

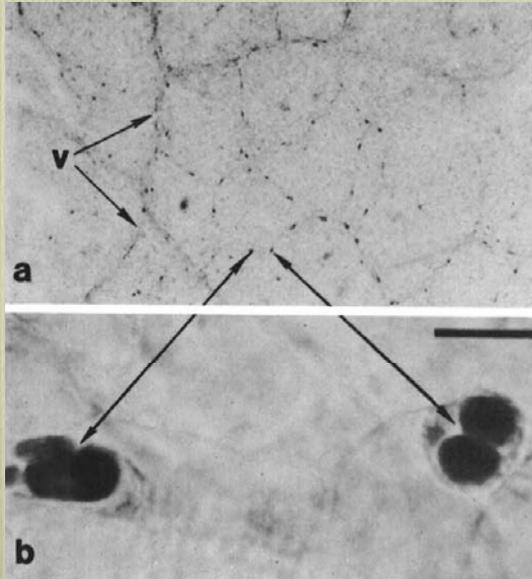
Light Microscopy



Microscopy

- Light vs. electron microscopy

Light vs. electron microscopy



- Nuclear inclusions of a geminivirus

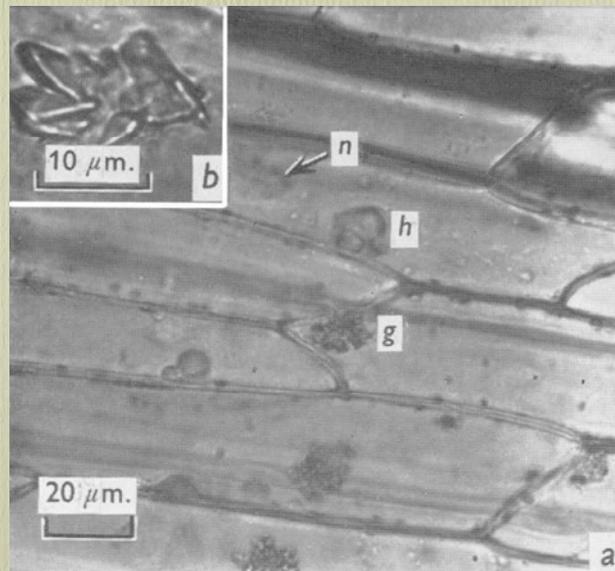
Virus inclusions

- Intracellular evidence of virus infection
 - Altered host constituents
 - Aggregated viruses or CP shells
 - Virus coded proteins (\neq CP)
 - Mixture of the above

Cell abnormalities

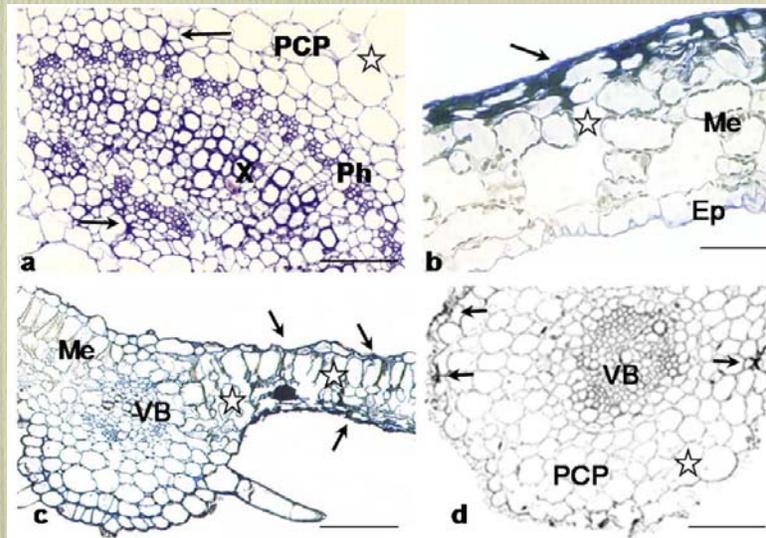
- Histological or Morphological changes
- Hypoplasia or Hyperplasia

Tobacco epidermal cells Infected by Tobacco necrosis virus



Kasanis et al 1970

PVY in tobacco



Otulak et al, 2014

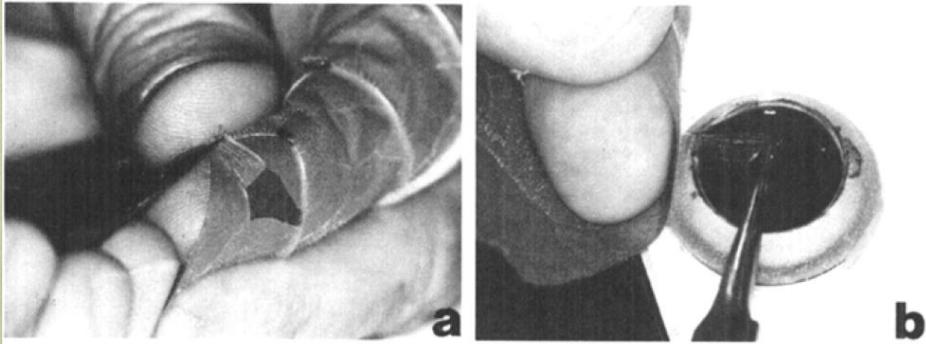
Stains

Staining reactions of cellular constituents

	Nucleus	Nucleolus	Plastids	Microcrystals	Protein	Cytoplasm
O-G (calcomine orange)	Blue	Red-violet	Faint pink to colorless	Colorless	Colorless	Colorless
Azure A	Orange	Green	Yellow	Green	Olive green	Pale yellow

Toluidine blue, Crystal violet, Methylene blue, and Azure B are useful for the detection of pathogenic alterations in virus infected plant tissues

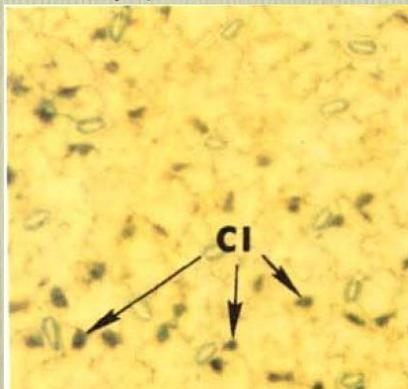
Tissue preparation



- Christie and Edwardson, 1986

Christie and Richardson, 1986

Cytoplasmic inclusions



PRSV, stained w/ O-G

Chenopodium

Virus crystal



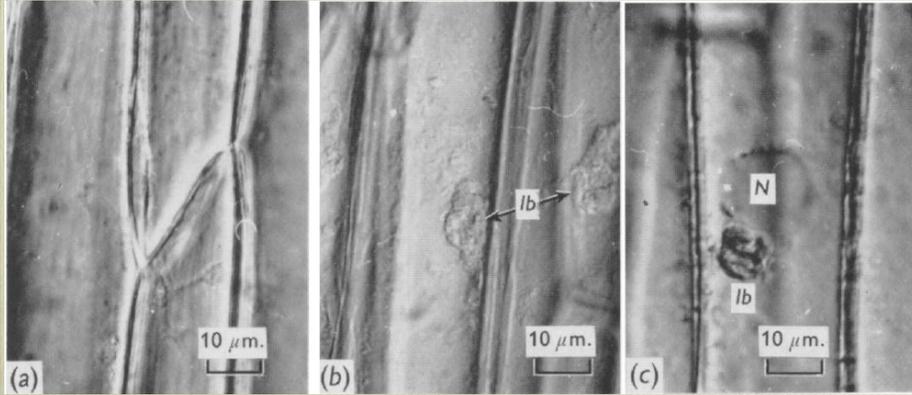
CMV, stained with Azure A

Tobacco

Brassica napa unstained cells

Healthy

Inclusions in infected cells

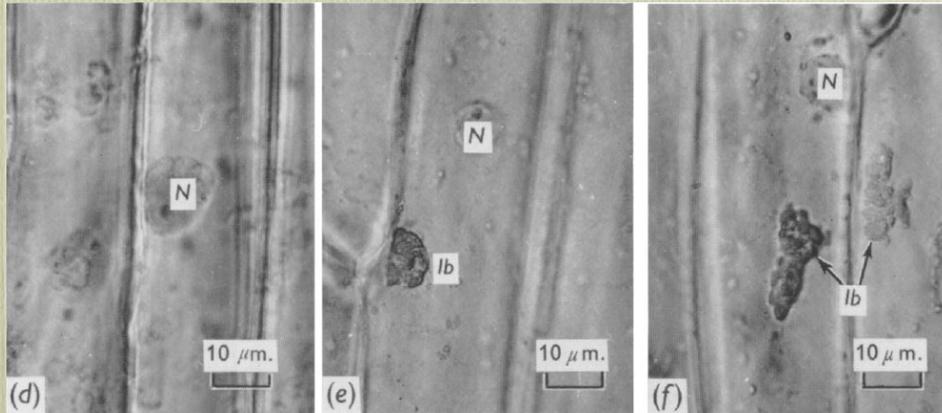


Martelli et al, 1971

Mercuric bromophenol blue stain

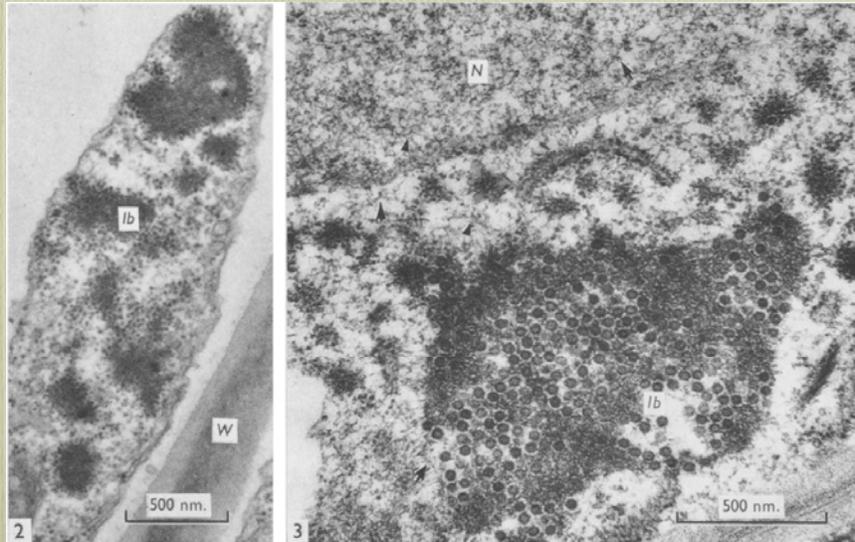
Healthy

Inclusions in infected cells



Martelli et al, 1971

Inclusion bodies viewed by TEM Cauliflower Mosaic Virus



Martelli et al, 1971

Florida Department of Agriculture Viral inclusions gallery

<http://www.freshfromflorida.com/Divisions-Offices/Plant-Industry/Science/Florida-Plant-Viruses-and-Their-Inclusions>