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Some Considerations for Spider Mite IPM in Tree Nuts

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As temperatures rise during the summer months, it is important to monitor for spider mites in almond and walnut orchards. In recent years, many growers have reported inconsistent mite control with miticides. Effective spider mite control requires more than simply selecting a miticide to spray. This article discusses key factors that influence spider mite control and offers practical suggestions to improve management outcomes.

1. Know the pest

Spider mites are tiny arthropods that feed on the leaf cells by using their piercing-and-sucking "straw-like" mouthparts to drain out the chlorophyll of leaf cells, causing stippling (spotting) and yellowing, and can ultimately lead to defoliation if populations get high enough. Leaf defoliation in the current season reduces carbohydrate accumulation in trees and negatively impacts terminal growth and crop yield in the following year. Spider mites reproduce rapidly and colonize the underside of leaves, making it difficult for sprays to reach them, especially when lower water volumes are used. Spider mites produce webbing that also acts as a hydrophobic barrier against the spray.

2. Know when and what to spray

Many general, and some specialized, natural predators often (usually??) keep mite populations under control, provided they are not disrupted by broad-spectrum insecticides, such as pyrethroids. These predators include six-spotted thrips, the Western predatory mite, and the Stethorus beetle. Spider mites and their predators can be monitored through leaf sampling, and yellow sticky cards (3x5 inch) can be used to trap six-spotted thrips and Stethorus beetles. Growers should consider both the abundance of mites and the presence of these predators when deciding whether to use a miticide spray. There are multiple categories of miticides available commercially (See table). Understanding the chemistry, their modes of action, and when to apply them is critical. Rotating among miticides with different modes of action is always the best strategy for resistance management.

3. Know how to spray

For the miticide to be effective, the materials must come into contact with mites, so thorough coverage

In this issue…

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with sufficient water volume is key. It is recommended to use 150–200 gallons of water per acre for almonds, and to increase it to 200–250 gallons for walnut trees. The size of the water droplets also matters. The droplet size is a function of spraying pressure, nozzle type, and nozzle orientation. If the nozzles produce droplets that are too fine, they will evaporate or fly away into the sky. If the droplets are too large (>350 microns), they won't penetrate the mite webbing effectively. Medium-sized droplets (200–350 microns) provide a balance between the two. The sprayer should provide sufficient air blast to physically shake and flip the leaves ("leaf flutter") as the tractor passes, and expose the undersides to the mist. It is suggested that the spray volume is directed to the top half to two-thirds of the canopy. Canopy size and height significantly influence spray effectiveness, as spray efficiency drops sharply above 16–18 ft in the canopy.

4. Know when not to spray

Weather factors, such as temperature and wind conditions, are often overlooked but are critical to improve spray efficacy. Studies have shown that when temperatures climb above 85°F, and the humidity drops below 40%, water evaporates at an incredibly fast rate. Under these hot, dry conditions, a large portion of the water can dry up mid-air between the nozzle and the top of the tree. This leaves the chemical becoming airborne as dry drift particles instead of landing on the leaves.

The ideal wind velocity is 2–4 mph to provide consistent coverage. Very calm conditions (<2 mph) are also undesirable due to the risk of a temperature inversion, which occurs when dense, cold air is trapped under a warmer layer, leading to spray materials not landing on target and spreading laterally as drift. Spraying at wind speeds exceeding 10 mph should be avoided at all costs, as this reduces the sprayer's air jet directional power, preventing penetration into the inner canopy and thereby increasing spray drift potential. Local orchard factors such as a dusty orchard floor/dirt road, hot temperatures, and water-stressed trees favor mite populations, and these conditions should be mitigated through proper orchard management.

Summary

Spider mite management requires an integrated approach that extends beyond miticide selection. When a miticide fails to control a mite population, multiple factors may be involved. These include selecting the appropriate miticide, achieving adequate coverage with a properly calibrated sprayer, maintaining a consistent (<2 MPH??) tractor speed, and avoiding applications during windy or excessively hot conditions. When populations are high with excessive webbing, high spray gallonage and slower tractor speeds are necessary. In addition, protecting beneficial predators and rotating miticides among different modes of action can help improve mite control and long-term resistance management.

Brand Name	Active Ingredient	IRAC Group	Chemical properties and best practices
Omni Supreme	Narrow range oil	Undefined	Contact including smothering and barrier effects. Use as an in-season treatment. Well-watered, non stressed trees to avoid phytotoxicity. May be used in organic.
Agri-Mek SC (and generics)	Abamectin	6	Translaminar. Best with narrow-range horticultural oil (NR 415/440) to penetrate the leaf cuticle. Documented resistance in certain areas. Toxic to predatory six-spotted thrips; not for recommended prophylactic use. Relatively longer PHI.
Onager	Hexythiazox	10A	Ovicidal /Juvenile. Longer residual but slow acting with no adult knockdown. Better fit for early stage of infestation. Long PHI.

Brand Name	Active Ingredient	IRAC Group	Chemical properties and best practices
Zeal MVP	Etoxazole	10B	Ovicidal /Juvenile. Locally systemic (translaminar) movement helps but still relies on thorough leaf wetting to maximize contact with eggs. Relatively longer PHI.
Acramite 50WS Vigilant 4SC	Bifenazate	20D	Strictly contact. Fast knockdown of active, mobile stages.
Kanemite 15SC	Acequinocyl	20B	Strictly contact. Knocks down all life stages. No impact to predatory mite (*Galendromus occidentalis*). Requires high water volume especially for large trees.
Nealta	Cyflumetofen	25A	Strictly contact. Highly selective for spider mites while remaining safe on predatory mites and six-spotted thrips. Requires thorough wetting to dissolve or coat heavy mite webbing.
Fujimite 5EC Portal XLO	Fenpyroximate	21A	Strictly contact. Delivers immediate stop-feeding action on motile stages; Adding surfactant or oil can help; Toxic to predatory mites, but not six-spotted thrips.
Magister SC	Fenazaquin	21A	Contact and ingestion activity. Broad-spectrum knockdown across all life stages, including eggs. Thorough coverage is necessary.
Envidor 2SC	Spirodiclofen	23	Kills all mite stages, but most effective on juveniles.

**Follow the label when applying any pesticides*

Regulated Deficit Irrigation During Hull Split in Almonds

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The goal of good irrigation management through the season is to match crop water use with water supply while avoiding over-irrigation and/or excessive tree stress.

Standing water and increased humidity from over-irrigation can increase the risk of diseases such as Phytophthora root rot, hull rot, and Alternaria. It can also reduce oxygen in the root zone, leading to poor root function and reduced tree growth. In addition, over-irrigation will increase pumping costs and fertilizer losses through leaching, which may require additional fertilizer applications to compensate. Excess irrigation can also increase the time needed for the soil profile to dry out, making it more difficult to apply deficit irrigation when needed.

As almond orchards move into hull split, irrigation management becomes one of the most important tools growers can use to sustain yield, promote proper hull split, reduce disease risk, and prepare for harvest. Regulated deficit irrigation, or RDI, is the planned reduction of irrigation during specific crop growth stages when almond trees are less sensitive to moderate water stress. Although any deficit irrigation can potentially reduce yield, hull split is one of the best times to apply RDI because moderate stress can help reduce hull rot, synchronize ripening, improve harvestability, and save water with minimal impact on yield when managed correctly.

Midday stem water potential, measured with a pressure chamber, is a useful tool to guide irrigation decisions during this period. Moderate stress levels vary by orchard, soil type, irrigation system, root zone depth, and irrigation history, but the following values can be used as general targets.

Strategy	Up until mid-June	1% hull split through 90% hull split	90% hull split to leaf drop
Moderate Stress	-8 to -12 bars	-14 to -18 bars	-10 to -14 bars

A practical hull split irrigation management strategy is to begin deficit irrigation just prior any hull split when you expect hull split to begin soon. The goal is to have trees already at mild–moderate stress when nuts begin hull split. A good strategy is to reduce irrigation by about 10–20% at approximately 1% hull split (One approach is to gradually reduce irrigation until trees reach about -15 bars of midday stem water potential near the beginning of hull split) and continue until about 90% hull split. However, the appropriate % reduction varies with soil conditions and irrigation system, so it should be evaluated separately for each orchard. This RDI period typically lasts about 2-3 weeks. After that point, irrigation should return to full crop demand. Maintaining stress for a longer period will not force nuts to split faster. Instead, prolonged or severe stress will stop hull split and result in hull-tights. Also, it can reduce kernel size and vegetative growth, and negatively affect next year's crop potential. Growers should keep in mind that this strategy is not a one-size-fits-all. Soil texture, soil depth, rooting depth, irrigation system design, and stored soil moisture should be considered.

Growers should be careful not to impose too much stress. Excessive water stress during this period can reduce yield and affect tree growth. RDI should be managed using evapotranspiration (ET), pressure chamber readings, soil moisture sensors, field observations, and consideration of the orchard's soil and irrigation system.

Applying moderate to severe water stress 20%–50% of ET for one week before harvest is generally enough to help minimize bark damage during shaking. Water applications should be resumed as soon as orchard conditions allow after harvest. Studies have found that delaying or withholding irrigation after harvest can negatively affect the following season's crop by reducing fruit set and, to a smaller degree, bloom intensity. Therefore, growers should plan ahead and keep at least 3 to 4 acre-inches per acre available from the typical 8 acre-inches needed for postharvest irrigation especially in dry years. Growers with drip irrigation may consider making one sweeper pass to remove nuts from the berm area before irrigating or using a single drip line to limit surface wetting. Using a conditioner can help improve drying before pickup.

Navel Orangeworm Management at Hullsplit: Key Tips for Almond Growers

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California almond growers will begin hullsplit sprays soon to help manage navel orangeworm. Successful navel orangeworm management requires careful integration of IPM practices, including pest monitoring tools, winter sanitation, mating disruption, early harvest, and well-timed insecticide application at hullsplit.

Here are a few tips when making hullsplit spray decisions.

1. Monitor hullsplit progress

Hullsplit first begins on nuts located in the upper and southwest portions of the canopy. Because blank nuts often split 1–2 weeks earlier than sound nuts, they can be used to anticipate the beginning of true hullsplit but should not be used to determine hullsplit spray timing. For this, monitor representative trees throughout the orchard and track the percentage of nuts that have reached hullsplit, indicated by an opening of about one mmin the almond suture. Hullsplit timing varies among varieties, locations, and seasonal weather conditions, so individual field observations should always guide management

decisions. Due to record breaking temperatures in March, we expect hullsplit to begin much earlier this year. Early split varieties include Nonpareil, Shasta, Yorizane, and Independence.

2. Track navel orangeworm activity

Navel orangeworm populations should be monitored using egg traps, female traps, and/or pheromone traps throughout the season. Although no trap provides a definitive treatment threshold, trap captures help determine population trends and identify periods of increased risk. Attention should be paid to increased egg counts or female moth captures during the hullsplit time for the second generation, and ~700 degree days after that for the third generation which occurs in early-to-mid August in the Modesto area.

The second generation of NOW typically poses the greatest risk because it coincides with hullsplit of early varieties, including Nonpareil and Independence. The goal is to protect nuts when they become susceptible to infestation. For this, avoid relying solely on calendar dates or previous years' spray timings. Seasonal weather patterns can shift both hullsplit timing and NOW development. Base spray decisions on actual hullsplit observations and trap activity.

Many almond orchards benefit from two hullsplit sprays: the first at 1% hullsplit timing, followed by a follow-up application in 2-3 weeks, by which time pollinizer varieties begin to split.

3. Choose insecticide wisely

A few effective reduced-risk insecticides, such as chlorantraniliprole, and insect growth regulators, such as methoxyfenozide, are compatible with predators and parasitoids. These insecticides target eggs and newly hatched larvae. However, avoid using the same active ingredient against different generations of navel orangeworm. For example, if you applied Altacor eVo (chlorantraniliprole) during the May spray period, do not use it again at hullsplit. However, the same active ingredient can be used for two applications spaced 2–3 weeks apart during hullsplit, as both sprays target the same generation.

Given the increased use of pyrethroids earlier in the season for leaffooted bug and stink bug management, their relatively low efficacy against navel orangeworm (NOW) due to resistance, their greater impact on predators and other beneficial insects, and the frequent exceedance of pyrethroid concentrations in surface waters throughout much of the Central Valley, it is advisable to avoid using pyrethroids whenever possible. Follow best practices to ensure good spray coverage, as coverage is one of the most important factors determining the effectiveness of a hullsplit spray.

Our Community Impact

Stanislaus County’s Ed Perry and Roger Duncan Honored

The Stanislaus County Farm Bureau recently honored Ed Perry and Roger Duncan, who both worked for the University of California Cooperative Extension in Stanislaus County before retiring, for their decades of service to the industry and local communities.

Head to our **website** to view the video!