Recognizing and Managing Almond Trunk and Scaffold Diseases

David Doll
NSJV Almond Day
Farm Advisor, Merced County
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Orchard Tree Diseases

Ceratocystis Canker in Almond

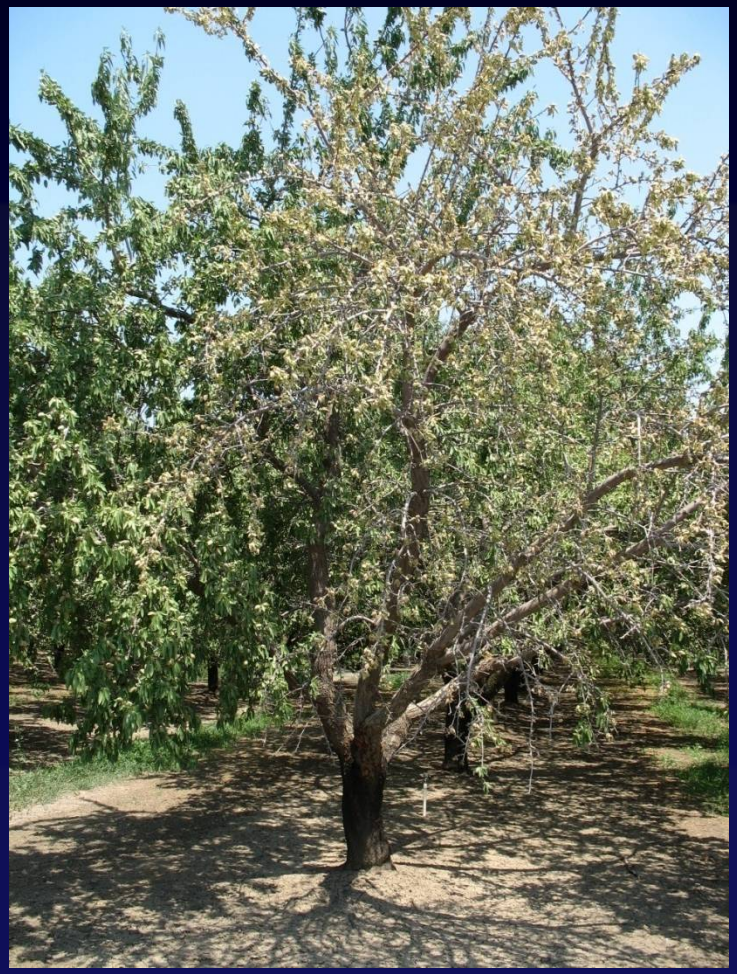
Fungal Disease caused by *Ceratocystis fimbriata*

Transferred around the orchard by fruit flies and beetles

Associated with injuries that expose the tree's cambium

- Shaker Damage
- Pruning Wounds
- Limb Breakage

Typically found on scaffolds



Ceratocystis Canker in Almond

Ceratocystis Canker in Almond

Disease Control – Canker Prevention --

Avoid tree damage at harvest:

- Insure orchards are relatively dry prior to harvest
- Reduce bark damage, used skilled shaker operators

Adjust Pruning Schedule:

- Prune mature orchards in early fall to avoid cool, rainy weather
- Prune nonbearing trees late to avoid rainy periods
- Pull pruned branches from trees with caution to avoid wounding

Disease Control – Canker Removal--

If choosing to surgically remove cankers, perform actions in the spring to avoid rainy periods.

Topical applications of various fungicides and bark penetrants have not (yet) provided control of canker growth.

Botryosphaeria Canker in Almond

- Fungal disease caused by *Botryosphaeria dothidea*
- Causes cankers on trunks, scaffolds, and branches
- Infects trees through natural openings and wounds
- Spores are spread through the air
- Becoming an emerging disease, with no control yet determined

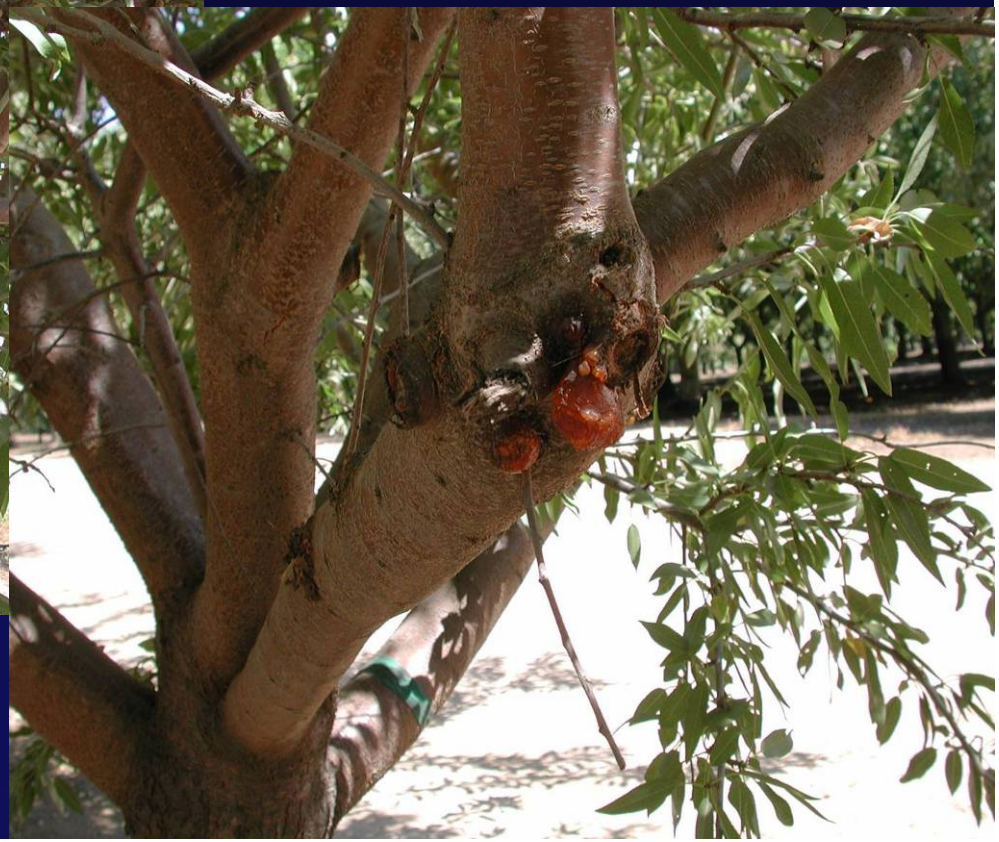
Band Canker in Almond

Botryosphaeria Canker in Almond

Scaffold and Branch Canker

Lenticel & growth crack infections

Pruning Wound Infections by *B. dothidea*



Sources of Inoculum

Primary

Airborne spores moving in from outside of the orchard

- Neighboring orchards with infections
- Other hosts which include Walnut, Pistachio, Eucalyptus, Olive (just about everything…)

Infected plants within almond rows

-Water splashed; airborne spores

Secondary

Spores from previously infected trees and trunks

Spores from current infections within the orchards

- Water splashed; airborne spores

Multiple Year Infection by *B. dothidea*

Secondary Inoculum Sources

Points of Infection for *B. dothidea*

1) Growth crack in trunks
2) Pruning Wounds
3) Lenticels
4) Rough bark
5) Cracks at the base of shoots

Timing of infection is unknown. Most likely occurs in the winter- spring or when excessive moisture is present.

Botryosphaeria Canker Management

1. Major pruning wounds need to be protected
2. Infected trees need to be removed entirely
3. Protecting the tree trunk with fungicides may be effective; curing the cankers seems very difficult
    - Liquid limed sulfur and copper fungicides are ineffective against *Botryosphaeria* pathogens
4. Avoiding wetting the tree trunks (sprinklers or micro-sprinklers) reduces band canker

Hull Rot in Almond

Fungal disease caused by

Monilinia fructicola

-Sacramento Valley and Northern San Joaquin

Rhizopus stolinifer

-San Joaquin Valley

Causes yield loss, spur loss, and limb death

Infects trees through the hull, translocating toxins up the branch

Spores are spread through the air

Hull Rot in Almond

Cultivar Susceptibility to Hull Rot

Highly Susceptible:

Butte
Kapareil
Nonpareil
Winters

Moderately Susceptible:

Johyn
Jeanette
Price
2-19E
Sonora
25-75

Moderately Resistant:

Aldrich
Morley
Yokut
Chips
Padre
10102W
JIML
Plateau
1-87
Kahl
Rosseta
2-43w
Livingston
Ruby
Mission
Sano
Wood Colony

Highly Resistant:

Hull Rot Management

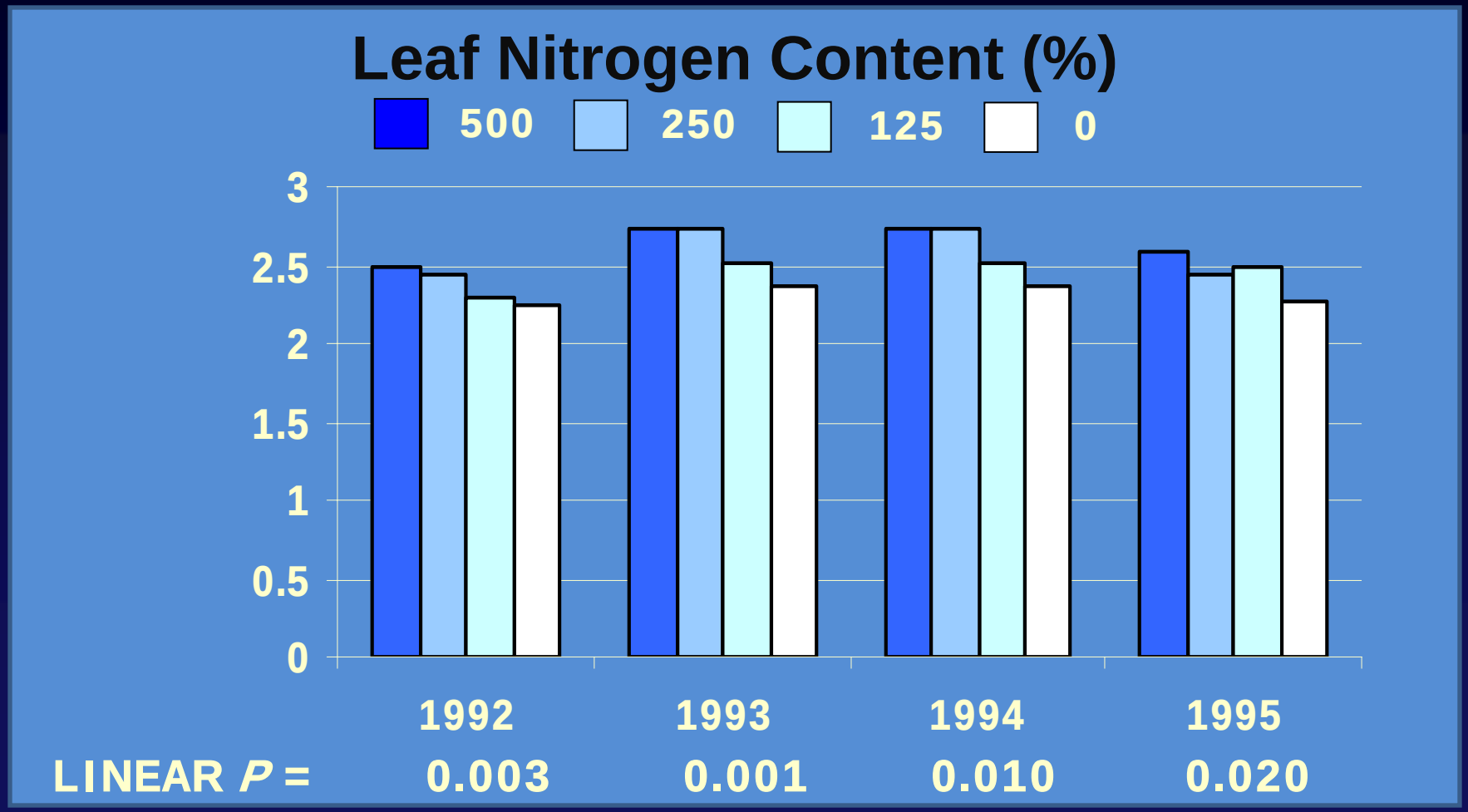
Rhizopus and *Monilinia* can only infect the hull after it splits

Management practices to reduce the timing of hullsplit

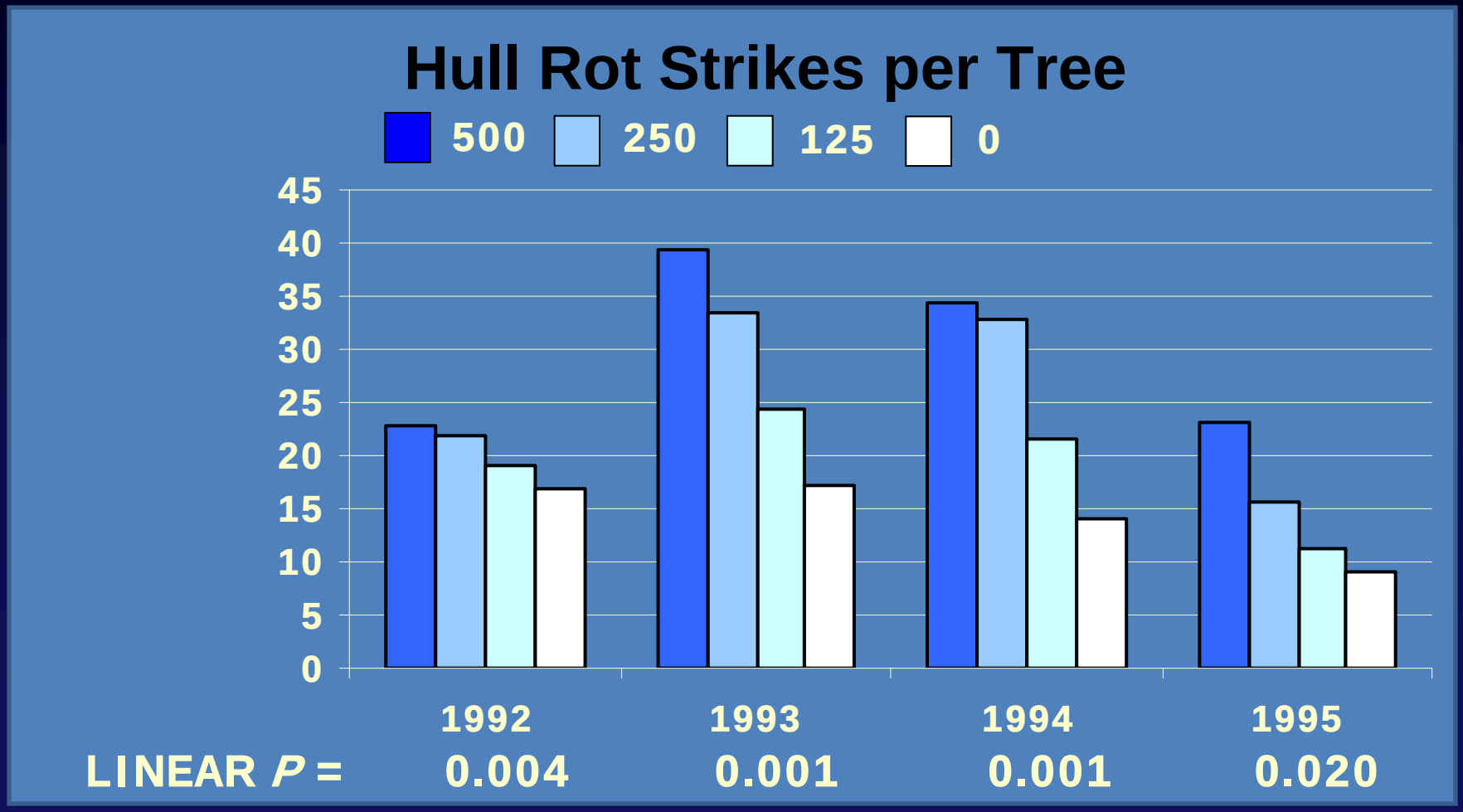
-Nitrogen

-Water

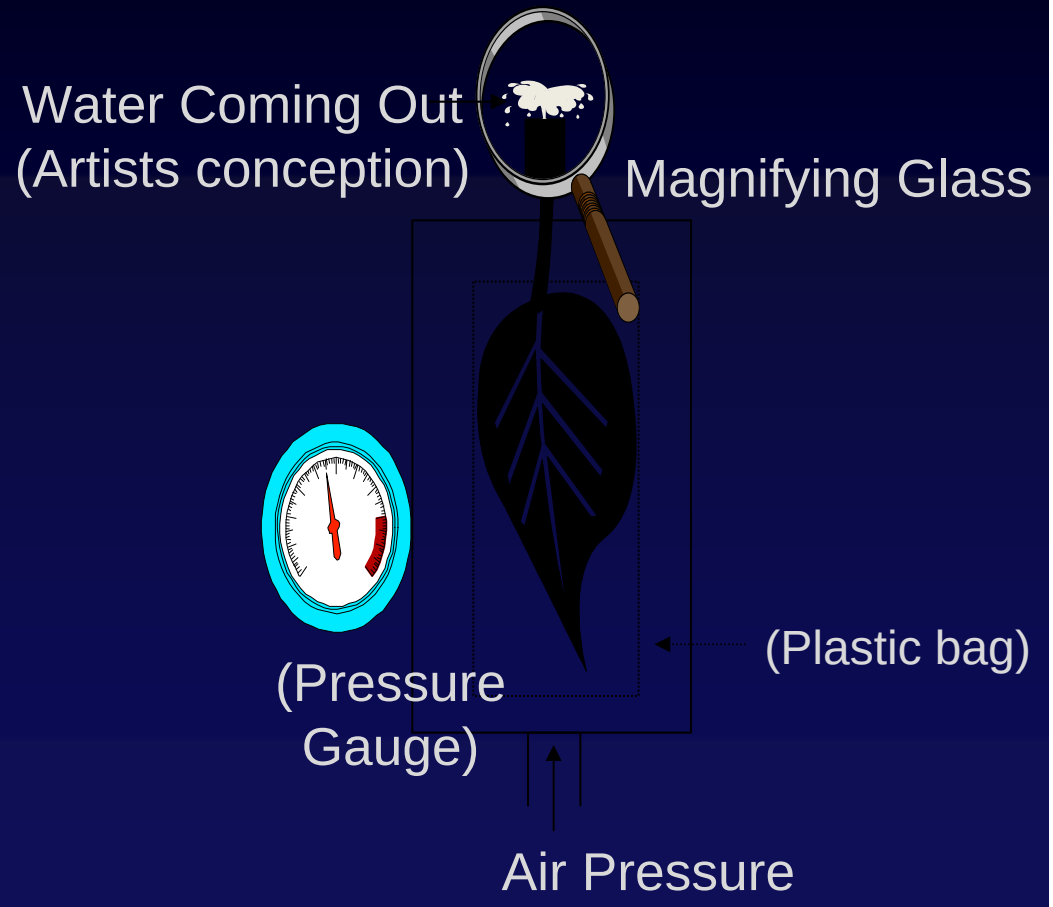
Hull Rot Management - Nitrogen



Hull Rot Management - Nitrogen



Hull Rot Management - Water



Hull Rot Management - Water

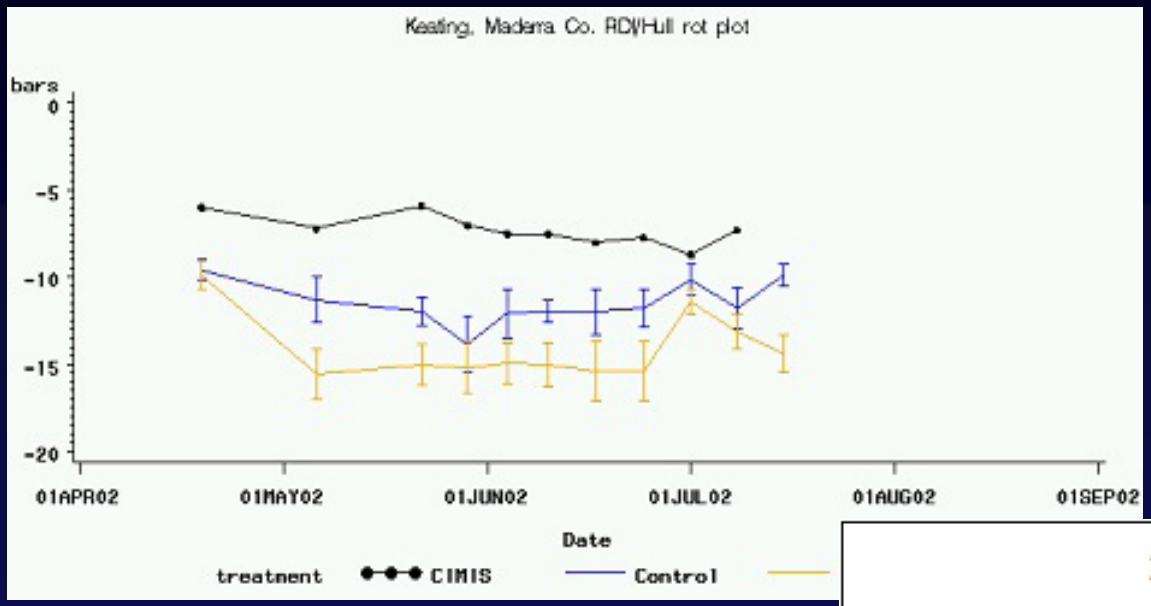
Proposed benefits of regulated deficit irrigation for almonds during hull split:

1) Reduce Hull rot
2) Reduce Stick-tights (Improve Harvestability)
3) Save Water

Prescription:

1) Measure stress using midday Stem Water Potential (SWP)
2) Prior to hull split: **-7 to -9 bars** SWP (fully irrigated baseline)
3) During hull split: **-14 to -18 bars** SWP (mild to mod. stress)
4) After hull split: **-7 to -9 bars** (as close to harvest as possible)

Hull Rot Management - Water



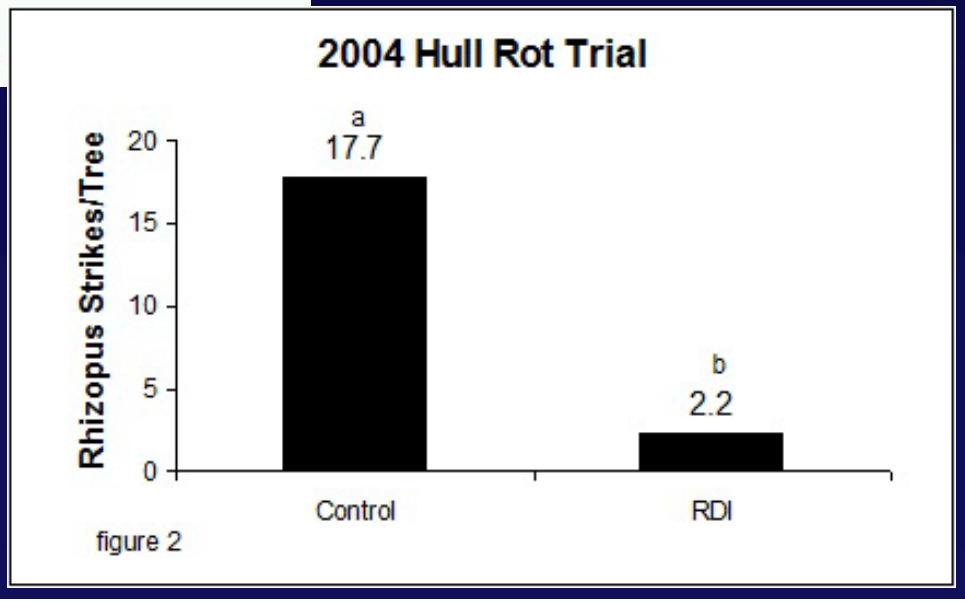


figure 2

Hull Rot Management

No need to apply fungicides, can be controlled through cultural practices

Avoid excessive nitrogen; maintain leaf nitrogen levels to 2.2-2.5%

Induce a mild water stress at hullsplit; allow trees to drop to -14 bars on stem water potential before watering

-Use a pressure chamber for measurements and your intuition as double-check

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