

Diseases of Peppers

Phytophthora Crown and Root Rot

Bacterial Spot

TSWV

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Phytophthora capsici

Broad Host Range

- ▶ Tomatoes
- ▶ Peppers
- ▶ Melons
- ▶ Squash
- ▶ Weeds?



Diseases:

- ▶ Post-emergence damping-off
- ▶ Crown and Root Rot
- ▶ Blight (foliar)
- ▶ Fruit Rot

Crown and Root Rot



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Clark

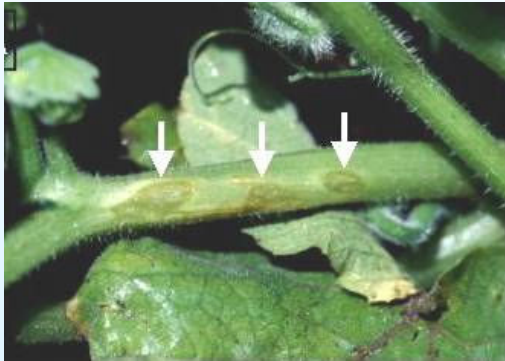


Holmes

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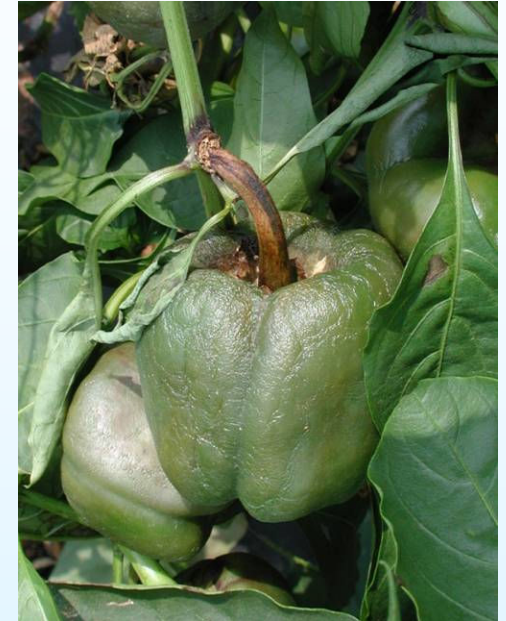
Foliar infections (blight)

Vine blight - pumpkin



- ▶ More of a problem in climates with higher humidity or summer rainfall

Fruit Rots



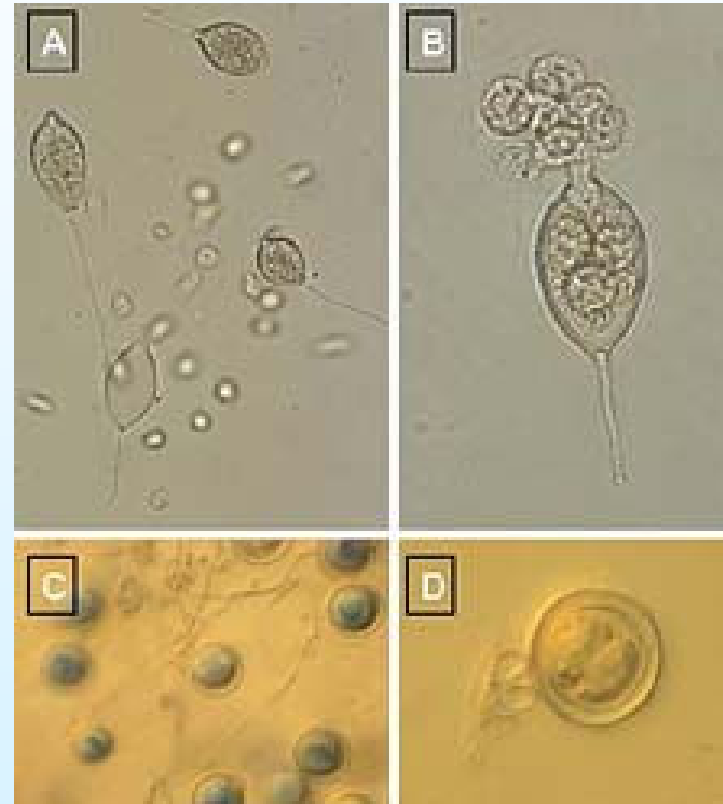
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Disease spread and soil survival

Phytophthora capsici
produces:

- sporangia and motile zoospores
- oospores which survive up to 3 years in field soil



Aggravating conditions

- ▶ Saturated soil (as few as 5 to 6 hours!!)
- ▶ Heavy soils, compacted soils
- ▶ Warm, wet conditions
- ▶ Soil salinity or other plant stress

2008 Field Trial

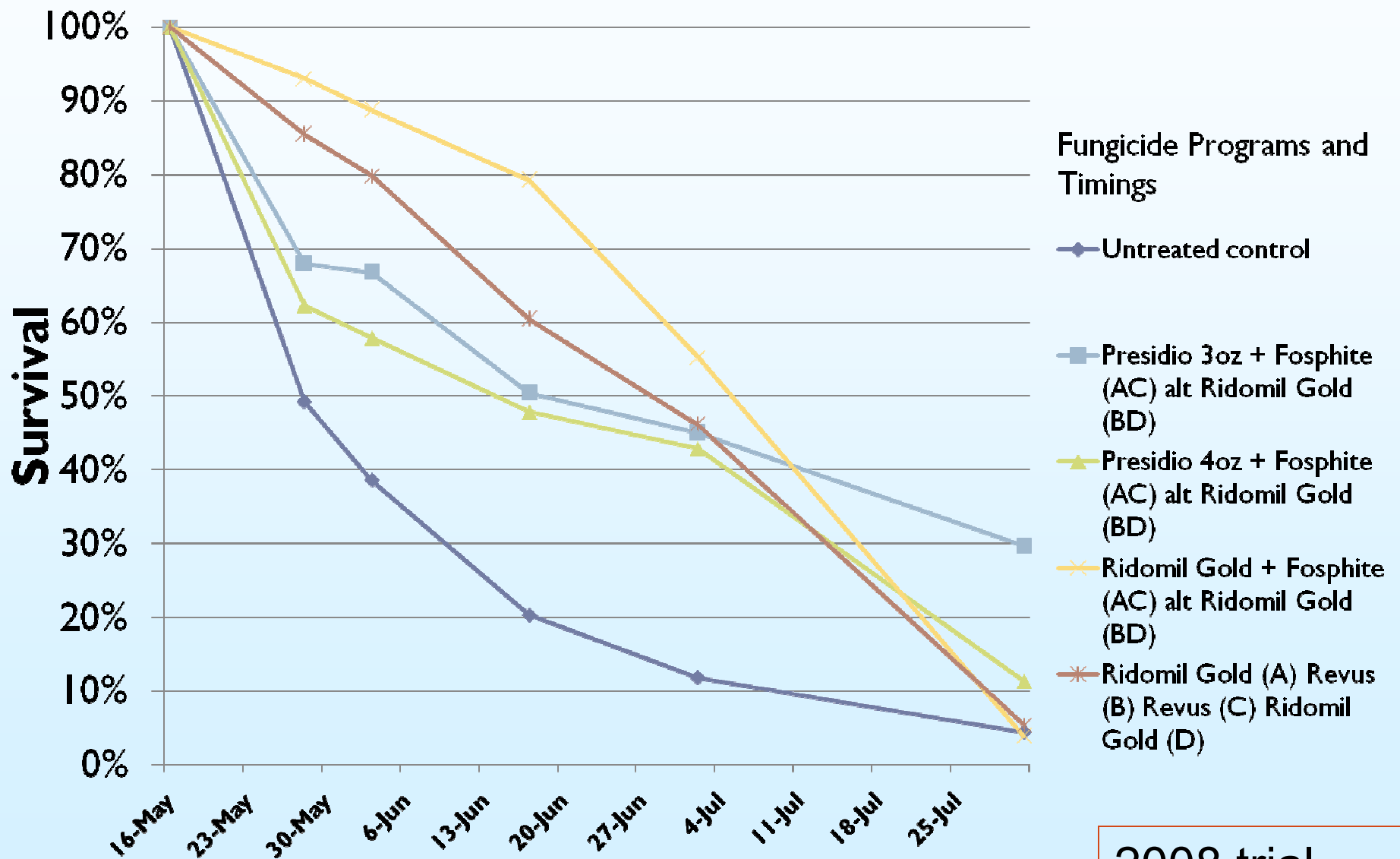
- ▶ UCD Plant Pathology Farm
- ▶ Sweet Bell cv. 'Wizard'
- ▶ Soil inoculated with *Phytophthora capsici*
- ▶ Four fungicides (plus non-treated control) evaluated in replicated design
- ▶ Fungicides applied as a soil drench (450 gallons per acre) at roughly 2-wk intervals (total of four applications)
- ▶ Furrow-irrigated weekly

Fungicide Programs Evaluated in 2008

Fungicide Program	Product(s)	Rate/acre	Active ingredient(s)	Timings
1	untreated control	—	—	—
2	Presidio +	3 oz	fluopicolide	AC
	Fosphite	4 qt	phosphorous acid	AC
	alt. Ridomil Gold	1 pt	mefenoxam	BD
3	Presidio +	4 oz	fluopicolide	AC
	Fosphite	4 qt	phosphorous acid	AC
	alt. Ridomil Gold	1 pt	mefenoxam	BD
4	Ridomil Gold	1 pt	mefenoxam	ABCD
	alt. Fosphite	4 qt	phosphorous acid	AC
5	Ridomil Gold	1 pt	mefenoxam	AD
	alt. Revus ^z	8 oz	mandipropamid	BC

^z Not registered for use on tomatoes California * Ridomil Gold applied at 1 pt per application

Pepper survival in inoculated soil



2008 trial

2009 Field Trial

- ▶ Similar to 2008 trial except:
- ▶ Less Phytophthora inoculum applied to soil
- ▶ Sweet Bell cv. 'Baron'
- ▶ Chemicals (and irrigation) applied via surface drip system
- ▶ Chemicals applied monthly (3 applications total)
- ▶ In addition to chemical control programs, Phytophthora-tolerant pepper cultivars were also evaluated in an adjacent trial

Fungicide Programs Evaluated in 2009

Fungicide Program	Product(s)	Rate/acre	Active ingredient(s)	Timings
1	untreated control	—	—	—
2	Presidio	4 oz	fluopicolide	ABC
3	Ridomil Gold	1 pt	mefenoxam	ABC
4	Fosphite	3 qt	phosphorous acid	ABC
5	BAS651 ^y	13.7 fl oz	?	ABC
6	Ridomil Gold	1 pt	mefenoxam	AC
	alt. Revus ^z	8 oz	mandipropamid	B
7	Forum	6 oz	dimethomorph	ABC

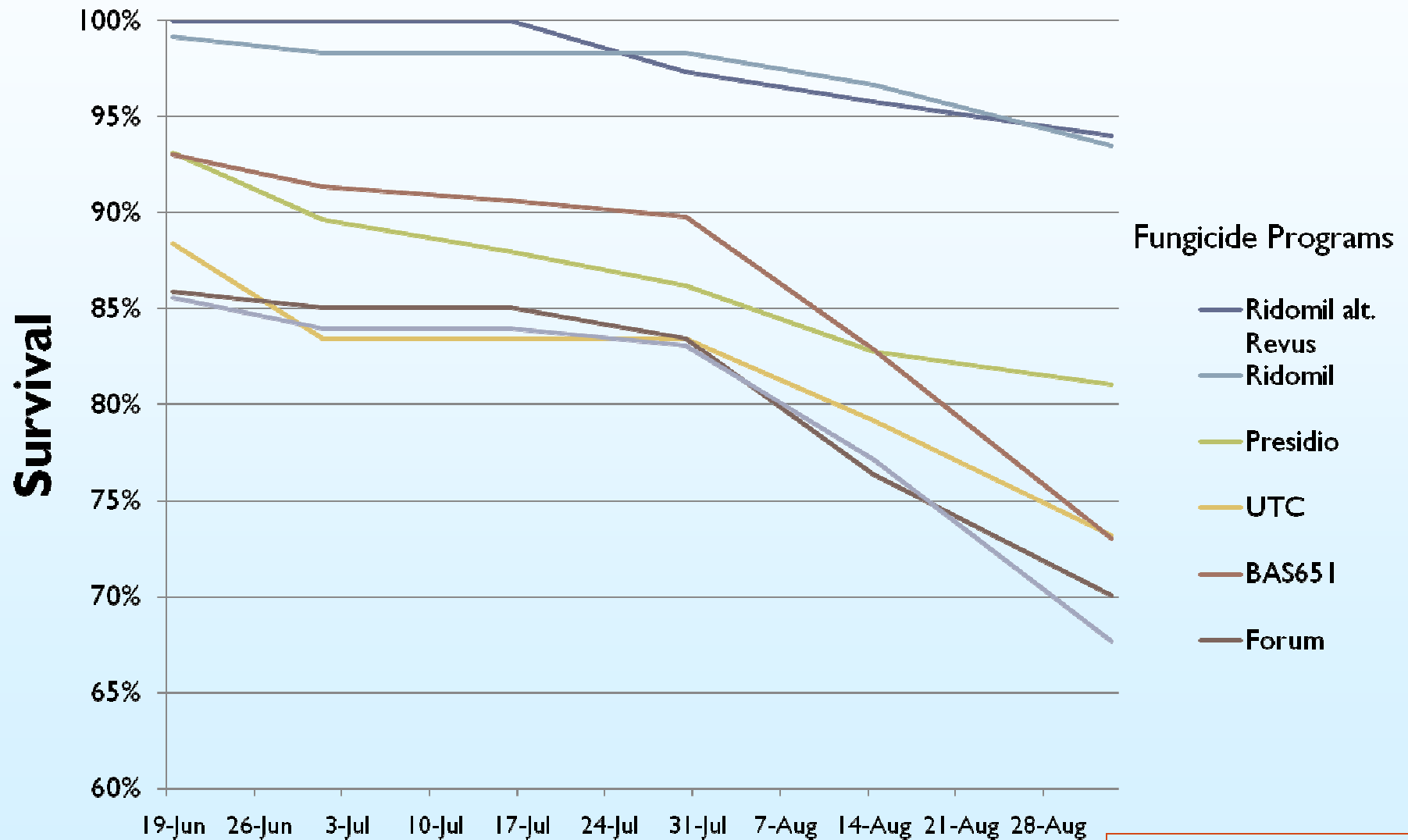
^y Experimental, not registered by US EPA

^z Not registered for use on tomatoes in California

Note: Ridomil Gold applied at 1 pt per application

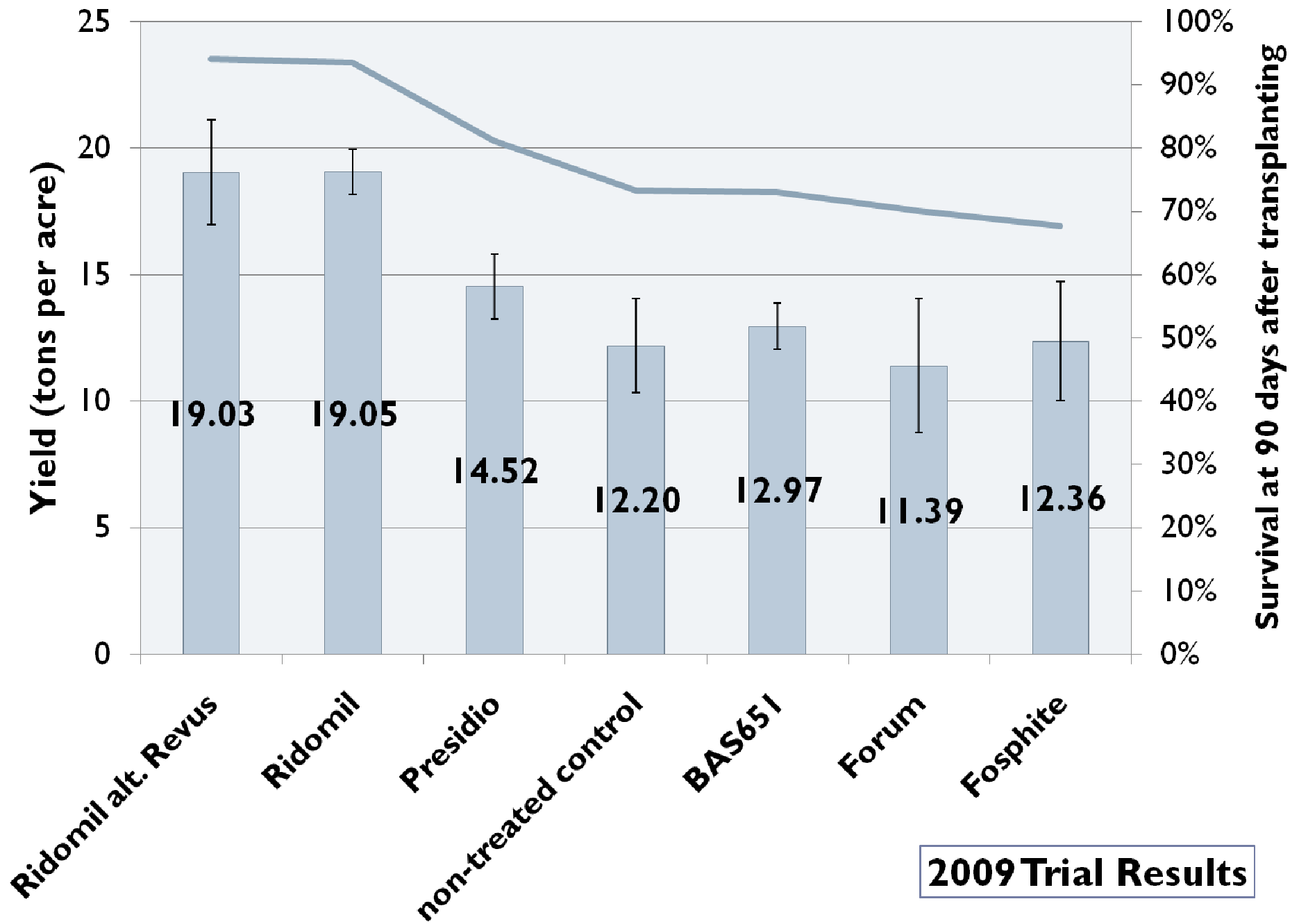


Pepper survival in inoculated soil



Transplanted June 5th

2009 trial



2009 Trial Results

Survival of Phytophthora-tolerant varieties in inoculated soil

Variety/line	Pepper survival at 90 days		Yield (tons/acre)	
	Baron	77.4%	+/- 5.9%	9.74
Prophet	95.0%	+/- 3.3%	15.87	+/- 1.7
Sakata 77824	97.4%	+/- 1.6%	15.15	+/- 1.3
Sakata 77827	100.0%		not harvested	
Sakata 77825	100.0%		12.94	+/- 0.6
Sakata 77826	98.5%	+/- 0.9%	19.16	+/- 0.7

Chemical Control of Phytophthora

Chemical	FRAC group	Products
Metalaxyl/mefenoxam	4	Ridomil, Ridomil Gold, Ridomil Gold Bravo, Ridomil Gold MZ & many others
fluopicolide	43	Presidio
fenamidone	11	Reason (supression only – foliar blight on foliage & fruit)
phosphorous acid materials	33	Various products

Always check labels before making recommendations or applications!

Chemical control of Phytophthora

- ▶ Resistance concerns
- ▶ Metalaxyl/mefenoxam may degrade rapidly in soils with a history of repeated use
- ▶ How to get the materials to where they need to be to prevent infection?

Cultural Control

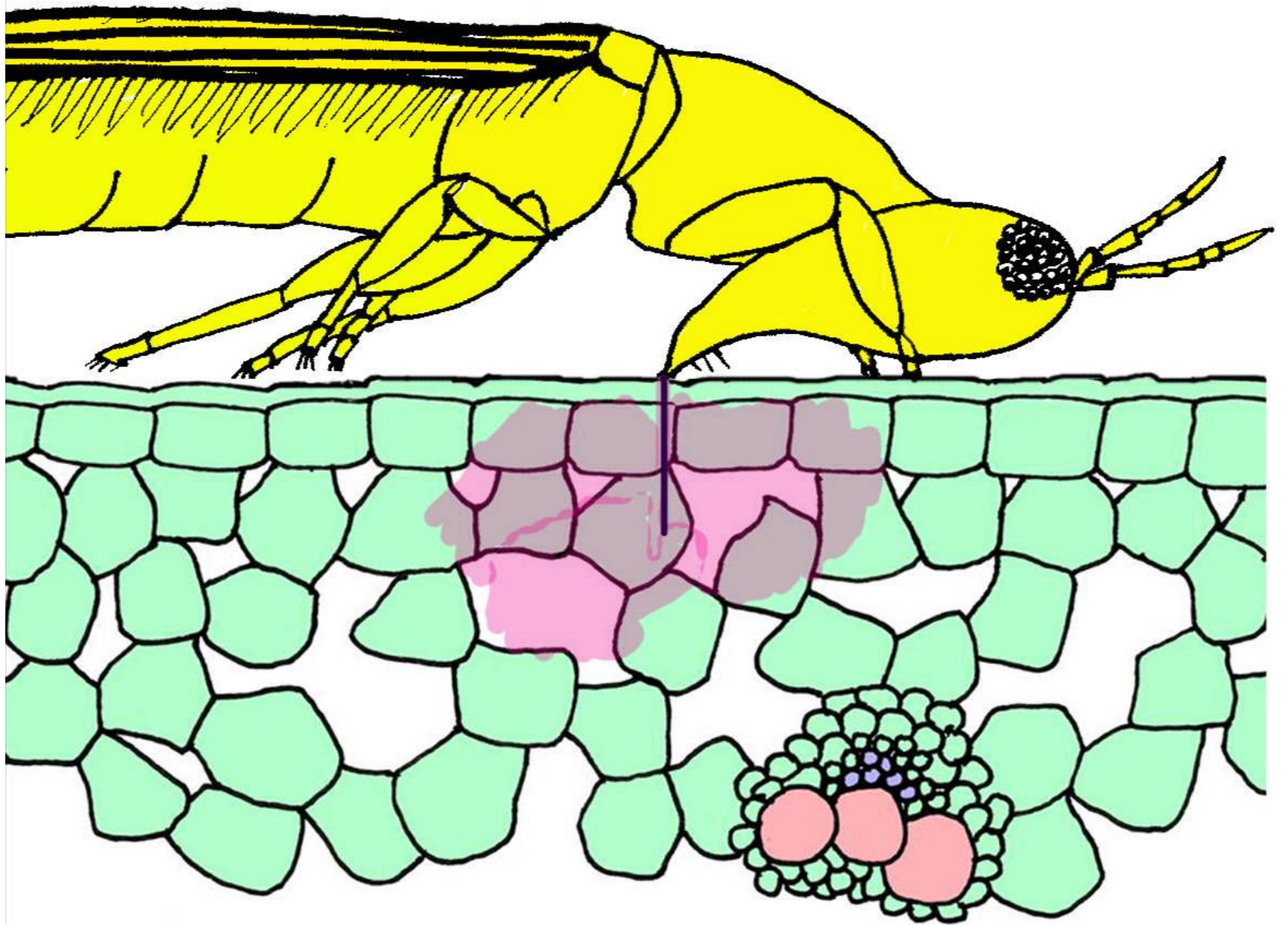
- ▶ Rotation out of tomatoes, peppers and cucurbits for 3+ years
- ▶ Clean equipment of soil when leaving infested fields
- ▶ Don't reuse water draining from problem fields
- ▶ Plant susceptible crops on well-drained soils
- ▶ In heavy soils, use alternate furrow irrigation or well-managed drip irrigation
- ▶ Tolerant pepper varieties (cv. 'Revolution', cv. 'Prophet')

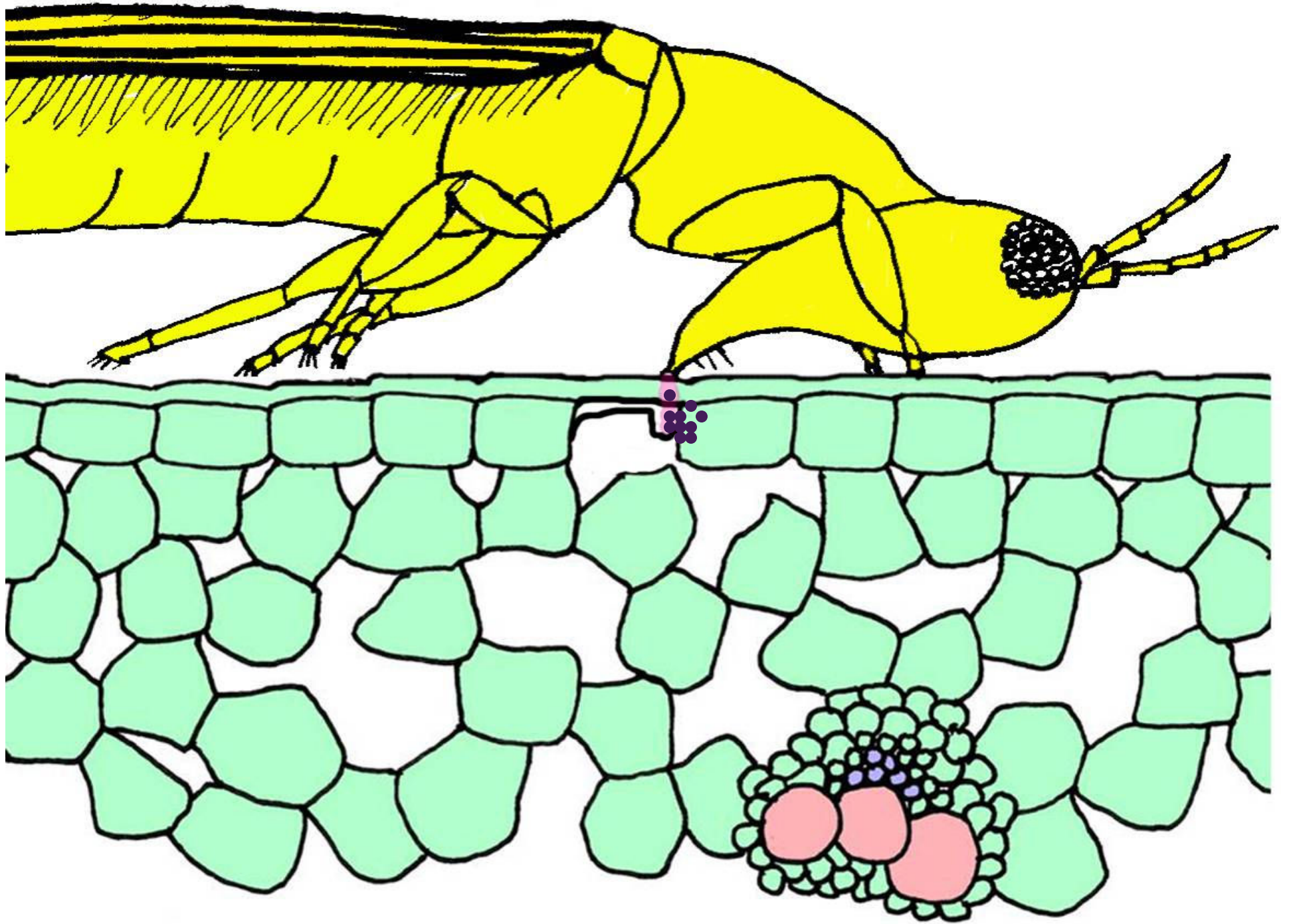


Bacterial Spot



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Feeding Damage

Non-Viruliferous Male



Non-Viruliferous Female



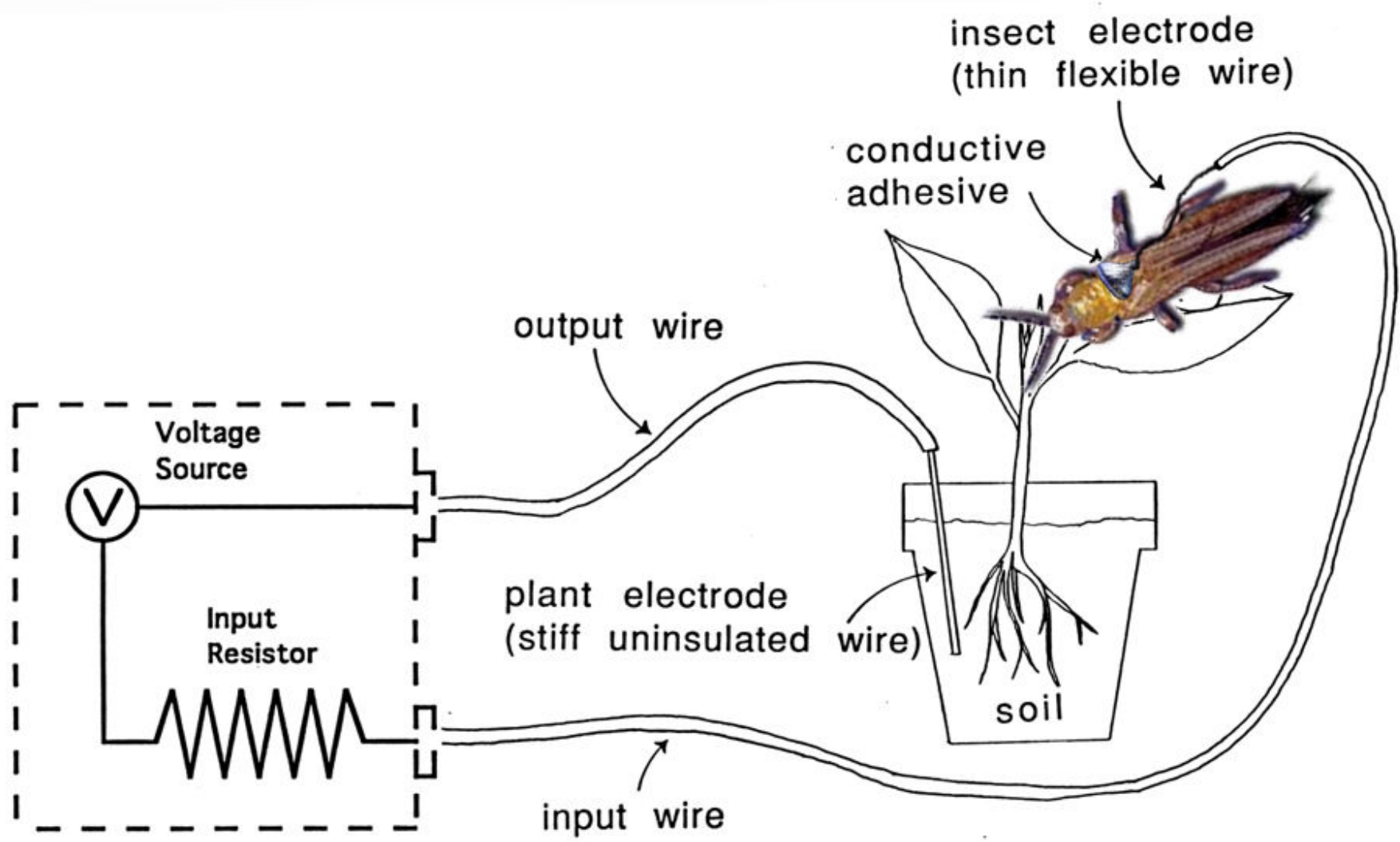
Viruliferous Male



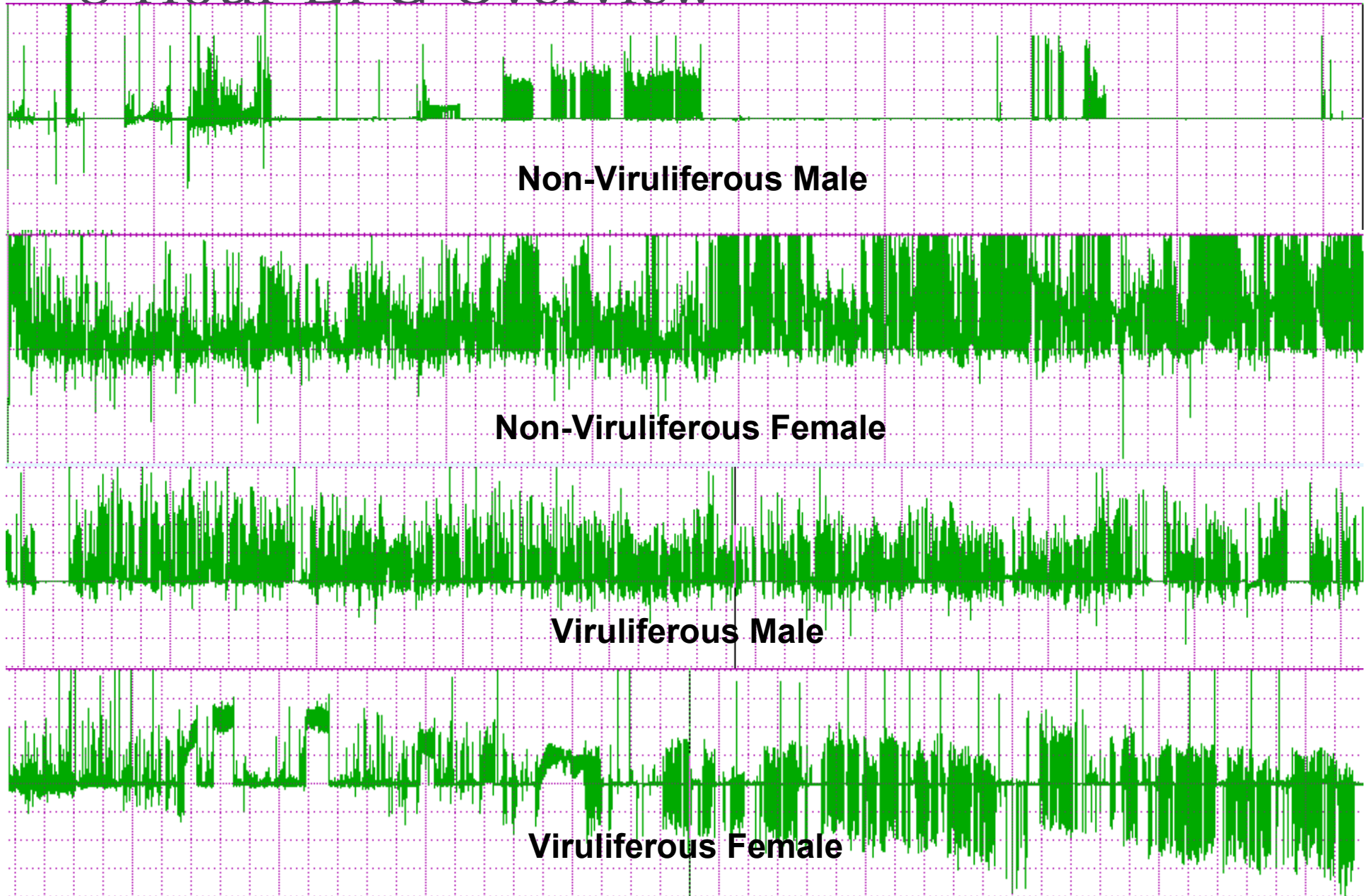
Viruliferous Female



Electrical Penetration Graph (EPG)



8 Hour EPG Overview



Conclusion

- ▶ Viruliferous males spend more time feeding than non-viruliferous males
- ▶ Viruliferous females spend less time feeding (and more time searching for new feeding sites) than non-viruliferous females

