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UCCE

From the Shell

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Produced by:

Gurreet

Gurreet Brar
Farm Advisor
Fresno & Madera Counties

Contents

UCCE Fresno has moved!

The University of California Cooperative Extension, Fresno County office has moved to a new location. Our new address, beginning July 1, 2013 is:

University of California Center,

550 E. Shaw Ave., Suite 210,

Fresno, 93710, CA

(Across from Fashion Fair Mall, just east of Men's Wearhouse)

The new phone numbers are:

559-241-7515 (main line)

559-241-7526– direct line for Gurreet Brar, Farm Advisor (Nut Crops)

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Almond Hull Rot – Cultural and Chemical Management

David Doll[1] and Brent Holtz[2],
University of California Cooperative Extension, Merced County[1], San Joaquin County[2]

Hull Rot is an infection of the hulls caused by either *Rhizopus stolinifer* or *Monilinia fructicola*. Upon infection, the pathogens release toxins that are translocated into the fruiting wood, which kills the wood and causes crop loss. These pathogens are common throughout the environment and are, in this case, serving as opportunistic pathogens. Once the hull splits, the perfect micro-climate for fungi is created as the hull is full of nutrients and water. Since the spores of these fungi are found within the orchard environment, they invade the newly split tissue, infecting, and completing their life cycle. By making conditions less favourable for the fungi, the number of hull rot strikes can be reduced. Strategies include reducing the water and nutrient content of the hull.

Nitrogen and Irrigation Management Can Reduce Hull Rot Incidence.

Hull rot often affects high vigour orchards. The highest incidence occurs on 'Nonpareil' with fewer strikes on other varieties (Table 1). Research conducted in 1990-2000 has shown that hull rot incidence can be reduced with adequate, but not excessive, nitrogen applications, and the application of a water deficit at the initiation of hull split.

Excessive nitrogen within the tree increases susceptibility to hull rot infection. In two long term studies performed by University of California researchers, there was a positive linear relationship between nitrogen rates and hull rot incidence. In other words, the more nitrogen applied, the higher the incidence of hull rot. Trees with nitrogen application rates above 250 lbs/acre were the most severely affected, and hull rot strikes were higher in low crop years. In order to reduce hull rot, nitrogen rates should be modified based upon crop load to keep the trees sufficient. Analysis of leaf nitrogen content should be conducted to determine nitrogen status. If properly sampled, the critical value for mid-summer leaf nitrogen percentage is 2.2-2.5%.

Table 1: Almond varietal differences in hull rot occurrence.

Variety	Strikes per tree	Susceptibility
Nonpareil	>500	Very High
Butte	>200	High
Winters	>200	High
Price	100-200	Medium
Sonora	100-200	Medium
Aldrich	10-100	Low
Wood Colony	10-100	Low
Mission	10-100	Low
Ruby	10-100	Low
Livingston	10-100	Low
Padre	10-100	Low
Fritz	0-10	Very Low
Carmel	0-10	Very Low
Monterey	0-10	Very Low

Data suggest that summer nitrogen applications increases hull rot incidence. Nitrogen should not be applied after kernel development is completed. This is typically in late spring, but in abnormal years, it may extend into early summer. Applications made after this point will be directed to the hull, making the hull more conducive to infection.

Nitrogen applications can resume in the post harvest period. Data suggests that nitrogen source does not influence hull rot. Research by Teviotdale and colleagues (2001) has shown that a slight to moderate water stress at the onset of hull-split can reduce hull rot. Irrigation should occur when the average stem water potential is four bars more negative than baseline. This measurement is taken uing a pressure chamber and is usually between -14 and -16 bars, depending on weather. The period of deficit irrigation should be carried out for two weeks. After the two weeks, full irrigation should resume until the harvest dry-down period. In managing the application of this stress, duration of the irrigation should be reduced, not the frequency. Typically, a 10-20% reduction in applied water will be needed, but this depends on the soil and irrigation system and will have to be determined on an orchard basis. A properly timed and applied deficit can reduce hull rot by 80-90%. Throughout the duration of the study, the application of this properly timed, regulated irrigation deficit did not affect yield or kernel size. It also appeared to have some effect of evening up hull split and subsequent harvest.

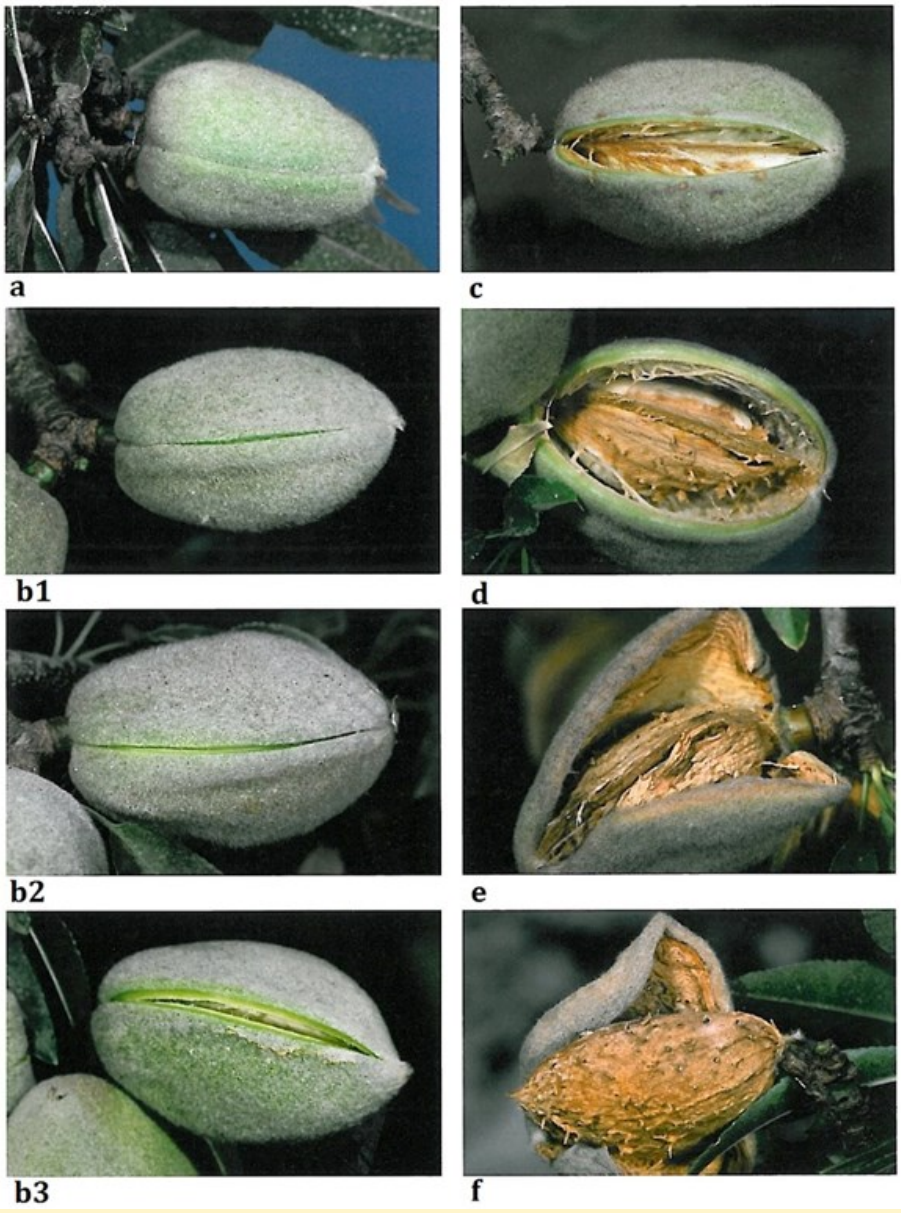

Figure 1: Stages of hull split. a. unsplit hull, b1. initial separation, b2.deep V split, b3. deep V split, but nut pops when squeezed, c. split, but less than 1 cm, d. split, more than 1 cm, e. initial drying stages, f. completely dry.

Stages of Hull Split and Fungicide Timing.

Work by Dr. Jim Adaskaveg (2010), UC Riverside, has found that *R. stolonifer* is only able to infect almond hulls during a brief period of nut development. Since the pathogen is not able to infect healthy tissues, it needs an injury in order to infect the hull. This wounding naturally occurs during the hull-split process. His studies elucidated that the highest incidence of infection occurred during the initiation of hull-split, when only a very small crack of the hull is present. This is classified as stage b2

(Figure 1) within the UC IPM manual. Later stages resulted in fewer infected fruit, and he concludes that the susceptibility differences of the stages are due to differences in hull moisture content.

Further work by Dr. Adaskaveg has found that sprays timed to the b2 stage will decrease hull rot incidence. Due to the variability of hull-split progression within the field, fungicides should be applied at 10-20% of hull-split. Both DMIs (FRAC 3) and strobilurin (FRAC 11) fungicides are effective. These sprays are additive to the reductions shown by the cultural management practices of irrigation and nitrogen management. It is important to note that increased populations of other foliar fungi that occur at this hull split spray timing increases the risk of developing fungicide resistance, so fungicide sprays for hull rot should be used as a last resort. Fungicides applied at this time do not work on hull rot caused by *Monilinia fructicola*. Maximum residue levels (MRLs) of the fungicide chemistry used should be discussed with the processor/handler to determine the most up-to-date information, and pre-harvest intervals should be followed.

Hull Rot Management: Bringing it all together.

Successful management of hull rot will rely on both cultural and chemical control strategies. Proper implementation of these practices must take in account the localized growing conditions. A late season rain may reduce the effectiveness of deficit irrigation or prevent the application of a fungicide spray. A late frost may lead to reduced crop load and an over-fertilized tree. Heavier and coarser soil types make the implementation of proper level of tree stress challenging; one requires a longer period of dry-down while the other may become dry too quickly. Even with varying environmental conditions, the mentioned strategies have been shown to reduce hull rot in both field studies and grower's operations. Success and proper application will be dependent upon the monitoring of tree status through stem water potential readings, leaf tissue analysis, and observations of hull split timing.

Irrigating almond trees from hull split to harvest

Hull split stage is a very critical time for almond orchards from irrigation standpoint. Higher relative humidity in the tree canopy during hull split may enhance the development of hull rot disease. The University of California recommendations suggest that you can provide the trees with mild to moderate stress during two weeks starting from hull split initiation. The trees can be irrigated with as low as 50% ET during first two weeks of hull split. However, the irrigation must be switched back to 100% after that period otherwise it can decrease the weight of kernels.

It is recommended that the mild to moderate water stress should be achieved by reducing the duration of the irrigation sets and not the frequency. From one week after the hull split initiation until one week prior to harvest full irrigation should be provided. In the pre-harvest week we can slightly hold the water back in order to start drying down of orchard floor in preparation of the harvest.

Remember that achieving irrigation uniformity and stressing the tree with optimum deficit irrigation will depend on a number of factors like your method of irrigation and variation of soil types within your orchard. So you must be very careful in achieving your deficit irrigation goals.

To learn more about the deficit irrigation strategies and irrigation scheduling, visit http://ucmanagedrought.ucdavis.edu/Agriculture/

POMOLOGY EXTENSION COURSE SCHOLARSHIP FOR GROWERS

UC Davis Pomology Extension Course

Principles of Fruit and Nut Tree Growth,

Cropping and Management

February 24th – March 6th, 2014

- **Three Scholarships (for new/transitioning growers)**
- **More than $3000 in value each (includes fees, some meals & transportation)**
- **Application Deadline September 1st, 2013**

The Fruit and Nut Research and Information Center (FNRIC) is offering three scholarships to new California growers, or growers transitioning to a new crop, to attend our second annual extension course. The first week of the course includes lectures at the UC Davis Conference Center and demonstrations in the surrounding teaching orchards. During the second week, the class will embark on a four day field tour of UC research stations, orchards, nurseries, and packing houses throughout Northern and Central California.

Scholarships will cover enrollment fees (up to $2,850 value), breakfast and lunch every day during the first week, two dinners, and transportation to field sites. Scholarship recipients will need to arrange for their own accommodations during the course.

To apply for a FNRIC Extension Course scholarship, please complete our online application by September 1st, 2013. The application is available at the following web address:

http://ucce.ucdavis.edu/survey/survey.cfm?surveynumber=11030

Please call the FNRIC (530-754-9708), or send an e-mail to (fruitsandnuts@ucdavis.edu), if you have any questions.

Sincerely,

Brooke Jacobs

Associate Specialist, Department of Plant Sciences, UC Davis

and

Carlos Crisosto

Director of the Fruit and Nut Research and Information Center

BACTERIAL SPOT – A NEW DISEASE OF ALMOND IN THE SAN JOAQUIN VALLEY

Roger Duncan[1], Brent Holtz[2], David Doll[3] and Themis Michailides[4]

University of California Cooperative Extension, Stanislaus County[1] , San Joaquin County[2], Merced County[3], and UC Kearney Ag Center Parlier[4]

Earlier this spring, we received reports from growers and pest control advisors that they had observed a few San Joaquin, Stanislaus and Merced County almond orchards with large amounts of amber-colored gum balls exuding from the hulls. The damage has been predominantly on 'Fritz,' but there are reports of similar damage on 'Monterey' and 'Padre.' In some orchards, Fritz is severely affected while the Nonpareil and other pollinators are very clean.

Samples from affected orchards were sent to University of California plant pathologists, Themis Michailides and Jim Adaskaveg. Both scientists confirmed that the lesions were caused by the bacterium, *Xanthomonas arboricola* pv. *pruni*, the bacterium that causes bacterial spot of almond and stone fruit. This is the first report of this disease on almond in the San Joaquin Valley. Although these orchards have apparently had the problem for multiple years in a row, the symptoms were misdiagnosed as leaf footed bug feeding injury or anthracnose. Dr. Michailides isolated the same organism from an almond orchard in Colusa County in 2006.

The symptoms of bacterial spot include multiple lesions on the hulls with large balls of amber colored "gum" or "sap". Over time, these spots can grow into slightly depressed lesions on the hull. Eventually the infected nuts may shrivel and fall from the tree. Occasionally angular leaf spots can be seen, but this is not (so far) a major part of the disease and can be hard to find. Bacterial spot can be confused with leaf footed bug feeding injury or anthracnose. Unlike leaf-footed bug feeding injury which exudes clear balls or strings of gum, injury from bacterial spot causes amber colored gum. In addition, cutting into a hull damaged by leaf footed bug often reveals evidence of a puncture wound through the hull and into the shell. This characteristic is absent with bacterial spot. Because this is a bacterial disease, there are no fungal spores present. This is in contrast with anthracnose-infected almonds which generally have pink or orange colored spores present within the lesions. In addition, anthracnose often leads to shoot death. This has not been observed so far with bacterial spot.

Bacterial spot is a common problem in Australia and growers there have been forced to abandon the two most severely affected varieties, Fritz and Ne Plus, due to extensive crop loss. Because we have no history of this disease in California, the only information we have is from Australia. Unfortunately, bacterial diseases are very difficult to control and intensive spray programs with copper and Mancozeb have not controlled bacterial spot in Australia. University of California farm advisors and specialists will establish several trials next year in an effort to develop management guidelines for this important disease in California.

In-season IPM checklist for Pistachios

Gurreet Brar,
UCCE Farm Advisor (Nut Crops), Fresno & Madera Counties

Navel orangeworm (NOW): Based on the trapping data (by Dr. Joel Siegel, USDA), the second flight of NOW began in early June and the appearance of pea splits was observed in orchards in late June. Therefore, Dr. Siegel suggests that you should begin your navel orangeworm protection plan by spraying at 1700 degree days, which was in early July this year. Since this pest can complete a generation very quickly on new crop (in only 500-600 degree days), therefore in orchards where pest pressure is high, you should consider spraying again at 2200 and 2700 degree days. Also, July is the time to sample 100 nuts weekly to see if there are any early splits. Early splits can increase the NOW infestation significantly. The need for winter sanitation in your orchards cannot be overemphasized, as this is an extremely important cultural control method, which helps reduce pressure of this pest. Therefore, to knock down the overwintering population of navel orangeworm, you must remove mummy nuts during the dormant period.

Alternaria: This disease can be a problem where flood or sprinkler irrigation is used as higher relative humidity in the canopy helps this fungus to grow. The symptoms of alternaria late blight are black lesions on leaves of both male and female tree. Also, on hulls of developing nuts, black lesions with a red halo may be seen. Under conditions of high humidity black spores develop in the center of these lesions. If you rub these lesions with your finger, the spores blacken your finger. Early August is the most critical period for development of this fungus. If you have this disease in your orchards, try adjusting your irrigation during this period so that the relative humidity stays low during early August. One way of achieving this is by irrigating every other middle. However, reducing irrigation during this time may affect nut quality adversely. Therefore, you must weigh your options depending upon the severity of the disease.

Citrus flat mite: If your pistachio orchard is located in the vicinity of citrus or pomegranate orchards, populations of this mite may buildup during late July and August. No thresholds for treatment decision have been developed, however, if mite populations are easily detectable in nut clusters, a treatment decision should be made before it causes nut shriveling.

Mealybug: Monitor for Gill's mealybug. The overwintering generation of this mealybug produces crawlers during late-May and the first generation develops during early June to mid-July. Chemical treatments are most effective on crawler of first generation, the spray timing for which was around mid-June. Applications later in the season have more variability in their effectiveness in control. However, keep monitoring your orchards for presence of mealybug through fall and mark area where you observe them. This will help you monitor this pest during the next spring. Chemical treatments during post harvest stage are not recommended because biological control is the most active at this stage.. For more information visit http://www.ipm.ucdavis.edu/

Pistachio nut clusters and leaves affected by alternaria late blight

Gill's mealybug in pistachios.

'From the Shell' is produced by UCCE Nut Crops Farm Advisor Gurreet Brar. Contact him for further information, or to be added to the e-mail list, at (559) 241-7526; or e-mail: gurbrar@ucanr.edu

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Our programs are open to all potential participants. Please contact the Fresno County UCCE office (two weeks prior to the scheduled activity) at 559-241-7515 if you have any barriers to participation requiring accommodation.