WEST COAST NUT

March 2018 Issue

SPOTLIGHT:
Pistachios: Warm Winter Temperatures are Becoming a Problem For California

In This Issue:

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WEST COAST NUT

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IN THIS ISSUE

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FEATURED ARTICLE

Warm winter temperatures are becoming a problem for California pistachio production. To survive winters, temperate deciduous trees like pistachios, that evolved in climates with much colder winters, become dormant in the winter. The function of dormancy is to minimize metabolic activity and conserve the tree's resources under conditions generally unfavorable for survival or growth. However, if the dormant season climate, with the temperatures that precipitate the tree entering dormancy change, the tree's responses will also change.

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HOW DO WARM WINTER TEMPERATURES AFFECT **PISTACHIO** BLOOM AND FRUIT SET

BY LU ZHANG | POSTDOCTORAL SCHOLAR, DEPARTMENT OF PLANT SCIENCES, UC DAVIS

Warm winter temperatures are becoming a problem for California pistachio production. To survive winters, temperate deciduous trees like pistachios, that evolved in climates with much colder winters, become dormant in the winter. The function of dormancy is to minimize metabolic activity and conserve the tree's resources under conditions generally unfavorable for survival or growth. However, if the dormant season climate, with the temperatures that precipitate the tree entering dormancy change, the tree's responses will also change. Kern County Farm Advisor Craig Kallsen recently produced an analysis demonstrating that the single greatest predictor of potential pistachio yield is the previous year's crop. His analysis also demonstrated the warm winter temperatures can decrease this crop. A pistachio's fruit bud is well differentiated before bloom but bloom, nut set and early growth need to be supported by the carbohydrates stored late the previous season in the twigs, branches and roots as, at bloom, the leaves are not mature enough to photosynthesize and produce carbohydrates. Dormant temperatures higher than the 45 °F (7.5 °C) needed for dormancy appear to affect the carbohydrate storage of the pistachio's shoots.

The quality of this dormant period; literally how well it conserves the tree's resources for the bloom and fruit set, has been traditionally evaluated by the measuring the depth and duration of temperatures the tree experiences from November 1-February 28th, or September 1st and August 31st, depending upon the measurement method used. This 'chilling-requirement' methods, called chilling models have included the straight hour accumulation method, "chilling hour accumulation" below 45 °F or 7.5 °C, and the newer weighted models that assign differential chilling quality as temperatures deviated from the 7.5 °C or 45 °F optimum from September 1st through August 31st; the Utah and Dynamic Models. A complete explanation of these various models and their calendar and unit parameters can be viewed at http://fruitsandnuts.ucdavis.edu/Weather_Services/chilling_accumulation_models/Chill_Calculators/?type=portion.

However, there remains no complete theory that could explain the mechanism of dormancy and how low temperatures, chill, interact with dormancy. Why is there a temperature range that above or below the values the chilling accumulation is invalid? What is actually being accumulated during dormancy, a specific substance? The purpose of this article is to what we do and do not know about winter temperatures and how they affect low pistachio bloom.

How High and Low Chill Affect Bloom Quality and Timing

In pistachio, bloom asynchrony, between the male and female trees, uneven bud-break within a rachis, nut blanking, and poor production are negatively correlated with dormant chill accumulations. To understand this better in 2017, we compared flower bud

Figure 1. Male (a) and female (b) flowers were classified into 5 stages, respectively. (a) stage 1, brown bud; stage 2, beginning red; stage 3, beginning open; stage 4, opening; stage 5, issuing pollen; (b) stage 1, brown bud; stage 2, beginning green; stage 3, extended green; stage 4, beginning open; stage 5, opening. Sources: Pistachio Production Manual, 2016.

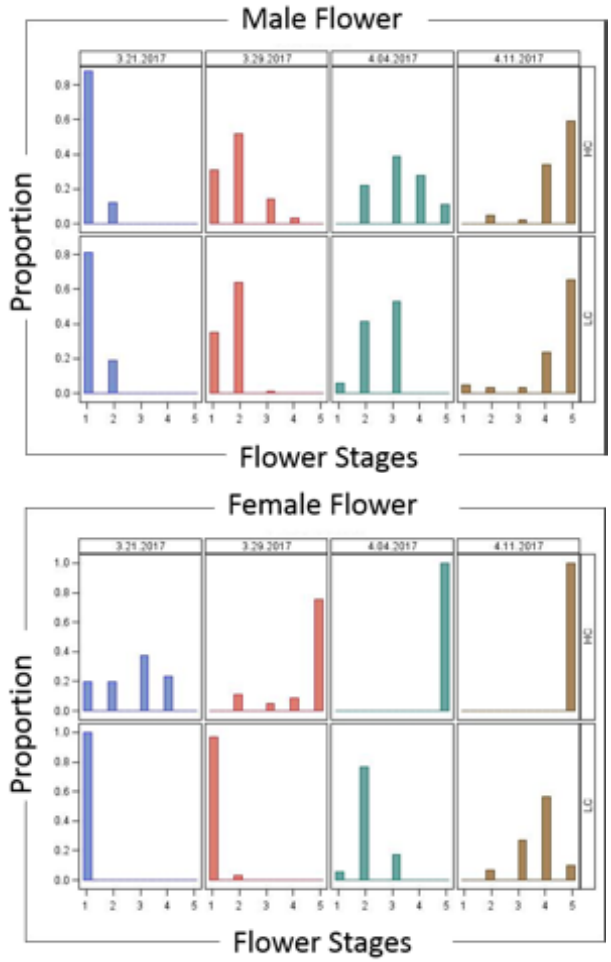

Figure 2. The development of both male (a) and female (b) flowers on shoots receiving both high chill (800 chilling hours) and low chill (400 chilling hours) recorded weekly from March 21th to April 11th. On each of the dates and locations, the proportion of flowers at each of the five flowering stages were evaluated. The stages of flowering are given in Figure 1. The results showed that with low chill both male and female flowers developed more slowly than flowers under high chill situation. In the case we observed, the bloom asynchrony appeared in low chill locations where the male flowers matured earlier than female flowers.

development under low (400 chilling hours) and high (800 chilling hours), winter temperatures. (**Figure 1, page 4**) shows the normal developmental stages of the male 'Peters' (a) and female 'Kerman' (b) flowers; from stage 1s, unopened buds to stage 5s with the stamens issuing pollen (a) and female florets blooming (b). Our results (**Figure 2**) demonstrated that with low chill both male and female flowers bloomed more slowly than flowers that experienced high chill. This was particularly obvious in female flowers with adequate winter chill; over 80 percent of the flowers had bloomed by the end of March bloom was limited under low chill.

Why Chill Accumulation Affects Bloom Quality and Timing

Carbohydrates, starches and sugars produced by the leaves the previous season and stored in the tree are the tree's energy source for dormant season maintenance, and spring bud break, bloom and growth before the new leaves on the current shoot growth are able to support maintenance and growth. Carbohydrates stored in the roots are slowly depleted during the winter and the consumption rate increases in the spring before bud break. Starch stored in the roots is broken down into soluble sugars delivered to shoots via xylem, the trees system that conducts water, sugar and nutrients from the roots to the shoots. Once in the shoot these sugars are again transformed to starch and stored. However, the critical levels of root and shoot carbohydrates required for successful bud break and bloom are unknown.

Recent research demonstrated dormant temperatures >45 °F increased shoot respiration and consumption of stored carbohydrates (Zwieniecki et al., 2015). And, that during warm winter nights, starch breakdown in the roots was reduced, limiting sugar transport to the shoots and therefore carbohydrates available to support bloom. These results collectively suggest warm winter temperatures will affect the carbohydrate supply proximal to buds, and in turn, the quality and timing of bud break and bloom.

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Effects of High and Low Chill on Shoot Carbohydrates, Bloom and Flower Quality

We investigated shoot carbohydrate levels and bloom timing and quality of Kerman and Peters pistachios grown in adjacent high and low chill locations. Specifically we measured the soluble sugar and starch content in both the phloem and the xylem, the former is the tree's reverse conducting system that transports the photosynthates produced by the leaves to storage or growing organs, and the xylem brings water and minerals from roots to the top of the tree. In winters and early springs, xylem tissue functions as the main carbon source as phloem transport is blocked, and there are no producing leaves. The objective was to correlate the chill accumulation with the shoot carbohydrates and flower quality. Shoot carbohydrate content immediately proximal to the bud, the flower development stages over time and the flower dimensions, length, width, weight and were measured and graphed as a function of shoot carbohydrate levels under low and high chill conditions.

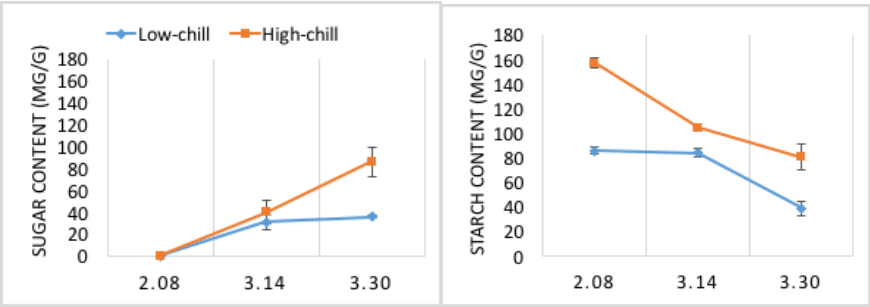

Figure 3. Sugar contents of buds (a) and starch contents in the shoot sections (b) that bearing buds in (a). Buds and shoots were collected from both high chill (800 chilling hours, red lines) and low chill (400 chilling hours, blue lines) locations. These graphs demonstrate that from early February to late March the starch contents of shoots (b) and on March 30th the sugar contents of buds (a) both having received low chill were significantly lower than the carbohydrate contents of shoots or buds that received higher chill. Meanwhile, the development of flowers in low chill locations was retarded in late-March as shown in Figure 2. Together, these results demonstrate that in warm winters,the shoots' carbohydrates were consumed, adversly affecting the bloom quality.

Our 2016 and 2017 results demonstrated that from February to April the carbohydrate contents of shoots receiving low chill were consistently and statistically lower than the carbohydrate contents of shoots that received higher chill. Before bud break (Feb 8th, 2017), the starch content in the xylem of shoots receiving lower chill was half that of the starch content in shoots receiving higher chill (Figure 3b). This suggests that the stored starch supporting bud break was dramatically correlated, and perhaps somehow directly reduced due to inadequate winter chill. And also that later spring starch/sugar source-sink transportation cannot rectify this deficit.

How the Trees Carbohydrates Determine Bloom Quality

Before bud break, there were no differences in carbohydrate levels in low

and high chill buds. On February 8th 2017, little sugar was detected in buds with high and low winter chill (**Figure 3, Page 6**). At bloom on March 30th, flower buds with high chill had higher sugar content and produced better bloom than buds with low chill with sugars of 86.03mg/g and 35.83mg/g, respectively. Compared to sugar, the starch contents in high chill buds was lower and stable. In buds receiving low chill, starch was rare and almost unchanged from bud break (0.28 mg/g) to bloom (0.59 mg/g). Our data thus far suggests the carbohydrates in the shoot support bloom as the buds have low carbohydrate reserves through the winter. As you can see in figure 3 starch levels in shoots reduced to half in both high chill and low chill locations suggesting that the shoot's reserved carbohydrates are exhausted by flowering. The retarded bloom on shoots with low chill also had lowered carbohydrates again suggesting that warm winter temperature promoted respiration which depleted the shoots carbohydrates.

We also conducted bud removal trials to demonstrate that if there were less buds on a shoot the decrease in shoot carbohydrates not would be as strong. Our results demonstrated that after bloom, the carbohydrate content of shoots with fewer buds were higher than the control shoots with more buds. This supports the hypothesis that bloom quality is highly dependent upon the carbohydrate content of the shoot before bloom.

To determine specifically how shoot carbohydrate content supports bloom we examined the floral bud's anatomical development under high and low chill conditions. Our results revealed that the xylem, the system that conducts carbohydrates to the bud, developed poorly under low chill conditions. This demonstrates how low chill conditions, with the warmer temperatures which promote the respiration that consumes the shoots carbohydrates, might result in poor bloom. The carbohydrates are not available for bud development and bloom.

In conclusion, all the results thus far have demonstrated that there are major differences in the shoot carbohydrate storage and bloom quality between shoots with high and low chill accumulation. This suggests that any production practice that increases shoot carbohydrate storage before dormancy, and decreases its loss during dormancy, will produce a better bloom the following spring.

Therefore, maintaining maximum leaf surface area as long as possible in the fall, to increase carbohydrate production and storage through photosynthesis and translocation from the leaves to the shoots, would be the first approach. Minimizing the effects of higher dormant season temperatures, particularly those produced by sunlight, is more difficult and multiple methods have been investigated; among these methods are late dormant season oil applications, early dormant season inert reflective material applications, the combination of two, and evaporative cooling produced during the dormant season with intermittent tree wetting. Merced County Farm Advisor, David Doll summarized his recent results examining the first two methods, late season dormant oil applications, early season kaolin clays applications, and the combination of the two, as follows. "In practical terms each of these treatments appear to have different timings for maximum efficacy. Kaolin clay should be applied early in the dormant period to maximize chill accumulation, especially when droughts have occurred and more days with high solar radiation are expected due to lower soil water content. Re-application after rain events may be needed. Even though an increase in chill portion accumulation was observed with dormant oil applications, at this time it appears applications should be done in late winter to maximize bud break and accelerate harvest. However, until how these treatments produce an increase in chill portions is truly understood perhaps treatment timing may change.

Thus far, the kaolin clay treatments appear to be of value if a low chill year is expected. Until mid- to long-range weather forecasting can be improved, the expense of kaolin clay applications is hard to justify due to the random occurrence of low chill years. If low chill years become more frequent, kaolin clay and dormant oil applications may provide the ability to maintain yields when chill portion accumulation is 10-15 percent deficient."

The final method, now being investigated, is evaporative cooling. In collaboration with Drs. Yiannis Ampatzidis from University of Florida and Dr. Jim Flore from Michigan State University and Mr. Rod Stiefvater of RTS Agri Business, an 'Automated Canopy Mist Delivery System' designed to monitor bud and shoot temperatures and automatically deliver mist for evaporative cooling is being investigated.

Comments about this article? We want to hear from you. Feel free to email us at article@jcsmarketinginc.com

A NEW CHAPTER IN WALNUT BLIGHT MANAGEMENT?

By Luke Milliron | UC Cooperative Extension Farm Advisor for Butte, Tehama, and Glenn Counties
Dr. James Adaskaveg | Professor of Plant Pathology at UC Riverside

For many who grow walnuts, 2017 will be remembered for being a tough year for walnut blight. A long, wet spring meant that conditions were ideal for orchard diseases, and there was no exception for the bacterium that causes walnut blight, Xanthomonas arboricola pv. juglandis (Xaj). If there was any time when a new tool to manage this viciously destructive disease would be especially welcomed, it would be now as many orchards head into the 2018 season with a tremendous amount of overwintering disease inoculum.

Walnut Blight Disease Cycle

This devastating bacterium overwinters in the dormant bud scales, "waiting" to be rain-splashed onto the flower buds and other green plant organs during the rapid expansion, termed "prayer stage" for the pistillate flowers. Twig cankers are another overwintering mechanism that can supply inoculum for primary infection. Infection during this period is typically classified as "end blight" due to the most common symptom being sunken black lesions at the flower end of the nut. If wet conducive conditions for infection persist in the subsequent weeks, newly blighted nuts serve as the main inoculum source for secondary infections, typically classified as "side blight". End blight infections will typically kill the developing kernel (see photos 1 and 2)

Photo 1 and 2: An "end blight" dropped walnut, blighted at the flower end and with evidence of the infection killing the developing kernel (photo by Luke Milliron).

resulting in a dropped nut, whereas these secondary side blight infections, if they occur later in the season or after the nut is fully formed, do not typically result in a dropped walnut but may predispose the nut to worm damage. In a year like 2017, the drop from early infections had the potential, particularly in the wetter Northern Sacramento Valley, to result in devastating crop loss (see photo 3).

In addition to facing a particularly

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CALIFORNIA WALNUTS

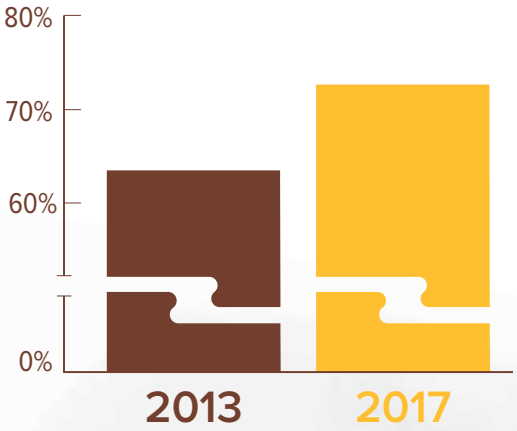
TARGETING NEW SECTORS TO DRIVE GROWTH

Retail

New retail programs are designed to stimulate consumer purchase by making the connection between our advertising and marketing efforts and the shopper experience at point of purchase. During **American Heart Month in February,** California Walnuts will provide in-store support for retailers in select markets with header cards, shelf talkers, loyalty card offers, in-store demos, TV tags and radio spots. All materials emphasize our message of heart-health*, simplicity, and versatility.

Food Manufacturers

To build awareness and interest in California walnuts as an ingredient in packaged foods, print and digital ads will target food manufacturers. The ads will communicate their premium image and heart-healthy goodness. Premium baked goods, sauces, and spreads containing walnuts are large categories with significant growth opportunities.



We're spreading the word

72% of consumers would purchase a food product knowing it contains walnuts.
2017 Attitude & Usage Study

71% of consumers are more likely to purchase walnuts with the California walnuts logo on the package.
2017 Branding Research Study

California WALNUTS

walnuts.org

American Heart Association CERTIFIED Meets Criteria For Heart-Healthy Food

Per one ounce serving

*Heart-Check food certification does not apply to recipes unless expressly stated See heartcheckmark.org/guidelines. Supportive but not conclusive research shows that eating 1.5 ounces of walnuts per day, as part of a low saturated fat and low cholesterol diet and not resulting in increased calorie intake, may reduce the risk of coronary heart disease. (FDA) One ounce of walnuts provides 18g of total fat, 2.5g of monounsaturated fat, 13g of polyunsaturated fat including 2.5g of alpha-linolenic acid - the plant-based omega-3.

Photo 3: Devastating crop loss from end blight in a walnut orchard in Southern Tehama County in June 2017 (photo by Luke Milliron).

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tough year for walnut blight control, many growers were further dismayed to hear that the Environmental Protection Agency (EPA) is reviewing a proposed 25 percent reduction in the maximum yearly application of metallic copper in walnuts from 32 pounds to 24 pounds (i.e., six applications at the maximum rate of four pounds metallic copper). Organic growers and walnut growers in the Northern Sacramento Valley are likely to be the most affected by the proposed reduction. Considering the tough blight year and proposed copper reduction, the industry has needed some good news. That good news may come on March 1st, when Kasumin 2L (kasugamycin) is slated for full registration (US EPA PRIA date) on walnut in California. Having a new tool in the fight against walnut blight would be welcome news, particularly if it is (as currently scheduled) available in time for the upcoming walnut blight season this spring.

Kasugamycin represents a new chapter in a very old fight against walnut blight. The first chapter of chemical warfare against Xaj was the reliance on copper alone, which served the industry well from the 1930s to the 1980s when resistance began to develop. The second chapter in that fight began in 1991 with the combination of an ethylene bis-dithiocarbamate (EBDC) class chemistry like maneb or mancozeb with copper.

The Kasugamycin Story

Kasugamycin has been in the regulatory pipeline for over eleven years and is finally slated for a full registration (FIFRA Section 3). So why did it take so long? Many speed bumps over the years have slowed the registration process, despite being a compound that breaks down to near zero levels within 30 days and has no worker safety issues. One of the most significant hurdles in the registration of kasugamycin was its classification by the EPA as an antibiotic. This classification was based on its similar chemistry as the aminoglycoside antibiotic streptomycin. This classification greatly slowed the process, despite kasugamycin being a novel compound that is not used in human or animal medicine. Also, despite its application in plant agriculture, research was done to demonstrate that it would not be placing antibiotic resistance pressure on non-target bacteria (i.e., those that infect humans and animals). This process could have been dramatically improved if there was a path of scientific regulatory vetting for antibiotics for use in plant agriculture separate from the process for human and animal antibiotics.

So after over a decade of a tumultuous regulatory pathway, what does kasugamycin offer walnut growers facing a perennial fight with blight? In California Walnut Board (CWB)-supported research efforts, Dr. Jim Adaskaveg, a Plant Pathology Professor at UC Riverside has found kasugamycin (Kasumin 2L) to have excellent and consistent efficacy when applied with either a copper

(e.g., Champion++, Kocide 3000, Badge X2, etc.) or mancozeb (e.g., Manzate, Dithane). However, kasugamycin is not a silver bullet. Used alone, kasugamycin (Kasumin 2L) has more moderate efficacy and is at an elevated risk for resistance.

The introduction of kasugamycin (Kasumin 2L) as a tool in the toolbox opens a new chapter in walnut blight management because of the opportunity to finally rotate chemistries. Kasumin 2L used in combination with copper (Cu) or with mancozeb, as well as the current industry standard of Cu-mancozeb can be used to form a three-part rotation. Dr. Adaskaveg found the Cu-mancozeb, kasugamycin-mancozeb, kasugamycin-Cu rotation to be highly effective. These two material rotations work well because each of the chemistries has a different mode of action (MOA) in targeting bacteria, denoted by the FRAC group M1 for copper, M3 for mancozeb, and 24 for kasugamycin.

Use of Kasumin 2L

If Kasumin 2L is successfully registered and available this season as expected, it will be important to carefully follow its labeled use and restrictions. The labeled rate is 64 fluid ounces per acre with a minimum of 100 gallons of water by ground rig, with no off-label use rates. You must have a sufficient volume of spray to attain good coverage, with a reduced spray volume possible on small trees. If successfully registered, there will only be two applications of Kasumin 2L allowed in the 2018 season. Upon further environmental toxicology documentation, it may be possible that four annual applications (a total of 256 fl/oz, or 4 applications x 64 fl/oz per application) will be allowed in future years. If there are four applications possible in future years, Kasumin 2L may be used in a maximum of two applications consecutively. There will also be a minimum interval of seven days between applications. In addition, alternate row spraying will not be allowed with Kasumin 2L. These restrictions are aimed at reducing the risk of resistance build-up. Other restrictions include a pre-harvest interval (PHI) of 100 days, which may be around the middle or end of June depending on the walnut variety. Finally, some additional restrictions are specific to its classification as an antibiotic (reducing

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exposure to non-target bacteria), such as prohibiting its use in orchards with animal grazing or fertilization from animal manure sources. As with any pesticide, it's critical to carefully read and follow the labeled use.

Management Fundamentals Remain

Kasugamycin is a highly effective spray partner with copper and with mancozeb. However, the material applied is only a single component in the management program of any pest or disease that requires spray application as a part of its integrated management. If the fundamentals of spray timing, rate, and coverage are not also successfully adhered to, the best materials will do little to control this tenacious disease capable of prolific spread and significant economic impact.

Proper timing of your first spray will depend on the orchard history of disease and weather conditions. Under the most severe conditions, whereby an orchard has a history of severe disease and rain is forecast, consider applying the first spray at 20-40 percent catkin expansion or at terminal bud break. Under slightly less severe disease history or forecast conditions, consider waiting until 20 percent of female flowers are visible (aka at the "prayer stage", see photos 4-7), or even 40 percent prayer stage if disease pressure is expected to be especially low. The first spray application is followed 7 to 10 days later with a second application. Further applications must be made on the judgment of the grower and Pest Control Advisor (PCA) as they consider forecast weather and orchard history and work to protect the explosion of canopy growth from secondary infection spread. In wetter Northern California, four applications are seen by some as a minimum, with the XanthoCast model (www.agtelemetry.com) available to help sync application timing with forecast susceptibility from rain or dew wetness.

Photo 4-7: Pistillate flower expansion or "prayer stage" has a range of appearances.

The application rate is also critical to ensuring a successful blight management program. Copper applications require careful attention to the actual rate of applied metallic copper, or metallic copper equivalent (MCE), which can be determined by multiplying the label rate of the copper material by the percent MCE (e.g. 30 percent MCE and a 6 lb rate: 0.3 x 6 or 1.8 lbs MCE). Under high disease pressure, consider the MCE achieved at the labeled rate by different copper materials.

Finally, good coverage is vital to getting the sprayed material that was applied at the correct timing and rate to directly reach the bacteria and prevent infection. Employing large spray rigs, using proper sprayer calibration, checking coverage with spray cards, and avoiding half sprays are just some of the techniques that help ensure good coverage. Remember with walnut blight, if you don't cover it, you don't protect it!

Walnut blight is a tenacious disease that can spread prolifically, and spray materials represent only a single part of the fight against the disease. However, it is also true that the copper-EBDC combination has been the only thing keeping the walnut industry in the fight against blight for nearly 27 years. If the effectiveness of the copper-EBDC combination was lost due to resistance, it would be an incredibly tough hit to the industry, particularly in the Northern Sacramento Valley. A third efficacious bactericide allows the industry to open a new chapter in the fight against walnut blight, one where we can finally rotate modes of action and preserve the effectiveness of copper-mancozeb for many years to come.

*The authors of this article and the University of California Agriculture and Natural Resources do not prescribe or recommend the application of any pesticide or other agrichemical. UC guidelines can be found at ipm.ucanr.edu/PDF/PMG/fungicideefficacytiming.pdf.

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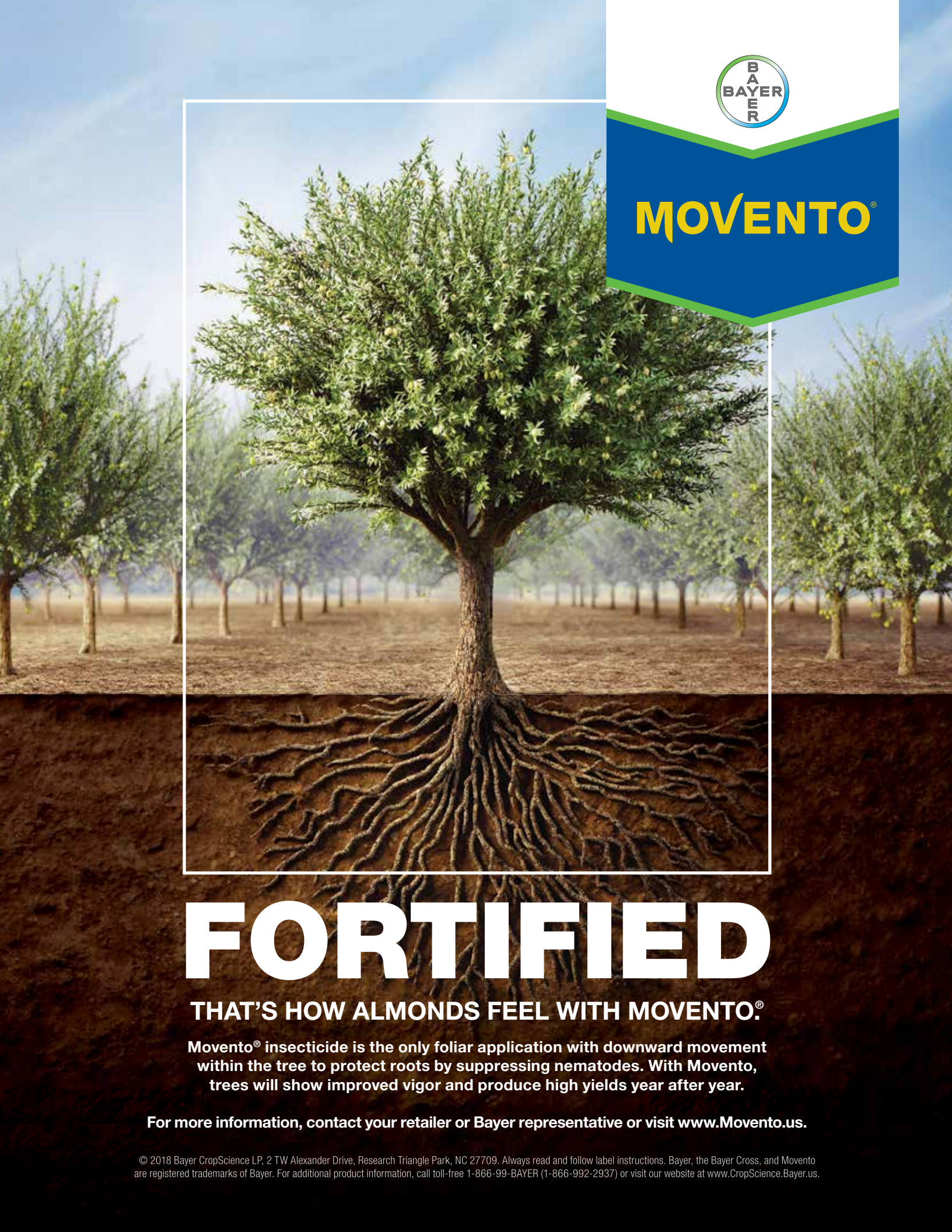
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BEST MANAGEMENT PRACTICES FOR **NOW** IN PISTACHIOS

By Cecilia Parsons | Contributing Writer

All Photos Courtesy of Kathy Coatney

Mating disruption (MD) in nut crops is not a new approach to control of navel orangeworm (NOW), but new research is showing it can be a cost effective part of the control strategy.

Placement of Traps

Placement of traps, the size and shape of orchard where MD is used and timing are all factors that can affect NOW control the success.

David Haviland, University of California (UC) farm advisor in Kern County said products that dispensed pheromones in orchards were first tried in the 1980s. Further refinement of the dispensers in the early 2000s proved the use of MD could reduce navel orangeworm damage at harvest. Area-wide MD trials were also promising.

Mating disruption, used as part of an integrated management program, uses dispensers that emit a pheromone compound that actively or passively keeps male NOW from finding and mating female NOW. The most common types of MD involve use of a canister that releases pheromone compounds at timed intervals during the night when NOW moths are sexually active. NOW males find females with the help of pheromones, but the dispensers elevate the level so that the male's ability to locate unmated females is affected.

The cannisters are placed in a grid pattern at the rate of one to two per acre in orchards at the time when pheromone traps indicate the first generation of NOW adults are flying.

Mating Disruption Pays

In his presentation at the annual UC Pistachio Day event, Haviland said research has shown a return on investment with the mating disruption products on the market. The research, funded by Almond Board of California used 40 acre plots in Kern County that were also in a regular spray program for NOW control.

Haviland confirmed that all four products used did shut down male pheromone traps and reduced the percentage of NOW damage at harvest. The research sites in Maricopa, Wasco and Buttonwillow averaged a 46 percent reduction in NOW damage.

While crop damage was reduced in the MD trials, Haviland said he also looked at the cost of MD compared to the yield improvement. Costs for an MD program ranged from $110-$120 per acre. In the trial, he said the increased percentage of clean crop surpassed the cost of the program. Haviland said all the data was for almond production and he plans to have data for pistachio production in the next trial.

Even if the MD cost only equaled the yield improvement, Haviland said, the advantages to using this technology still make it a worthwhile strategy. Lowering the NOW population also reduces aflatoxin levels, improving crop quality. Lowering NOW populations in orchards also helps with resistance management. Marketing strategies can include reduction of pesticide use and no pesticide residues.

Haviland noted several instances where MD did not work as expected in the orchard. The Kern County sites in the trial were square or rectangular. Trial sites with triangular shapes did not have the same success. Mating disruption was less effective, Haviland said, because of windier conditions and longer edges where more mated female NOW could enter the orchard. For the $120 per acre investment at those sites, only $17 per acres was returned.

Area-Wide Treatment Program

An area-wide type treatment program where neighboring orchards are included would have a better MD outcome, Haviland said.

All trials, he noted, were in orchards that already had active sanitation and spray programs. Mating disruption, Haviland stressed, is not an excuse to skip winter sanitation in the orchard or cut back on pesticide programs.

"Mating disruption can help with NOW control, but it cannot save you," he said.

Where a program of MD, sanitation and pesticide applications are used for NOW control, and low NOW populations are achieved, there could be a chance to reduce pesticide use.

"We're not there yet," Haviland warned.

Hullers, not surprisingly, have been very supportive of MD programs in almonds to reduced NOW damage, Haviland said. High levels of nut damage slow sorting and increase processing costs.

Orchard Terrain

In addition to the shape of the block in a mating disruption program, there are other factors that can limit its success. Timing is important. Jhalendra Rijal, UC Integrated Pest Management (IPM) advisor in San Joaquin, Stanislaus and Merced counties said, placing the

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dispensers in the orchard before the first flight of adult NOW is recommended. Placement in the tree is also important. Rijal recommended that the dispensers be hung on a strong middle limb about a third of the way from the top of the tree.

Other factors to consider in an area wide MD program are orchard terrain, prevailing winds and the edge effect. The goal is to have uniform pheromone distribution throughout the site. Longer site edges, especially those near untreated orchards can be an entry for mated females to fly in and lay eggs. Pheromone distribution will not be uniform in undulating terrain and dispenser placement strategies will be necessary for even coverage. Prevailing winds can influence efficacy. Rijal said growers and the representative of the MD product they choose should evaluate the orchard site and plan a pheromone placement strategy suited to the shape and terrain.

Mating Disruption Products

The options in mating disruption products include Suterra's puffer, Semios' variable rate dispenser and Pacific bio control's Isomate. There is a Trece product that is not yet registered for use, but Rijal said research trials were promising.

Early research done by Suterra included effects of different ways to dispense pheromone on NOW mating and crop damage. Puffer dispensers and hand applied membrane dispensers were used peripherally around almond blocks and placed in a grid pattern in both almonds and pistachios. The evenly placed puffers showed greatest reduction in male NOW captured and females mated compared with other dispensing systems. However, results were much better in almonds than in pistachios.

The Isomate pheromone dispensers used in the UC trials contain a more concentrated form of pheromone and only one dispenser per acre is needed, Rijal said. The dispensers are made of a porous plastic that slowly releases the pheromone during the time NOW are active.

The Semios product, Rijal said, is different in that the pheromone can be dispensed at a variable rate to match NOW activity. This remote controlled system uses an automated camera to view trap activity. This system is completely managed by the company and provides growers and managers with updates on pest activity. One or two per acre is recommended. Semios also offers a schedule pheromone application rate in response to the current and forecast pest pressure in the orchard.

The Trece pheromone dispensing product is a passive system with pheromone impregnated plastic strips that are hung in the trees. The strips continuously release the pheromone. Rijal said in the trial they were hung at the rate of 12, 20 and 30 per acre in almonds and walnuts.

Reducing Aflatoxins

In addition to preventing nut damage, growers need to suppress NOW populations in their orchards to reduce aflatoxin contamination and retain global markets.

Aflatoxins are known carcinogens produced by molds, primarily of the Aspergillus genus. NOW feeding transfers the molds to nuts. Bob Klein, California Pistachio Research Board manager warned growers that export markets can be lost to U.S. growers if they do not reduce aflatoxin levels in pistachios. Iranian pistachio growers lost markets in the European Union (EU) in 1996 due to high aflatoxin levels. Though this opened the market for U.S. exports, Klein said it was ten years before market demand reached previous levels.

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TESSENDERLO Kerley CROP VITALITY

PROCESSING: The Newest In Sorting Machines

By Cecilia Parsons | Contributing Writer

Walnut Huller
All Photos Courtesy of Kathy Coatney

Automation, food safety and efficiency are driving forces in nut processing equipment innovation.

Leaders in some of the major walnut processing equipment and systems design companies spoke about some of the changes that have occurred in walnut hulling, sorting and drying.

The process begins right after walnuts are picked up from the orchard floor and delivered to a huller. Unlike almonds, walnuts are not stockpiled due to their high moisture content. They must be hulled and dried quickly to preserve quality.

Hullers first separate out field debris, sticks, dirt and rocks. Next, hulls are removed and undesirable nuts are sorted out. The nuts next go into drying bins until they reach stable targeted moisture levels. At that point they can be stored or processed further for different markets.

Rising Labor Costs

The rising cost of hand labor has definitely made automation critical in walnut processing, said Chris Sinclair of Woodside Electronics Corp or WECO. This Woodland, California-based company is known for its development of optical sorting. The founder of the company, in 1999 developed a high-resolution optical sorting technology for the walnut hulling industry. The next step for WECO was development of Xres camera technology for in-shell walnut sorting.

Sinclair said technology advances allow more product to move through at a much faster rate. Mechanical separation of sticks, green, black and sunburned walnuts from clean nuts is more cost effective. The company developed a new camera system in 2012 called Chromax that has greatly improved accuracy and performance. This year WECO is providing a new infrared component to the cameras for the 2018 harvest.

Labor costs and regulations are driving the move to automation, Sinclair confirmed.

WECO customers also need to move

much higher volumes through the huller in such a short period of time and that need has driven the equipment innovations.

High-Volume Hulling

Sinclair, along with Steve Smallwood of Jessee Equipment in Chico and Larry Grossi of Grossi Fabrication in Hughson, said the walnut industry's move to the Chandler variety has made high-volume hulling a necessity.

"We have to process more per hour than we did even five years ago," said Smallwood.

In years past, Grossi said, an eight week harvest period was normal with early, middle and late varieties being delivered in fairly equal quantities. Popularity of the Chandler variety, spurred by customer preference for the light color pellicle, means high-volume of nuts delivered to hullers in a relatively shorter period.

Huller capacity has had to increase to meet the demand. Grossi said normal capacity 15 years ago was 10-12 tons per hour. Now, Grossi standard systems are facilities designed for 20-40 tons per hour operations needed to keep pace with daily nut deliveries from the orchard.

Walnuts ready for shipping

Energy Consumption

Energy consumption is another concern for processors. Smallwood said Jessee is addressing that—along with food safety issues with its drying systems. Forced hot air is used to remove surface moisture from the nuts. Moisture sensors determine drying times. The equipment

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is also made with stainless steel or galvanized steel, so no paint chips come into contact with the product.

Automation

Their customers are looking for automation in their processing systems, Smallwood said, and the company has responded with touch screens and fully adjustable control panels. Their hulling lines come in varying capacities from 10 tons per hour to 30 plus tons per hour. The lines also have high volume rock and debris removal and a de-watering system.

Their washing system for hulling also uses less water. Higher pressure cleaning uses half the amount of water per minute and volume can be adjusted to deal with higher levels of mud or debris on the product.

Jessee automation allows for individual truck load tracking for food safety requirements and yield data. Food safety is going to be an important requirement in the future, Smallwood said.

Grossi said the systems designed by his company are aimed at preparing the walnuts for the next step in processing whether it is in pre-cleaning, hulling, drying or shelling.

Walnuts ready for shipping

"We prepare and clean product mechanically so where it goes further in processing the condition will allow the electronics to perform at maximum efficiency," Grossi said.

He added that his drying systems are now designed with an automated recirculation system that has the ability to recirculate heated air in the building which will reduce fuel and energy costs.

It is important, Grossi added, that when products are separated in the system, they remain separated so each can be handled according to need. Green, adhering hulls, higher moisture nuts may constitute only a small percentage of a load, but their presence also determines drying time. Separating those nuts out saves time and energy, Grossi said.

Color Sorters

He said they integrate WECO color sorters into the system to reduce labor needs and make hulling more efficient. Labor has become a big problem for hullers as the larger plants run is dictated by harvest rate. Erratic schedules make it hard to keep employees, he said.

Drying Efficiency

More walnuts are also arriving at hullers with a higher moisture content than in years past. That is why, Grossi said, it is important to separate out the high moisture nuts and dry them separately because mixed with lower moisture nuts they can add hours to the drying time. That is not only a waste of energy, he said, but over drying affects nut quality and can reduce your shippable weight.

WECO's WalnutTek system is addressing drying efficiency with several system components. The automated moisture meter with a control door will initiate burner shutdown then the fan to save energy and fuel. This also prevents over drying.

The system includes automatic fill gate oversight along with moisture monitoring and control of fill doors. This is also labor saving as the gate is closed automatically when the fill point is reached.

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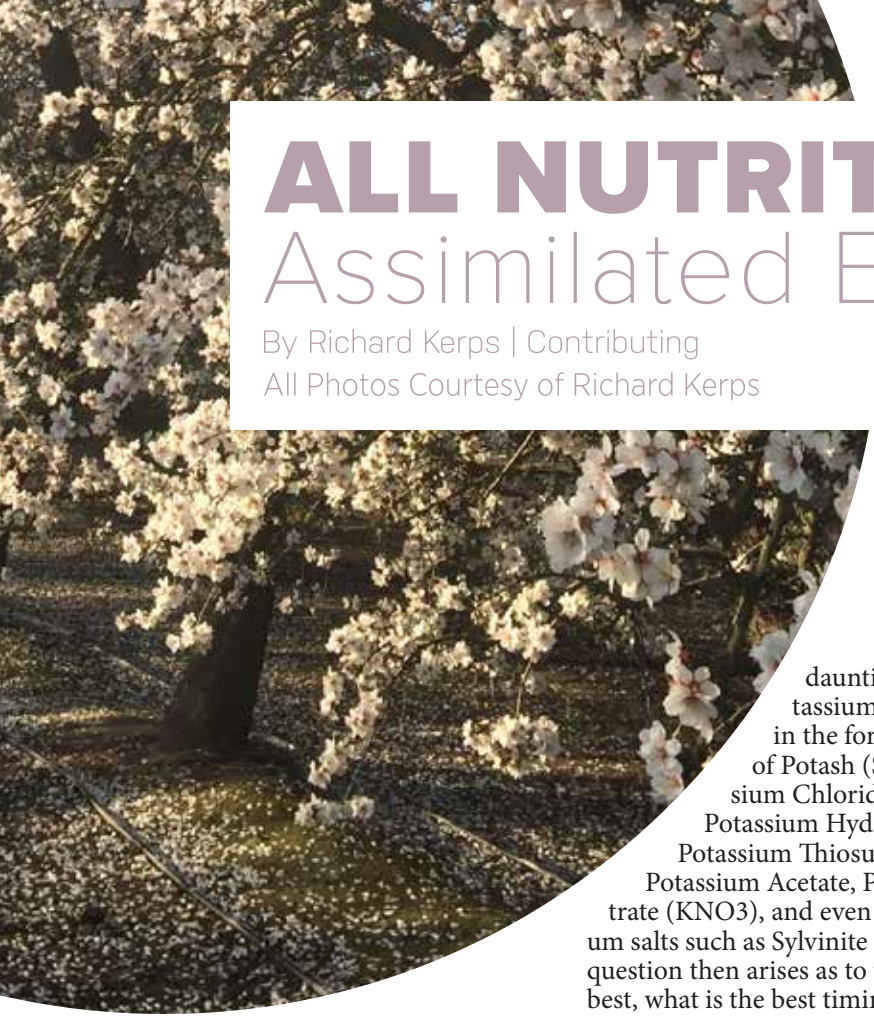

ALL NUTRITION IS NOT Assimilated Equal

By Richard Kerps | Contributing

All Photos Courtesy of Richard Kerps

Many times as farmers we get so caught up in our hectic day-to-day that we have to rely on others to help us maximize yields. Whether it's your Pest Control Advisor(PCA), Certified Crop Advisor (CCA), Agronomist or all of the above, it usually becomes a team effort. Maximizing crop nutrition has inspired quite a bit of debate over the years from all of these factions. Deciphering the advice we receive and making our own opinions is critical to keeping our operations efficient and profitable.

Secondary Macro Nutrients

Over the years we have turned some of our attention from the essential primary macro nutrients Nitrogen, Phosphorus and Potassium to the secondary macro nutrients, Calcium, Magnesium, and Sulfur. As we get more sophisticated at evaluating these nutrients and their effect on our crops, we have fine-tuned their application timing to maximize uptake. Assessing the Four R's: Right Rate, Right Time, Right Place and Right Source, we may need to take a closer look at how important that source is at affecting yield optimization.

When we look at our potassium options for crop nutrition it can be a bit daunting. Our potassium sources come in the form of Sulfate of Potash (SOP), Potassium Chloride (Muriate), Potassium Hydroxide (KOH), Potassium Thiosulfate (KTS), Potassium Acetate, Potassium Nitrate (KNO3), and even crude potassium salts such as Sylvinite and Kainit. The question then arises as to which form is best, what is the best timing and how can we measure it?

Are all forms of a specific nutrient the same? The answer is probably no. KNO3, SOP and KCl are all normally delivered at 46 percent to 60 percent as a dry weight percentage of potassium. However, in chasing our plant uptake of K we have to consider the anion (-charge) part of the fertilizer salt we are using. SOP is 45 percent sulfate. KNO3 is 13 percent nitrogen. KCl is 40 percent Chloride. KTS is 25 percent K and 17 percent Sulfur in the form of both Sulfate and elemental Sulfur. We have to consider the effects of the entire salt we are applying, not just the nutrient we are trying to maximize. Many of these salts can be detrimental to plant leaf tissues and roots if applied to soils with high tests or too high of a rate at the wrong time.

Solubility

Now let's take a look at another critical component, solubility. SOP has historically been applied as a post-harvest application with a dry broadcast on the berms or banded. High quality SOP comes in at 50 percent potassium by volume but only tests at 7 percent solubility. A 400 pound application yields 200 pounds of K by volume, but at 7 percent solubility, only yields 14 pounds of soluble Potassium. Although studies show K is not as mobile as Sodium in the soil, having a single charge and relatively similar molecular size, it will move with soil solution. Applied once in a big slug in the fall brings up the question of how much of that 7 percent soluble K gets leached in the winter. KTS boasts a 100 percent solubility and can greatly enhance K uptake. But with the efficacy of the K with sulfate and sulfur, KTS applied too heavy can easily burn roots. Muriate of Potash is 100 percent soluble but you're applying 45 percent chloride to your soil with each application. KOH (potassium hydroxide) by itself is 100 percent soluble but has a pH of 11, so it's very basic. Without the buffering capacity of an acid, KOH, or caustic potash as it's also known, may also burn roots.

pH

That brings us to the question of pH. What effect does acidity or basicity have on nutrient uptake? Our fertilizer companies have become very good at manufacturing cleaner, more efficacious and sustainable nutrients. However, when we look at the labels of many of our nutrient products often we see a range on the pH scale from 6-8. That's a big swing and tough to set up a specific protocol for our mixers.

Since pH is a logarithmic measure of hydrogen/hydroxide concentration, a 1 point change in pH is equivalent to 10 times more acidic or basic! This difference can exist even in packaged products and not just improperly mixed bulk deliveries. Looking at the pH scale of nutrient efficacy we see that many of the minor nutrients availability is greatly affected by pH. If it's too low, copper, zinc, boron, and Iron can be out of balance on the high side. When it's too high, it will enable Calcium, Sodium and Magnesium to compete more aggressively with the uptake of Potassium. With many of our fertilizers having a broad range of pH potentials, we also need to be cognizant of how they are being applied.

It can be of critical importance when applying nutrients foliarly. Testing your spray tanks and adjusting their pH can ensure you aren't throwing away your money when applying micronutrients to your crops. Make sure you test your source water before, and your spray tank after you have mixed your nutrients. Opening lines at the far end of a run on your drip or sprinkler systems will allow you to measure the pH of your water during a fertigation event. You can then adjust acid systems or water source blending to create a better environment for plant nutrient absorption.

Example of burned roots

Regulatory Restrictions

Every year it seems we are facing an environment of more stringent regulatory restrictions to ensure every nutrient we apply to our crops are more readily absorbed. Being more diligent in the source of nutrients we apply with proper timing will help us comply with those restrictions. Just as importantly, working with our crop nutrition experts will ensure our compliance efforts are beneficial and optimize our yields.

It is important to lean on your consultants for pre-season nutrient application plans to predict specific budgetary and yield outcomes. Final analysis that measures your outcomes will enable year-to-year modifications to enhance those results.

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Example of nutrient insolubility

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After applying specific nutrients, calculate their percentages by both weight and solubility. Comparing that with your crops nutrient uptake curves and subsequent tissue testing, you will be able to determine which products are more effective. This will have a positive effect on your return on investment. Being able to apply a specific nutrient at a lower rate and seeing a beneficial response in our crops will make compliance simple. Better crop health and a positive bottom line will ensure that our efforts keep the lifeblood of our economy growing in the right direction.

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Navigating Human Resources in the Food and Farming Industries

By: Amy Wolfe | MPPA, CFRE President and CEO, AgSafe

When we think about the food and farming industries, human resources is probably not the first thing to come to mind. However, as any business owner who has employees can attest to, it is a critical function of a successful organization because it is the area of our business that deals with an essential element—people. Navigating the realm of human resources (HR) may seem daunting; forms, handbooks, policies, and paperwork. Breaking HR into four key components—hiring, motivation, discipline, and separation—helps us wrap our arms around the requirements.

Hiring

After an extensive job search, you have made the decision to hire a new employee. What does the first day of employment look like? That first day sets the tone for that employee's experience with your company. Having a thoughtful on-boarding program should make the new employee feel comfortable and excited to be a part of the team. Taking the time on the first day not only sets the tone, but gives you the opportunity to complete required paperwork.

On-boarding elements should include:

- Introduction of yourself and other appropriate staff members
- Brief history of the company
- An explanation of the chain of command, including applicable contact information
- Review of the job description
- Collecting their emergency contact information

Tour of facility or site:

- Make note of the required postings, such as Sexual Harassment Prevention, OSHA, etc.
- Disclose any safety hazards
- Working from heights, including ladders, scaffolds, roofs, or any raised work area
- Confined spaces
- Machinery-related hazards (lockout/tagout, boiler safety, forklifts, etc.)
- Temperature extremes—hot and cold
- Chemical hazards
- Safety Data Sheets (SDS)
- Container labeling and other forms of warning
- Other applicable employee training specific to the job and its unique hazards
- Provide the employee with the company handbook and verbally review the following policies:
- Anti-Harassment and Anti-Discrimination
- Meal and Break Periods
- Timekeeping System and Payday
- Employee Benefits
- Company Code of Conduct
- Expense Reimbursement Process

• At-Will Employment

• Drug and Alcohol Policy

• Complaint Procedures

The following are the forms and pamphlets that need to be completed by and provided to all employees (full-time, part-time, regular, temporary/seasonal) at the time of hire:

• Form I-9 (Employment Eligibility Verification)

https://www.uscis.gov/system/files_force/files/form/i-9-paper-version.pdf

• IRS Form W-4

https://www.irs.gov/pub/irs-pdf/fw4.pdf

• State Disability Insurance (SDI) Pamphlet (DFEH-2515)

http://www.edd.ca.gov/pdf_pub_ctr/de2515.pdf

• Paid Family Leave (DFEH-2511)

http://www.edd.ca.gov/pdf_pub_ctr/de2511.pdf

• Discrimination is Against the Law (DFEH-151)

http://admin.lmu.edu/media/admin/hr/DFEH-151%20Discrimination%20is%20against%20the%20law%20pamphlet%2011.14pdf.pdf

• Sexual Harassment Prevention (DFEH-185)

https://www.dfeh.ca.gov/wp-content/uploads/sites/32/2017/06/DFEH_SexualHarassmentPamphlet.pdf

• Pregnancy Leave (DFEH-186)

http://hr.fullerton.edu/payroll_benefits/DFEH-186.pdf

• Notice to Employee—Employment Terms (Labor Code Section 2810.5)

https://www.dir.ca.gov/dlse/lc_2810.5_notice.pdf

• Migrant and Seasonal Agricultural Worker Protection Act: Worker Terms and Conditions of Employment (MSPA – WH 516)

https://www.dol.gov/whd/mspa/

• Time of Hire Pamphlet: Workers' Compensation Guide for New Employees with Designation Form

https://www.dir.ca.gov/dwc/DWCPamphlets/TimeOfHirePamphlet.pdf

While the onboarding process seems extensive, it is helpful to have a checklist to ensure to that all elements are addressed.

Motivation

To keep with the positive tone established on the day of hire, it is important for employers to consider employee motivation and the positive impact it can have in your company. Something as simple as feedback on progress or effectiveness can help an employee stay motivated, even during

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HIRING CHECKLIST

Employee Name: _____ Position: _____

Hire Date: _____ Hourly Rate: _____ Benefits Eligibility Date: _____

Full Time/Part Time: _____

- ☐ W-4
- ☐ New Employee Safety Orientation
- ☐ MSPA Worker Info – Terms and Conditions (WH516)
- ☐ New Employee Information Sheet (emergency info incl.)
- ☐ Employee handbook receipt form
- ☐ Workers' Comp Time of Hire packet
- ☐ DFEH Paid Family Leave brochure
- ☐ DFEH Anti-Discrimination and Harassment brochure
- ☐ DFEH Pregnancy Leave brochure
- ☐ I-9 and (view support documents)
- ☐ New Employee Safety Orientation Form
- ☐ Employee handbook
- ☐ MPN Information
- ☐ Health Insurance Marketplace Notice
- ☐ Notice to Employee (DLSE NTE form)
- ☐ DFEH Sexual Harassment Prevention brochure
- ☐ Completed Application for Employment

While the onboarding process seems extensive, it is helpful to have a check list to ensure to that all elements are addressed

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a busy season like harvest. Motivated employees lead to increased productivity, safer work environments and allow an organization to achieve overall greater success.

Here are some simple employee motivation ideas to implement in your organization:

• Give employees a chance to lead

• Paycheck stuffers with words of encouragement or an update on the overall performance of the company. When employees know the company is doing well as a result of their efforts, they are inclined to stay energized and driven

• End of season BBQ, party or celebration

• Provide helpful feedback, give praise when earned, either verbally or in writing

• Provide opportunities for training and professional growth

• Company gear—hats, shirts, cups, window clings—items that allow them to demonstrate their pride in working for the company to the outside world

• Celebrate success often and as a group—positivity is contagious

Discipline

Even in the most positive work environments, the need for employee discipline will arise. Your company code of conduct and disciplinary policy should be included in your employee handbook, which is reviewed on the employee's first day. Your policy sets the tone early about what type of behavior is acceptable in the workplace.

Disciplinary Do's

• Privately discipline unacceptable behavior

• Suggest changes in behavior, if appropriate
• Actively listen to what the employee has to say

• Engage the employee in helping solve problem or issue

Disciplinary Don'ts:

• Publically discipline unacceptable behavior

• Jump to a conclusion

• Be accusatory

• Scream
• Lose your temper
• Use profanity or derogatory comments

Consider a progressive disciplinary mode (see Page 30), using increasingly severe measures when an employee fails to correct a problem after being given a reasonable opportunity to do so. Regardless of the severity of the disciplinary action, always document the incident.

Separation

Making the decision to separate is a difficult one, but it is important that the end of employment process be thoughtful and lawful. It is essential to distinguish

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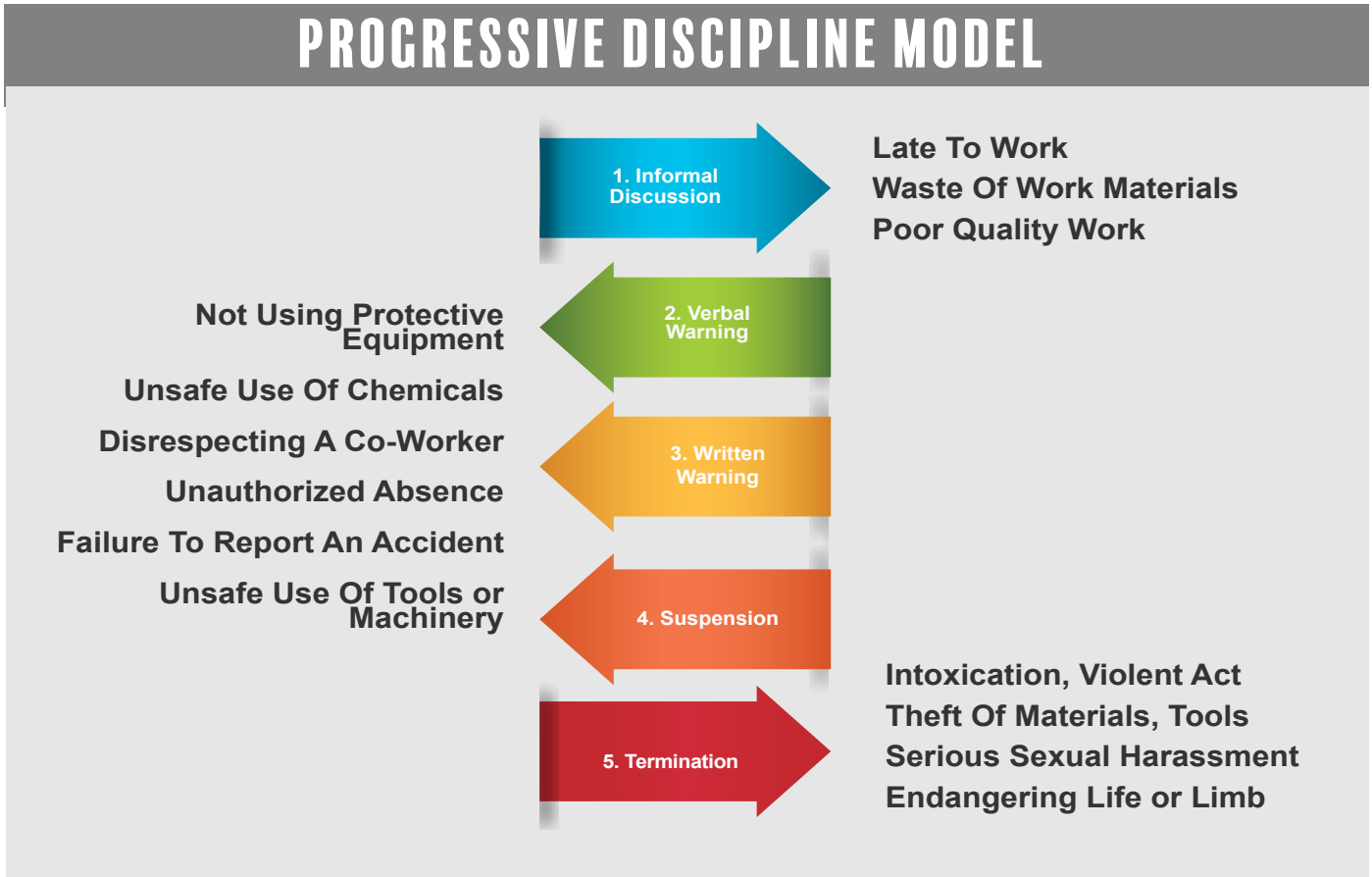

Consider a progressive disciplinary model, using increasingly severe measures when an employee fails to correct a problem after being given a reasonable opportunity to do so.

Continued from Page 29

between the type of separation taking place. Termination is as a result of violation of company policy or the law or failure to successfully do the job as outlined in the job description. A layoff takes place when a position is no longer available or when the season comes to an end. Typically with a layoff, depending on the circumstances, the company would rehire the individual if able, where that is not the case with termination. When termination is the appropriate course of action, it is essential to remember certain actions by the employee are protected under the law and if used to justify the separation, would constitute wrongful termination.

Wrongful termination examples

- Terminating employees who act together with other employees to ask for changes in working conditions or wages (even if they are not represented by a union)
- Whistle blowing by the employee
- Written or implied promises by the employer, including the supervisor/foreman/crew leader
- Discrimination of a legally protected status, such as gender, ethnicity, religion, sexual orientation, pregnancy status, etc.
- Retaliation against legally permitted actions by the employee

Justifiable termination examples

- Poor performance and/or low productivity
- Lying or misrepresenting experience, education or qualifications
- Negligence
- Violation of company policies, workplace safety rules and regulations
- Theft, damage or unauthorized use of company property
- Harassment, discrimination and/or abusive conduct
- Use or possession of alcohol or drugs on the job

Separation Checklist

- Employee's Name, Employee ID Number and Separation Date
- Final Paycheck
- Final Paycheck Acknowledgement—signature by the employee that the check was received
- Change in Relationship Form

http://www.edd.ca.gov/payroll_taxes/pdf/NoticetoEmployeeasto ChangeinRelationship.pdf

- For Your Benefit (EDD Form 2320)

http://www.edd.ca.gov/pdf_pub_ctr/de2320.pdf

- Cal-COBRA / COBRA Initial

http://www.calhr.ca.gov/employees/Pages/cobra.aspx

- Health Insurance Premium (HIPP) Notice

http://www.dhcs.ca.gov/services/Documents/ HIPPDHCS9061Eng (TermEmployees)Revised9-15.pdf

- Exit Interview

Hopefully breaking these HR elements into the four key components—hiring, motivation, discipline and separation—will support you in navigating HR best practices. This is simply an overview of human resources requirements for the food and farming industries. If you have questions about the specifics, please visit www.agsafe.org, call (209) 526-4400 or send an email at safeinfo@agsafe.org. AgSafe is a 501c3 nonprofit providing training, education, outreach and tools in the areas of safety, labor relations, food safety and human resources for the food and farming industries. Since 1991, AgSafe has educated nearly 75,000 employers, supervisors, and workers about these critical issues.

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Tulare Sheriff's Department

TAKES A BITE OUT OF AG THEFTS

By Kathy Coatney | Editor

Thefts from farms is always a concern for growers. The Tulare County Sheriff's Department (TCSD) has embraced some new technology to hopefully prevent and recover stolen items.

SmartWater

Mark Gist, a Lieutenant with TCSD said, the program was launched in February 2017.

It's a two phase program, and phase one starts with agriculture. TCSD purchased the program through SmartWater, a company based out of Fort Lauderdale, Florida. The company produces a water-based, inorganic traceable liquid that contains a unique forensic signature. It isn't DNA, so it can't be removed by fire, humidity or sunlight.

The mark can only be seen with a specific UV light, and when the mark is illuminated, it comes up as a yellowish-green color. A regular black light won't work correctly, Gist said.

TCSD purchased 1,200 kits from SmartWater, and each vial of SmartWater has it's own unique code. Each participating farmer is issued a kit that has enough product to mark 50 items. Also included is registration into the database and their own unique code, plus signage to post on their property that says it's SmartWater protected.

"We don't make any money on it as an agency at all. This is just a means for us to hopefully curb theft on our end," Gist said.

TCSD gives the farmer or ranchers the initial startup kit that includes the vial to mark up to 50 items and signage to post on their property, Gist said.

If a grower needs to mark more than the 50 items, he/she is referred to the company where they are offered a discounted rate to purchase more product because they started the program with TCSD.

It only takes a tiny amount to mark the item. "It's almost like a Q-tip applicator and just a small dab is placed on it," Gist said, and it dries within an hour.

The items can be anything from paper, plastic, steel, rubber, or wood, and there is a minimum five year guarantee on the mark, Gist said.

How it Works

Gist offers this example of how it would work with law enforcement.

"Let's say a patrol officer or a detective was following up on a case," Gist said.

Investigators knew that the farmer's tractors, or fruit bins, or the twine on a bale of hay were marked.

The officer or detective would take the special UV light over the twine of the hay, tractor, or fruit bin. If it's been marked, it glows a yellow-green under the special UV lighting.

"At that point, they're going to investigate further," Gist said.

A sample of the mark will be scratched off or the entire item will be sent to the SmartWater CSI lab for testing to identify the owner of the mark using the owner's own specific code. Within 10 days or less, the results will come back.

The first assumption would be the item was from Tulare County, but it might not be the case, Gist said.

"It could be in Oregon, it could be in Washington or back east in Florida. We don't know, so we're going to take a sample," Gist said, and we will most likely hold the item for safe keeping pending the outcome from the lab.

Having proof from the lab will also bolster the case, and it allows law enforcement to return the property to its rightful owner, Gist said.

Selling Marked Items

What happens when a marked item is sold? "That's something that we've been explaining to all of our farmers is, if you're going to sell a piece of equipment, you need to let the buyer know," Gist said. They would also need to notify the company's CSI database in Florida, and a special notation would be made that the item has been sold.

"It's just all about communication at that point," Gist said, or the farmer could grind off the mark when the item is sold.

Where to Place the Mark

Once the SmartWater dries, it can't be rubbed off. "If you put it on a gear, something with a lot of friction and grinding and handling, it's probably not going to last five years," Gist said, and it will most likely wear off.
"But if you put it on places where there's not constantly a foot or a hand touching it all the time, then it's going to last a minimum of five years," Gist said, adding some marks are still working 15 years later.

"Oftentimes tractors do get parted out. That's always a concern, so they might mark a tractor in more than one location," Gist said.

The steering column on a tractor is a common place. "Sometimes they'll pop the hood of the tractor and put it right behind the motor of the tractor," Gist said.

If the mark is placed in a generalized area, it makes it easier for the officer or detective to inspect it, Gist said.

TCSD

Currently, TCSD is the only law enforcement agency in California that is using this technology as a crime deterrent. "There may or may not be some other agencies that we're unaware of that might be using it on a covert level, but for a crime deterrent program in identifying and getting property back, we are the only agency in California," Gist said.

Education

Gist does presentations and educates their Ag Land partners, groups and clubs about the program.

"We're also educating our inmates in the facilities. We run a constant program in all the modules, of all of our facilities," Gist said.

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"We give them examples—what it is and what it does," Gist said, adding it's a deterrent program, and the hope is a potential thief will think twice when a farmer or rancher has a sign posted that it's SmartWater protected.

Reducing Theft

To date, those who have participated in the program have not reported any thefts, Gist said.

We did have a case that involved the Union Pacific Railroad four to five months ago, Gist said.

"We worked together with them. We actually marked up some train horns," Gist said.
Train horns are valued at $900 each, and the railroad has been having repeated thefts as a result, Gist said.

"This involved surveillance as well, so they (the suspects) couldn't beat it because they were caught red-handed," Gist said, and they also had the item with them that was marked with the Smartwater.

All terrain vehicles are important to mark as well as other farm equipment that is frequently stolen.

"The case is not quite adjudicated yet," Gist said, but there are two suspects in custody.

Other Items

Gist advises those participating in the program to mark other items like firearms. "If suspects remove a serial number from a firearm, you still have that SmartWater on your firearm. We'll be able to tell who it belongs to," Gist said.

Items like mountain bikes, televisions, cellphones and even jewelry can be marked, too, Gist said.

Currently the company has applied to the Food and Drug Administration (FDA) to get approval so that the product could be misted onto things like nuts or to mark cattle, Gist said.

Phase Two

Whatever is left of the initial 1,200 kits after distributing to their Ag Land partners, TCSD will distribute to the rural communities for homeowners to use, Gist said.

"The goal is to start introducing the SmartWater product into the rural communities toward the end of 2018," Gist said.

"If you're not a farmer or rancher, but you're a citizen in the county, it gets issued to that citizen," Gist said.

Private citizens will be able to mark their items the same way the farmers have and hopefully prevent theft of their personal property, Gist said.

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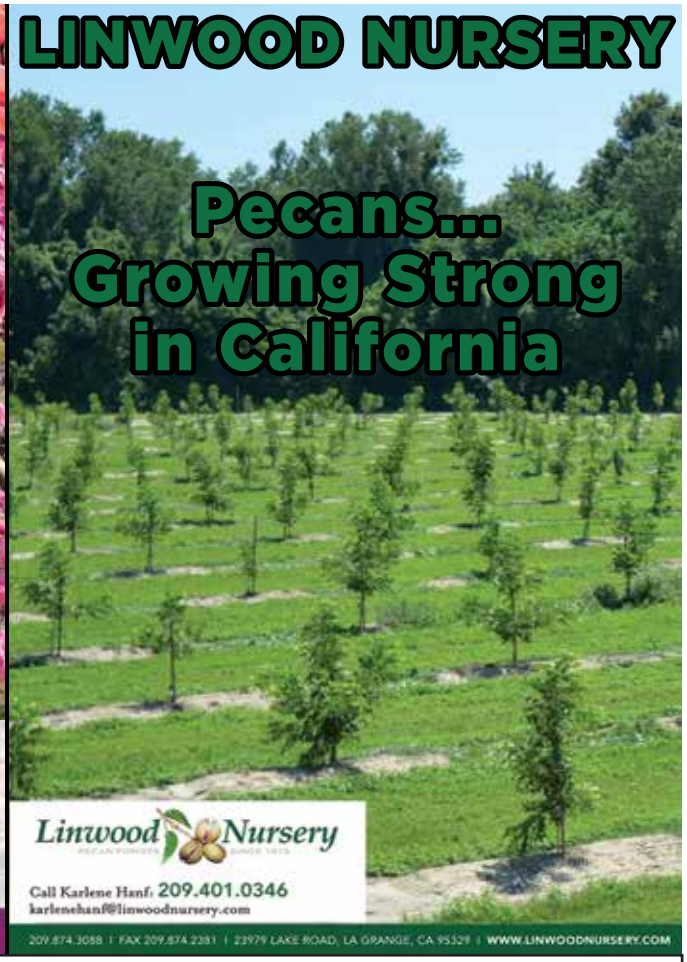
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INDOOR HEAT ILLNESS—CAL/OSHA RELEASES ANOTHER DRAFT OF PROPOSED REGULATION

By Roger A. Isom | President/CEO
Western Agricultural Processors Association (WAPA)

All photos courtesy of Kathy Coatney

Like a broken record, here we go again. Another regulation for regulation's sake. As mandated by the California State Legislature, the Division of Occupational Safety and Health (DOSH) at CalOSHA is working on an "indoor heat illness regulation". They are now on their third iteration of a draft regulation, and this latest one is more complicated than the last draft. This effort was precipitated by a single case that stemmed from a 2012 serious citation issued to a warehouse and distribution center for the heat illness suffered by an employee who was working inside a metal freight container with a temperature of over 100 degrees. DOSH penalized the employer for failing to implement an effective injury and illness prevention plan (IIPP), but the employer appealed the citation winning their case before an administrative law judge (ALJ). In March 2015, DOSH appealed that decision to the Appeals Board stating that the employers had failed to effectively correct the indoor hazard and had not trained employees on indoor heat exposure. In November 2015, the ALJ's decision was overturned by the Appeals Board reinforcing the responsibility that employers have to protect the health and safety of their workers, including those working indoors.

Indoor Heat-Related Illness

Despite there being only one incident, in 2016 the state legislature

Continued on Page 40

Drive Yields with Nutrition, Right Nutrient, Right Timing, Right Form, Right Mix

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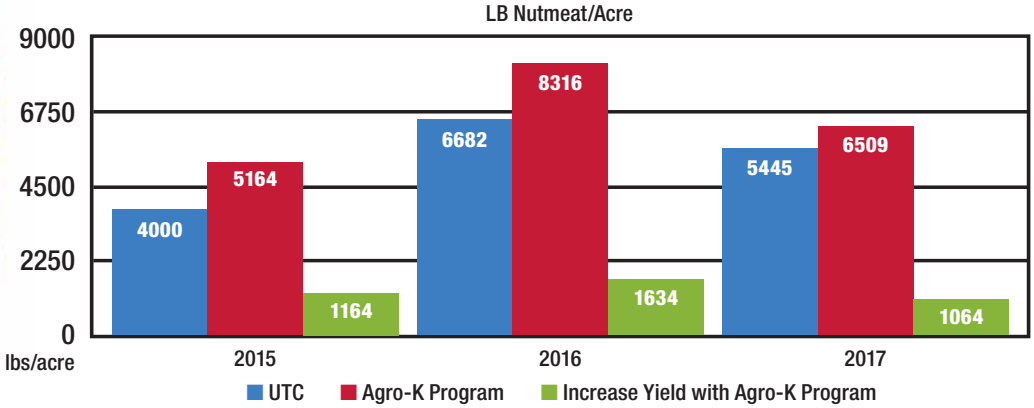

Agro-K's "Science Driven Nutrition" approach to foliar feeding walnuts delivers the right nutrients at the right time and in the right form. Walnuts, due to their sheer size, large root system and significant foliage have heavy nutrient demands to achieve maximum yield and quality. Zinc, manganese and other micronutrient requirements are larger than for other tree crops and are also more difficult to supplement because walnut leaves are thick, leathery and harder to penetrate effectively. Agro-K's science-based approach to soil and foliar nutrition delivers high yields and quality nuts while improving long-term tree health and productivity.

Maximizing early season growth processes and tree function requires a variety of micronutrients – zinc to maximize leaf development/size, vascular function and root growth; manganese for proper root development, root health and nitrogen utilization; magnesium and iron to maximize chlorophyll formation and efficacy. Agro-K's **Zinc Plus +4 D.L.** provides all these nutrients in the proper balance. Applying **Zinc Plus +4 D.L.** with Agro-K's high ortho-phosphate/low potassium **AgroBest 9-24-3** helps meet early season nutrient demands when soils are still cool and roots function is constrained.

Agro-K's proprietary **Dextro-Lac** formulation is soft on foliage but designed to penetrate thick tissue rapidly and completely. Because the Dextro-Lac process is not a chelation process, but sugar based, once absorbed by the tree the nutrients are immediately available. Unlike chelated products, no energy requirement is needed to break the chelation bonds for the tree to access the nutrients. **Zinc Plus +4 D.L.** is also specifically designed to be compatible with early season copper sprays.

As bloom, nut set and cell division occur demand for calcium peaks; in addition micronutrient demand is still occurring as new leaf and terminal growth continues. Applying **Vigor-SeaCal** in combination with **AgroBest 9-24-3** followed by **Zinc Plus +4 D.L.** during rapid leaf growth help growers meet a walnut tree's complex and significant nutrient demand at this critical physiological stage. Satisfying peak nutrient demand will result in improved nut set and cell division that sets the stage for large, dense nuts with maximum weight at harvest. **Vigor-SeaCal** combines calcium in a carbohydrate formulation with Agro-K's powerful seaweed extract to enhance nut cell division. Applying an energy-stimulating high phosphate NPK like **AgroBest 9-24-3** enhances seaweed efficacy helping drive more nut cell division for larger, denser nuts. **AgroBest 9-24-3** is specifically designed with minimal potassium content for early season foliar applications. Foliar spray mixes with even moderate amounts of potassium applied during cell division will antagonize calcium uptake and negatively impacting leaf cell wall integrity and nut quality. The **AgroBest 9-24-3** ratio provides more units of ortho-phosphate, for better foliar uptake, per dollar than most other NPK blends without antagonizing calcium incorporation into cell wall structures.

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succumbed to the labor union pressure and decided it was necessary to force CalOSHA to adopt a specific standard mandating that employers develop, adopt and implement an indoor heat illness program. Later that year, the Governor signed into law SB 1167, which mandated that by January 1, 2019, the DOSH propose for review and adoption by the Standards Board, a standard that minimizes heat-related illness and injury among workers working in indoor places of employment. The legislation requires the standard to be based on environmental temperatures, work activity levels, and other factors. Most importantly; however, it specifies that these provisions do not prohibit DOSH from proposing, or the Standards Board from adopting, a standard that limits the application of high heat provisions to certain industry sectors.

"Limiting the Applicability"

In this latest draft, unfortunately, DOSH is not "limiting the applicability" and is including any and all employers with an indoor place of employment where the temperature is equal to or greater than 80 degrees. This means farm shops, packing houses, hullers and processors would all be subject to the new regulations, even if they haven't had a single incidence of heat illness. These operations must provide access to water and a "cool-down area". The cool-down area must be open to the air or "provided with ventilation or cooling". A cool-down area must be provided when the temperature exceeds 80 degrees Fahrenheit, and employees shall be allowed and encouraged to take a "preventative cool-down rest" in a cool-down area when they feel the need to do so.

"Heat Index"

When the temperature is such that the "heat index" equals or exceeds 95 degrees Fahrenheit, the employer shall implement control measures to reduce the heat index to below 95 degrees Fahrenheit.

These measures are now proposed to include engineering controls such as fans and air conditioning; administrative controls, such as changing work schedules or reducing work intensity; and personal protective equipment, such as water-cooled or air-cooled garments, heat-reflective clothing and supplied-air personal cooling systems.

Emergency Response Procedures Similar to the current outdoor heat illness standard emergency response procedures must be in place, and close observation during acclimatization must occur. In addition, training will remain a priority with risk factors, heat illness procedures, recognizing heat illness symptoms, and emergency procedures. The employer will also have to establish and implement a written plan.

Final Stages

As we move into the final stages of this rule development process, the debate now centers on CalOSHA's proposed approach. One option would be to open up the existing outdoor standard and do a combined indoor/outdoor standard. The second option would be a standalone indoor heat illness standard. The agricultural industry does not want to open up the existing standard and give the labor activists another chance to tighten the outdoor standard. Yet, we remain concerned with the confusion

Continued on Page 42

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caused by having two separate standards, and what happens when employees work both indoors and outdoors for the same job (e.g. forklift drivers at a huller). We also remain opposed to the whole concept as the agricultural industry has yet to see a fatality or even illness to indoor places of employment such as a huller or processor. As I write this, I just found out that the State Water Resources Control Board (SWRCB) is proposing to increase their waste discharge fees (for processors) by 14 percent, and the workshop will be on the very same day as the indoor heat illness workshop. Only in California…

Comments about this article? We want to hear from you. Feel free to email us at article@jcsmarketinginc.com

California Almond Sustainability Program Achieves Gold Status by SAI Platform

By Almond Board of California

CASP's gold equivalence rating is a testament to the California Almond community's investment of more than $70 million and 40 years of work to build a foundation of research focused on continuously improving how almonds are grown, processed and consumed.

New enhancements to the California Almond Sustainability Program (CASP) are expected to help further increase confidence in almond growers' and processors' practices throughout the global supply chain.

At its annual conference in Sacramento in December, Almond Board of California (ABC) announced that CASP achieved "gold equivalency status" with the Farm Sustainability Assessment (FSA), a globally recognized agricultural practices reporting tool used in 32 countries.

This designation means the almond sustainability program has achieved "the highest level of equivalency" with the global program, according to Joe Rushton, FSA manager at the Sustainable Agriculture Initiative (SAI) Platform, whose 90 members constitute most of the world's leading food companies.

SAI Background and Benchmarking Tool

Created in 2002, the SAI Platform is the primary global food and drink value chain initiative for sustainable agriculture. The platform develops sustainable agricultural tools and principles that form secure, strong agricultural supply chains to protect the earth's resources. The FSA is one of the Platform tools, offering a simple, highly effective resource to assess, improve and communicate on-farm sustainability. The tool is transparent and rigorous to ensure consistent, fair outcomes, and third parties are employed throughout the process to ensure this result. The process includes an assessment of 112 questions that cover social, environmental and economic aspects of the farm. Ultimately, the FSA provides a common benchmark for the agriculture industry to gauge the effectiveness of their sustainability programs, and provides food and beverage

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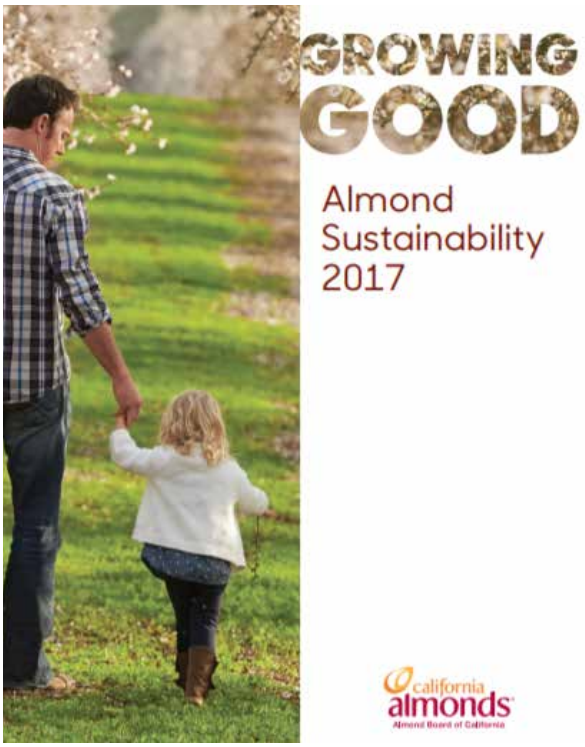

In December 2017, ABC released its first-annual almond sustainability publication, Growing Good, which highlights the California Almond community's journey and commitment to responsible practices.

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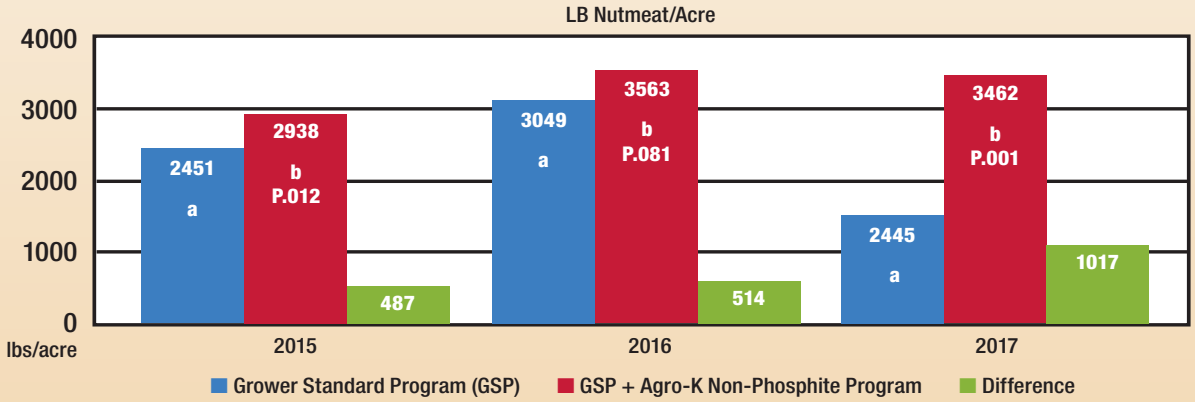

Maximizing profitability in your almond orchard starts with maximizing nut set every year. Achieving consistency in set and minimizing alternate bearing cycles is the key to consistent yields and higher profits. The secret is ensuring the tree has the right nutrients at the right time in the right forms and right mix. Agro-K's carbohydrate based foliar line including **Vigor-SeaCal, Vigor-Cal-Bor-Moly and Zinc Plus +4 DL**, are designed to help growers meet peak nutrient timings in the crop cycle.

Nut set can be influenced by boron which enhances pollination. Calcium is synergistic with boron and enhances its affect. Molybdenum plays a direct role in nut set and retention. Agro-K's **Vigor-Cal-Bor-Moly** is the perfect mix to apply from pink bud to early bloom. Applying **Vigor-SeaCal** with **AgroBest 9-24-3** just prior to and during the bloom period provides rapid penetration, uptake and translocation of calcium and phosphate to help drive cell division setting the stage for large, dense nuts with maximum weight.

The energy requirements to maximize cell division and nut fill is significant and requires large, healthy, and efficient functioning leaves. Zinc is essential for maximum leaf development, vascular function and root growth. Magnesium is critical for chlorophyll. Manganese is required for proper root development and nitrogen utilization. Agro-K's **Zinc +4 D.L.** provides these key nutrients helping maximize leaf surface area, ***chlorophyll*** and root growth.

Yield results of three consecutive years of replicated data, *on the same trees*, are shown in the charts. **The increases on the treated plots equaled 486, 514 and 1017 lbs./ac in 2015, 2016 and 2017 respectively. These nut meat yields were statistically different from the grower standard practice all three years. This is an average annual yield increase of 25% over the three year period.**

The trial was replicated six times on 4th, 5th and 6th leaf *Independence* variety almonds using the same replicate plots in both years to demonstrate not only efficacy of a complete foliar and soil nutrient program but also the cumulative benefits of the Agro-K program built on sound agronomic principals and designed to maximize yield and minimize alternate bearing.

Almonds naturally tend towards alternate bearing. Meeting peak nutrient demand at all stages of crop growth and tree development is critical to maximizing tree growth and health in the current year and to set the stage for next year's production. Achieving consistent above average yields year over year requires a thorough understanding of plant physiology and nutrient demands, the right tools to address the nutrient requirements on a timely basis, and the commitment to stick to a long-term ***Science-Driven*** approach to nutrient management. If you are interested in increasing yields on a consistent basis, talk to your PCA today about Agro-K!

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companies a platform to easily identify and source sustainably produced agricultural raw materials.

In December 2017, the Almond Board's CASP became the first nut-specific program to be benchmarked at gold-level equivalency, and one of only two sustainability programs in the U.S. to reach that status. According to Rushton, "gold equivalence reflects the comprehensiveness of the Almond Board's sustainability program, coupled with applicable federal and state regulations, and demonstrates how CASP can be used as an equivalent means of assessing sustainable practices relevant to the California Almond industry."

CASP is a valuable tool for almond growers as it enables them to assess their own practices and confidentially compare their performance to peers. Moving forward, the industry now has a basis for exploring how CASP can be leveraged throughout the supply chain.

Richard Waycott, Almond Board of California President and CEO, said, "establishing equivalency with the FSA's Gold level is an important step in recognizing the California Almond industry's well-established practices and commitment to being an economically, environmentally and socially responsible crop for California and the world."

Growing Good in California Almonds

CASP's gold equivalence is a testament to the California Almond community's investment of more than $70 million and more than 40 years of work to build a foundation of research focused on continuously improving how almonds are grown, processed and consumed. By addressing new challenges, exploring new possibilities and providing a scientific basis for best practices across several priority areas, the Almond Board's research programs have led to exciting results to propel the industry forward.

In December 2017, ABC released its first-annual almond sustainability publication, Growing Good, which highlights the industry's journey and commitment to responsible practices. Growing Good spotlights three key areas of ABC's research programs that are exploring new innovations and technologies to add value to the local California Almond community and environment: water use efficiency, the use of coproducts and bee health and pollination.

Water Use Efficiency

ABC has funded more than 200 water research projects since 1982, paving the way for the amplification of new irrigation methods, like micro irrigation, that helped contribute to an average 33 projects reduction in the amount of water it takes to grow one pound of almonds. This is just part of the evolution, however. Almond irrigation experts developed the Almond

"Establishing equivalency with the FSA's Gold level is an important step in recognizing the California Almond industry's well-established practices and commitment to being an economically, environmentally and socially responsible crop for California and the world," said Richard Waycott, Almond Board of California president and CEO.

Visit www.Almonds.com/BeeB-MPs to learn more about the Honey Bee Best Management Practices, which ABC developed to ensure almond orchards are a good and safe place for honey bees.

Irrigation Improvement Continuum to demonstrate how growers may further improve water use efficiencies across five management areas: 1) calculating orchard water requirements, 2) monitoring irrigation system performance, 3) measuring applied water, 4) monitoring soil moisture and 5) monitoring plant water status.

Coproducts

Exciting new developments for potential uses of coproducts—specifically, alternative uses that provide value for other industries—are driving the California Almond industry into the future towards zero waste. For example, Growing Good highlights the efforts of researchers exploring whole orchard recycling, the process of grounding up entire almond orchards at the end of their life, and also biosolarization, a process that uses almond hulls and shells, water, tarps and the power of the sun to naturally deplete the soil of oxygen, making it inhospitable to pests. Researchers are considering extracting sugar from almond hulls to use in fuel or in food ingredients, and also examining the process of torreffaction, in which almond shells are transformed into a charcoal-like product ideal for strengthening biodegradable plastics such as tires, flower pots, garbage cans and more.

Bee Health and Pollination

Almond Board of California has long recognized honey bees' irreplaceable role in almond production, having invested more in honey bee health research than any other crop group. ABC developed the Honey Bee Best Management Practices to ensure orchards remain a good and safe place for honey bees. Researchers are also exploring the benefit of planting bee-friendly forage near almond orchards to act as an additional food source before and after almond bloom. To learn more about bee health and pollination, visit Almonds.com/Pollination.

Comments about this article? We want to hear from you. Feel free to email us at article@jcsmarketinginc.com

Dust Management—A Year Round Process

By Kathy Coatney | Editor

Dust in an Almond Orchard
All photos courtesy of Kathy Coatney

Dust control in almond orchards is an environmental, safety and pest control issue.

Maintaining orchard roads with water, oil and different salt solutions will help reduce dust and stress on the trees.

Tree Stress

The dust created in an orchard will consolidate, settle on the trees and continue to build. When a tree becomes dusty it becomes stressed, and that stress will bring in mites.

"It's not the dust itself that attracts mites, it's the stress of the tree that attracts the mites," David Doll, University of California Cooperative Extension (UCCE) pomology farm advisor for Merced County, explained.

The two key factors to dust are: tree stress will promote mites, and the dust will make pesticides applications less effective.

David Haviland, UCCE entomology farm advisor in Kern County, agreed dust is a contributing factor to spider mites in almonds, so good dust control on orchard roads is important.

"Dust promotes spider mites as well as it's effect on the efficacy of pesticides that need to come in contact with the leaf," Haviland said.

"Dust reduces efficacy of many insecticides," Haviland continued. "So, if they're being sprayed on a nice, clean leaf with no dust on it, they're much more likely to be effective than if the product is being sprayed onto a layer of dust restricting the ability to actually enter the leaf," Haviland said.

Dave Richmond, manager of Braden Farms in Hughson, California, said, "When we're doing our mite sprays we will run the water trucks at the same

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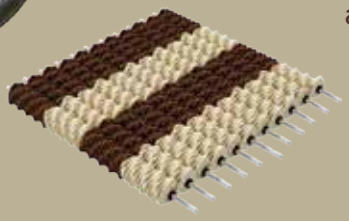

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time, and if there's areas where the trees are dirty from dust, we have the ability to wash the trees off with the water truck." Doing this allows the miticide to actually touch the leaves and not the dust, Richmond said.

Weather is also a factor, for a couple of reasons, Haviland said. "The hotter it is, the faster mites develop. Second, excessive heat can cause stress to the trees, and stressed trees are more prone to having spider mites. Third, excessively dry conditions, especially with wind, leads to dusty conditions," Haviland said.

Dust control was more challenging during the drought, Richmond said, and he found that the orchard roads broke down quicker due to less moisture on them.

Mites

Mites feed on the leaves of the almond trees, and that reduces the photosynthetic activity of the tree, Doll said.

That's not necessarily a major concern until the mite feeding becomes so severe that it actually causes defoliation, Doll said.

"Once that happens, then you get a reduction of leaf surface area, and you have a tree that's not as active," Doll said, and if the damage happens late enough in the season, it could impact next year's crop.

Dust control being used on a road in an almond orchard.

"Mites can flare up even after harvest, but it tends to be rare because once you get into late August, early September, the biology of the mite changes to where it's not as active," Doll said, and that really slows down its lifecycle.

The goal with controlling road dust is to reduce the reproductive rate of the mites earlier in the season, so you have less of a mite population later, Doll said.

Compaction and Cover Crops

Reducing compaction is another a way to reduce dust. Avoid driving through the orchard when soils are wet to avoid forming ruts that would have to be graded and create more dust.

Cover crops can also reduce compaction and dust. While cover cropping isn't always convenient with other orchard practices, it does help reduce compaction and dust. Cover crops can also be a challenge to manage during harvest.

Maintaining Orchard Roads

The first step Doll recommends is that growers have a dust control plan. "Look at the maps of your fields, look at the main arteries, look at the secondary roads, look at the tertiary roads, and develop a dust management strategy that incorporates the traffic associated with each of those roads," Doll said.

"Your main roads that are giving daily access need to have some more, I wouldn't say permanent, but semi-permanent dust management measures, because you're going to kick up a lot of dust on those," Doll said.

"That's a little bit in contrast to your secondary and tertiary roads, which may have temporary or a different type of access," Doll said.

Dust Management Options

There are different dust reducing agents available. "For the most part, people use some form of salts. I think the most common is magnesium chloride to help settle it, or they use an oil," Doll said.

There are four main options for controlling dust on roads.

- Water
- Salt
- Oil
- Asphalt

The least permanent option would be water, and it would need to be applied more consistently, Doll said.

"We run water trucks, and we'll concentrate those water trucks on where we're working," Richmond said. "We don't water all our roads every day. We concentrate where the work is being done."

The semi-permanent options are salt and oil applications, followed by the permanent option of asphalt or some type of road surface material, Doll said. Richmond doesn't do salts or oils because his current dust control program has been effective for him.

"We've talked about it, and I've even looked into to it some, but it just seems like we keep watering roads. I would say if anything we would maybe do a dust coat, but not real heavy application of oil," Richmond said.

"Often in relatively large operations multiple strategies should be considered, especially on busy roads where you have a lot of truck traffic. You may find that the best strategy could be to actually pave that one section, or to put it in some type of decomposed granite, or something like that," Doll said.

Richmond used gravel on his main entrance roads. "Our soil is sandy enough that we can just put straight gravel down, and it packs into the road, and that will prevent dust," he said.

"Generally, the way that I always look at it is, your most driven on roads should have the most focus and probably the more expense. These are going to be the main arteries in and out of the orchard, especially at harvest time," Doll said.

The secondary and tertiary roads that don't get a lot of use, in many cases they're managed with water, Doll said. They may be watered every day or every other day, and only when they're actively being used, he added.

Reducing Speed in the Orchard

Doll said reducing speed in the orchard is an important component to reducing dust.

"The slower you go, the less dust that you kick up, and that's why you often see these five to 10 mile per hour speed limit signs," Doll said.

"The reality is, the faster you go, the more dust you kick up," Doll said.

Speed becomes important on the secondary and tertiary roads because if they don't have a lot of treatments, they will kick up a lot of dust, Doll said.

"That dust has to go somewhere. It usually moves into the orchard, settles on the tree, and when that dust settles on the tree, it creates a stress on the tree," Doll said, which in turn will leave the trees more susceptible to mites.

Richmond encourages his employees to drive slowly in the orchard to reduce dust.

"We have weekly tailgate meetings and it's brought up, 'Hey don't drive too fast and create dust'," Richmond said.

Richmond doesn't have specific speed limit. "It's more of a look and see what you're doing because some ranches are dustier than other ranches," he said, adding we're spread out across 20 miles, and the soil type changes between the ranches.

"The more standard rule is, let's not make dust," Richmond said, but if there's an emergency don't worry about dust.

"We have done dust control for a long time because it's even a safety issue during harvest," Richmond continued, adding too much dust leads to accidents because workers can't see each other.

"That's why the water trucks were initially started was for a harvest practice," Richmond said, adding now they generally run from the first of May to the end of October, depending on when the rains begin.

Multi-prone Approach

"Every farm I've been on that takes an active approach on managing dust, they take a multi-prone approach. They're putting down water, they're putting out oil—some will even asphalt main roads," Doll said.

There are pros and cons to all of these options, Doll said.

"That's why I think you've got to look at your budget, you've got to look at what fits your system, and then make that decision from there," Doll said.

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Monitoring, and Management of Walnut Husk Fly

By Julie R. Johnson | Contributing Writer

The management of walnut husk fly was the subject of Robert Van Steenwyk's presentation during this year's Walnut Trade Show hosted by West Coast Nut on Jan. 5 at the Yuba-Sutter Fairgrounds.

Sharing updated information and current research, Van Steenwyk, entomologist and cooperative specialist emeritus in the Department of Environmental Science Policy and Management at UC Berkeley, broke his presentation into three parts—coverage, insecticides, and bait improvements.

The walnut husk fly, Rhagoletis completa, or WHF, infests walnuts in most California walnut-growing areas. It feeds on black walnut and on all varieties of English walnut.

WHF is about the size of a housefly and colorful, the wings having three prominent dark bands, one of which extends around the wing to form a V-shape. The banded wings distinguish it from other flies found in the walnut orchard.

UC IPM Statewide Project The Walnut Husk Fly, Rhagoletis completa, is about the size of a common housefly and colorful. It damages walnuts by nutshell staining and causing the husk to stick to the shell, making them difficult to remove.

UC IPM Statewide Project After hatching, the white maggots of WHF feed inside the husk, then emerge and drop to the ground to burrow into the soil to pupate. They can remain in the soil in this state from two to four years.

The insect produces one generation a year and overwinters as a pupa in the soil beneath trees. Adults usually emerge from May to early September.

Egg laying begins anywhere from two to six weeks after the first emergence and continues until fall. When females lay their eggs beneath the surface of the husk, it often leaves a small, string like mark on the husk, which eventually turn into black spots. This provides growers with their first indication of infestation.

After hatching, the white maggots feed inside the husk, then emerge and drop to the ground to burrow into the soil to pupate. They can remain in the soil in this state from two to four years.

Damage from WHF is nutshell staining and causing the husk to stick to the shell, making them difficult to remove.

Coverage

Van Steenwyk explained WHF move up the tree in late spring looking for carbohydrates –sugars– and a nitrogen source, either bacterial or fungal or bird feces, as they work their way to the top of the tree.

At the top of the tree the males mark

Continued on Page 54

NEMATODES: ROOT HEALTH & TREE LONGEVITY THREAT

GROWERS CAN'T SEE

UNSEEN BUT FIERCE ON ROOT HEALTH

Nematodes, microscopic roundworms barely visible to the naked eye, pose a serious problem for walnut and almond growers. Even with proper sanitation and fumigation practices, nematodes can still become an issue after setting new trees. Nematode populations can build up in the soil, attack tree roots and impact overall tree health.

NEMATODE THREATS TO ORCHARD HEALTH AND LONGEVITY

- ROOT DAMAGE
- REDUCED WATER & NUTRIENT UPTAKE
- LOW TREE VIGOR
- DISEASE TRANS-MISSION
- -345 Lb./A REDUCED CROP YIELD[1]

NEMATODES CAUSED **$157 B** IN YIELD LOSS **WORLDWIDE**[2]

A NEMATODE-CAUSED TREE DEATH CAN CREATE **25 YRS** OF YIELD LOSS IN YOUNG TREES

BEST PRACTICES FOR TREATING NEMATODES[3]

1. Sample for nematodes to determine the presence, species and number of nematodes through an experienced lab.
2. If possible, fumigate the soil prior to planting new trees. This will reduce the number of nematodes initially, but will offer only a temporary solution.
3. Applications of Movento® in established orchards resulted in a reduction of nematode populations. Movento does offer a nematode management tool that can easily be incorporated into a tree nut grower's cultural practices.

RESEARCH SHOWS

Applications of Movento® in established orchards helped result in:

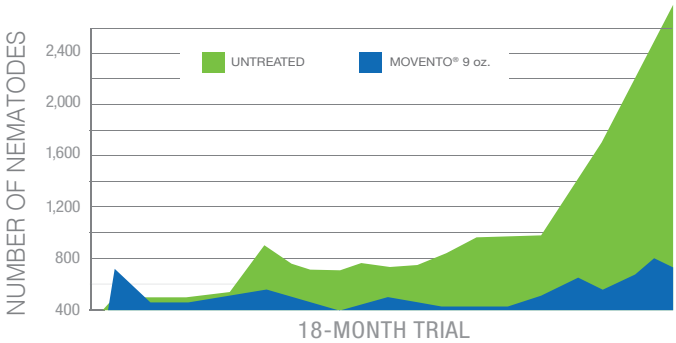
85% SUPPRESSION OF RING NEMATODES

59% SUPPRESSION OF ROOT LESION NEMATODES

Trial conducted by Gary Braness, Bayer CropScience, Kerman, CA, 2009–2011.

Two-year trials show

MOVENTO® SUPPRESSES RING NEMATODES BY 85%



Ring nematodes/500g sample in almonds (2009–2011) (Butte & Padre pooled, n=24 trees)

Trial conducted by Gary Braness, Bayer CropScience, Kerman, CA.

EXPERTS SAY

"Established orchards saw better yield where Movento® was used to treat for high nematode pressure. The tree has a lot of vigor and doesn't stress as bad."

According to Tim Weststeyn, a pest control advisor (PCA) with Crop Production Services in Vernalis, CA. He consults on 4,000 to 5,000 acres of tree nuts and is in his third year of treating established almond trees with Movento for nematode management.[4]

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[1]Average yield loss in lbs. per acre is based on *California Agricultural Statistics Review*, 2014–2015. California Department of Food and Agriculture.

[2]"Nematodes: A Threat to Sustainability of Agriculture," Satyandra Singh, Bijendra Singh and A.P. Singh.

[3]University of California – Cooperative Extension. Department of Agriculture and Resource Economics. UC Davis, 2012.

[4]"The Dangers of Nematodes," *Growing Produce – 2012.*

Continued from Page 52

their area to warn other male husk flies that this is his territory, he added. A female comes along and they mate, she then works her way down to the shady parts of the tree where she oviposits a group of about 20 eggs. She then puts a big X on it to keep other females away. She does this over and over moving around the tree until she has deposited hundreds of eggs. Van Steenwyk said the goal is to kill the adults.

"To do that you have to get your coverage up high. How do you do that? By using spray from the ground or helicopters," he added. "If you have very tall trees and are using a sprayer from the ground, you still aren't reaching the top of the trees."

During research, Van Steenwyk used a truck pulling a sprayer rig generating 500 psi and traveling 10 miles per hour, putting out about 10 gallon/acre to see how high it would spray. "It worked wonders, but that is impractical," he said.

Referring to a 2013 study, Van Steenwyk said treatments were applied every other row using grower operated speed sprayers, with a grower standard of 100-125 gallon/acre, traveling two miles per hour.

This practice was compared to low volume treatment. "The speed you travel depends on your ground, whether it's rough or smooth, but no matter your ground, it is needful to travel relatively slow to keep coverage at an optimum," he added. "And direct all your spray high. To do this using a low volume treatment, growers can apply their product through modified speed sprayers.

"We took spray rigs, closed all but the top two nozzles, which we replaced with quarter inch hose barb adapters from the drip system," Van Steenwyk said.

"The nozzles provided two high-pressure solid streams of toxicant with two streams intersecting at 10-15 feet in the air. We also adjusted air baffles to drive the toxicant 40-50 feet in the air, before falling back over the tree tops." The study compared infestation on 100 nuts/replicated, on untreated control, treated at low volume and grower standard.

When a female WHF lays eggs beneath the surface of the walnut husk, if often leaves a small, stringlike mark which eventually turns into black spots on the husk. Between the husk and the shell the maggots do their damage. Photo courtesy of Robert Van Steenwyk

"The conclusion showed low volume was as effective, if not better, as the grower standard, and there was a benefit in lower treatment costs," Van Steenwyk said.

Insecticides

Working on an acre of Hartley walnuts near Hollister with a high WHF, researchers started studying insecticide efficacy over a lengthy period of time. Van Steenwyk said treatments were applied with a handgun orchard sprayer operated at 250 psi, with a final spray volume of 300 gal/ac. Three or four applications annually—mid-late July, mid-August, late-August/early September—on average about every three weeks. Treatments were replicated four times in randomized complete block design, with replicates consisting of a single tree.

Researchers conducted their evaluation of 125 nuts/replicate before commercial harvest in mid-September, Van Steenwyk said.

Conclusion

• Excellent Efficacy—Leverage 360 at 2.8 fluid ounce/acre, Assail 8.0 ounce/acre, Danitol/Belay 21.3 and 6 fluid ounce/acre, Stallion/Brigadier 11.8 and 12.8 fluid ounce/acre, and Baythroid 2.8 fluid ounce/acre.

• Good Efficacy – Termitry 14.0 ounce/acre, Assail 6.0 ounce/acre, Belay 6.0 ounce/acre, Danitol 21.3 ounce/acre, Athena/Brigadier 16 and 12.8 ounce/acre, Brigade/Brigadier 16.0 and 12.8 ounce/acre, and Provado 7.0 ounce/acre.

• Moderate Efficacy – Success (Entrust) 6.4 ounce/acre, Assail 4.0 ounce/acre, Warrior 2.56 ounce/acre, Belay 3.0 ounce/acre, Delegate 3.2 ounce/acre, Intrepid Edge 12.7 ounce/acre, Venerate XC 128 ounce/acre, and Exirel 20.5 ounce/acre.

• Little Efficacy—Malathion 64.0 ounce/acre, Harvanta 16.4 ounce/acre.

• No Efficacy—Bexar 27.0 ounce/acre and Altacor 4.0 ounce/acre.

Bait Improvement

In recent comparison study of molasses to Brandt Insect Bait and NuLure Insect Bait, said Van Steenwyk, molasses has been found to be an excellent WHF bait and had greater response than NuLure or Brandt alone.

In a bait demonstration, researchers utilized six orchards—two each in north, central and south valley designations.

Two treatments were replicated at least three times each in the test orchards, with each replication covering 1.5 to 3 acres.

The number of WHF was monitored weekly and harvest evaluation conducted.

At the Stockton and Escalon sites, three applications at 50 psi/acre compared growers standard bait of Brandt, to experimental use of molasses. The growers standard test trees were treated with Assail, Imidan or Lorsban insecticide.

At Dairyville, the growers standard was applied four times, again comparing Brandt to molasses, with Intrepid Edge or Bifenture as insecticide on the growers standard treated trees.

The Hamilton City orchard received six applications with the same bait treatments, and Assail insecticide on the growers standard trees.

According to Van Steenwyk, at the conclusion of the study researchers found feed grade molasses plus an insecticide was as effective in controlling adult WHF as Brandt Insect Bait or NuLure Insect Bait in two trials and superior in two additional trials.

"In addition, molasses plus an insecticide resulted in reduced Walnut Husk Fly in one of the trials," he added.

"There was not significant difference in WHF infestation in the other three trials."

Van Steenwyk said the study showed the economical and practical use of feed grade molasses as an improvement for growers to use as an effective feeding stimulant at 1:50 dilution ratio with a field effectiveness of greater than seven days.

Comments about this article? We want to hear from you. Feel free to email us at article@jcsmarketinginc.com

Going Organic — What Almond Growers Need to Know

By Cecilia Parsons | Contributing Writer

Flamer used to control weeds on the berm of the organic almond orchard.
All photos courtesy of Kathy Coatney

Do the economic rewards of almond production in an organic system make up for the challenges?

That depends, say industry leaders, farm advisors and growers, on the strength of the production plan and the dedication of the producer to an organic system. Prices paid for organically grown almonds may be double that of conventionally produced almonds, but costs of organic production can also be double. There are also costs for organic certification.

Organic Certification

A major organic certifier, California Certified Organic Farmers (CCOF), reports good market opportunities for organically grown almonds. In the last three years, more than half of the imported almonds were organic.

Organic almond production in California is at around 5,000 acres, a virtual drop in the bucket compared to the 1.2 million acres of almonds farmed conventionally. The number of acres producing organically grown almonds is increasing, said Wendy Larson of Big Tree Organics, but demand for organically grown almonds is outpacing production. There can be large price swings for the crop, she noted, but there are some larger almond producers who are adding organic production.

Planning Ahead

Planning ahead and ensuring a good start for young trees is the best way to get into organic production, current growers and farm advisors report. It is much more difficult to transition a mature orchard to organic production or start a young orchard in an organic system.

Unless the site for a new planting has never been farmed, it is difficult to establish a new organic production system. Ground previously planted in almonds or other crops may harbor parasitic nematodes, high populations of weed seeds or pathogens that cause replant disease. Without preplant soil fumigation, newly planted almond trees have difficulty establishing strong healthy root systems and often fail to reach yield potential. Most growers who want to go the organic route with almonds choose to use conventional production methods to establish a new orchard and transition to an organic system during the first three years before the first crop is harvested.

"Transitioning an almond orchard from conventional to organic

Continued on Page 58

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Organic almond orchard showing grass grown in the center of the orchard that is intentionally left green.

Continued from Page 56

production is not a simple process," said Franz Niederholzer, farm advisor in Yuba and Sutter counties. Niederholzer, who has conducted studies of organic almond production at the Nickels Soil Lab, said the process is complicated and calls for planning to meet nutritional needs in the orchard.

Transitioning an orchard site from a conventional system of farming to an organic system also requires a grower transition. Larson said producers who want to move to organic systems need to have a different mindset about managing their orchard. One of challenges is, getting used to 'busy' orchard floors instead of the clean floors they would normally have, she said.

"They have to be proactive with their management practices," Larson said.

Organic Systems Plan

Developing an organic systems plan prior to transitioning or planting is the first step. Larson said growers need to understand the concept of organic production and then write a plan to achieve their production goals. Both are necessary for becoming a certified organic producer. Being proactive includes more intensive crop monitoring to initiate action before pests or diseases threaten the viability of the crop. Orchard sanitation, a primary strategy for control of navel orangeworm (NOW), is critical to keeping populations down.

Larson said the organic systems plan has to start with improving soil health to provide a healthy environment for young trees. With this foundation, nutritional needs of young trees are more likely to be met with the use of organic production approved fertilizer. Even if an orchard is established with conventional farming methods and the goal of transition to organic production, growers need to build soil biodiversity and encourage microbial activity. That is accomplished by adding approved organic matter or compost and incorporating it into the soil. Building up the soil health is much easier in a young orchard that will be transitioned, Larson said. Transitioning older orchards to organic is more difficult because often soil health is not optimal.

In addition to tree nutrition, Larson said the organic systems plan should include how weeds, insect pests, diseases and vertebrate pests are managed. Young trees need to be managed to prevent diseases. Monitoring for pests is critical so they can be controlled before populations build.

Weeds

Weeds can be a major limiting factor to tree growth. Larson said there are several strategies used in organic systems. She said mulch, weed fabric or plastic have been used to prevent weed growth. Organic approved herbicides are not effective, she said, and they are also expensive. Steam treatments to wilt leaves are also used, but they are only effective with broadleaf weeds. Flaming weeds is done more often on mature orchards. Mowing or hoeing weeds is still the most used weed control method, she said.

Variety and Rootstock Selection

Niederholzer said almond variety

selection and rootstock selection are critical in organic production systems as there is a range of susceptibility to some diseases. Susceptibility may not be an issue in a conventional system, he said, but can be big deal in organic production due to the limitations on crop protection tools. Later maturing crops with late harvest dates are more vulnerable to pest damage.

Flamer used to control weeds on the berm of the organic almond orchard.

Orchard Location

Success with organic production can also depend on orchard site. Growing areas with higher humidity, where leaves remain wet for longer periods pose challenges for an organic system. Proximity to conventional orchards with high pest populations can make control difficult. Niederholzer said soil fertility would be the most expensive crop input. Certified organic approved nitrogen applied via drip costs 10 times more than conventional nitrogen fertilizer and almonds have a high demand for nitrogen.

Larson said transplanted almond trees need not be certified organic. The three year transition program begins at planting and both the trees and ground are managed according to National Organic Program standards and growers work with their third party organic certifier to be sure all applications are permitted under (NOP) rules.

Organic Advisory Panel

Kelly Damewood, director of policy and government affairs at Santa Cruz-based organic certifier CCOF, said the transition period is when a grower should work closely with their certifier. In addition to certifier assistance, she said Natural Resources Conservation Service as well as UC farm advisors could help growers during the transition period.

The Almond Board of California (ABC) has a new organic advisory panel to provide guidance and recommendations to the board. The panel does not have committee status, but members supply input on topics of interest to the organic almond industry to the ABC board and committees.

Brad Craven of Superior Almond Hulling, Cantua Creek, is chair of the panel, and Steve Koretoff, Purity Organics, a handler in Kerman, is vice chair. Larson also sits on the panel.

Organic Advisory Panel meetings are public and can be attended by any interested industry member. On topics that affect the whole organic almond industry, particularly if there is no consensus, the Board may request a query of all organic almond growers and processors prior to adopting a recommendation presented by the panel.

The Organic Advisory Panel members have reviewed the history of Almond Board's funding of research related to organic management of pathogens and insect pests, as well as other research projects related to organic production.

The panel is also considering:

- Research into postharvest fumigation options
- Shelf-life studies
- Production reporting
- New pasteurization technologies
- Farm bill implications.

Comments about this article? We want to hear from you. Feel free to email us at article@jcsmarketinginc.com

Marijuana Use and Your Employees

By: Amy Wolfe | MPPA, CFRE President and CEO, AgSafe

Photos courtesy of AgSage

Since Californians voted in favor of the recreational marijuana initiative that allows adults 21 and over to possess up to an ounce of marijuana and cultivate up to six plants indoors, employers have been confused as to whether or not they have to accommodate marijuana-using employees. What if an employee operates heavy machinery at work under the influence? What if an accident occurs and the employee tests positive? What does it mean if the employee has a doctor's note for use of marijuana? Where do employers begin to navigate this hazy environment?

The new law very clearly empowers employers to set parameters for whether marijuana use by their employees will be allowed or not. As a result, it is essential that owners and managers exercise this right afforded to them and define how they will address marijuana use during hiring, post-incident drug testing, when the need for medical marijuana is raised by an employee, and the overall language of their drug and alcohol policy.

Hiring

The new law did not eliminate a company's right to conduct pre-employment drug testing. As before, though, this is a process that must be applied either for all prospective employees, regardless of the position, or for all candidates of positions where performing the work under the influence poses a risk to themselves and others. Under current law, an employer cannot randomly drug test applicants because they appear "suspicious." It's all or nothing.

In addition, if a candidate tests positive for marijuana, the company is not required to offer that individual employment. As a result, it is critical that this process be very clearly articulated to all applicable job candidates at the start of the hiring process. It is also essential that the tests are conducted and the results received prior to an offer of employment being made.

All too often in the food and farming industries, we have prospective workers show up at the job site, fill out an I-9, W-4, maybe a job application and then throw them into the job before the test has been conducted, let alone the results known. In that situation, an expectation of employment has now been created and terminating the worker once the test results are received after they've begun working is grounds for wrongful termination. It is imperative that an employee not begin the job until the test results are received and the decision has been made to, in fact, hire the individual knowing their drug-use history. Remember, the California Supreme Court has held that an employer may refuse to hire an applicant who tests positive for marijuana, even if the drug is legally prescribed for a disability.

Post-Incident Drug Testing

The use of mandatory post-incident drug testing has long been considered a best-practice within the food and farming industries. When consistently and lawfully applied, it gives an employer critical information needed to have a complete picture of what happened when the incident transpired. For years, worker advocates argued that post-incident drug testing discouraged workers from reporting incidents when they occur. In May 2016, OSHA agreed with this conclusion and amended the Code of Federal Regulations to add provisions regarding proper reporting and retaliation for workplace reporting. OSHA took the position that certain workplace policies may discourage proper incident reporting, including disciplinary policies, incentive policies and post-accident drug testing policies. In June 2017, the Trump Administration placed a stay on OSHA's position and as a result, employers with a post-incident drug testing policy, done in accordance with state law, will not be considered retaliatory.

As a result, it is essential that companies leverage this additional tool available to them when managing legal marijuana use by their employees. Lawful implementation of this practice is key, most notably the uniform, consistent implementation of testing for each and every incident regardless of the circumstances. Employees must also be informed of the practice in the company's drug and alcohol policy, which is reviewed in detail at the time of hire. As with pre-employment drug testing, this practice must be an all-or-nothing practice so as to ensure an employee cannot make a claim of discrimination or retaliation.

Medical Marijuana

In light of the new law, it is easy to expect that there will be an increase in the number of employees who assert their right to use marijuana for medicinal purposes. In addition, it is easy to confuse the rights an employee has under the Americans with Disabilities Act (ADA), specific to prescribed medication that must

Continued on Page 62

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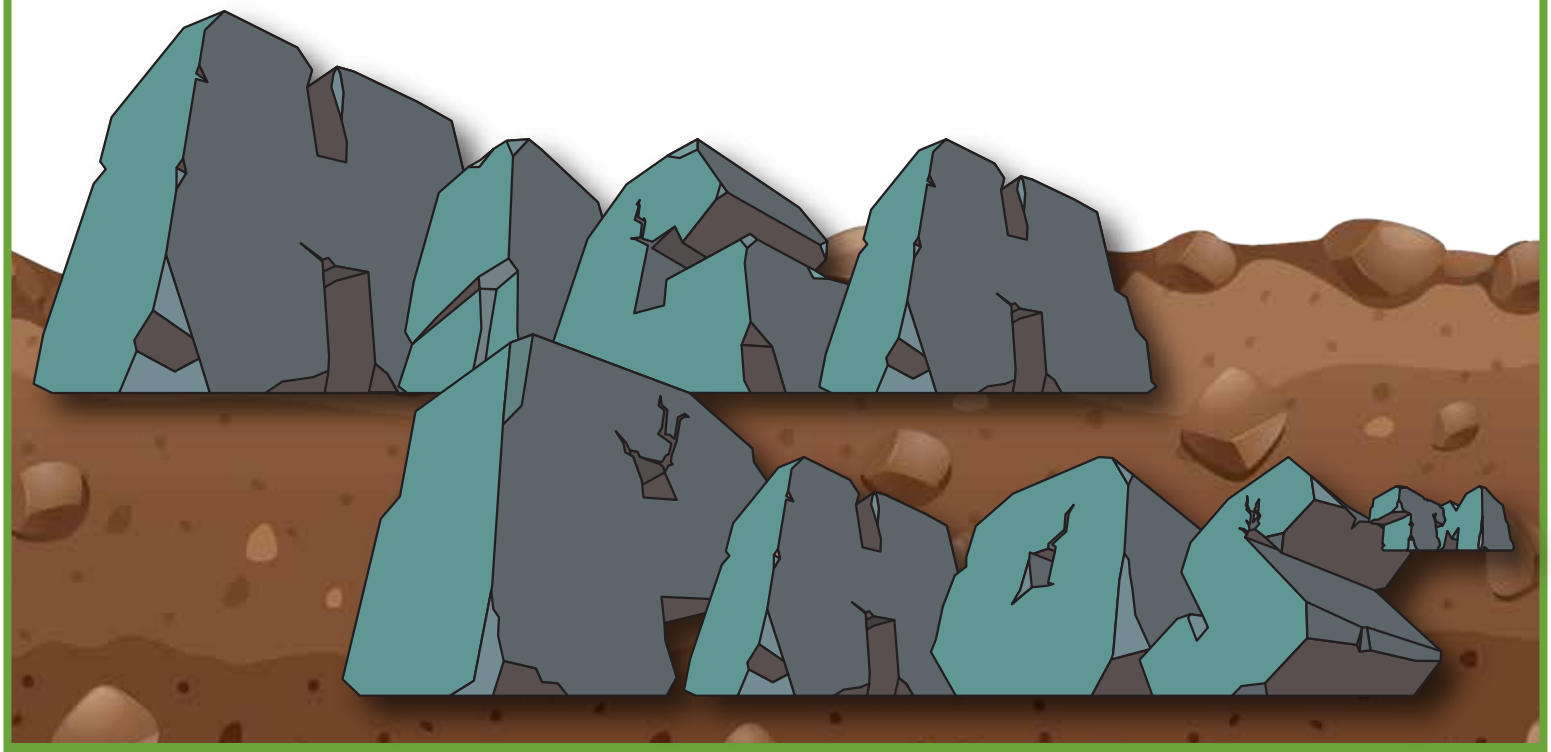

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Proposition 64 explicitly allows public and private employers to enact and enforce workplace policies pertaining to marijuana.

Continued from Page 60

be taken to treat an injury or illness of some kind. To be clear, under current California law, there are no workplace provisions protecting the rights of medical marijuana patients.

In addition, since the ADA is a federal standard and the federal government does not recognize marijuana as a legal drug, an employee will not be protected from the tenants of that regulation. In California, there is no law requiring accommodation for medicating on the job or protection from termination. In fact, the state Supreme Court has ruled that companies can fire workers who fail drug tests even if they present evidence of a doctor's recommendation for legal medicinal use.

As noted previously, the key to effectively implementing the laws is to ensure that the company has a drug and alcohol policy clearly stating that marijuana use, even with a physician's authorization, will not be allowed during working hours, on company property or when representing the organization in any professional capacity. This aspect of the policy should be reviewed during new employee orientation and on an ongoing basis so as to ensure employees understand the importance of not violating the rules.

Company Drug and Alcohol Policy

As noted previously, Proposition 64 explicitly allows public and private employers to enact and enforce workplace policies pertaining to marijuana. The initiative was specific in its language allowing for recreational use. It is well within an employer's right to have a zero-tolerance policy in the workplace. This policy needs to address a number of elements, at minimum including:

- Zero-tolerance perspective and the disciplinary action to be taken if an employee violates the policy.
- Post-incident drug testing and the process that will be followed uniformly and consistently after each incident, regardless of who is involved or the severity of the incident.
- Personal property searches, as part of the company's due diligence in enforcing the policy.
- Specific reference to prohibiting the use of marijuana, even with a prescription.

On the Horizon

The implementation and enforcement of this new law is overwhelming across state agencies. More specifically, January 1, 2021, a task force of law enforcement is to report to the state legislature its policy recommendations and the steps that state agencies are taking regarding impaired driving.

In simplest terms, the group needs to conduct the necessary research to create a marijuana-equivalent to the Blood Alcohol Content standard and subsequently, the baseline that would determine at what level it is safe to operate a car or equipment.

This is merely a brief overview of the latest regulations food and farming employers have to navigate. If you have questions about the specifics, including a sample Drug and Alcohol Policy, visit www.agsafe.org, call (209) 526-4400 or send an email to safeinfo@agsafe.org. AgSafe is a 501c3 nonprofit providing training, education, outreach and tools in the areas of worker safety, human resources, food safety, and pesticide safety for the food and farming industries. Since 1991, AgSafe has educated nearly 75,000 employers, supervisors and workers about these critical issues.

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