms

### – Mosaic/Mottle



Mandevilla



Fern



Hosta

# Viruses

## Types of Symptoms

### – Mosaic/Mottle



Bean



Lettuce



Monocots



# Viruses

## Types of Symptoms

### – Ringspots/Line Patterns



Impatiens



Nemesia

Ann Chase



Tobacco

# Viruses

## Types of Symptoms

### – Flower break



*Tulip flower breaking virus*



*Angelonia flower break virus*



# Viruses

## Types of Symptoms

### – Leaf deformation



### Portulaca





# Viruses

## Types of Symptoms

– Fruit deformation



# Viruses

## Types of disease

– Stunting

*Citrus tristeza virus*



# Viruses

## Types of Symptoms

- None





# Rose Mosaic

## Multiple viruses involved

- *Rose mosaic virus* (=Apple mosaic virus)
- *Prunus necrotic ringspot virus*
- *Arabis mosaic virus*



# *Cucumber mosaic virus* and *Nandina mosaic virus*

Healthy



Infected



## Viruses of Cacti and Succulents

- Difficult to work with due to gelatinous tissue
- Distribution of viruses can be uneven in plants
- Not a lot of research on these plant hosts



# Viruses of Cacti and Succulents

## *Cactus virus X*

- Infects many species in *Cactaceae*: *Cereus*, *Saguaro*, *Opuntia*, *Zygocactus* and *Hylocereus*
- Found worldwide
- Symptoms range from none to distorted areoles, deformed spines, necrosis, mottling
- 3 main strains known to date
- Transmitted by grafting, mechanical, plant contact
- NOT transmitted by seed; NO known vector
- Found in all plant parts including buds, flowers and fruit
- Relatively high infection levels in most hosts

*Cactus virus X on Hylocereus* (Dragon fruit)



*Cactus virus X on Hylocereus* (Dragon fruit)



Chlorosis and Mottling



*Cactus virus X on Hylocereus* (Dragon fruit)



Twisting of arms





*Cactus virus X on Hylocereus* (Dragon fruit)



Reddening



Speckling

# Viruses of Cacti and Succulents

## Other Viruses

- Zygodactylus virus X, Schlumbergera virus X
- Opuntia tobamovirus
- Cactus 2 virus (carlavirus)
- Saguaro cactus virus (carmovirus, sphere, AZ)



## Management

- No “cure”
- Destroy infected stock
- Avoid mechanical transmission: handling, tools, pots, remove plant debris
- Decontaminate tools and surfaces with bleach, quaternary ammonium, chlorhexidine, etc (follow labels)

## Avoidance/Testing Protocols

- Scout routinely for symptoms
- Isolate particularly susceptible varieties
- Eliminate hosts outside GH, weeds, landscape plants
- Regular testing for most common pathogen/host combos
- Collect younger leaves, with symptoms if available

Thank you

