CFAES

Integrated Disease Management of Fruit Crops

WINTER COMMERCIAL RECERTIFICATION CONFERENCE

FEBRUARY 12, 2020

THE OHIO STATE UNIVERSITY

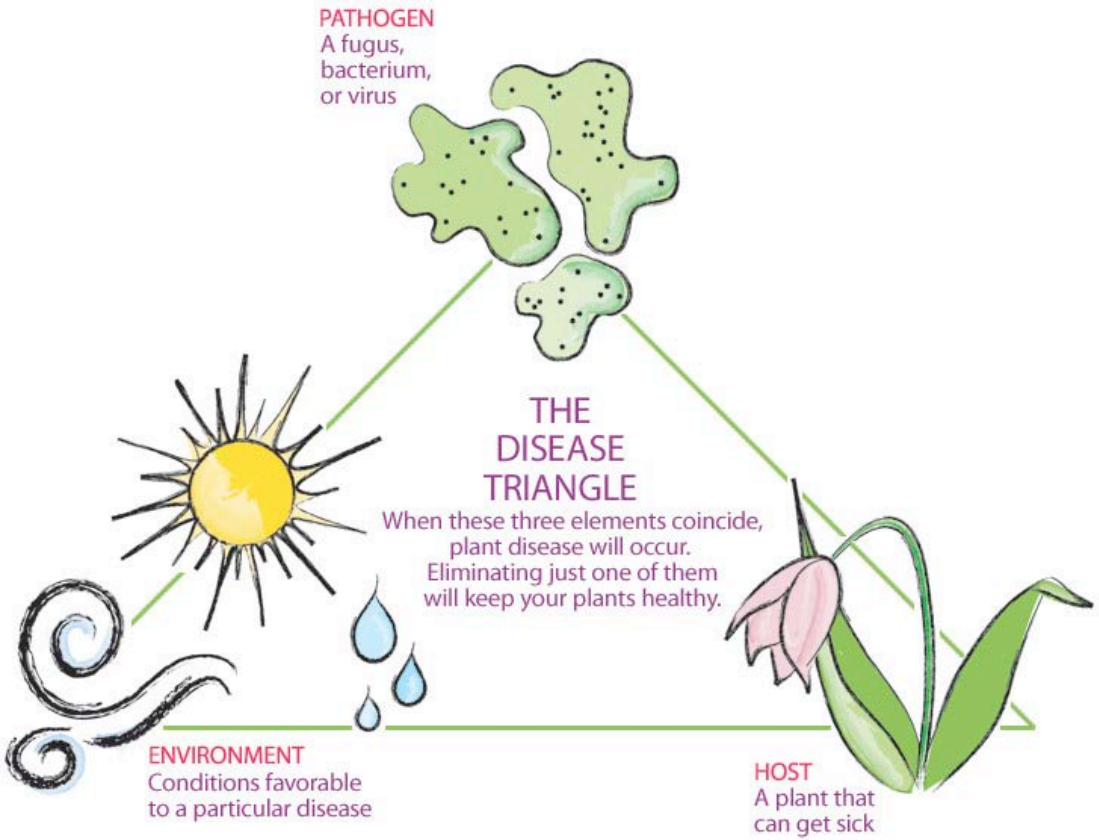
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

Presentation Topics

1. Integrated Disease Management
2. Fungicide Resistance Management
3. New and Emerging Diseases in Ohio
4. New(er) Fungicides and Biocontrol Products
5. Fruit Disease Management Resources

The Disease Triangle

- Susceptible host
- Pathogen
- Environmental conditions that favor the pathogen



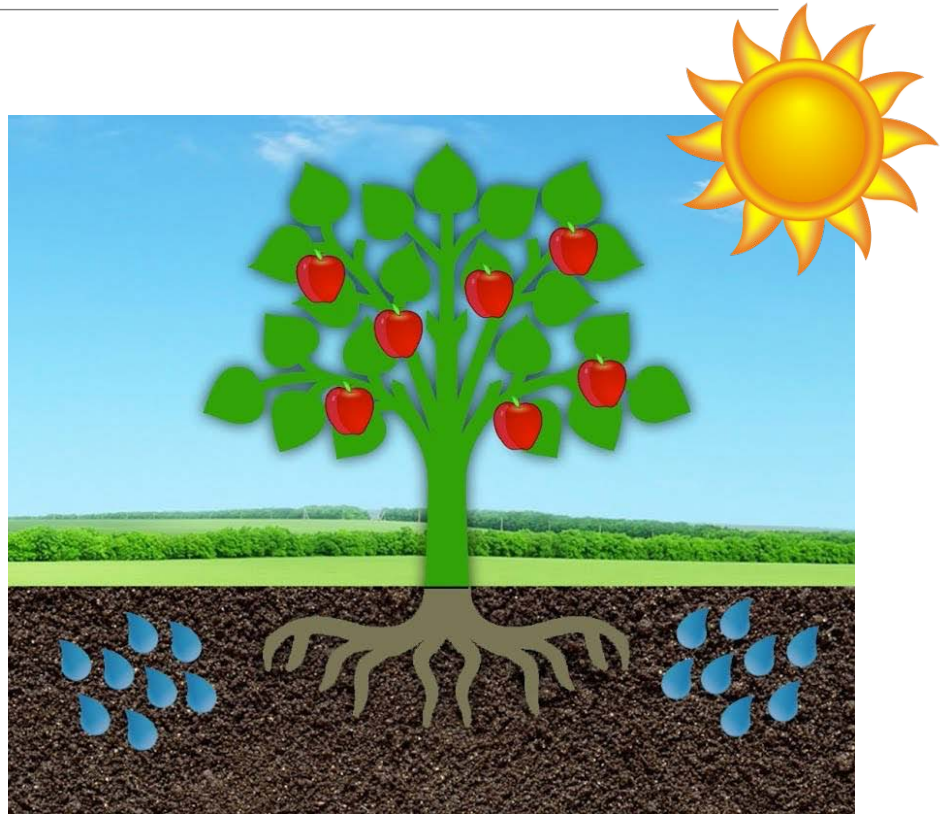
Integrated Disease Management

Use of multiple strategies to prevent and manage diseases

1. Host resistance
2. Clean planting stock
3. Monitoring and forecasting
4. Cultural and sanitation practices
5. Chemical and biological control
6. Pesticide resistance management

Disease Management Begins Before Planting

- Select a location with:
  - full sun
  - healthy soil
  - good drainage
- Other considerations:
  - Soil depth
  - Wind direction
  - Morning vs. afternoon sun
  - Plants in the area



Plant Resistant Varieties

- Select root stocks with disease resistance
- Select varieties with resistance
  - Consider environmental conditions and prevalence of diseases in the region

Plant Resistant Varieties

Cultivar	Juniper Rusts	Powdery Mildew	Apple Scab	Fire Blight
Cortland	S	HS	S	S
Enterprise	R	S	R	R
Red delicious	R	MR	S	R
Liberty	R	S	R	R
Fuji	R	R	S	S
Gala	R	R	S	S
Honey crisp	S	S	MR	?
Baldwin	R	S	S	S
Crimson crisp	S	MR	R	R

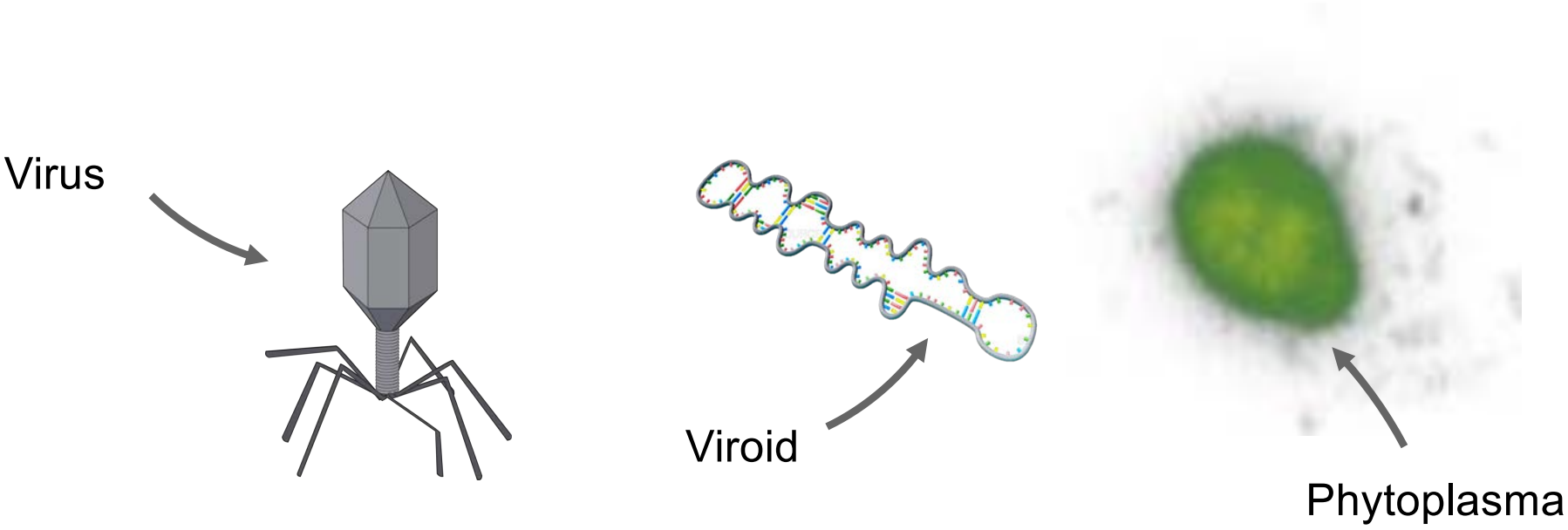
Select Clean Plant Stock

- Foundational or Generation 1 (G1) plant line or cultivar
  - Tested for and found free of economically important plant pathogens
  - Maintained under controlled conditions to prevent reinfection

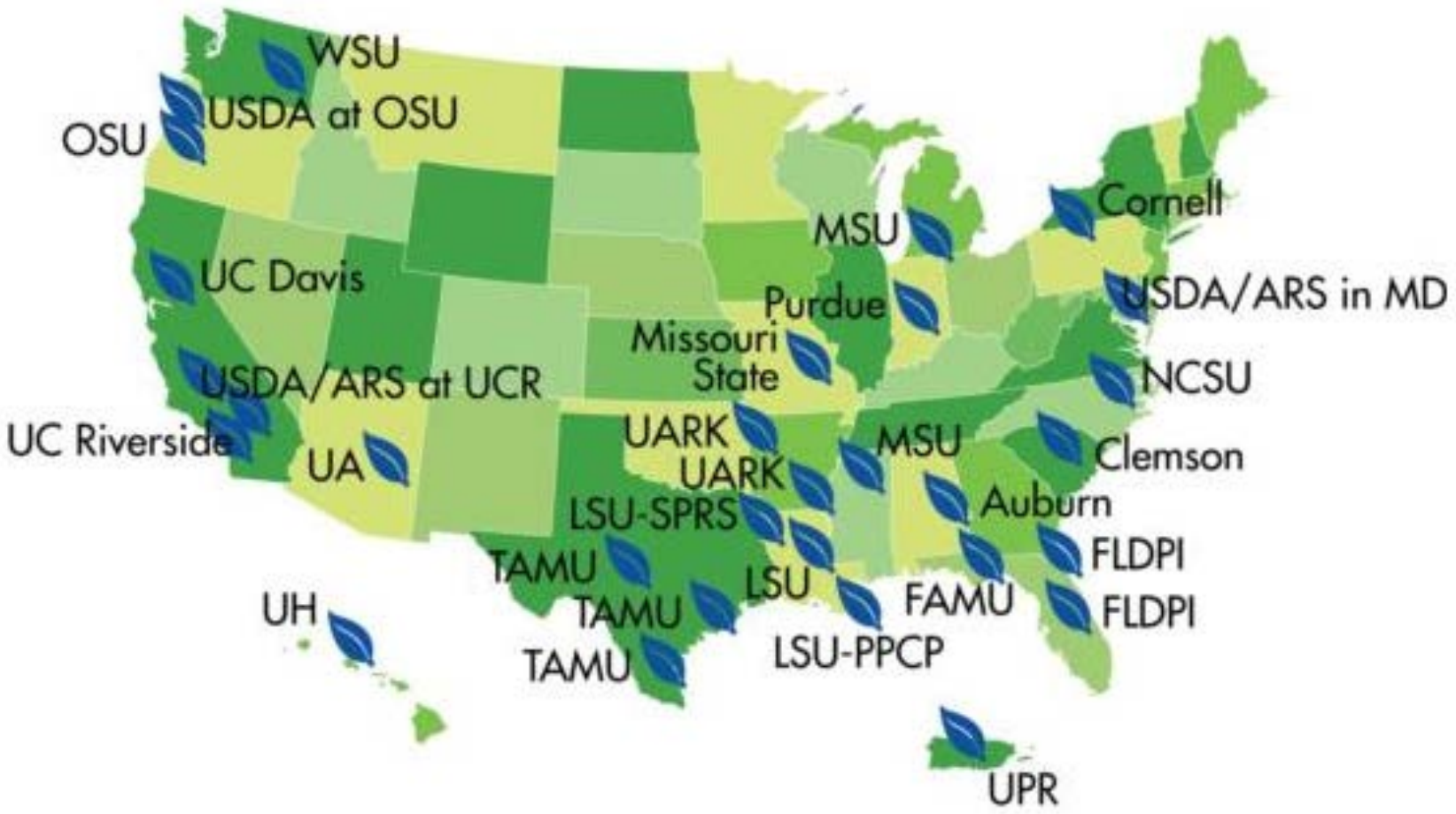
- Not guaranteed to be free of ALL pathogens

National Clean Plant Centers

- Rigorous pathogen testing and screening process
  - Viruses, viroids, phytoplasma
  - Root pathogens, nematodes



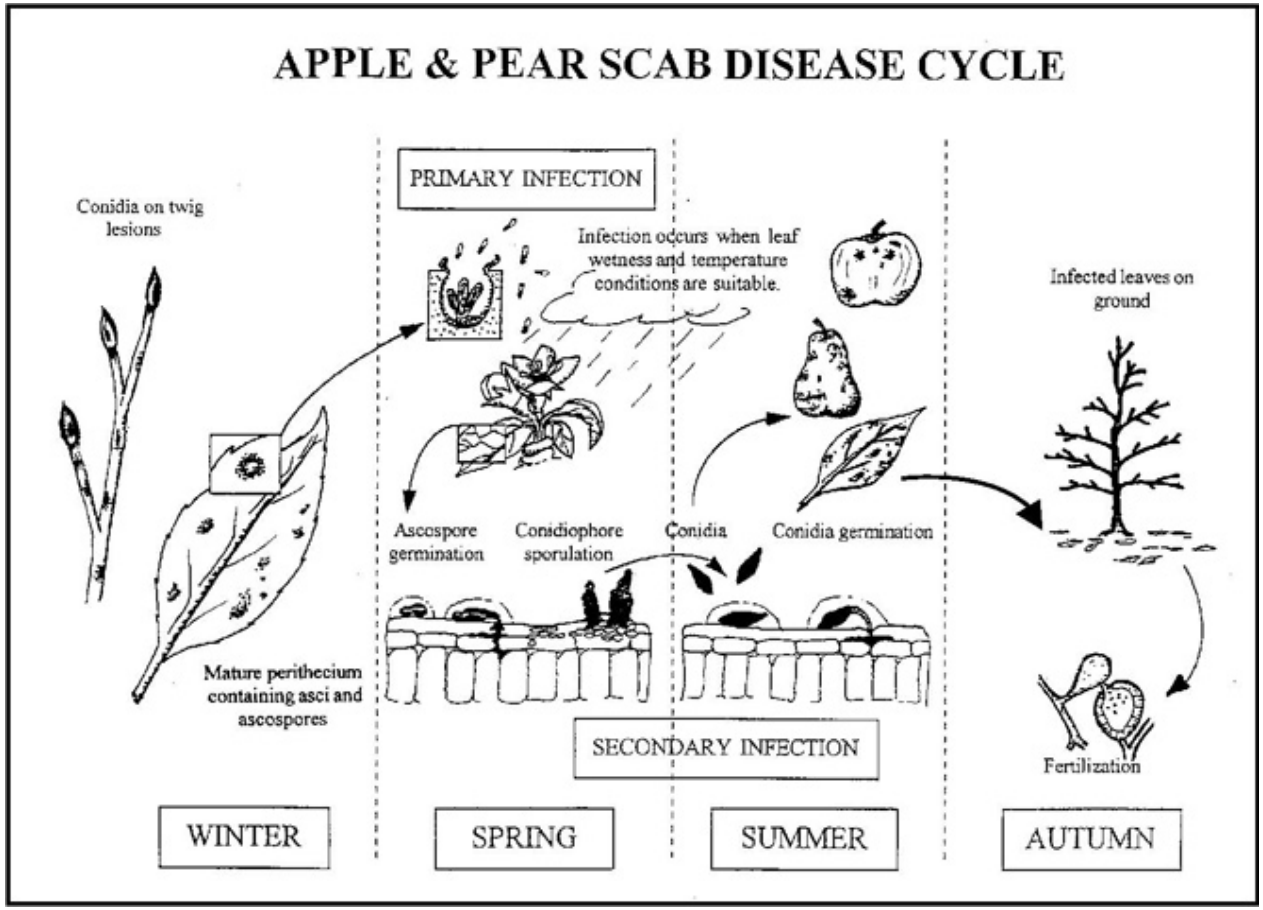
National Clean Plant Centers



National Clean Plant Centers

Location	Berries	Grapes	Fruit Trees	Hops
Arkansas	X			
North Carolina	X			
Oregon	X			
California	X	X	X	
South Carolina			X	
Washington		X	X	X
Missouri		X		
New York		X		
Florida		X		

Disease Management Throughout the Year



Use Best Cultural and Sanitation Practices

- Maintain a clean planting site
  - Prevents the introduction and build-up of pathogens in the cropping system

Use Disease Forecasting Models

- Weather based models
- Assists growers with fungicide spray timings
- Available disease models for Ohio:
  - Fire blight
  - Apple Scab
  - Sooty blotch/fly speck
  - Grape diseases including downy mildew

Also many insect pests!

Network for Environmental and Weather Applications (NEWA)

- Free forecasting for apple and grape diseases
- Requires a weather station on or near farm
  - Rainwise or Hobo (Onset)

NEWA Platform

- On-line resource (newa.cornell.edu)
- 36 stations in Ohio

New York State Integrated Pest Management Program

NEWA Network for Environment and Weather Applications

Website status:
No issues reported
1/10/2019 5:08:44 PM

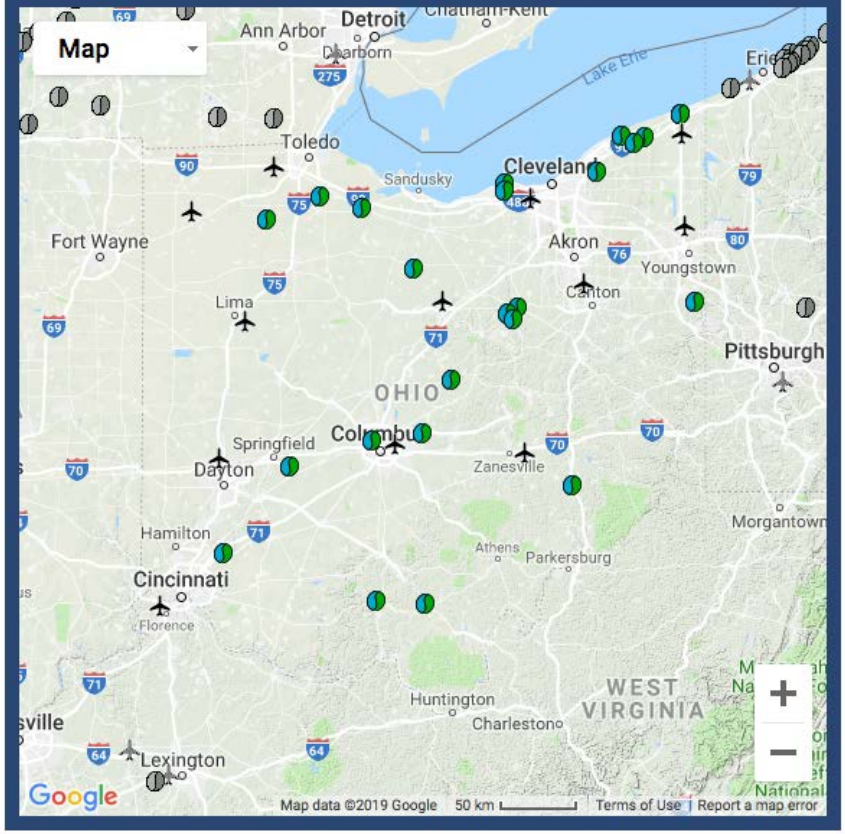
Weather Data | Pest Forecasts | Station Pages | Crop Management | Crop Pages | Weather Stations | Help

Weather Stations in Ohio

Weather Stations
Akron/Canton
Ashtabula
Avon
Avon Lake
Caldwell (Eastern ARS)
Chesterland
Cincinnati
Cleveland
Columbus
Columbus (AP)
Custar (Northwest ARS)
Dayton
Defiance
Freemont (North Central ARS)
Geneva
Jackson (Jackson ARS)
Kingsville (AARS Ridgetop)
Kingsville (Ashtabula ARS)
Lima
Madison
Mansfield
Moreland
Morrow
Mount Vernon
Pataskala
Pemberville
Perry
Piketon
Rogers (Peace Valley)
South Charleston (Western ARS)
Toledo
Willard (Muck Crops ARS)
Wooster
Wooster (Troutman)

36 records found.

Click on a map marker to go to the weather station's home page.



NEWA Apple Disease Models

Select a disease: Fire Blight

State: Ohio

Weather station: Chesterland

Date of Interest: 05/12/2018

Calculate

Map | Results | More info

Fire Blight Risk Predictions for Chesterland

Orchard Blight History: Fire blight occurred in your neighborhood last year.

Select the fire blight history in your orchard block of interest and the tool will calculate risk. Toggle orchard blight history to recalculate risk.

First blossom open date: 4/23/2018 Click if bloom has not occurred

The first blossom open date above is estimated based on degree day accumulations. Enter the actual first blossom open date for your orchard block of interest and the tool will calculate the protection period during bloom more accurately.

Accumulated degree days (base 43°F) through 5/12/2018: 483 (0 days missing)

	Past	Past	Current	Ensuing 5 Days				
Date	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17
Cougarblight 4-Day DH	Extreme 501	High 489	High 414	Low 108	Low 88	Caution 188	High 318	Extreme 509
Infection Potential EIP value	Infection 124	Moderate 83	Moderate 41	Moderate 0	High 19	High 38	Moderate 72	Infection 123
Wetness Events								
Rain Amount	0.38	0.00	0.22	0.65	0.31	0.07	0.00	0.00
Dew ?	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Leaf Wetness (hours)	8	9	10	11	12	7	0	0
Hours >90% RH	4	0	9	17	17	9	0	5
RH max/min	93/44	87/56	96/71	98/84	100/70	97/72	89/47	97/40
Temp avg F	64	48	51	54	61	64	64	64

NA - data not available

View Cougarblight Charts

Download Time: 5/18/2018 23:00

Fungicide Resistance Management

- Critical to an effective and sustainable fungicide spray program

Brown rot

Gray mold

Apple scab

Preventing the Development of Fungicide Resistance Pathogens

- Accurately diagnose the problem

Downy Mildew

Powdery Mildew

Preventing the Development of Fungicide Resistance Pathogens

- Accurately diagnose the problem

Spider mites

Hop Mosaic Virus

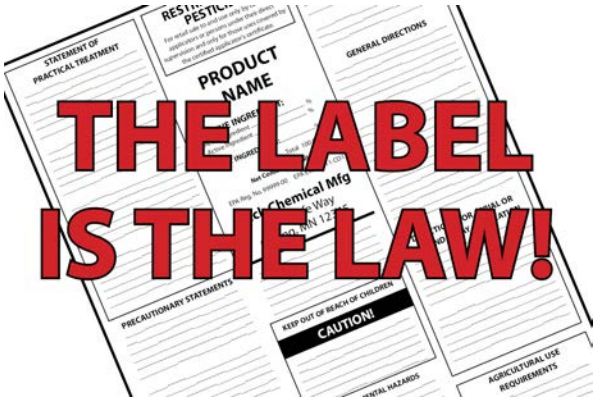
Preventing the Development of Fungicide Resistance Pathogens

- Know the mode of action of the fungicide
  - FRAC number or group number

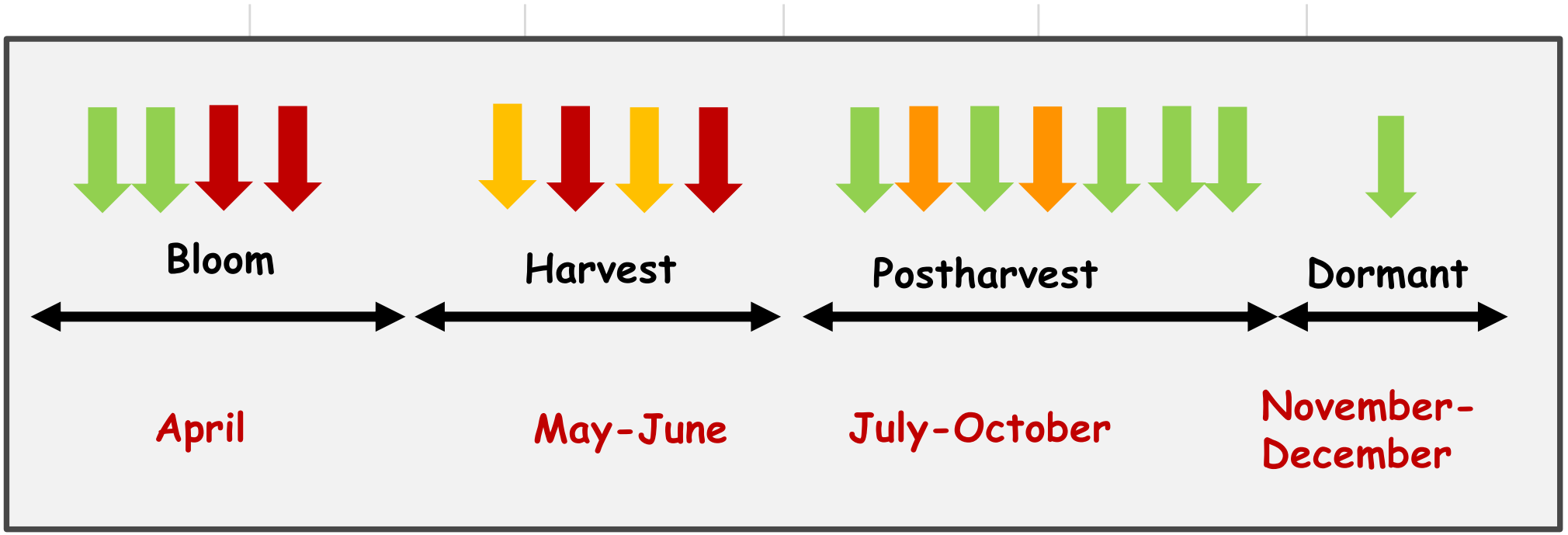
Fungicide Resistance Management Strategies

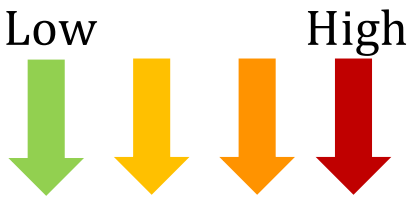
- Never use one mode of action alone in a full season program
  - Alternate with fungicides with a different mode of action
  - Use the “2-spray” rule (unless label indicates otherwise)

- Stay within the recommended rate range
- Apply at the correct growth stage



Seasonal Fungicide Spray Program for Strawberry Fruit Rot Control





Berry, low growing, except cranberry, subgroup 13-07G

Bearberry; Bilberry; Blueberry, Lowbush; Cloudberry; Lingonberry; Muntries; Partridgeberry; Strawberry; cultivars, varieties, and/or hybrids of these.

Disease Control	Application Rate	Product Instructions
Powdery mildew *(Sphaerotheca macularis)* Anthracnose *(Colletotrichum spp.)* Phomopsis leaf blight / fruit rot *(Phomopsis obscurans)*	4.0 to 7.6 fl oz/acre	Apply at the critical timings for disease control. Refer to University and/or extension guidelines for best application timings. Continue as needed on a 7- to 14-day interval. When disease pressure is severe, use the higher rates and/or shorter intervals.
Gray mold *(Botrytis cinerea)*	6.0 to 7.6 fl oz/acre	Apply at the critical timings for disease control. Refer to University and/or extension guidelines for best application timings. Continue as needed on a 7- to 14-day interval. When disease pressure is severe, use the higher rates and/or shorter intervals.
Disease Suppression	**Application Rate**	**Product Instructions**
Rhizopus fruit rot *(Rhizopus spp.)* Leaf spot *(Mycosphaerella fragariae)*	7.6 fl oz/acre	Apply at the critical timings for disease control. Refer to University and/or extension guidelines for best application timings. Continue as needed on a 7- to 14-day interval. When disease pressure is severe, use the shorter intervals.

Restrictions:

- Do not apply more than 27.1 fl oz of LUNA SENSATION per acre per year.
- Apply using ground, aerial, or chemigation equipment.
- Regardless of formulation or method of application, do not apply more than 0.446 lbs fluopyram or 0.6 lbs trifloxystrobin per acre per year, including soil and foliar uses.
- Can be applied the day of harvest.
- To limit the potential for development of disease resistance to these fungicide classes, do not make more than 2 sequential applications of LUNA SENSATION or any Group 7 or Group 11 containing fungicide before rotating with a fungicide from a different Group.

Antibiotic Resistance Management

Apply antibiotics for fire blight management at the correct growth stage

New and Emerging Fruit Diseases in Ohio

- Blackberry Downy Mildew
- Sudden Apple Decline (SAD)
- Anthracnose Crown Rot of Strawberry
- Blossom end rot of chestnut
- Hop Powdery Mildew
- Hop Stunt Viroid
- Grapevine Red Blotch Virus

Blackberry Downy Mildew

- *Peronospora sparsa*
- Systemic pathogen
- Symptoms occur on leaves and fruit (dry berry)

- Hosts:
  - blackberry (thorny and thornless)
  - boysenberry
  - raspberry hybrids (red and black)

Sudden Apple Decline

Anthracnose Crown Rot of Strawberry

- *Colletotrichum* spp.
- Appearing in plants grown using plasticulture
- Fungicide resistance to QoI reported in 2018

- Symptoms:
  - Wilting
  - Necrosis
  - Lesions on petioles
  - Red marbling in crown

Blossom End Rot of Chestnut

- *Colletotrichum* spp.

- Symptoms:
  - Darkening of the shell
  - Internal rot

Hop Stunt Viroid Disease

- Hop stunt viroid

- Stunting, yellow-green leaves
- Small cones
- Decrease in alpha acids

Hop Powdery Mildew

- *Podosphaera macularis* MAT1-1
- Infects shoots, leaves and cones
- Overwinters in crown buds as fungal strands only

New(er) Fungicides on the Market

- Kenja (SummitAgro)
  - isofetamid
  - Translaminar activity
  - SDHI class
  - FRAC 7
  - PHI= 0-14 days
  - 12.5-22 fl oz/A

Supplemental labels:

Cane berries
Stone fruit
Pome fruit

Exp. 6/2020

New(er) Fungicides on the Market

- Aprovia (Syngenta)
  - Benzovindiflupyr
  - Translaminar activity
  - SDHI class
  - FRAC 7
  - PHI= 30 days
  - 5.5-7 fl oz/A

New(er) Fungicides on the Market

- Aprovia Top (Syngenta)
  - Benzovindiflupyr + difenoconazole
  - Translaminar activity
  - SDHI class
  - FRAC 7 + 3
  - PHI= 21 days
  - 8.5-13.3 fl oz/A

Hardy Kiwi

New Fungicides on the Market

- Intuity (Valent)
  - mandestrobin
  - Translaminar activity
  - QoI (strobilurin) class
  - FRAC 11
  - PHI= 0 (strawberry)
  - PHI= 10 days (grape)
  - 6 fl oz/A

New Fungicides on the Market

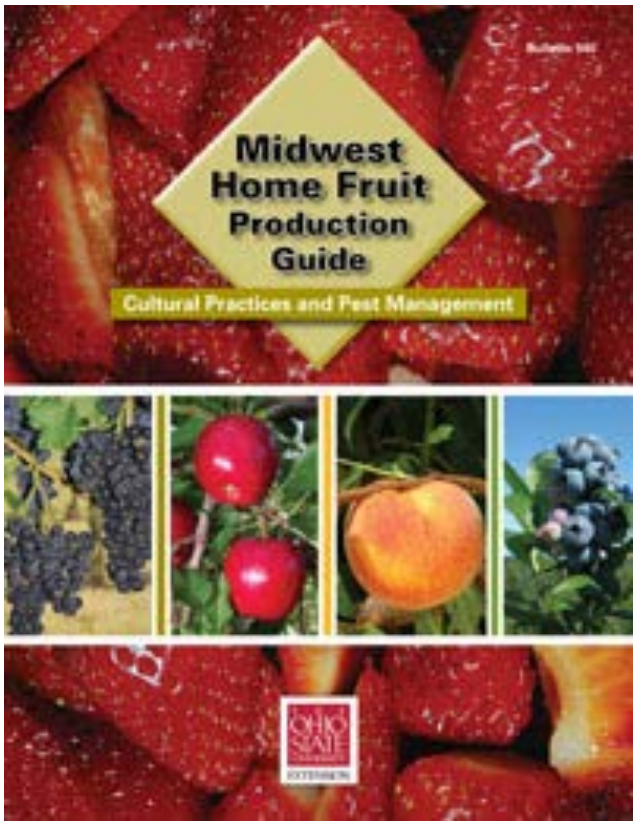
- Cevya (BASF)
  - Mefentrifluconazole
  - DMI (triazoles) class
  - FRAC 3
  - PHI= 0 (pome and stone)
  - PHI= 14 days (wine grapes, tree nuts)
  - 3-5 fl oz/A

New Biological Control on the Market

- LifeGard (Certis)
  - *Bacillus mycoides* isolate J
- Triggers induced resistance
- PHI= 0 days
- Organic approved

Resources

Publication No. 506
$15.00



Publication No. 940
$23.25

Resources

Publication PP Series 147

Publication PP Series 148

Publication PP Series 155

(free, updated annually)

Resources

Supporting Fruit Production

OHIO FRUIT NEWS

Research and Recommendations from The Ohio State University

December 2018

Fungicide Resistance Reported in Colletotrichum from Strawberries

Rachel Kaufman and Melanie Lewis Ivey (Fruit Extension Pathologist)

Over the past few years the incidence of anthracnose crown rot of strawberry, caused by the fungal pathogen *Colletotrichum* spp., has been increasing in Ohio. Symptoms of anthracnose crown rot include plant stunting, wilting, slightly sunken lesions on the petioles and internal red and white marbling of the crown. Generally, the roots remain fibrous and white.

Diseased transplants are the primary source of fruit inoculum during the season. Therefore, using disease-free transplants is the most effective method of controlling crown rot in production fields. While weekly foliar sprays of protectant fungicides such as captan are effective in slowing and reducing the spread of crown rot from infected to health transplants they do not adequately control the disease on infected plants. Therefore, single-site fungicides are recommended, unless resistant isolates are present. **Unfortunately, this year we detected resistant isolates of *Colletotrichum* in transplants with anthracnose crown rot.** These isolates, which were identified as *Colletotrichum nymphaeae*, were resistant to thiophanate methyl (FRAC 1) and the quinone outside inhibitors (QoI) fungicides (FRAC 11), including azoxystrobin. Based on current fungicide recommendations in the 2019-2020 Midwest Fruit Pest Management Guide for anthracnose crown rot, 58% contain a QoI mode of action including Abound, Cabrio, Luna Sensation, Merivon, and Pristine, to name a few. Because there is cross resistance between all members of the QoI group, the implication for effective management of anthracnose crown rot is serious.

Strawberry plants with Colletotrichum infection in the crown.

Inside This Issue:

The Ohio State University College of Food, Agricultural and Environmental Sciences

Supporting Fruit Production

OHIO FRUIT NEWS

Research and Recommendations from experts at The Ohio State University

October 2018

Spotted Wing Drosophilia: Fall Update

Jim Jasinski (Extension educator) and Celeste Welty (Extension entomologist)

Several Extension educators, specialists, and growers have been diligently trapping for spotted wing Drosophila (SWD) in berry crops at multiple sites across 20 counties in Ohio since June. In general, SWD populations at most locations have peaked at this point, but they can remain abundant for several weeks longer. Even after the first frost, some SWD adults are usually active in the field.

At some monitoring sites where growers have been spraying through the season, we are still able to trap SWD adults. Adults are also being trapped at sites where fruit is no longer being produced. While this is concerning to growers with fruit still in the field, there doesn't seem to be any significant fruit infestation or damage, which is good news. If you haven't kept up on your spray schedule and still have fruit out in the field, it is strongly recommended that you check your fruit with a simple salt water test to see if you have any infested fruit. Here are the directions from an OSU factsheet (cpb-us-w2.wpmucdn.com/u.osu.edu/dist/1/8311/files/2017/04/SWD-salttesthandout-updated-pnd335.pdf) or via an OSU IPM YouTube video (youtube.com/watch?v=MtMXHxqcSVs).

Our closing message is that if there is still fruit on your farm worth harvesting, keep up on your spray schedule in order to protect those fruit from infestation. If you deem it necessary to spray for another few weeks, it is important to keep an eye on the PHI of products used. Most PHI's range between 0-7 days, but some products labeled for grapes have a 30-day PHI. Here is the complete list of insecticide PHIs and maximum number of applications allowed: cpb-us-w2.wpmucdn.com/u.osu.edu/dist/1/8311/files/2017/02/SWD_insecticideOptions2018-1ppr7m8.pdf .

Inside This Issue:

SWD larva floating from infested fruit.

u.osu.edu/fruitpathology/fruit-news-2/

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