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Identifying and managing foliar diseases of potato

Rick D. Peters

Agriculture and Agri-Food Canada

Charlottetown Research and Development Centre

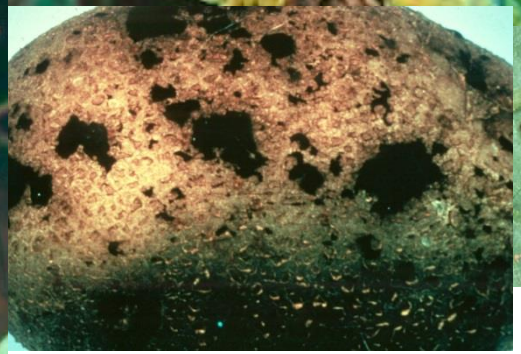
Canada

Foliar Disease Problems





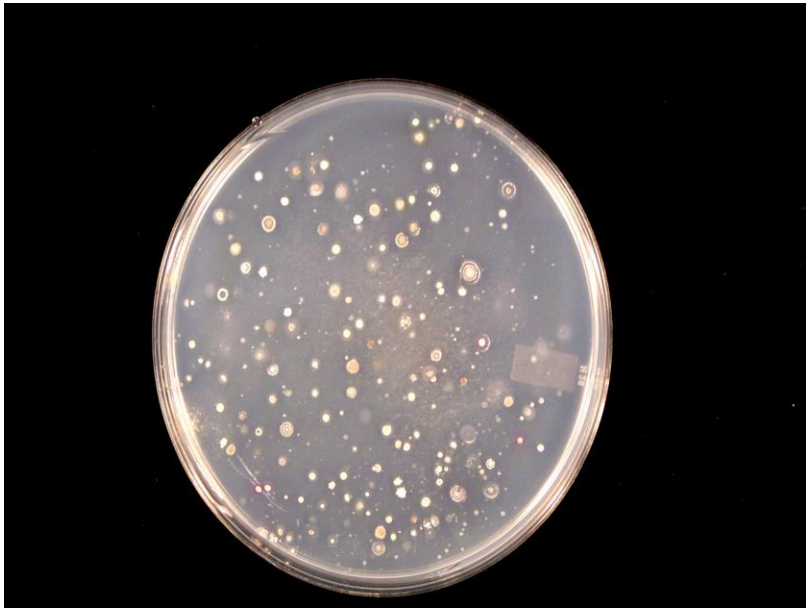


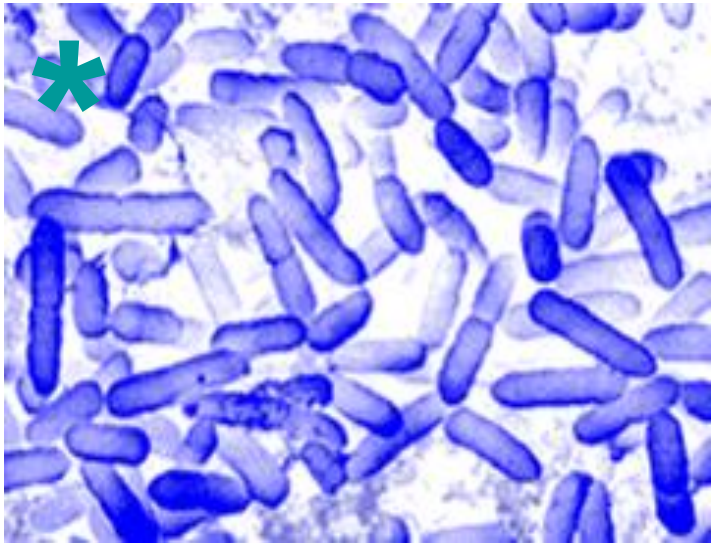




Blackleg/Soft Rot - Symptoms

Blackleg/Soft Rot – Causal Agents

- ***Pectobacterium*** **spp.;** ***Dickeya*** **spp.**
- **Gram-negative rods**





Blackleg/Soft Rot – Disease Cycle

- tuber-borne (seed-borne)
- spread by seed cutting and handling
- contaminated soil water
- contaminated tubers going into storage are symptomless until stressed (harvest & storage operations; other diseases)

Blackleg/Soft Rot – Management

- clean seed
- sanitation of equipment
- plant well-suberized seed pieces in well-drained soil
- reduce tuber bruising at harvest
- do not harvest when soil temperatures are too warm (>25 C)
- in storage, wound healing then cooler temperatures and adequate ventilation

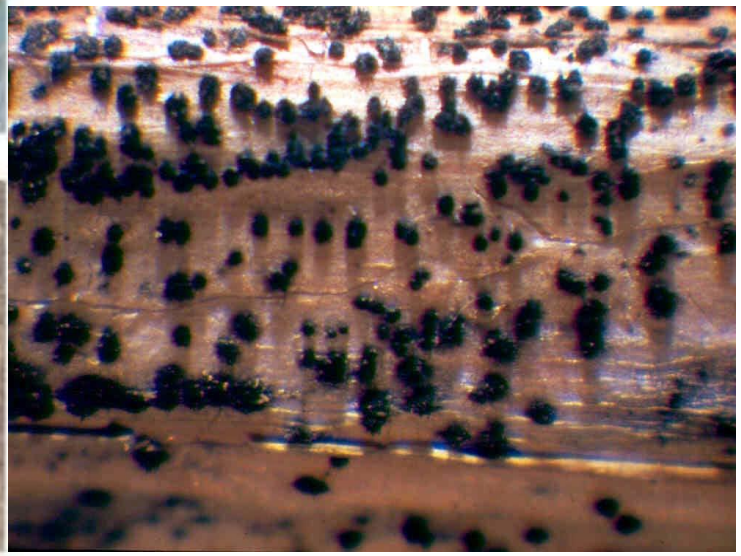
Black Dot - Symptoms

Fig. 1

Fig. 2

Fig. 3

Fig. 4



Black Dot – Causal Agent

Colletotrichum coccodes

Fig. 5

Fig. 6

Black Dot – Disease Cycle

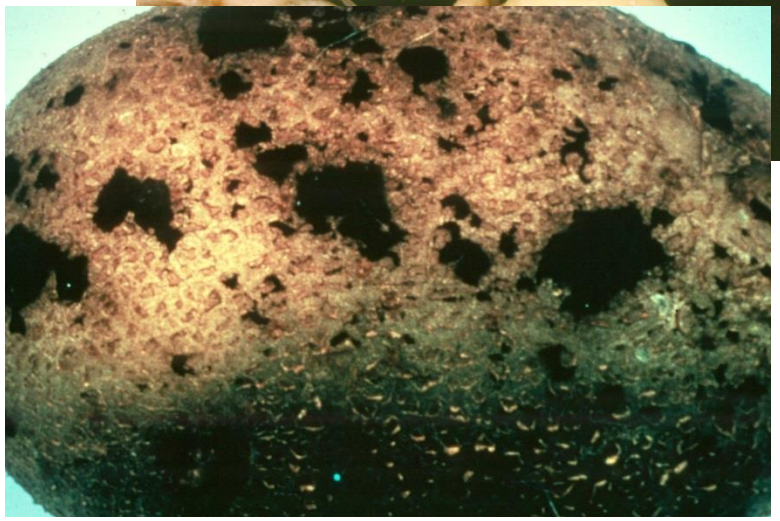
- overwinters as sclerotia on tubers or in plant debris in the field
- infects other Solanaceous crops
- acts in combination with other pathogens
- most severe with continuous moisture and warm temperatures; plant injury or stress
- tuber infection at stem end related to aboveground disease

Black Dot – Management

- use clean seed
- crop rotation
- adequate moisture and fertility
- protective fungicides to reduce foliar infection
- grow early cultivars

Rhizoctonia Stem and Stolon Canker; Black Scurf

Rhizoctonia solani



Rhizoctonia Canker & Black Scurf – Management

REDUCE

SEED-BORNE INOCULUM

SOIL-BORNE INOCULUM

White Mold – Causal Agent

Sclerotinia sclerotiorum

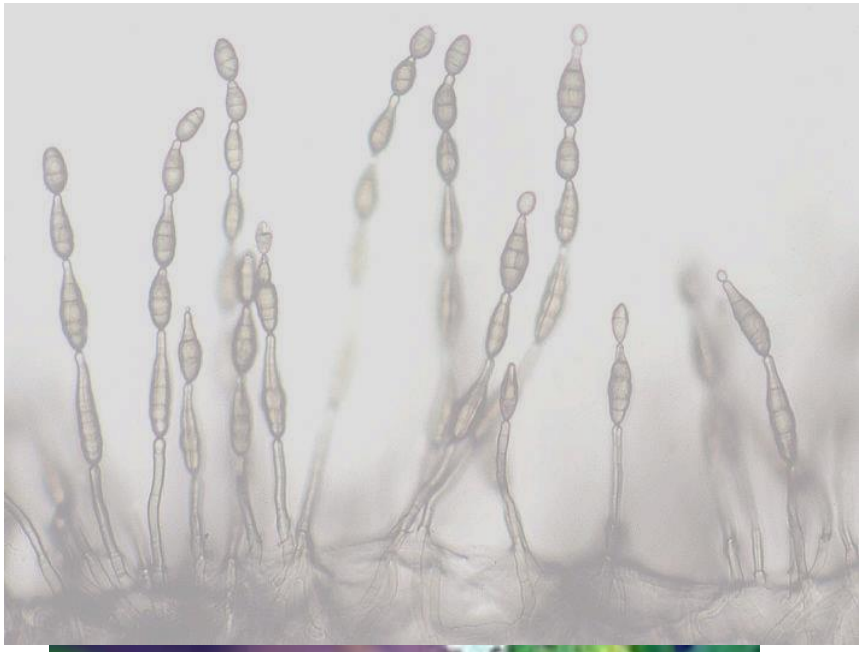
White Mold – Disease Cycle

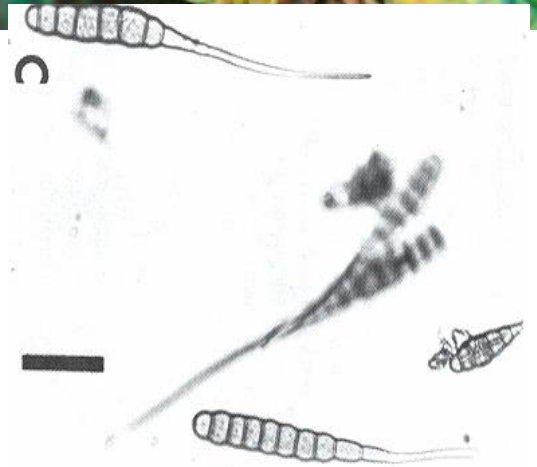
- pathogen overwinters as sclerotia
- sclerotia germinate directly or produce apothecia and ascospores
- apothecia produced over a 2 to 8 week period beginning at row closure
- ascospores require free water for germination and infect senescing leaves or blossoms
- very wide host range

White Mold – Management

- protectant fungicides applied before infection (number depends on length of time of apothecia production in the area)
- manage canopy to reduce conducive microclimates (fertility, irrigation, etc.)

Early Blight and Leaf Disease Complex





Conidial morphology

A. solani:

- long/slender
- beak present
- solitary

A. alternata:

- short/club-shaped
- no beak
- chains

Early Blight - Symptoms

Brown Spot - Symptoms

‘Late’ Blight vs ‘Early’ Blight

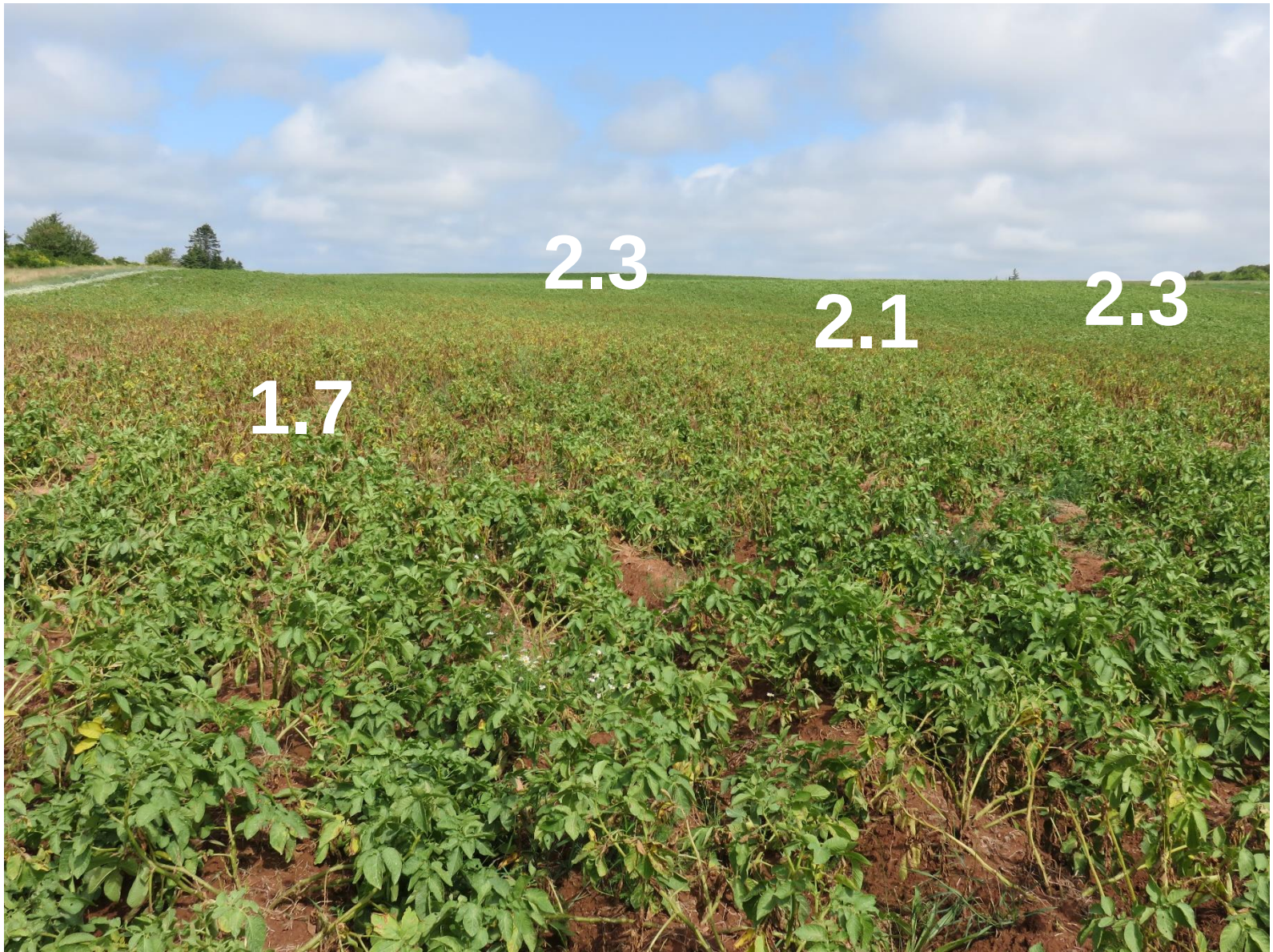
- Can appear early in season
- Attacks vigorous, young foliage
- Only overwinters in infected tubers

- Can appear late in season
- Attacks older tissues and/or stressed plants
- Overwinters in debris

Early Blight/Brown Spot Management – Cultural Practices

- High quality seed
- Disease forecasting tools
- Regular field scouting
- Eliminate sources of primary inoculum
  - Encourage breakdown of crop residues and debris
    (crop rotation, tillage)
- Select less susceptible varieties (disease more severe in early-maturing cultivars)
- **Reduce crop stress**
  - **Soil moisture, fertility, other diseases**
- Proper harvest and storage procedures (proper skin set; reduce bruising; allow wound healing)

Early Blight Management – Cultural Practices
Percent Organic Matter



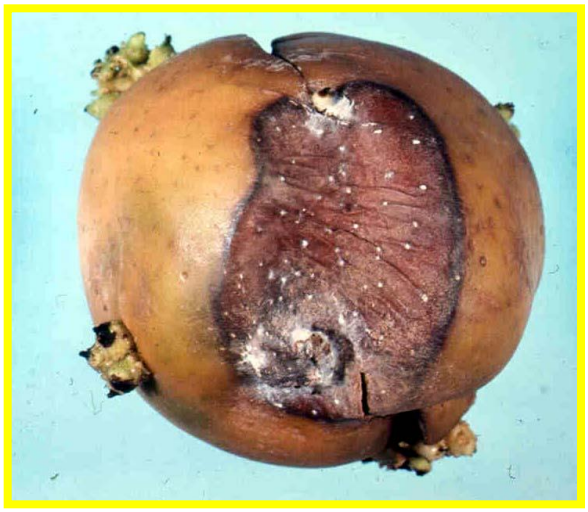
Early Blight/Brown Spot - DISEASE MANAGEMENT

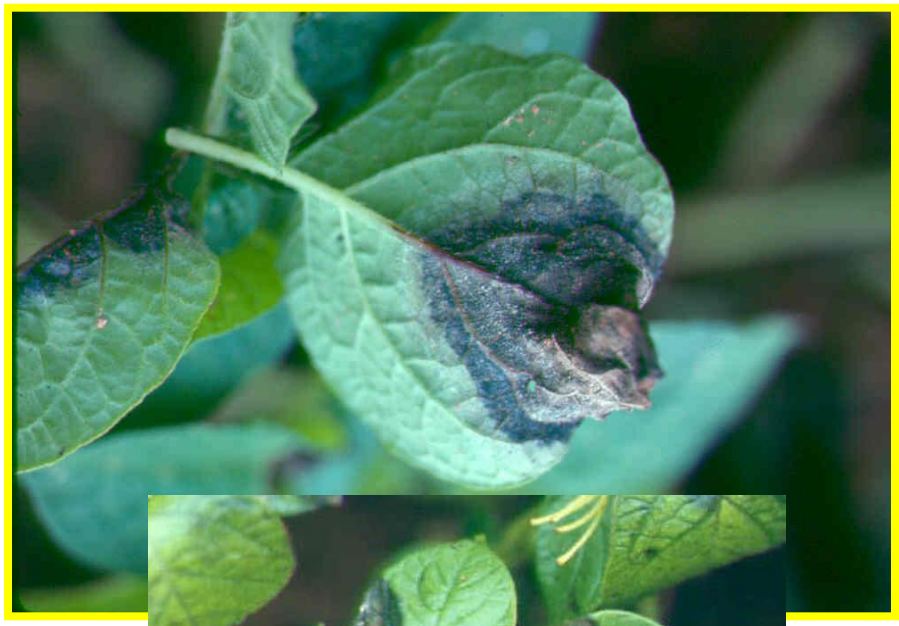
Fungicides

- a preventative program works best
- good coverage is key
- frequent application to protect foliage
- timed applications when weather conditions are conducive to disease and /or disease risk is high

Commercial Name	Active Ingredient	FRAC Group
Aprovia Top	benzovindiflupyr + difenoconazole	7+3
Azoxy	azoxystrobin	11
BAS 700	fluxapyroxad	7
Cabrio Plus	pyraclostrobin + metiram	11+M
Cantus	boscalid	7
Headline	pyraclostrobin	11
Inspire	difenoconazole	3
Luna Privilege Velum Prime (in-furrow)	fluopyram	7
Luna Tranquility	fluopyram + pyrimethanil	7+9
Quadris	azoxystrobin	11
Quadris Top	azoxystrobin + difenoconazole	11+3
Quash	metconazole	3
Reason	fenamidone	11
Scala	pyrimethanil	9
Sercadis	fluxapyroxad	7
Tanos	famoxadone + cymoxanil	11+27
Treoris	penthiopyrad + chlorothalonil	7+M
Vertisan	penthiopyrad	7

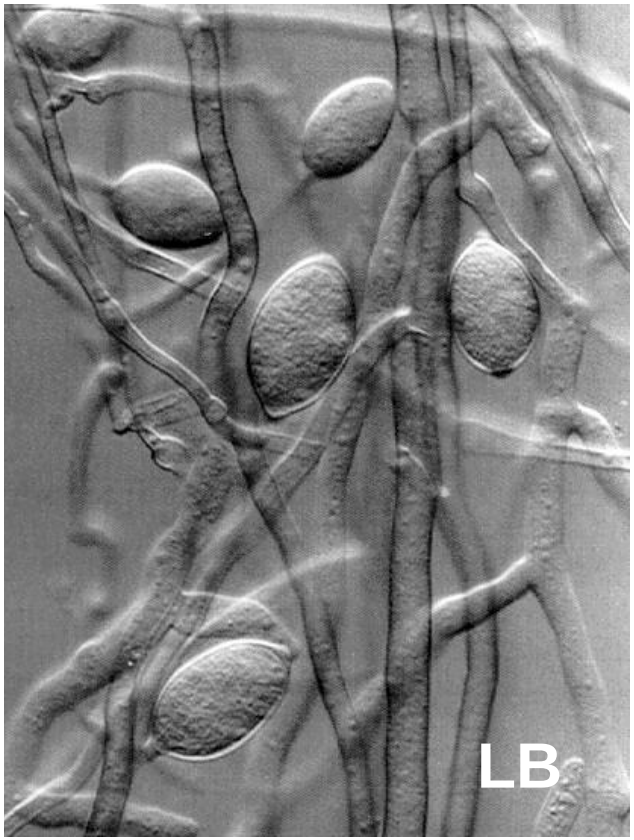
Gray Mold - Symptoms

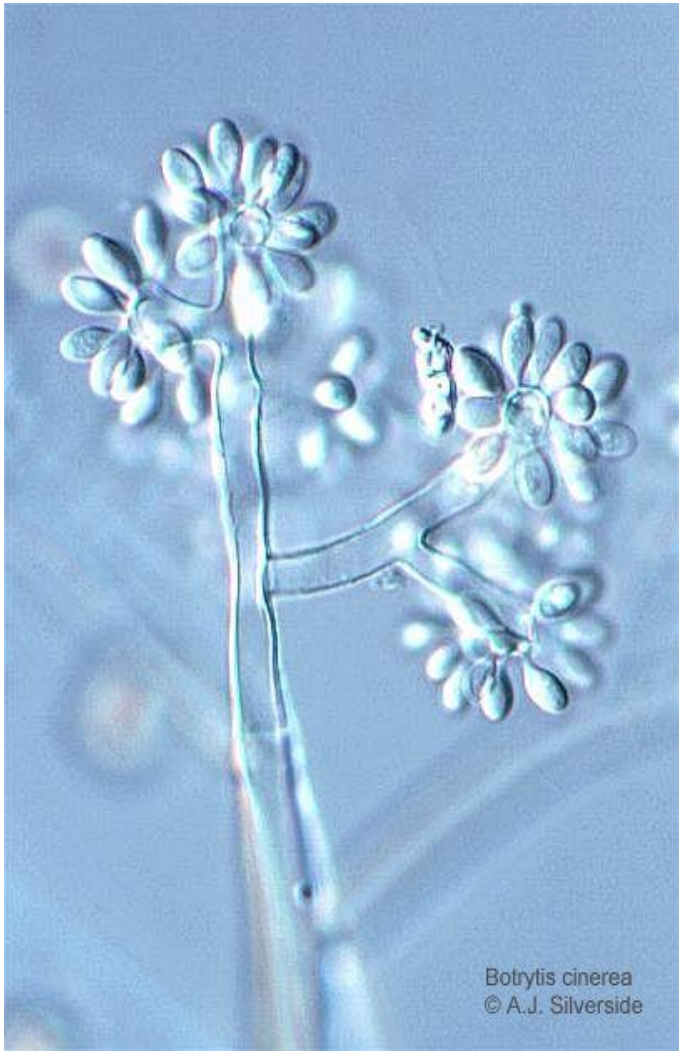




Gray Mold – Causal Agent

Botrytis cinerea





Gray Mold – Disease Cycle

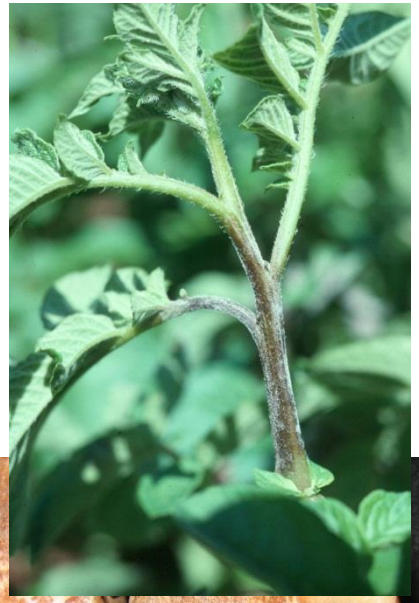
- ascospores or conidia from sclerotia in crop debris
- wide host range
- flower infection; petals fall to initiate foliar infections
- cool, wet weather and dense canopies favour disease
- wounds facilitate infection, particularly of tubers

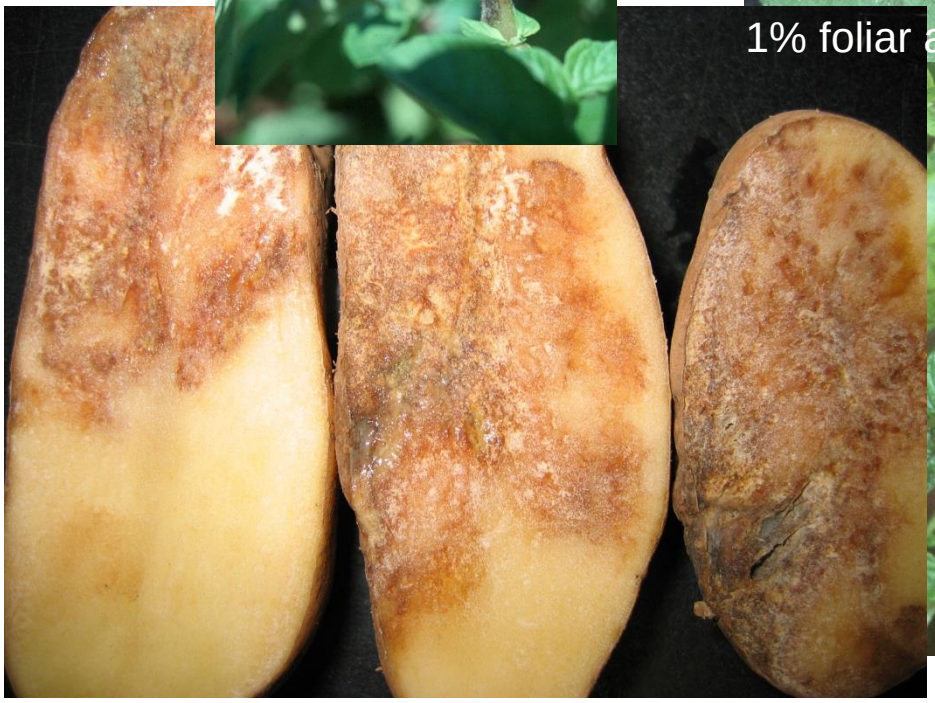
Gray Mold – Management

- do not encourage excessive vine growth
- fungicides (resistance in strains infecting other crops)
- reduce tuber injury at harvest and encourage tuber healing

Late Blight = *Phytophthora infestans*

- oomycete (related to algae)





1% foliar area affected=2 billion spores/acre

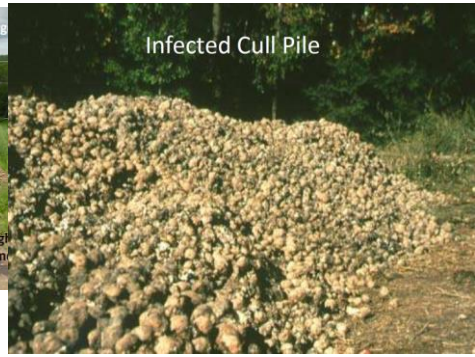
Symptoms of Late Blight *on Tomato*

Sources of Pathogen Inoculum

Alternate Hosts

Infected Potato Seed

Cull Piles



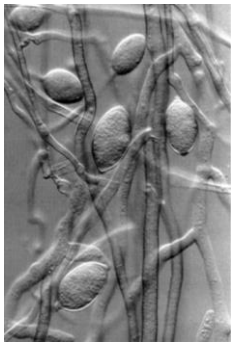
Volunteers

Adjacent Fields/Production Areas

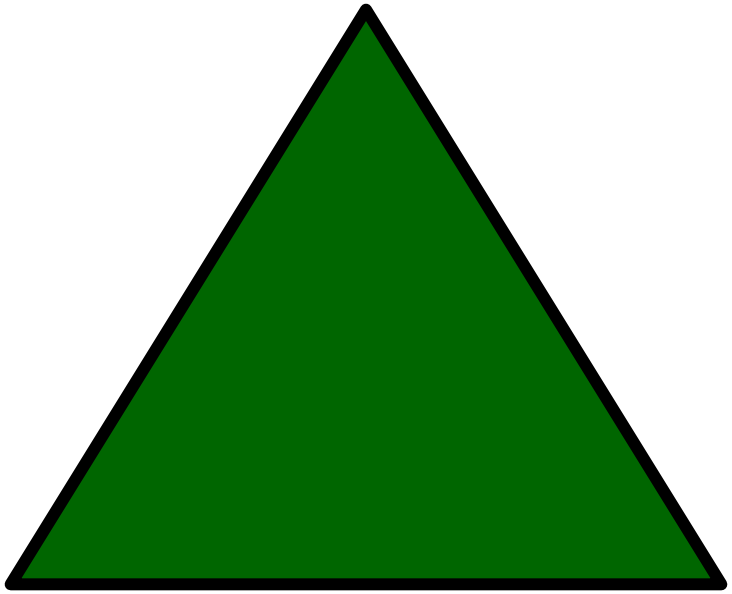
The Disease Triangle

Host

?

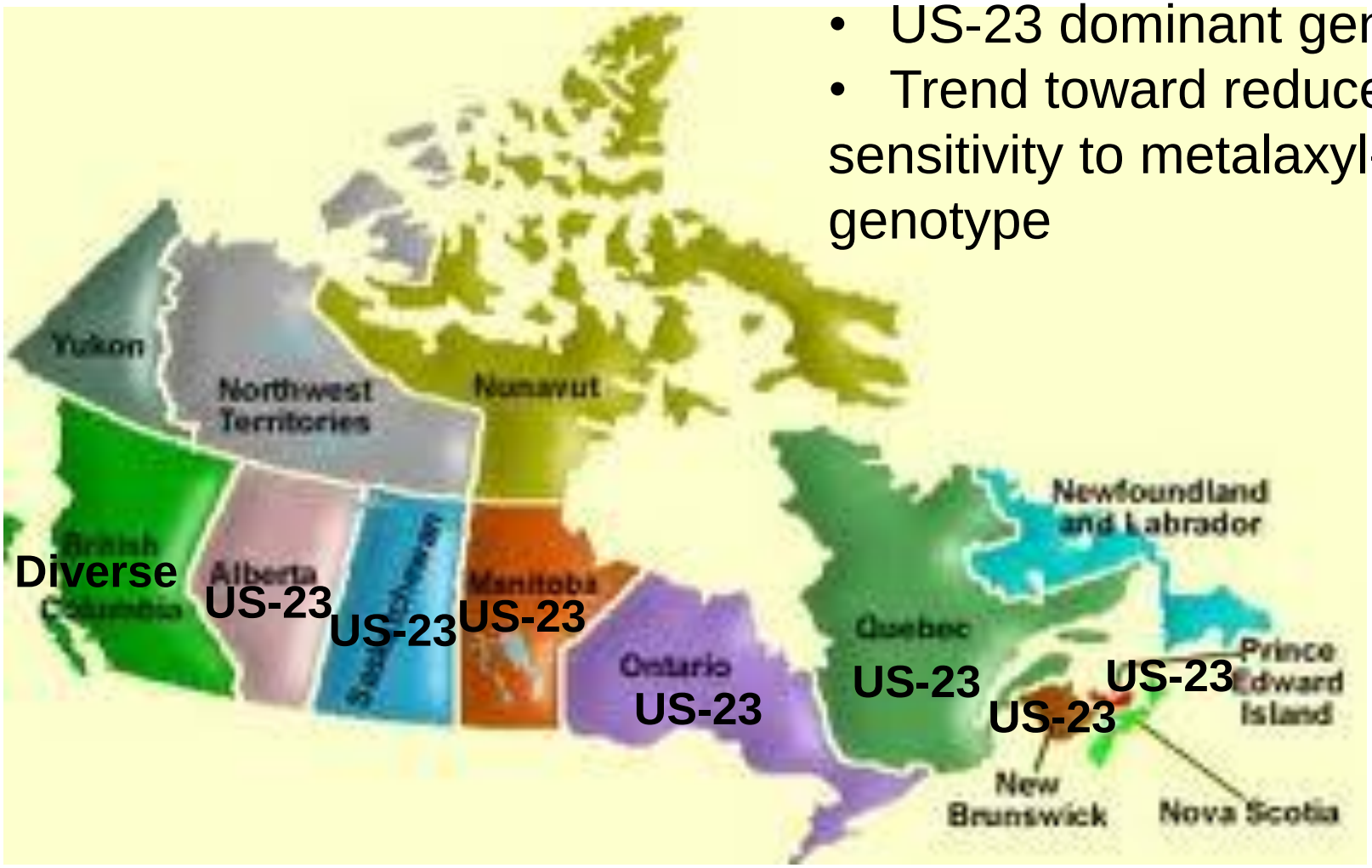


Pathogen



Environment

Late Blight (*Phytophthora infestans*) Recent Canadian Surveys



- US-23 dominant genotype
- Trend toward reduced sensitivity to metalaxyl-m in t genotype

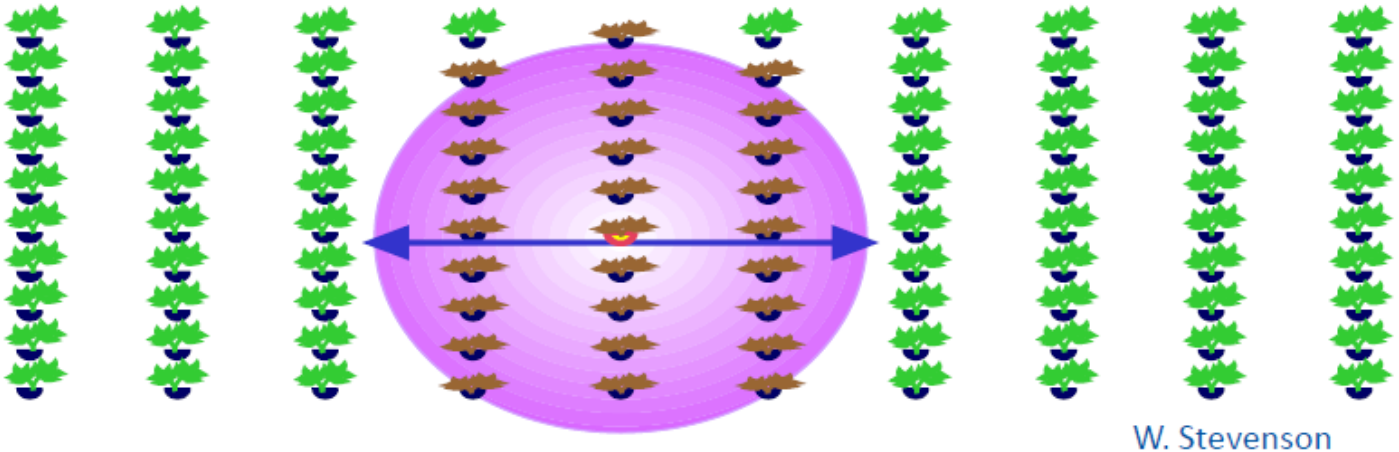
P. infestans - DISEASE MANAGEMENT

Manage Late Blight in Tomatoes!

- Look for disease in transplants (industry and home-owner awareness)
- Manage the disease in tomatoes grown in home gardens
  - destroy and bag diseased plants
  - grow resistant varieties!
  - awareness of issue in general public

When Late Blight is Present

- Immediately destroy infected plants and surrounding area (twice the size of the infected area - either side).



W. Stevenson

- Late in the season it is advisable to avoid excessive irrigation as tubers become infected with late blight when spores wash down through the soil from infected leaves.

* Courtesy of Khalil Al-Mughrabi, NB Department of Agriculture, Aquaculture and Fisheries

P. infestans - DISEASE MANAGEMENT

Late Blight Fungicides

- a preventative program that starts early in the season is critical
- good coverage is key
- frequent application to protect new foliage
- specialty products when weather conditions are conducive to disease and /or disease risk is high

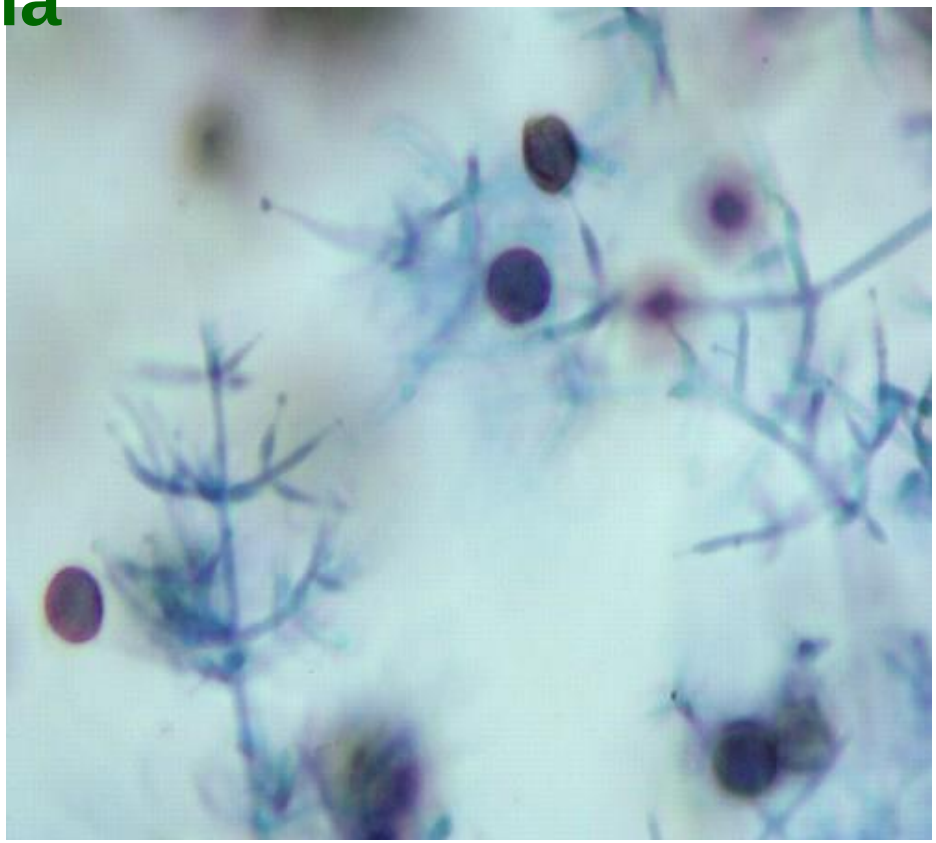
Early Dying Complex

Verticillium spp., nematodes, *Colletotrichum*, etc.

Verticillium Wilt – Causal Agent

Verticillium dahliae **– microsclerotia**
Verticillium albo-atrum **– septate, resting, dark mycelia**

verticillate whorls



Verticillium Wilt – Disease Cycle

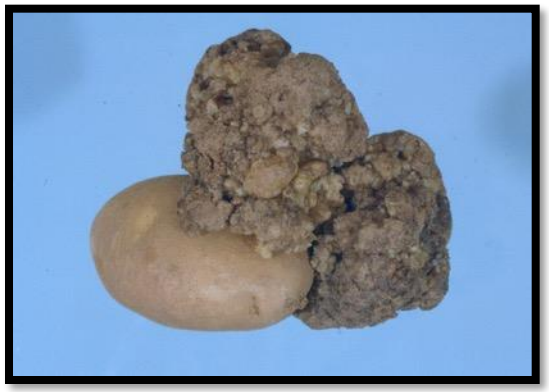
- **contaminated soil; infected or infested seed**
- **survive via microsclerotia or resting hyphae**
- **infect roots, moves to vascular system**
- **wide host range**
- **synergistic interaction with root lesion nematode, and *Colletotrichum coccodes* *(Early Dying Complex)***

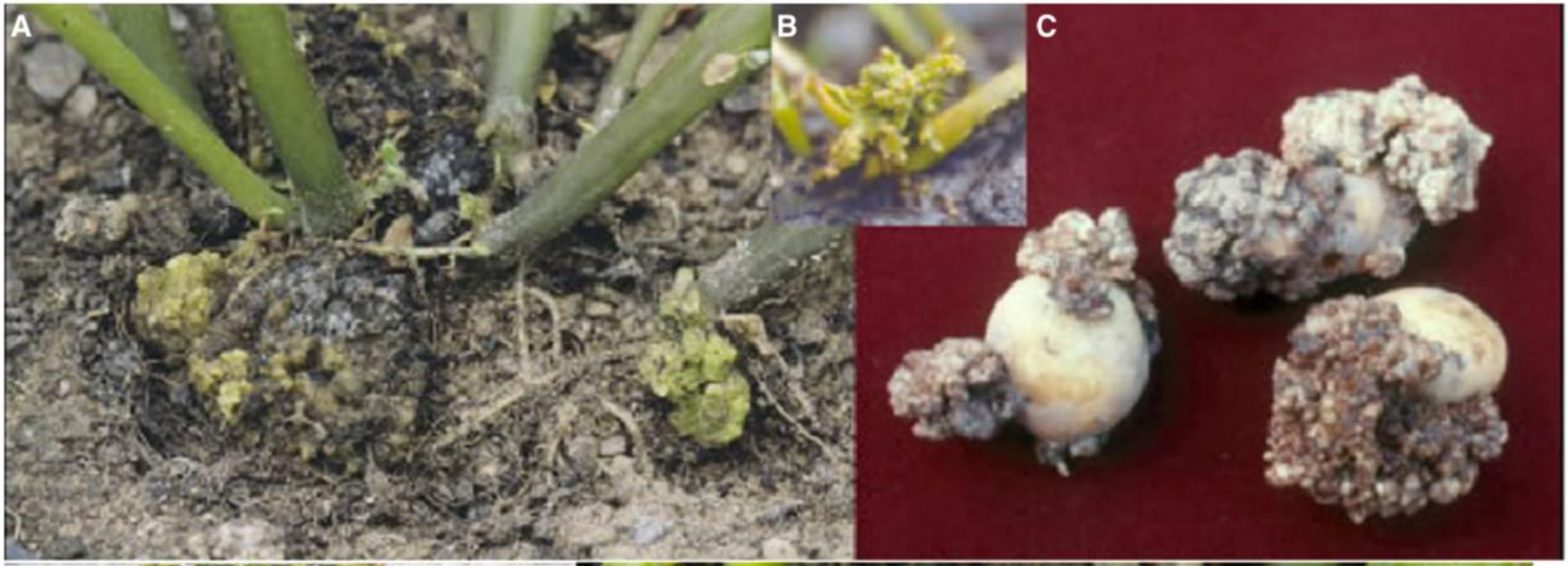
Verticillium Wilt – Management

- resistant and tolerant cultivars (ie. Butte)
- adequate fertility reduces disease severity
- avoid water stress
- crop rotation
- green manure crops (biocontrol)

What is potato wart ?

- Potato wart is a disease caused by a soil-borne fungus *Synchytrium endobioticum*
- Warts or cauliflower-like formations on tubers and sprouts of plant
- Spores can remain viable for decades (> 40 years)
- Several pathotypes (or races) exist and resistance to potato variety generally pathotype-specific.
- Spread through the movement of potato crops, soils, or equipment.
- *S. endobioticum* is a quarantine organism (CFIA regulated pest, US Select Agent List)

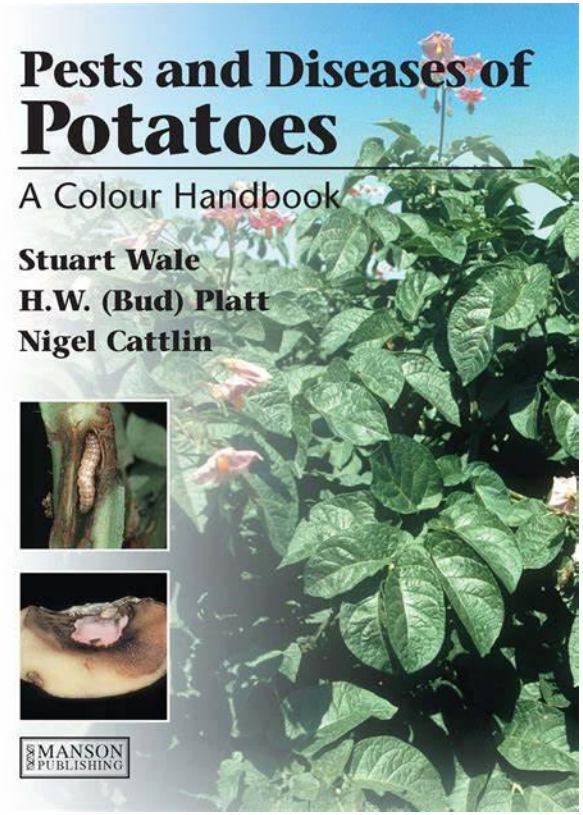


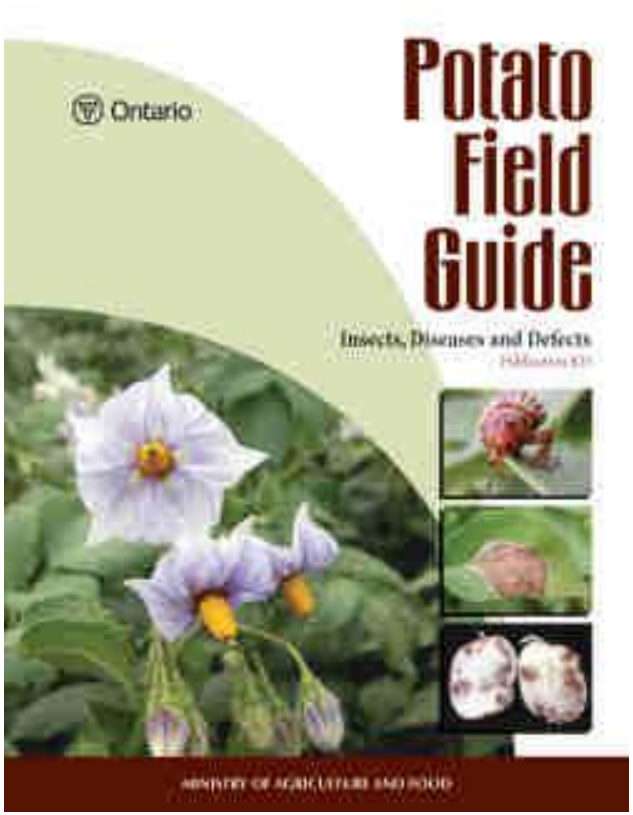

A
B
C

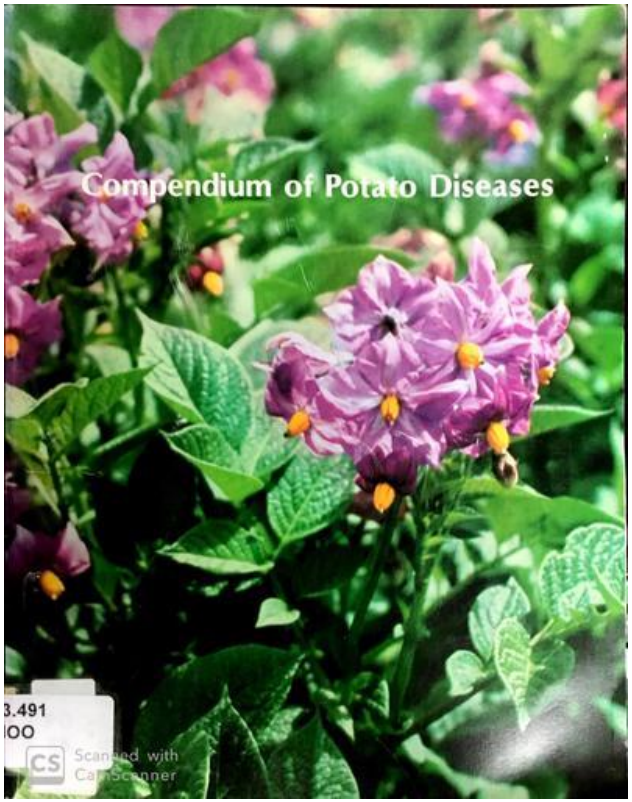

D


H

Potato Field Guides







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Thank you !

For more information:

–Contact Rick Peters: rick.peters@agr.gc.ca

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