

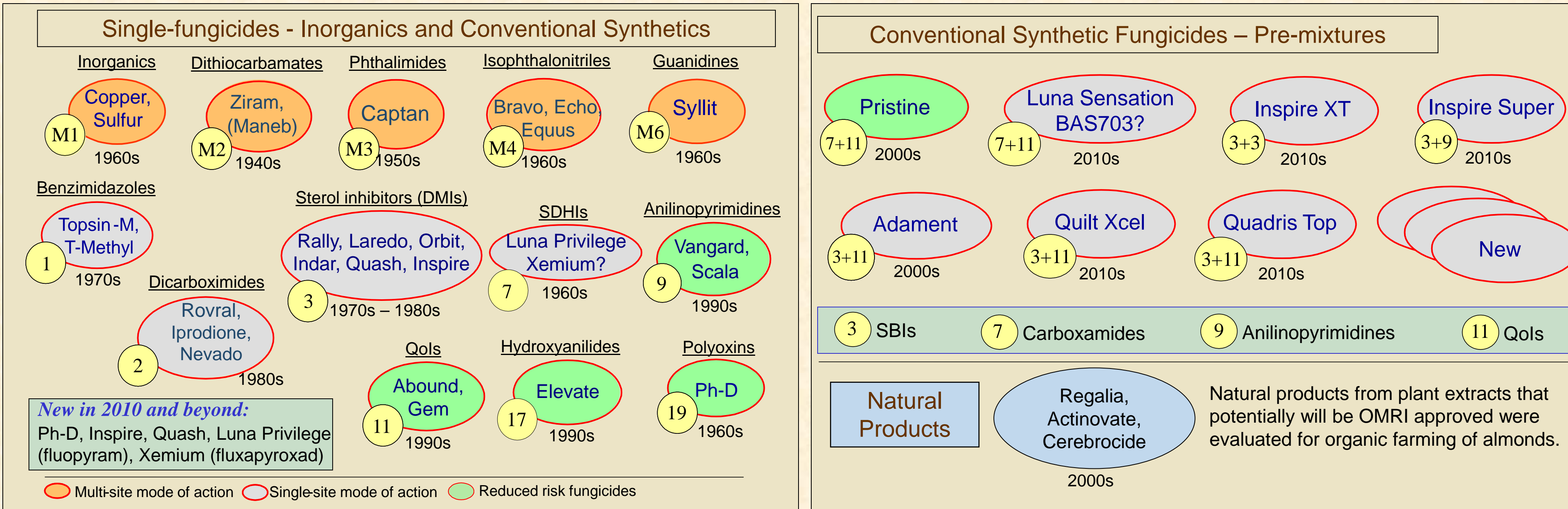


Epidemiology and Management of Brown Rot, Gray Mold, Shot Hole, rust, and Hull rot of Almond

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Classes of fungicides and natural products registered and in development for use on almond in California



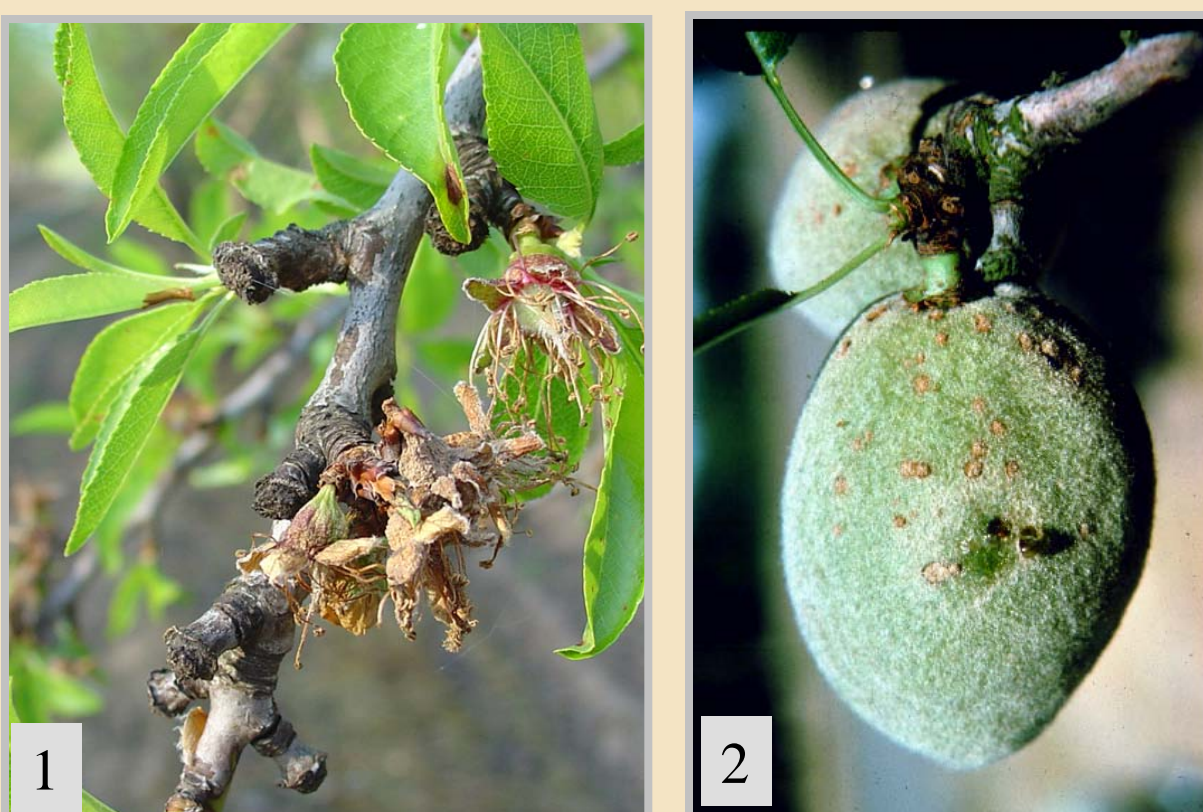
Field trials on disease management in 2010

New fungicides evaluated in 2010

Type	Name	Class
Single compounds	Quash	SBI
	Inspire	SBI
	Luna Privilege Ph-D	SDHI Polyoxin
Pre-mixtures	Luna Sensation	SDHI + QoI
	Inspire XT	SBI + SBI
	Quilt Xcel	QoI + SBI
	Quadriz Top	QoI + SBI
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Natural products	Regalia	Natural product
	Actinovate	Biocontrol/Nat. prod.
	Cerebrocide	Natural product

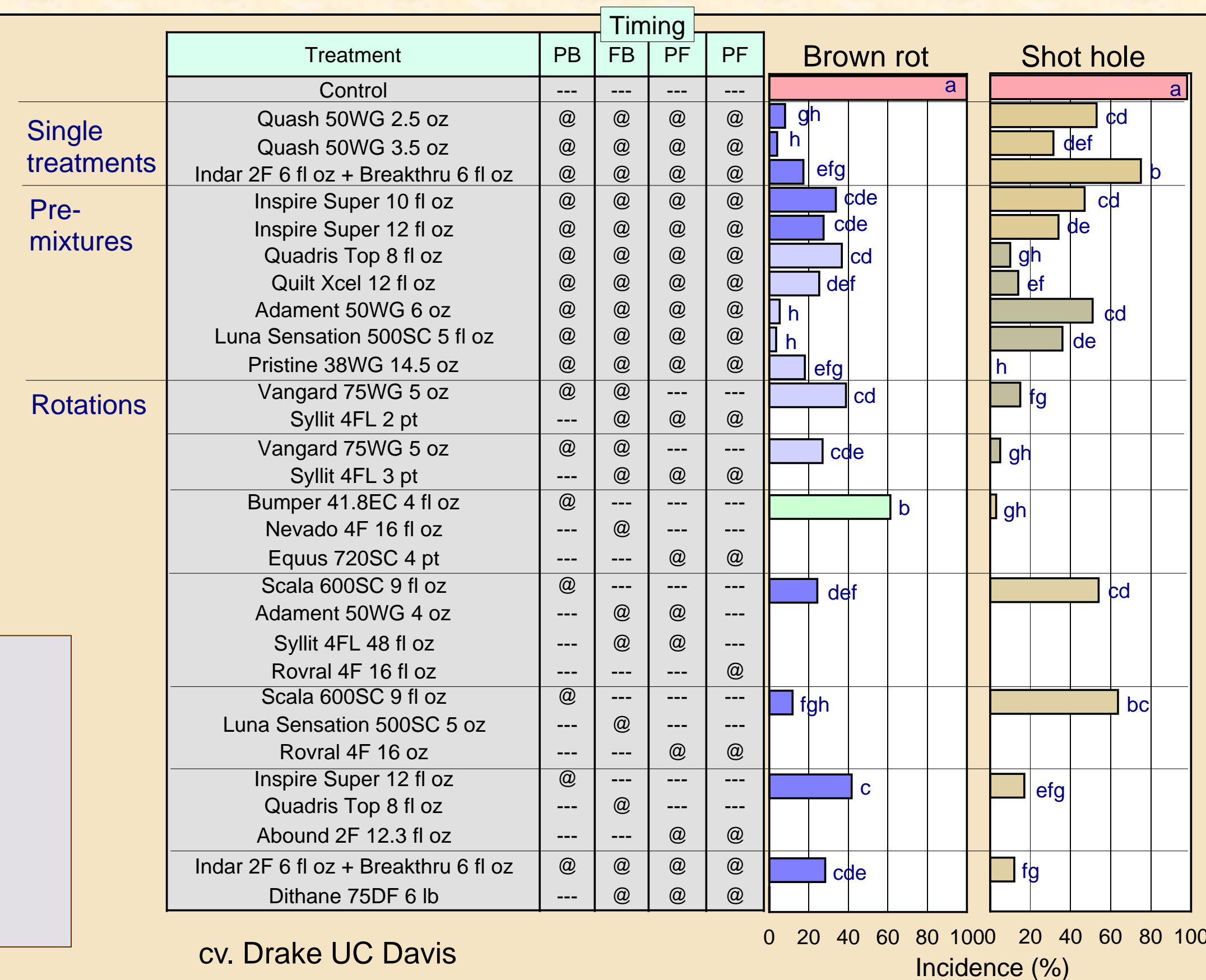
New products including new active ingredients and several new pre-mixtures are being developed. Additionally, an experimental and a registered natural product from plant extracts, as well as a new registered biocontrol that are OMRI approved were evaluated for organic farming of almonds.

Brown Rot Blossom Blight and Shot Hole



1) Brown rot blossom blight caused by *Monilinia laxa* and *M. fructicola*. Blighted blossoms and twig infections. 2) Shot hole caused by *Wilsonomyces carpophilum*. Symptomatic fruit.

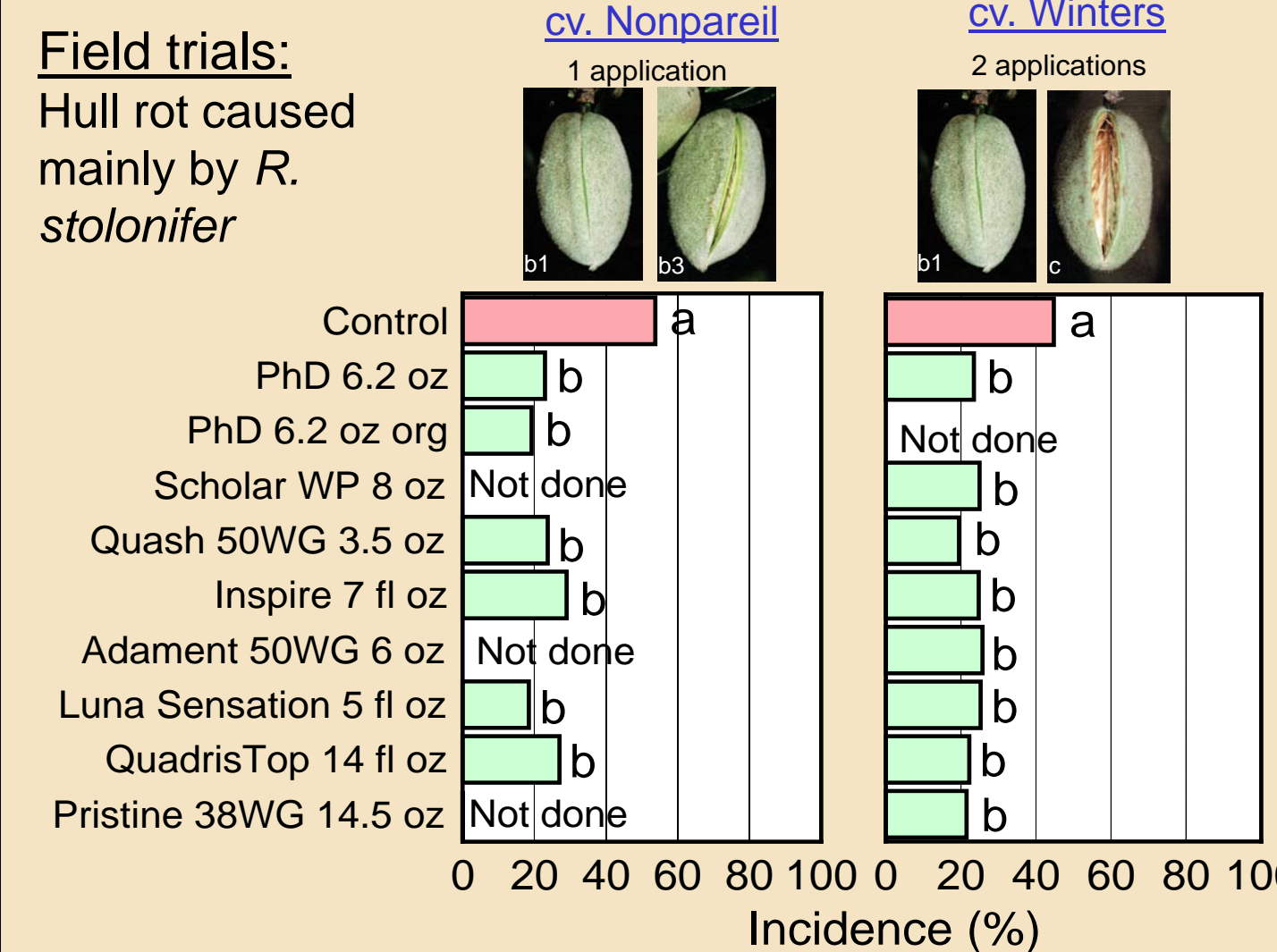
- Most effective new fungicides:
- Brown rot:** Adament, Luna Sensation, Quash. Also: Inspire Super, Inspire XT, and Quilt Xcel (when used at higher rates as in 2009)
- Shot hole:** Syllit, Quadriz Top, Quilt Xcel
- The natural products/biocontrols Actinovate, Regalia, and Cerebrocide showed some activity in other trials, but were not as effective as most fungicides. Actinovate was the most consistent.



Hull Rot

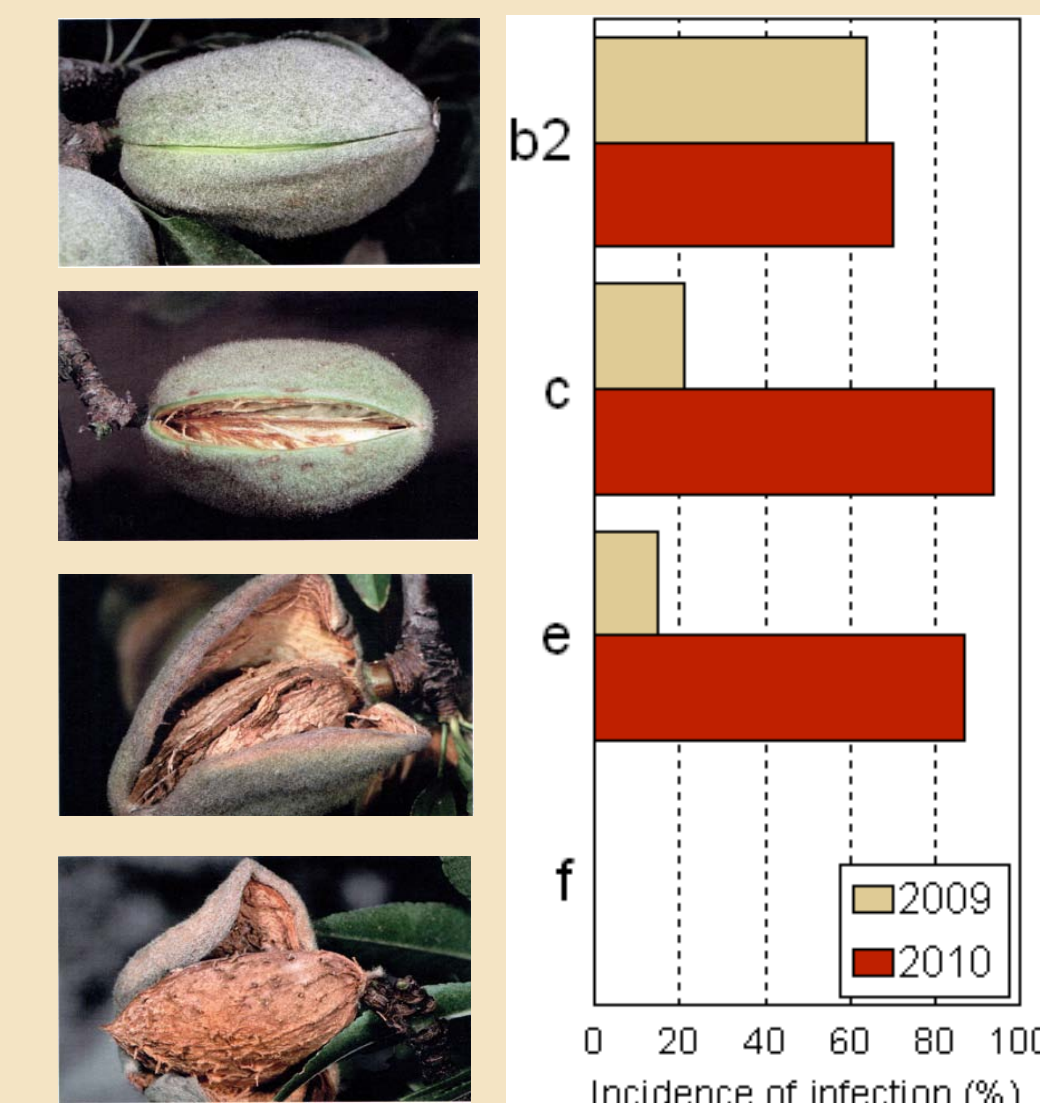


Hull rot caused by *Rhizopus stolonifer* and *Monilinia* spp. 1) Fruit infected by *R. stolonifer*. 2) Infection of the almond hull progressed into branch dieback.



Application cv. Nonpareil: 8-13-10, Evaluation on 9-9-10
Applications cv. Winters: 8-31, 9-10-10, Evaluation on 10-1-10

Susceptibility of almond fruit at different hull split stages to infection of *Rhizopus stolonifer* - Laboratory studies

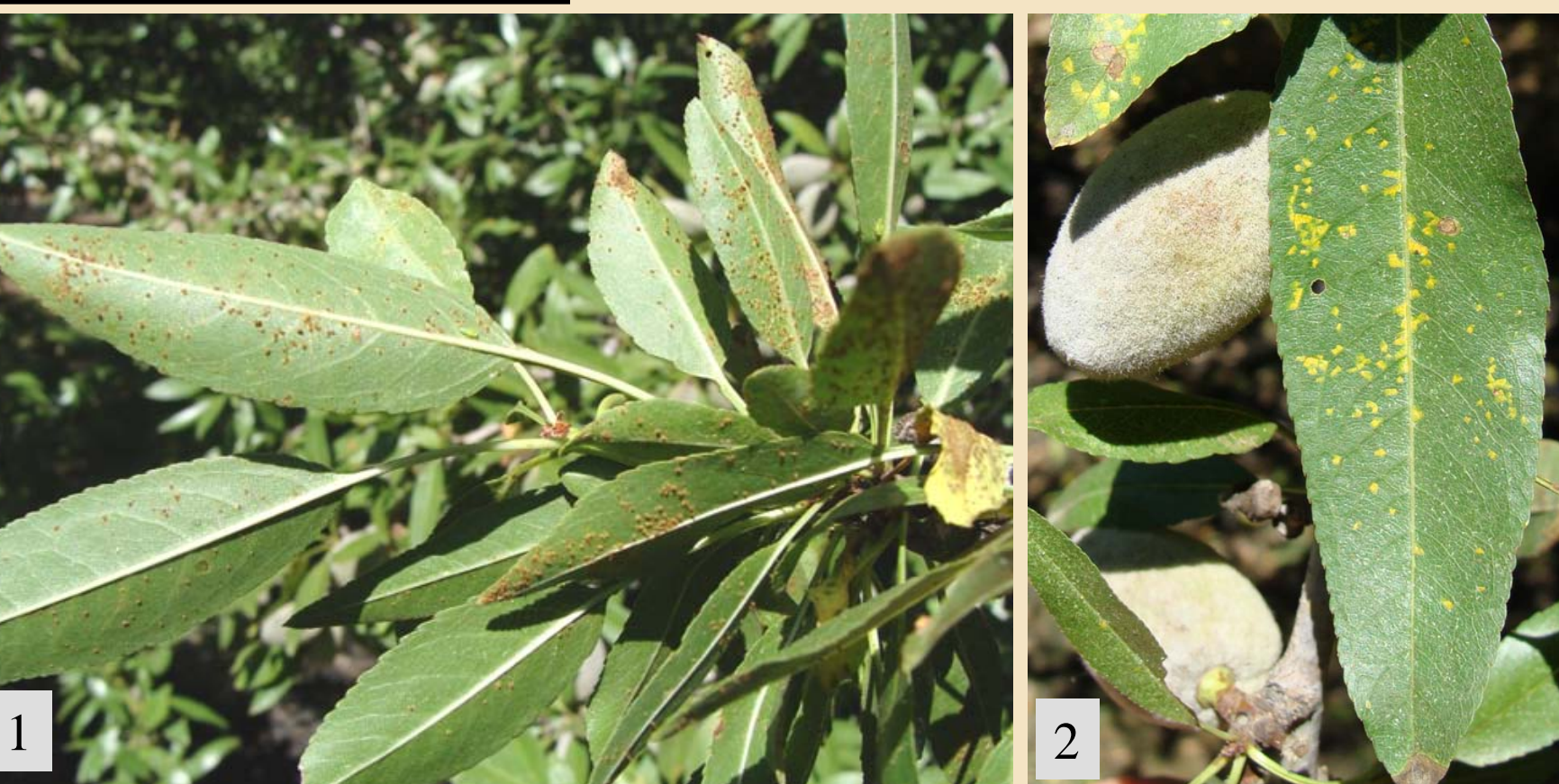


- Hull is highly susceptible to infection during early to mid-split stages of nut development.
- Most susceptible at hull split stages: b2 through e.
- Infection likely due to conducive environments, but apparently not due to moisture content of the hull (laboratory studies).
- This information is important for the timing of fungicide applications.

Hull stages based on the UC-IPM Manual for Almonds.

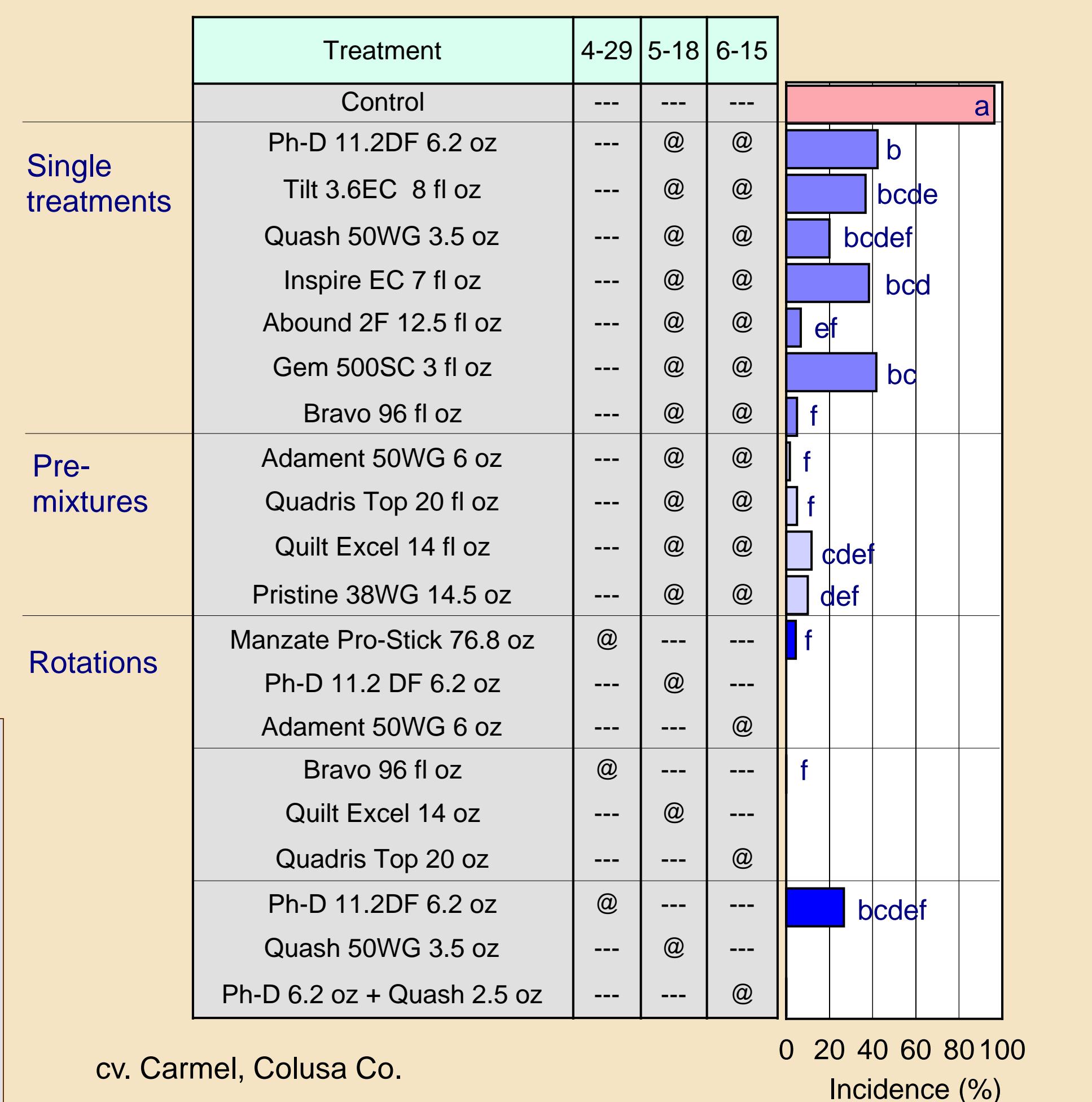
- High incidence of hull rot in 2010 due to early fall rains.
- In trials in 2009 and 2010, fungicide treatments were effective in reducing hull rot (all were similarly effective and have activity against hull rot pathogens) but there was no significant difference in efficacy among fungicide timings, number of applications, and application volumes.
- No differences in application timings possibly because of the long hull split duration within an orchard where a similar number of nuts were in a susceptible stage at each fungicide timing.
- Trials should also be conducted in locations where *Monilinia* spp. are the causal pathogens.
- In 2010, PGRs were evaluated: ethephon increased rate of split (with some defoliation based on rate), gibberellin delayed hull split. Fungicide efficacy was not affected by PGR treatments.
- For the most effective integrated management of hull rot, hull split should be induced simultaneously with proper water management (i.e., deficit irrigation) and should proceed as quickly as possible to shorten the highly susceptible period. A fungicide could then be applied most effectively during the stages when susceptibility is high.

Almond Rust

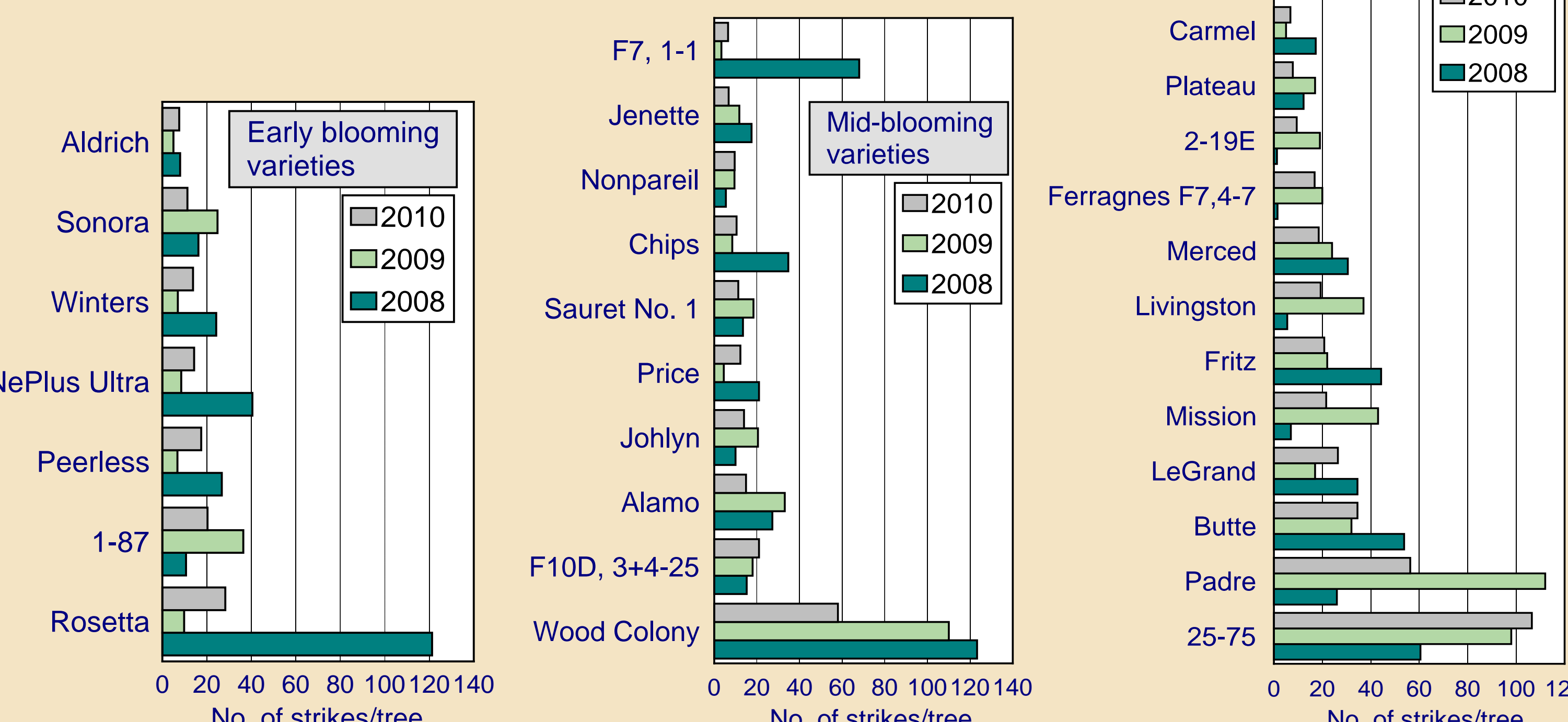


Almond rust caused by *Tranzschelia discolor*. Symptoms on 1) lower and 2) upper leaf surface.

- Materials that included a QoI compound (e.g., Abound, Adament, Quadriz Top, Quilt Excel, Pristine) were among the most effective fungicides.
- The DMIs (Quash, Tilt, Inspire) and Ph-D also significantly reduced the incidence of disease.
- Chlorothalonil (e.g., Bravo) was also highly effective, but this fungicide is currently only registered for use up to 150 days of harvest (changes pending).
- The first fungicide application should be done at the very first occurrence of disease symptoms in the spring/summer or late April if the disease occurred in the previous season.



Natural host susceptibility of almond cultivars against brown rot blossom blight - UCD Variety Block



An almond variety block was established at UC Davis for evaluation of natural incidence of disease. This study provides relative comparisons for 33 varieties in one orchard.

The relative susceptibility against blossom blight was mostly consistent among almond varieties over three years.