Lettuce disease management update

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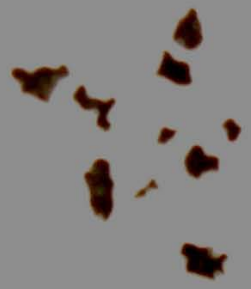
Sclerotinia drop on lettuce

Sclerotinia minor and *Sclerotinia sclerotiorum*

Disease cycle for Sclerotinia drop begins with sclerotia

S. minor

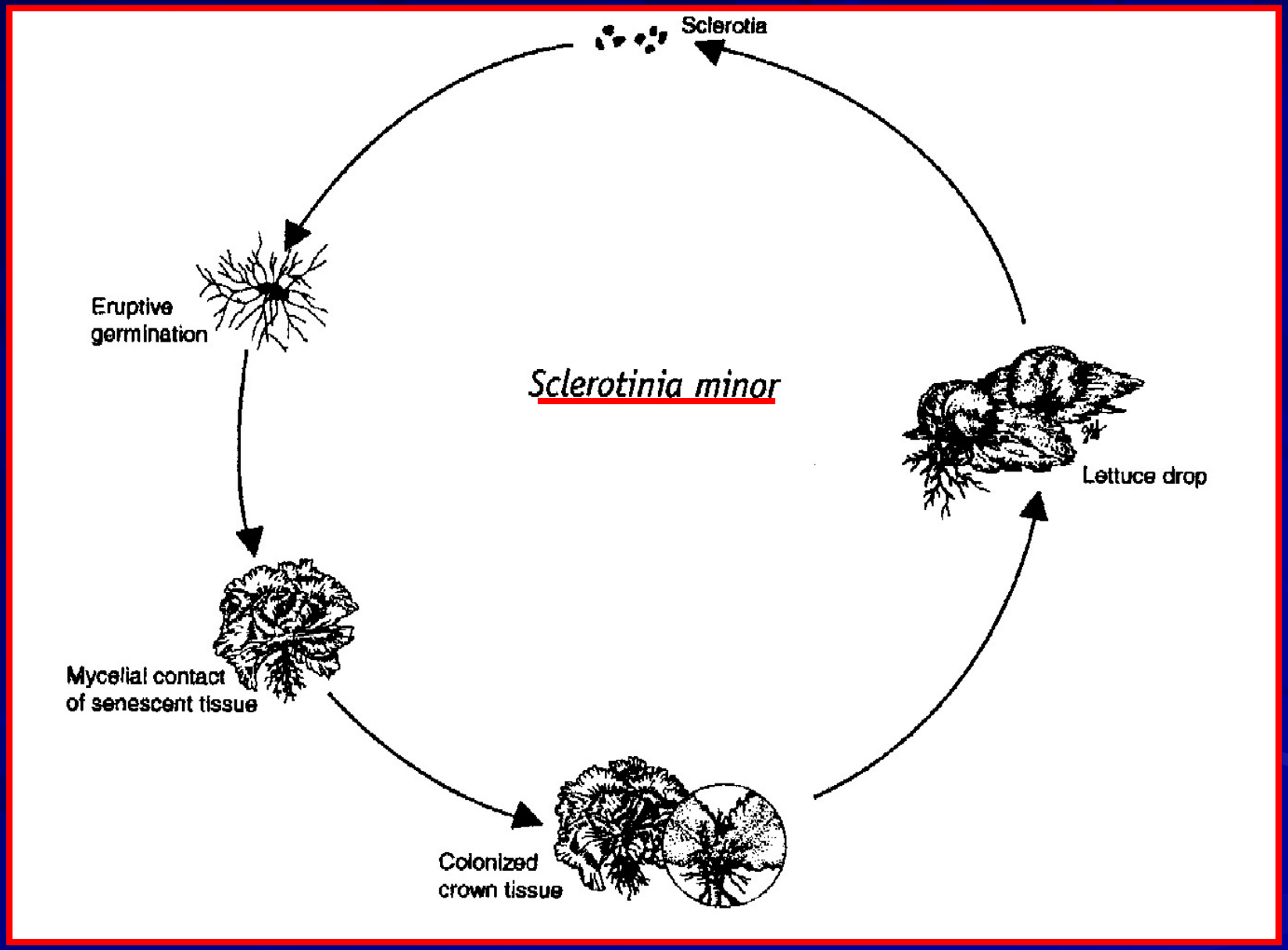


0.5 -2.0 mm long

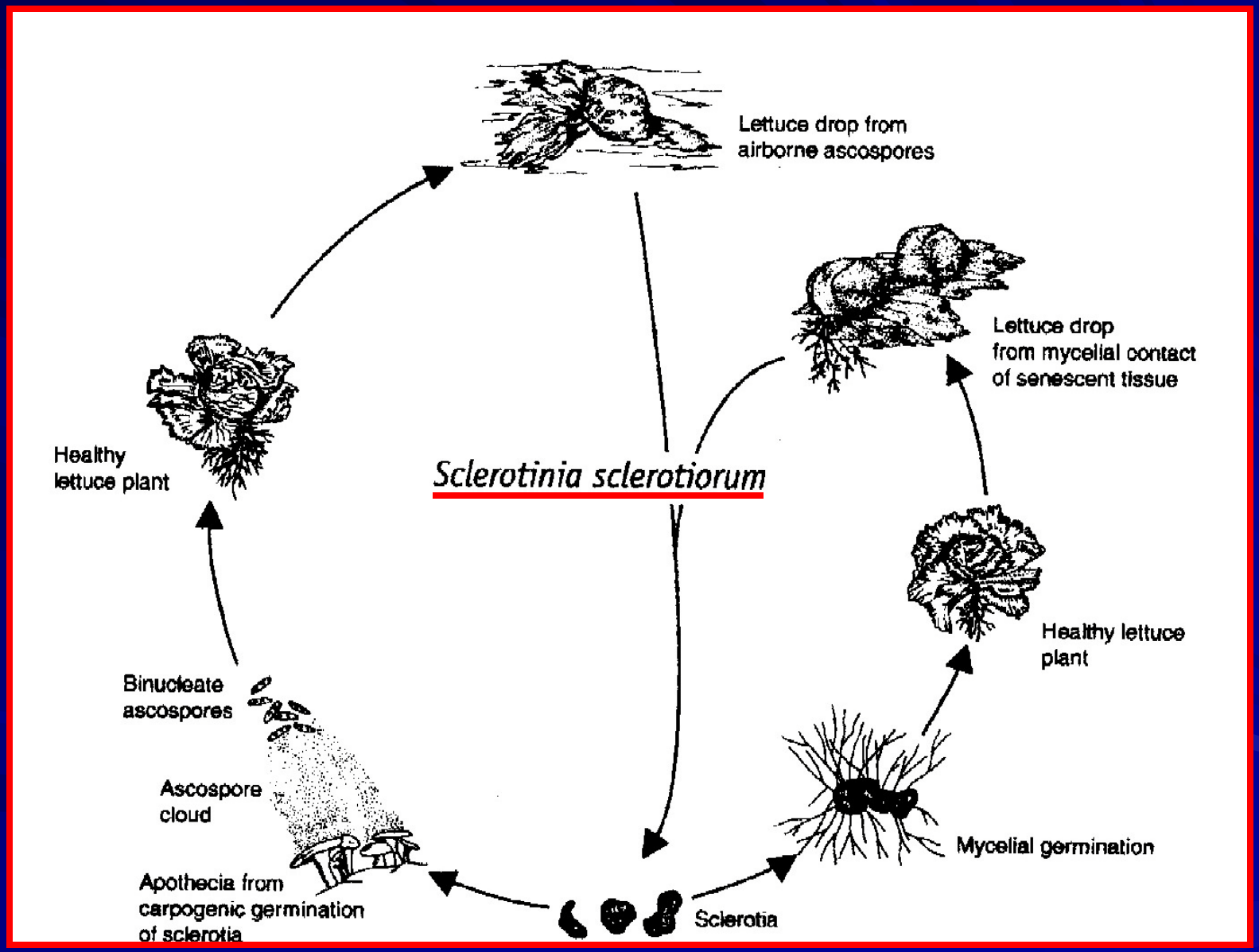
S. sclerotiorum

2.0 to 20.0 mm long

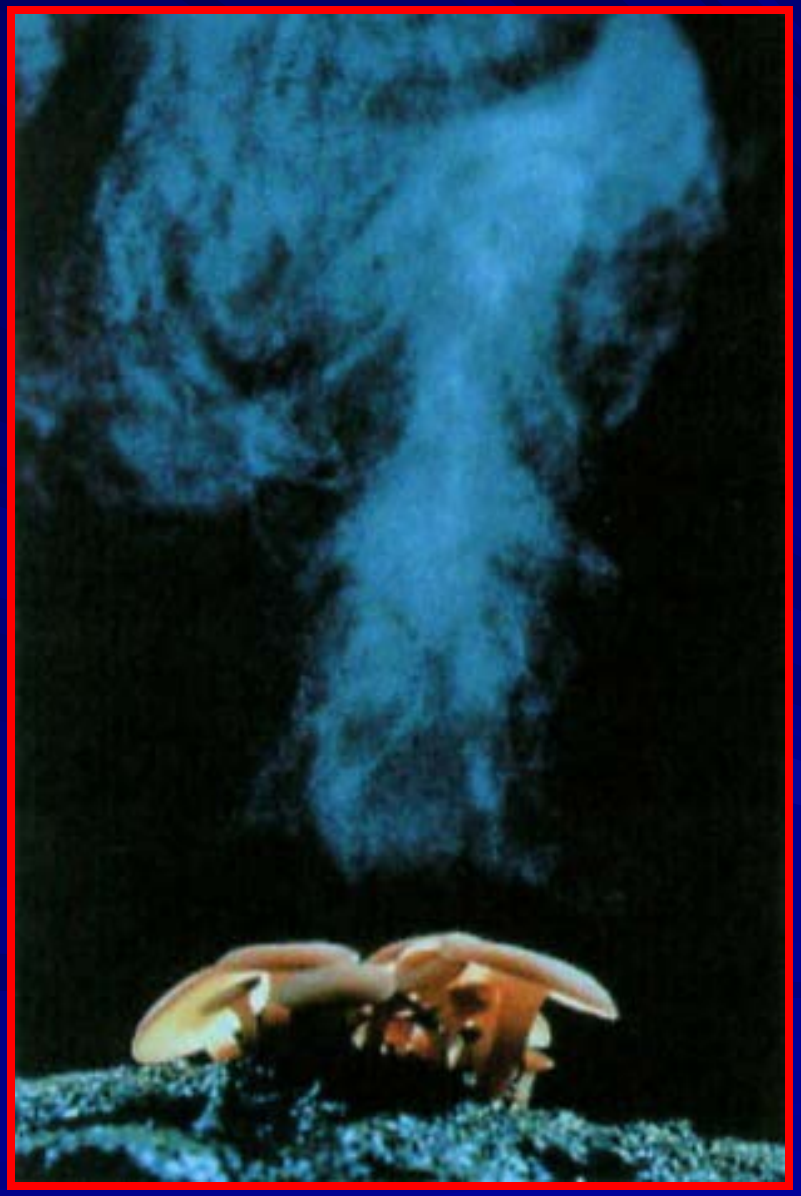
Disease cycle: *Sclerotinia minor*



Disease cycle: *Sclerotinia sclerotiorum*

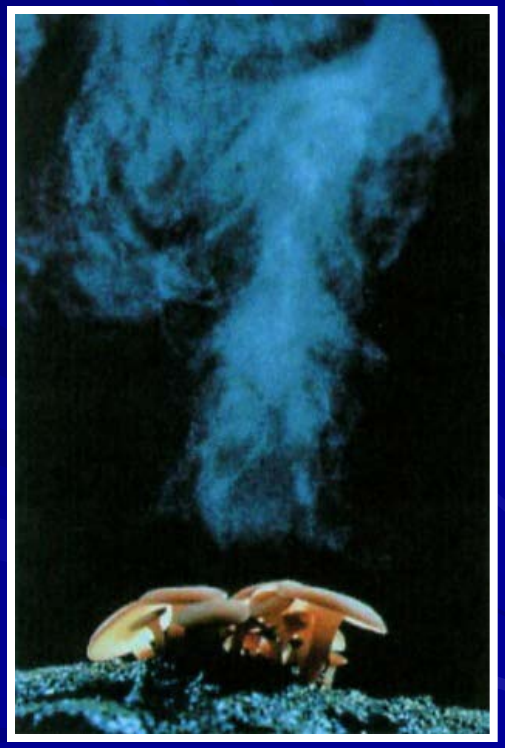


Airborne spores of *S. sclerotiorum*



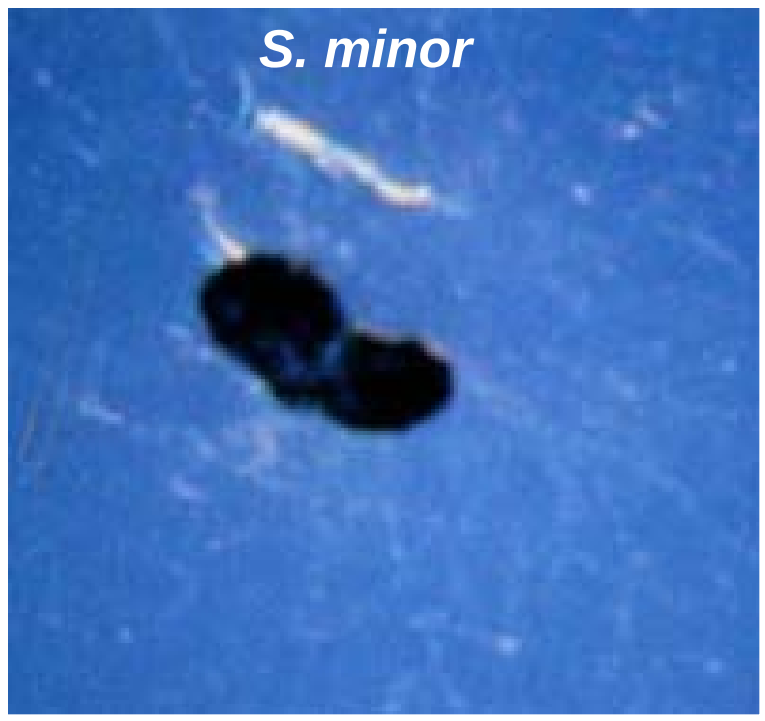
Requirements for airborne spore production by *S. sclerotiorum*

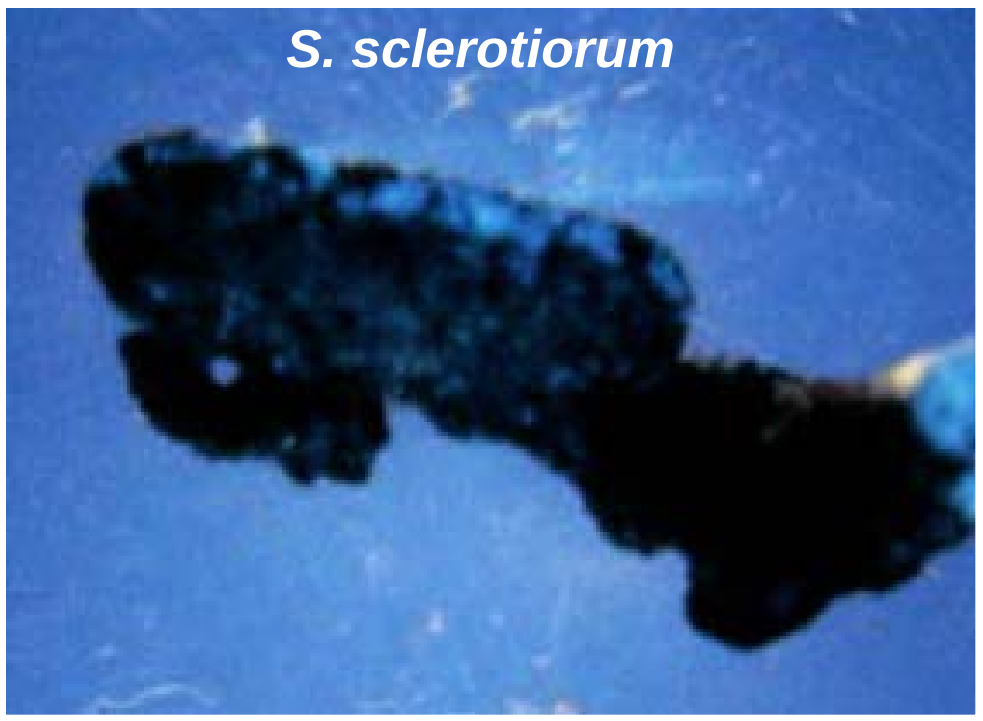
- At least a 2-week period of chilling (40°F) in very wet soil
  - Following this period, temperatures in the range of 48 to 60°F
  - Sclerotia in the top 2 inches of the soil profile are the source of most airborne spores
  - These conditions are not common in the desert southwest



Most Sclerotinia drop on lettuce in Arizona is initiated by direct germination of sclerotia

- Direct germination of sclerotia favored by wet soil at temperatures ranging from 50 to 75°F





More abundant production of sclerotia (10 to 100X) by *S. minor* compared to *S. sclerotiorum*

Summary of differences between *Sclerotinia* species

- Size of sclerotia
- Abundance of sclerotia
- *S. sclerotiorum* can produce airborne spores
  - When this occurs, entire fields can be infected and destroyed

At the end of the crop, sclerotia mixed back into soil to await the next lettuce crop

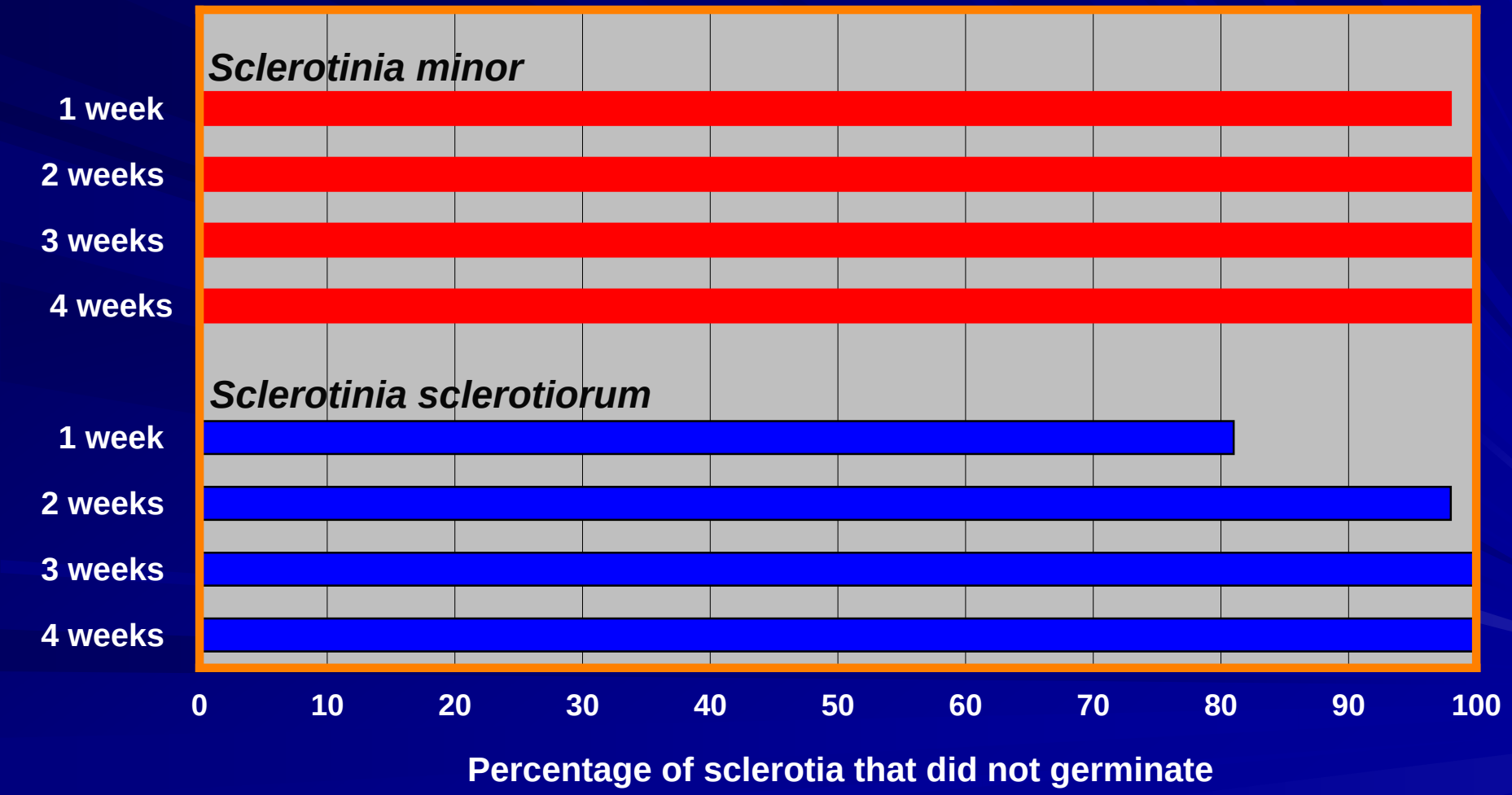
Management of Sclerotinia drop

- The target of disease control efforts are the sclerotia
- Sclerotia allow the pathogens to carry over in soil from one lettuce crop to another
- Disease management tools
  - Cultural
  - Biological
  - Chemical

Cultural disease management tools

- Do nothing
  - Population of sclerotia will decline over time
- Soil solarization
  - Sclerotia in nonsolarized furrows will not be affected
- Summer soil flooding for 3-4 weeks

Effect of summer soil flooding on viability of sclerotia



Management of Sclerotinia drop with biofungicides

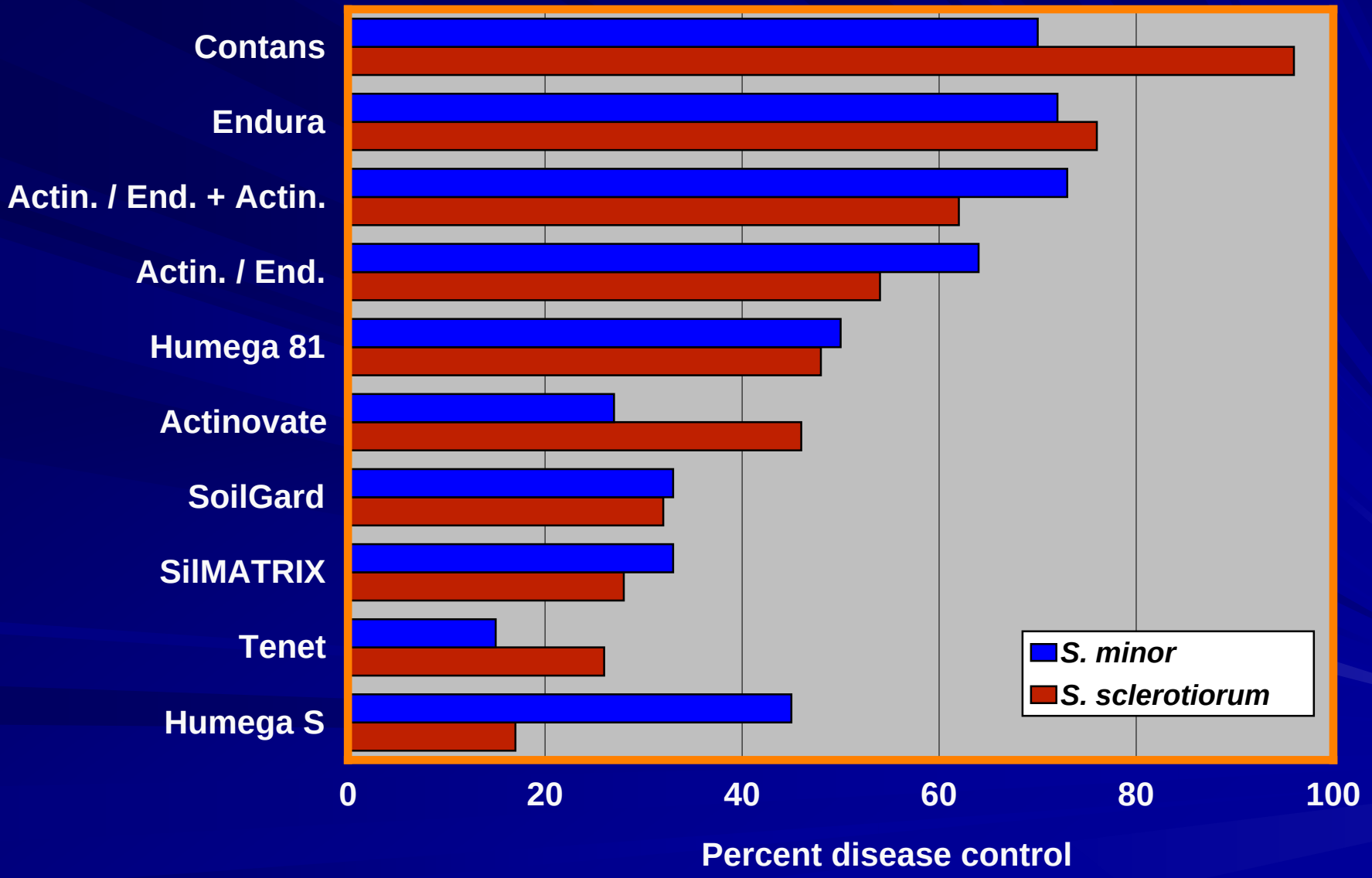
Evaluating efficacy

Biofungicides evaluated in 2010 trial

Product	Active ingredient	Source	Applications
Actinovate	*Streptomyces lydicus*	Natural Industries	At seeding, after thinning
Contans	*Coniothyrium minitans*	SipcamAdvan	At seeding, after thinning
Endura	Boscalid	BASF	At seeding, after thinning
Humega 81 Humega S	*Bacillus amyloliquefaciens* *B. amyloliquefaciens, B. megaterium, B. subtilis*	BioFlora	At seeding, +14 and 28 days
Sil-Matrix	Potassium silicate	Certis USA	At seeding, +6 times
SoilGard	*Gliocladium virens*	Certis USA	At seeding, after thinning
Tenet	*Trichoderma asperellum* *T. gamsii*	SipcamAdvan	At seeding, after thinning

Percent lettuce drop control

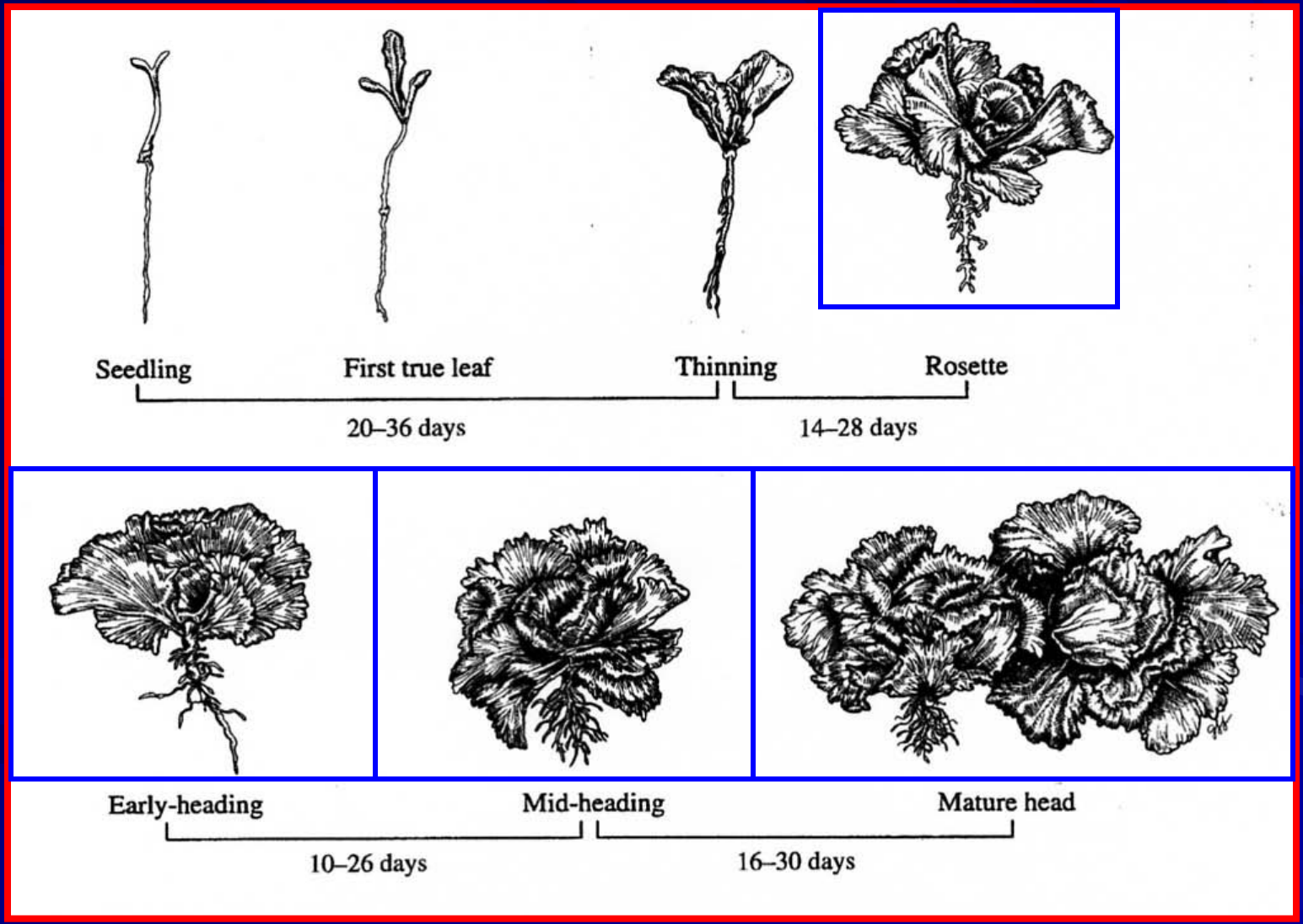
2010 biofungicide trial



Management of Sclerotinia drop with conventional chemistries

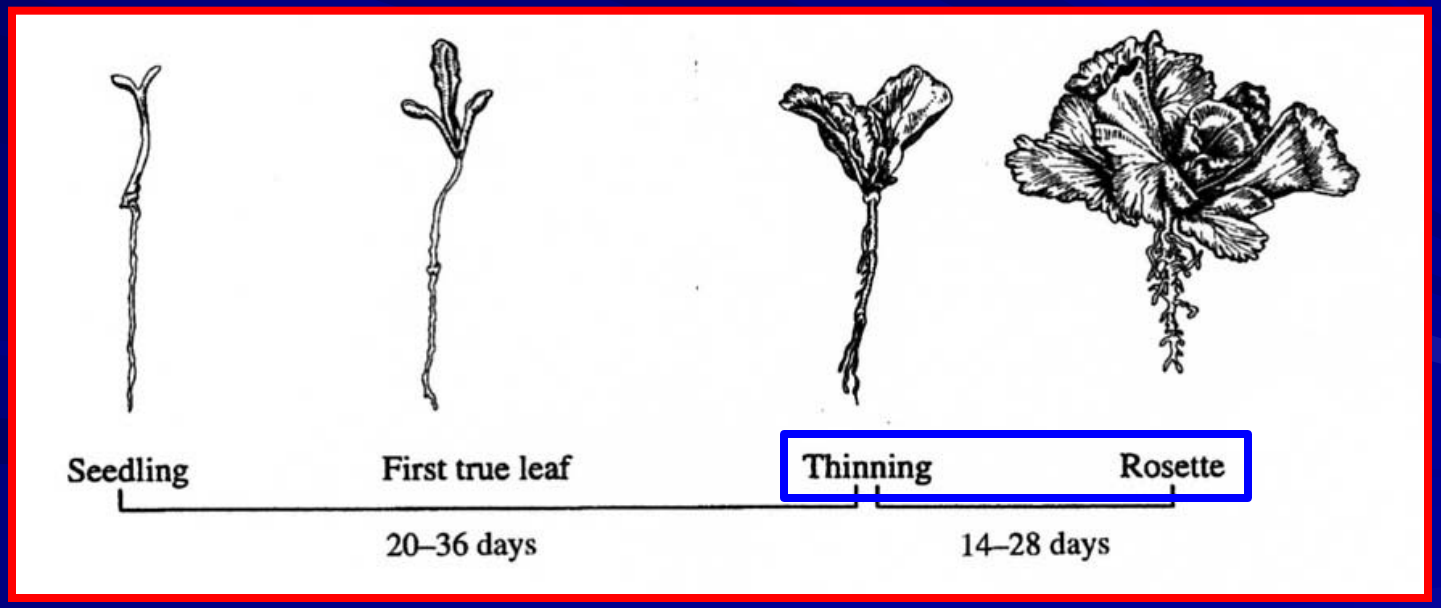
Evaluating efficacy

Typical growth stages of crisphead lettuce and occurrence of Sclerotinia drop

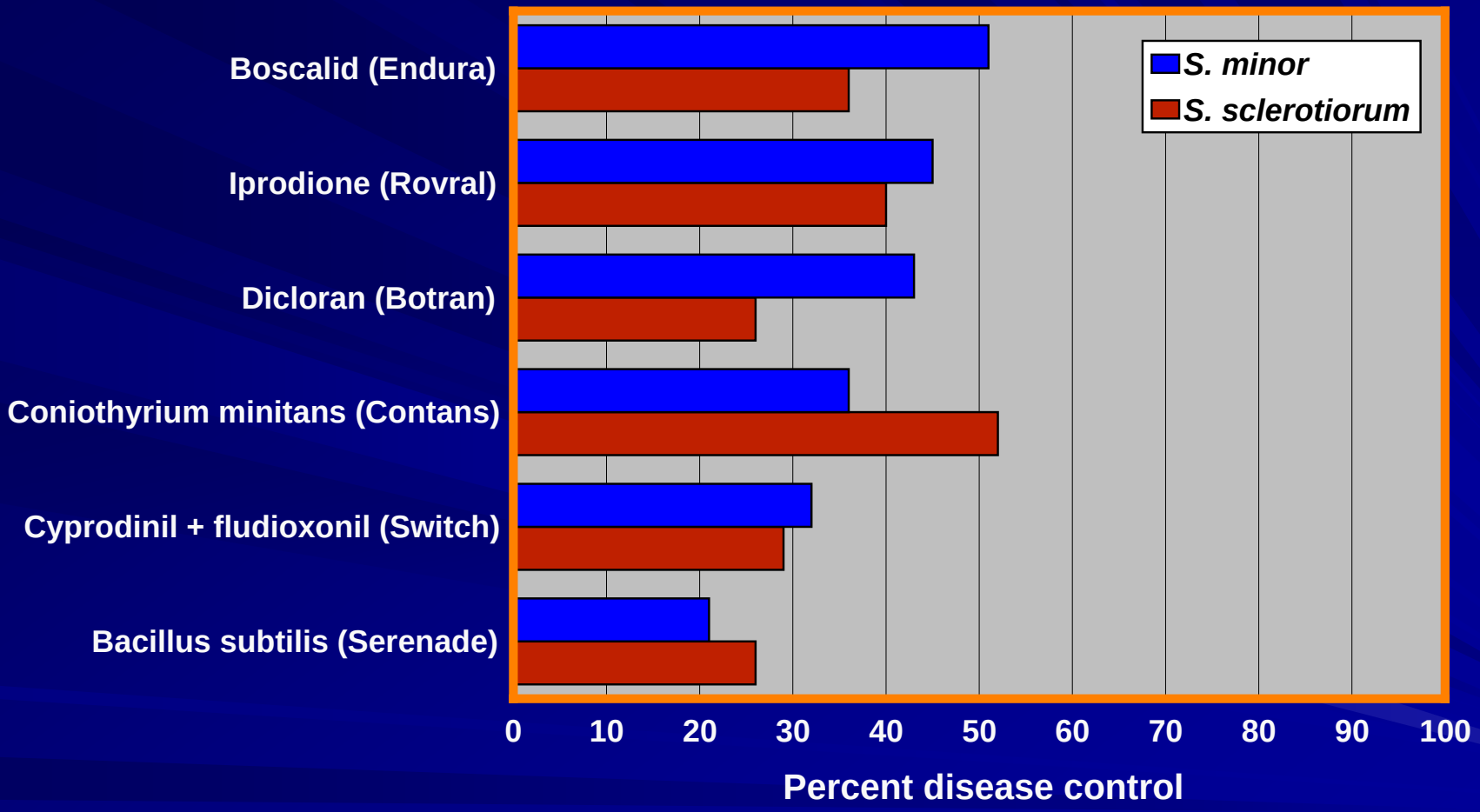


Chemical disease management

- Traditional application timing: Applied to bed and base of plants to prevent germination of sclerotia at or near soil surface
  - Immediately after thinning and cultivation
  - At rosette stage (2-3 weeks after thinning)



Relative efficacy of products for management of lettuce drop caused by each species of *Sclerotinia*



Each value is the mean from 4 trials, with 2 applications of each product per trial

Field trial protocol 2009-10 field trial
Evaluation of new chemistries

- Lettuce seeded on raised beds in double rows, 12 inches apart
- At thinning, sclerotia produced in the laboratory were spread on the surface of each 25-ft-long plot between the rows of lettuce seed and mixed into the top 2-inches of soil
  - 2100 sclerotia of *S. minor*, 800 of *S. sclerotiorum* per plot
  - Five replicate plots per treatment

Field trial protocol (continued)

- First application of products after thinning
- Field irrigated by sprinkler irrigation to germinate seed, then furrow irrigated for remainder of trial
- Usually one subsequent application of products 2 to 3 weeks after thinning
- At crop maturity, the number of dead plants per plot due to *Sclerotinia* infection was recorded

Products tested in 2009-10 lettuce drop trial

Trade name	Active ingredient	Source	FRAC #
Botran	dicloran	Gowan	14
Cannonball	fludioxonil	Syngenta	12
Endura	boscalid	BASF	7
LEM 17	penthiopyrad	DuPont	7
Luna Privilege	fluopyram	Bayer	7
Omega	fluazinam	Syngenta	29
Pristine	pyraclostrobin + boscalid	BASF	11, 7
Rovral	iprodione	Bayer	2
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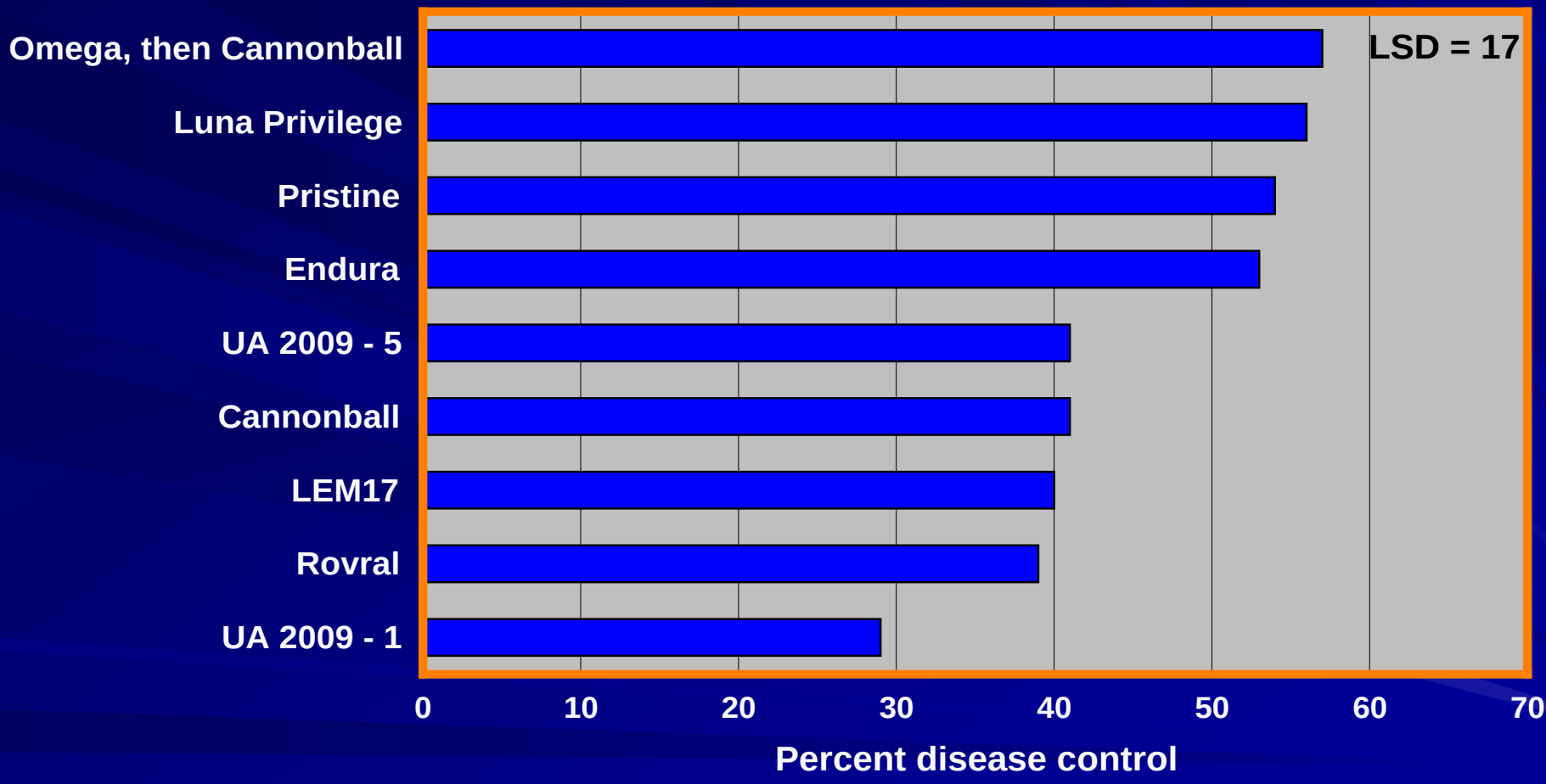
Registered on lettuce			

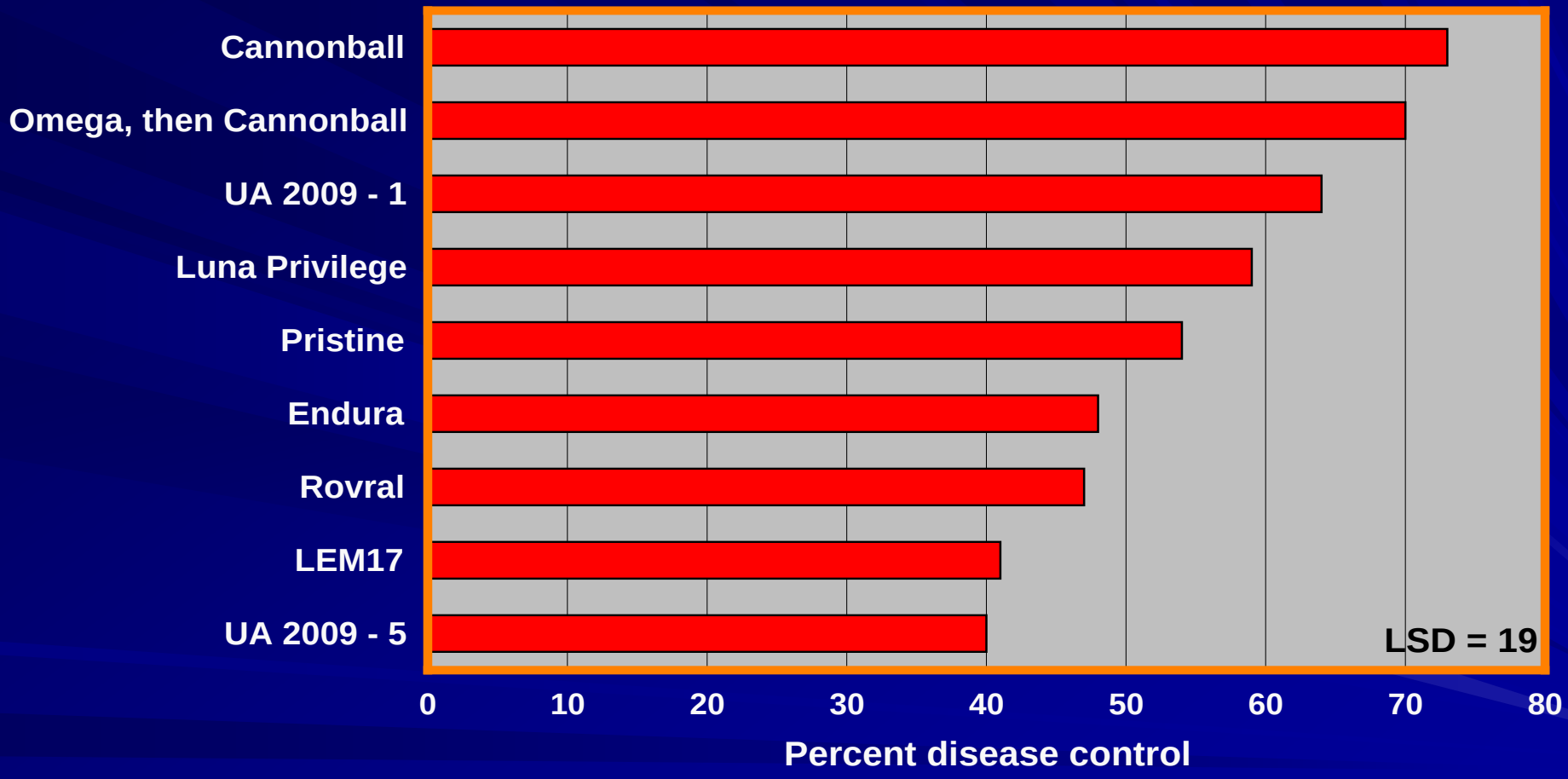
Lettuce drop control: *S. minor*

Two soil surface applications: 2009-10 trial



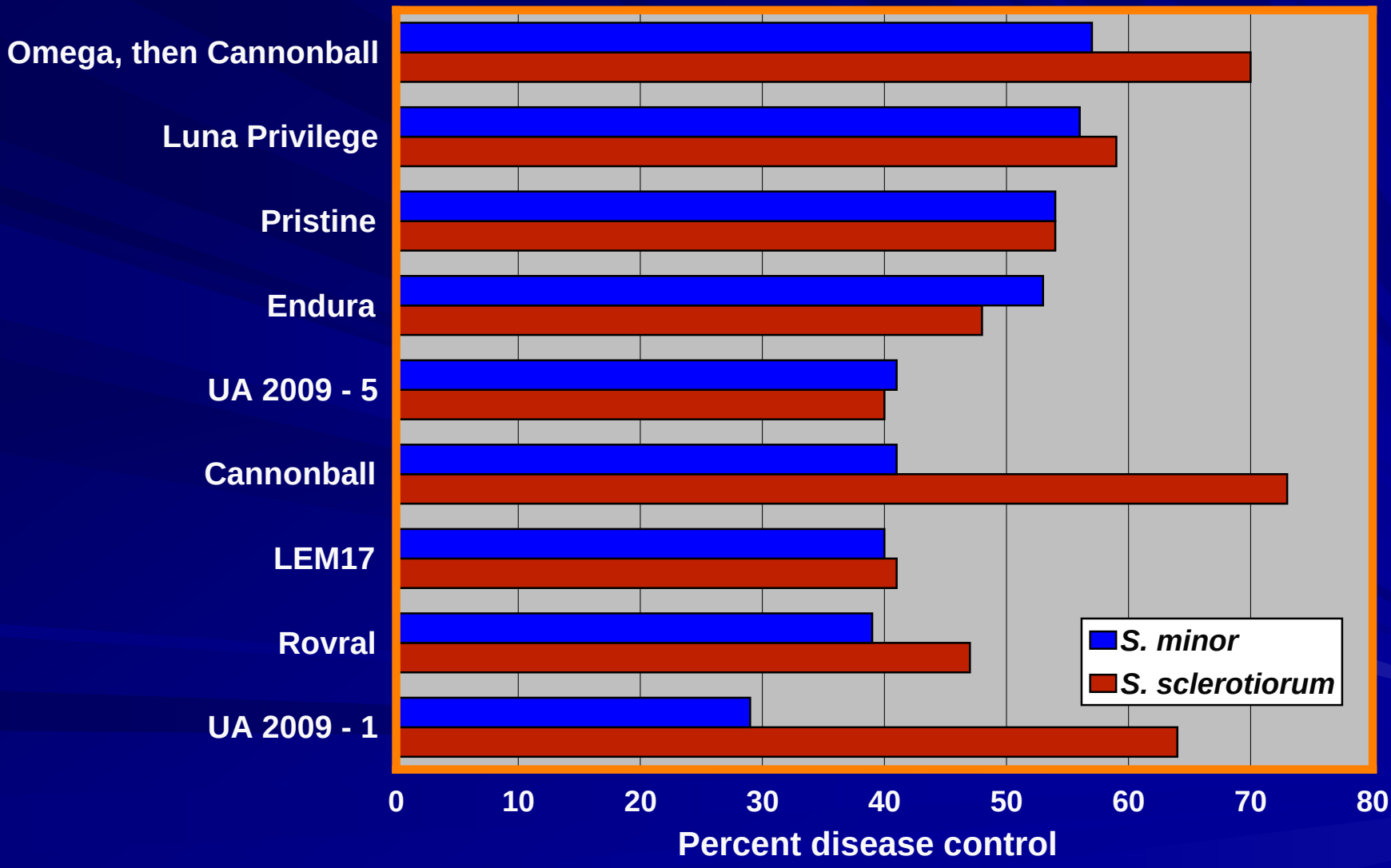
Lettuce drop control: *S. sclerotiorum*

Two soil surface applications: 2009-10 trial



Lettuce drop control: 2009-10 trial

Two soil surface applications

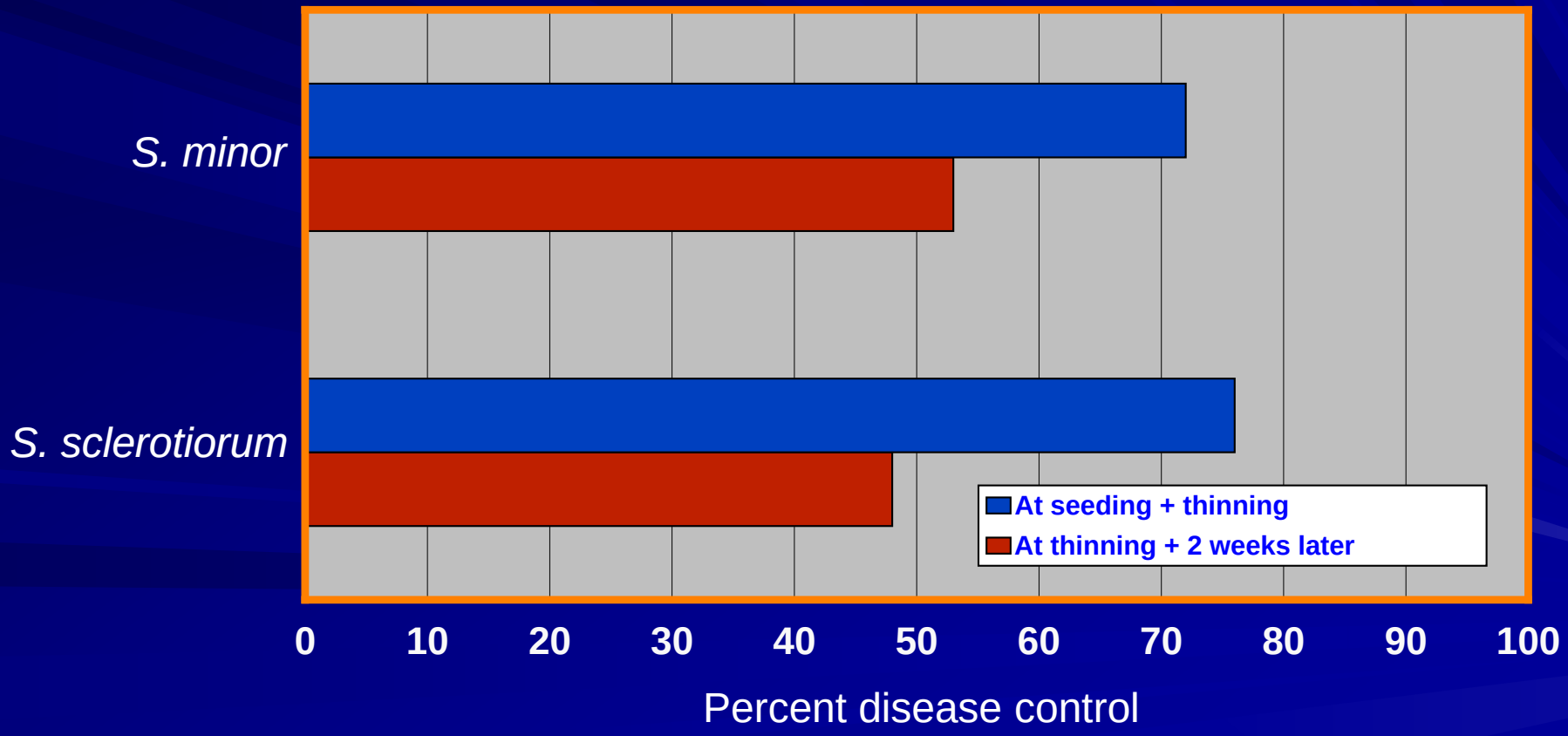


Chemical disease management

- Traditional application: applied to bed and base of plants to prevent germination of sclerotia at or near soil surface
- Alternate application methods: goal is to inactivate sclerotia in the soil profile
  - To bed surface: at seeding, after thinning
  - Physical incorporation into bed

Alternate application methods 2009-10

- Bed surface: compare Endura applications
  - At seeding, after thinning
  - After thinning, 2-3 weeks later

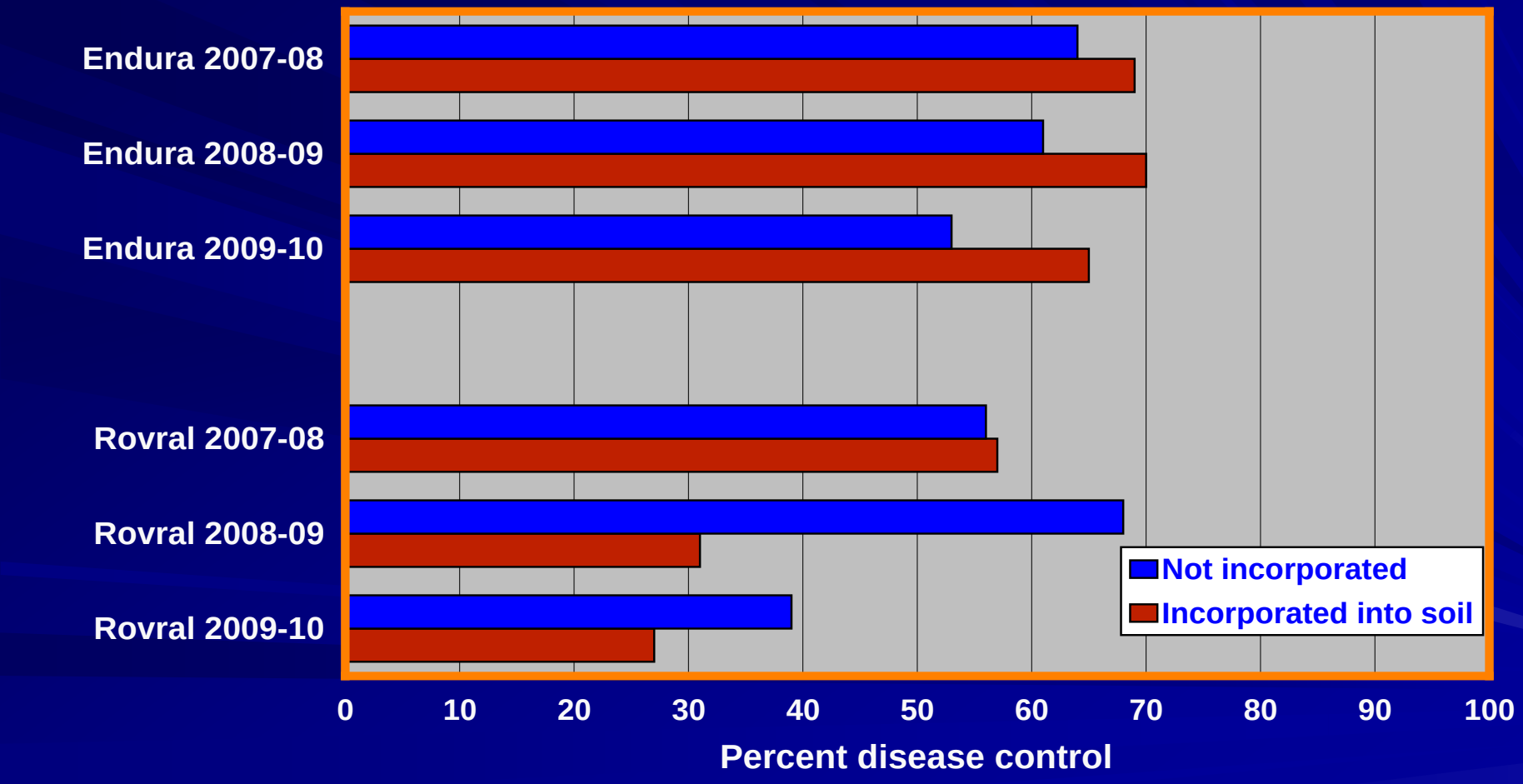


Alternate application methods

- Bed surface application followed by physical incorporation into top 2-inch layer of soil
  - Endura
  - Rovral

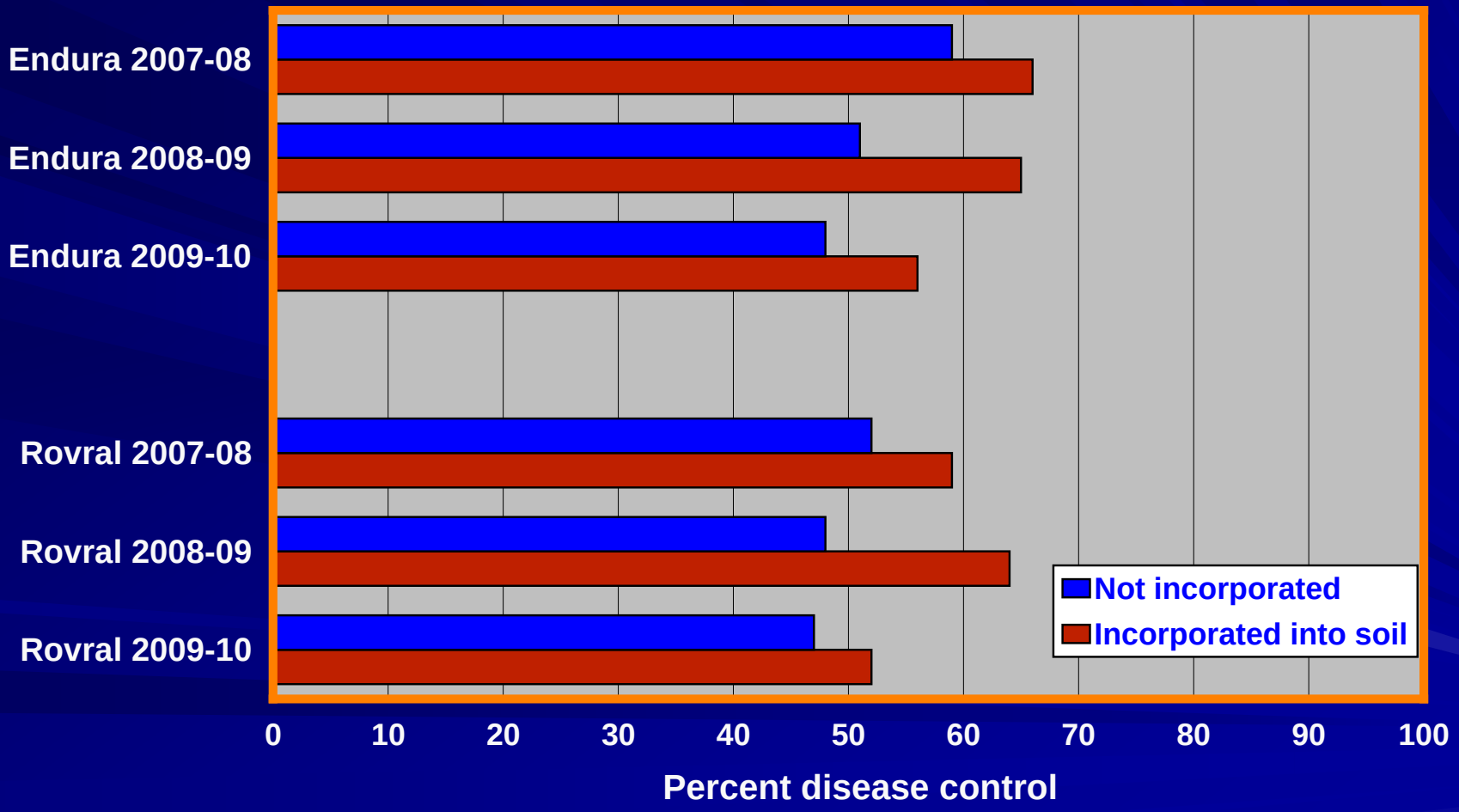
Lettuce drop control: *S. minor*

Two soil surface applications (after thinning, 2 weeks later)
+ or - incorporation



Lettuce drop control: *S. sclerotiorum*

Two soil surface applications (after thinning, 2 weeks later)
+ or - incorporation



Future research

- Continue to examine alternate methods of application with the goal of maximizing control of Sclerotinia drop