Nematodes Viroids & Parasitic Plants

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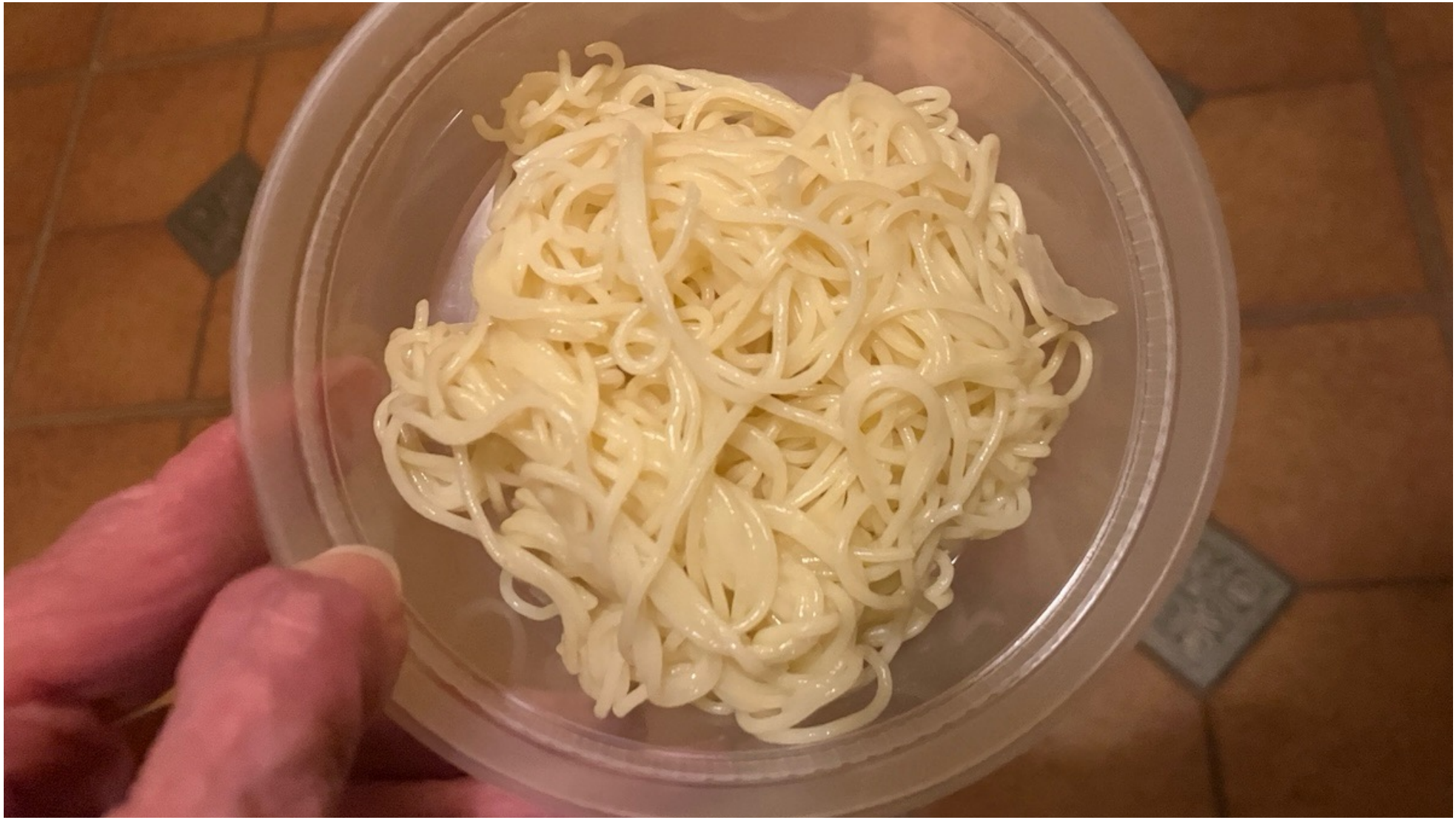
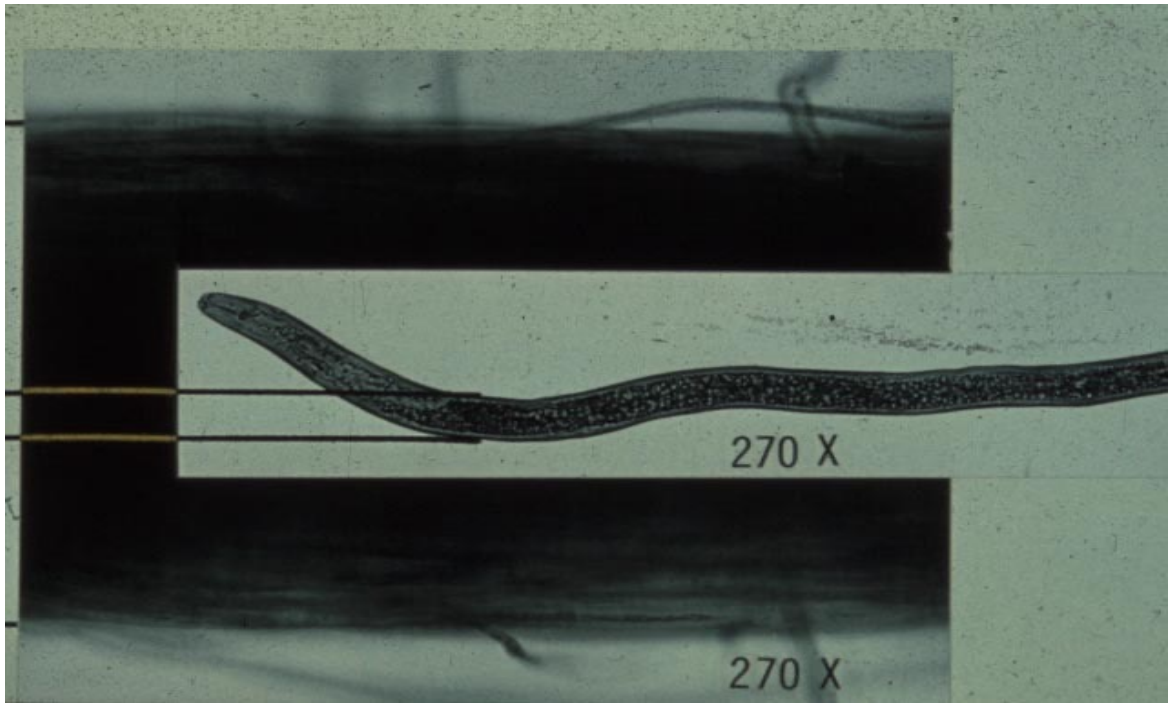
PLANT PATHOGENS include members of these groups:

- ❑ Fungi
- ❑ Water Molds (oomycetes)
- ❑ Bacteria (including phytoplasmas)

- ❑ Nematodes
- ❑ Viruses (and viroids)
- ❑ (Parasitic plants)

Nematodes





Plant-parasitic nematode (with stylet)

Nematodes

Not all nematodes are beneficial!

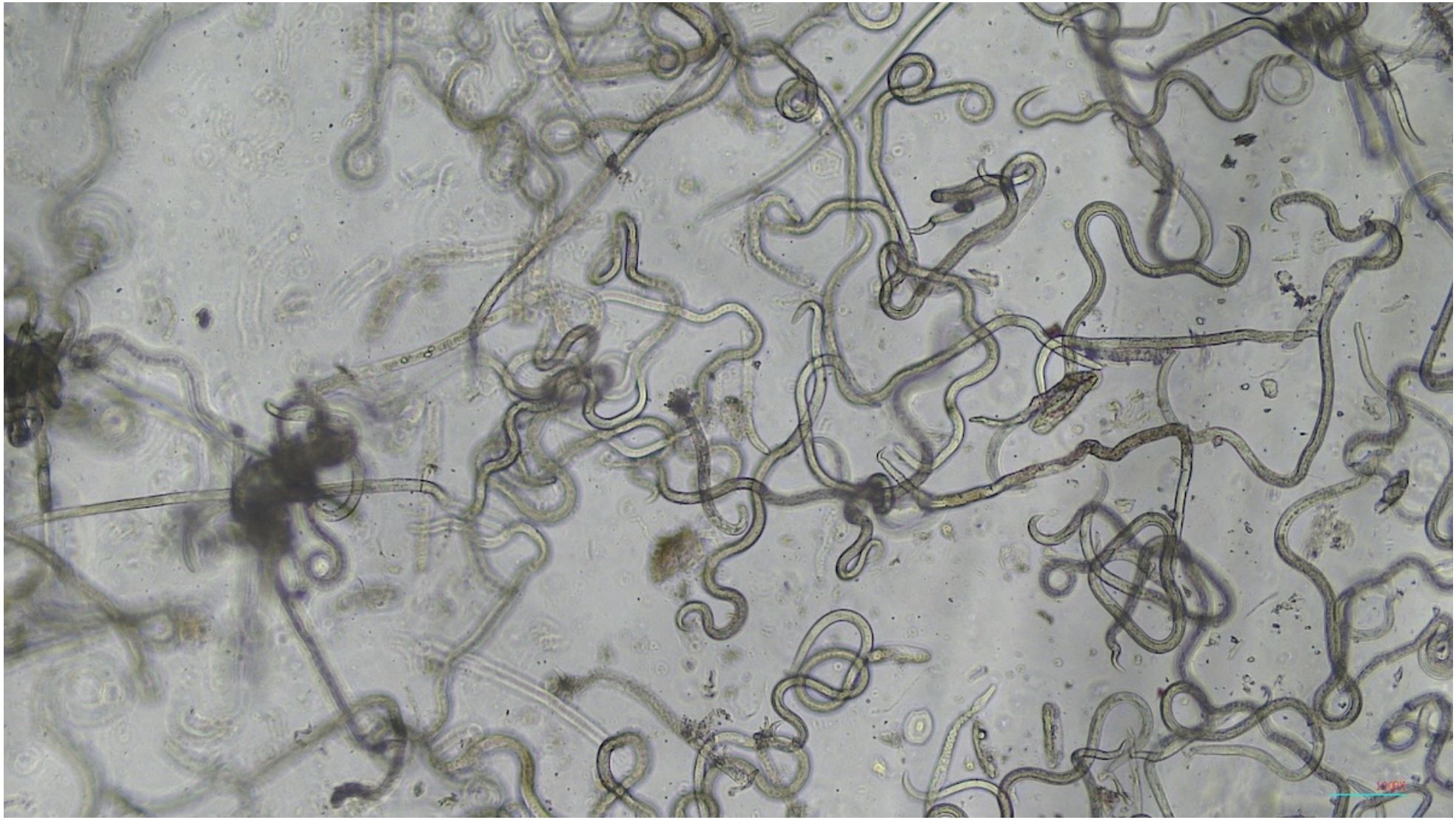
Some are insect predators

Some are decomposers

Some are parasites of plants!

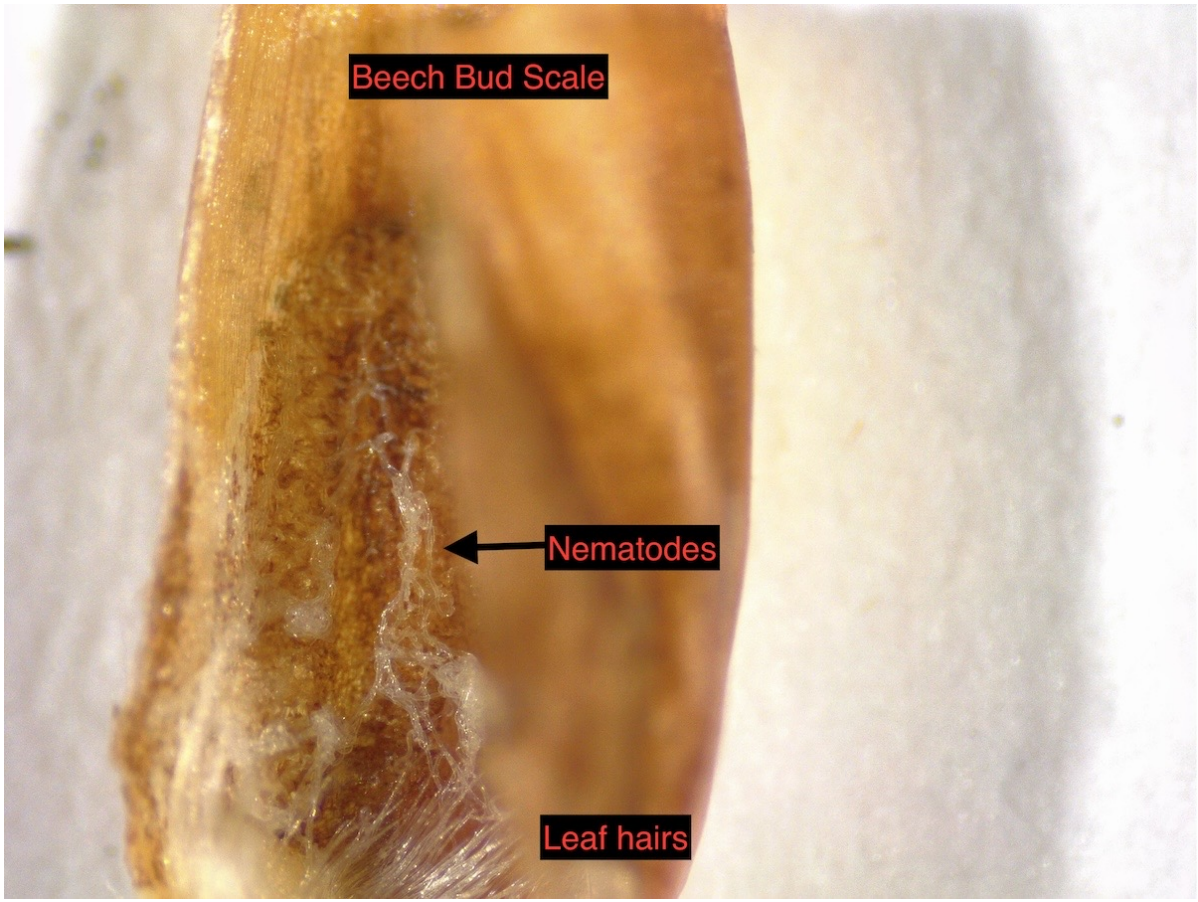
E Shechet and M Daughtrey

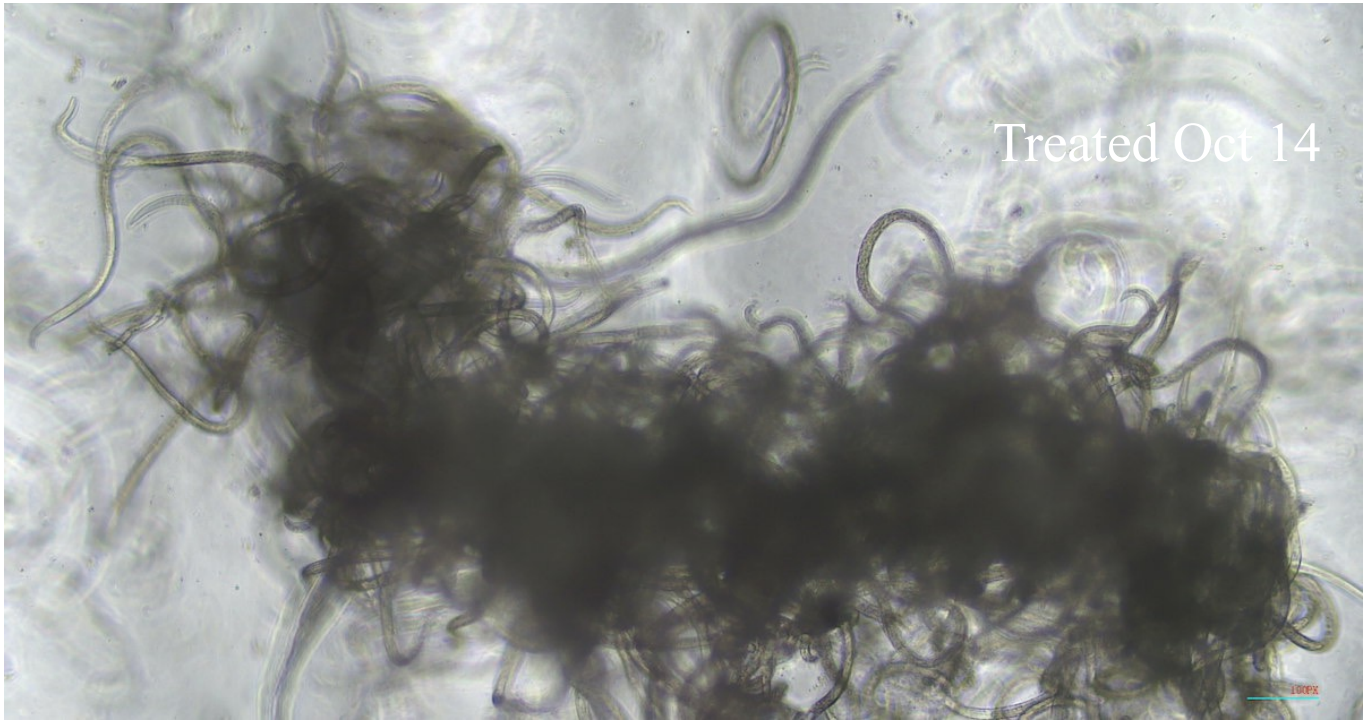
They do have their fans, though . . .




Mike Gaines image

Beech Leaf Gall Nematode


Beech Bud Scale
Nematodes
Leaf hairs


Treated Oct 14

Pine Wilt

Caused by
Pinewood Nematode
Bursaphelenchus xylophilus

When plants are infected by nematodes…

Root Effects Most Typically Seen

Stunted root system

Lesions on roots

Stunted top growth

Nutrient deficient look

. . . Or galls!

Root Knot Disease Caused by Root Knot Nematode
(galling)

There are
approx 100 different
Meloidogyne spp.

Meloidogyne incognita
M. javanica

Biocontrol against RKN (in tomato):

- *Purpureocillium lilacinum* strain 251

[Available as BioAct Prime (Bayer)]

Other potential biocontrols for Root Knot:

Bacteria:

Pasteuria penetrans

Bacillus spp.

Fungi:

Arthrobotrys

Monacrosporium

Pochonia chlamydosporia

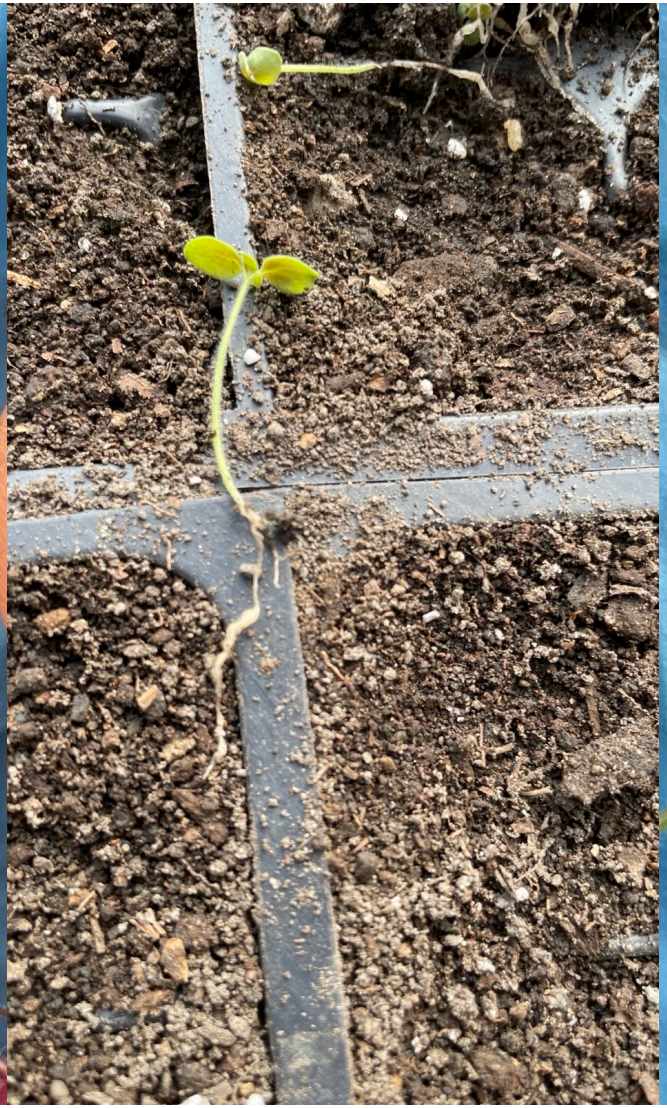
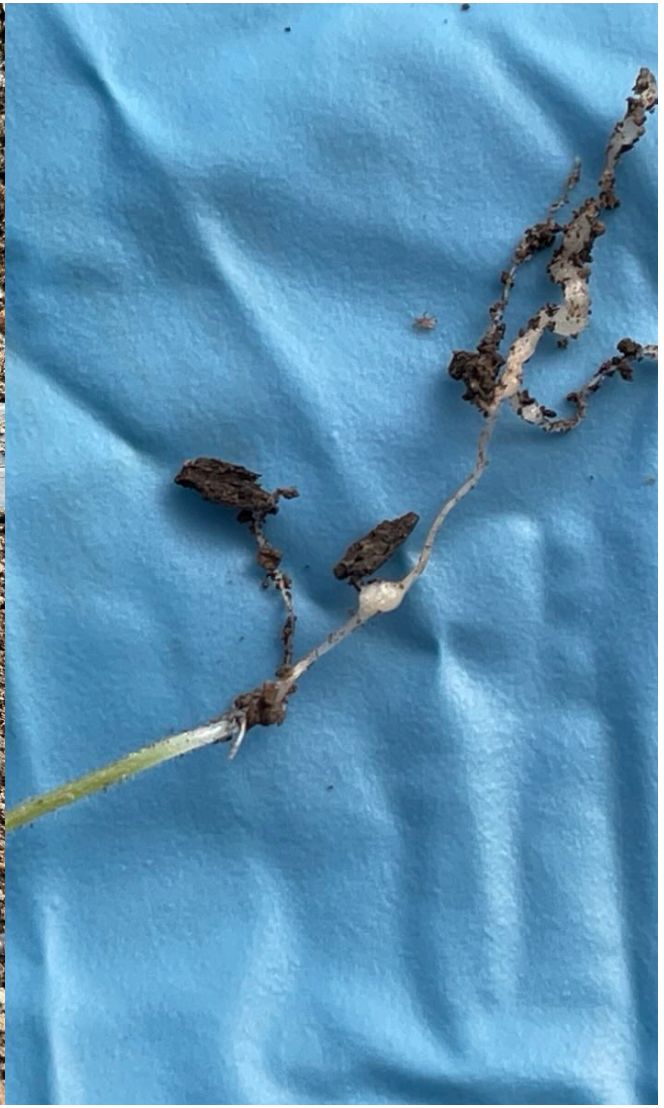
Paeciliomyces lilacinus

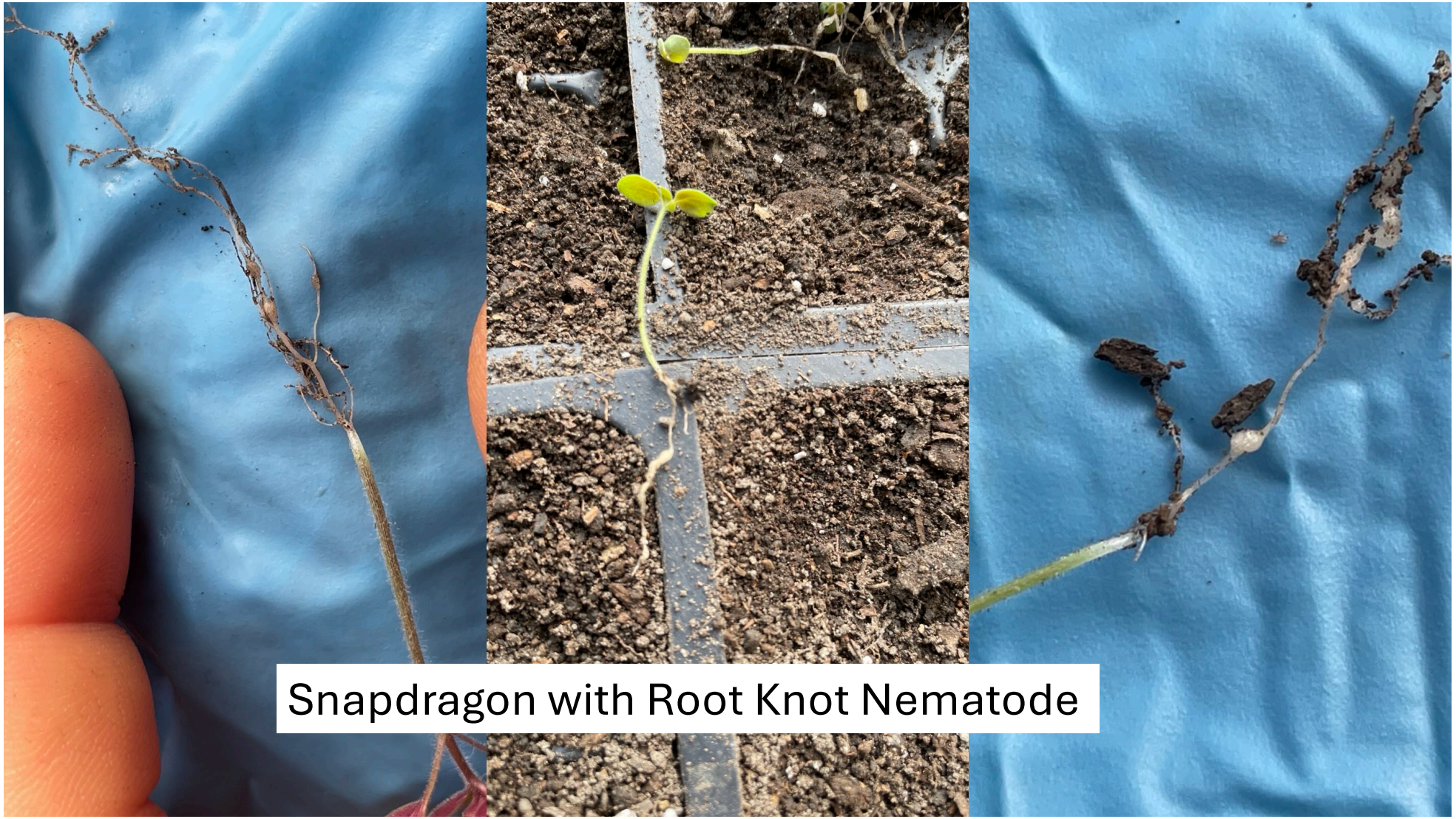
When affordable to grow? Mitkowski and Abawi 2011

Another alternative to biological control:

Chitosan HCl

- leads to toxic levels of ammonia mineralization in the soil
- Promotes microorganisms that make chitinases (this takes out eggs)

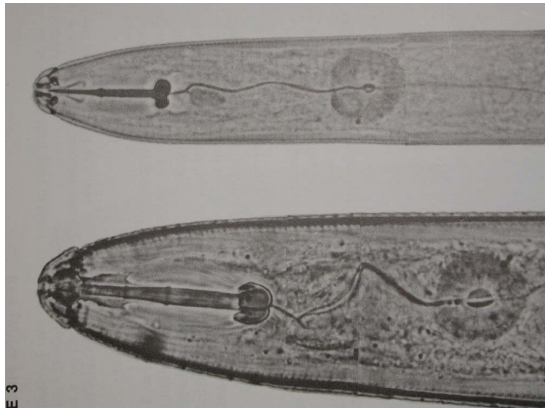


Snapdragon with Root Knot Nematode

Foliar nematodes

Aphelenchoides ritzema-bosi, A. fragariae

Japanese anemone, Bergenia, Lamium, Lamiastrum, Heuchera, Hosta, etc etc

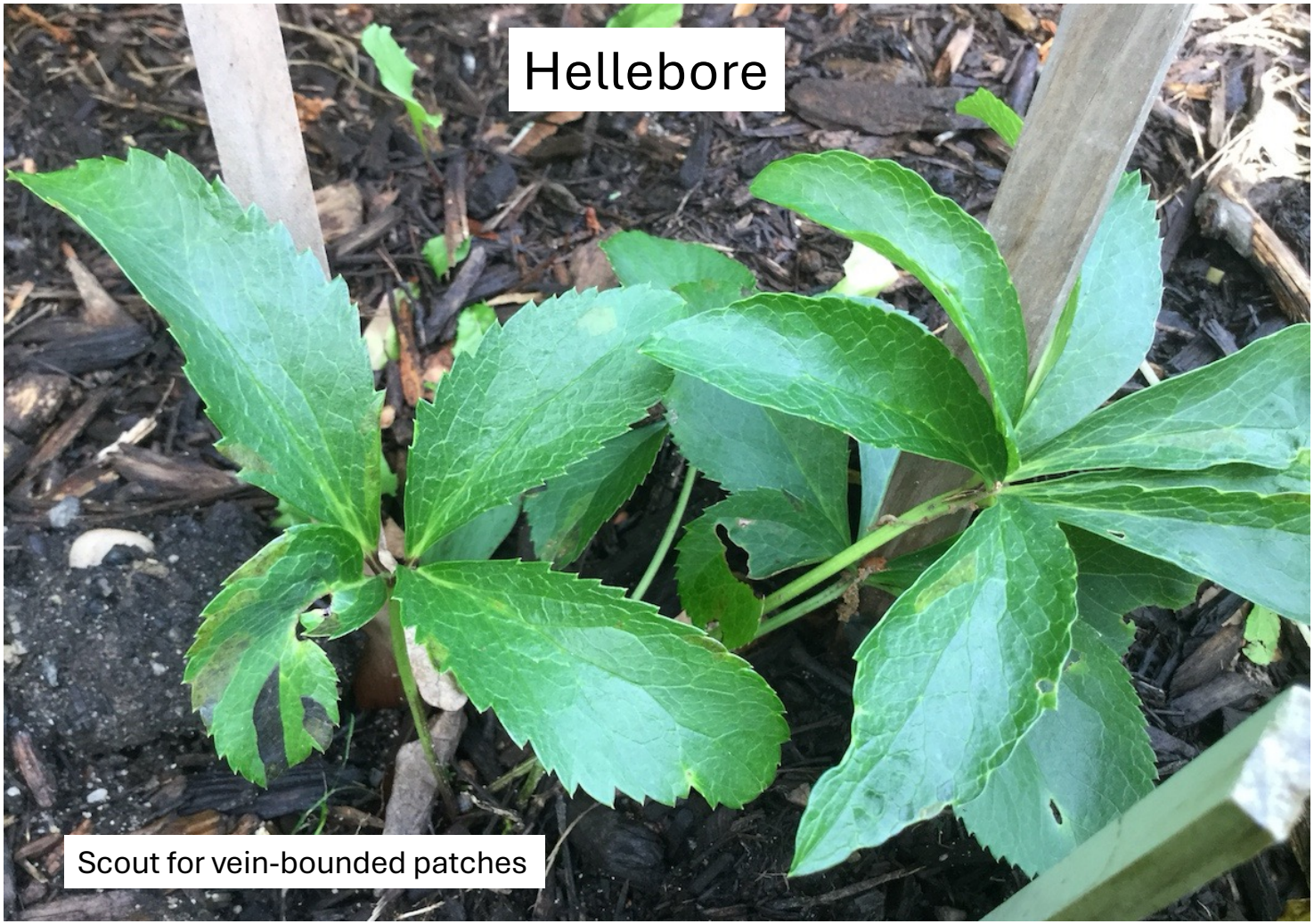



Foliar nematode
Symptoms on Bergenia leaf

Japanese anemone - foliar nematode


Foliar nematode

Echinacea with Foliar nematode


Hellebore
Scout for vein-bounded patches

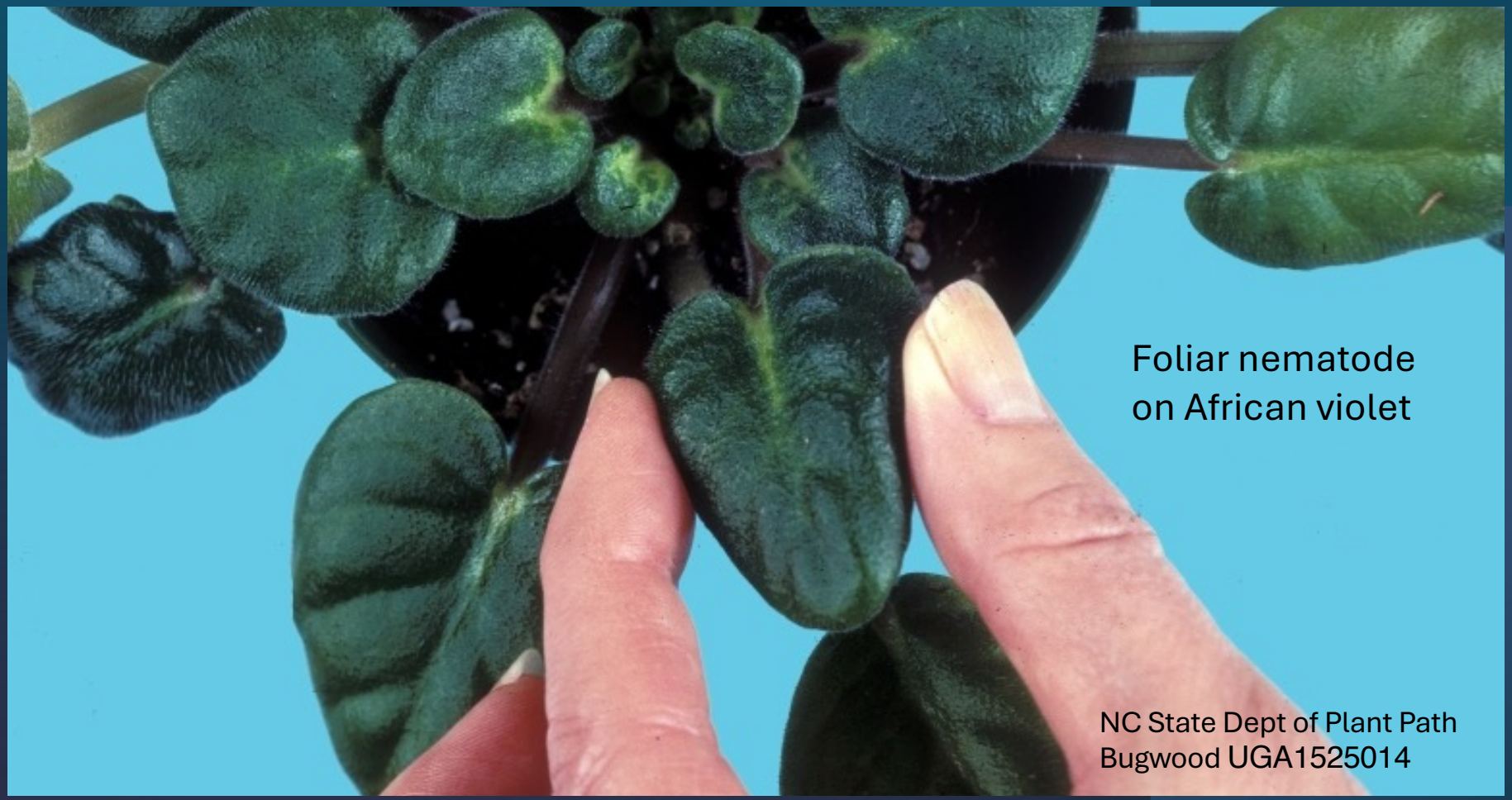

Brunnera
E. Lamb garden

On mum, RKN common in soil-based systems
Steam every 5 -6 production cycles

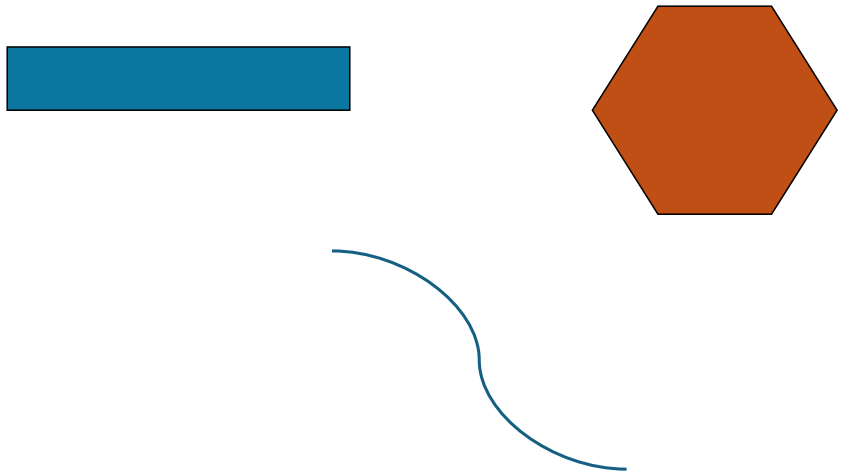
Looking for alternatives:

- Biological nematicides derived from garlic extract
- Chitosan HCl
- Biostimulants: e.g. sea salt ….this has been correlated with reduced RKN damage


Chrysanthemum
Aphelenchoides pseudobesseyi
Billy Crow image


Foliar nematode
on African violet
NC State Dept of Plant Path
Bugwood UGA1525014

Viruses

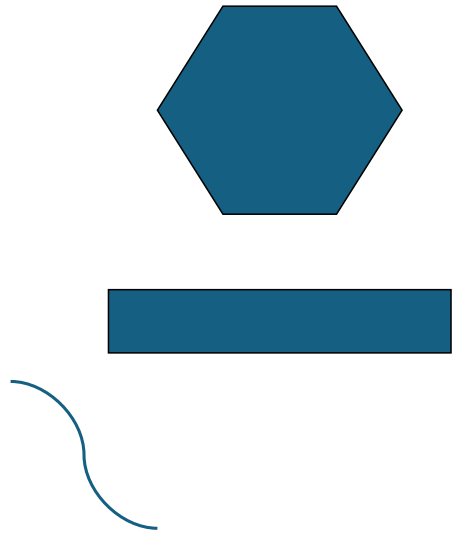


DNA or RNA in a protein coat

Viruses

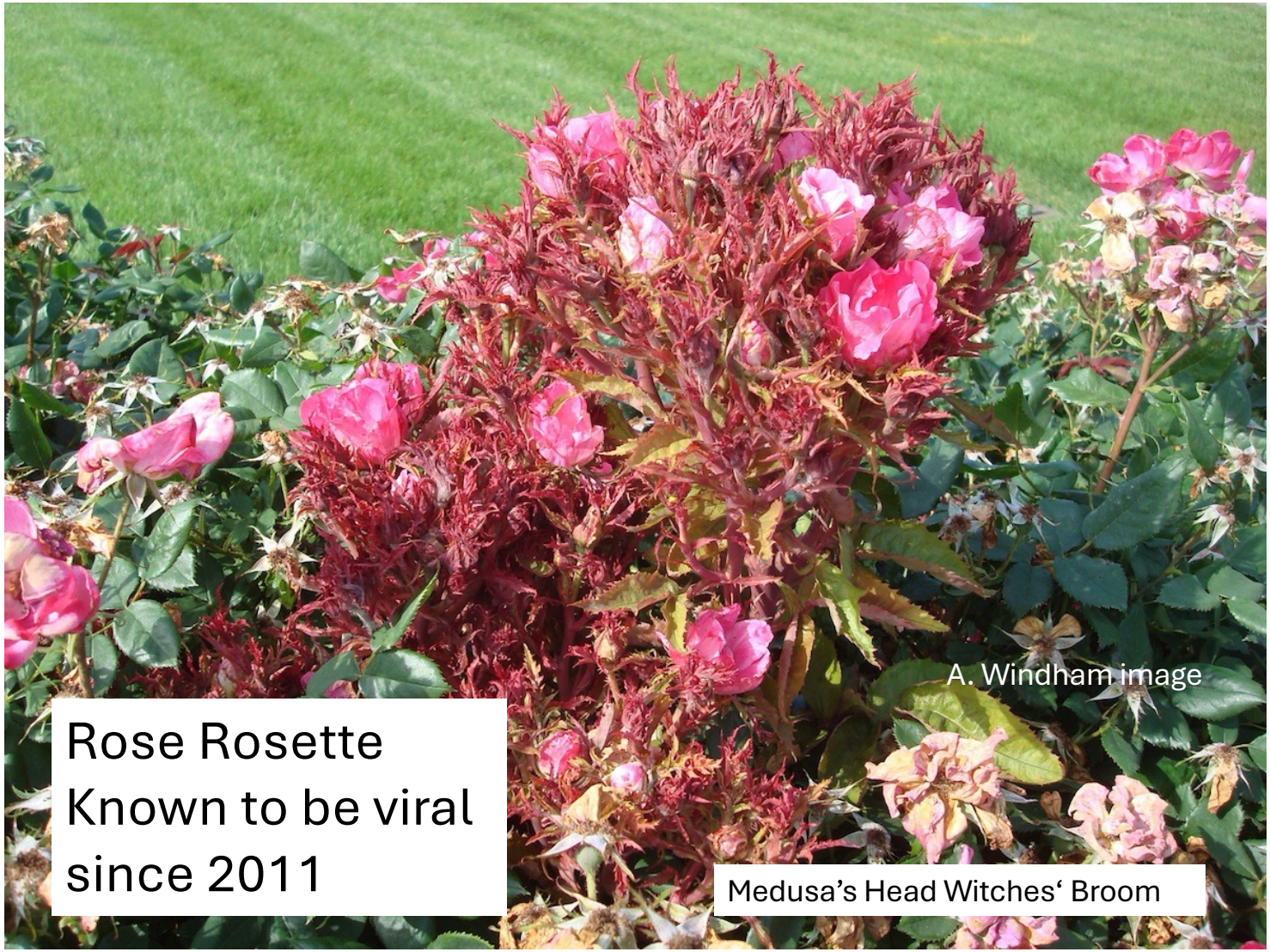
Cause:

Mosaics
Leaf spots
Ring spots
Line patterns
Necrosis
Stunting



A virus that we haven’t covered so far

Rose Rosette Virus (RRV)


A. Windham image
Rose Rosette
Known to be viral
since 2011
Medusa's Head Witches' Broom


A. Windham image

Geo. Robinson image

Multiflora Rose
Schodack Is., Rensselaer Co.
June 2013

NC

Hyperthorniness

Eriophyid mites are the vector for the rose rosette virus

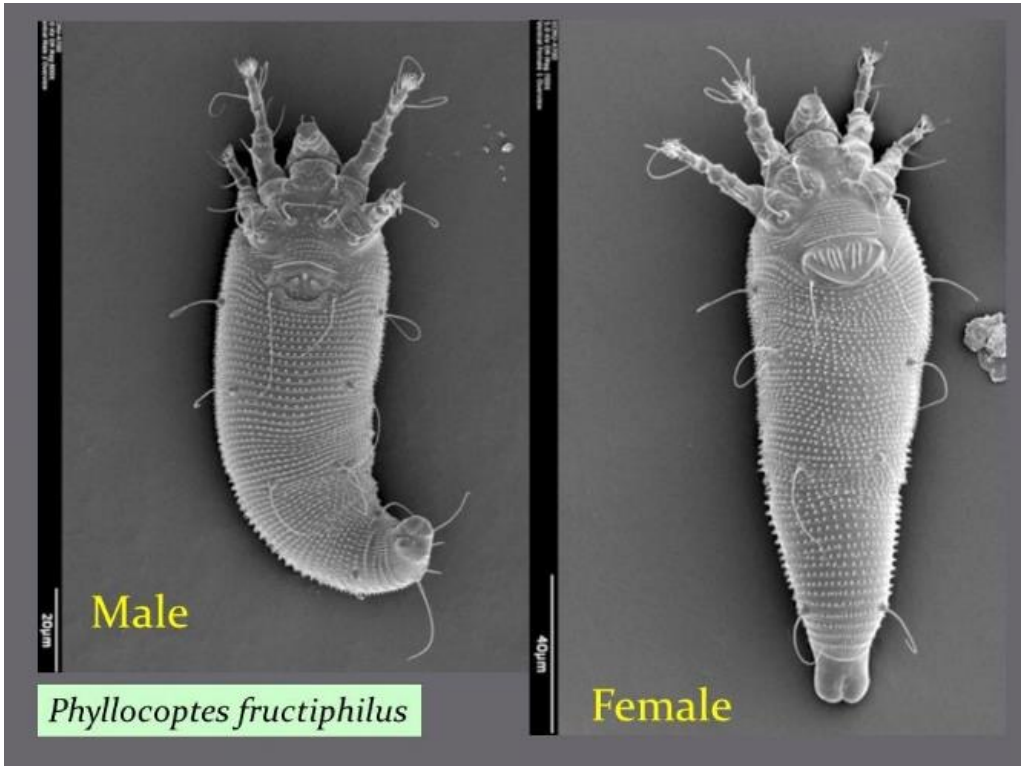
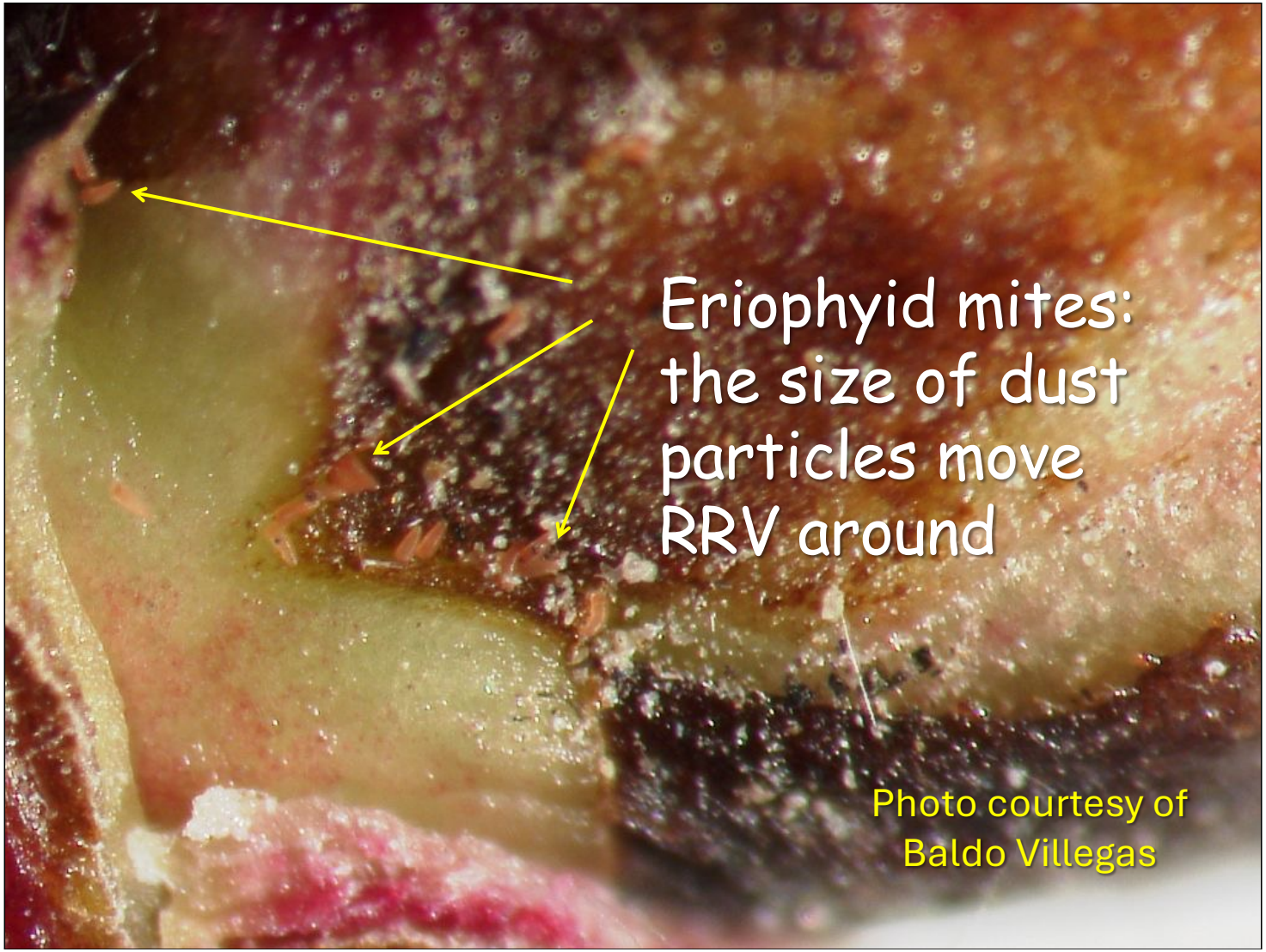


Photo courtesy Ron Ochoa USDA


Eriophyid mites: the size of dust particles move RRV around
Photo courtesy of Baldo Villegas

Things you might find in mums
While you are scouting:

Viroids

Single-stranded, circular RNA

246-401 nucleotides
44 species reported; 2 families
Movement internationally on contaminated seed, or on plants

Things you might find in mums
While you are scouting:

CChMVd
CSVd

(Two viroids)

CChMVd = Chrysanthemum chlorotic mottle viroid
Reported in NY 1967, then Japan and China. Pale leaves with yellow spots; stunt etc.

CSVd = Chrysanthemum stunt viroid
Cause reported 1973; Quarantined by European countries
Seen in Turkey, Japan, Korea and India. Stunt, early Flowering, etc.

Viroids known primarily on Asteraceae and Solanaceae

Chrysanthemum Stunt Viroid Effects

J Dunez image. Bugwood
UGA 0454059

Mum Viruses and Viroids

CVB - 24.7%
TAV - 17.5%
TMV - 4.4%
PVY - 4.4% (finds in a study in China)
CSVd - 2.9%
CMV - 2.5%
CChMVd - 1.5%

Flower color break
Mottled leaves
Flower distortion
Depressions on ray florets
Leaves with chlorotic ring mosaic

Methods for Detection of Viruses and Viroids in Plants

- Bioassays on indicator plants

- Immunoelectron microscopy IEM
- Enzyme-linked immunosorbent assay ELISA
- Double-antibody sandwich ELISA DAS-ELISA
- Dot-blot hybridization
- Reverse transcription polymerase chain reaction RT-PCR
- Immunocapture reverse transcription polymerase chain reaction IC-RT-PCR
- Restriction fragment length polymorphism RFLP analysis
- Loop-mediated isothermal amplification LAMP
- Multiplex RT-PCR – simultaneous detection of mixed infections in a single reaction

Phytoplasmas

Phytoplasmas

Bacteria that are:
Pleomorphic
Phloem-dwelling
Cause symptoms like those of viruses

Aster Yellows Phytoplasma is the most commonly encountered


Aster yellows disease
Candidatus phytoplasma asteris

Parasitic Plants

Nora Catlin image

Dodder
Cuscuta sp.

Forms haustoria to absorb nutrients & water from plants


Dodder

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Questions?

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