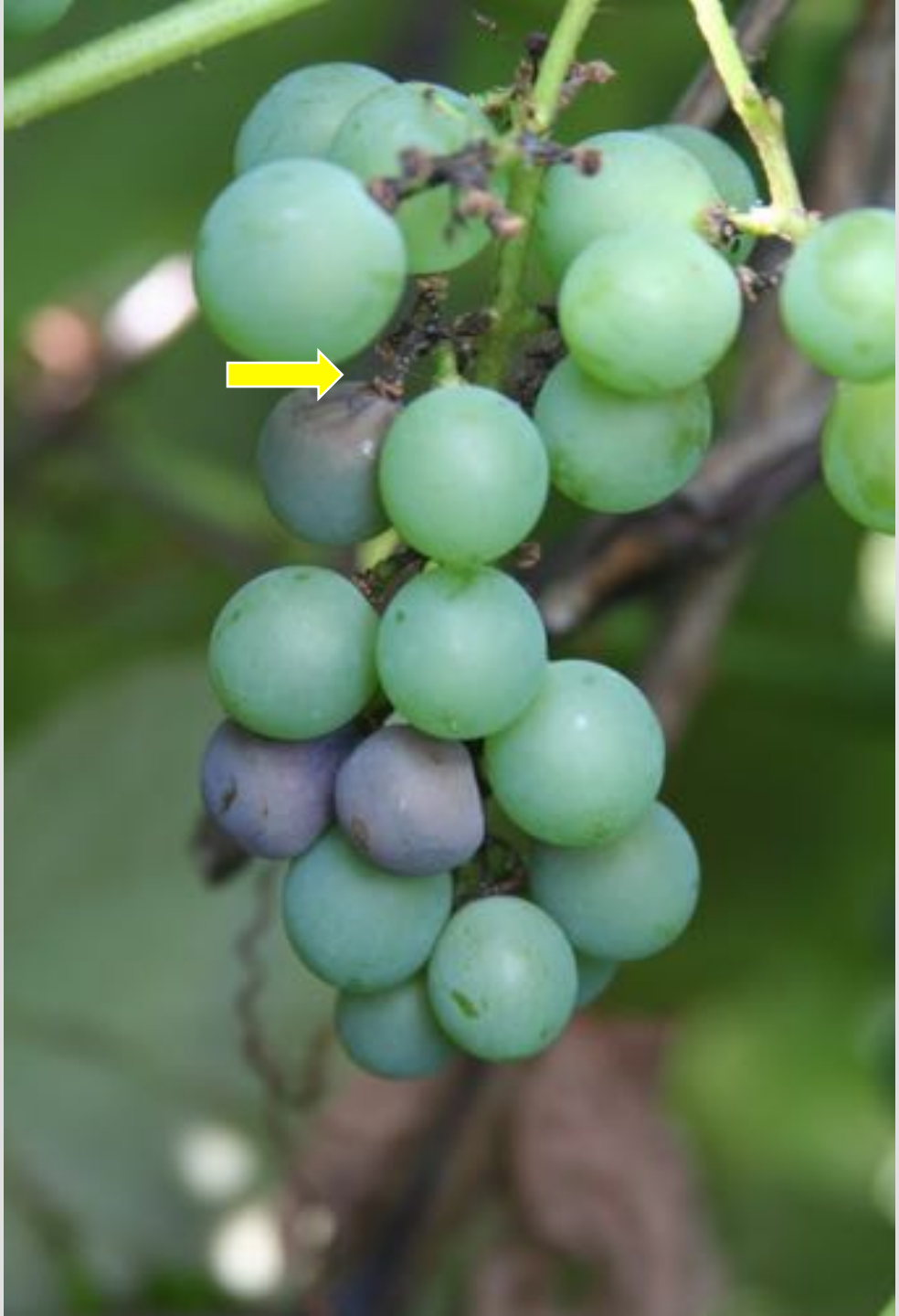

Phomopsis--Shoot infection


Phomopsis--Rachis infection



Phomopsis Rachis & Berry Infections


Photo W. McFadden-Smith

PHOMOPSIS: BIOLOGY IN A NUTSHELL

- Fungus persists (years) in old infected wood

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- Fungus persists (years) in old infected wood
- Produces spores early season, rain-splashed to tissues within a couple of feet
- Infection worse with long rainy periods
- No within-season spread, infection risk over soon after fruit set (spore supply exhausted)

PHOMOPSIS: CONTROL

- Prune out dead wood, pruning stubs to remove fungus (spread is local)
- Critical spray time = When clusters first appear (3- to 5-in shoot growth, +/-)
- One early spray typically adequate, a second (2 wk later) sometimes helps

PHOMOPSIS: FUNGICIDES

- Captan, mancozeb are standards
  - Ziram comparably effective
- Modern fungicides: More expensive, less effective
- No good "organic" options
  - Copper, dormant lime sulfur are best available


Anthracnose


Anthracnose, shoot and leaf symptoms

ANTHRACNOSE

- In NE, restricted to a few highly susceptible cultivars
  - Vidal blanc traditional problem
  - New MN cold-hardy cvs (**esp. Marquette**), also several older Swenson cvs. (x *V. riparia*)
  - Minor hybrid table grapes (esp. Reliance)
  - (Cayuga white, Chardonnay, Vignoles, Villard blanc, Concord in Midwest, not common here)

ANTHRACNOSE: DISEASE CYCLE

- Fungus overwinters primarily in cane lesions on the vine (also diseased berries on floor)
- Spores produced in spring, dispersed by splashing raindrops (short-distance dispersal)
- Likes it warm (70's and 80's) but infects at colder temps if wet long enough

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- Disease spreads from new infections once they occur (splashing rain)

ANTHRACNOSE: PERIOD OF SUSCEPTIBILITY

- Shoots & leaves: Young, succulent
- Rachises, pedicels: Young
- Berries: Through veraison

ANTHRACNOSE: CONTROL

- Sanitation
  - 1° inoculum almost entirely from within vineyard, reduction is very beneficial
    - Removal of infected canes
    - Tillage, mulching diseased berries on ground if plentiful and practical

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  - Canopy management to facilitate drying, spray penetration

ANTHRACNOSE: CONTROL

- Lime sulfur (calcium polysulfide) late dormant
  - Greatly reduces spore production from overwintered cane lesions
  - Expensive & unpleasant but can be important control strategy if established in vineyard, esp. if limited fungicide program

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  - Greatly reduces spore production from overwintered cane lesions
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- Broad-spectrum fungicides (captan, mancozeb, copper, DMI [Rally, tebuconazole, Mettle, Revus Top) applied against other diseases during season

FUNGICIDE RESISTANCE: A GROWING PROBLEM

- New fungicides = Fungal-specific (+/-) site of activity
  - Good:
    - Highly effective
    - Relatively “clean”, non-toxic

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- New fungicides = Fungal-specific (+/-) site of activity
  - Bad:
    - Much easier for target fungi to develop means to "dodge this one bullet" = develop resistance

Multi-site Fungicides

- Affect multiple metabolic processes
  - If fungal mutation negates effect on one process, material is still active against the others
  - Good: Resistance is very unlikely
  - Bad: "Non-target" effects

FUNGICIDE (PESTICIDE) RESISTANCE: "EVOLUTION on STEROIDS"

- Results from the
  - SELECTION
  - of INDIVIDUALS
  - in a POPULATION

"PRACTICAL RESISTANCE"

- (1) Loss of acceptable control when material is used according to recommendations

Caused by

- (2) Increased frequency of resistant individuals in the population

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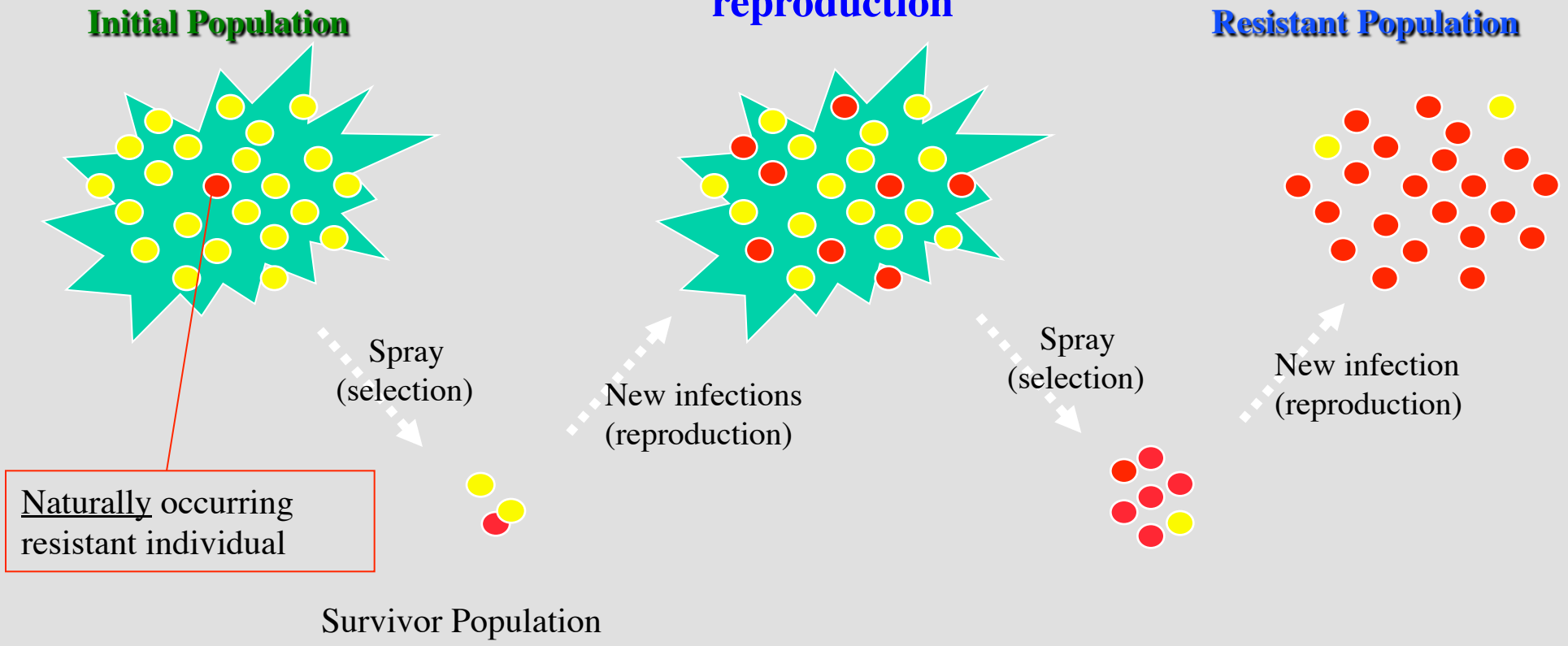
- (1) Loss of acceptable control when material is used according to recommendations

Caused by

- (2) Increased frequency (selection) of resistant individuals in the population
  - Requires survival followed by reproduction

Selection for Resistance

Development of *Practical Resistance* is a continuing process: Cycles of selection, reproduction



RESISTANCE MANAGEMENT STRATEGIES

- Minimize the number of selection events (sprays)

RESISTANCE MANAGEMENT STRATEGIES

- Provide selection pressure (spray) only when the pathogen population size is small
  - *x* % R of a few << *x* % of many
    - Avoid using when significant disease is present
      - Use early in disease cycle
      - To maintain clean vineyard later in cycle

RESISTANCE MANAGEMENT STRATEGIES

- Limit reproduction of selected, resistant individuals
  - Non-chemical control measures
  - Effective, unrelated fungicides in rotation, tank-mix

GROUP 3 40 FUNGICIDES

PULL HERE TO OPEN

RevusTop®

syngenta.

Fungicide

Active Ingredients:	
Mandipropamid (CAS No. 374726-62-2)	21.9%
Difenoconazole (CAS No. 119446-68-3)	21.9%
Other Ingredients:	56.2%
Total:	100.0%

Revus Top is formulated as a suspension concentrate (SC).

Contains 2.08 pounds of mandipropamid active ingredient and 2.08 pounds of difenoconazole active ingredient per gallon

KEEP OUT OF REACH OF CHILDREN.

CAUTION

See additional precautionary statements and directions for use inside booklet.

EPA Reg. 100-1278

EPA Est. 100-NE-001

SCP 1278A-L1E 0514
4039307

2.5 gallons
Net Contents

™

RESISTANCE RISK (FUNGICIDE x DISEASE COMBO)

- Function of:
  - (1) Fungicide biochemistry, activity
    - Number and quality of specific action site/s
    - Keep track of via FRAC Group #

FUNGICIDE GROUPS in RISK CATEGORIES

- HIGH
  - Strobilurins (11), Ridomil (4), (Rovral [2]),
- MODERATE
  - DMIs (3); SDHI group (7); Elevate (17); Vangard/Scala (9); phosphites (33); Group 40 (Revus, one Zampro component); Vivando (U8); Quintec (13); Torino (U6)
- LOW
  - Mancozeb, sulfur, copper, bicarbonates

RESISTANCE RISK (FUNGICIDE x DISEASE COMBO)

- Function of:
  - (2) Pathogen characteristics
    - Reproductive rate, dispersal efficiency
  - NOTORIOUS (all crops):
    - Powdery mildews
    - Downy mildews
    - Botrytis

Fungicide Resistance Risk

Combined Risk: 0.5-1.5 = low; 2-4 = Medium; 5+ = High

11 Sovran, Flint, Pristine **4** Ridomil **2** Rowral	**High** **3**	**3**	**6**	**9**
9 Scala, [illegible] **13** Quintec* **17** Elevate **40** Rewus **U8** Vivando*	**Medium** **2**	**2**	**4**	**6**
33 Confine* **M** Captan, Folpan, Manzate, Polyram, Ferbam, Dikar, Copper, Sulphur, MilStop, PureSpray green*	**Low** **0.5**	**0.5**	**1**	**1.5**
Fungicide Risk - Number of sites - Quality of activity **Pathogen Risk** - Reproductive rate - Dispersal		**1**	**2**	**3**
		Phomopsis	*Guignardia*	*Botrytis* *Plasmopara* *Erysiphe*

TWO MAJOR TYPES OF RESISTANCE

- Quantitative
  - "Partial", "shades of gray"
  - Slow decline in efficacy
  - DMI fungicides (Topas)
- Qualititative
  - "All or nothing", "immunity"
  - Sudden control failure
  - QoI (Stroby, Fenomenal), SL567A

EFFECT OF RATE ON PM CONTROL: DMI-RESISTANT VINEYARD ('Seyval', Finger Lakes)

	%Disease control, fungus type		
Treatment, rate (a.i.)/ha	All	Susceptible	Resistant
Untreated ……	(68% cluster area infected)		
Systhane, 112 g.....	84	94	79
Systhane, 56 g.....	49	89	29

STROBILURIN (QoI) RESISTANCE IN NEW YORK

- In NY in 2002, serious powdery mildew cluster infections appeared suddenly in treated vineyards, at multiple commercial sites
  - Extremely susceptible varieties (Chardonnay)
  - Total of 15 - 20 applications since registration, then resistance problems began

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- In 2002, serious powdery mildew cluster infections appeared suddenly in treated vineyards, at multiple commercial sites in NY
  - Extremely susceptible varieties (Chardonnay)
  - Total 15 - 20 applications since registration
  - Not all users had problems
    - Few problems for those who had regularly tank-mixed w/sulfur (effective partner), even with >20 applications

POWDERY MILDEWCONTROL, 2002 (cv. CHARDONNAY, FINGER LAKES, NY)

Treatment, rate (a.i.)/ha	% PM, Cluster area
None	80
Standard*.....	51
Pristine**, 224 g	9

*DMI/ 2 QoI solo/ DMI/2 QoI solo/ 2 sulfur
**Pyraclostrobin + boscalid

POWDERY MILDEWCONTROL, 2002 (cv. CHARDONNAY, FINGER LAKES, NY)

Treatment, rate (a.i.)/ha	% PM, Cluster area
None	80
Standard*.....	51
Pristine**, 224 g	9
pyraclostrobin, 77 g	56
boscalid, 147 g	3

*DMI/ 2 QoI solo/ DMI/2 QoI solo/ 2 sulfur

**Pyraclostrobin + boscalid

RATE EFFECT?

POWDERY MILDEWCONTROL, 2003: cv. CHARDONNAY, FINGER LAKES

Treatment, rate/A	PM, % area Cluster
None	98
BAS 500 (Pyraclostrobin), 3.9 oz	97
BAS 500 (Pyraclostrobin), 5.4 oz	94
BAS 500 (Pyraclostrobin), 6.8 oz	95

7 sprays @ 2-wk intervals, 6 Jun - 27 Aug


Pyraclostrobin, highest rate