



Meet the Japanese Beetle

life cycle and control strategies



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BACKGROUND

- Native to Japanese archipelago
- Accidentally introduced to US around 1916 in NJ
- Damages a broad range of plants, including grape
- By 1972 in 22 states infested, including Michigan
- Spread in MI, through all southern tier of the L.P.
- Sporadic outbreaks outside the established distribution
- Suitable conditions into the U.P.

Japanese beetle life stages



EGGS

1-2 mm eggs laid in grassy areas
Eggs laid in batches of ~5
Require moisture to hatch



LARVAE

White and C-shaped
Develop in moist soil
Feed on roots, organic matter
Overwintering stage



PUPAE

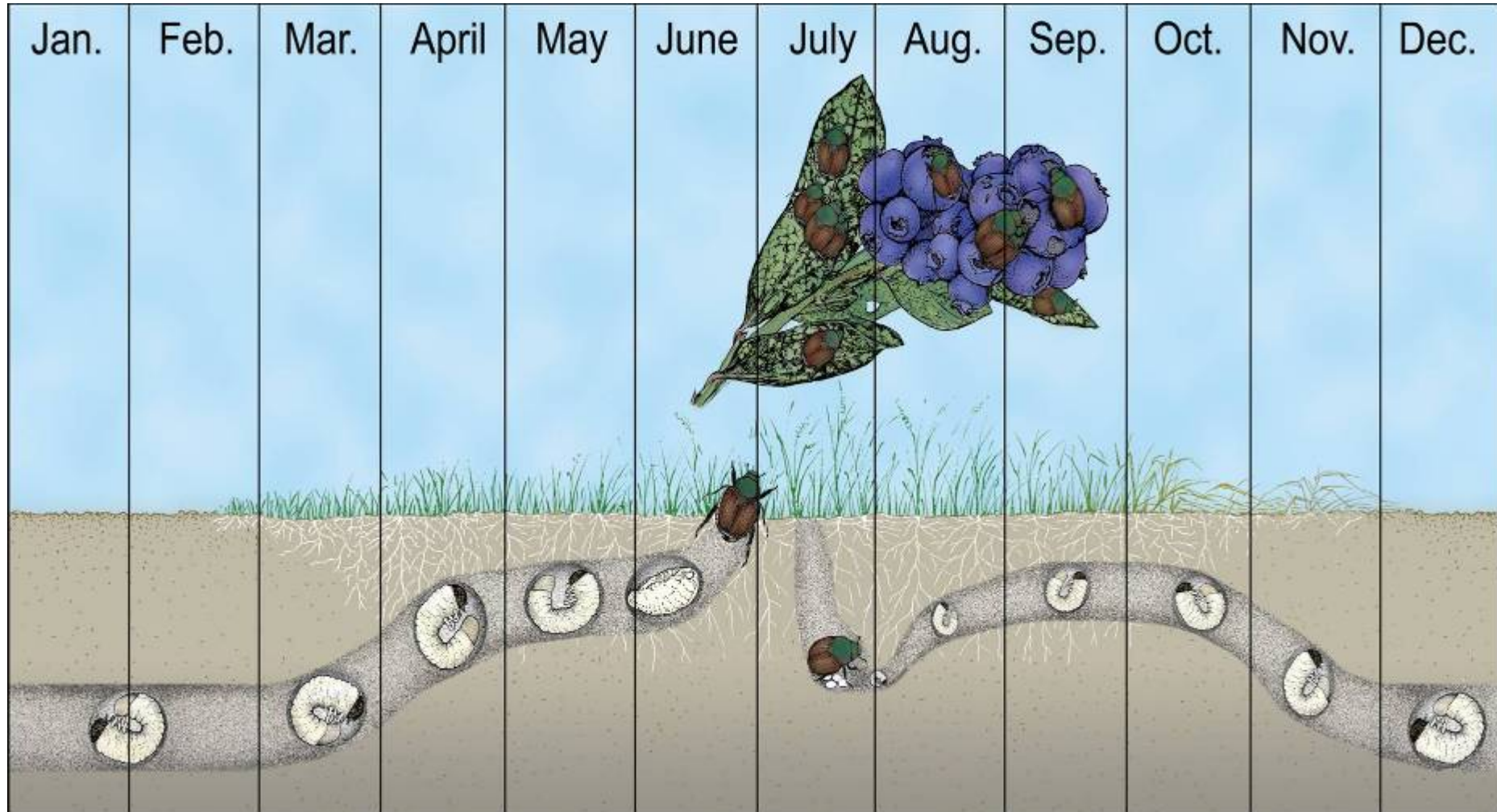
Develop in soil in late spring



ADULTS

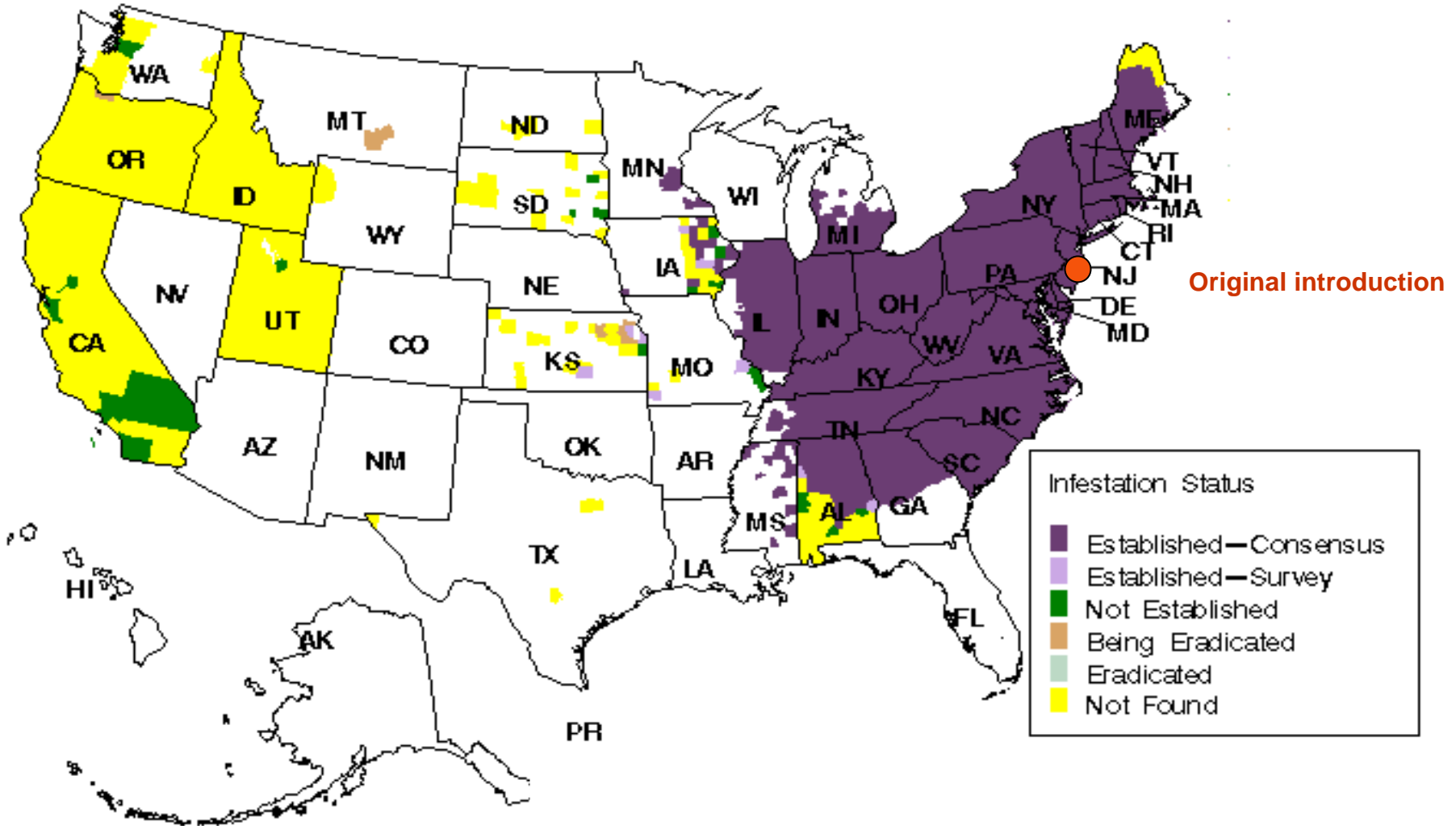
Adult beetles emerge in mid-summer
Highly mobile
Females lay ~50 eggs

Japanese beetle life cycle (S. Michigan timing)



“Official” distribution of Japanese beetle in the United States

NAPIS Report, November 14 2005



Distribution in NW Michigan

- First detected by MDA in 2005
- Set of 25 traps set to monitor JB
- 19 traps set by NWMHRS/MDA in 2006 to further establish distribution of JB
- Set along roads around hot-zone
- Beetles weighed/counted weekly

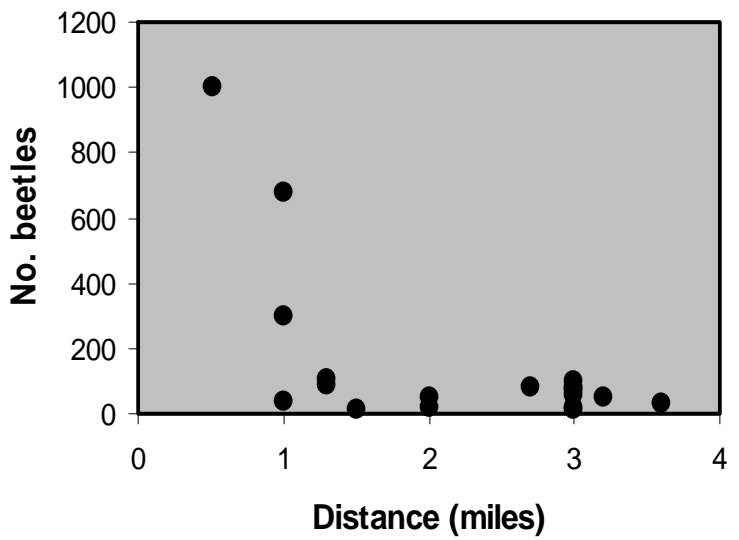
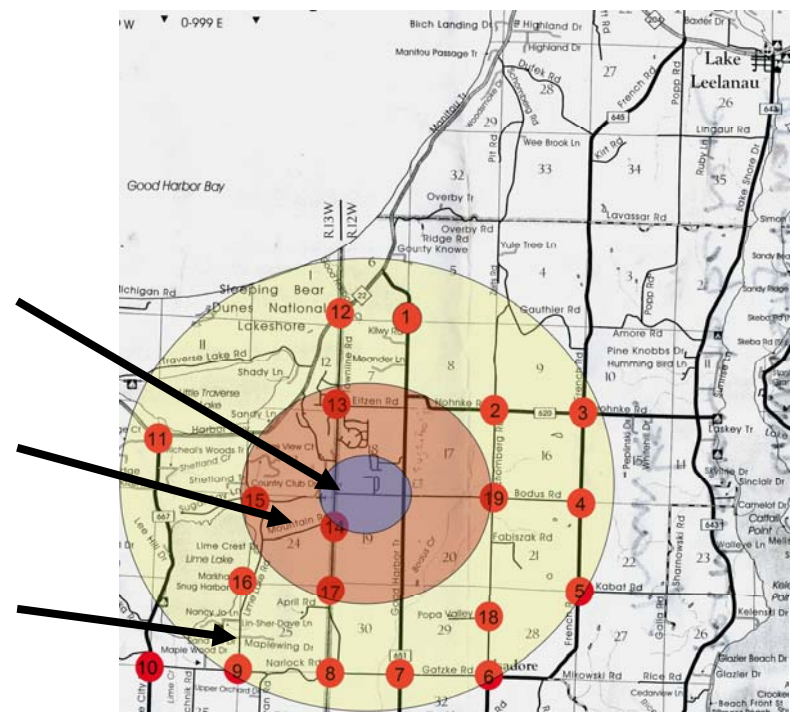


Trapping Results

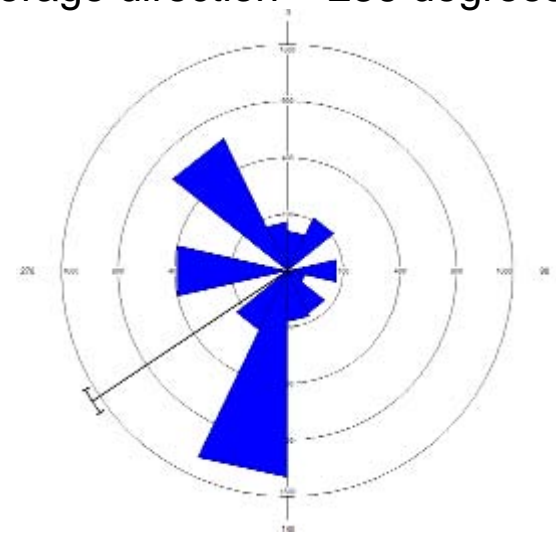
2005 Original site – 61,800

2006 Inner ring – 2,150

2006 Outer ring – 868



Average direction = 236 degrees



Japanese beetle IPM program

- **Create suppressive vineyard landscape**
 - Bare ground
 - Biocontrol agents
 - Remove attractive plants
- **Monitor regularly**
 - Use visual observation
 - Look for beetles and their damage
- **Consider factors influencing vine tolerance**
 - Leaf:fruit ratio
 - Where beetles are feeding (terminals/main leaves)
- **Spray only when needed**
 - Foliar insecticides
 - (Soil-applied insecticides)

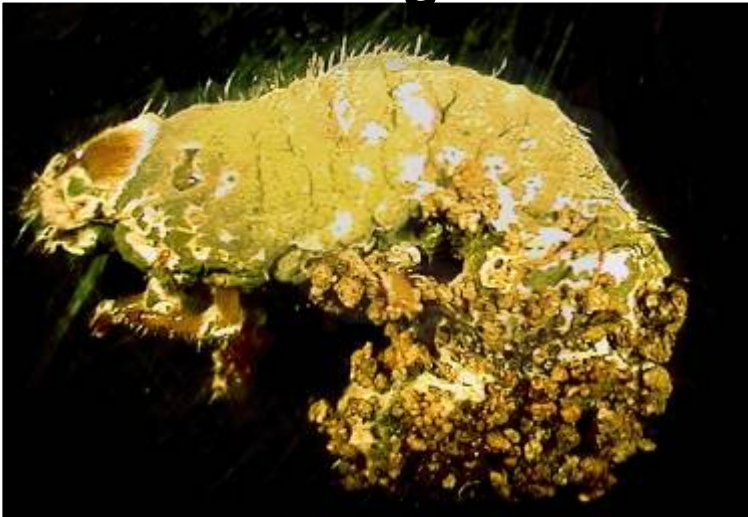
nematodes



gregarines



fungi



milky spore

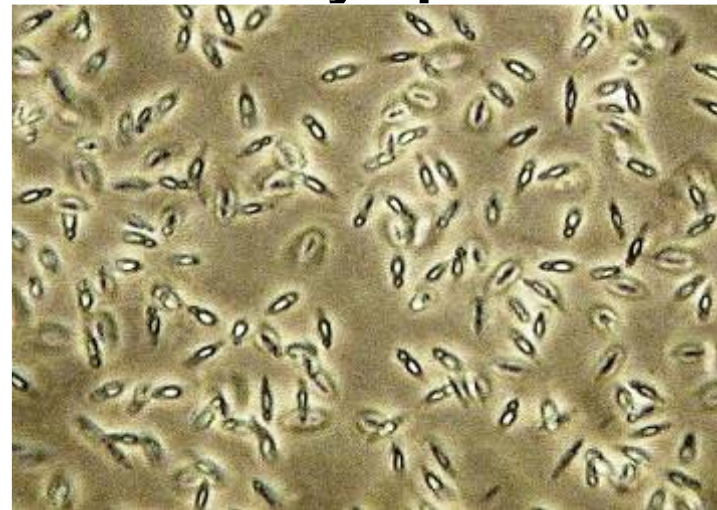


Photo credits - D. Cappaert

Cultivars vary in their resistance to feeding

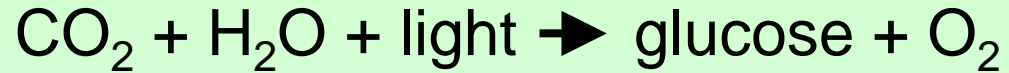
Resistance levels: Labrusca > hybrids > vinifera



Labrusca juice grapes

Hybrid vines

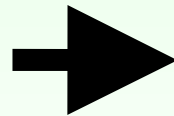
PHOTOSYNTHESIS (sunlight into sugar)



**CARBOHYDRATE
ALLOCATION**

Growth

Photosynthesis



Carbohydrates

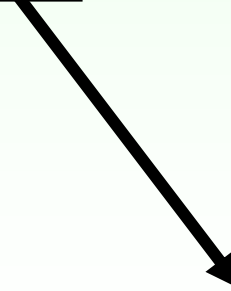
Fruit



Respiration



Storage



How much leaf injury can vines tolerate?

*Tolerance = Ability to withstand a certain level of injury without a reduction in vine **productivity** and **fruit quality***

Previous studies....

Boucher & Pfeiffer, 1988 from Virginia

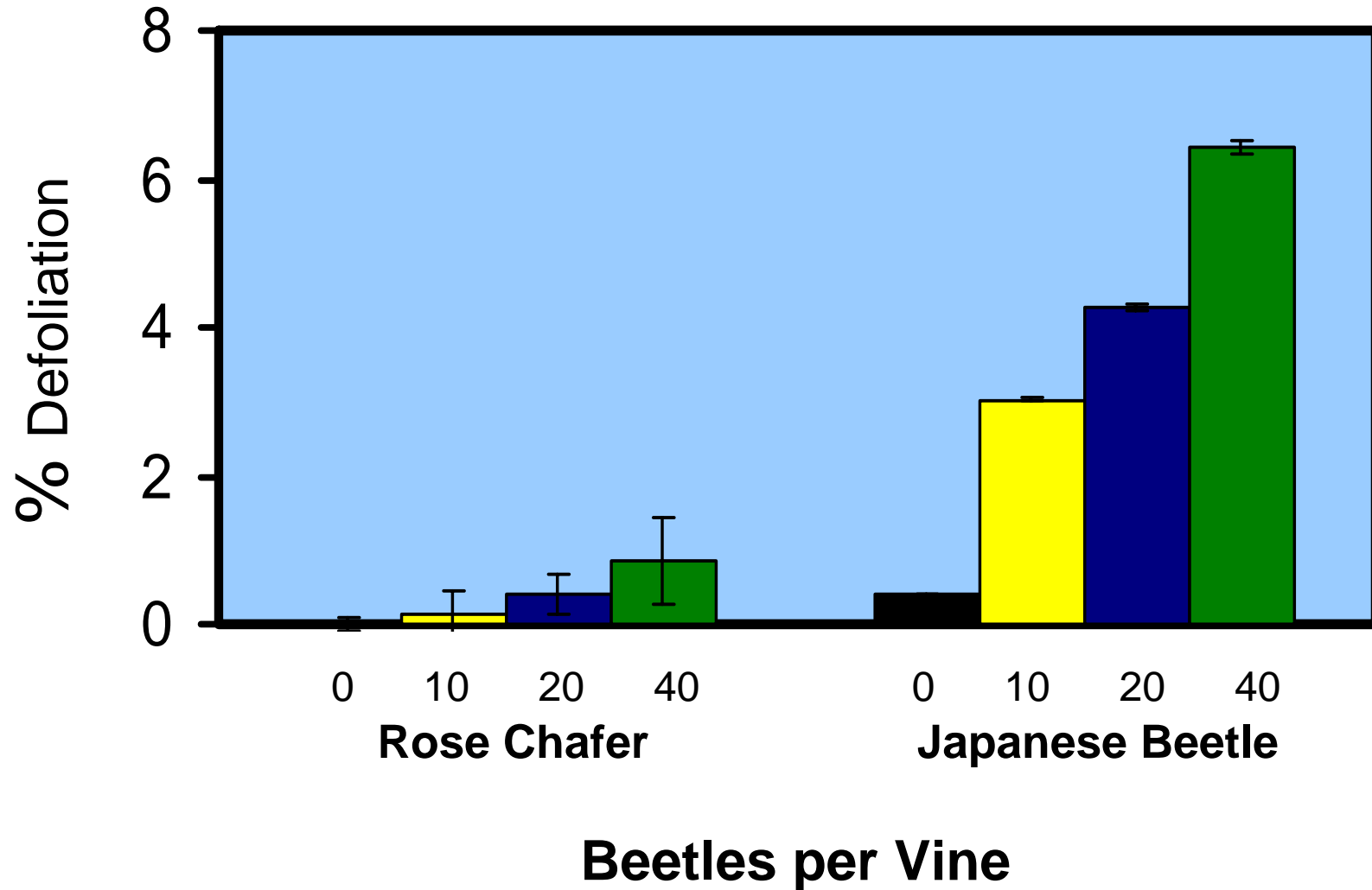
In Seyval vines, natural levels of Japanese beetle feeding (6.5% leaf area loss) had no effect on vine growth or fruit quality.

Intensive feeding after veraison inside cages (11% leaf area loss) reduced fruit quality

More recent studies in Michigan on juice grapes....



Leaf Area Removed by Rose Chafer and Japanese Beetle (2 weeks exposure)



No effect of beetle density on wood pruned from vines

Beetles per vine	Average fresh weight (g) \pm S.E.	
	Rosechafer	Japanese beetle
0	439 \pm 53	484 \pm 99
10	496 \pm 48	481 \pm 104
20	476 \pm 87	493 \pm 79
40	482 \pm 71	487 \pm 56

Not sig.



Not sig.





Growth of Vines with Leaf Area Removal at Different Times

Timing of 30% area loss	Pruning weight (g)	Next year Yield (kg)
No damage	1035 ± 142 a	3.6 a
Bloom	617 ± 65 b	2.4 ab
Veraison	862 ± 105 a	3.6 a
Bloom and Veraison	559 ± 67 b	1.3 b

Loss of 30% leaf area at bloom reduced growth

Injury at veraison (30% leaf area loss) had little effect on growth

Evidence for a synergistic effect : damage at bloom made vines less tolerant of damage at veraison

Insecticide Options



Conventional Insecticide Classes for JB

Increasing trend toward more pyrethroids

Organophosphates

Imidan 70WP

Carbamates

Sevin XLR

Lannate 90SP

Pyrethroids

Danitol 2.4EC

Brigade 2EC (No more Capture 2EC)

Baythroid XL

Mustang Max (expected 2007)

New Insecticide Classes for JB

expect more in the future

Neonicotinoids

Provado Pro, Assail 30SG, Venom

Botanicals (neem)

Neemix, AzaDirect, etc.

Botanicals (pyrethrums)

Evergreen EC 60-6, Pyganic EC 1.4, etc.

Japanese beetle chemical control

Applications on July 19 to 7 vine plots using an airblast sprayer at 50 GPA.

Beetles per vine measured 1, 7, and 14 days after treatment (DAT)

Treatment	Beetles per vine	
	1 DAT	7 DAT
Untreated	14.6 a	123.9 a
Danitol 10.6 oz	1.7 b	31.1 b
Imidan 2.0 lb (pH 6.0)	0.8 b	18.7 b
Capture 3.2 oz	3.9 b	47.2 ab
Provado 1.0 oz	3.3 b	34.4 b
Evergreen 16.0 oz	5.4 b	40.8 b

Summary



- Japanese beetle is present in Leelanau County
- Options for making fields less suitable, but some may not be compatible with viticultural priorities (e.g. bare ground)
- Some cultivars can tolerate significant leaf area loss in summer
- Crop load and season will also affect tolerance
- Regular scouting is key to management
- If needed, many insecticide options available