

Understanding the 2009 BOT Blowup: Management Guidelines for 2010

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Severe Botryosphaeria blight (1998)



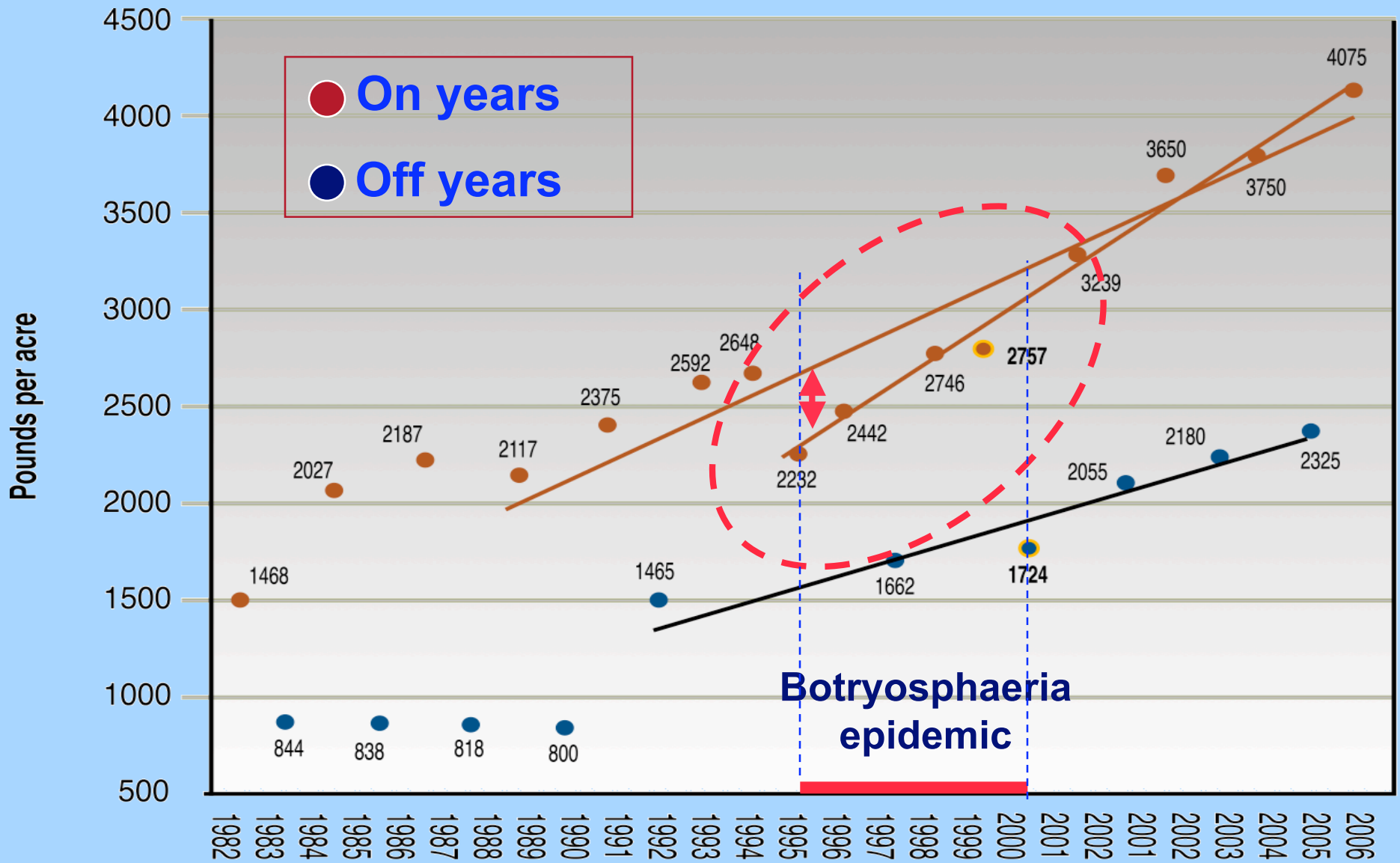
**Botryosphaeria blight
in 1998**



Major damage



Yields and Botryosphaeria blight



Botryosphaeriaceae from pistachio



Botryosphaeriaceae on pistachio:

Botryosphaeria dothidea

Neofusicoccum mediterraneum

Lasiodiplodia theobromae

Diplodia seriata

Botryosphaeria obtusa

California

Botryosphaeria obtusa

South Africa


Botryosphaeria dothidea

Neofusicoccum parvum

Greece

Botryosphaeriaceae on other hosts in California:

Botryosphaeria dothidea *
Neofusicoccum parvum *
Neofusicoccum mediterraneum *
Neofusicoccum nonquaesitum
Diplodia seriata *
Macrophomina phaseolina *
Dothiorella sarmentorum



Almond

* also on pistachio

Botryosphaeriaceae on other hosts in California

Botryosphaeria dothidea

Neofusicoccum parvum

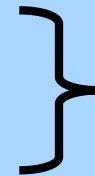
Neofusicoccum mediterraneum

Diplodia seriata



Walnut

7 Botryosphaeriaceae species



Grapes





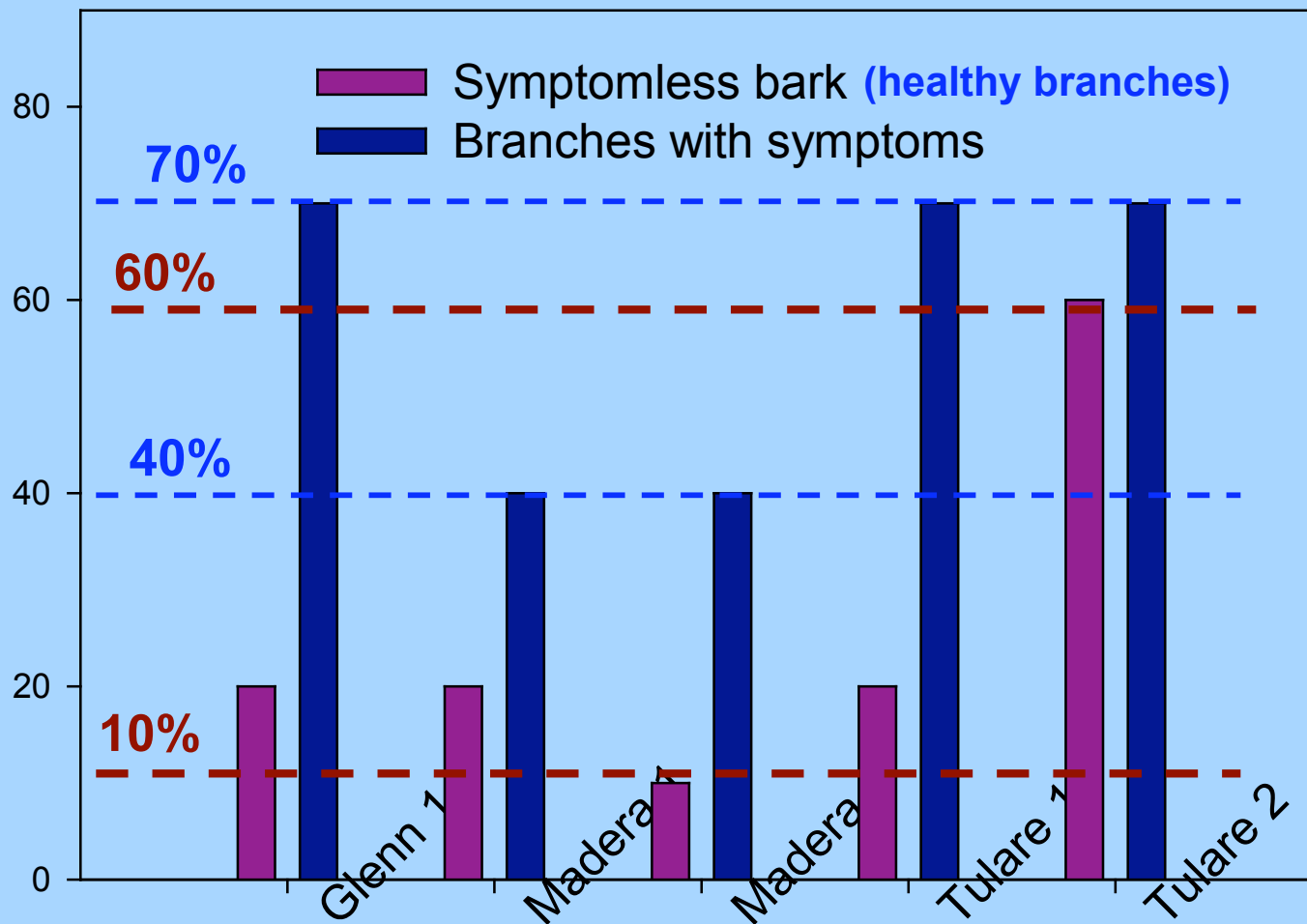




pycnidia of *Botryosphaeria*
in the bark



Incidence of *Botryosphaeria* from isolations of bark of pistachio branches



.....o r c h a r d s.....

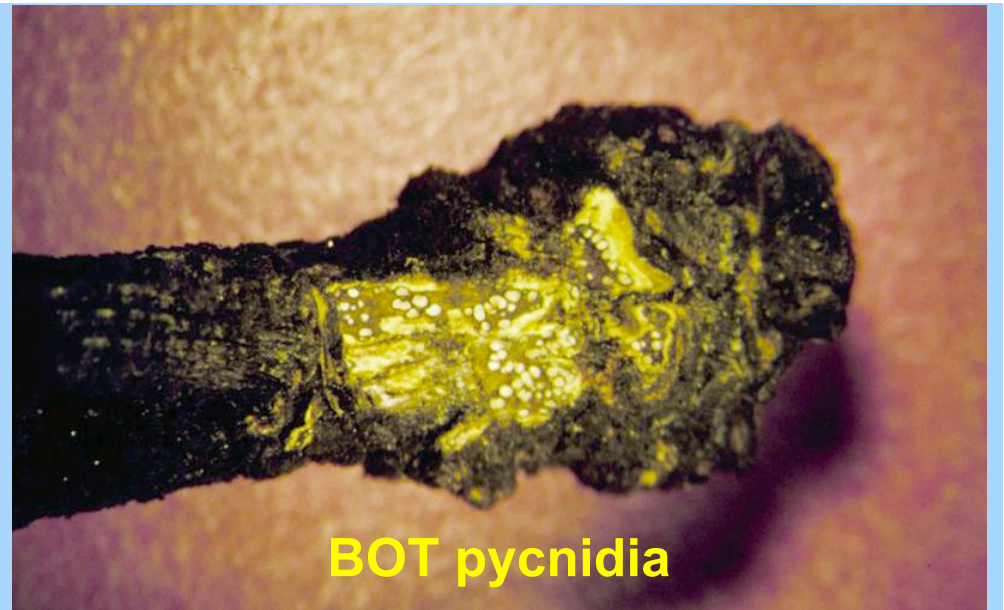
Riparian areas next to pistachios





In summary:

- ✓ More species of Botryosphaeriaceae fungi are involved in BOT blight of pistachio.
- ✓ These species are abundant among nut crops and other hosts in California.
- ✓ Spore inoculum builds up with time in older orchards.



Spore inoculum in pistachio orchards:

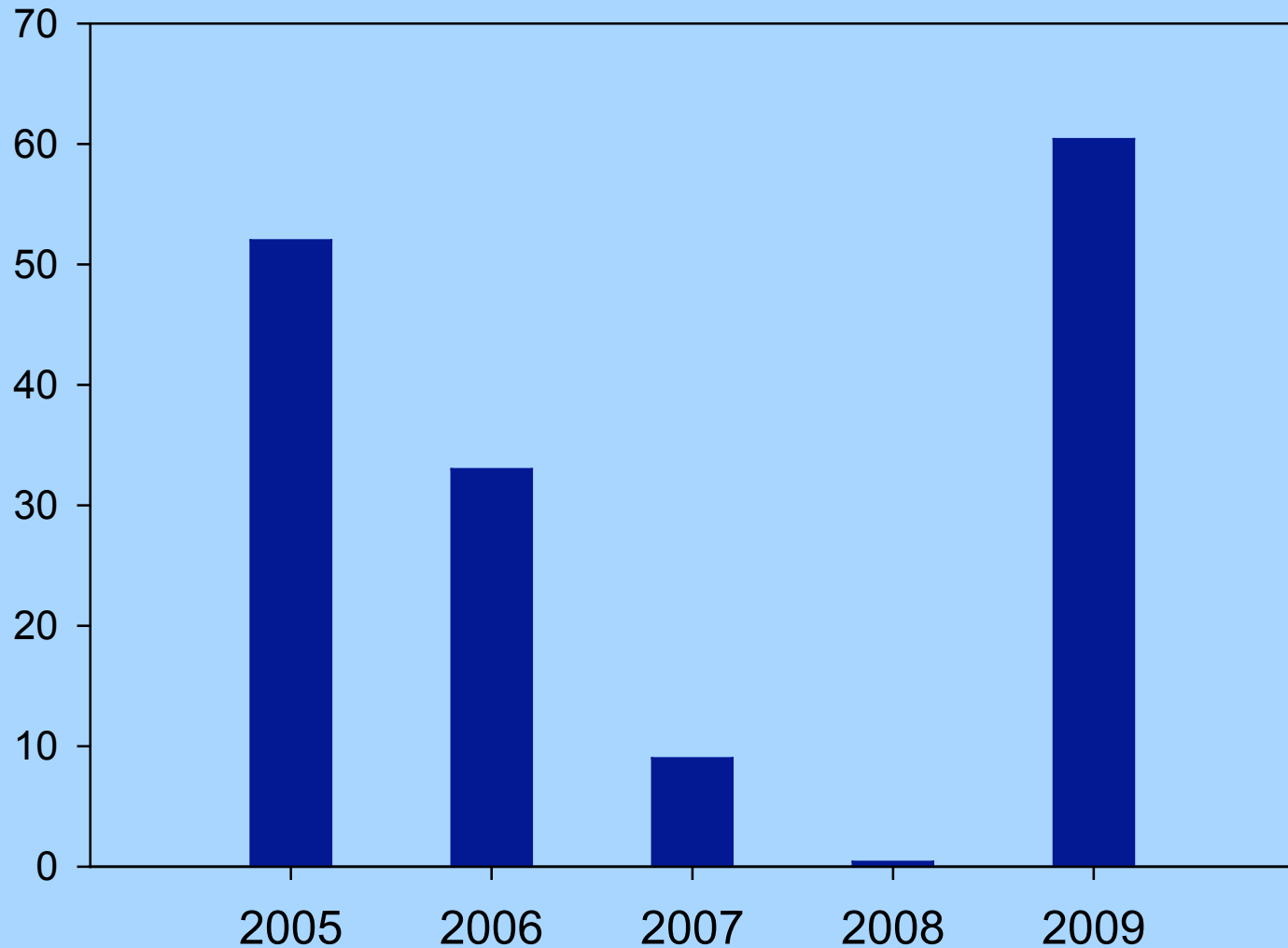
- ✓ Viable spores in pycnidia in old cankers and also in killed branches.**
- ✓ Spores accumulate also in the bark of healthy branches.**
- ✓ Inoculum does not seem to be a limiting factor for BOT disease.**

BOT is back!



The Sleeping Dragon Syndrome...

Botryosphaeria blighted clusters in untreated trees of an orchard in Glenn Co.

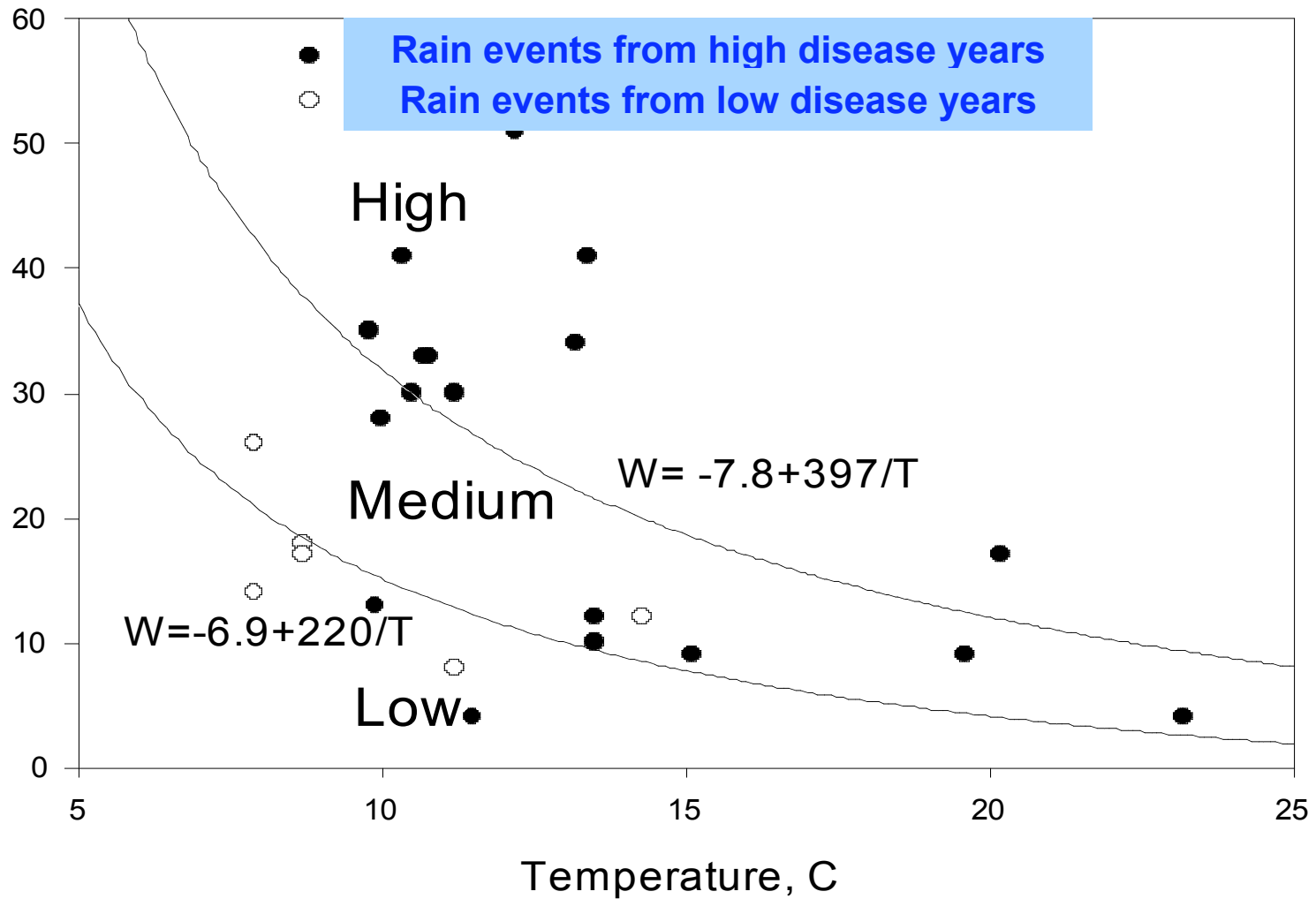


Total rain → **19"** **19"** **10"** **14"** **16"**

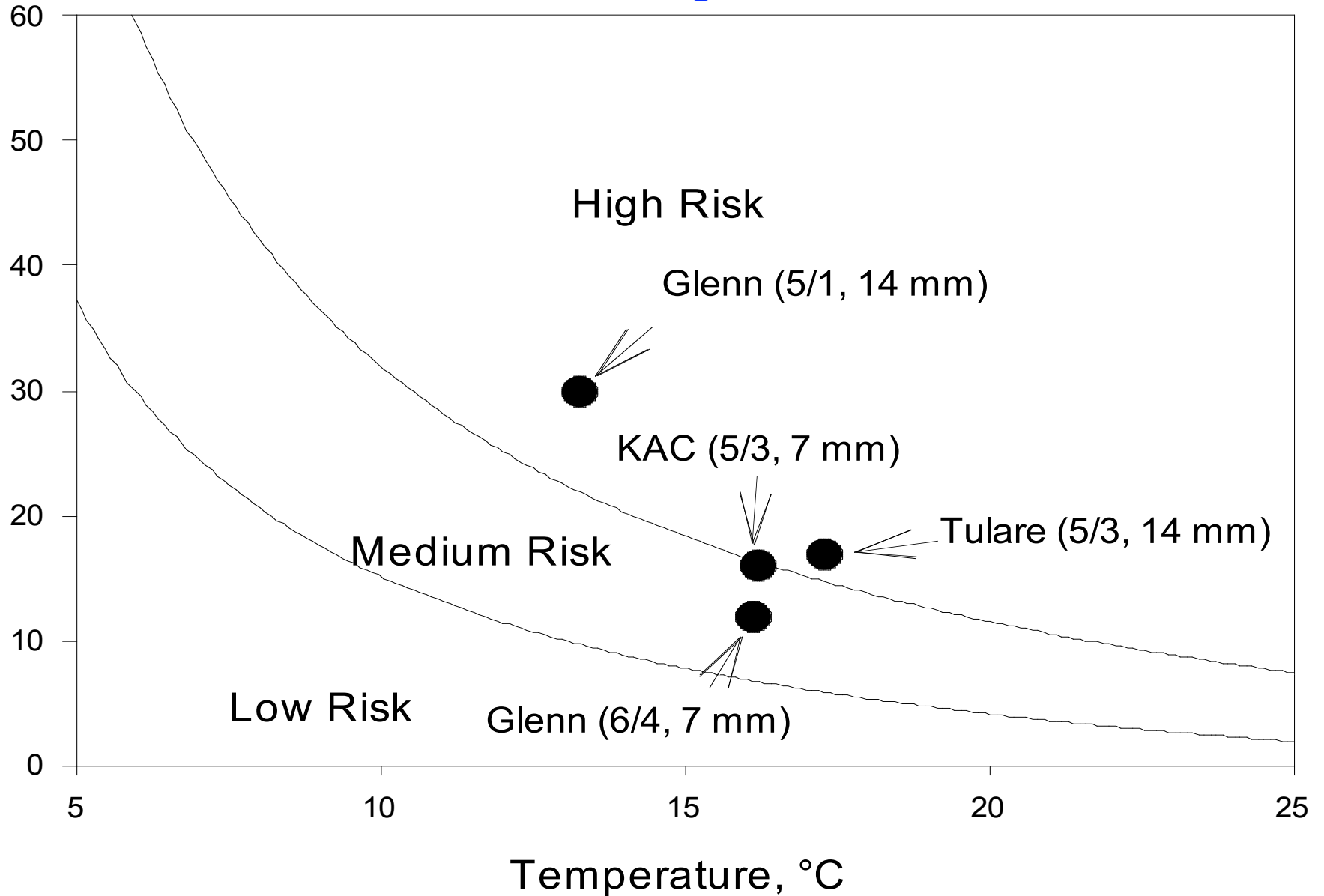
Monthly rain (mm) in a pistachio orchard in Glenn Co.

Year	April (mm)	May (mm)	June (mm)	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 %

Relative risk of infection of pistachio fruit by *B. dothidea* by wetness period (W) events and Temperature (T)



In 2009, medium and high risk infection events



Botryosphaeria spread

- ✓ moving water in the orchard ++++++*
- ✓ insect transmission (hemiptera) ++
- ✓ pollen +
- ✓ pruning equipment ++

*late rain(s)

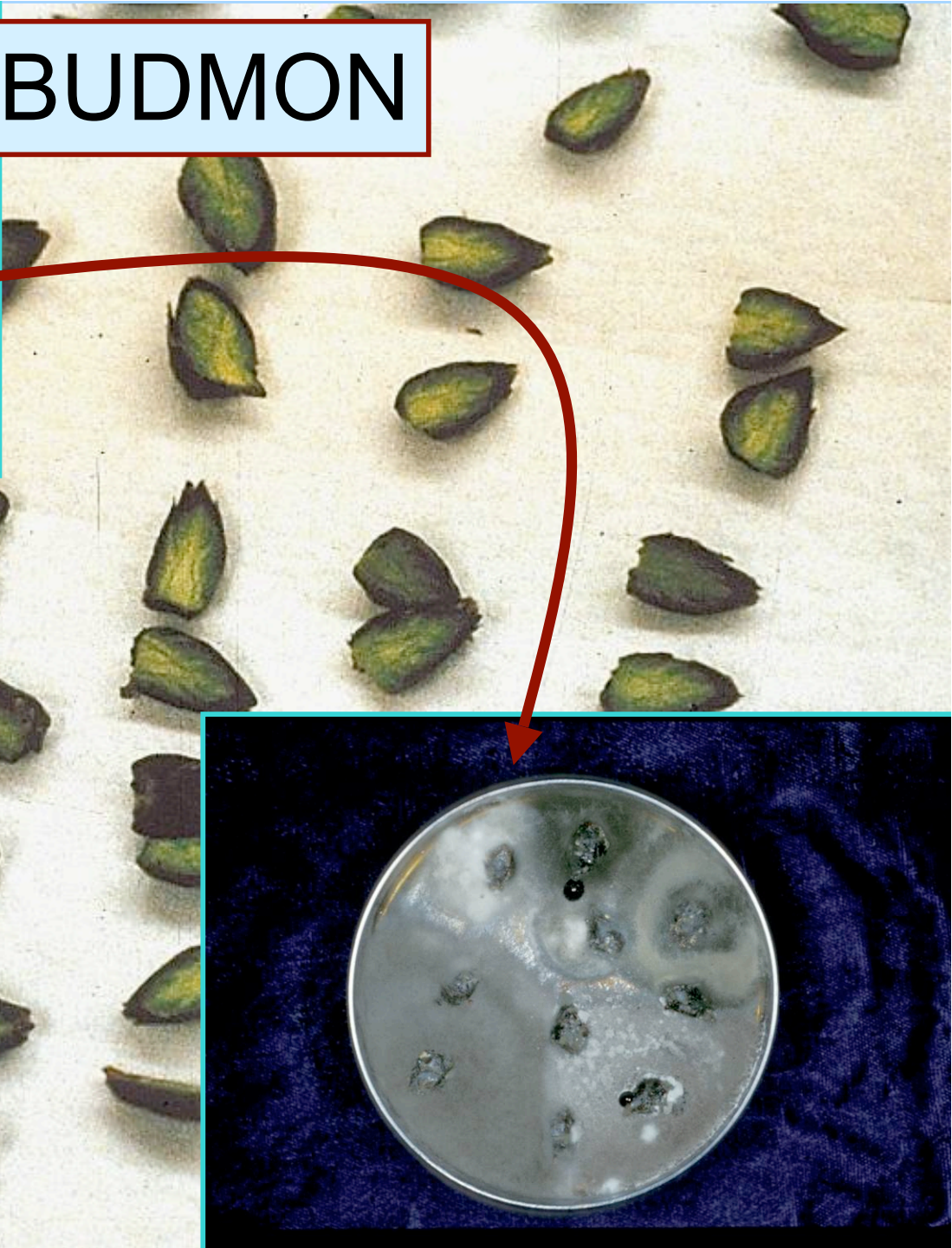
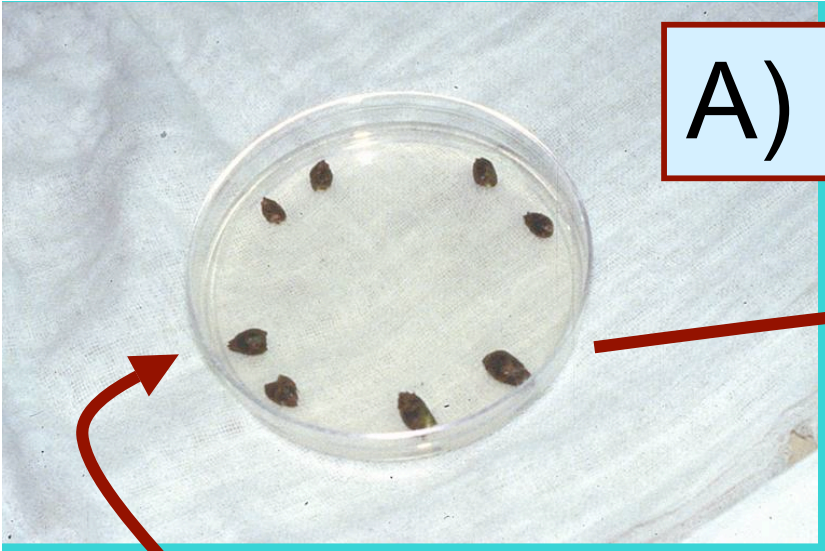


Techniques for monitoring the pathogen in latent infections:

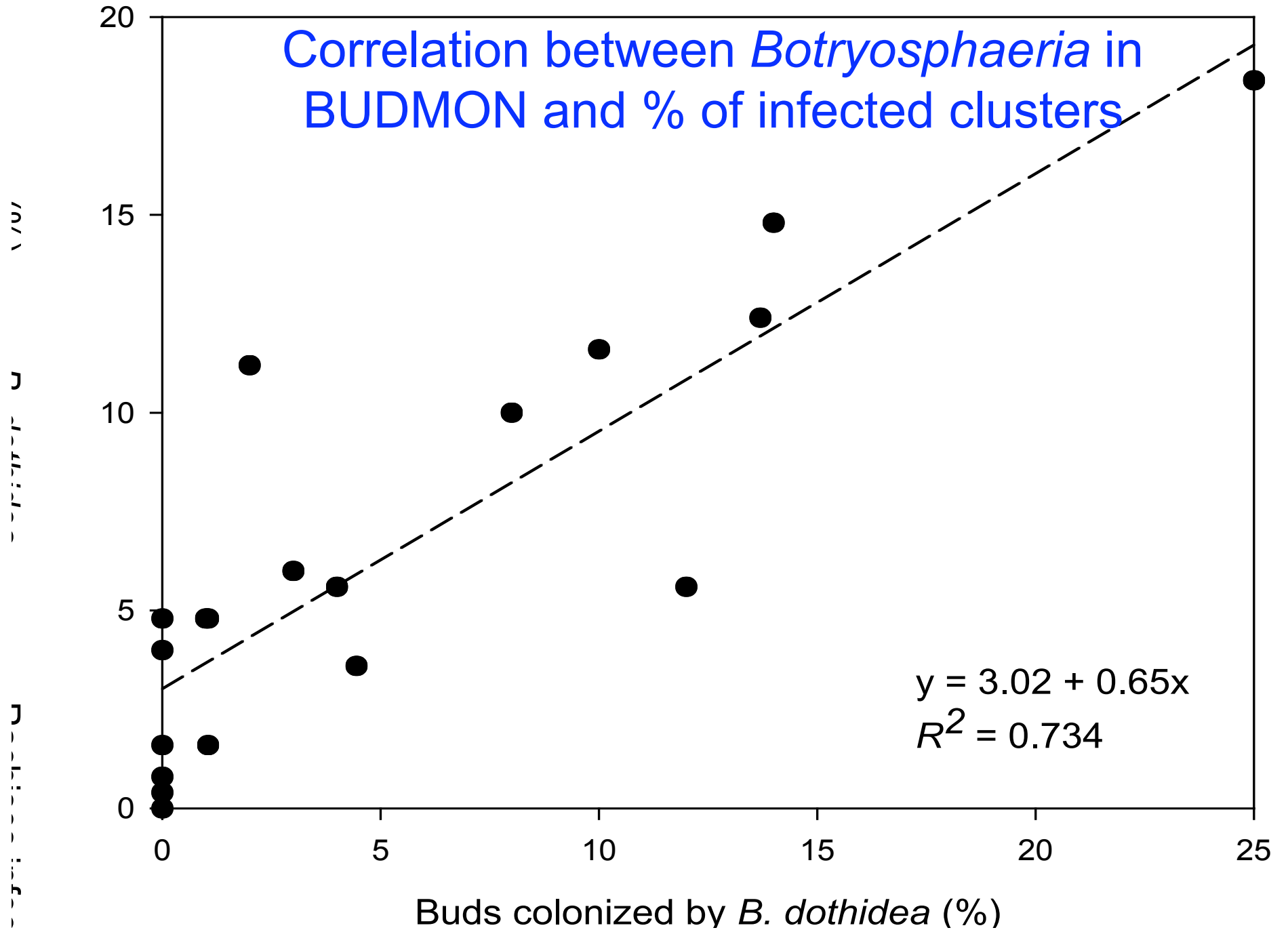
- ✓ A) Bud Monitoring for *Botryosphaeria* (BUDMON) ...**preseason (Feb-March)**
- ✓ B) Overnight Freezing Incubation Technique (ONFIT) --- **during the season (June)**

Risk: ✓ how much BOT in the orchard
✓ how much disease you expect

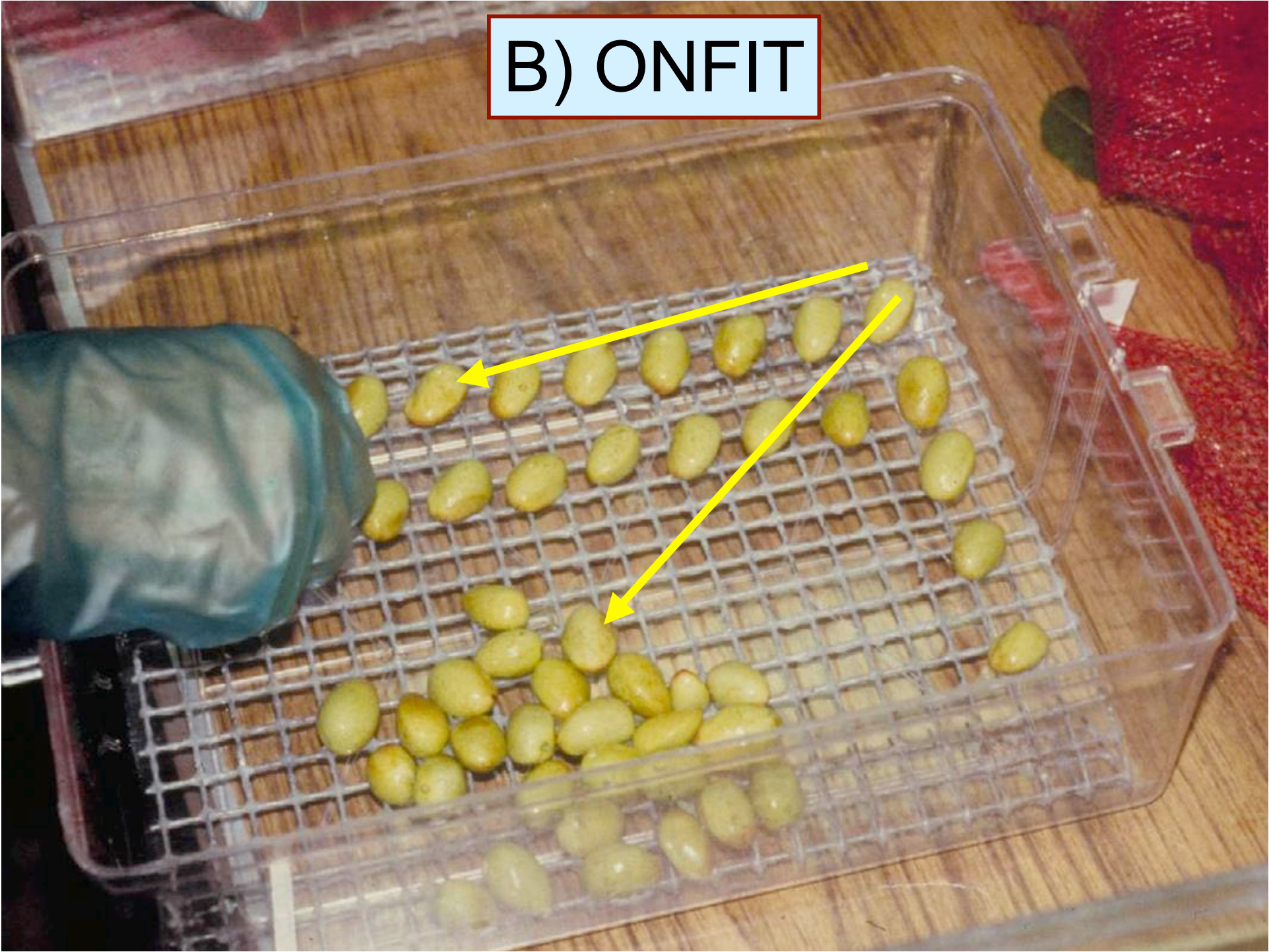
A) BUDMON



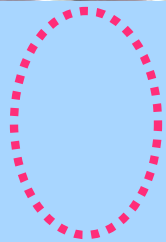
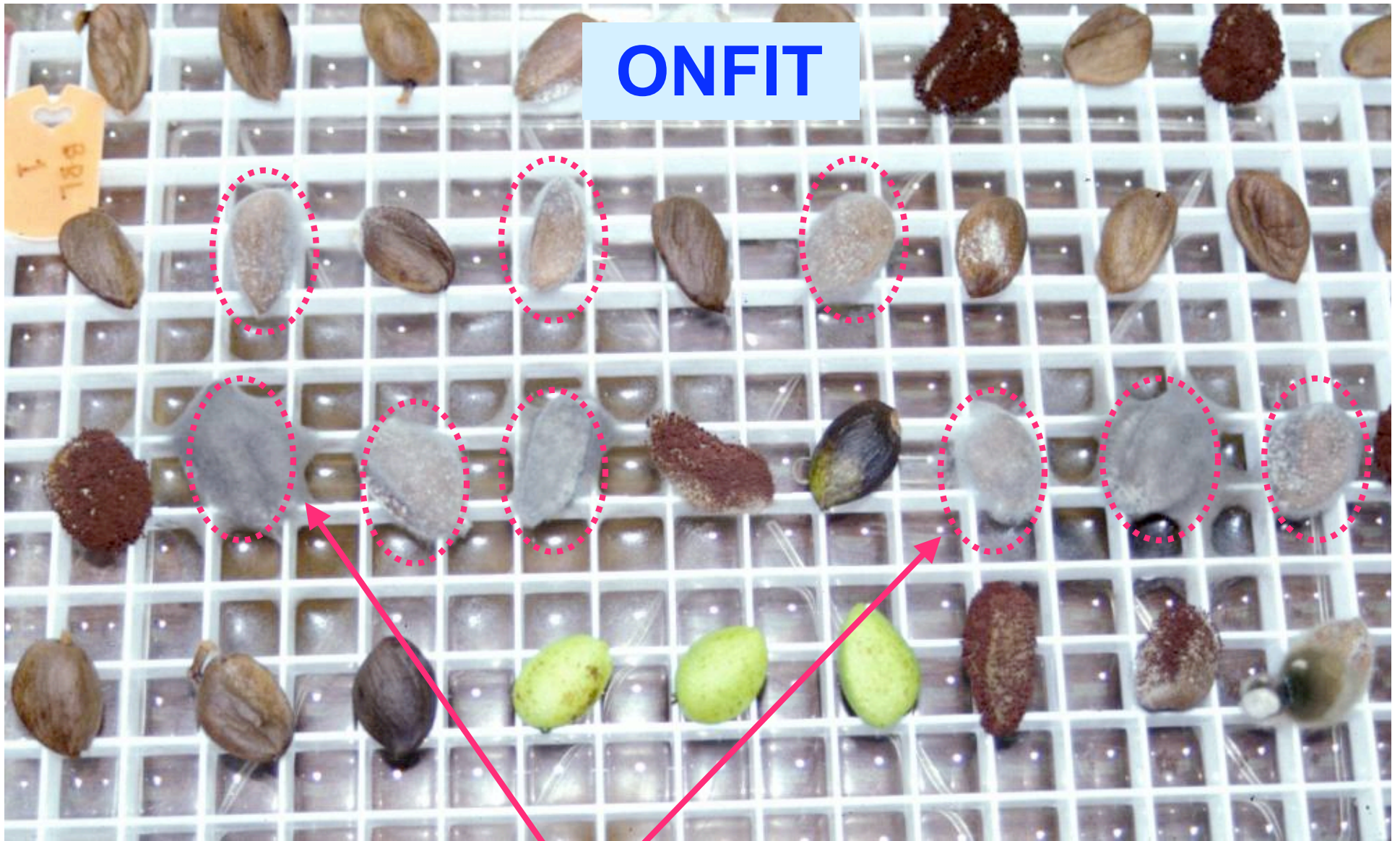
Correlation between *Botryosphaeria* in BUDMON and % of infected clusters



B) ONFIT

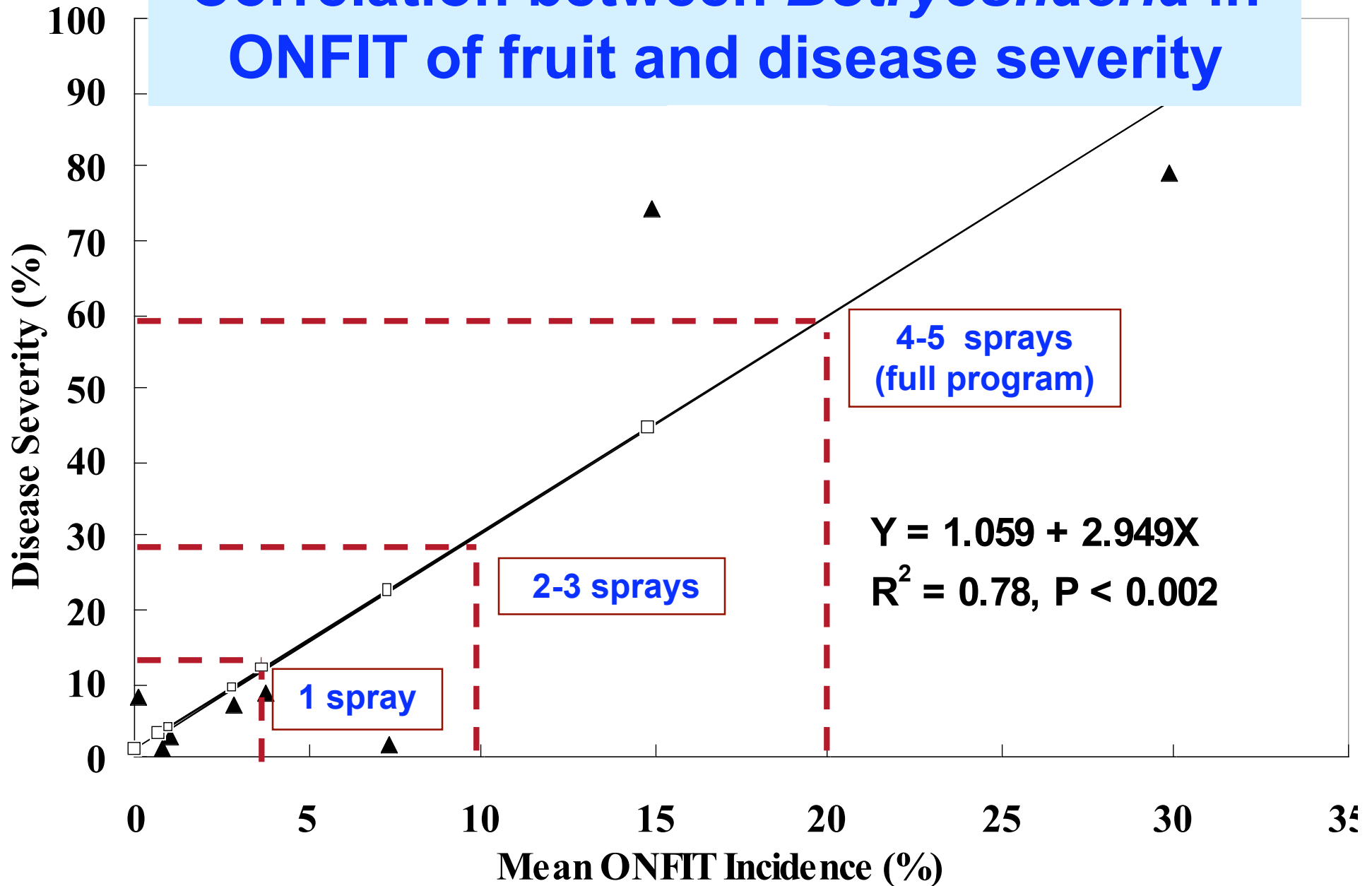


ONFIT



=Nuts with *Botryosphaeria*

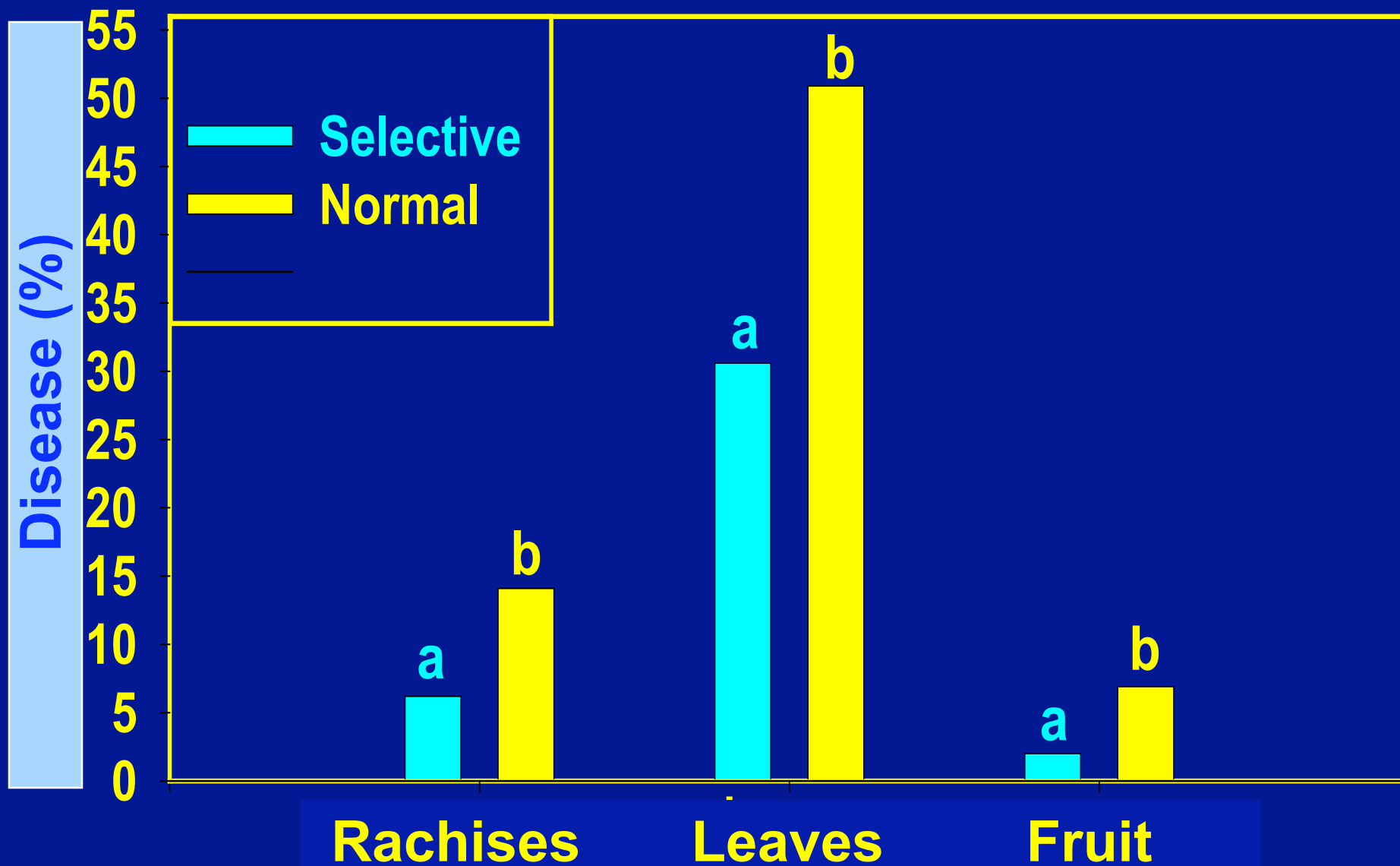
Correlation between *Botryosphaeria* in ONFIT of fruit and disease severity





1. Sanitation: winter pruning

Selective=pruning of shoots / clusters with cankers



Summer pruning - removal of prunings





2. Control hemiptera bugs

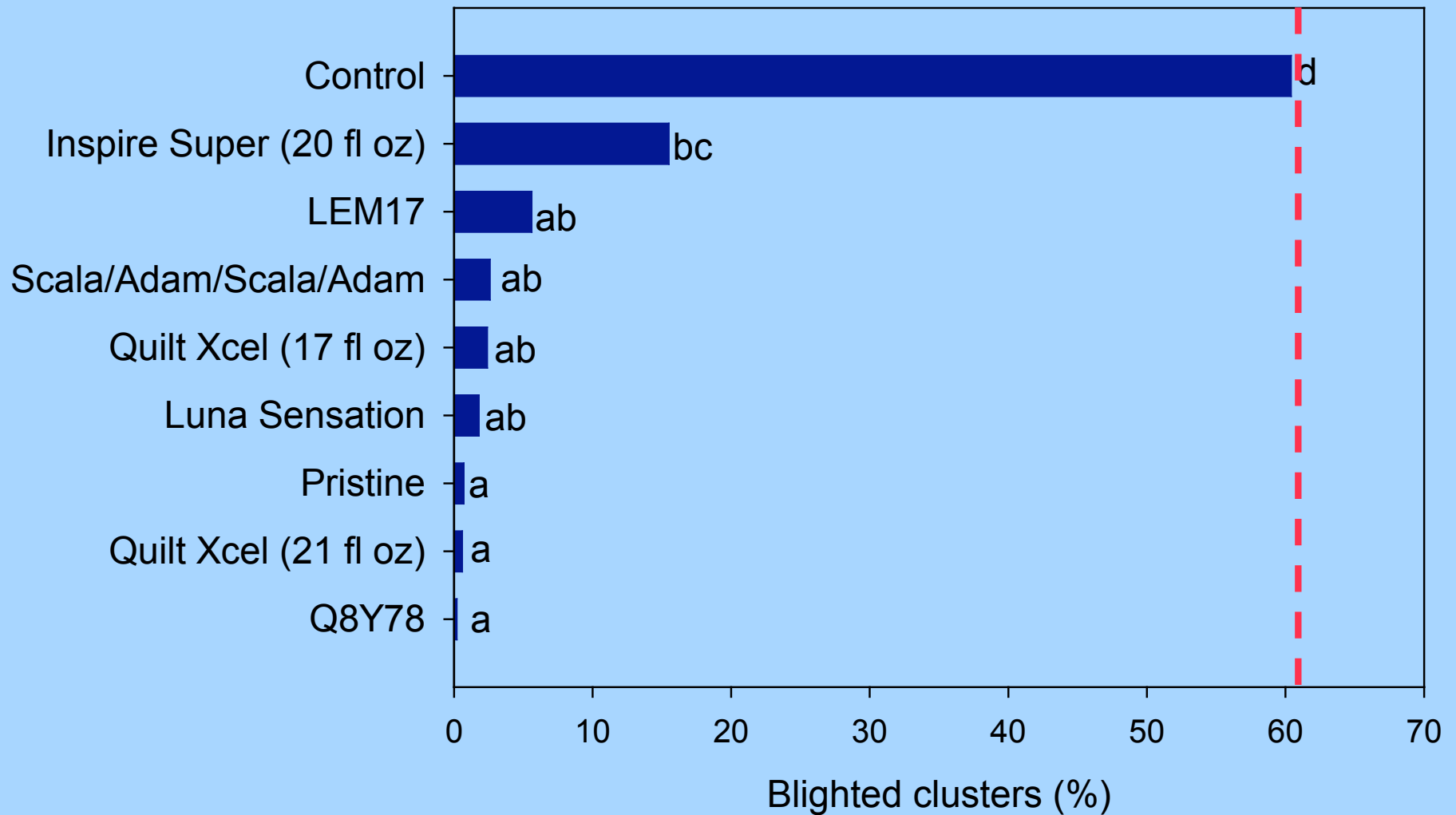




3. Chemical Control: Fungicide efficacy

Fungicide	Resistance risk (FRAC#)	Alternaria	Botrytis	BOT
<u>Abound</u>	high (11)			<u>+++</u>
Bravo	low (M5)			++
<u>Cabrio</u>	high (11)			<u>+++</u>
Echo	low (M5)			NR
Elevate	high (17)			ND
Tilt	High (3)			++
<u>Flint/Gem</u>	high (11)			<u>+++</u>
Pristine	high (7/11)			++++
<u>Scala</u>	high (9)			<u>+++⁷</u>
Switch	high (9/12)			++
Topsin-M	high (1)			++
Quash	high (3)			++
Liquid Sulfur	low (M2)			+/-

Most effective fungicides – Glenn Co. (2009)



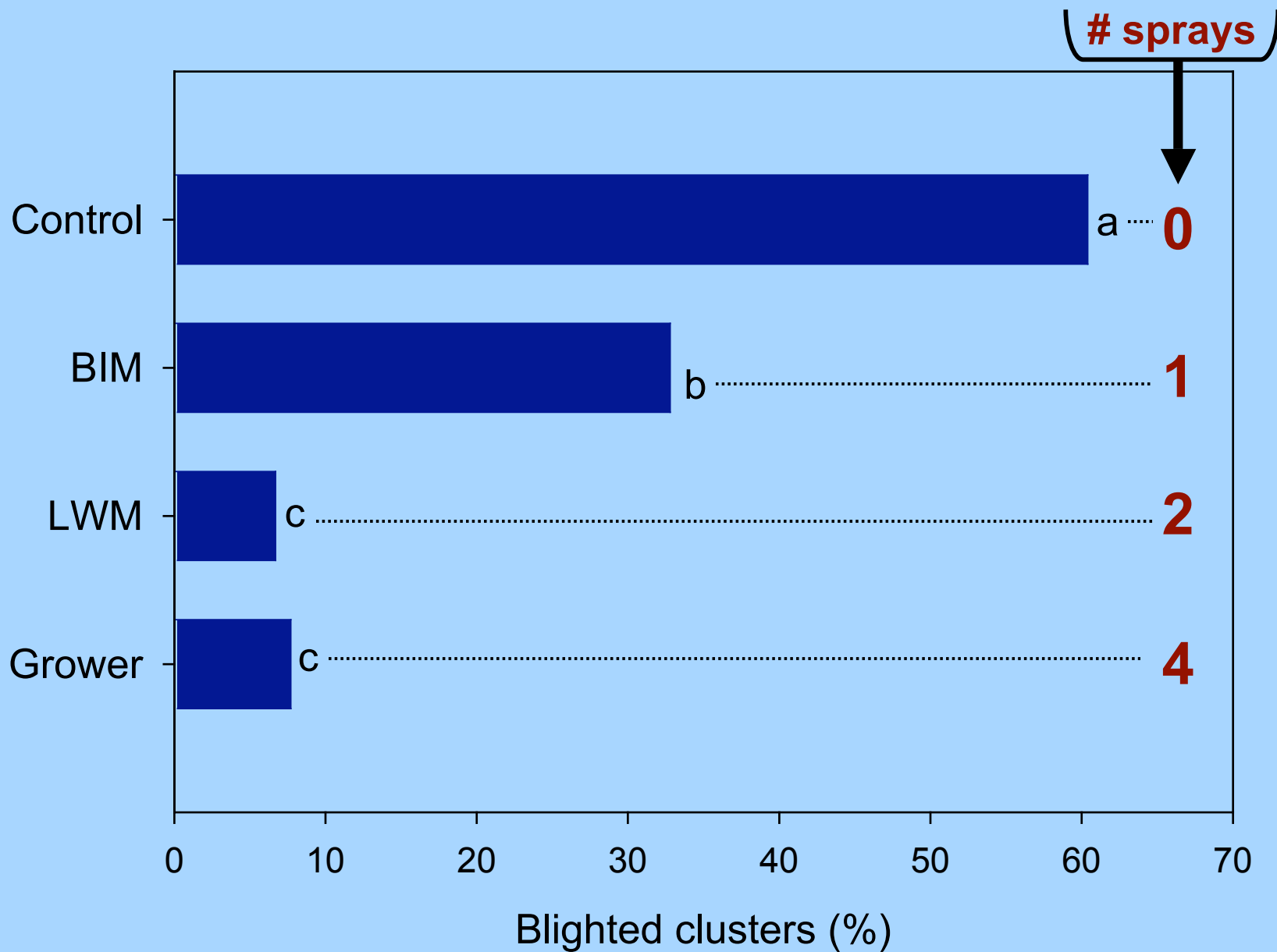
PISTACHIO—Fungicide treatment timing

Disease	Dormant	April May	June	July	August
Alternaria	----	----	+++	+++	++
BOT	+	++	+++	+++	++
Botrytis	----	+++	----	----	----

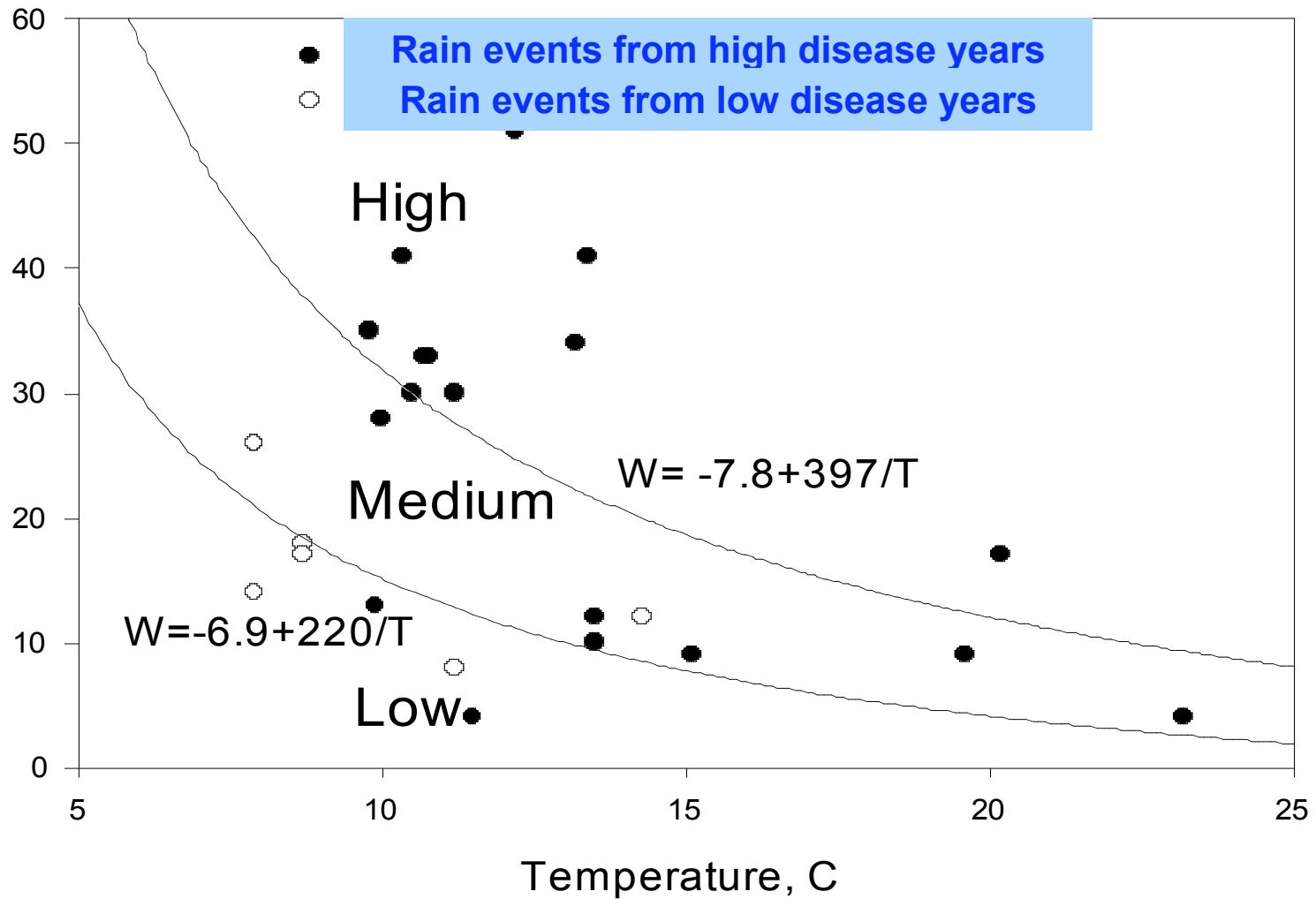
Source: <http://www.uckac.edu/plantpath/>



Fungicide sprays based on disease models



Relative risk of infection of pistachio fruit by *B. dothidea* by wetness period (W) events and Temperature (T)



Take-home message

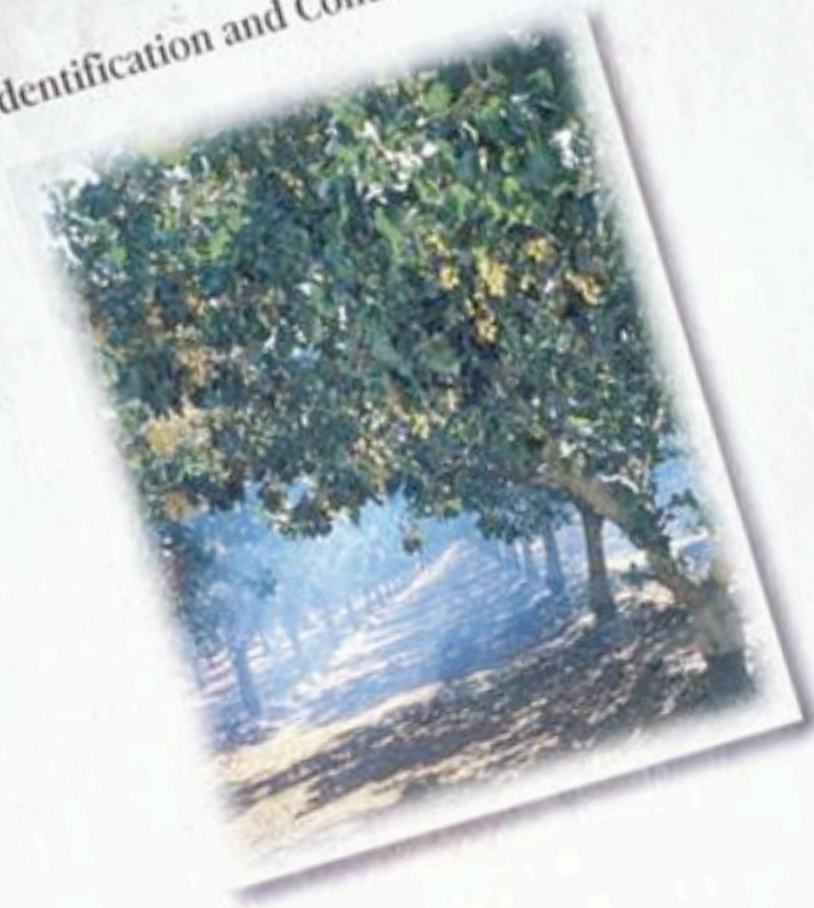
- Fungi of **Botryosphaeriaceae** accumulate in the bark of older trees (The Sleeping Dragon).
- If you do not have Botryosphaeria inoculum in your orchard, then you will have no disease.
- Rains in May & June with warm temperatures trigger infection events that cause BOT blight.
- Monitoring leaf wetness and Temperature (LWM) is a great way to decide when and how many times to spray to manage BOT blight.

BOT Management Guidelines

- ✓ Learn what “BOT” looks like
- ✓ Watch your orchard carefully
- ✓ Consider bud monitoring in Feb/March***
- ✓ Consider ONFIT at end of rainy season***
- ✓ If “BOT” appears act immediately
- ✓ Prune out infections (summer pruning)
- ✓ Evaluate your irrigation system
- ✓ Apply fungicides***
- ✓ Practice selective pruning (fall/winter pruning)

BOTRYOSPHERIA
BLIGHT OF PISTACHIO

Identification and Control Manual



October-November
Fall

Year Round Symptoms

Early Summer
(June-July)

Spring
(March-April)

Winter
(December-February)



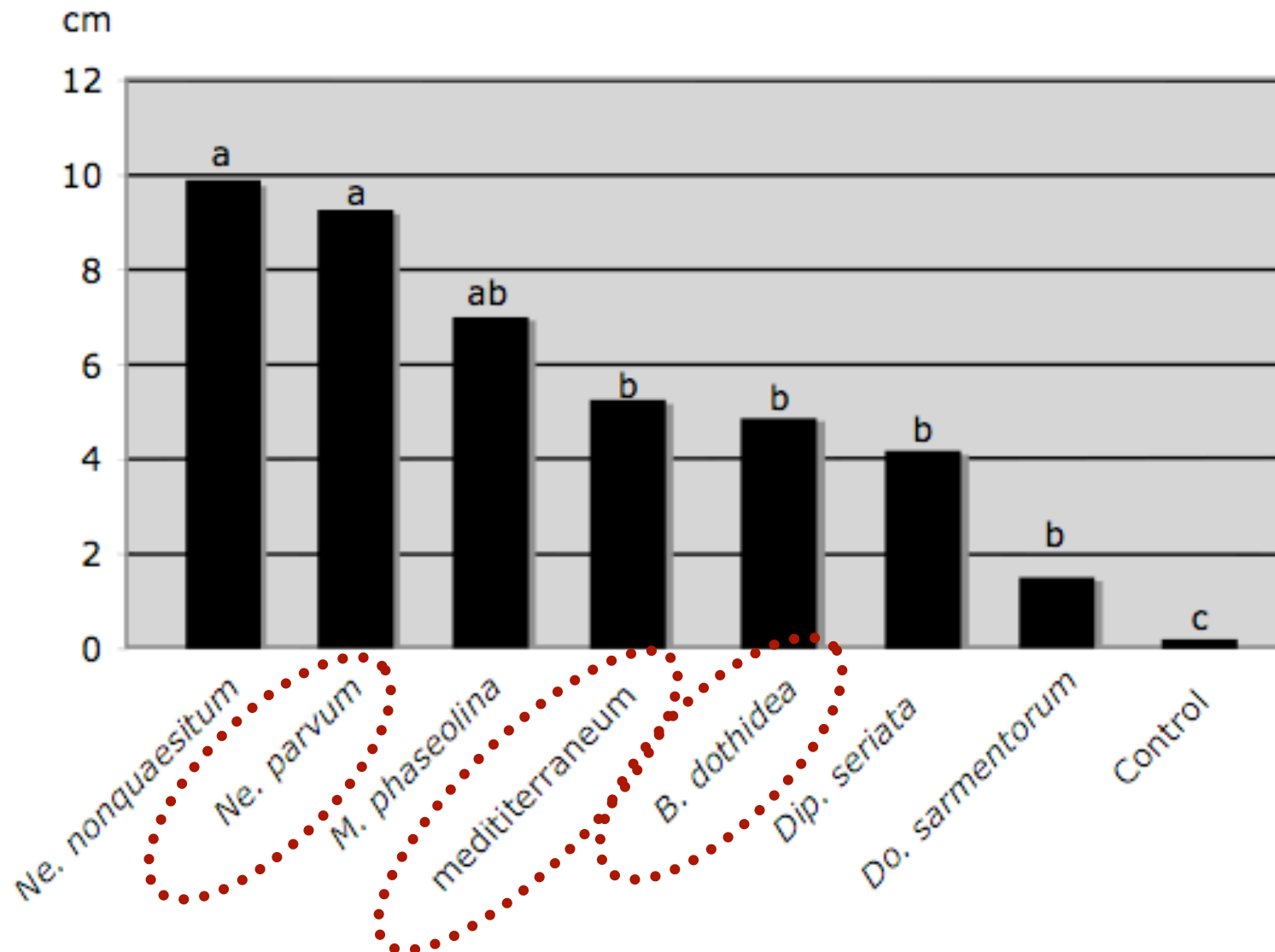
Acknowledgments:

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- **Jessica Windt**

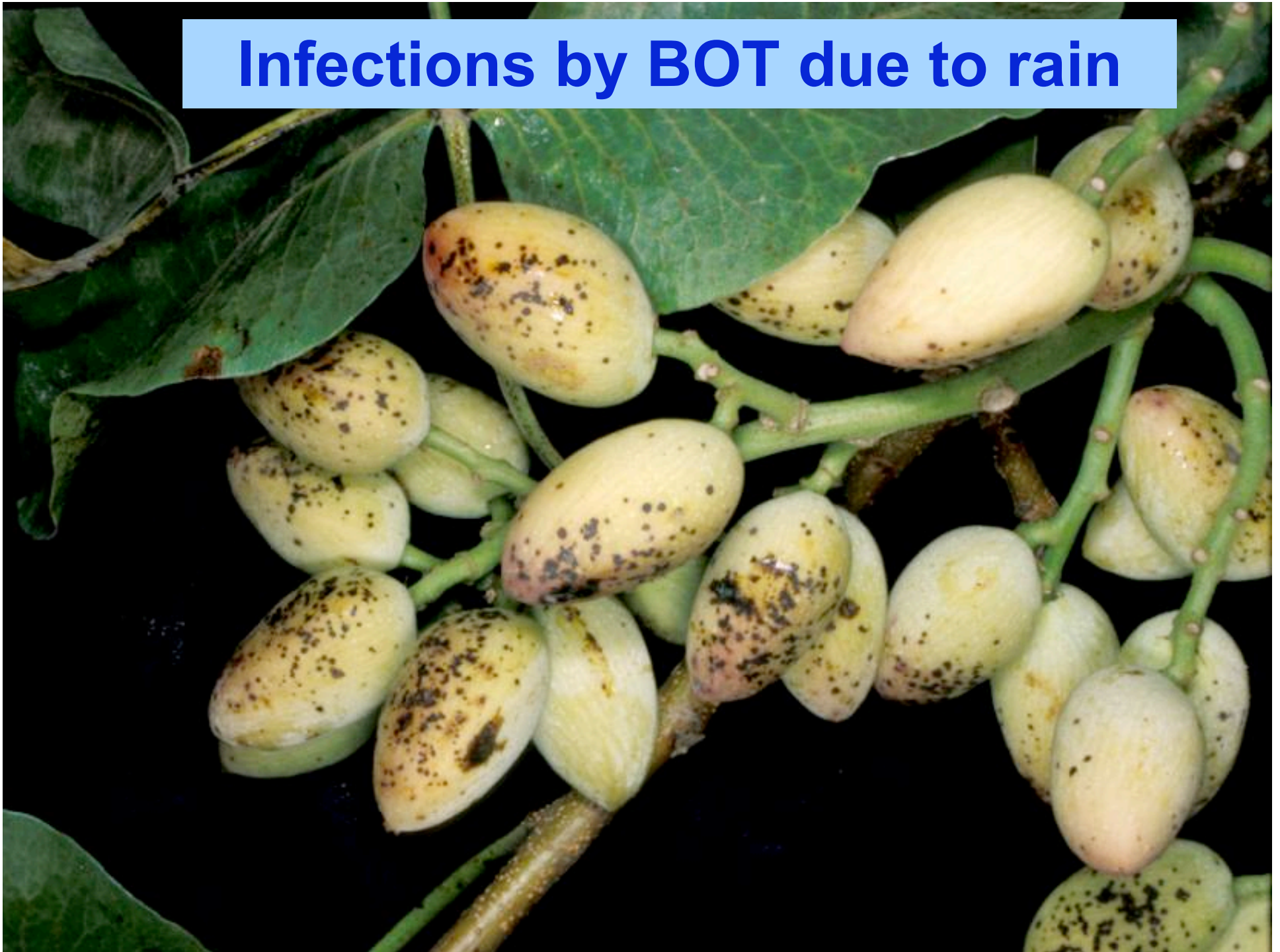
Blighted clusters remain on trees (...1999)



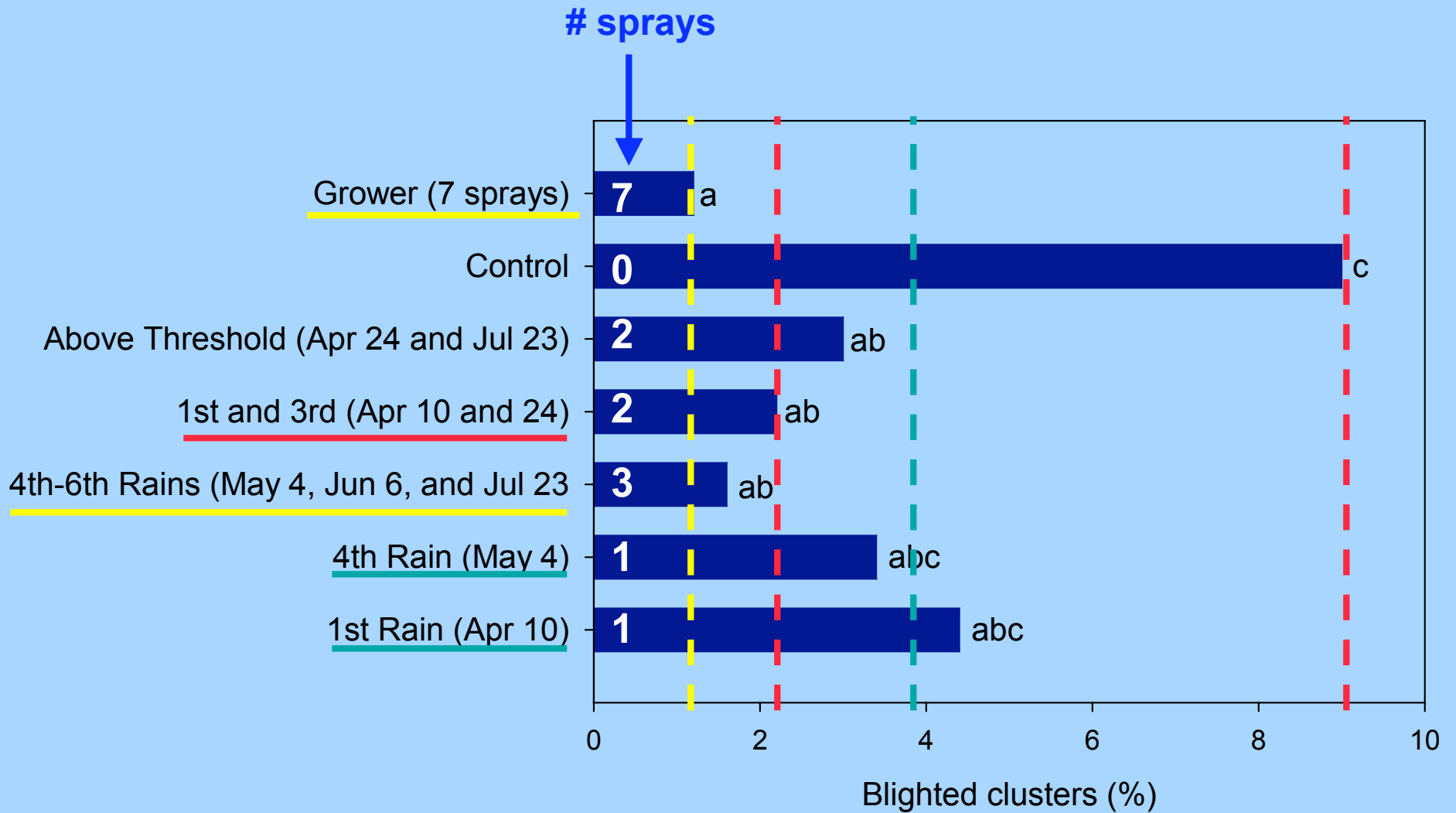
Pathogenicity of various Botryosphaeriaceae on almond



Infections by BOT due to rain



Sprays timed near rain events controlling Botryosphaeria blight (2007)



In 2009, medium and high risk infection events

