

Grape Pest Management



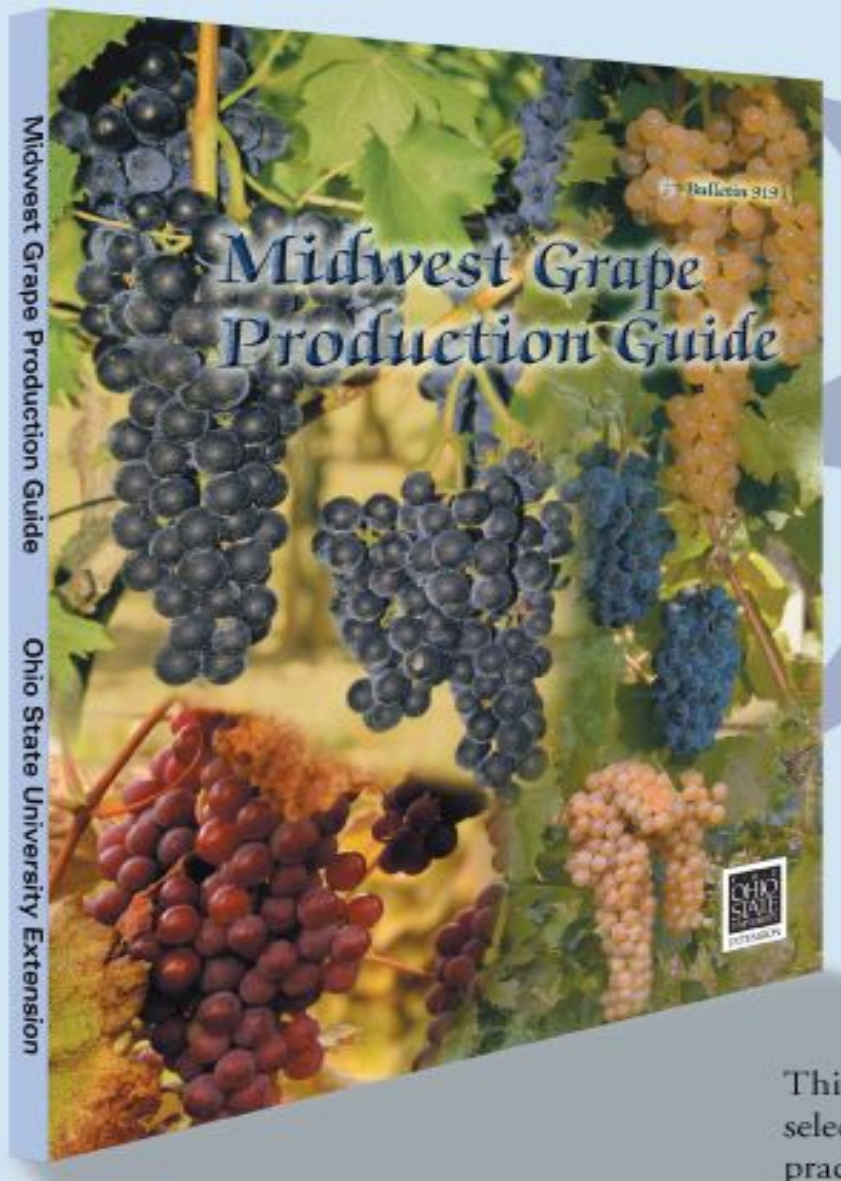
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به روزترین سایت گیاه پزشکی

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Midwest Commercial Small Fruit and Grape Spray Guide

2006

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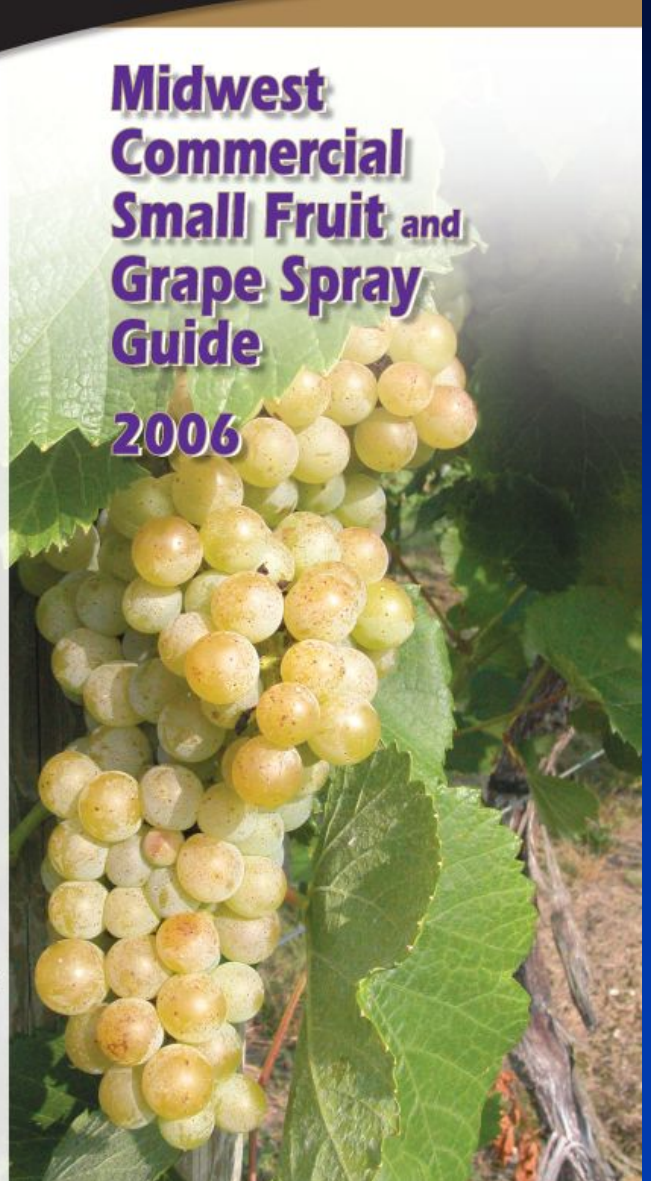
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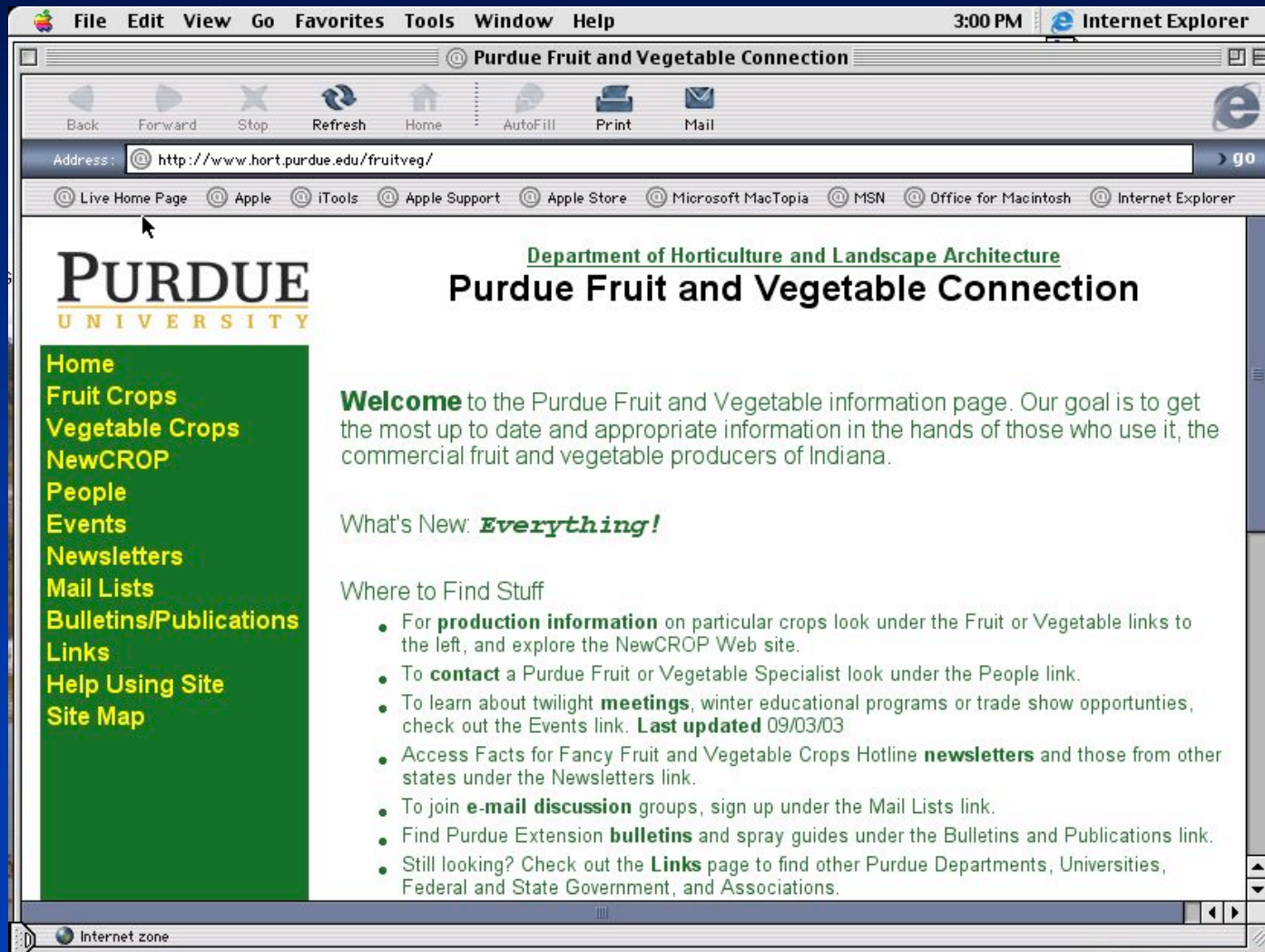
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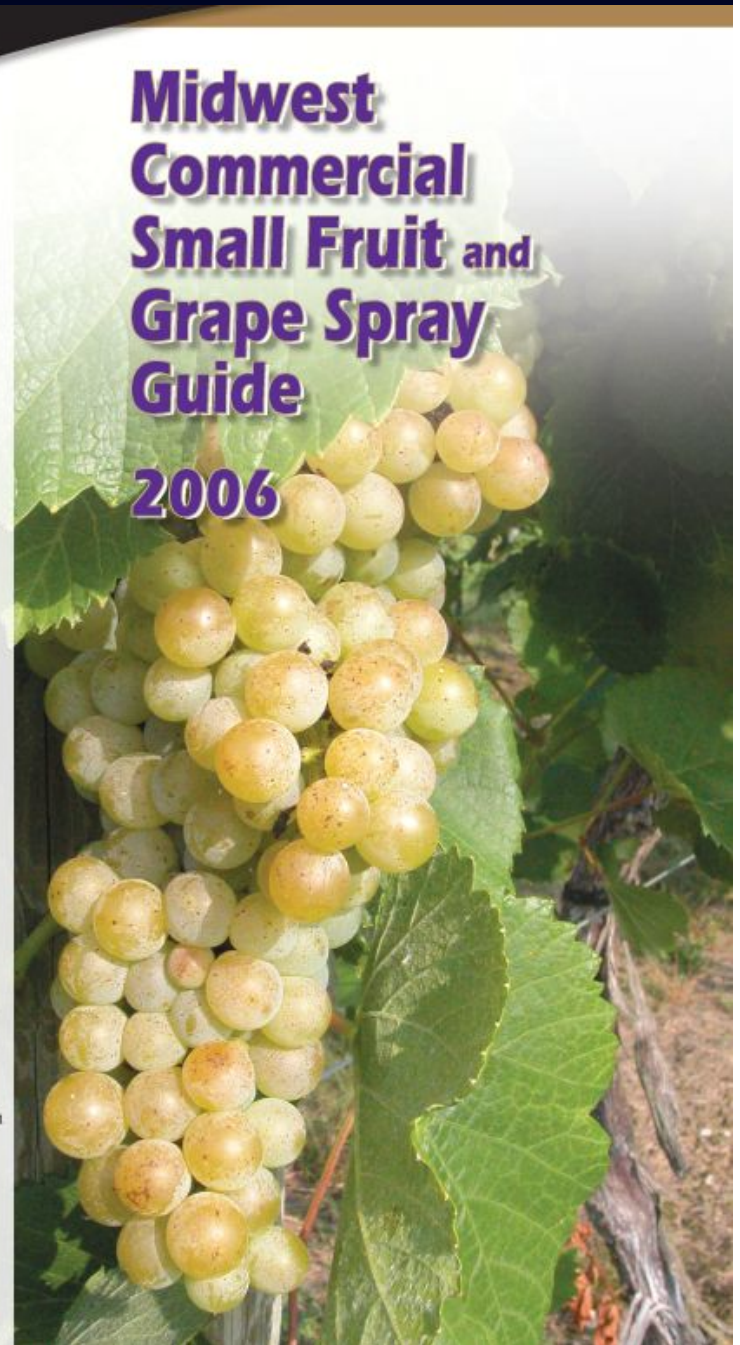
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Disease and Insect Control

- **Grapes are susceptible to several fungal diseases.**
 - Black rot
 - Powdery mildew
 - Downy mildew
 - Phomopsis cane and leaf spot
 - Botrytis fruit rot
 - Miscellaneous fruit rots
- **Grapes are susceptible to a few insect pests**
 - Japanese beetles
 - Flea beetles
 - Grape berry moth
 - Grape root borers
 - Multicolored Asian Lady Beetles***

Effective Grape Disease Control

- **Combination of cultural and chemical methods**
- **Proper identification of disease**
 - Some chemicals are specific for certain disease causing organisms
- **Proper selection of control measures**
 - Cultural management to reduce incidence
 - Chemical application to prevent infection
- **Proper application of chemicals**
 - Timing
 - Rate
 - Coverage

Cultural Methods of Disease Management

- **Cultivar resistance**
 - Cultivars vary significantly in their susceptibility to particular diseases (esp. mildews)
 - See Table 4 in ID-169
- **All aspects of canopy management**
 - Encourage air flow within canopy
 - Proper vine spacing
 - Appropriate training system
 - Proper plant nutrition program
 - Shoot positioning
 - Leaf removal
 - Etc.

Proper coverage using an air carrier sprayer



Common Grape Diseases

Black rot (*Guignardia bidwellii*)



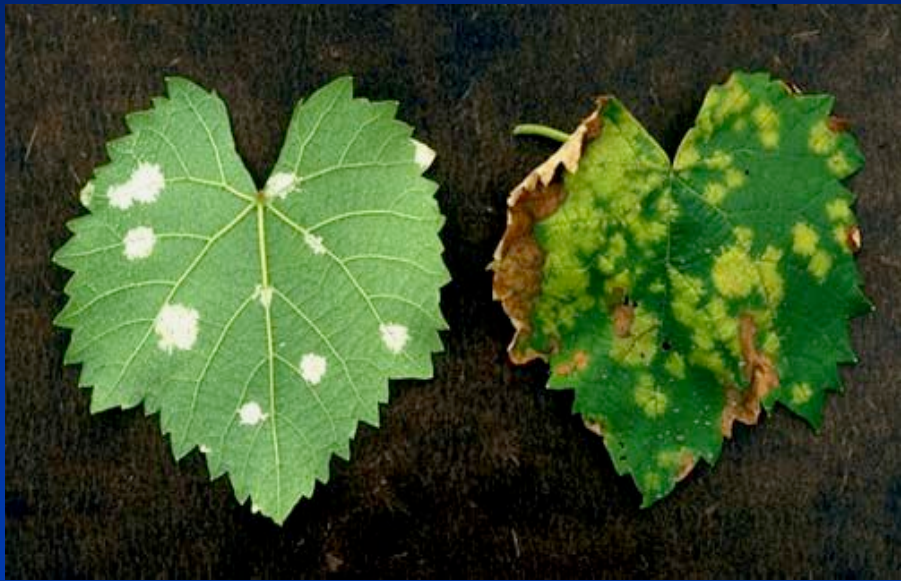
Common Grape Diseases

Powdery mildew (*Uncinula necator*)



Common Grape Diseases

Downy Mildew (*Plasmopara viticola*)



Common Grape Diseases

Botrytis Bunch Rot (*Botrytis cinerea*)



Common Grape Diseases

Phomopsis Cane and Leaf Spot (*Phomopsis viticola*)



Common Grape Diseases

Anthracnose (*Elsinoe ampelina*)



Common Grape Diseases

Bitter rot (*Greeneria uvicola*)



Fungicides Types

- **Based on mode of action**
 - **Protectant**
 - **Must be on the plant prior to an infection event - preventative program. Most are broad spectrum. Some phytotoxicity.**
 - Captan, mancozeb, ziram, copper, sulfur
 - **Systemic**
 - **Most are locally systemic (not throughout the plant). Most have eradicated action and can stop disease development after infection occurs if applied soon enough.**
 - Sterol inhibitors and ridomil
 - **Semi-systemic**
 - **Most are trans-laminar systemic so they are very resistant to wash off. Usually don't have much eradicated action.**
 - strobilurins

Fungicide Classes

- **Dithiocarbamates, phthalimides**
 - Captan, mancozeb, ziram, ferbam, etc.
 - Broad spectrum, protectants
- **Other broad-spectrum fungicides**
 - Copper, sulfur (inorganics)
- **Sterol inhibitors (DMI)**
 - Nova, Rubigan, Bayleton, Elite, Procure, etc.
 - Specific for certain diseases, esp. powdery mildew and black rot
- **Boscalid (new product for powdery mildew, Endura)**
 - Component of Pristine
- **Stobilurins (Reduced risk)**
 - Abound, Sovran, Flint, Pristine*
 - Broad spectrum
- **Botryocides (specific for Botrytis cinerea)**
 - Rovral, Elevate, Vanguard
- **Alternatives (organic and/or reduced risk)**
 - Oils, phosphorous acid, potassium bi-carbonate, potassium monophosphate, Oxidate, compost tea, Serenade, etc.

Managing Fungicide Resistance

- Many of the newer fungicides affect a single “site” in the fungal cell metabolism, and consequently, are susceptible to development of resistance in the pathogen population. The Fungicide Resistance Action Committee has developed a set of codes to use in managing resistance.

Strategies for managing fungicide resistance

- Follow label exactly
 - Number of applications, rates, etc.
- Do not apply a fungicide susceptible to resistance development when an epidemic has already started.
 - Use a material that will kill the existing population
 - Many alternatives (oils, phos, KBC, etc. fit this category)
- Rotate to another mode of action class (FRAC Code)
 - Keeps resistant populations from building up
- Tank mix with broad spectrum fungicides
 - Kills both resistant and susceptible populations
- Understand the FRAC codes and use fungicides accordingly

FRAC Code	Group Name	Common Name	Examples	Comments
1	Methyl Benzimidazole Carbamates	Benzimidazoles thiophanates	Benlate Topsin M	High risk Cross rs common
2	Dicarboximides	dicarboximides	Rovral	Medium to high risk, cross rs common
3	DMI (SBI class I)	Triazoles, pyridines, Pyrimidines	Nova, Bayleton, Rubigan, Elite, Procure, Scala	Medium risk, cross rs likely
4	Phenyl Amides	metalaxyl	Ridomil	High risk, cross rs common
7	carboximides	Boscalid	Endura	Medium risk
9	Anilino-Pyrimidines	cyprodinil	Vanguard	Medium risk
11	Quinone outside Inhibitors	azoxystrobin pyraclostrobin kresoxim-methyl trifloxystrobin	Abound Pristine Sovran Flint	High risk, cross rs shown between all members of QoI group.
13	Quinolines	Quinoxifen	Quintec	Medium risk
17	hydroxyanilides	fenhexamide	Elevate	Medium risk
33	Phosphonates	Fosetyl-Al Phosphorous acid	Aliette Phosphorous acid	Risk unknown, assumed to be low
M	Multi-site contact activity	Inorganics Dithiocarbamates Phthalimides	Copper, sulfur Ferbam, mancozeb, ziram captan	Low risk, no cross resistance

Resistance Development Potential

- **Bunch Rot (*Botrytis cinerea*)**
 - Fungicide resistance is very common
 - Strategies of tank mixes with FRAC M and rotation to other FRAC groups
- **Powdery Mildew (*Uncinula necator*)**
 - Fungicide resistance is very common (esp NE US)
 - Strategies of tank mixes, rotation, use of sulfur, potassium salts, oils, etc. as eradicants if a epidemic is started.
- **Downy mildew (*Plasmopora viticola*)**
 - Fungicide resistance is possible (ridomil) so only combination products are sold. Not sure about strobies.
 - Several good eradicants in group M & 33.
- **Black rot (*Guignardia bidwellii*)**
 - Fungicide resistance has never been shown. Apparently low risk.
- **Phomopsis Cane & Leaf Spot (*Phomopsis viticola*)**
 - Fungicide resistance unknown.

Recommended Spray Program for Indiana Vineyards

- **Early (1-12 inch shoots)**
 - Broad spectrum protectant (mancozeb)
 - Repeat at 7-10 day intervals depending on rainfall and shoot growth rate (3-4 sprays)
- **Mid (pre bloom, bloom, and post bloom)**
 - **Three most important sprays of the year!**
 - Use “best” products: strobies and sterol inhibitors in rotation. (Sprays about 10 days apart)
 - Be sure to get thorough coverage, especially clusters
- **Late (2 weeks post bloom through veraison)**
 - Use products on 14-21 day schedule. Choose products depending on weather, cultivar susceptibility, etc.
 - Scout for mildew outbreaks and spray accordingly
- **Post harvest**
 - Maintain good leaf health until first frost

Disease Calendar

	Budbreak	Pre-bloom	Bloom	1 st Post-bloom	Cluster closing	Veraison	Harvest	Leaf drop
Black rot	++	++++	++++++	++++++	+++	+	0	0
Powdery Mildew	++	+++	+++	++++	+++++	++++++	++++++	++++++
Downy Mildew	++	+++	+++	+++	+++++	++++++	++++++	++++++
Phomopsis	++++++	++++++	++++++	++++++	++	++	++++++	+++
Botrytis	+	+	++++++	+	++++++	++++++	++++++	0
Bitter rot	++	++	++++++	++++++	+	+	++++++	0
Anthracnose	++++++	++	++	++	++	+	+	+

+, ++, +++, etc. denotes fungus activity

++++++ denotes appropriate time to spray

Disease Control Summary

- **Know cultivar susceptibility**
- **Understand pathogen biology**
- **Develop a disease management strategy**
 - **Cultural methods**
 - **Chemical methods**
- **Practice proper chemical application techniques**
 - **Rates**
 - **Timing**
 - **Coverage**

Grape Insect Pest Control

- **Proper identification of pest**
- **Proper selection of insecticide or other control measure**
- **Determination of economic threshold**
- **Proper timing**
 - Monitor population with pheromone traps
- **Thorough coverage of susceptible plant parts**

Common Grape Insect Pests

Japanese beetle



Japanese Beetle Damage



Japanese Beetle Damage

Edge Effect



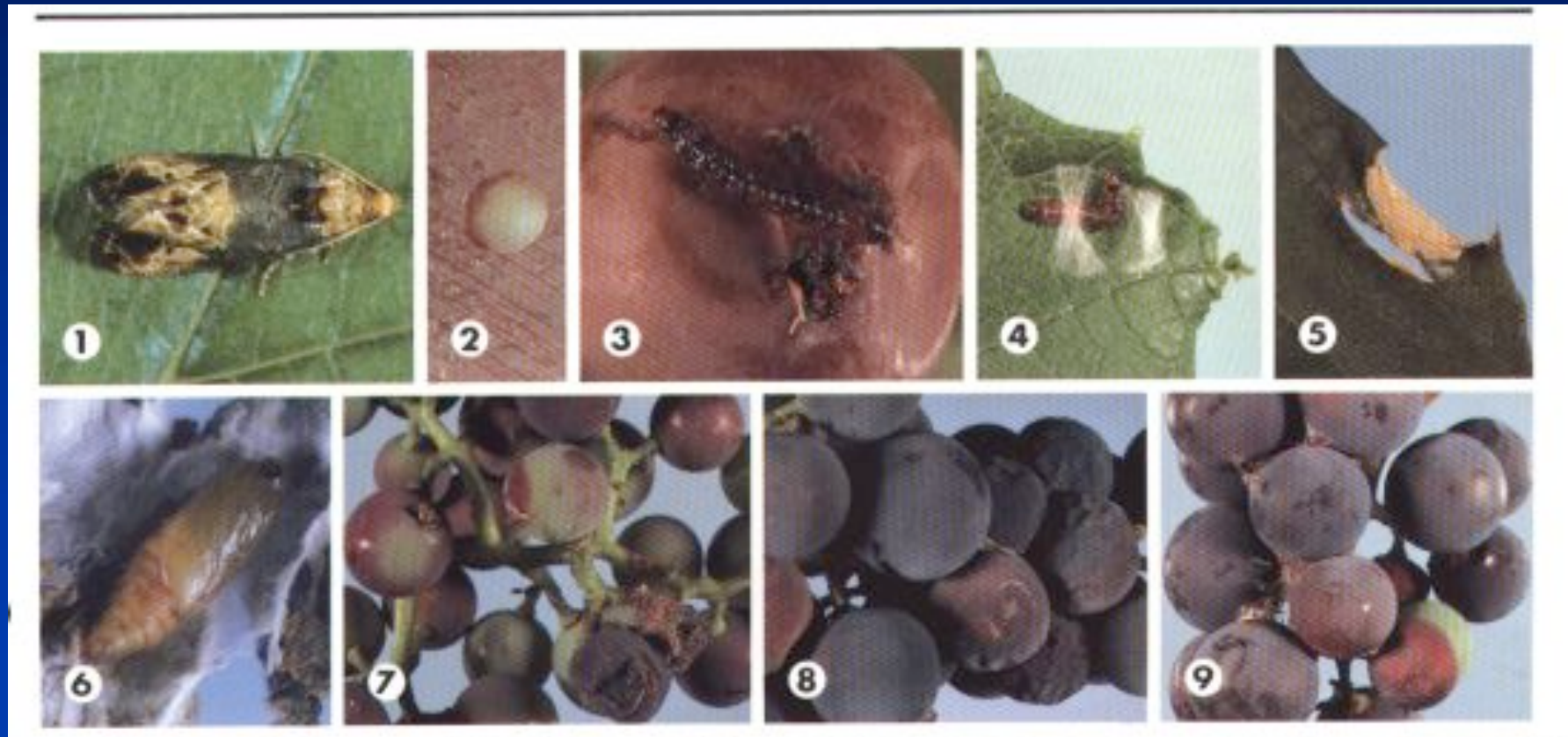
Japanese Beetle Damage

3 day weekend!



Common Grape Insect Pests

Grape berry moth



Common Grape Insect Pests

Grape flea beetle



Leaf Phylloxera



Leaf Phylloxera



Not-so-Common Grape Insect Pest

- **Multicolored Asian Lady Beetle**
 - Not a pest, but a winemakers nightmare!



Multicolored Asian Lady Beetles on Fruit



Multicolored Asian Lady Beetles on Fruit



Multicolored Asian Lady Beetles in Juice



MALB from 30 lbs Fruit



Insect Management

- **Grape Berry Moth**
 - Monitor population with pheromone traps
 - Disrupt mating with pheromones
 - Add insecticide into cover sprays when needed
- **Japanese beetle**
 - Monitor damage and spray if necessary
 - Don't overreact to minor damage
 - Don't wait until all your leaves are gone
- **Other insect pests**
 - Monitor and treat only if necessary
 - Scout for Grape Flea Beetle damage
 - Scout for grape phylloxera (leaf form)

Grape Insecticides

- **For Grape Berry Moth**
 - Sevin
 - Imidan
 - Danitol (RUP)
 - Guthion (RUP)
 - Intrepid
- **For Japanese Beetle**
 - Sevin
 - Danitol (RUP)
 - Imidan
- **For Grape Leafhopper (not a big problem)**
 - Assail
 - Applaud
 - Danitol (RUP)
 - Provado
 - Sevin

Grape Insecticides

Miscellaneous pests

- **For Grape phylloxera (leaf form)**
 - Danitol (RUP)
 - Thiodan (endosulfan) --- *phytotoxic!*
- **For Multicolored Asian Lady Beetle**
 - Provado (0 day PHI)
 - Malathion (3 day PHI)
 - Neemix or Aza-Direct (0 day PHI)
 - Pyrethrins (0 day PHI)

Managing Insecticide Resistance

- **Similar to fungicide resistance management**
 - IRAC codes for mode of action
 - Rotate chemistry where possible
 - Utilize mating disruption where possible
- **Grape pest known to have developed insecticide resistance:**
 - Grape berry moth
 - Two spotted and European red spider mites

Organic Production?

- **In the Midwest, very few grape cultivars can be grown without controlling diseases and the dominant insect pests.**
 - Norton is the most disease resistant
 - Cayuga White, Steuben, etc are also candidates
- **Organic production does NOT mean NO SPRAY, it often means that more spraying will be necessary.**
 - Organic growers will have to grow varieties that are tolerant of major diseases, and use OMRI certified fungicides such as copper, sulfur (on non-sensitive cultivars), phosphorous acid, bi-carbonates, oils, etc. on a regular basis throughout the season to maintain acceptable disease control.
 - Organic control of Japanese beetles? (Neem extracts? Surround?)
- **Environmental impact of “organic production” can be worse than with modern reduced risk chemicals.**

Weed Control & Vineyard Floor Management

- **Cover crop between rows**
 - planted perennial cover crop - usually grass
 - native species - mixture
- **Provides solid surface for equipment**
- **Reduces soil compaction**
- **Increases water infiltration, reduces runoff and erosion**

- **Weed-free strip beneath vine row**
 - eliminate competition for water, nutrients
 - improve air movement - reduce disease incidence
 - eliminate crop contamination

Weeds

Any plant in the vine row other than grapevines

- **Grasses**
- **Broadleafs**
- **Brushy perennial weeds: brambles, poison ivy, etc.**

Weed Control in the Vine Row

Pre-emergent + post-emergent herbicides

- Band-applied - one or both sides of each row
- **Single or double sided boom**
 - Even fan nozzles
 - Offset nozzle body
 - Low volume (20-40 gpa)
 - Low pressure (15-30 psi)
- **Low-volume CDA Sprayers (for post-emergent)**

Mechanical weeding

Mulching

Herbicides

Pre-emergent and post-emergent herbicides

- **Pre-emergent - prevent weeds from becoming established**
- **Post-emergent - kill or suppress existing weeds**
- **Tank mix post-emergent plus one or more pre-emergent (selected for problem weeds)**

Post-emergent herbicides

Broad Spectrum

- Roundup, Touchdown - glyphosate
- Rely - glufosinate
- Gramoxone Super, Extra - paraquat (RUP)
- Aim - carfentrazone

Grass Specific

- Poast - sethoxydim
- Fusilade 2000 - fluazifop (non-bearing)
- Select - clethodim (non-bearing)
- Reglone - diquat (non-bearing)

Pre-emergent herbicides

- Surflan (oryzalin)
- Treflan (trifluralin)
- Princep (simazine)
- Solicam (norflurazon)
- Karmex (diuron)
- Casoron (dichlobenil)
- Devrinol (napropamide)
- Treflan (trifluralin)
- Goal (oxyfluorfen)
- Prowl (pendimethalin) (non-bearing)
- Gallery (isoxaben) (non-bearing)
- Kerb (pronamide) (RUP)
- Chateau (flumioxazin)

Differ in specificity,
soil behavior,
vine age restrictions, etc.
See Weed Control chapter
in ID-169

READ THE LABEL

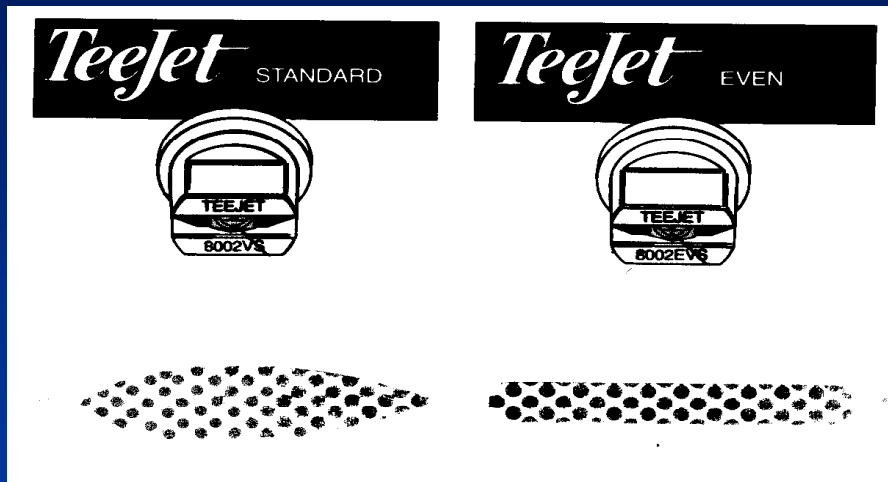
Herbicide Sprayer



Boom and Nozzles

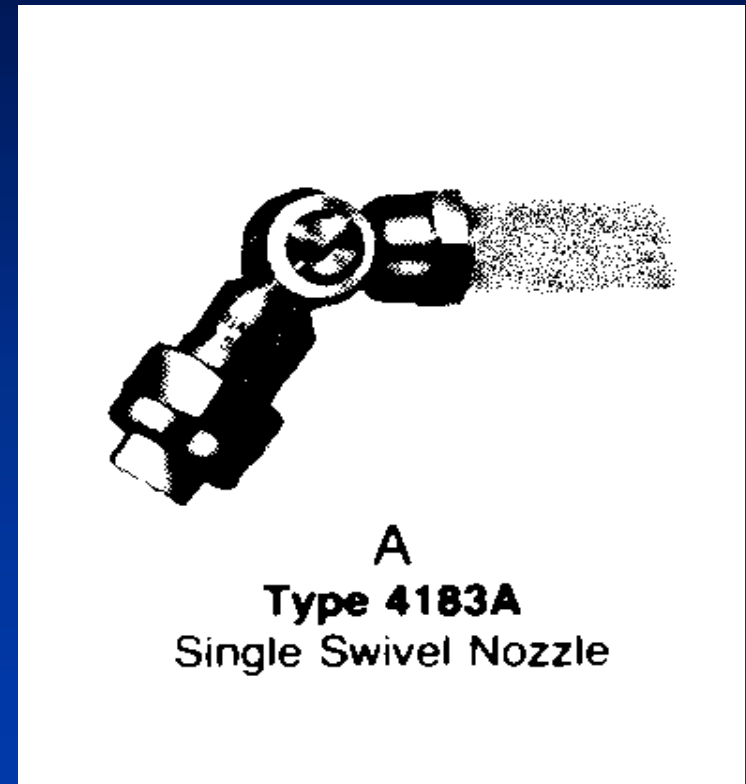


Spray nozzles



Standard

Even



Low volume CDA Sprayers Post-emergent Only



Post Emergent Strip



Damage from 2,4-D



Damage from Dicamba



Mechanical weeding

- **Grape hoe**
 - Green hoe
 - Radius
- **Rotary cultivator**
 - Weed Badger
 - other

Rotary Cultivators



Mulching

- **Mow & Throw**
 - Grow cover crop between row, mow, and throw mulch under row
- **Apply organic mulch under vine row** (wood chips, leaves, etc.)
- **Plastic or fabric mulch**
- **Herbicide desiccated cover crop**
 - Grow rye fall-spring, kill with herbicide and leave in place as a mulch**
- **Living mulch?**
 - Non-competitive ground cover

Pesticide Application Licenses

www.btny.purdue.edu/ppp/
www.oisc.purdue.edu

- **Private Applicator**
 - Required to purchase and apply any Restricted Use Pesticide on land they own, rent or otherwise control
 - Recommended for all growers (especially those that plan to sell their produce)
- **Commercial Applicator**
 - Required for any person that applies a pesticide for hire.

Record Keeping



- Pesticide application records are **REQUIRED** for Restricted Use Pesticides
- Pesticide application records are highly recommended for General Use Pesticides
- See Record Keeping charts in ID-169
 - Record date, time, field, stage of growth.
 - Record chemical applied and EPA registration number.
 - Record rate, volume applied, etc
 - Record weather conditions, etc.
- Keep records for a minimum of 3 years

Pest Management Summary

- **Grapes (and other fruit crops) require intensive management of pests, especially diseases.**
 - Proper pest and disease identification
 - Understand pest biology
 - Choose appropriate control measures
 - Apply materials timely and effectively
 - Stay current on pesticide registrations and application rules.
 - Be a good neighbor and land steward