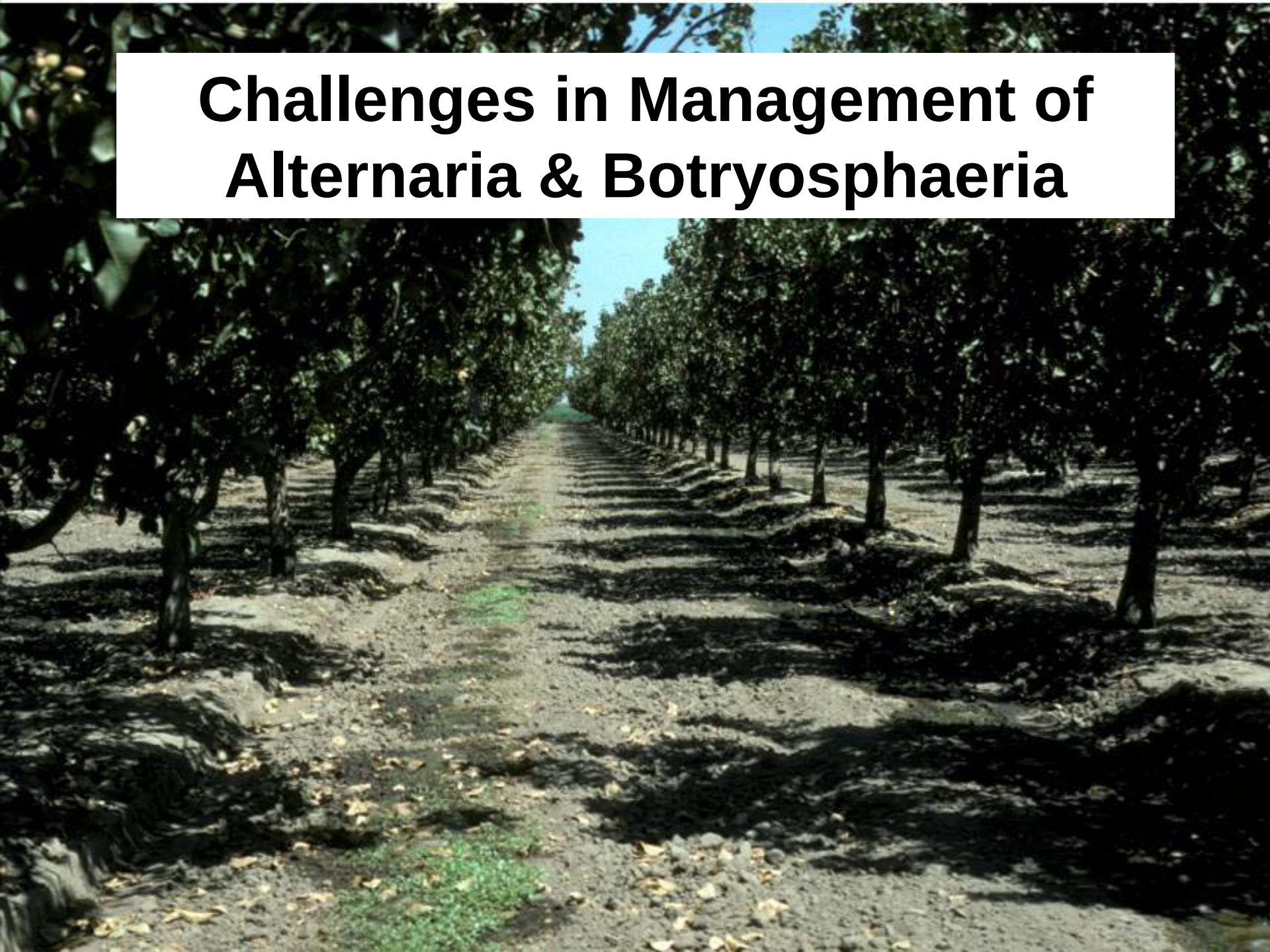
Challenges in Management of Alternaria & Botryosphaeria



...ance by crows and scrub

	Acceptance
...it	Poor
	Poor

Alternaria Sp. A Pathogen Of Pistachio?

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Introduction

On June 4, 1985, G. S. Sibbett (Farm Advisor, Tulare County) provided samples of pistachio fruits with small black surface lesions. Isolations from surface sterilized lesions showed 62% Alternaria alternata (Table 1). Another sample sent on June 13 by R. Stiefvater (Pacific Producers of California, Madera) also showed small black le... ns, not typical of Botryosphaeria blight, ...ata was also isolated from this sam... Isolations from various plant ...m three additional coun... ...cidence of, Botryo... ...aled very high ...n leaves, ...buds

purpose of this study was to determine whether A. alternata is pathogenic to pistachio.

Materials and Methods

Cluster inoculations. Kerman tree clusters (8–10 fruit/cluster) were surface sterilized with 400 µl a.i. chorine (household bleach, 5.25% sodium hypochlorite) for 3 min, allowed to dry, placed over wire screens in plastic containers, and sprayed to runoff with a 1×10^5 conidia/ml suspension. Spore suspension was prepared from a 30-day-old culture grown on acidified potato-dextrose agar. The same experiment was made on abscised fruit from both 'Kerman' and 'Trabonella' pistachios. They were sprayed with a 1×10^5, 2.5×10^5, and 5×10^5 conidia/ml suspension of Alternaria alternata.

Leaf inoculations. Leaves of 'Kerman' ...chio were surface sterilized with 400 µl ...e, allowed to dry, placed in plastic ...d sprayed with a 1×10^5 conid... The plastic containers ...rature (25 ± 1 C). ...d leaves of 5... ...d with a...

leaves were sprayed with steri... shoots were covered with bo... a brown paper bag for 3 d... were recorded 3, 10, and... oculation.

Results and Di...

The Alternaria sp. th... various sample so... November (Table... naria alternata (... characteristics... phores resem... tacking pist... (5) and we... scribed b... Aucl., w... nata a... Tw... clus... dai...

Alternaria late blight difficult to control

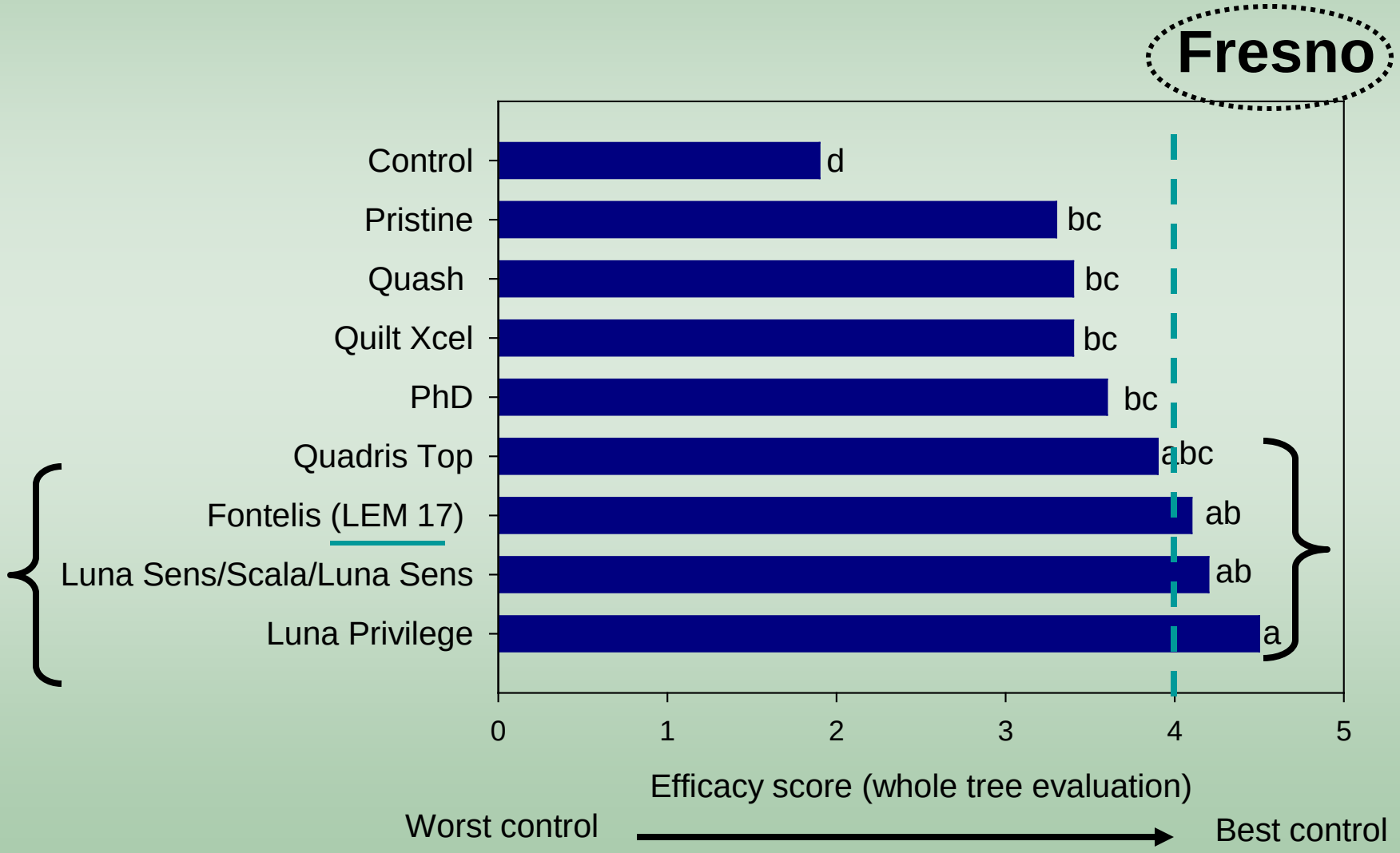
Management of Alternaria late blight:

- **Cultural practices** (manage irrigation, improve water infiltration, buried drip, hedge trees, no cover crops, etc.)
- **Chemical control** (apply fungicides)
- **Integrated disease control** (use both cultural & chemical control)

Fungicides registered for Alternaria late blight

Fungicide	Active ingredient	Efficacy
Abound	Azoxystrobin	++
Adament	Trifloxystrobin+tebuconazole	+++
Bravo	chlorothalonil	++
Bumper/Tilt	propiconazole	+++
Cabrio	pyraclostrobin	+++
Gem	trifloxystrobin	+++
Quash	metconazole	++
Fontelis	penthiopyrad	++++
Pristine	boscalid+pyraclostrobin	++++
Quilt-Xcel	azoxystrobin+propiconazole	+++
Scala	pyrimethanil	++
Switch	cyprodinil+fludioxonil	+++
Tebuzol	tebuconazole	+++
Copper	Copper	+

Three sprays of fungicides against Alternaria late blight - 2010



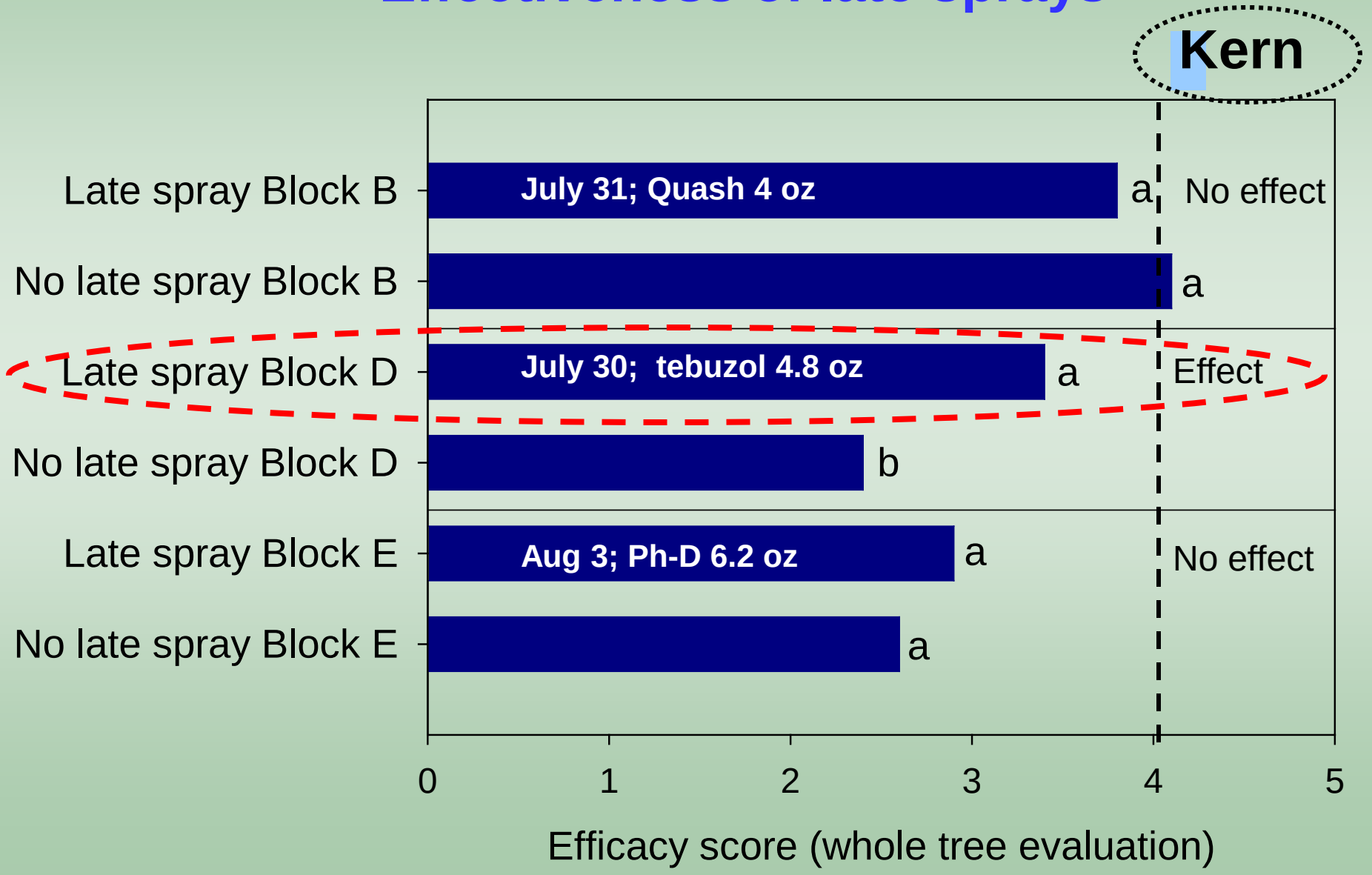
Programs for controlling Alternaria late blight (2010)

Kern

Block B 5 sprays	Pri @ 14.5 oz Scala @ 18 oz Pri @14.5 oz Tilt @ 8 oz Switch @ 14 oz	2 Apr ↓ 26 Jun	4.0 (efficacy score)
Block D 5 sprays	Scala @ 18 oz Pri @14.5 oz Scala @ 18 oz Tilt @ 8 oz Switch @ 14 oz	2 Apr ↓ 30 Jun	2.4 (efficacy score)
Block E 4 sprays	Scala @ 18 oz Pri @14.5 oz Tilt @ 8 oz Switch @ 14 oz	2 Apr ↓ 30 Jun	2.6 (efficacy score)

0= worst control 5 = best control

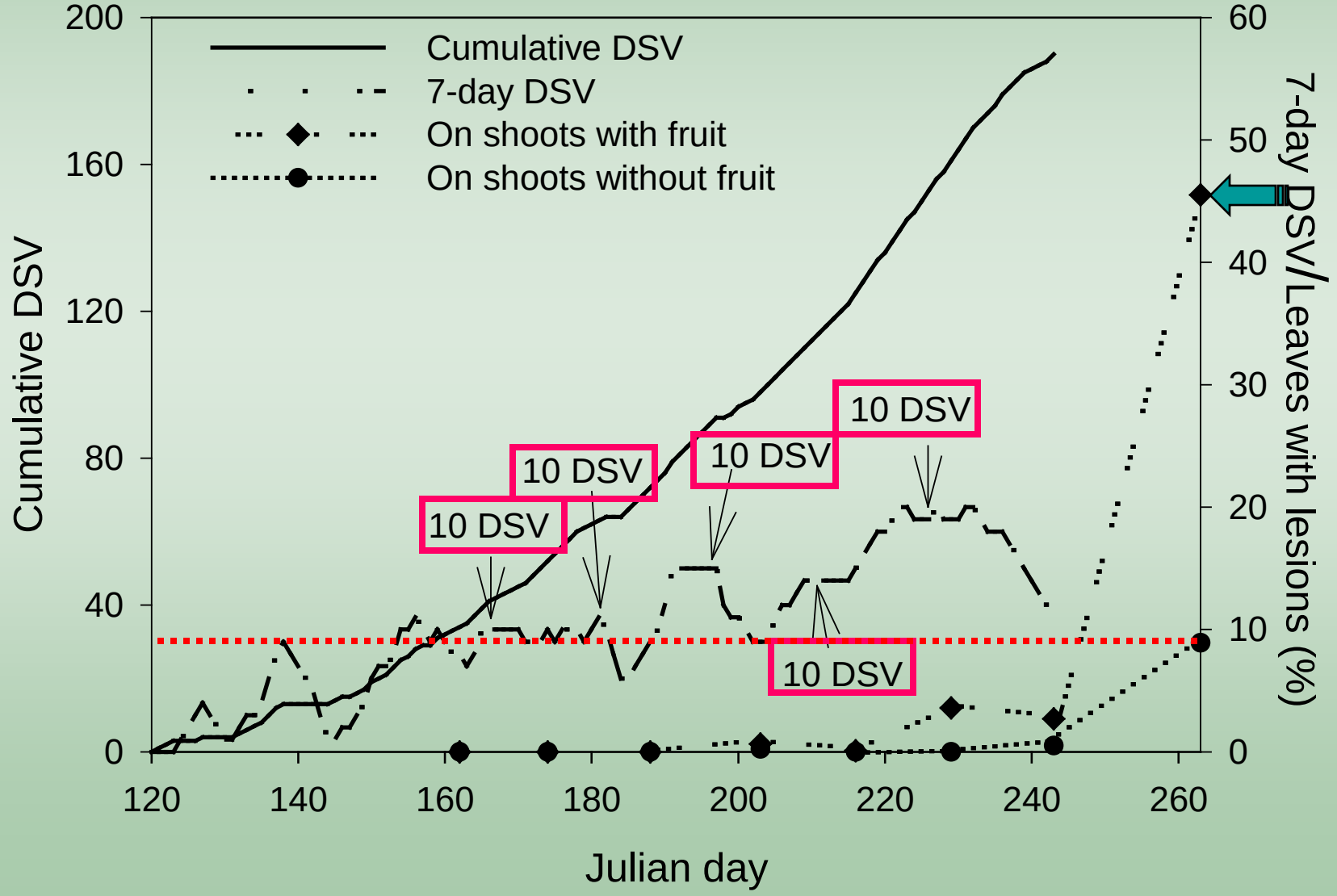
Effectiveness of late sprays



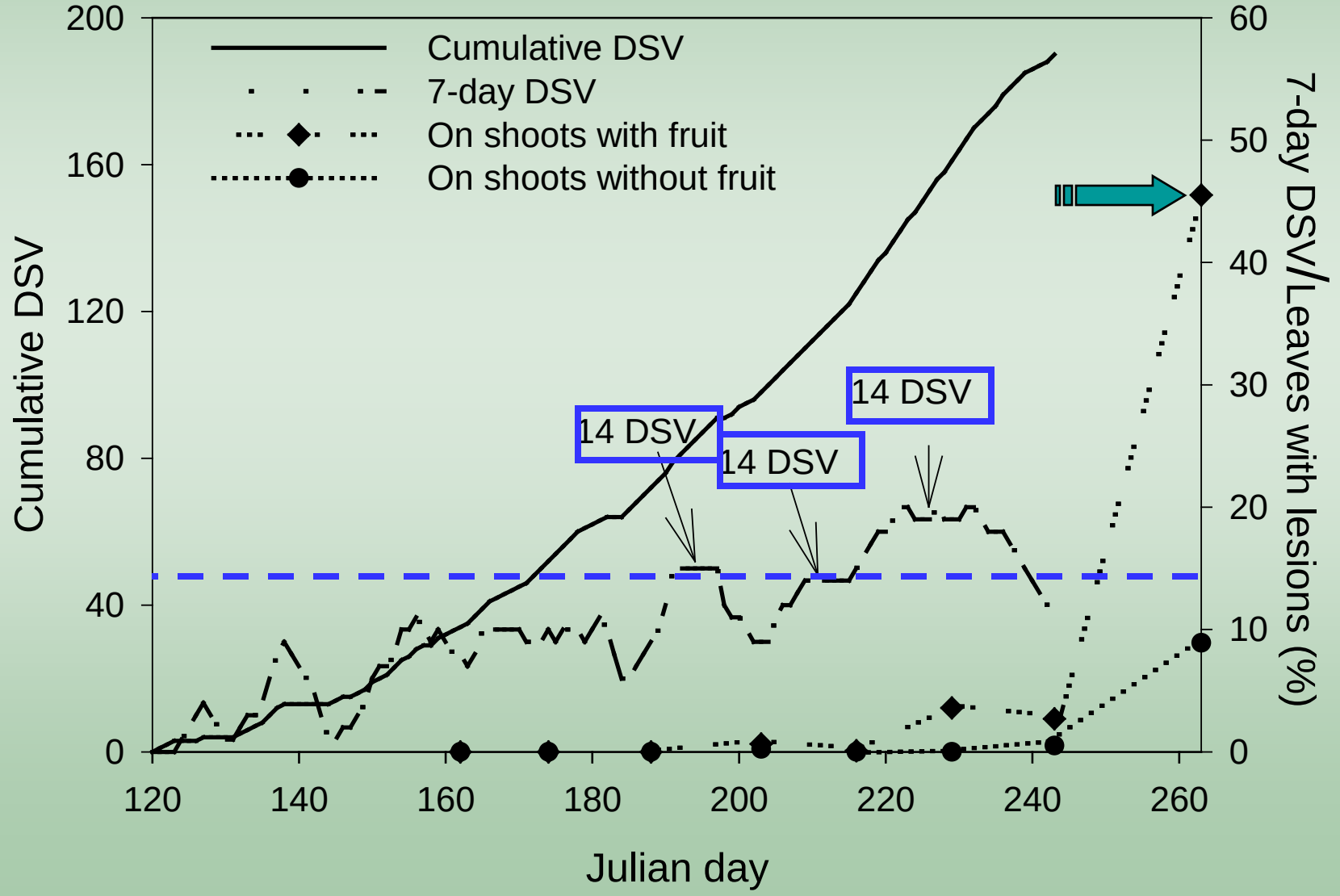
Disease Severity Values (DSV) for Alternaria blight of tomato

	Leaf wetness hours required to produce disease severity values (DSV) of:				
Mean air temp ºF	0	1	2	3	4
55-63	0-6	7-15	16-20	21+	
64-68	0-3	4-8	9-15	16-22	23+
69-78	0-2	3-5	6-12	13-20	21+
79-84	0-3	4-8	9-15	16-22	23+

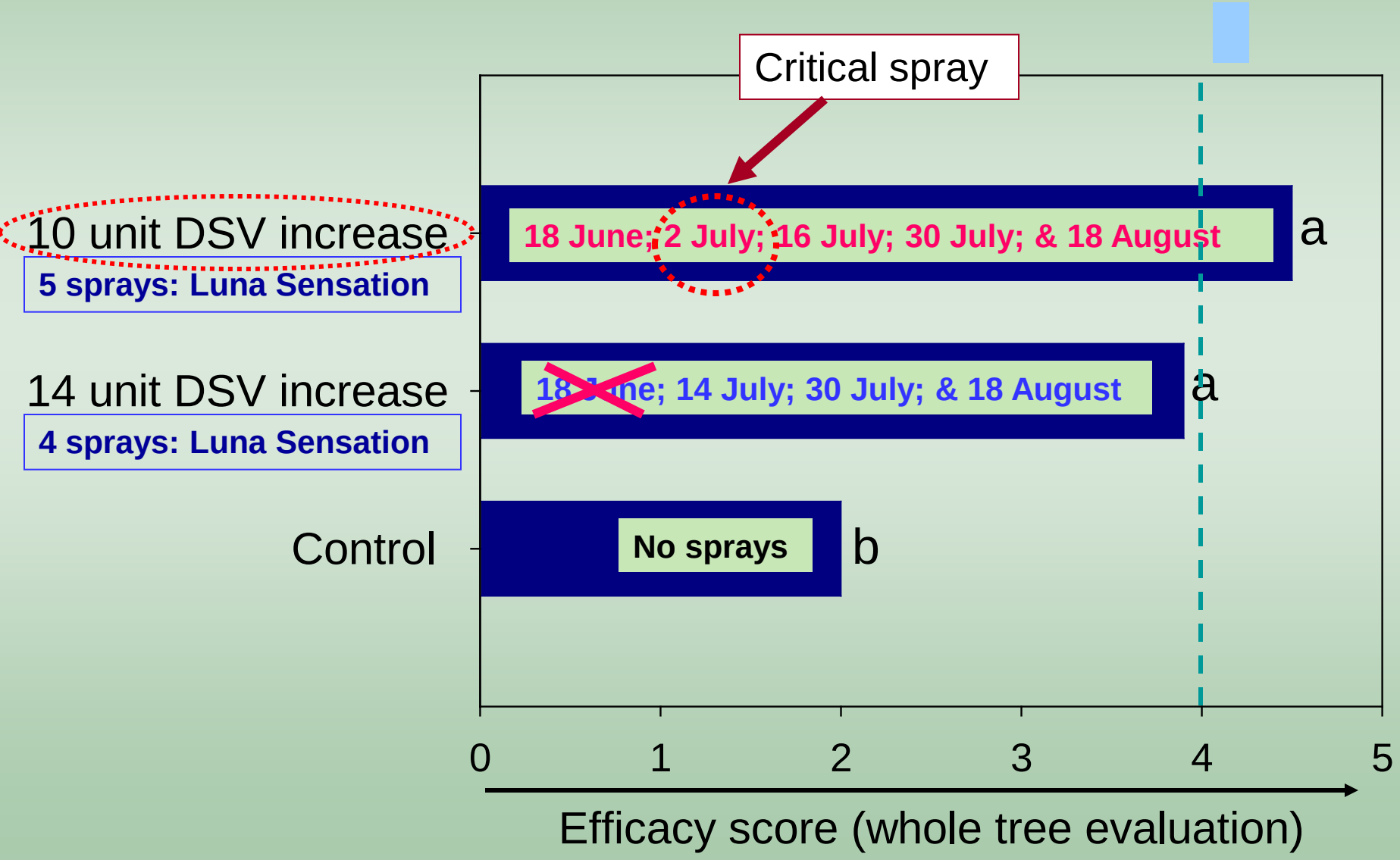
DSV timed sprays - Kearney Ag Center - humid site #1 - 2010



DSV timed sprays - Kearney Ag Center - humid site #1 - 2010



Sprays predicted by DSV at Fresno Co. orchard - 2010



Alternaria alternata isolates tested for resistance or reduced sensitivity to one of the fungicides -2010

			Number of isolates that show resistance or reduced sensitivity		
Orchard	County	Isolates	Boscalid	Penthiopyrad	Fluopyram
KAC	Fresno County	9	1	2	1
23-01	Madera County	10	7	7	2
40-48	Madera County	9	9	9	2
40-42	Madera County	9	7	9	1
39-18	Madera County	4	4	4	1
DB-GR	Kern County	9	9	9	3
FAG	Kings County	10	6	8	2
ORA-2	Tulare County	6	1	0	0
ORA-3	Tulare County	9	3	4	1
SVF-A	Kern County	8	3	3	0
SVF-B3	Kern County	10	5	8	2
SVF-E4	Kern County	10	8	8	2
GAT	Kern County	9	8	8	0
COR-A	Kings County	8	1	2	0
DRU-F	Kings County	5	0	0	0
	Total	125	72	81	17

Cross resistance

No cross resistance

General conclusions:

✓**There are a number of fungicides the growers now can choose to design a program.**

✓**Follow label recommendations, do not use reduced rates, rotate fungicides of different classes, and aim for good coverage.**

✓**New fungicide registrations can provide alternatives to overcome the challenge of the *Alternaria* resistance.**

PISTACHIO—Fungicide treatment timing

Disease	Dormant	April May	June	July	August
Alternaria	----	----	+++	+++	?

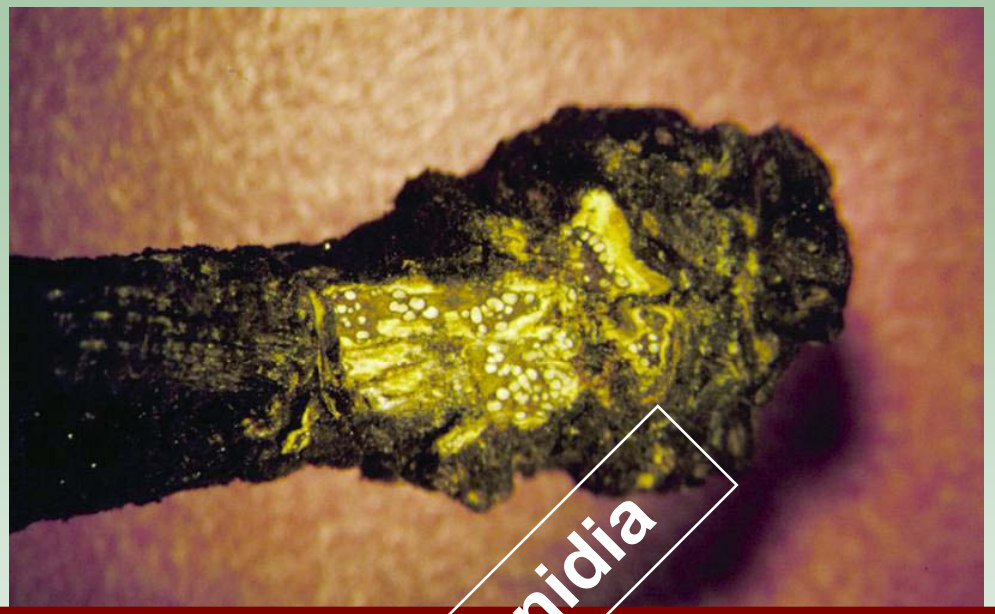
Source: http://www.ipm.ucdavis.edu
http://www.uckac.edu/plantpath

Take-home message

(It is important to diagnose the disease in the orchard correctly)

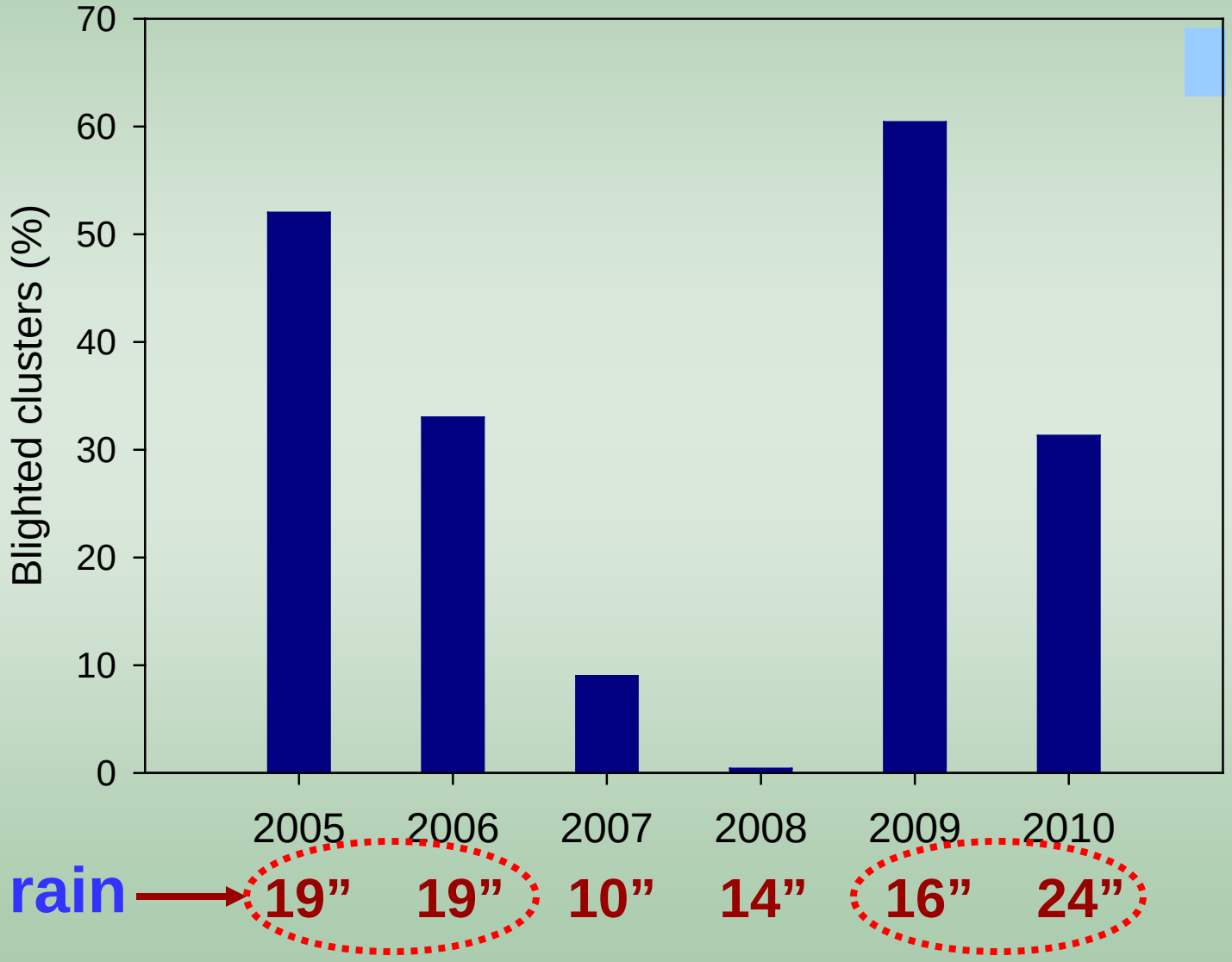
- Spray in early June and finish by end of July).
- **One critical spray**: **end June /early July**.
- Bloom sprays * and some late* season sprays (early Aug) not effective.


Botryosphaeria blight

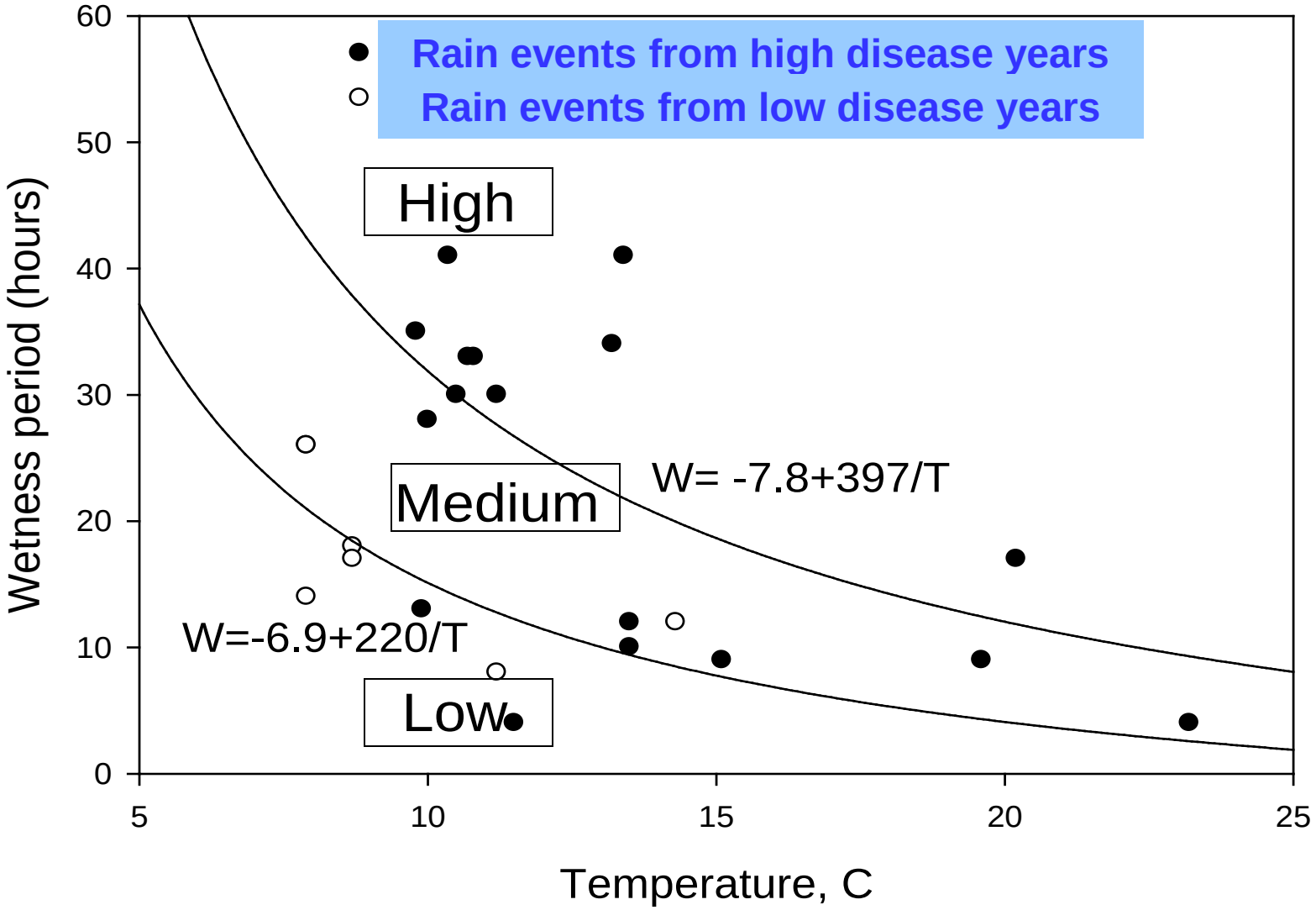


BOT pycnidia

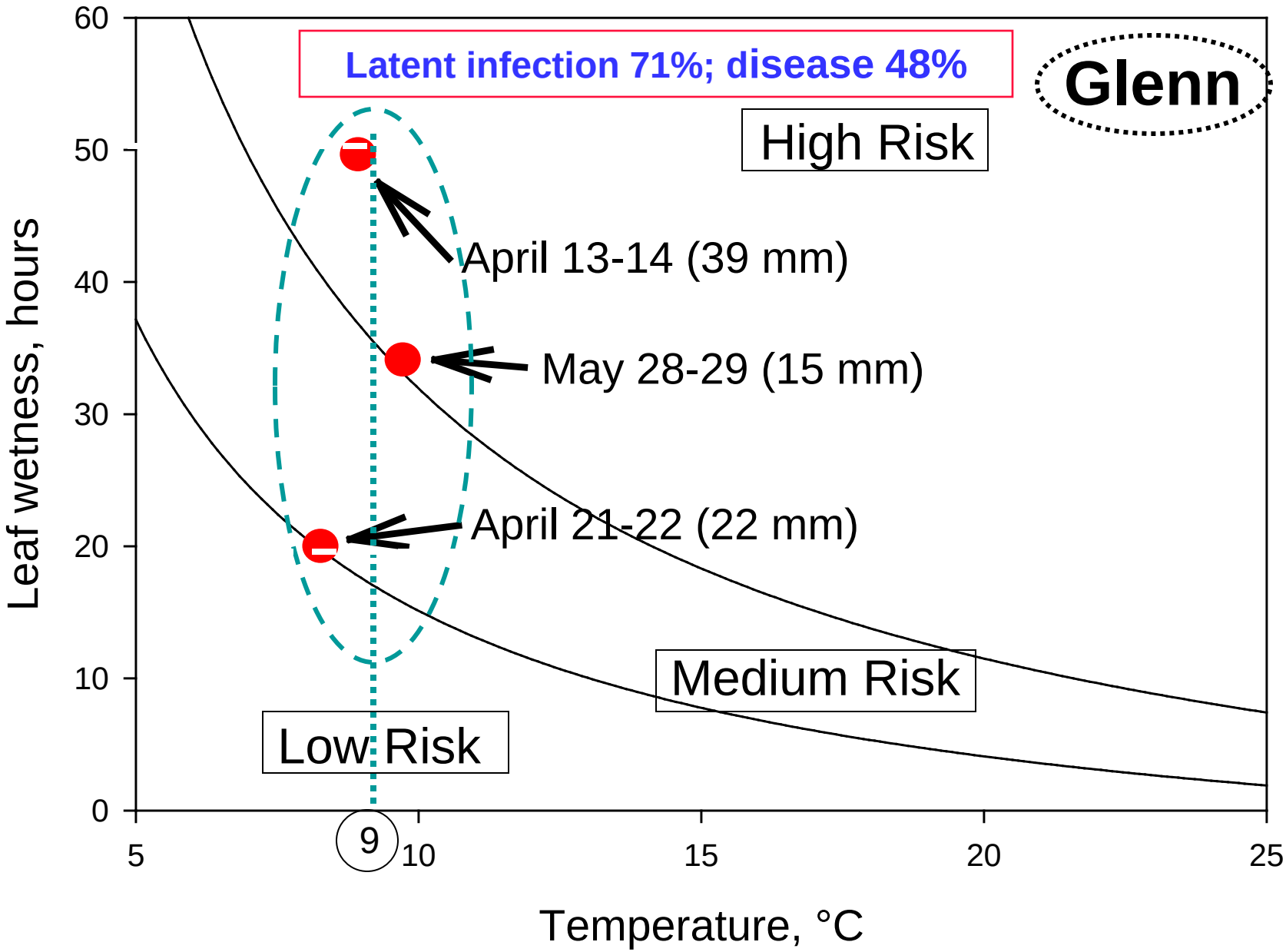
Botryosphaeria blight in unsprayed control (orchard in Glenn Co.)



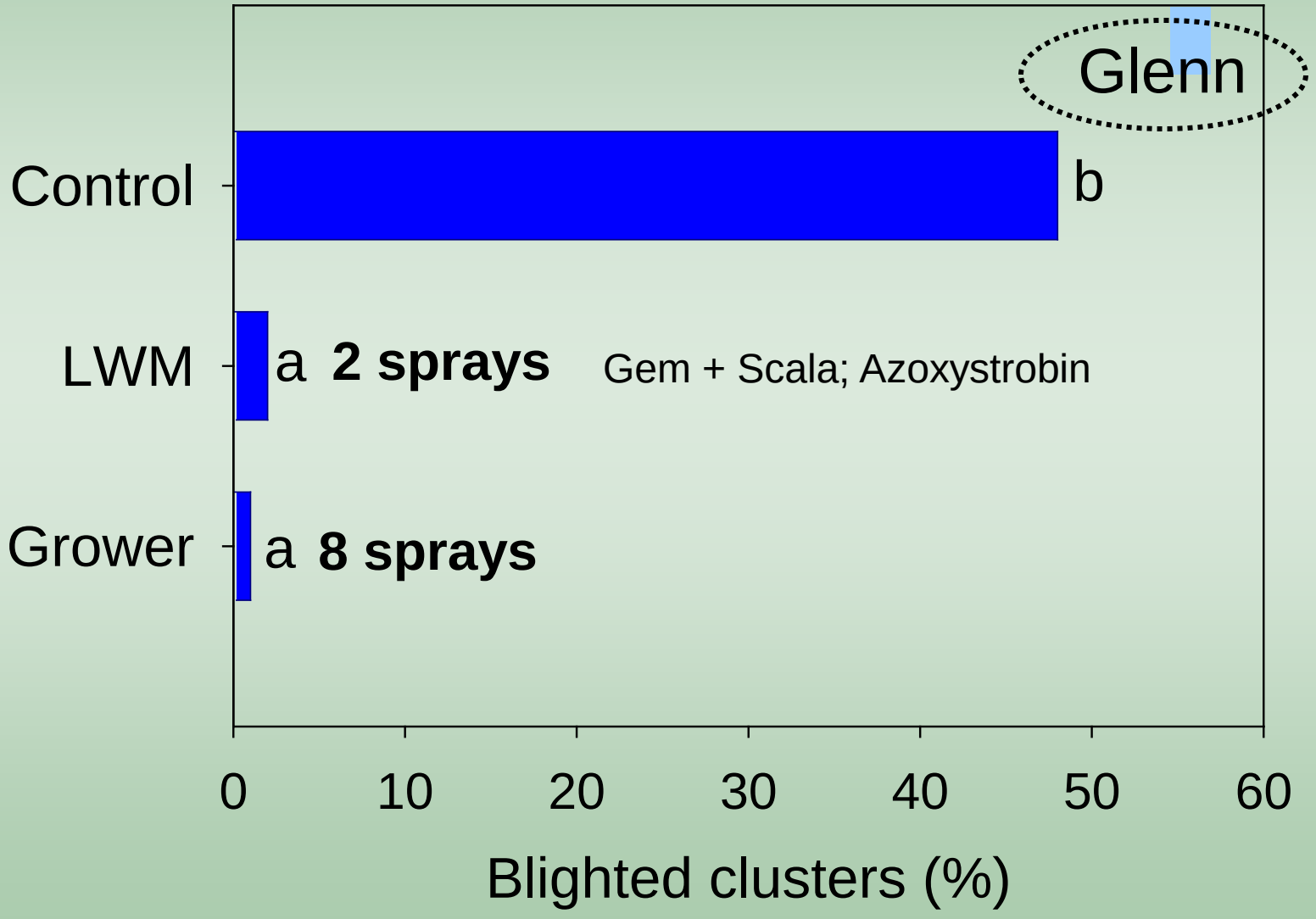
Relative risk of infection of pistachio fruit by *Botryosphaeria*



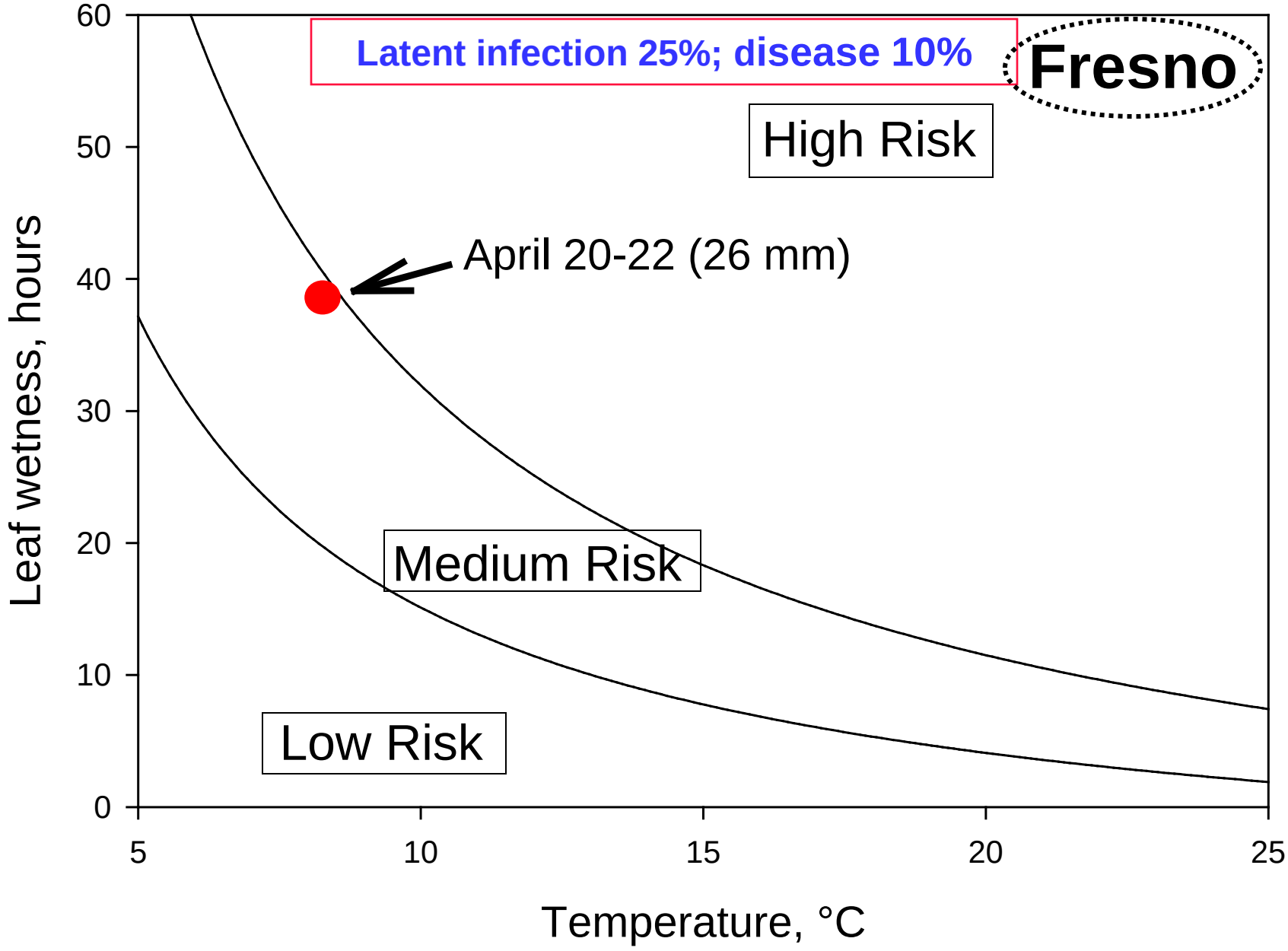
Medium and high risk infection events in 2010



Disease control based on the Leaf Wetness Model in 2010



Medium risk infection event in 2010



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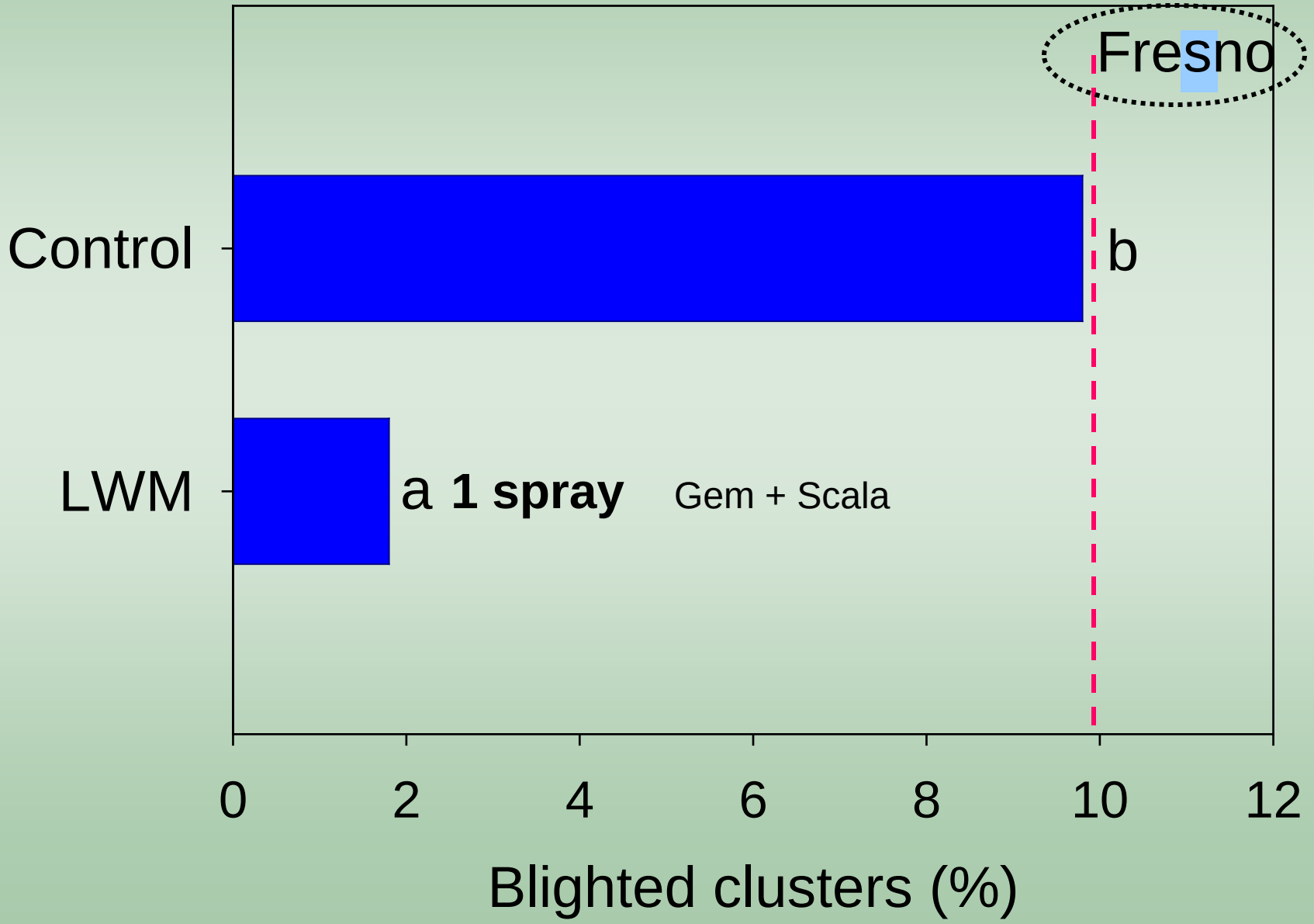
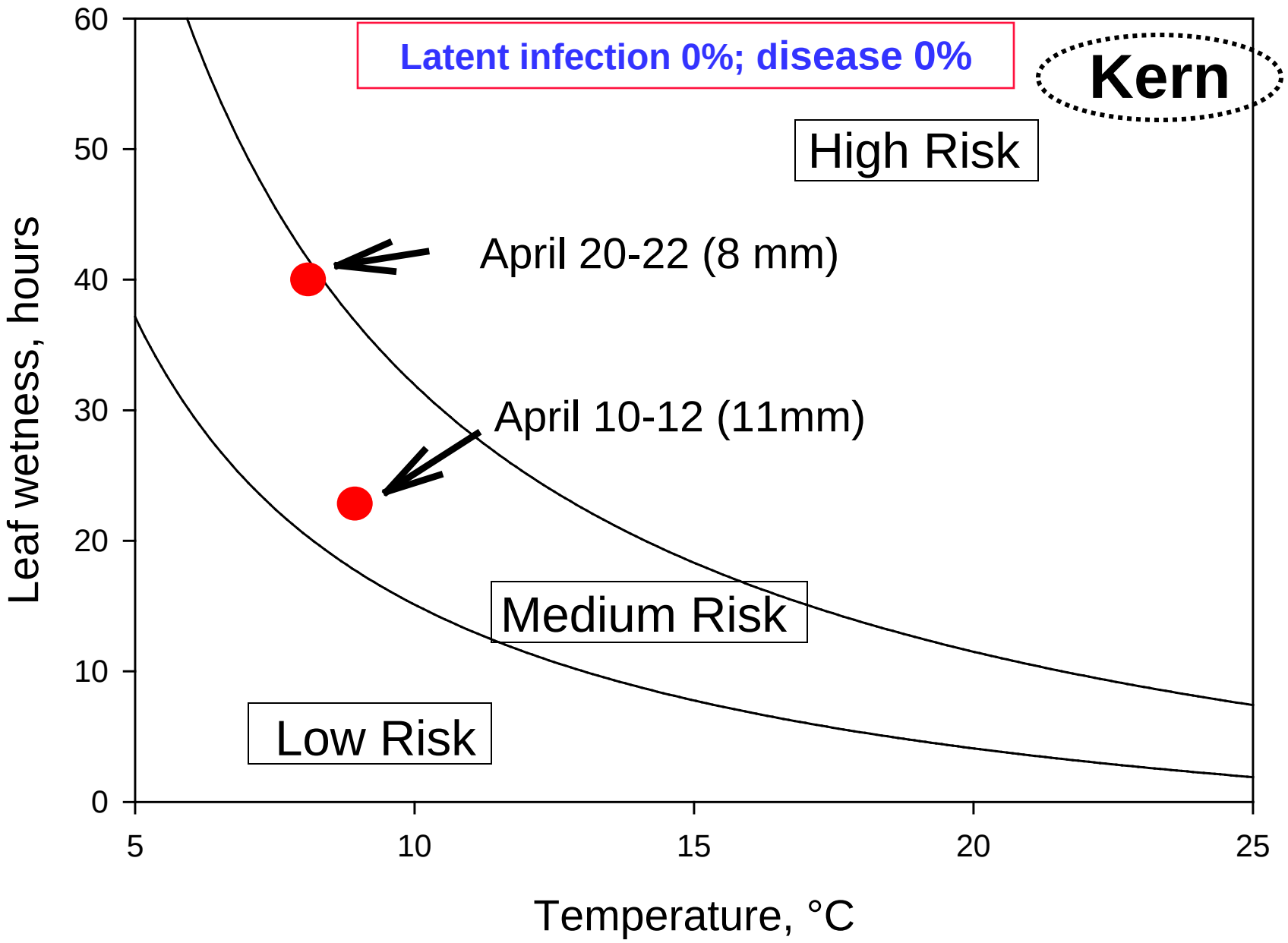


Medium risk infection events in 2010



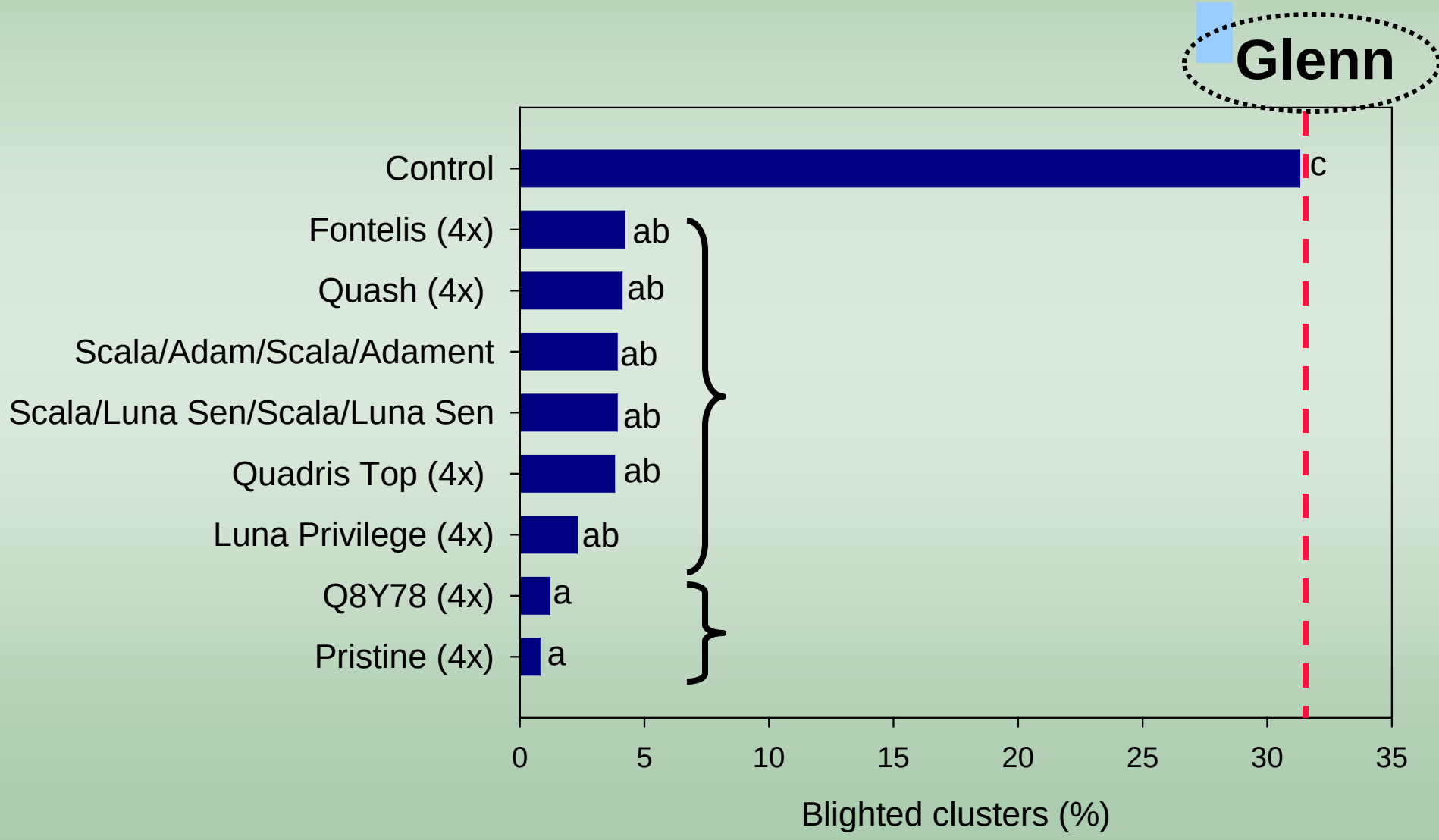
Sanitation: winter pruning to remove inoculum

Summer pruning & removal of prunings

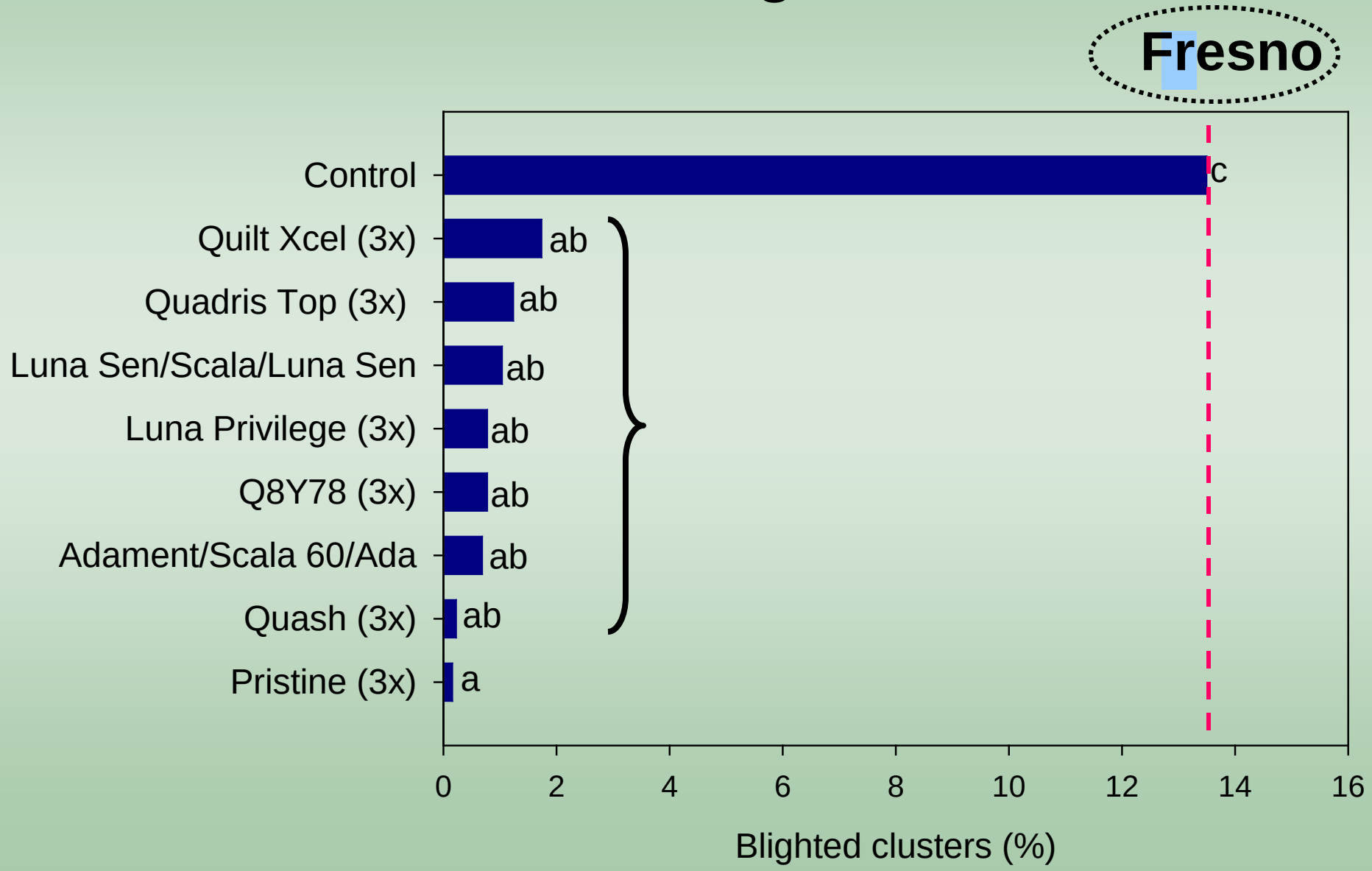
Fungicides registered for Botryosphaeria blight

Fungicide	Active ingredient	Efficacy
Adament……	Trifloxystrobin+tebuconazole	++
Abound …….	azoxystrobin	+++
Bravo…….	chlorothalonil	++
Bumper/Tilt…...	propiconazole	++
Cabrio…….	pyraclostrobin	+++
Gem …….	trifloxystrobin	+++
Quash…….	metconazole	+++
Pristine …….	boscalid+pyraclostrobin	++++
Quilt-Xcel……..	azoxystrobin+propiconazole	+++
Scala……..	pyrimethanil	+++
Switch…….	cyprodinil+fludioxonil	++
Tebuzol…….	tebuconazole	+++
Topsin-M……..	thiophanate-methyl	++
Copper……..	Copper	+/-

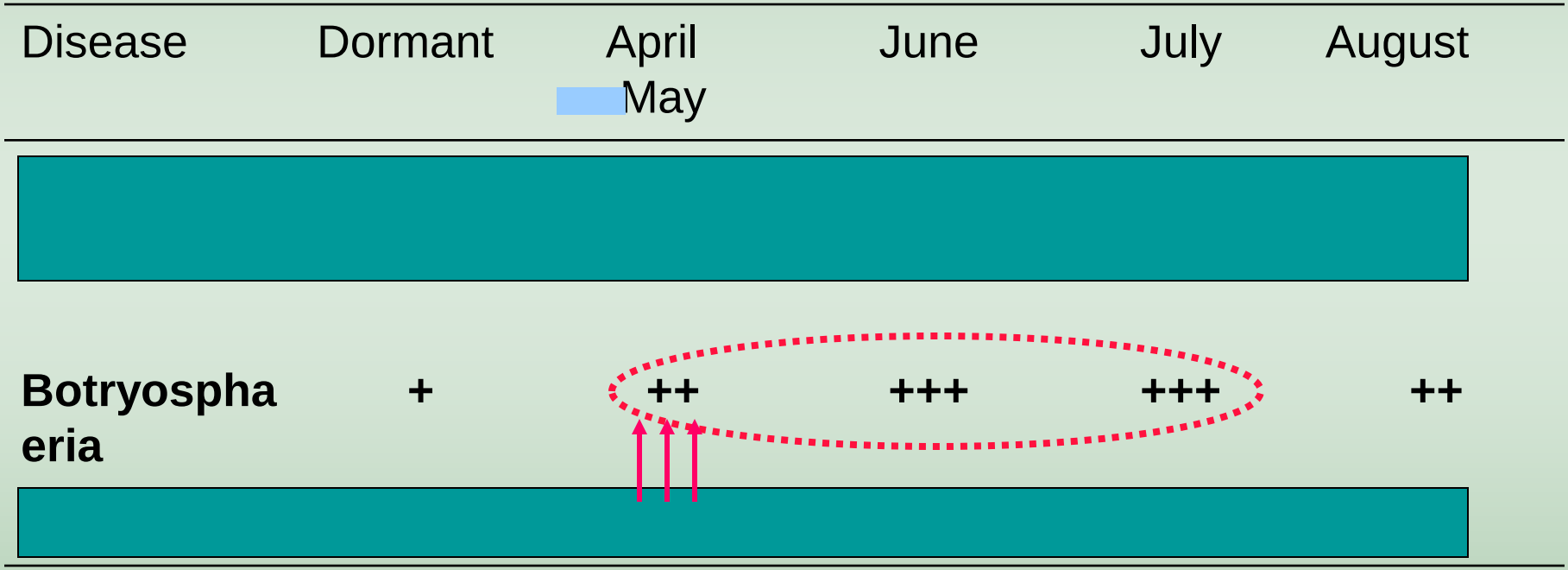
Botryosphaeria blight control – 2010



Most effective fungicides – 2010



PISTACHIO—Fungicide treatment timing



Source: http://www.ipm.ucdavis.edu
http://www.uckac.edu/plantpath

Take-home message

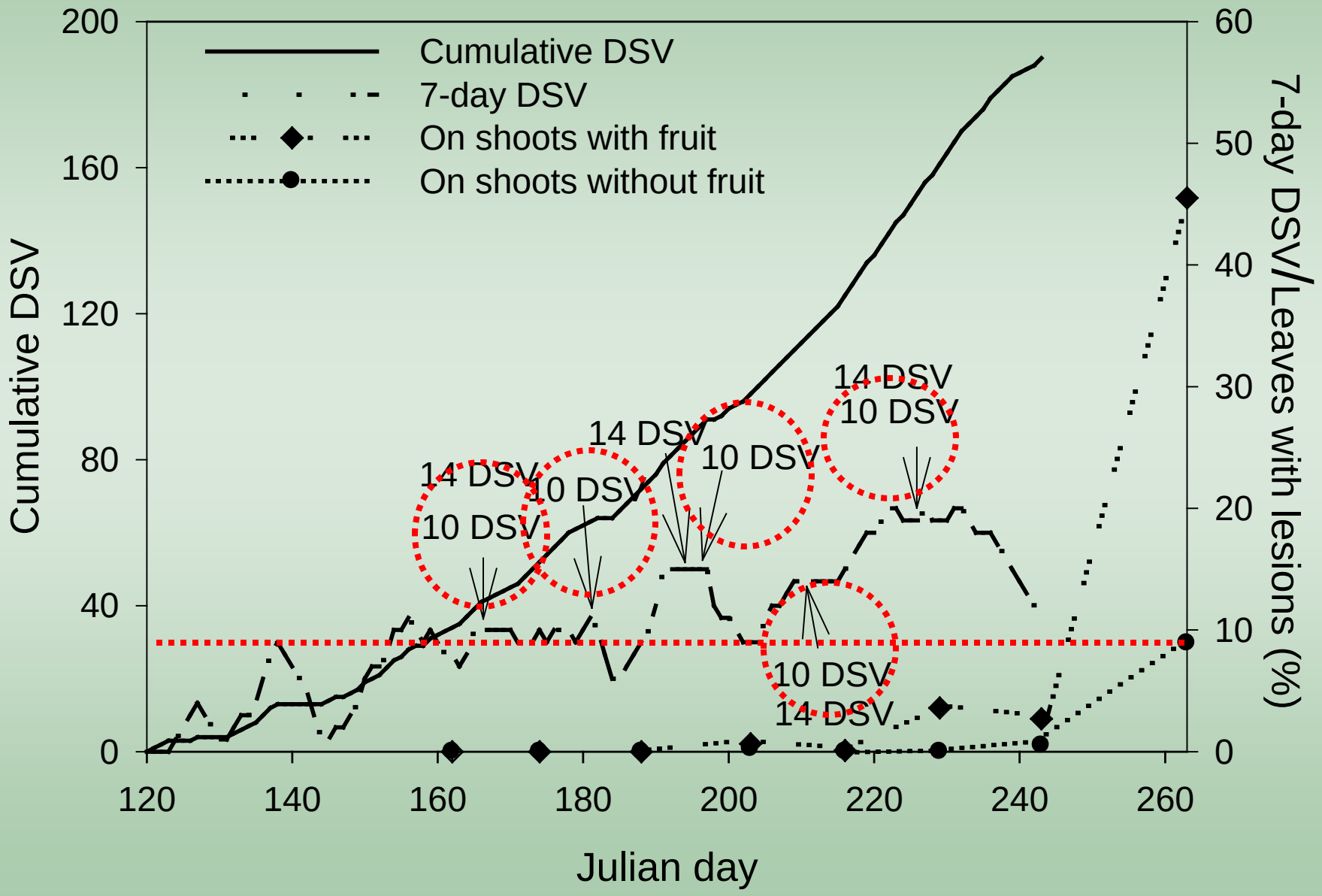
(It is important to diagnose the disease in the orchard correctly)

- **Monitor orchard frequently to determine any arrival of inoculum.**
- **If there is no *Botryosphaeria* inoculum in your orchard, disease will not develop.**
- **If sanitation is not done, *Botryosphaeria* will accumulate in the orchard ("The Sleeping Dragon" syndrome).**
- **Rains in April, May & June trigger infection events that cause BOT blight (need to spray after rain events).**
- **Monitoring leaf wetness (LWM) is a great way to decide when and how many times to spray per season.**
- **Good news! no resistance; a number of effective fungicides!**

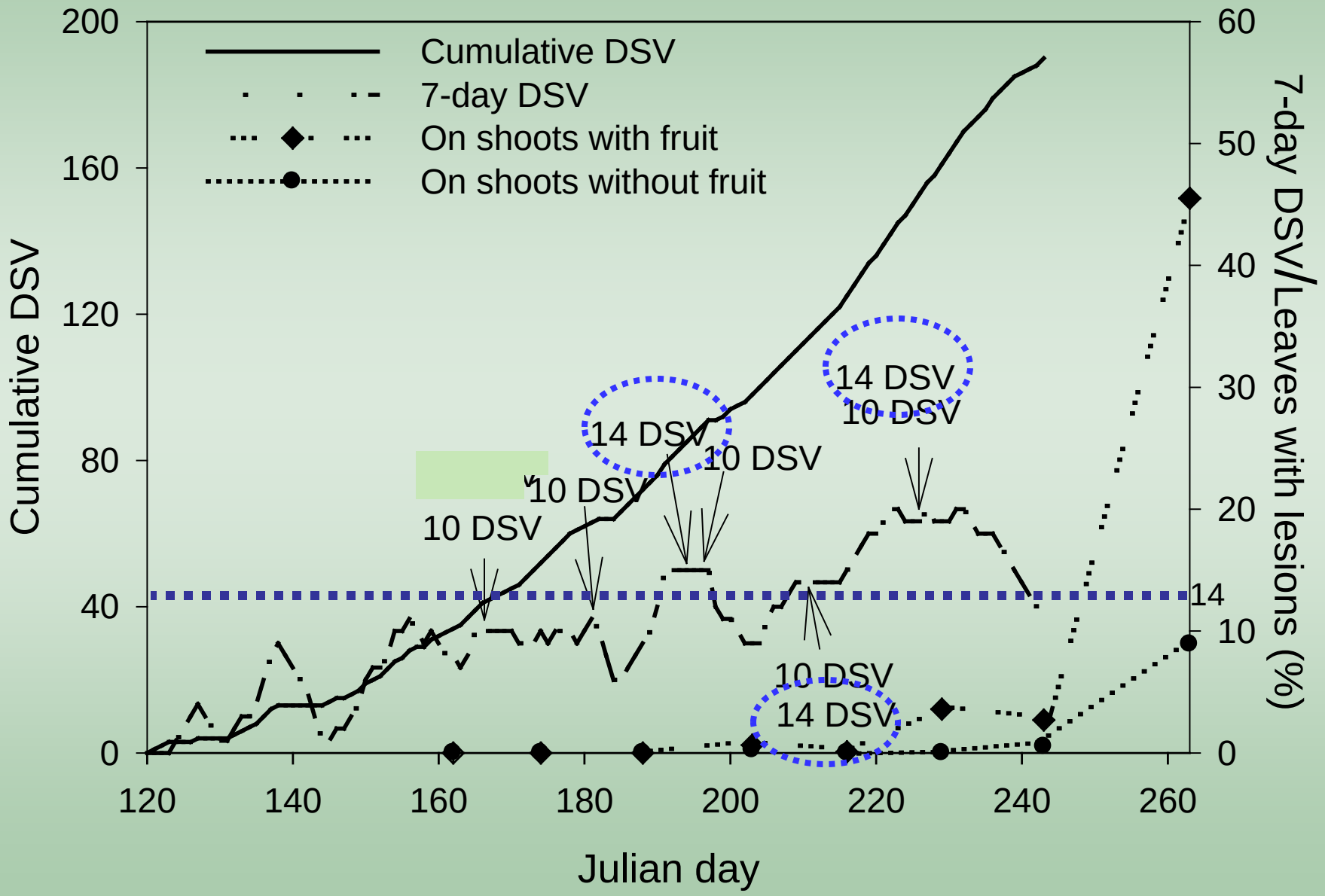
Acknowledgments:

- **David Morgan**
- **Ryan Puckett**
- **Heraclio Reyes**

Fresno County orchard -2010



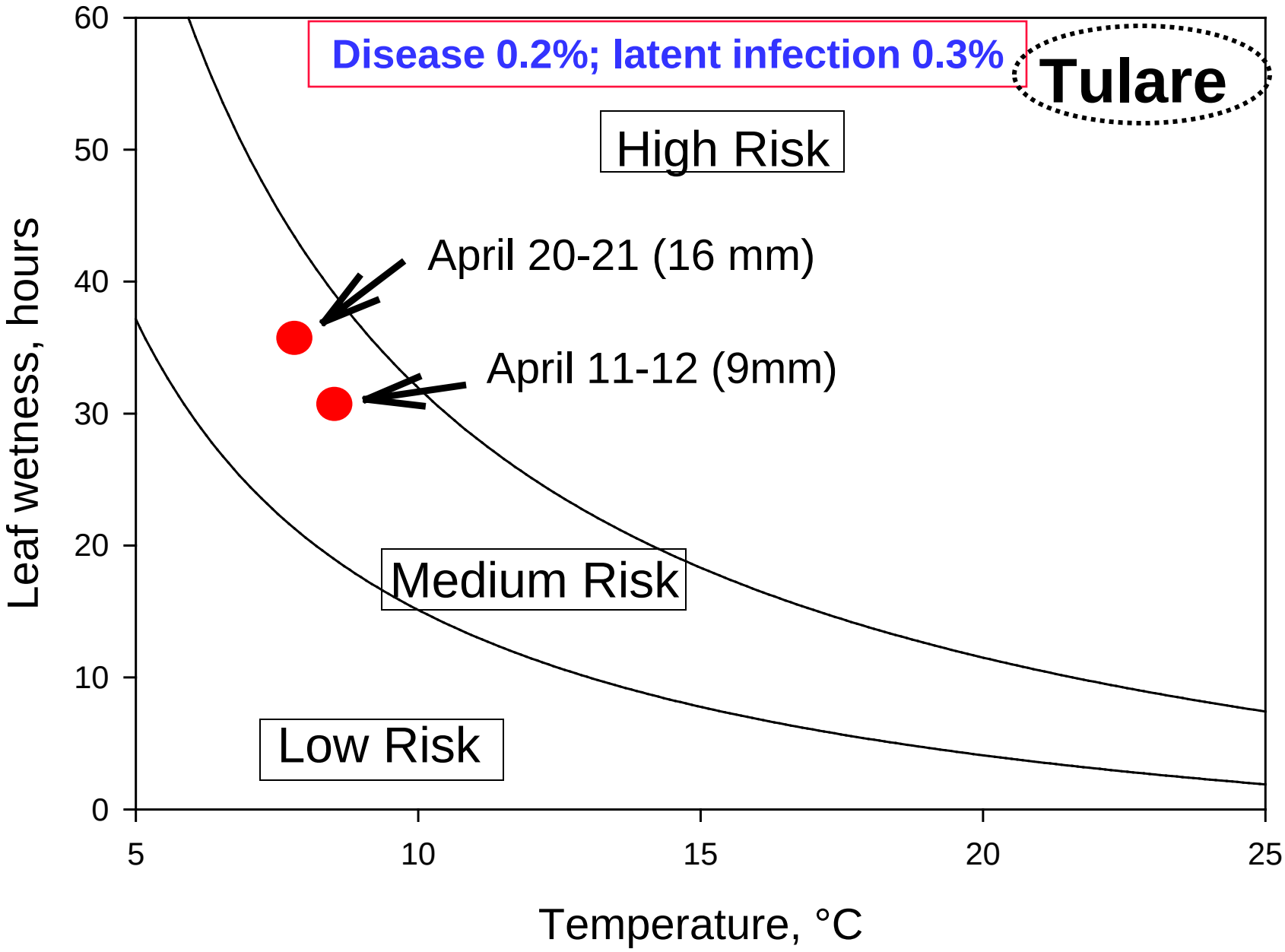
Fresno County orchard - 2010



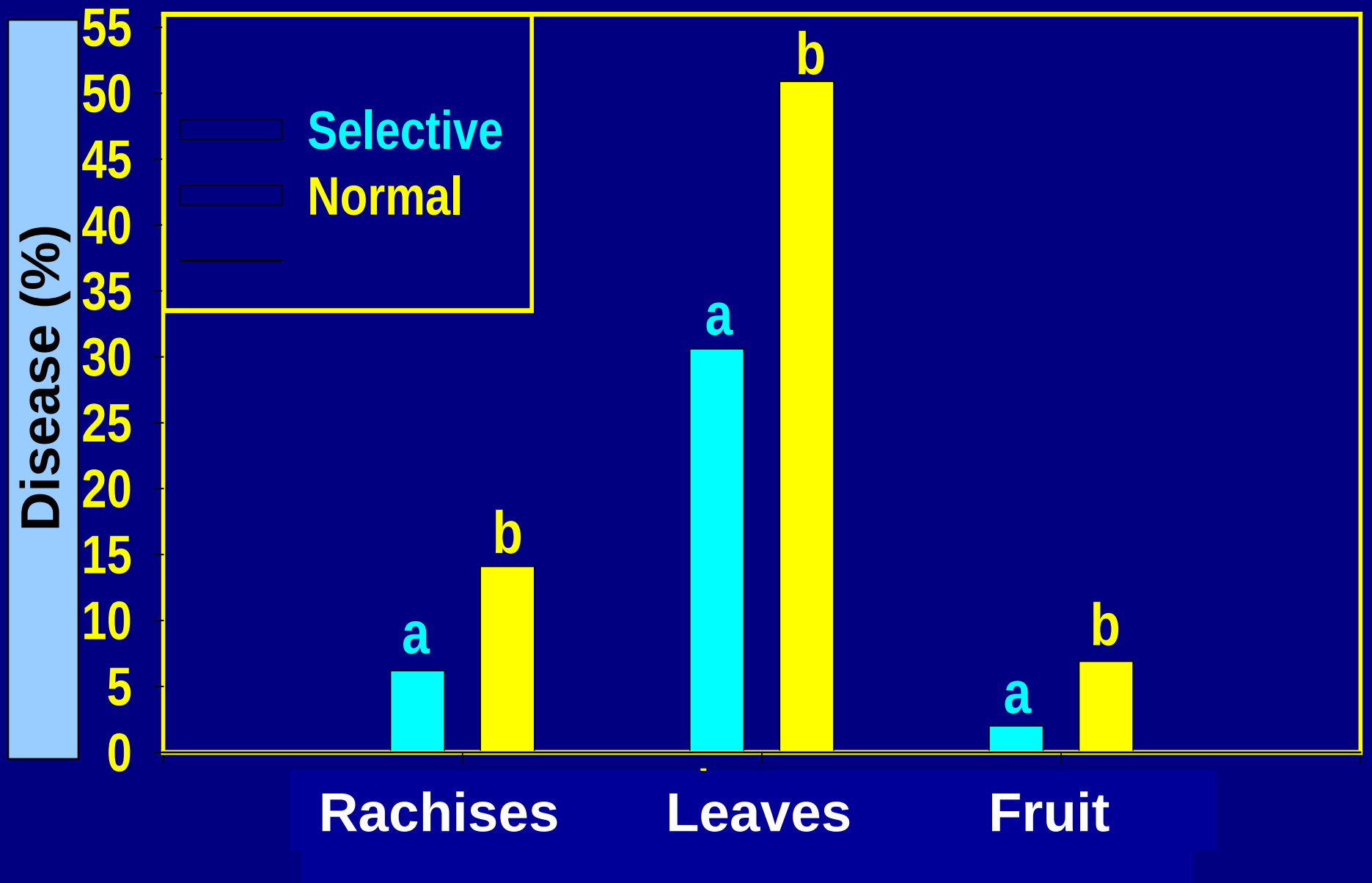
Monthly rain (mm) & Botryosphaeria blight (Glenn Co.)

Year	April	May	June	Blighted clusters
2005	37	66	58	52 %
2006	100	17	2	30 %
2007	24	7	9	8 %
2008	2	4	0	1 %
2009	9	13	12	60 %
2010	37	27	0	31 %

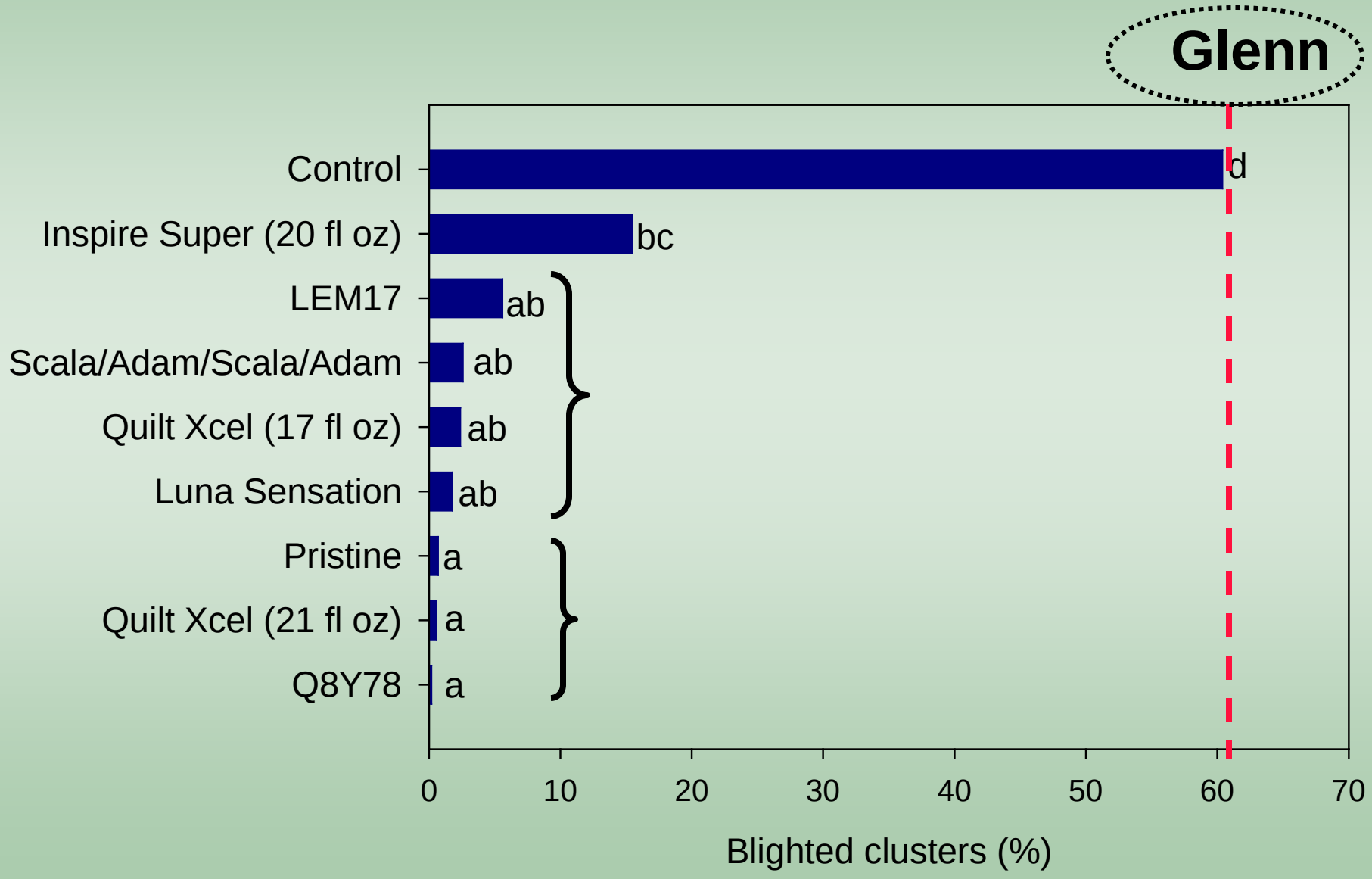
Medium risk infection events in 2010



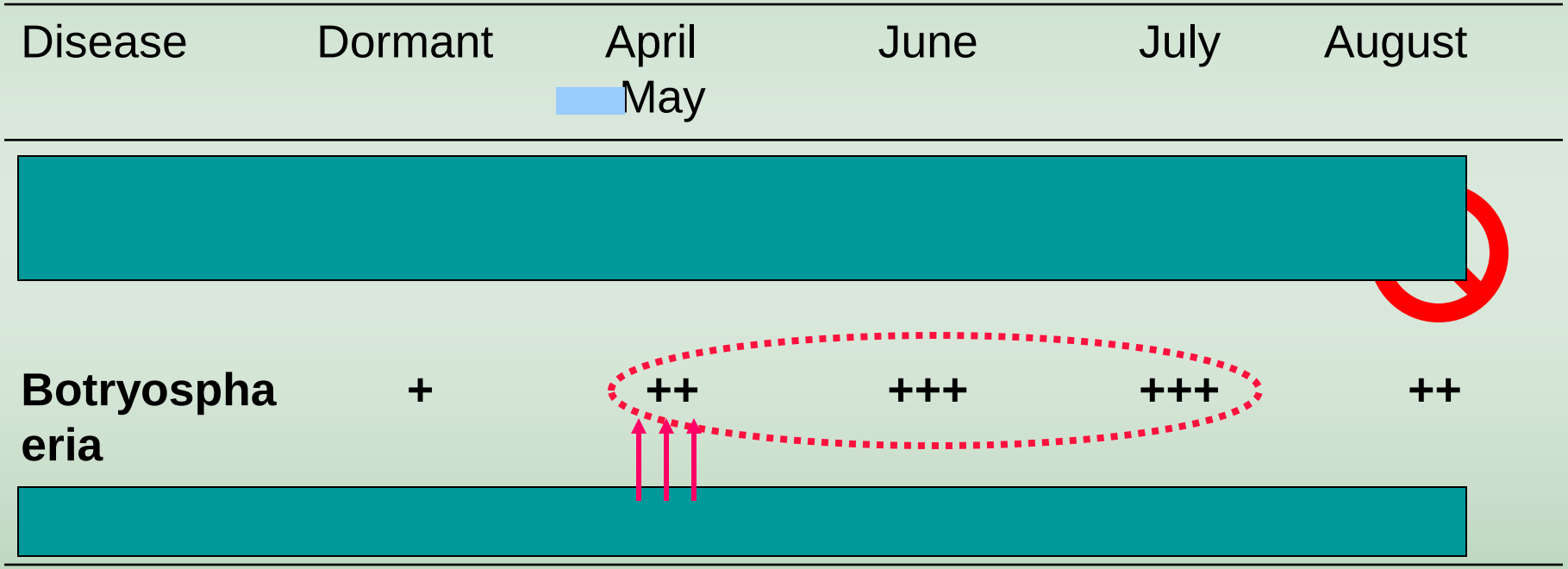
Selective=pruning of shoots / clusters with cankers



Botryosphaeria blight control – 2009



PISTACHIO—Fungicide treatment timing



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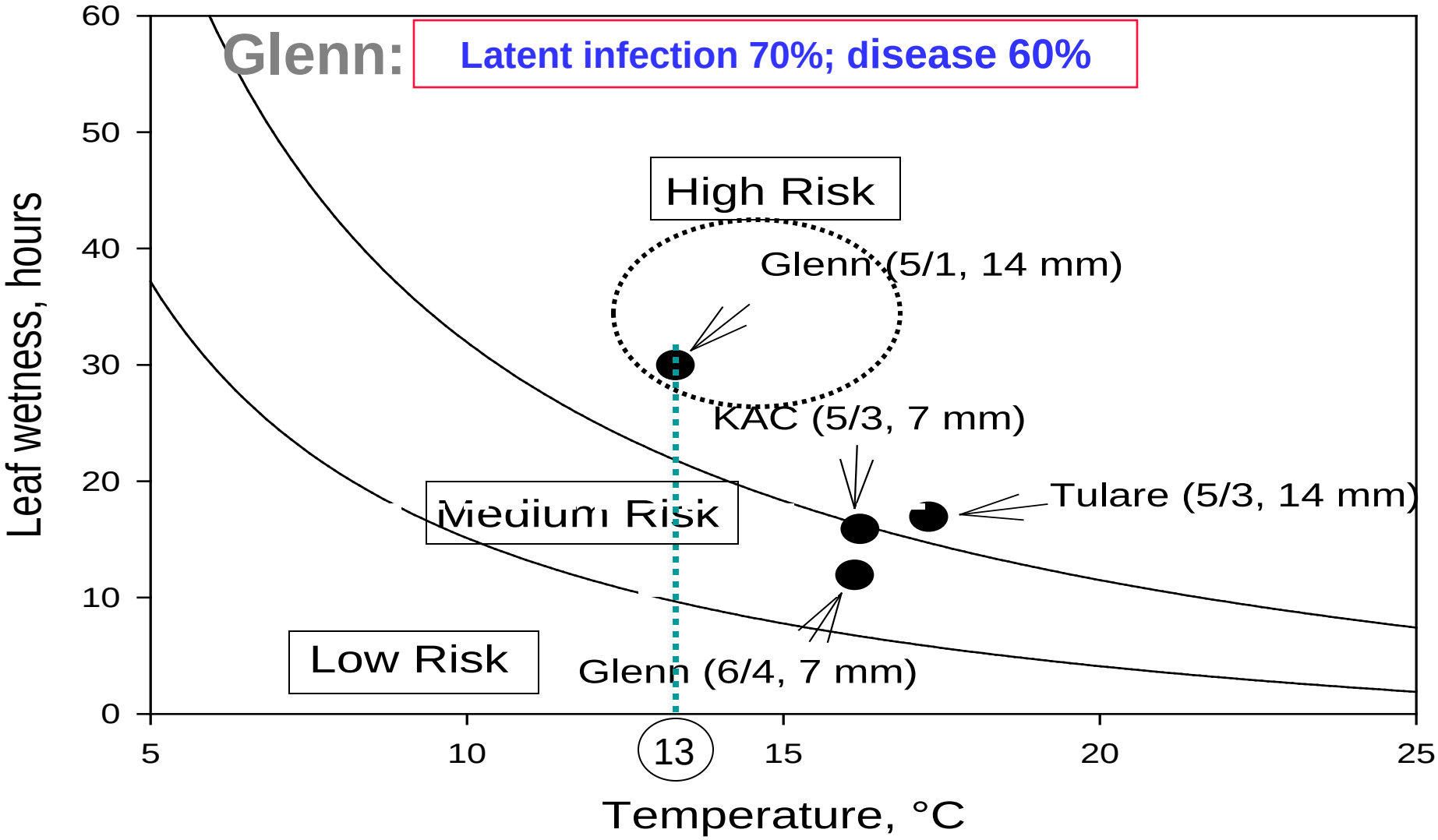
Medium and high risk infection events in 2009



Fungicide sprays based on disease models & Botryosphaeria blight