

Crop Protection Options for Potatoes

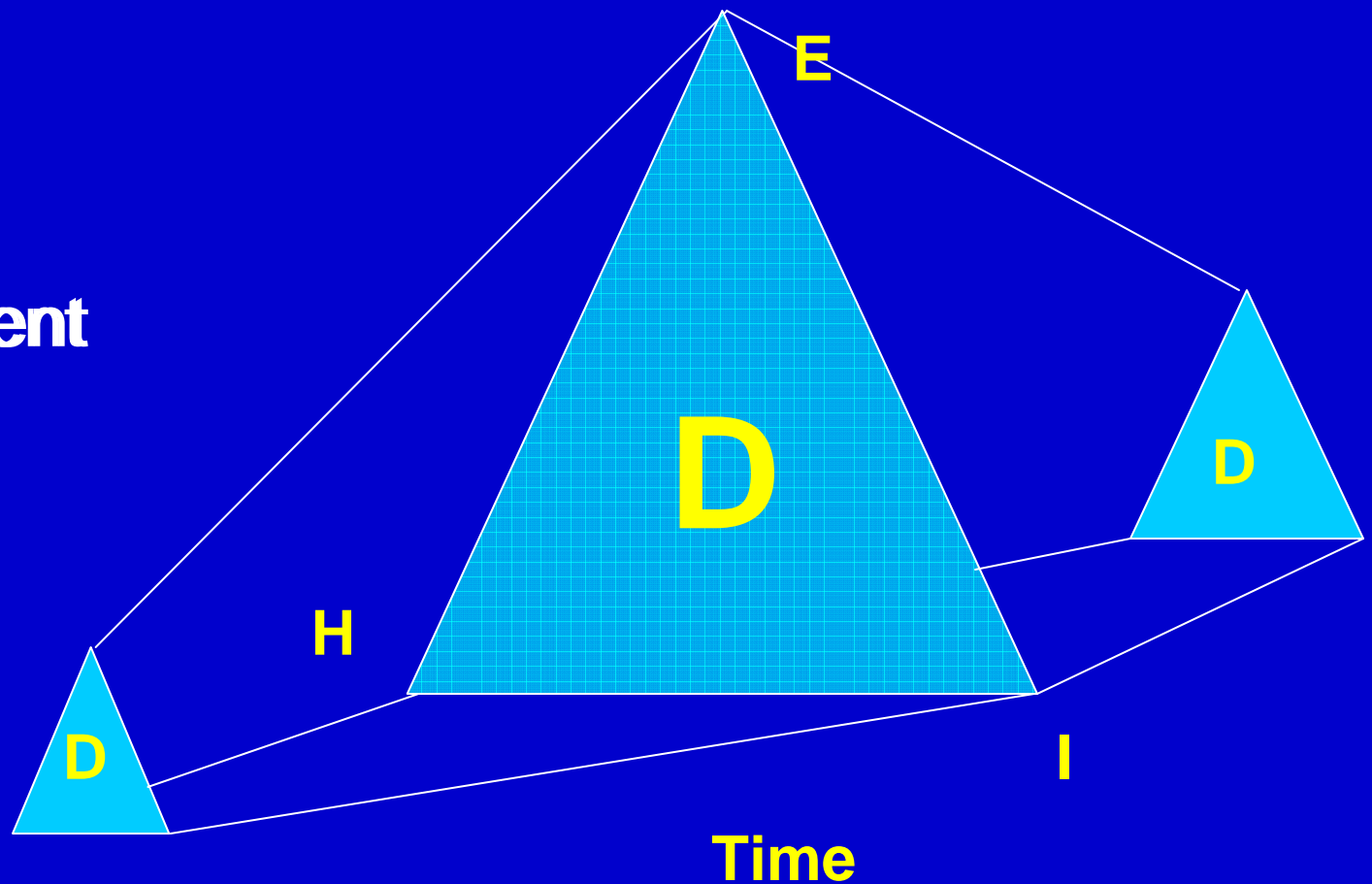
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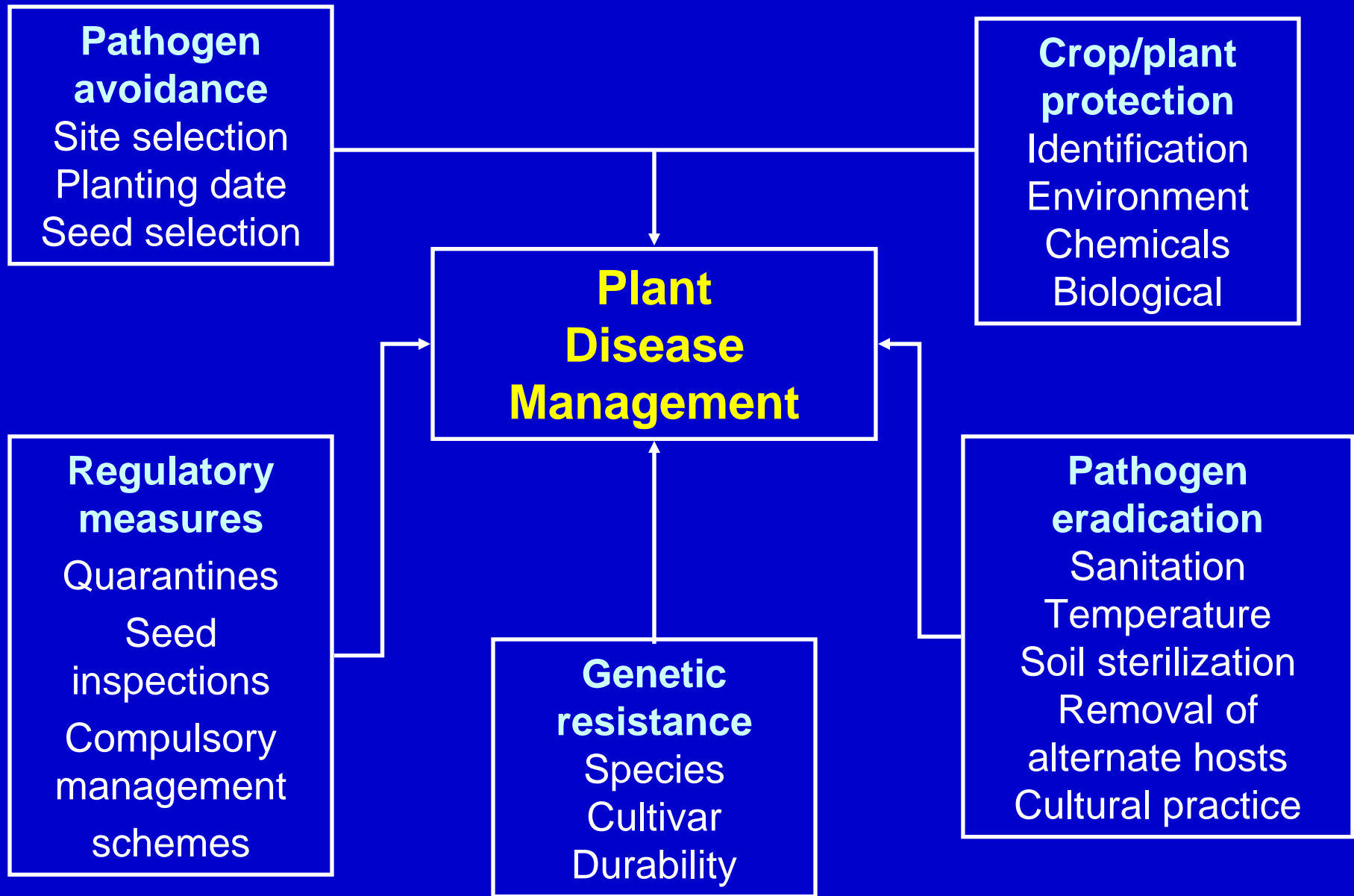
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Agrochemical Industry
Acknowledgments to Ron Gnagney and Dick Crawford (MSU)

Potato diseases are an undesirable outcome of a set of interacting factors.

- Inoculum
- Environment
- Host





Opportunities for Crop Protection

- Seed treatment (to whole or cut seed)
- Soil treatment (pre-; at-; post-planting)
- Foliar treatment (emergence to desiccation)
- Indirect tuber protection (systemic fungicides; SAR inducement)
- Pre-storage tuber treatment (fungicides applied directly to tubers on harvester or at bin-loading)
- In-storage tuber treatment (humidification)

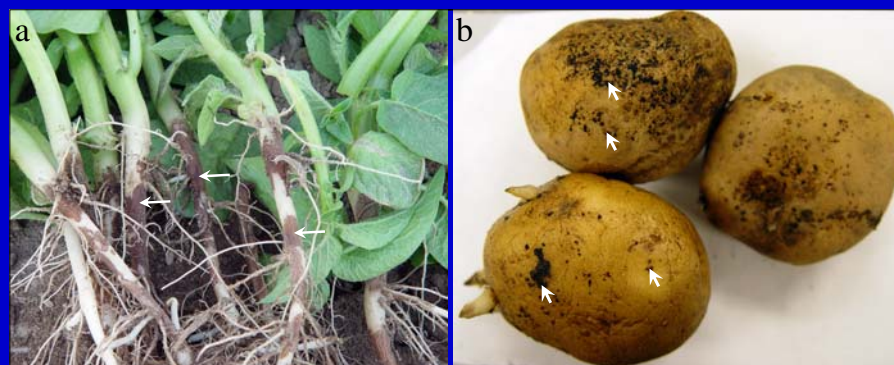
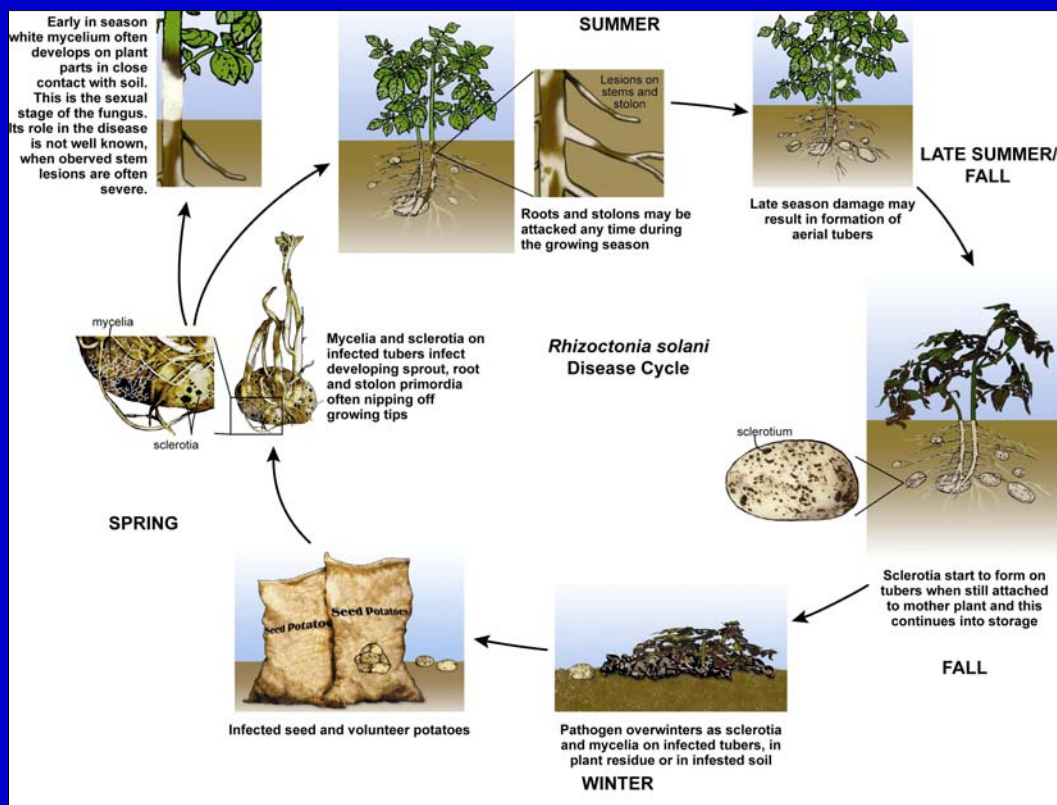
Potato diseases are an undesirable outcome of a set of interacting factors.

- How does the grower implement crop protection strategies to avoid disease?
- Limitations of fungicides – never perfect control
- Use as many tools as possible to optimize performance
- Genetic resistance; Cultivar
- Pathogen avoidance; Planting date
- Disease prediction; Fungicide use rates and frequency.

Examples of strategies and limitations

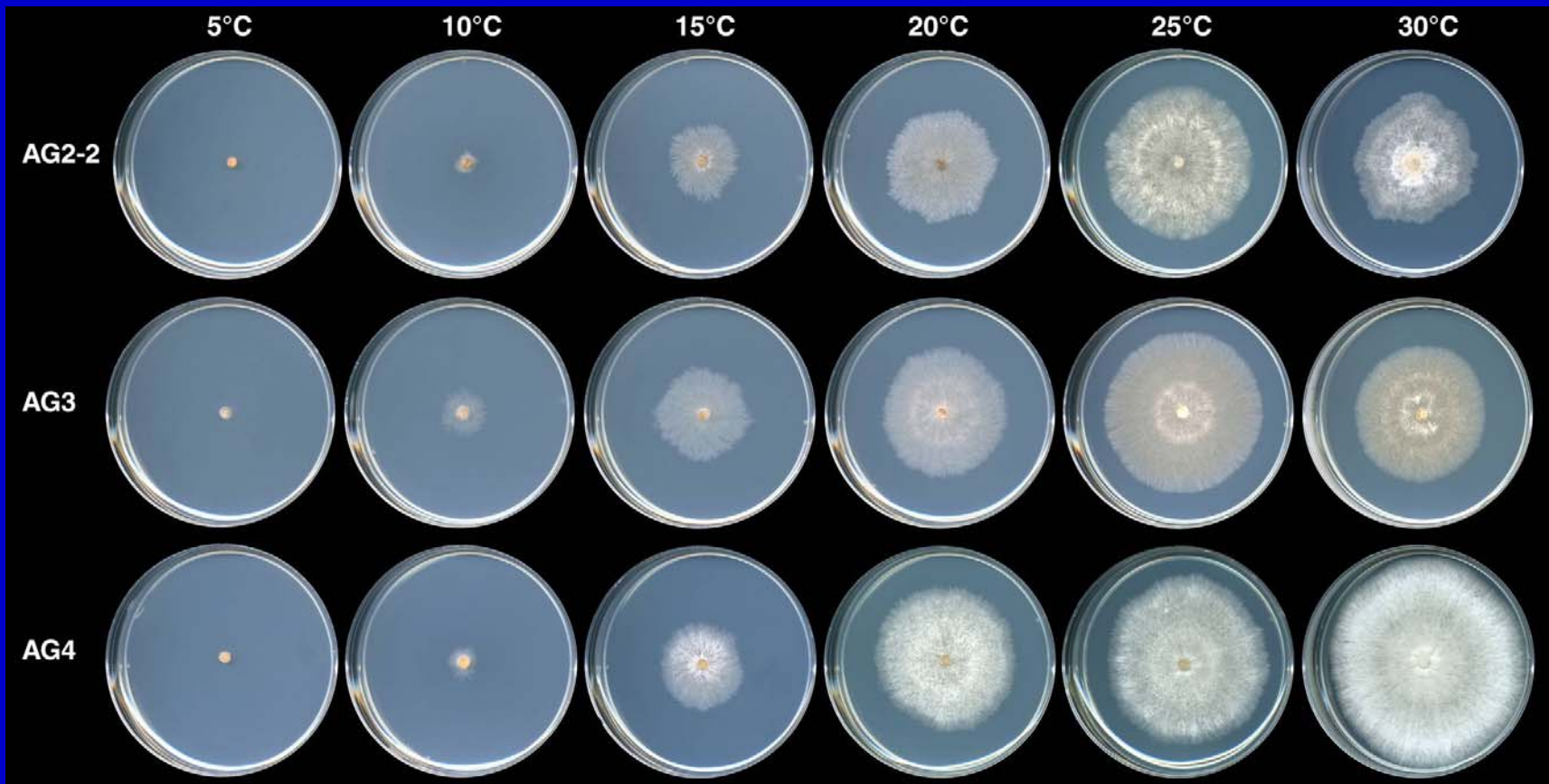
- Seed treatment (to whole or cut seed)
- Soil treatment (pre-; at-; post-planting)
 - Stem canker; black scurf (*Rhizoctonia solani*)
 - Range of fungicides
 - Planting dates
 - Cultivars

Stem Canker and Black Scurf



Disease symptoms of *Rhizoctonia* on potato. (a) Brown sunken lesions form on potato shoots, stolons and roots (arrows). Severe lesions may girdle the affected organ resulting in delayed emergence, poor stands, or weakened plants. (b) Black sclerotia (arrows) on the surface of potato tubers resemble soil that will not wash off.

Radial growth patterns of *Rhizoctonia solani* anastemoses groups (AG) 2-2, 3 and 4 on PDA at different temperatures.



Effect of planting time (soil temperature) on overall incidence and severity of sclerotia on potato tubers of different varieties caused by *Rhizoctonia solani*.

Timing (°C)	Black scurf incidence (%)		Black scurf severity (%)	
	2004	2005	2004	2005
47	85.6 a	10.8 a	43.6 a	11.5 a
57	25.4 b	12.3 a	14.3 b	11.8 a
68	14.4 b	9.0 a	10.0 b	11.5 a

Seed treatment	In-furrow	Emergence	14 day post- emergence	Control of stem canker		Control of stolon canker		
				FL 1879	Russet Norkotah	FL 1879	Russet Norkotah	
No	Amistar			-	-	-	-	
		Amistar		-	-	-	-	
		Amistar		-	-	-	-	
	Moncut			-	-	-	-	
		Moncut		-	-	-	-	
		Moncut		-	-	-	-	
	Headline				+	-	++	-
		Headline			-	+	-	-
		Headline			-	-	-	-
Yes	Amistar			-	-	-	-	
		Amistar		+	+	++	-	
		Amistar		-	-	-	-	
	Moncut				-	-	-	-
		Moncut			-	-	-	-
		Moncut			-	+	-	-
	Headline				-	+	-	+
		Headline			-	-	-	-
		Headline			+	-	-	-
				-	+	-	-	

Effect of soil temperature at planting time on incidence and severity of black scurf on tubers of different varieties of potato in 2004.

Variety	47F				68F			
	Incidence		Severity		Incidence		Severity	
FL 1867	91.2	a	42.7	abc	7.6	bc	4.0	ab
FL 1879	69.8	a	29.0	c	2.4	c	1.0	b
Jacqueline Lee	95.8	a	65.3	ab	28.4	ab	27.3	a
MI Purple	93.9	a	38.3	abc	0.0	c	0.0	b
Pike	82.8	a	31.0	bc	9.0	bc	3.0	b
Russet Norkota	90.8	a	30.7	bc	5.7	bc	1.0	b
Snowden	80.3	a	46.0	abc	37.0	a	27.3	a

Seed Treatment Conclusions

- Temperature important variable in growth of pathogen; grows at 40-50F
- Planting date
 - Slower emergence in cool soils
 - Longer exposure to growing pathogen
 - But:– pathogen grows faster at higher temps.
 - Risk is therefore present all season
 - Two phases of disease
 - Seed (early)
 - Soil (late)

Seed Treatment Conclusions

- Fungicide activity generally reduced at higher temperatures (88F).
- Quadris activity reduced at 70F but more effective at low and high temperature range??
- Fungicide also loses efficacy with time in soil.
- Useful for early season disease.
- Interaction between fungicide type, application time and variety.
- Seed treatment activity rarely enhanced by additional application of early season fungicide but application at early emergence useful.
- Varieties all susceptible but some more so than others.

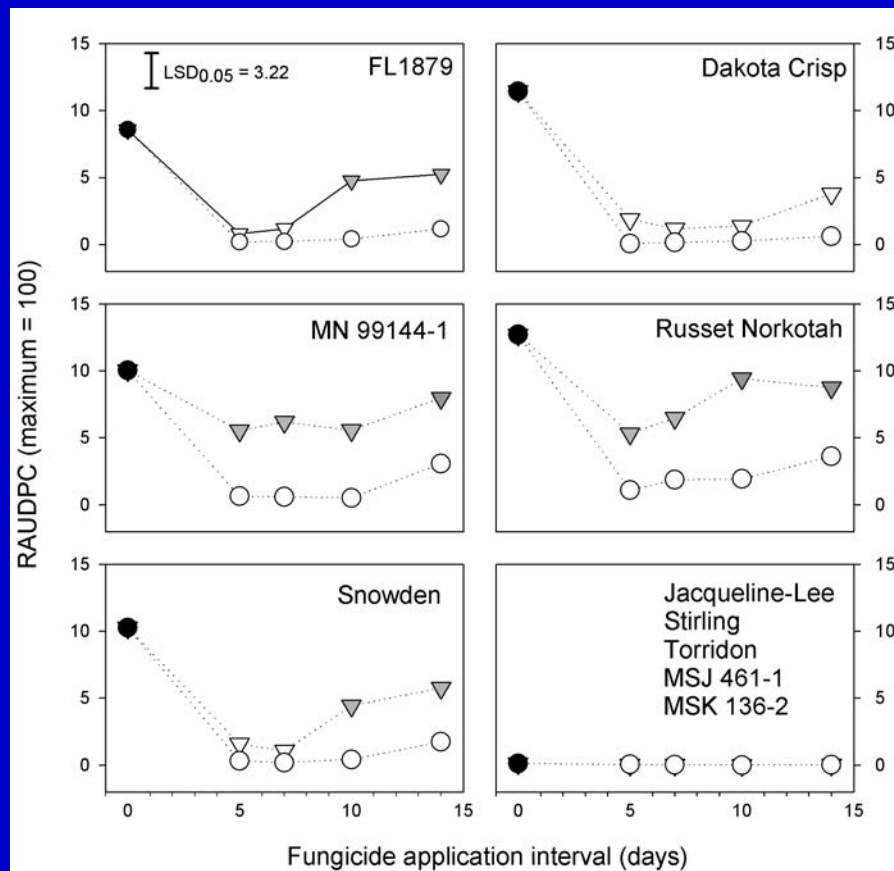
Potato diseases are an undesirable outcome of a set of interacting factors.

- Potato foliar diseases (e.g. Potato Late Blight)
- How does the grower implement crop protection strategies to avoid disease?
- Limitations of fungicides – never perfect control
- Use as many tools as possible to optimize performance

- Genetic resistance; Cultivar
- Fungicide use rates and frequency
- Disease prediction; <http://lateblight.org>

Potato Late Blight

Severe problem in MI in 2006



Conclusions

- **Studies over the past 8 years demonstrate that potato cvs./ABL with reduced susceptibility to late blight can be managed with**
 - **reduced fungicide rates and**
 - **longer application intervals**
- **thus offering a less expensive option for disease control.**

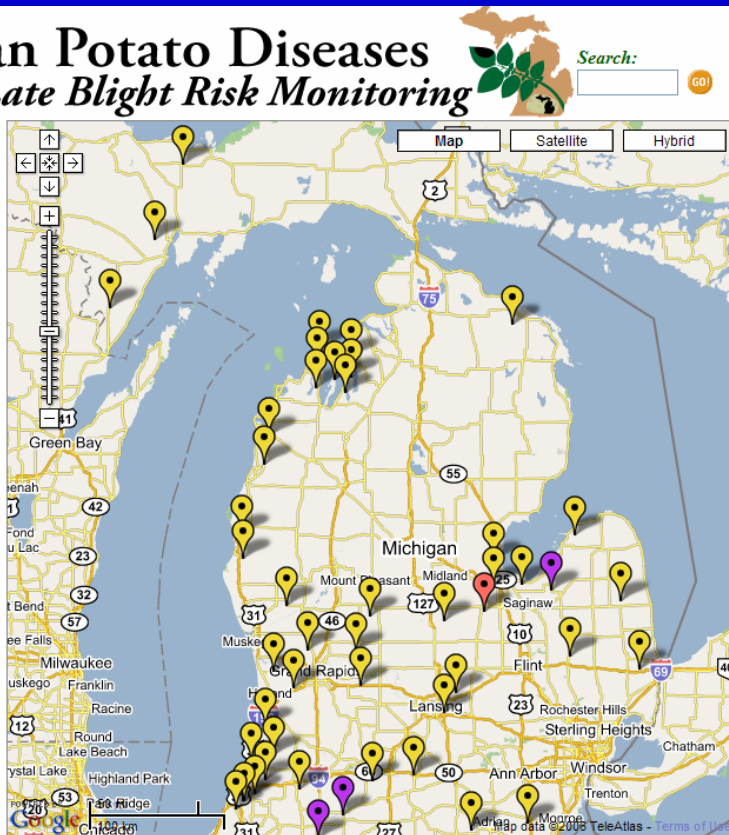
Risk Monitoring and Educational Resources

Michigan Potato Diseases *Late Blight Risk Monitoring*

- ▶ Home
- ▶ News & Alerts
- ▶ Compare Stations
- ▶ Calculate DSV's
- ▶ Fungicide Rates
- ▶ Help

- ▶ Publications
- ▶ Foliar Diseases
- ▶ Tuber Diseases
- ▶ Images
- ▶ Links

NEWS ALERT:
LATE BLIGHT FOUND IN MICHIGAN!
click here for further details.



Click on the map marker closest to your location to get details on the late blight risk level in your area. Use your mouse or the directional arrows to pan left, right, up and down to see areas that are hidden offscreen. Use the slider to zoom in and out. The map may take a few seconds to load, if it does not click here.

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- <http://www.potatodiseases.org>
- Disease Risk forecasting
- Extension publications
- Trial results (all diseases)
- Images of diseases
- Crop protection options for potatoes