

Diseases of brambles

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Photo; Gerald Holmes,
California Polytechnic State
University at San Luis
Obispo

Today's topics

- ▶ **Viruses**
- ▶ **Cankers/cane blight/twig blight**
- ▶ Root rot
- ▶ Fruit rots – botrytis
- ▶ Raspberry rust

Back to Basics - Brambles

- ▶ **Location, location, location**
 - ▶ Good sunlight, good air circulation, good drainage
 - ▶ Avoid wild brambles nearby (source of viruses, etc)
- ▶ **Soil**
 - ▶ Organic matter (2-4%)
 - ▶ pH 6.0-6.5

Integrated management- Table modified from Midwest Small Fruit Pest Management Handbook

Practice	Viruses	Vert. wilt	Orange Rust	Cane blights	P. Mildew	Fruit rots
Good air/water drainage						
500 ft from wild						
Eliminate wild brambles						
Rotation						
Cultivar resistance						
Avoid adjacent plantings						
Disease free stock						

Will cover as we move along

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Practice	Viruses	Vert. wilt	Orange Rust	Cane blights	P. Mildew	Fruit rots
Rogue infected plants						
Improve drying						
Dispose of diseased canes						
Maintain vigor						
Fungicides						
Harvest before overripe						
Good handling/storage						

Will cover as we move along

Common themes in management

- ▶ **Exclude!**
- ▶ **Inhibit/Limit!**
- ▶ **Eradicate!**

- ▶ Cathie Heidenreich, Cornell University

Virus diseases - brambles

- ▶ Mosaic
- ▶ Leaf curl
- ▶ Raspberry Streak
- ▶ Tomato ringspot

Brambles are particularly vulnerable to viruses – yields can be reduced 70%

Even more viruses

- ▶ Alfalfa mosaic virus (AMV)
- ▶ Arabis mosaic virus (ArMV)
- ▶ Cucumber mosaic virus (CMV)
- ▶ Impatiens necrotic spot virus (INSV)
- ▶ Potyvirus group test (POTY)
- ▶ Prunus necrotic ringspot virus (PNRSV)
- ▶ Raspberry bushy dwarf virus (RBDV)
- ▶ Raspberry ringspot virus (RpRSV)
- ▶ Strawberry latent ringspot virus (SLRSV)
- ▶ Strawberry mild yellow edge virus (SMYEV)
- ▶ Tobacco ringspot virus (TRSV)
- ▶ Tobacco streak virus (TSV)
- ▶ Tomato ringspot virus (ToRSV)
- ▶ Tomato spotted wilt virus (TSWV)

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Even more viruses - “Berry screen”

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www.agdia.com

First sample - \$126.20

Each additional - \$31.20

Bramble virus - Mosaic

- ▶ Caused by **several viruses**

- ▶ *Rubus* yellow net
- ▶ black raspberry necrosis
- ▶ raspberry leaf mottle
- ▶ raspberry leaf spot



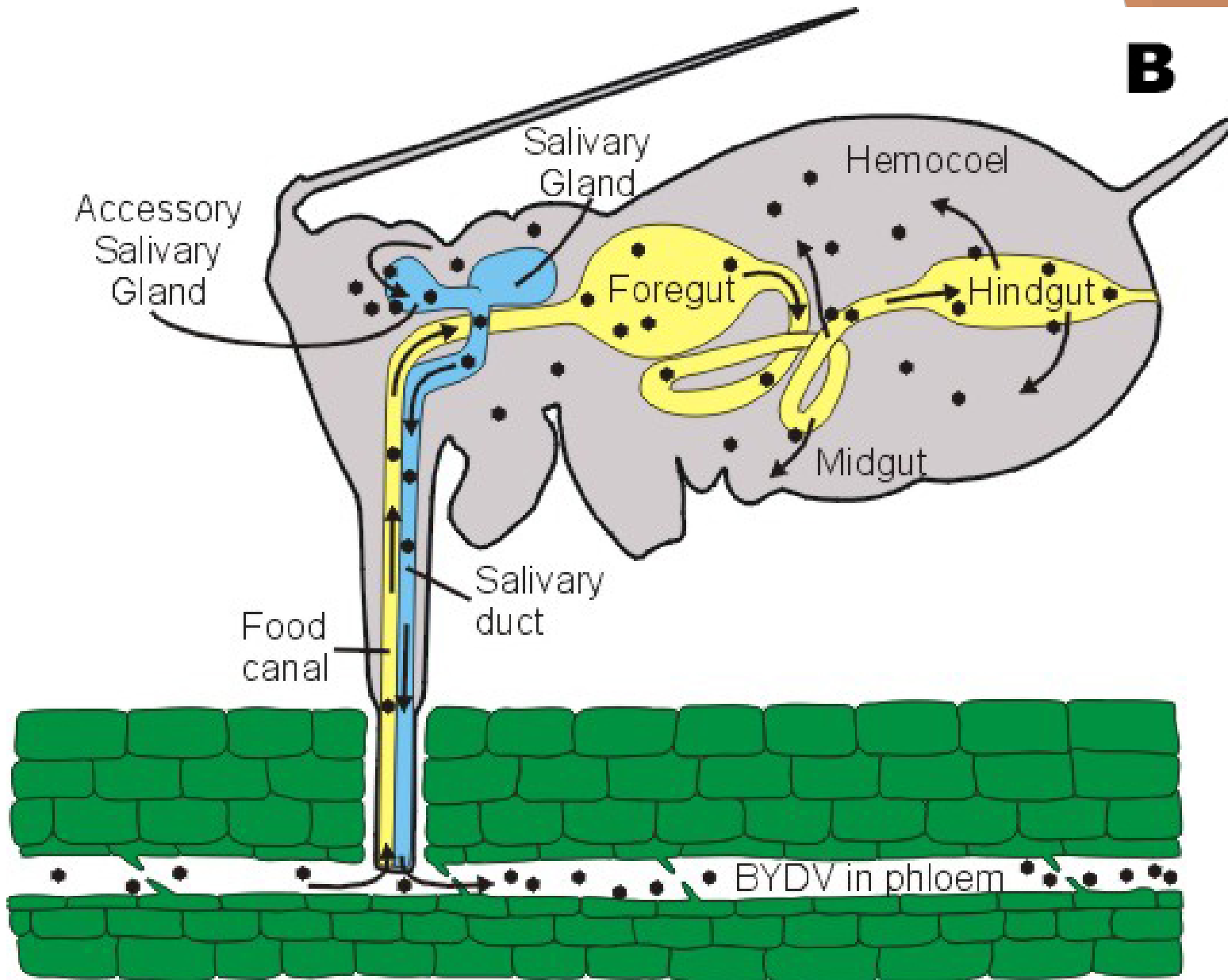
4 distinct
viruses

(cold vs flu
vs West
Nile)

- ▶ Black and purple raspberries more severely damaged than red (but red can get, too)
- ▶ Spread by **large raspberry aphid**

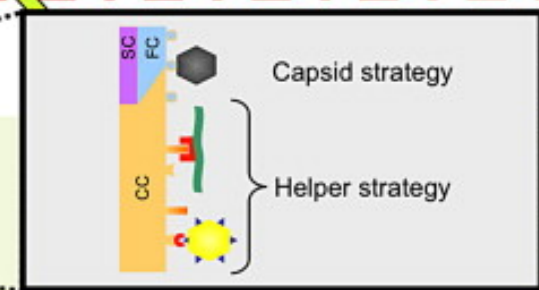
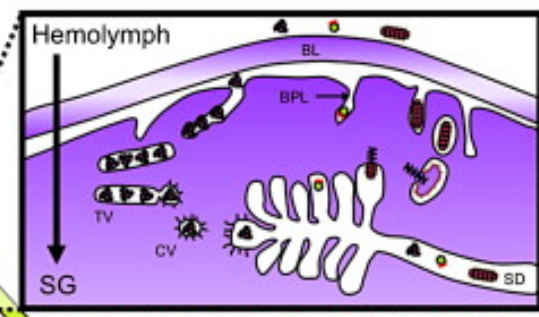
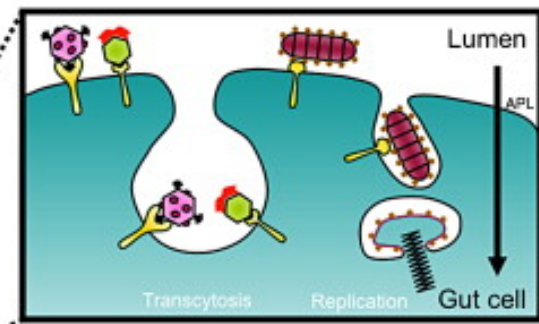
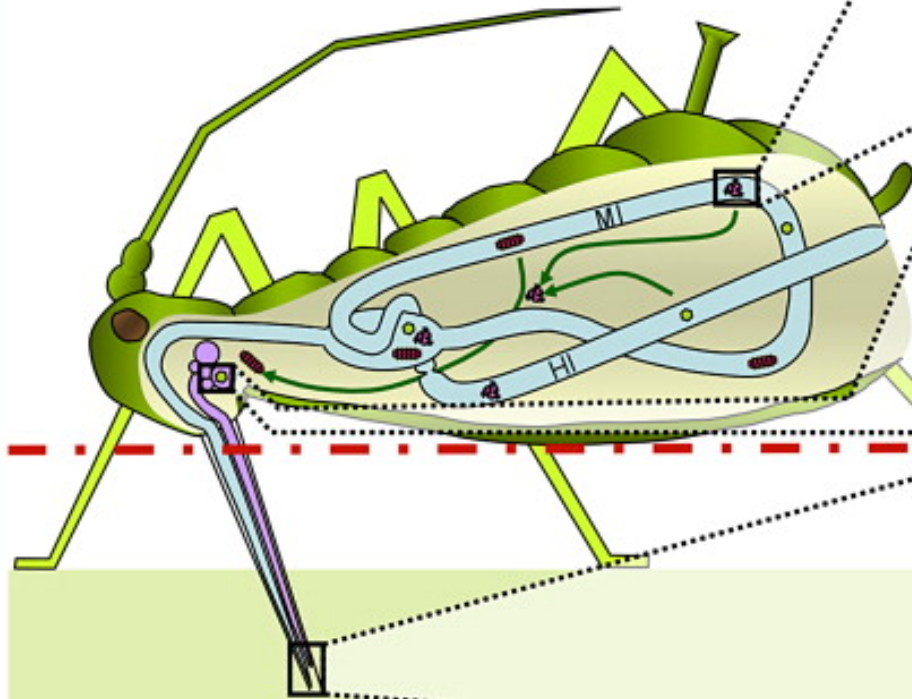


<http://www.fruitdisease.co.uk/EntomologyResearchPage4.asp>



Circulative Transmission:

Non-propagative & Propagative



- Virions
 - Green hexagon
 - Yellow hexagon
 - Pink/red hexagon
 - Green hexagon
 - Red striped rod
- Viral genome
 - Black zigzag line
- Viral protein
 - Blue triangle
- HC
 - Red L-shaped structure
 - Red curved structure
- Receptors
 - Orange crescent
 - Blue circle
 - Yellow Y-shape
 - Yellow T-shape
 - Yellow hook

Non-Circulative Transmission:

Helper & Capsid strategies

Véronique Brault , Maryline Uzeit , Baptiste Monsion , Emmanuel Jacquot , Stéphane Blanc

Aphids as transport devices for plant viruses

Comptes Rendus Biologies, Volume 333, Issues 6–7, 2010, 524 - 538

<http://dx.doi.org/10.1016/j.crv.2010.04.001>

Mosaic - Symptoms

- ▶ Vary by cultivar, time of year, and which viruses (**remember – there are four**)
- ▶ Short plants, low vigor
- ▶ Leaves mottled
- ▶ Leaves puckered
- ▶ Symptoms progressively worse year after year
- ▶ Reduced yield
- ▶ Dry, seedy fruit with less flavor
- ▶ Symptoms can disappear in summer heat, but plant still infected

Raspberry mosaic - symptoms



Virus diseases - brambles

- ▶ Mosaic
- ▶ **Leaf curl**
- ▶ Raspberry Streak
- ▶ Tomato ringspot

Raspberry leaf curl virus

- ▶ Small, crinkled, curled-down leaves
- ▶ Plant loses vigor year after year
- ▶ Berries small, dry, seedy
- ▶ Spread by **small** raspberry aphid



R. Stace-Smith, Bugwood.org

Small raspberry aphid



<http://www.fruitdisease.co.uk/file.asp?ID=8>

Virus diseases - brambles

- ▶ Mosaic
- ▶ Leaf curl
- ▶ **Raspberry Streak**
- ▶ Tomato ringspot

Raspberry streak virus

- ▶ Caused by **tobacco** streak virus
- ▶ Affects **black raspberry**
- ▶ Symptoms – purple streaks on lower canes
- ▶ Leaves hooked, twisted
- ▶ Fruit are small, seedy, crumbly
- ▶ Uneven ripening



<http://ipm.illinois.edu/diseases/series700/rpd710/index.html>

Virus diseases - brambles

- ▶ Mosaic
- ▶ Leaf curl
- ▶ Raspberry Streak
- ▶ **Tomato ringspot**

Tomato ringspot virus

- ▶ Affects many species of plants
- ▶ Red raspberries
- ▶ Plant looks fairly normal, somewhat reduced vigor
- ▶ Small, crumbly berries
- ▶ Spread in soil by **dagger nematode**



http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-FR-S-9.pdf

Viruses - management

- ▶ Certified virus-free stock
- ▶ Remove infected plants
 - ▶ Scout in June and again in Aug/sept
 - ▶ Don't just prune out symptomatic canes
- ▶ Manage insects (aphids)
 - ▶ May not be effective – fast transmission
- ▶ Plant 500 + feet from wild brambles
- ▶ Avoid planting black or purple raspberries near red (separate as much as possible, don't put reds upwind – aphids spread)
- ▶ Resistant varieties –see *Midwest Small Fruit Pest Management Handbook*
- ▶ Don't put new plantings near old, virus-infected ones
- ▶ **Abiotic issues can resemble virus – herbicide, cold damage, etc**

Cane/twig diseases

- ▶ Raspberry anthracnose
- ▶ Cane blight
- ▶ Spur blight
- ▶ **Similarities and differences**

Cane disease - Anthracnose

- ▶ Fungus – *Elsinoe veneta*
- ▶ Results in cane dieback, loss of fruit production
- ▶ Particularly severe on black and purple raspberries
- ▶ Small purple spots, enlarge to become oval and sunken
- ▶ Girdles the cane
- ▶ Fruit may fail/shrivel



Anthracnose

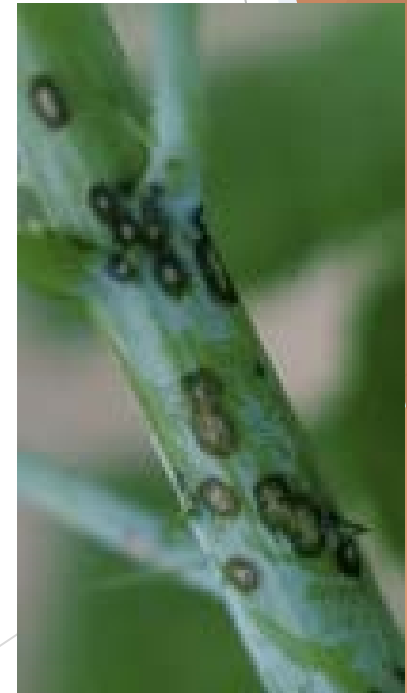


<http://www.extension.umn.edu/distribution/horticulture/dg1152.html>

Charles Drake, Virginia Polytechnic
Institute and State University,
Bugwood.org

Anthracnose

- ▶ Fungus survives winter in lesions on the canes
- ▶ Spores germinate and spread to new tissue in spring, usually in between where the leaves attach (internodes)





<http://www.extension.umn.edu/garden/yard-garden/fruit/integrated-pest-management-for-home-raspberry-growers/cane-diseases/>



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Cane diseases - Spur blight

- ▶ Fungal disease (*Didymella applanata*)
- ▶ More common on red raspberry than black/purple
- ▶ Damage
 - ▶ Blighting of fruit-bearing spurs
 - ▶ Kill buds
 - ▶ Dry/small seeds
 - ▶ More prone to winter injury

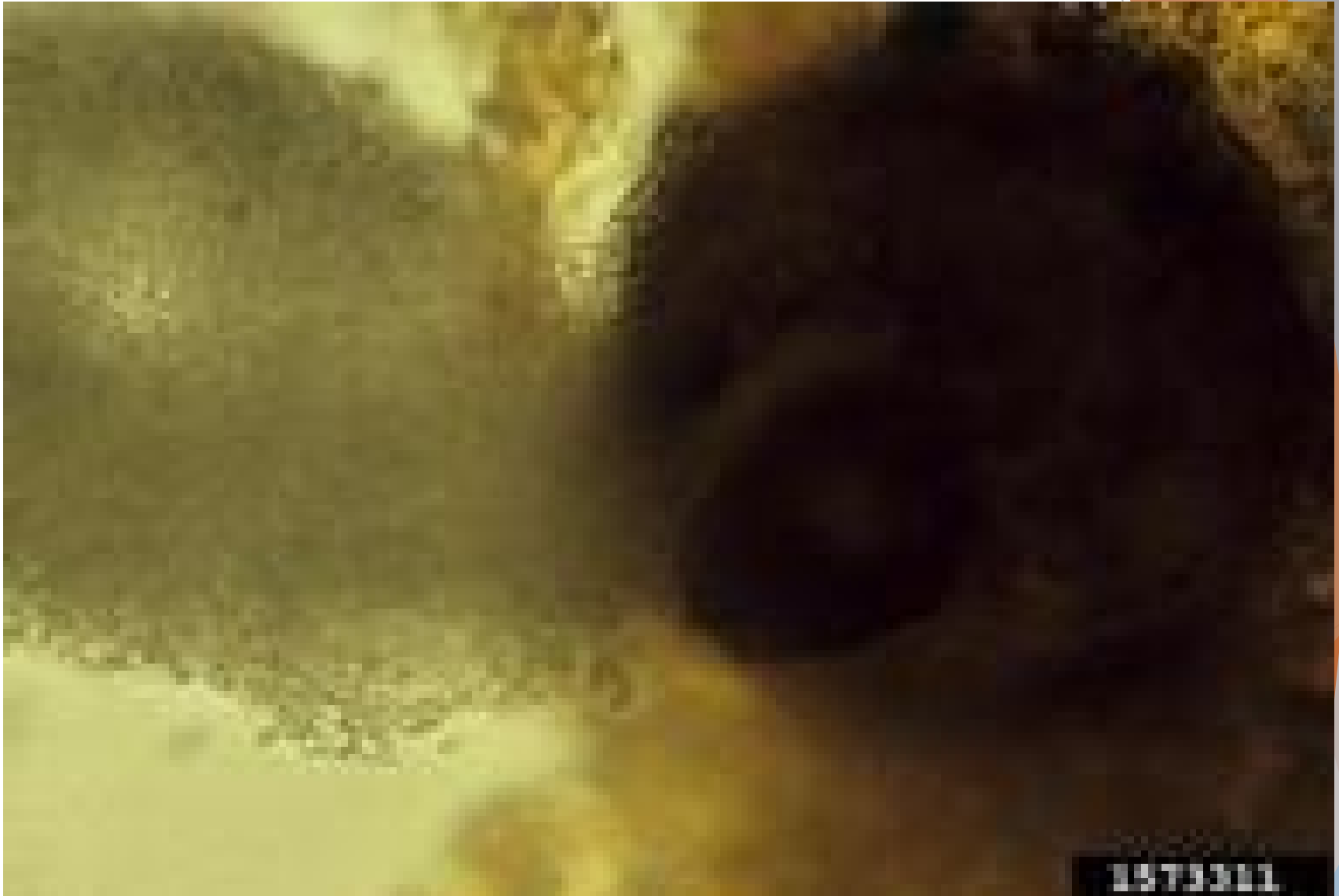
- ▶ Dark areas form in late spring/early summer, often **where leaf attaches (node)**
- ▶ Girdle cane
- ▶ Canes crack/split
- ▶ Spore-producing structures form
 - ▶ Summer (pycnidia)
 - ▶ Winter (perithecia)





<http://www.extension.umn.edu/garden/yard-garden/fruit/integrated-pest-management-for-home-raspberry-growers/cane-diseases/>

D. Bryoniae – spores oozing



D. bryoniae



5513686

Cane diseases - Cane blight

- ▶ Fungal pathogen (*Leptosphaeria coniothyrium*)
 - ▶ Also affects rose, others
- ▶ More common on black raspberry, but also on red and purple. Rare on blackberry
- ▶ Damage
 - ▶ Shoot death, low yield
 - ▶ Often starts at wounds



http://ipm.illinois.edu/fruits/diseases/spur_blight/index.html

Cane blights - Common themes

- ▶ Caused by fungi
- ▶ Spread from last year's canes (floricanes) to new canes (primocanes) in wet weather in late spring/early summer
- ▶ Canker/girdling

Management:

anthracnose, spur blight, cane blight

- ▶ Avoid winter injury – appropriate fertility
- ▶ Careful pruning **to break life cycle**
 - ▶ Scout in late summer – easier to see
 - ▶ Prune out affected canes
 - ▶ Remove/destroy
- ▶ Adequate water
- ▶ Late dormant applications of lime sulfur, copper, sulfur
- ▶ Other fungicides
 - ▶ See *Midwest Small Fruit and Grape Spray Guide*
 - ▶ *If no history, pre-bloom probably not needed*

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Good air/water drainage	-	-	-	++	+	++
500 ft from wild	++	-	-	-	-	-
Eliminate wild brambles	++	-	++	-	+	-
Rotation	+	++	-	-	-	-
Cultivar resistance	++	++	++	-	+	-
Avoid adjacent plantings	++	-	++	-	+	-
Disease free stock	++	++	++	++	+	-

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Rogue infected plants	++	-	++	-	-	-
Improve drying	-	-	++	++	-	++
Dispose of diseased canes	-	+	+	++	-	-
Maintain vigor	-	-	-	++	-	-
Fungicides	-	-	++	++	++	-
Harvest before overripe	-	-	-	-	-	++
Good handling/storage	-	-	-	-	-	++

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Maintain vigor	-		++	
Fungicides	-		++	
Harvest before overripe	-		-	
Good handling/storage	-		-	

Phytophthora root rot



Phytophthora root rot

- ▶ Several *Phytophthora* species affect brambles

Symptoms on raspberry



Symptoms on raspberry



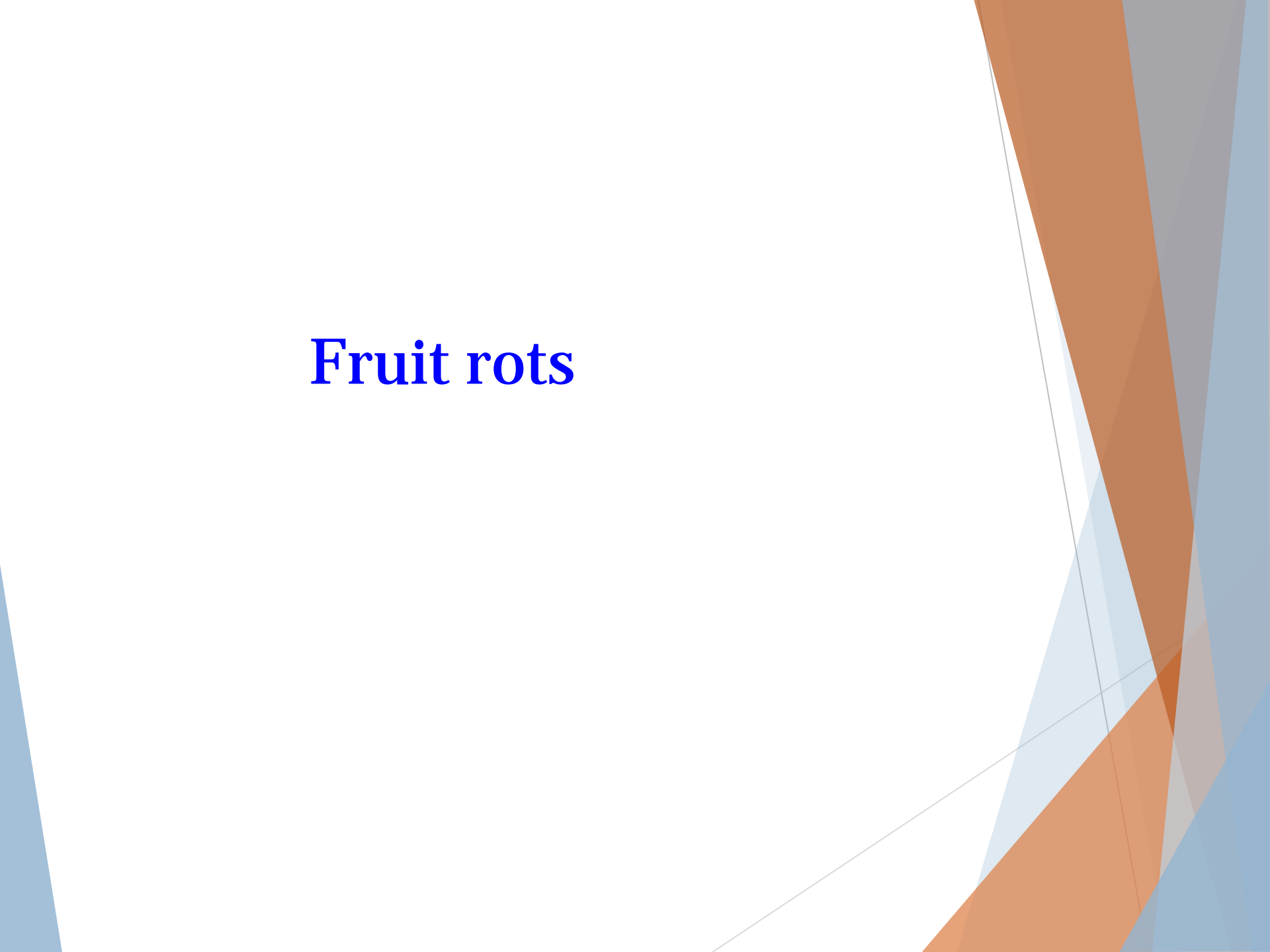
<http://www.fruit.cornell.edu/tfabp/dom11.htm>



Root rot - management

- ▶ Site selection
 - ▶ Drainage
 - ▶ Avoid heavy soils
 - ▶ Raised beds
 - ▶ Manage irrigation to avoid overly wet soil
- ▶ Cultivars – some varieties of red raspberry are less susceptible
- ▶ Fungicides – See *Small Fruit & Grape Spray Guide*

Fruit rots



Botrytis (gray mold)



<http://www.berriesnw.com/BerryDisordersDetail.asp?id=72>

Botrytis biology

- ▶ Overwinters in many plants, plant parts
- ▶ Fungus – spreads by spores
- ▶ Infects flower parts then spreads to fruit, often staying latent
- ▶ Fruit rot activates as it matures/ripens
- ▶ Temps 70-80F, moisture, and high humidity favor disease

Botrytis management

- ▶ Pruning to promote faster drying
- ▶ Avoid excess N
- ▶ Fungicides – at bloom through petal fall
 - ▶ See *Midwest Small Fruit and Grape Spray Guide*
- ▶ Careful handling at harvest

Orange Rust

- ▶ **Systemic** fungal pathogen often introduced on infected planting material
- ▶ Variability in cultivar resistance
- ▶ Red raspberries **not** susceptible
- ▶ Bright orange pustules form on bottom surface of leaves in spring



Late Rust

- ▶ Severe on red raspberry



Managing rusts

- Use healthy, disease-free planting material
- Select site with good air movement and sun
- Eradicate wild hosts
- Prune/canopy management for airflow
- Rogue all infected plants as soon as they appear
- Fungicides – see *Small Fruit & Grape Spray Guide*
- Resistance
 - Late rust – black raspberries and blackberries immune
 - Orange rust – red raspberries immune

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Dispose of diseased canes	-	+	+	++	-	-
Maintain vigor	-	-	-	++	-	-
Fungicides	-	-	++	++	++	-
Harvest before overripe	-	-	-	-	-	++
Good handling/storage	-	-	-	-	-	++



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<http://www.raspberries.us/>