University of California Cooperative Extension

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Smart Sprayers Make $ense

Franz Niederholzer, UC Farm Advisor, Sutter/Yuba Counties

It costs a lot to farm tree crops. It will probably cost more before (if?) it ever eases up. So, how can you keep investing in your orchard to maintain yield and income and still make a living? Here are my answers to that question:

- Consistently raise a large, high quality crop
- Protect and maintain orchard health
- Produce what the market wants
- Be efficient

Towards these goals, there is a tool that will reduce your pesticide/foliar fertilizer costs by an average of 20% without changing crop protection or spray coverage. It's a sprayer with sensors - a "smart sprayer". If you aren't thinking about buying one, you should.

How smart sprayers work. Smart sprayers "look" for trees with sonar or laser "eyes", and turn on only the nozzles when there is a target (the tree) to spray. They are available as after-market add-ons or built into the sprayer at the plant. Some models can only activate/deactivate one side of the sprayer. These models perform best in uniform young orchards with regular gaps between the trees. Others models have two or three "eyes" per side. Each eye controls half or a third of the nozzles on a side. The multiple eye models cost more, but are more flexible. They are the best units to have in an irregular mature orchard with replants, skips and/or shaded-out regions.

Smart sprayers save you money. Smart sprayers can save you around 20% on pesticide costs/acre compared to running the sprayer with all nozzles on. That number will go up or down depending on the orchard system. Hedgerow plantings should show less savings, especially if the nozzles are carefully set up for each particular block. Mature orchards with gaps between the trees or multiple replants should see an increase in savings. Significant savings should be seen in young plantings with gaps between each tree. Smart sprayers lower your pesticide bill without reducing orchard pest protection. You spray your trees, not the orchard and everything there in. A recent study at California State University, Chico projected a multiple-eye smart sprayer cost recovery to be 1-2 years for a 300 acre almond orchard. That's on a $15,000 initial investment in an aftermarket addition of the smart sprayer "eyes" and control valves on an existing sprayer. How would that work for your farm? Here's a rough estimate for almonds. An annual almond orchard pesticide bill can run around $250/acre. A 25% saving on that bill - the kind of savings that growers with smart sprayers report - is $62.50/acre/year. That number doesn't include the diesel and time saved by stretching 5 acres/tank at 100 gpa into 6.25 acres/tank with the same coverage. That extra acreage in each tank could help come crunch time (at bloom, when wind is forecast, or when PHI is an issue).

Smart sprayers help your operation be sustainable. The first rule of drift management is "target the tree." The smart sprayer does that for you - automatically. Off-target pesticides can drift or land on the orchard floor and be lost with irrigation or storm runoff. A smart sprayer is a cleaner sprayer.

A smart sprayer is also driver friendly. Using a smart sprayer gives the sprayer operator one less thing to worry about at the end of the row. It shuts off the nozzles automatically as you turn out of one row and then back on as you enter the next row. Note: it will spray telephone poles! The operator is free to drive, not multitask. Do you farm near roads? Smart sprayers help operators reduce spray drift near sensitive areas, and avoid spray drift fines. Finally, more and more fruit and nut buyers are looking for evidence of "sustainable" practices. Keeping

the customer happy is a key to successful business. If they want "sustainable" and you want good crop protection, a smart sprayer could be a solid answer.

Federal help in buying a Smart Sprayer. The 2009 EQIP program of the USDA Natural Resources Conservation Service (NRCS) provides cost share money for growers in the San Joaquin Valley to buy and use "precision pesticide/herbicide application technologies"- Smart Sprayers. The goal of this program is to reduce use of VOC emitting chemicals (Lorsban EC, etc.) by 20%. That EQIP program pays $30/acre for a maximum of 500 acres. Contact your local USDA NRCS office for more details.

Reality Check. Smart sprayers are not perfect.They are more complicated than a conventional airblast sprayer. There are more electronic components to maintain and to repair. Specialized technical service costs money. If the problem can't be fixed over the phone, you have to take the sprayer to the manufacturer or pay to have them come to you. However, to get you through an application, smart sprayers can go "dumb" with the flick of a switch. If your farming operation is not comfortable with new technology anywhere from the head office to the field, then smart sprayers may not be for you. Owner applicators have a better success record with smart sprayers than companies paying hourly wages to their operators.

Summary: Smart sprayers save you money without compromising coverage and protection. They have been in commercial production for over a decade. They are more complicated than standard sprayers. They are not free. They require regular, specialized maintenance. The flexible models run about $15,000. The one-side-ON-or-OFF units cost less. A smart sprayer is an investment in application efficiency that should pay dividends for years after it has paid for itself.

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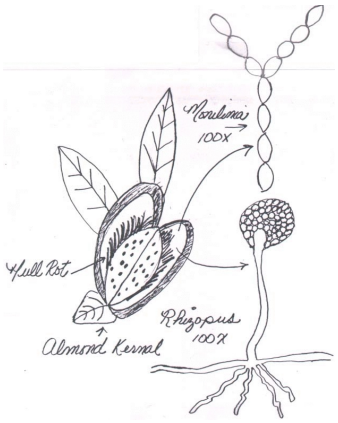
Hull Rot Management on Almonds

by Brent Holtz, Ph.D., University of California Pomology Farm Advisor



Many growers noticed this spring that their Nonpareil, Sonora, Butte, or Monterey almond varieties lacked bloom in the lower half of their trees along with a lot of dead fruiting spurs while other varieties like Carmel displayed normal bloom and growth in the lower tree canopy. Most of the orchards I observed with these symptoms I attribute to hull rot infections that took place the previous growing season after hull split. Many growers confuse hull rot with shading out since both can produce dead wood in the lower canopy. I believe that hull rot actually enhances shading out as the tree abandons infected wood in the lower canopy for healthy wood receiving sunlight at the top of the canopy. I also believe that hull rot is the single greatest yield reducer of vigorous young almond orchards in the central San Joaquin Valley that are entering their prime production years!!! Irrigation management is the only practical control for Hull Rot and the following article addresses hull rot management.

As almond trees approach harvest, at about mid hull split, clusters of dry leaves begin to appear scattered through the tree canopy. Individual spurs, small shoots or entire small branches may collapse due to hull rot infections. The loss of fruiting wood, especially in the lower parts of the tree, can negatively affect yield for years to come. Nonpareil is usually the most severely affected cultivar though Sonora and Kapareil can also sustain extensive damage.

Hull rot is caused by either of two fungi, *Monilinia fructicola* or *Rhizopus stolonifer*. *Monilinia fructicola* is best known as one of the brown rot fungi and *R. stolonifer* is often called the bread mold fungus, and will turn bread left out black and moldy. In the southern San Joaquin Valley I believe that *Rhizopus* is the primary pathogen responsible for hull rot while *Monilinia* may be more important in the Sacramento Valley. These two organisms are very different but can cause similar disease symptoms on almond. As the name implies, a lesion or dryish rotted area develops on the hull, and dense masses of *Rhizopus* spores produce a powdery dark gray to black growth between the hull and the shell. *Monilinia* spores

are buff-colored and can be seen on inner and outer hull surfaces. The nut meat is not damaged, but a toxin produced in the infected hull moves from the hull into the neighboring leaves and shoots causing death of these tissues.

Neither *Monilinia* nor *Rhizopus* are able to invade the healthy outer hull surface. Only after hull split begins can spores gain access to the inside of the hull and initiate infections. Once hull split starts, trees are at risk of becoming infected. One or both pathogens may be present in an orchard, but Monilinia hull rot is less common in southern San Joaquin Valley orchards than in other almond growing regions of the state. Leaves may become infected near infected nuts and sometime the hole spur or shoot can die as well. Clusters of dead leaves can become visible in the summer scattered among healthy green foliage. Spur and leaf die-back are attributed to fumaric acid which is produced by the pathogens and transported to the leaves and shoots. The black vascular tissues in the dead spurs and wood can be traced back to a pedicel or infected fruit. The nut kernel is not harmed but the death of the fruiting wood reduces bloom and yield in subsequent years. Sometimes infected fruit does not fall during mechanical harvest and must be removed by hand poling and can also provide overwintering sites for navel orangeworm (NOW).

Cultural practices play a crucial role in determining the severity of hull rot in an orchard. Vigorous, heavily-cropped, well-watered and fertilized orchards suffer the most damage. I have often referred to hull rot as the "good growers disease" since the disease is often worse in well maintained orchards. Beth Teviotdale calls hull rot the "gout of almond diseases–too much food and drink is bad for almonds just like it is bad for us." The reasons for this are not clear. The association with heavy crops might be simply a matter of numbers: more infected fruit means more toxin produced which results in more leaf and shoot death.

Research by Drs. Beth Teviotdale, David Goldhammer, and Mario Viveros have shown that hull rot can be reduced by inflicting mild water stress on trees during early hull split. In experiments in Kern County, hull rot incidence was lessened by half or more when half the normal amount of water was delivered to trees for two weeks during early hull split. Eliminating irrigation during the two weeks preceding harvest reduced hull rot by 400-500%, but completely denying trees water for two weeks may be dangerous and less drastic irrigation reductions may also reduce disease and stress trees less. In their research they irrigated almond trees at 70, 85, and 100% of potential evapotranspiration (Etc). There were two types of deficit irrigation: sustained and regulated. The sustained irrigation was just reduced irrigation the whole season while the regulated started the year at normal irrigation but then drastically reduced irrigations (50% Etc) during the period preceding and during hull split. For Kern county those dates included 50% Etc from 1-15 July (85% season Etc reduction) or 1 June- 31 July (70% season Etc reduction). The regulated deficit irrigations were much more effective at reducing hull rot than the sustained deficit irrigations.

The University of California tested several approaches to reduce water use under different irrigation strategies and soil types. In a large cooperative trial lead by Dr. Ken Shackel in Pomology at UC Davis and farm advisors, we used midday stem water potentials to monitor deficit irrigation in almond in order to reduce hull rot without severely stressing trees. We use a pressure bomb to monitor midday stem water potentials (SWP) through the season in order to keep fully irrigated trees between stem water potentials of -7 to -9 bars. Then during hull split we tried to irrigate less in order to achieve stem water potentials between -14 to -18 bars. The higher the negative number, the more water stress. Figure 1 shows a graph of our 2002 data where the grower standard is our RDI reduced deficient irrigation treatment (-14 to -18 bars) while the control consists of fully irrigated trees (-7 to -9 bars). Hull rot in the fully irrigated treatment averaged 44.4 strikes per trees while the RDI treatment averaged only 17.7 in 2002. In 2003 hull rot in the fully irrigated treatment averaged 17.7 strikes per trees while the RDI treatment averaged only 2.0 (figure 2). In both years the differences were significant.

By using the pressure bomb to monitor tree stem water potentials we are imposing enough stress to reduce hull rot and not over stress the trees so that they are susceptible to mite damage or defoliation. Soils can vary greatly throughout the state and irrigation management can be very difficult. For instance, in some orchard experiments we could withhold water and reach -14 bars in just a few days while in other orchards with deep, well-drained soils it

might take as long as 20-30 days to achieve -14 bars in stress. This is why irrigation management using mid day stem water potentials and a pressure bomb is in my belief the only real management strategy for hull rot control. Other benefits of hull split stress are more uniform nut maturity and earlier harvest which will have a significant impact on Navel Orange Worm (NOW) control and damage. Experiments in Stanislaus County demonstrated that hull rot severity increases with increasing amounts of nitrogen. Nitrogen should not be applied in excess of that needed for tree health and productivity. The nitrogen content of the irrigation water should be included in calculations of required added fertilizer.

Figure 1

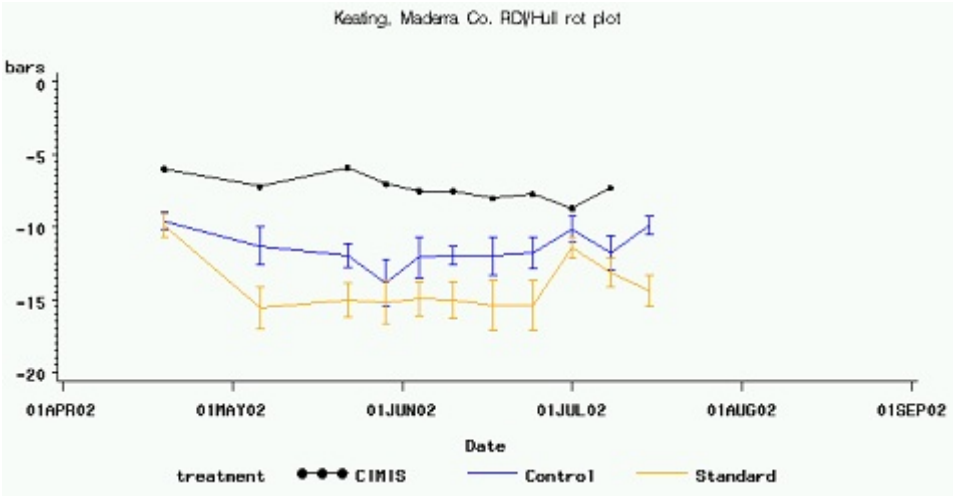
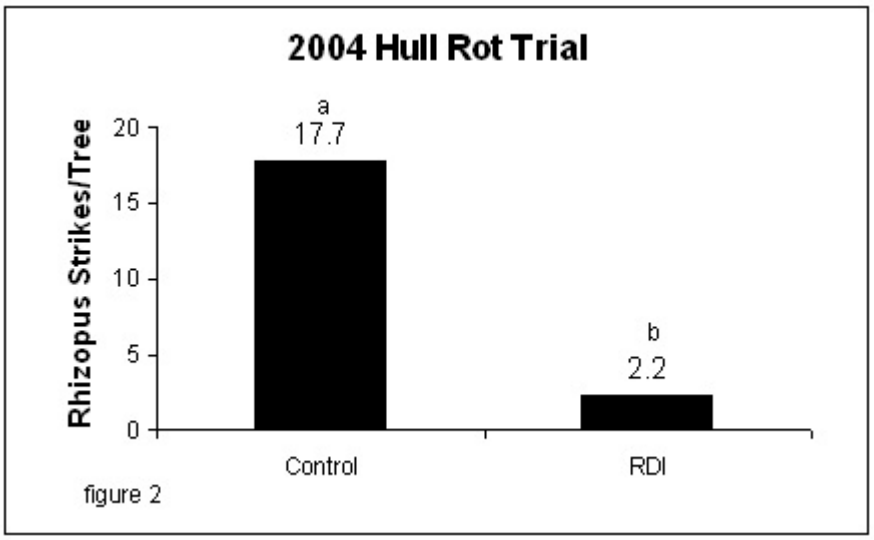


Figure 2



Central San Joaquin Valley Summer Almond Meeting

Wednesday, June 17th, 2009

Merced UCCE Classroom

2145 Wardrobe Avenue, Merced, CA 95341; 209-385-7403

8:00 AM-12:00 PM

8:00 a.m. **Introduction, PCA and continuing education credits sign-up**
David Doll, Farm Advisor, UCCE Merced County

8:30 a.m. **Summer insect pest management in almond orchards**
Walter Bentley, Area wide UCIPM advisor*, Kearney Ag Center*

9:00 a.m. **Identifying and preventing hull rot of almond.**
Brent Holtz, PhD, Farm Advisor, UCCE Madera County

9:30 a.m. **Managing summer water stress in a drought year.**
Ken Shackel, PhD, Extension Specialist, UC Davis

10:00 a.m. **Break**

10:30 p.m. **Using leaf nutrient values to determine the following year's nitrogen budget.**
Patrick Brown, PhD, Extension Specialist, UC Davis

11:00 p.m. **Orchard replanting: Should I fumigate?**
David Doll, Farm Advisor, UCCE Merced County

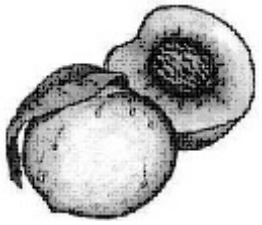
11:30 p.m. **Design and development of a successful orchard.**
Roger Duncan, Farm Advisor, UCCE Stanislaus County

12:00 p.m. **Conclusion and Thank You.**

2.0 hours of PCA, CCA and Private Applicators Credit have been requested.

COMING EVENTS:

University of California Cooperative Extension and the Kearney Agricultural Center present
2009 VARIETY DISPLAY AND RESEARCH UPDATE SEMINAR SERIES
8:00 am – 9:00 am Variety display by stone fruit nurseries, breeders and the USDA
9:00 am – 10:00 am Research Update Topic and discussion in the field



Mark your calendars for these dates: Friday, June 26, Friday, July 31, Friday, August 21
Topics to be discussed will include: Mechanical Blossom Thinning, Stone Fruit Rootstocks, Water Management, Pedestrian Orchards, Fruit Quality

Kearney Agricultural Center
9240 S. Riverbend Avenue
Parlier, CA 93648

For more information call: Scott Johnson (559) 646-6547, Kevin Day (559) 685-3309, Ext. 211, Brent Holtz (559) 675-7879, Ext. 205 or Bob Beede (559) 582-3211, Ext. 2737

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Sincerely,

Brent A. Holtz, Ph.D.
Pomology Farm Advisor

For special assistance regarding our programs, please contact us.

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