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Counties

### Almond Management Considerations: Spring & Early Summer

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#### LATE APRIL

- **Irrigation:** We have started the 2024 season with a full soil moisture profile. Monitor orchard moisture to avoid excessive stress from [starting irrigation too early or too late](#). Target 1-2 bars below baseline for pressure chamber readings early in the season (generally -8 to -12 bars) before beginning irrigation.
- **Diseases:** Monitor for [rust](#), [scab](#), [anthracnose](#), and [alternaria](#), treat as necessary. If we have a wet, warm spring consider a rust treatment before symptoms are visible in blocks with a history of rust. See the article in this issue about disease modeling and IPM for disease control.
- **Nutrients:** Assess crop size and plan your nitrogen (N) and [potassium](#) (K) budget accordingly. It is a waste of money to fertilize for the crop you want, rather than the crop you have.
- **Insects and mites:** Monitor for navel orangeworm (NOW), peach twig borer (PTB), [leaffooted bugs](#), [stink bugs](#), and [spider mites](#). Hang mating disruption dispensers for NOW and PTB. Monitor NOW traps to [determine biofix](#). See the article in this issue for a NOW update.

#### MAY

- **Irrigation:** Maintain trees at 1-2 bars below baseline using a pressure chamber. Both too much and too little water can reduce yield. [Pressure chamber readings](#) are the most direct way to measure water status of trees and are a powerful tool when used in combination with [ET](#) and [soil moisture sensors](#).
- **Nitrogen and Potassium:** Almonds use 80% of their annual N budget by June; May is a time of high N use in orchards. See detailed information on [nitrogen management in almonds](#) from The Almond Board of California. Maintain leaf K levels in an adequate range (>1.4%) to reduce spur death and crop loss potential next year.
- **Spray coverage:** In lean years, make sure that the products you're paying for are getting to the part of the tree you want them to hit. Make sure your sprayer is [calibrated and working as intended](#).
- **Diseases:** Continue monitoring for [foliar diseases](#) and treat as necessary.
- **Insects and mites:** Continue monitoring for insect and mite pests and beneficials. See [this article about May sprays](#) in lean times.

- **Gophers/ground squirrels:** Monitor closely and apply steady control practices to active mounds/tunnels.
- Revising your **weed management** is a way to cut costs in a lean year, by reducing strip width and treatment intensity. See article in this newsletter for more information.

## JUNE

- **Irrigation:** If an orchard has been fully irrigated, a strategic irrigation deficit at the onset of hull split offers *Rhizopus* hull rot management and a shorter, cleaner shake at harvest. Reduce irrigation set length as kernel fill completes. Deep, heavy soils with micro-sprinkler or solid set irrigation will have more soil moisture available and will respond more slowly to reduced irrigation compared to lighter soil and/or drip irrigation. For two to three weeks, beginning at the onset of hull split (late June or early July), SWP levels of 4 to 8 bars drier than the baseline (generally -14 to -18 bars) will promote hull split and uniform nut maturity leading to timely harvest. Once hull split is 90%, return the orchard to full irrigation until preharvest cutoff.
- **Fertilizer application:** Apply **potassium** as needed to maintain 1.4% range through July. Assess K fertilizer need using current crop set, last year's leaf analysis results, plus orchard observation. Finish **nitrogen** applications by the end of June. Remember that almond trees use 80% of their Nitrogen by the end of May, so applications in June should be tapering off. This matches N supply with N demand and significantly limits the risk of [hull rot](#)
- **Continue pest monitoring:**
  - Ants: Contact your PCA, check for ants and find a treatment plan. Some application programs start 10 weeks ahead of planned harvest. Apply bait promptly after purchase to dry ground to increase efficiency: product opened for 1-2 weeks no longer works.
  - Continue scouting for [spider mites and their predators](#).
  - **NOW:** Check for hull split in the upper southwest canopy of edge trees. Early is better than later for [hull split sprays](#).
- **Hull rot:** Best control combines adequate, but not excessive, N (2.4-2.6% N in summer leaf samples), moderate water stress (-14 to -18 bars on the pressure chamber) between kernel fill and end of early hull split, and 1-2 fungicides in June or early July. Different hull rot pathogens require different control timings.
  - **Monilinia:** For best control of *Monilinia* hull rot (tan lesion on the outside of the hull), spray in early June as hull split timing does not effectively control this hull rot pathogen.
  - **Rhizopus:** For orchards with a history of *Rhizopus* (black spores) hull rot, spray a fungicide at early hull split timing (tank mix with NOW insecticides).
  - **Aspergillus niger:** Fungicides are more effective once the hulls have actually split.
- **Equipment preparation:** Time and money can be saved by checking harvest equipment before hull split and harvest. Plan for a [low-dust harvest](#).



## Pest management for Shothole and Scab

*Joe Connell, UC Cooperative Extension Advisor Emeritus, Butte Co.*

**Shothole.** The primary concern now with [shothole](#) disease is the potential for leaf infections that can lead to defoliation and yield loss. Dr. Jim Adaskaveg and I did work years ago that led to an understanding of how to more effectively “pest manage” this fungus. We know that the first round of disease in the spring comes from overwintering spores produced on leaf lesions in the fall. Occasionally a few blossom infections are found on the jackets and a little shothole in spring is not a big deal. An epidemic outbreak of leaf infections is a big deal and can affect your bottom line. Periods of 10 to 16 hours of continuous moisture are needed for shothole infection of leaves. Therefore, the primary objective of shothole sprays is protection of the foliage from bloom until five weeks after petal fall.

To “pest manage” this disease you need to pay attention to what’s happening with any shothole lesions you monitor regularly on leaves. When it’s cool and rainy the tree’s response to the disease lesion is slow. The lesions may persist in the leaf rather than shot-holing out. Watch out if you see a spore producing sporodoccia (the little black dot in the center of the lesion) in a leaf lesion. Once spore producing lesions are present on leaves and it rains, the secondary in-season disease cycle begins. When large numbers of splash dispersed spores germinate throughout the tree during rainy weather a shothole epidemic can occur. This can be followed by defoliation and even nut drop when the outbreak is extreme. If continued rain is forecast, prevent an epidemic shothole outbreak by having effective protective fungicide sprays in place to prevent the secondary epidemic.

If on the other hand, you see a few shothole lesions and it warms up and stays dry, the tree’s response is to wall off the lesion with a yellow halo before sporodoccia can form. When the lesions drop out before making spores, the tree wins and the potential for shothole spore production is gone, as is the potential for an epidemic outbreak.

**Scab.** The primary concern for [scab](#) is the potential for an epidemic outbreak and nearly complete defoliation in June to early July that can affect future yield. Somewhat like shothole, we have the potential to “pest manage” treatments for scab depending on the status of overwintering twig lesions and the timing of spring rains compared to twig lesion sporulation.

Some varieties such as Carmel, Winters, and Peerless readily produce over-wintering twig lesions on green wood.

The fungus begins its seasonal cycle by producing black spores around the margins of twig lesions from roughly late March to mid-April, most often forming spores in about mid-April.

This disease can become a problem when rains continue after spore formation. If rain occurs after twig lesions sporulate, an epidemic scab outbreak can be present by June.

So, keep an eye on the twig lesions. If it’s raining before twig lesions form spores, scab won’t be a serious problem. Once spores have formed on the twig lesions and significant rain is forecast, an April spray application is important to prevent infections now and defoliation later. While this disease is favored by protracted spring rains, sprays at five weeks after petal fall have generally controlled scab.

By June, scab infections that started in May will show up as yellowish spots on the under surface of leaves as light comes through the leaf. Later, the lesions develop a gray, greasy appearance visible on the upper leaf surface as well, ultimately producing oily greyish black spots on leaves as they defoliate. Severe infections result in partial to complete defoliation of almond trees in early to mid summer.

Our research has also shown that later May sprays will further help reduce the severity of scab. If we get into a continued rainy pattern into late spring, later applications of fungicides will help prevent serious defoliation from developing. Scab infections can produce black spots or a grey haze on hulls but this has no effect on kernel quality.

**Fungicides** are primarily protective and must be **applied with good coverage** and must **dry on the tree** before rain occurs to be effective and to reduce the chance of resistance developing. The “best” program for one orchard may not be the “best” for another... heed the diseases present in your orchard. Different classes of materials should be rotated in a spray program to reduce the chances of resistance developing (and to reduce the loss of our currently effective materials).



### Navel Orangeworm Updates

*Sudan Gyawaly, UCCE IPM Advisor, Northern Sacramento Valley  
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Historically high navel orangeworm damage in almonds last year has caused many growers to commit to aggressively managing navel orangeworm (NOW) this year. Many (most?) growers sanitized their orchards this year with winter shaking, although we're not sure how many were able to get below the recommended 2 mummies per tree average.

Now that the season has begun, what can growers do to manage NOW? Many growers are adding mating disruption in their orchards this year. Mating disruption is a proven technology with about a 50% reduction in nut damage by NOW when using this tool with other control methods, and cost is justifiable when the damage is above 1%. Dispensers should be up this spring following manufacturer's guidelines. Likewise, many growers with a high NOW damage last year and more than 2 mummies/tree at the start of the season may opt to use a spring (mummy) spray this year to reduce NOW populations within the orchard. Mummy sprays can reduce NOW pressure within an orchard going into hull split, but should not be seen as an alternative to winter sanitation. If you are considering applying a spring spray to manage NOW, be smart about the product you select and the timing when you apply it.

**Selecting the product(s).** There are two important facts to remember while selecting insecticides for spring sprays. **First**, the flights of spring generation can extend over 3-4 months; therefore, using a product with a longer residual effect should be more effective. Also, using higher label rates should extend the insecticide activity. **Second**, broad-spectrum insecticides (pyrethroids such as Asana, Warrior, Brigade, etc.) applied during this period can flare up spider mites as they can reduce natural enemy populations. Using growth regulators (Intrepid, etc.) or other reduced-risk insecticides (Altacor, etc.) that have relatively longer residual effects and have lower risks to spider mite predators could therefore be a good choice for spring sprays. Keep in mind that these insecticides tend to be more costly.

**Timing insecticide spray.** New crop almonds are not susceptible to NOW damage until hullsplit. Mummy nuts are the bridge that NOW use to move from crop to crop. The rationale behind insecticide sprays in spring is to target the mummy nuts prevent the NOW population from building up in high numbers ahead of hullsplit. This approach is theoretically correct. However, one application likely won't cover all the overwintering population and will not control NOW in neighboring orchards. Determining egg-laying biofix using egg traps and spraying insecticides after 100 DD after biofix (or spray timing for peach twig borer) to cover the peak egg laying activities is important for these treatments to have the most impacts in reducing NOW numbers.

**Hullsplit Sprays.** Finally, applying insecticide 1-2 times at hullsplit is critical in protecting the crop from NOW damage regardless of spring sprays. Doing hullsplit sprays correctly is crucial for NOW control. Do not wait too long (spray at 1% hullsplit or slightly earlier); early sprays (after blank nut hullsplit) are reportedly better than later. Very good spray coverage is highly critical in protecting the nuts from NOW damage. High volume sprays (150-200 GPA) with a slower spraying speed (2 MPH) provides better coverage. Rotate the insecticide between the generations (i.e., use chlorantriliprole (Altacor) at hullsplit sprays if methoxyfenozide (Intrepid) was used during spring) to reduce or slow the risk of insecticide resistance development.

Navel orangeworm is impossible to control completely, it must be carefully managed to reduce damage and improve grower income. Growers and PCAs are fighting back to manage NOW this year. Following the steps outlined in this article should help growers land punches and avoid swinging misses.



### **Disease management decisions in low-income year(s)**

*Franz Niederholzer, UCCE Farm Advisor, Colusa and Sutter/Yuba Counties*

Timing may not be everything, but it's really important in disease control in almonds. Fungicides work best when applied ahead of infection. Post infection fungicide spray results usually range from so-so to no good.

Dr. Jim Adaskaveg (UC Riverside) has identified critical spray timings and control factors in foliar and nut diseases of almonds. Here's a quick review of his findings.

Disease is triggered when all the following conditions occur in the orchard 1) the disease pathogen is present, 2) vulnerable plant tissue is present, and 3) the environmental conditions for infection are "right". When one factor is missing, infection doesn't occur. Knowing the status of these three factors in each orchard is key to cost effective disease management. Unneeded spraying wastes money. Early defoliation due to an uncontrolled disease outbreak could be really costly in lack of flowers (and yield) next year.

**Vulnerable tissue:** Blossom brown rot and jacket rot infect flower tissue. Since bloom is the critical time of the year in orchards, Dr. Adaskaveg recommends at least one bloom spray against brown rot. The pathogen risk is difficult to know with any certainty (there is no way to test spore load in an orchard) and the stakes are sky high. Dew can last long enough to cause major infections in susceptible varieties. Selecting a fungicide with jacket rot activity is recommended when spraying for brown rot at full bloom.

**Presence of the pathogen:** In general, rust, shothole, and/or scab can be controlled with a fungicide spray after the earliest signs of the disease appear in the orchard. For example, a fungicide spray is recommended if rain is forecast and one leaf in 100 in an orchard has a rust spot, or scab and/or shothole spores are seen on twig lesions (scab) or in leaf lesions (shot hole).

In orchards with a history of scab and/or rust, preventative sprays at 2 and 5 weeks after petal fall (scab) or 5 and 10 weeks after petal fall (rust) maybe needed for the best results.

**Environmental conditions:** The risk of some diseases increases substantially when certain weather conditions occur. If spring temperatures are warm (above 63oF) and leaves are wet for extended time, anthracnose infections can occur, producing leaf and nut loss as the season progresses. If bloom weather is warm, anthracnose infection is also a risk then. Alternaria infections cause significant leaf loss and reduce return bloom if defoliation occurs before or during harvest. Alternaria infections commonly occur when high orchard relative humidity results in long hours of leaf wetness overnight. Warmer temperatures (average temp more than 60oF) increase disease risk. Models predicting anthracnose and Alternaria risk have been developed and are available for growers and PCAs.

**Disease control:** Critical spray timing is important. Additional important factors in effective disease control include proper fungicide selection (efficacy, resistance management, etc.), and careful application (slow ground speed, complete spray coverage of the trees, every row spraying). Also, because multiple diseases can occur at the same time, making sure that the fungicide(s) in the tank work on all potential diseases is important. Dr. Adaskaveg and colleagues have a great, free, publication on disease management in deciduous tree crops. Click [HERE](#) to view/download it.

In conclusion, several steps must all be done correctly for fungicide sprays to be most effective. Missing one step can severely limit the outcome (and cost the grower a lot of money). That is especially true in a wet spring like this year (2024). Working together, growers and PCAs can keep almond orchards healthy and productive.



**Scan the QR code to see details for upcoming meetings!**

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