

Current and potential management tools for powdery mildew on melons

Michael E. Matheron
Yuma Agricultural Center



Requirements for disease development

- Susceptible host
- Virulent pathogen
 - *Podosphaera xanthii* (*Sphaerotheca fuliginea*)
- Favorable environment

What is a favorable environment for development of powdery mildew on melons?

- Infection can occur from 50 to 90 F.
- Optimum temperature for disease development is 68 to 80 F.
- Powdery mildew development is arrested at temperatures at or above 100 F.
- High relative humidity (RH) favors infection; however, infection can occur at a RH below 50%.

What is a favorable environment for development of powdery mildew on melons?

(continued)

- Spores remain viable for 7-8 days after production.
- Time between infection and appearance of symptoms is from 3-7 days.
- Dense plant growth and low light intensity.
- Dry conditions favor colonization, sporulation and dispersal.

Control measures for powdery mildew on melons

- Resistant cultivars
- Fungicides

**Can the control measures that we use
to manage powdery mildew affect the
pathogen?**

Can the control measures that we use to manage powdery mildew affect the pathogen? Yes!!

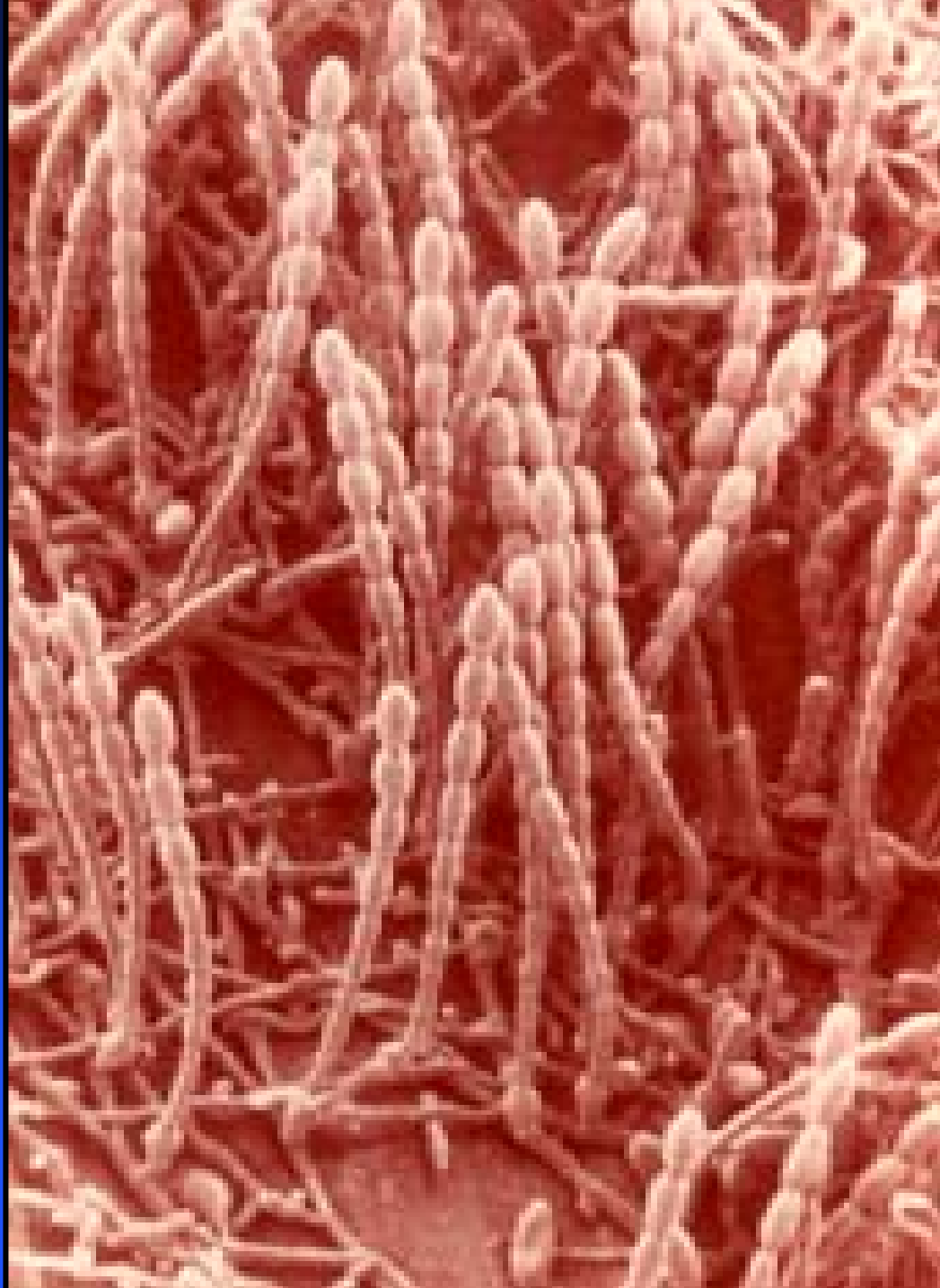
- Planting resistant cultivars has resulted in the development of at least 11 different races of *Podosphaera xanthii* worldwide.
- At least three of these races are found in the U.S.

Can the control measures that we use to manage powdery mildew affect the pathogen? Yes!!

- Reduced sensitivity of *Podosphaera xanthii* to some fungicides has already occurred.
 - This insensitivity or resistance to a fungicide results from overuse of a chemistry.

Powdery mildew spores

They may look identical; however, there are subtle differences among them biochemically.



Development of insensitivity (resistance) to a fungicide by a pathogen

- The initial population of a pathogen may contain a very small number of individuals that are insensitive to a fungicide.
- Each use of a particular fungicide will kill a large proportion of the sensitive but not the insensitive individuals.
- As the pathogen population rebuilds after each fungicide use, the proportion of insensitive individuals increases.

Development of a new race of a pathogen

- The initial population of a pathogen may contain a very small number of individuals that can cause disease on a newly developed resistant cultivar.
- Continuous use of the resistant cultivar will shift the pathogen population in favor of individuals that can cause disease on the resistant cultivar, leading to development of a new race of the pathogen.

**How can we minimize the risk of
development of insensitivity
(resistance) to a fungicide by a
pathogen?**

Fungicide resistance management strategies: from the Fungicide Resistance Action Committee (FRAC)

- Do not use a product in isolation. **Mix or alternate an at risk chemistry with an appropriate partner fungicide.**
- Restrict the number of treatments applied per season. Apply only when necessary.
- Maintain manufacturer's recommended dose.
- Avoid eradicant use.
- Integrated disease management.
- Chemical diversity.

Resistance management strategy: Mix or alternate an at risk chemistry with an appropriate partner fungicide.

- What is an at risk chemistry?
 - Generally, any fungicide with a single site mode of action.
- What is an appropriate partner fungicide.
 - A fungicide with a multiple site mode of action.

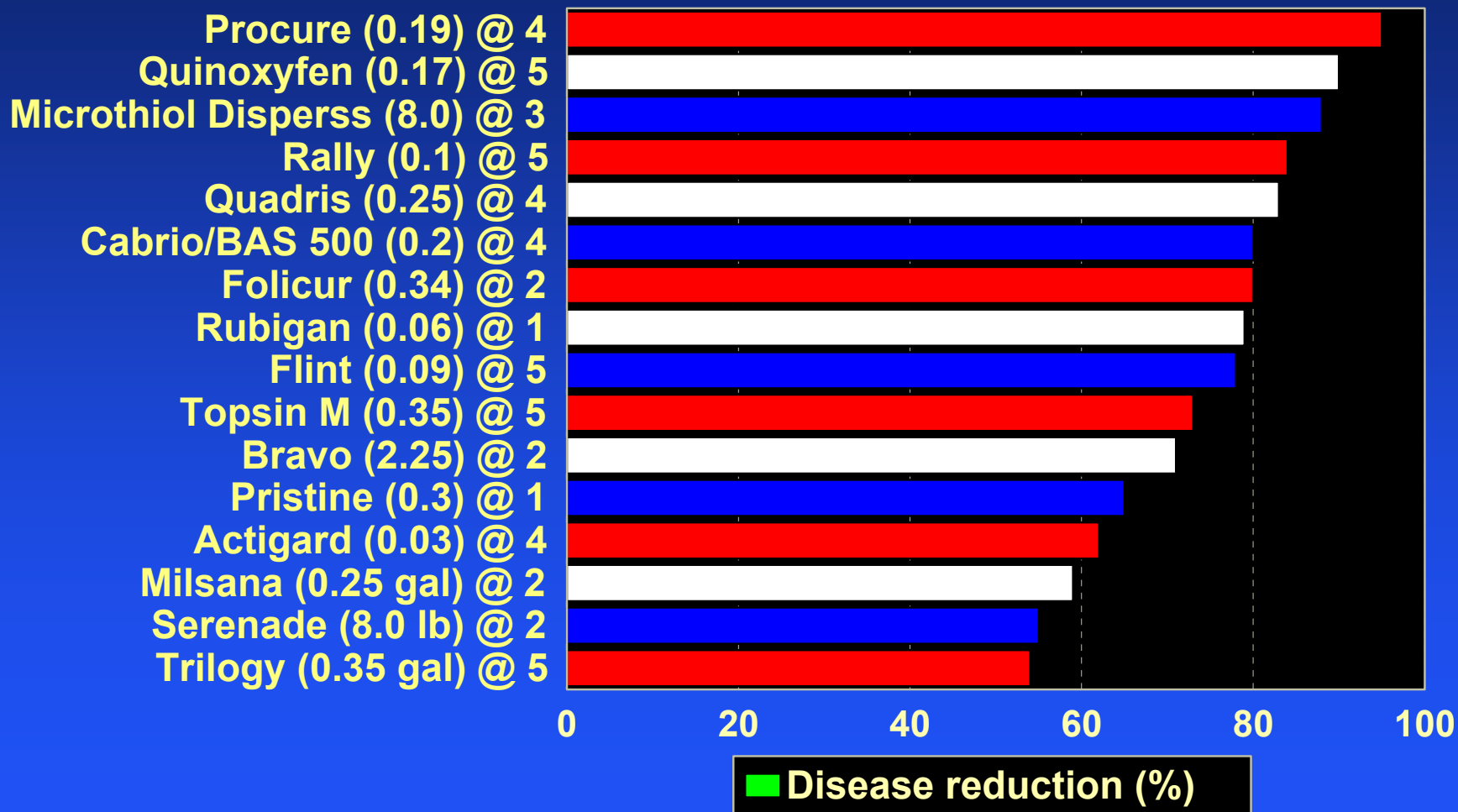
Efficacy of current and potential fungicides for control of powdery mildew on cantaloupe



Cantaloupe powdery mildew

Multiple year data

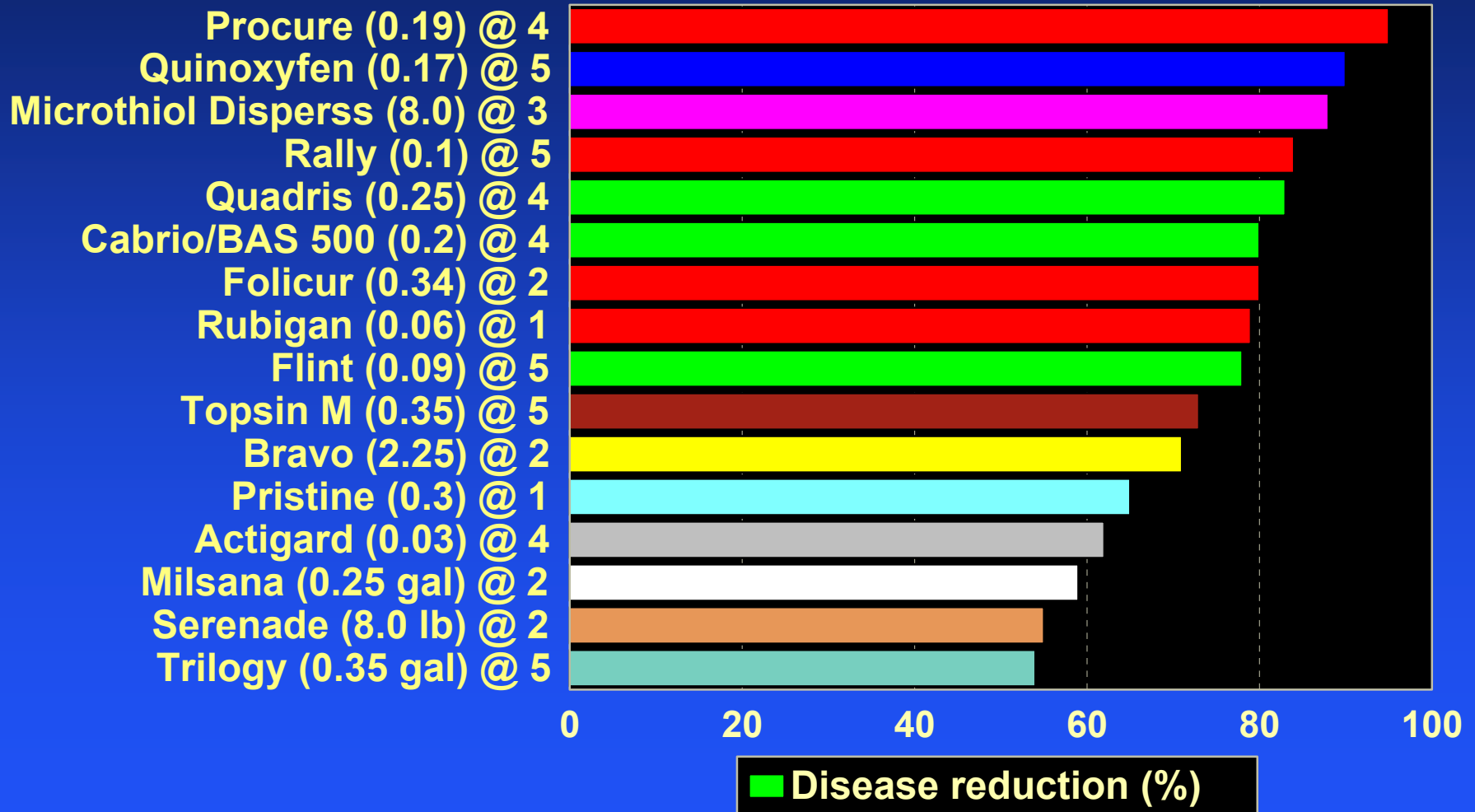
Comparison of individual compounds.



Cantaloupe powdery mildew

Multiple year data

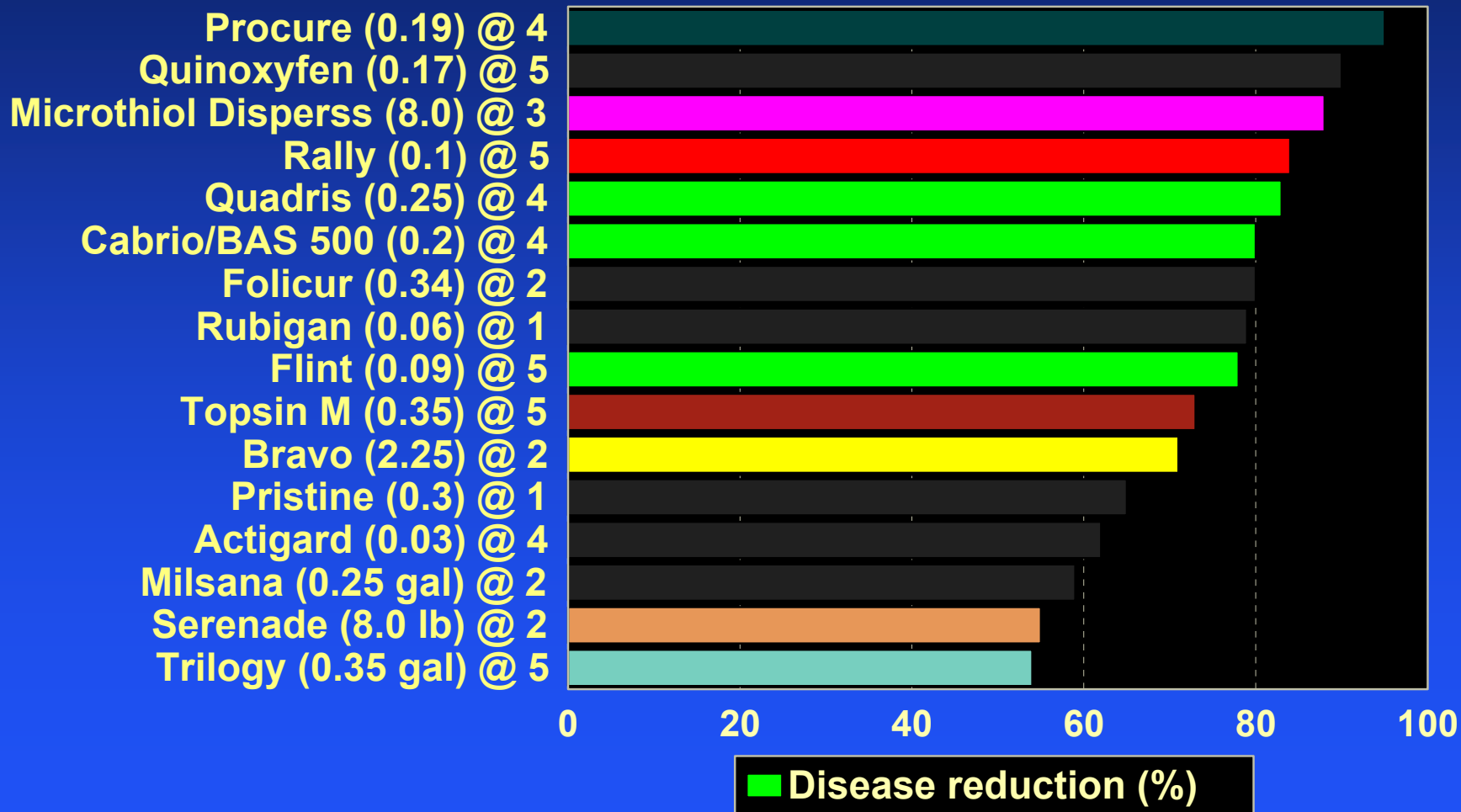
Colors denote different modes of action.



Cantaloupe powdery mildew

Multiple year data

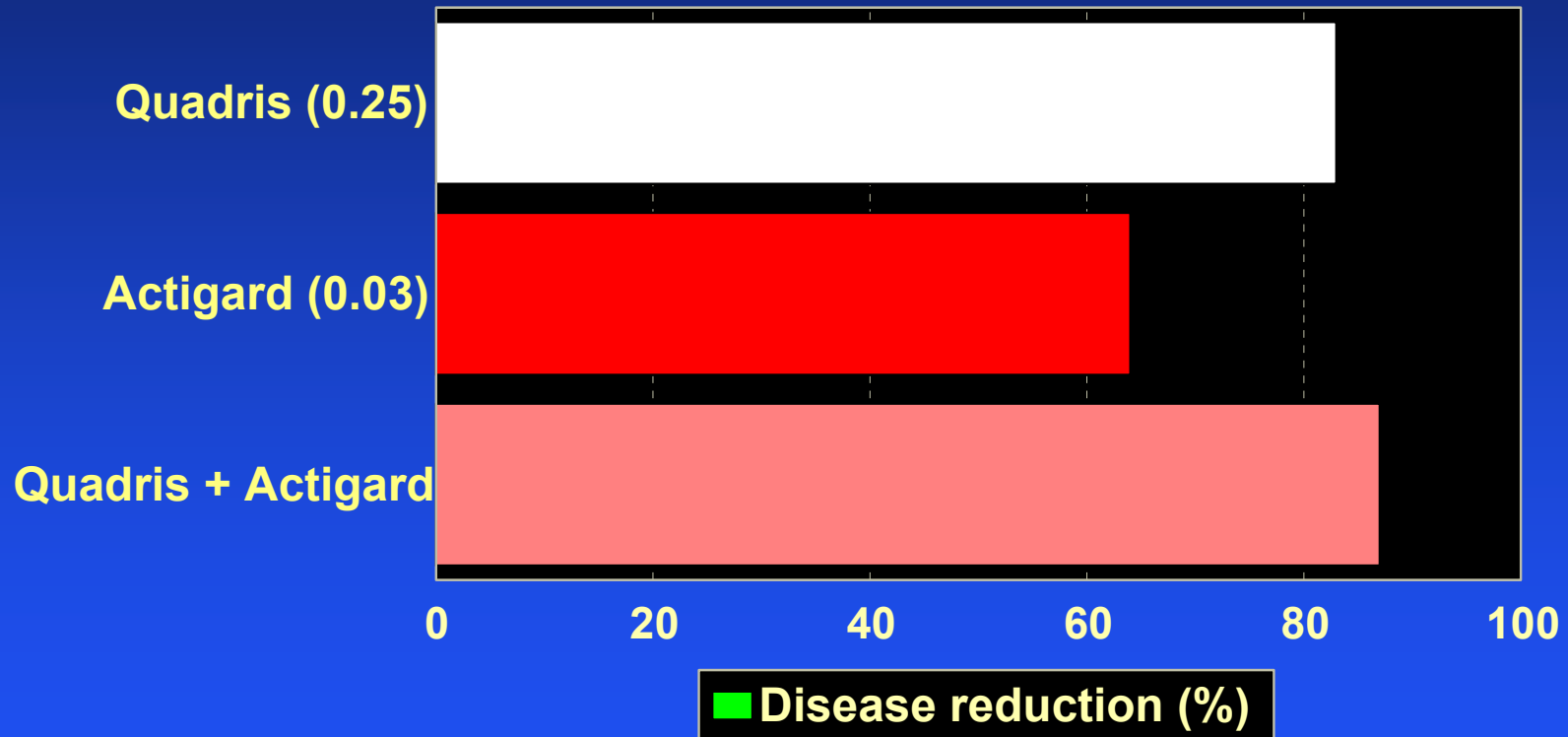
Products available for use on melons in Arizona.



Cantaloupe powdery mildew

Three year comparison

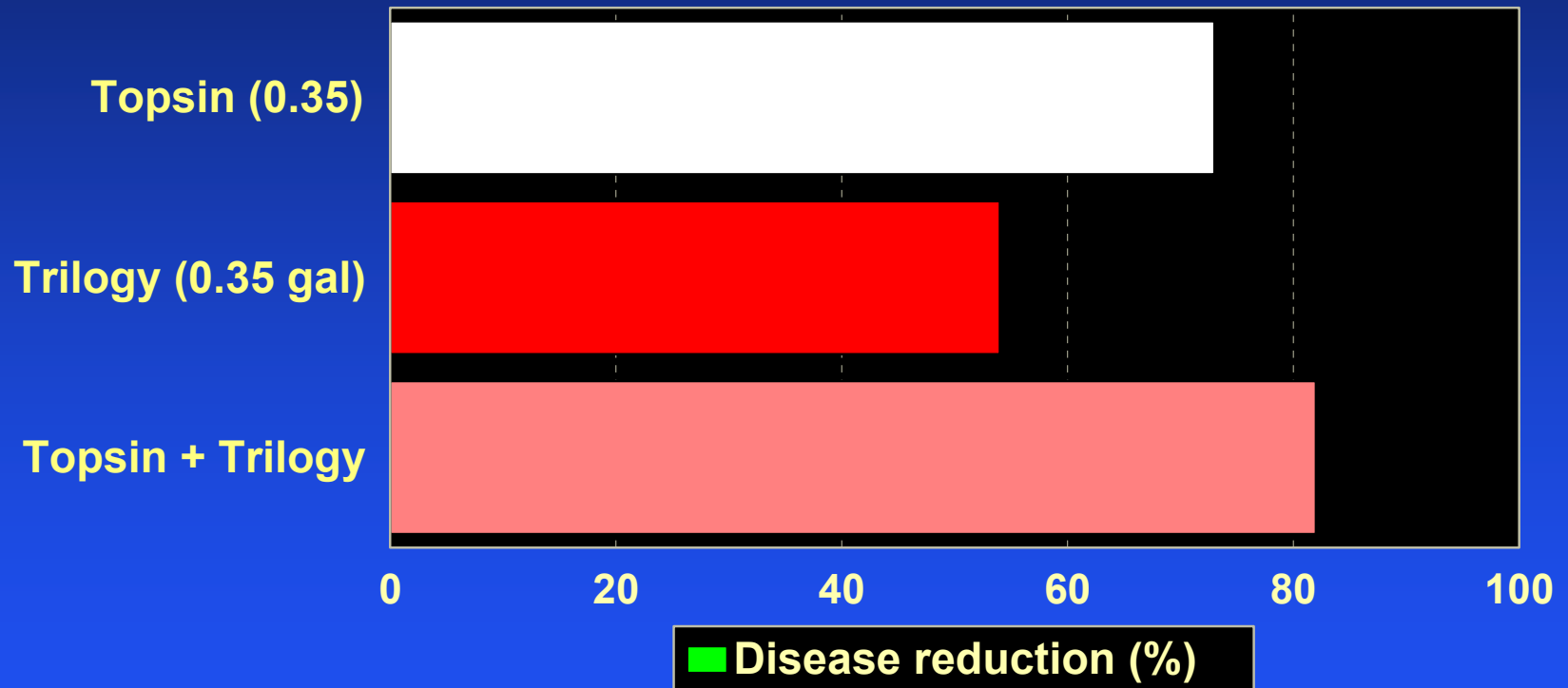
Comparison of mixture to single compound.



Cantaloupe powdery mildew

Five year comparison

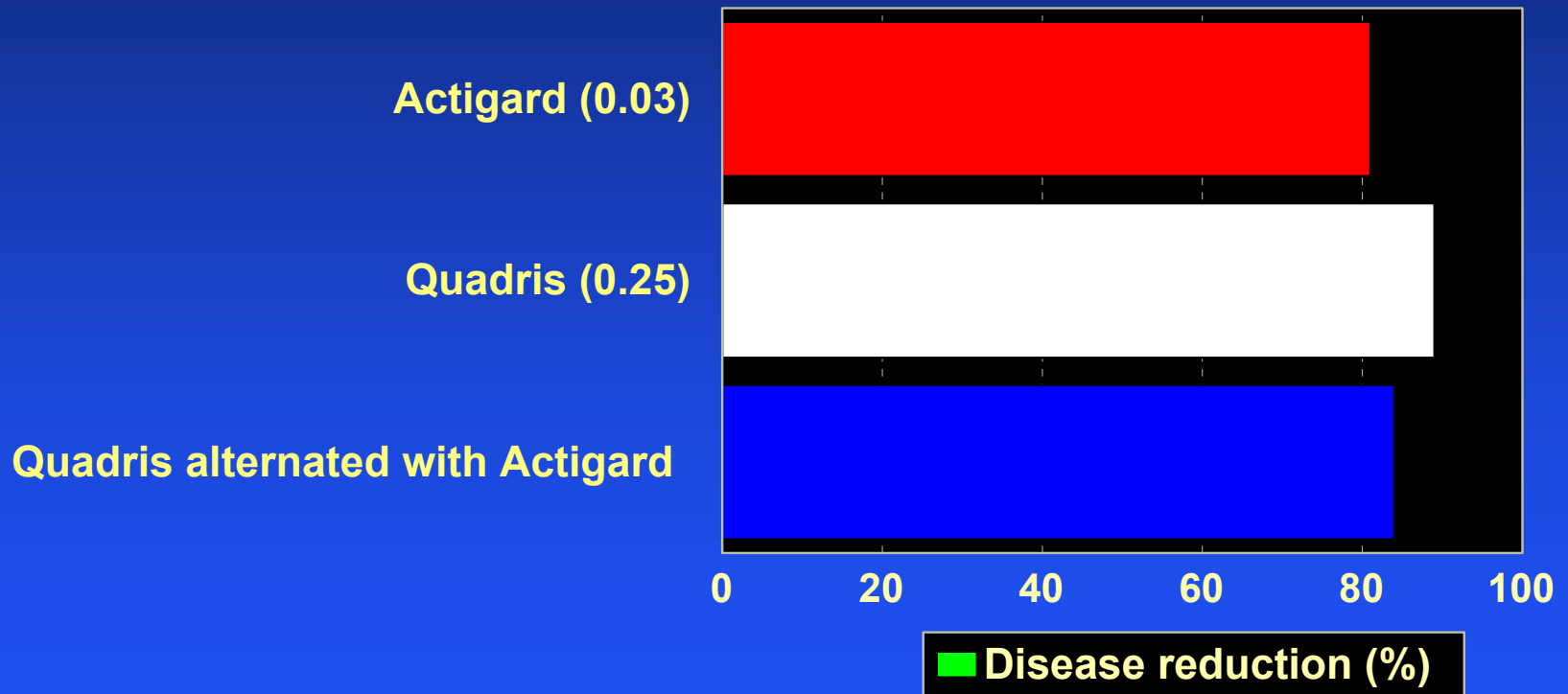
Comparison of mixture to single compound.



Cantaloupe powdery mildew

Two year comparison

Comparison of alternation to single compound.



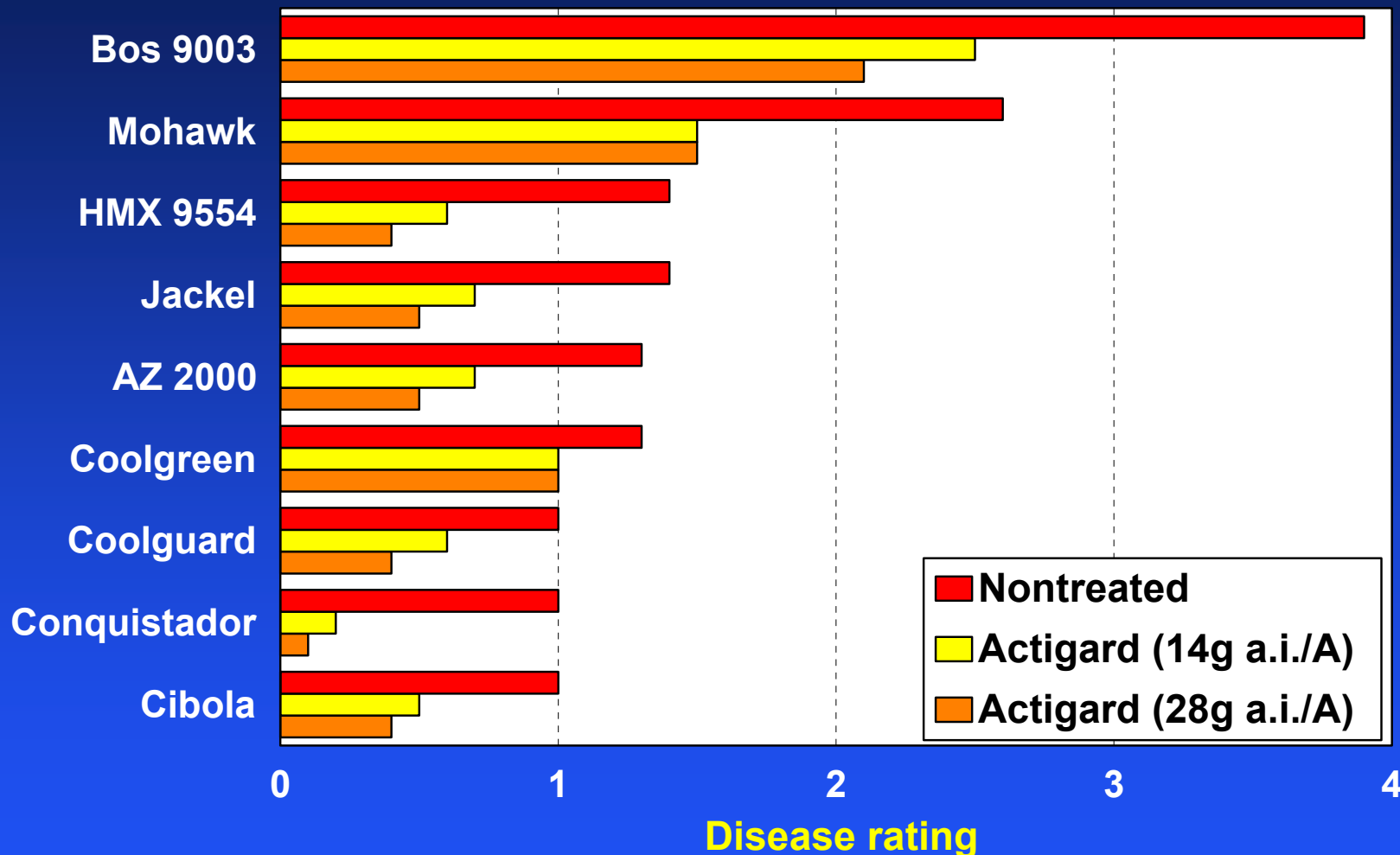
How can we minimize the risk of development of a new race of a pathogen?

- For fungicide resistance management:
Strategy is to mix or alternate an at risk chemistry with an appropriate partner fungicide.
- For pathogen race management:
One strategy is to apply fungicides on a resistant cultivar.

The effect of genetic resistance and application of Actigard on severity of powdery mildew on lettuce.

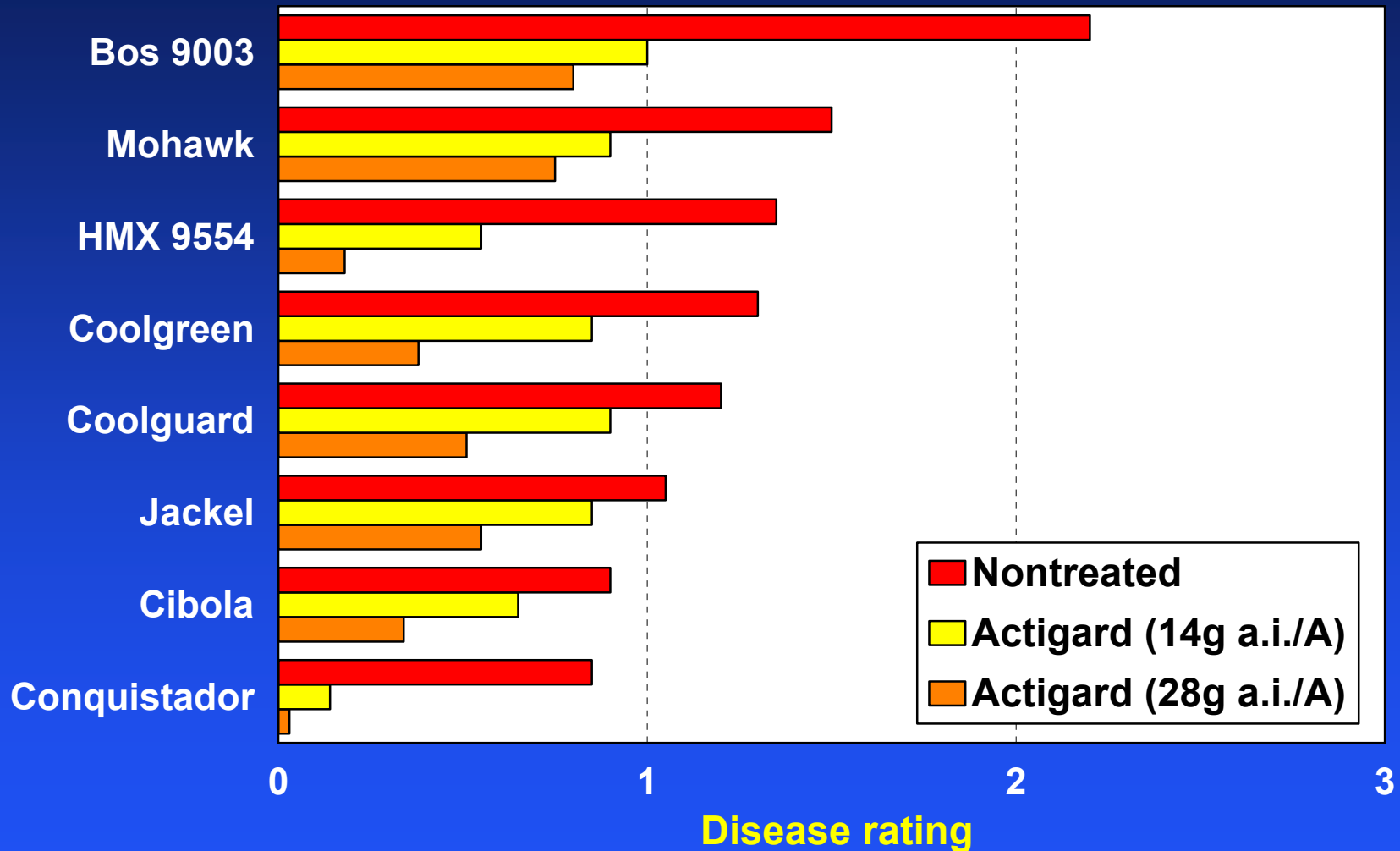


Effect of lettuce cultivar and Actigard on severity of powdery mildew in 2000



Actigard treatments applied Feb 16, Feb 29, Mar 8 and Mar 15, 2000.

Effect of lettuce cultivar and Actigard on severity of powdery mildew in 2001



Actigard treatments applied Feb 1, Feb 15 and Mar 5, 2001.

Conclusions:

Preservation of effective fungicides.

- Some effective fungicides are now available for control of powdery mildew on melons; furthermore, additional chemistries are nearing registration.
- To preserve the efficacy of these compounds, it is essential to use fungicide application programs incorporating mixtures or alternations of products with different modes of action.

Conclusions:

Preservation of resistant cultivars.

- Use host genetic resistance along with mixing or alternation of fungicides with different modes of action.
 - This can lead to enhanced disease control and help preserve the effectiveness of 1) fungicides and 2) genetic resistance as disease management tools.