Topics in Subtropics Newsletter

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News from the Subtropical Tree Crop Farm Advisors in California

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International Research Conference on Huanglongbing Coming to Riverside in March 2024

The International Research Conference on Huanglongbing (IRCHLB) will be held at the Riverside Convention Center in Riverside, California, USA starting on March 26, 2024, and ending March 29, 2024. This conference is being produced by the California Citrus Research Board, with the support and guidance of the citrus industry and the Steering and Program Committees.

IRCHLB VII will bring together diverse international researchers and perspectives. Previous IRCHLB have presented a wide range of research, much of which is basic in nature. Now, some of these discoveries are being implemented or tried at the field level. Thus, the theme of IRCHLB is "Transitioning Research to Field Reality". The conference will feature invited keynote speakers presenting information on HLB with an international perspective. A wide range of topics will be presented in talks and posters. Specific topic areas include the causal organisms, their vectors, and their plant hosts, interactions between these, and the consequences of HLB infection. In addition, research on cultural control and disease management technologies will be presented. The information will be of interest to well-informed growers as well as scientists.

Additional information, registration, and abstract submission is available at: http://www.irchlb.com/

Pocket gopher management

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Pocket gophers (*Thomomys bottae*) may be responsible for more damage to orchards than any other mammal species. It can be important to minimize their presence in orchards and this is particularly relevant for young trees that are highly susceptible to gopher damage. Since reproduction increases toward late winter through early spring, control is more effective before this reproductive pulse since there are fewer individuals to remove. When soil moisture is high, gophers make mounds frequently, easing identification of active tunnel systems, and thus reducing the time required to treat the orchard. Gopher control programs include a variety of tools including trapping, rodenticides, burrow fumigants, and potentially biocontrol, among other options. Below are some thoughts on the utility and implementation of some of the more commonly used strategies for managing this burrowing rodent.

Trapping—Trapping is safe and one of the most effective, although labor-intensive, methods for controlling pocket gophers. Nonetheless, the cost and time for application is often offset by effectiveness. Several types and brands of pocket gopher traps are available. The most common type is a two-pronged, pincher trap such as the Macabee, Cinch, or Gophinator, which the pocket gopher triggers when it pushes against a flat, vertical pan. Another popular type is the choker-style trap. Historically, these have been box traps that require extra excavation to place and may be a bit bulky to be practical in a large field setting. More recently, I've seen substantial use of a cylinder-type trap called the GopherHawk, which is a choker style trap that takes little excavation and is quick and easy to set. Of trap types tested, the Gophinator trap appears to be one of the most effective. In particular, it has proven more effective than the Macabee trap, which is likely the most commonly used pocket gopher trap in the western U.S. The increased effectiveness of the Gophinator is due to its ability to capture larger individuals at a greater rate.

For trap placement, the first step is to probe near a fresh mound to find the main tunnel, which often is on the side closest to the plug of the mound. The main tunnel usually is 6 to 8 inches deep; the probe will drop quickly about 2 inches when the tunnel is encountered. Traps will then need to be placed in as many tunnels as are present, as you will not know which side the pocket gopher currently is using. After placing the traps, you can cover the hole to keep light out of the tunnel. However, covering trap sets only marginally increases capture efficiency when temperatures are high (perhaps >85°F, although the exact impact of temperature is not known) and provides no increase in capture success at other times. Therefore, if setting a large number of traps, a substantial amount of time in setting and checking traps can be saved if the trap-holes are left uncovered. Various attractants have been tested to see if they will increase capture success; they do not appear to have much impact. Human scent also does not influence capture success, so there is little reason to worry about handling traps with bare hands. Trap sets are typically operated for 24 hours. If no activity is present in that timeframe, they should be moved to a new location to maximize capture probabilities.

Pincer-type traps can also be placed in lateral tunnels, which are tunnels that lead directly to the surface. To trap in laterals, the plug is removed from a fresh mound and a trap placed into the lateral tunnel so that the entire trap is inside the tunnel. Pocket gophers will come to the surface to investigate the tunnel opening and will be caught. This approach is quicker and easier to implement than trapping in the main tunnel. However, trapping in lateral tunnels may be less effective at certain times of the year (e.g., summer) and for more experienced and larger pocket gophers (e.g., adult males).

Rodenticides—There are three primary rodenticides for pocket gopher control: 1) strychnine, 2) zinc phosphide, and 3) anticoagulants (e.g., chlorophacinone and diphacinone). Extensive laboratory and field trials have shown that strychnine products are far more efficacious than other rodenticides currently registered for pocket gopher control. However, pocket gophers do develop a behavioral or physiological resistance to strychnine if repeatedly used over time. Therefore, strychnine baiting should be used only as one part of an Integrated Pest Management (IPM) program.

There are two primary methods for baiting in agricultural fields: 1) hand baiting with an all-in-one probe and bait dispenser, and 2) a burrow builder. For hand baiting, an all-in-one probe and bait dispenser is used to locate a tunnel. The bait is then directly deposited into the tunnel. The opening left by the probe is covered up with a dirt clod or rock to prevent light from entering the burrow. When using this method, care must be taken not to bury the bait with loose dirt as this will limit access to the bait. Typically, it is recommended that burrow systems be treated at least twice to maximize efficacy. Research has shown that the experience of the individual who applies the bait is very important; those applicators who have been properly trained on how to use the equipment, and who can detect the difference between extant versus back-filled tunnels, are more than twice as efficacious as those individuals who have not received the proper training, so be sure to train properly before use.

A burrow builder pulled behind a tractor that creates an artificial burrow can be a practical method for treating larger areas. Gophers will come across these artificial burrows and consume bait that has been deposited at set intervals within the artificial burrow. Soil moisture must be just right; if too dry, the artificial burrow will cave in, if too wet, the burrow will not seal properly allowing light to filter in thus preventing gophers from travelling down the burrow. Efficacy varies greatly depending on how well you implement the method.

Burrow fumigation—Aluminum phosphide is generally considered the most efficacious burrow fumigant. It is a restricted-use material and can only be used by or under the direct supervision of a Certified Applicator. That said, it is quite effective and has a low material cost if used over small areas. The primary method for applying aluminum phosphide is similar to that of hand baiting. You use a probe to find a pocket gopher tunnel, then wiggle the probe to enlarge the opening (if the probe hole is not already large enough to allow passage of the aluminum phosphide tablets into the tunnel), and drop the label specified number of tablets or pellets into the tunnel. You then seal up the opening to eliminate light from entering and the toxic gases from exiting the tunnel. Once again, care must be taken not to bury the tablets with loose soil as this will render them ineffective. Typically, each burrow system is treated twice to maximize efficacy. The key with aluminum phosphide treatments is to only apply when soil moisture is relatively high. If you can ball up a clump of soil at the tunnel depth and it maintains that ball in your hand, then soil moisture is high enough to fumigate; if the clump falls apart in your hand, it is too dry. Because of this, fumigation is typically most effective in late winter and early spring. However, fumigation after irrigation can also be a good strategy.

In addition to aluminum phosphide, carbon monoxide generating machines can be used to control pocket gophers. As their name implies, these devices generate carbon monoxide and inject it into the burrow systems which then asphyxiate the inhabitants. Trials have indicated that this approach is moderately effective (56–68%), although efficacy is less than typically observed with trapping, aluminum phosphide, and strychnine. Additionally, equipment can be expensive to purchase. However, many more burrow systems can be treated during a day of application with this approach, so these machines likely have utility moving forward, particularly for growers and pest control professionals who have large acreage to treat.

A carbon dioxide injection device is now registered for use against pocket gophers as well. Data on the efficacy of this tool is limited at this point, although the expectation is that efficacy should be relatively equivalent to that observed for pressurized exhaust machines. In contrast to pressurized exhaust machines, the carbon dioxide injection device requires a tank of carbon dioxide. This could make it more challenging to use over large acreage given the potential need for multiple tanks per day.

Biocontrol—This approach relies on natural predation to control pocket gopher populations. From a management perspective, this typically involves the use of barn owl boxes to encourage owl predation of rodents over desired fields. A couple of small studies have shown a reduction of pocket gophers in vineyards that have erected barn owl boxes to reduce rodent numbers. More extensive research is needed on this control method to better understand its utility for helping to manage these burrowing rodents. It is also important to understand that barn owls will not eliminate gophers from your property; at best they will reduce population densities, so additional methods of control will likely be needed. That said, at a minimum, erecting barn owl boxes on the perimeter of orchards cannot hurt management efforts and may potentially help to keep pocket gopher numbers lower than they would be without barn owl assistance.

Summary—It is important to note that effective management will rely on a combination of tools (i.e., IPM), not a single approach. It is also imperative that the grower recognize that re-invasion into orchards will occur. Regular long-term monitoring and removal of invaders before they multiply and re-establish is an important part of good orchard management. For additional information on managing gophers, check out the UC IPM Pest Management Guidelines for pocket gophers (https://ipm.ucanr.edu/agriculture/citrus/pocket-gophers/).

Phytophthora diseases of California citrus

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There are at least four species of *Phytophthora* species (*P. citrophthora*, *P. parasitica*, *P*. *syringae*, and *P. hibernalis*) associated with citrus in California and all species can cause various symptoms in citrus including the three main 'diseases' associated with *Phytophthora* spp. The three diseases in citrus caused by these fungal-like pathogens are; Phytophthora Root Rot, Phytophthora Brown Rot of citrus fruits both pre-and post-harvest, and Phytophthora gummosis, which causes a canker at the lower area of the tree usually at or around the soil line. These organisms are active within the field essentially all year long so one tree could possibly have all three disease symptoms at one time, but this is usually not the situation. These pathogens are also ubiquitous within the soils of California citrus groves so keeping an eye out for these diseases is essential to help manage these citrus issues.

Phytophthora Root Rot (PRR): PRR is caused primarily by *P. citrophthora* and *P. parasitica*. The former is most active in the winter with respect to PRR whereas the latter is more active in warm weather so PRR can be found throughout the year. This disease can affect young to mature trees and is often associated with groves that do not have good drainage such as high clay soils. For example, in the Terra Bella area of the San Joaquin Valley, there are areas with high clay soils that lead to problems with PRR due to the lack of drainage which can also lead to additional disease issues such as Dry Root Rot (*Fusarium solani*). In fact, both pathogens seem to work in tandem because Phytophthora can weaken the trees by destruction of the feeder roots leading to colonization by *Fusarium solani* and both pathogens can often be isolated in these situations.

Both pathogens are common throughout most citrus grove soils and can survive for years in the soil by producing persistent spores (clamydospores). When moisture is present in the soils, these pathogens can then produce oospores which are the reproductive spore stage. Oospores will differentiate into motile swimming zoospores that are released by the oospores and swim in the free water in the soil towards the primarily feeder roots. These motile zoospores are the infective spores which can decimate the citrus root system leading to potential death of the tree.

Trees that are infected with this disease will often show light green to yellowing of the leaves, thinning of the canopy, and often causes a slow decline of the tree once infected (Fig 1). The trees decline because the feeder roots get destroyed so the plant cannot uptake water and nutrients effectively, thus leading to potential death of the tree. If PRR is the potential suspect of decline, it is possible to dig up roots to evaluate them because this pathogen mostly infects the feeder roots below the soil line within a foot or so from the surface of the soil line. Figure 2 shows what a healthy root system looks like as well as a root system infected by the pathogen. The colonization of the feeder roots is primarily within the root cortex which becomes soft and disintegrates these cells which makes it easy to separate this tissue layer from the stele of the feeder root.
Root rot can also lead to other diseases due to stressing the plants once feeder roots are consumed by *Phytophthora*. For example, *Fusarium solani*, which causes dry root rot in citrus is a secondary pathogen that usually only infects citrus once the trees are under stress. Moreover, if the citrus trees are already infected with *Citrus tristeza virus* (CTV), the combination of CTV and *F. solani* can play a major role in quick decline of citrus on sour orange rootstock. Other viruses or viroids may also play a role in this interaction but no studies that we are aware of have tested this specifically.

Figure 1. Yellowing and thinning of citrus canopy due to *Phytophthora* infection.

Figure 2. Healthy root system of a citrus plant (left) and a root system infected with Phytophthora showing decay of the feeder root system (right).

Fig 3. Brown rot symptoms of *Phytophthora* on a lemon fruit.

Brown Rot: This disease is caused by the various *Phytophthora* spp. and is usually associated with mature fruits. However, twigs, leaves, and flowers can also occasionally be infected which can result in death of these tissues. This disease is usually associated with cool and wet conditions. The symptoms can be seen in the field, primarily on low lying fruit because the spores of the pathogen can get dispersed with water and wind and move from the soil to the low-lying fruit in the tree (Fig 3). Therefore, it is recommended to 'skirt' the trees so that there is no low-lying fruit to get infected. Brown rot can also occur after the fruit is picked (not showing symptoms) so it is also a post-harvest issue as well. In this situation, fruit that does not show obvious symptoms may be picked and stored at the packing house and the disease can spread to healthy fruit during storage.

Phytophthora Gummosis (PG): This disease is caused by the various *Phytophthora* spp. This disease is usually only seen around the soil line to a foot or so above the soil line but could produce a larger canker higher up the trunk (Fig 4). The disease is recognizable because once infected, the tree starts to produce compounds to combat the infection which results in oozing of sap from small, infected cracks in the bark which may look as if the tree is bleeding. The bark usually remains firm but dries out and eventually cracks and can slough off the trunk. Sometimes a white crust appearance will also be seen within and around the canker. Once an infection occurs and the tree is not treated, the canker can eventually spread around the circumference of the trunk that can lead to complete girdling of the tree. This can weaken the tree leading to general decline and or kill the tree which can occur within a year under favorable conditions (moist and cool) but usually will take several years of active infection to cause major damage.

Figure 4. Gummosis symptoms on lower trunk of a citrus tree. Note that the scion is more susceptible than the rootstock because most growers use *Phytophthora* tolerant rootstocks.

General information on control of Phytophthora diseases. If a grower has a field that has had a history of various *Phytophthora* issues, there is the possibility to do a pre-plant fumigation using metam sodium or chloropicrin. If a grove becomes infected after planting, the most common methods of control are the use of chemicals usually applied through the drip lines. The most common products are Aliette, Ridomil Gold, and Prophyt. In the last several years, another product (Orondis), as well as some other chemistries, have been developed to control *Phytophthora* diseases. In this study, minimum effective rates to reduce Phytophthora root rot incidence and pathogen soil populations were determined after one and two applications in fall 2016 and summer 2017, respectively, and greenhouse studies confirmed the efficacy of the new fungicides. These findings led to fluopicolide recently receiving a federal and oxathiapiprolin (Orandis) a full registration for use on citrus. The researchers also requested that ethaboxam and mandipropamid also be considered for registration for control of Phytophthora diseases of citrus in CA. These new compounds will provide highly effective treatments and resistance management strategies using rotation and fungicide mixtures for the control of Phytophthora root rot of citrus.

Micronutrient sprays that contain phosphite may also help to control these diseases because this molecule stimulates a systemic inducedresistance response in the citrus trees that helps the plant fight off infections. The new compounds will provide good control when used in a rotation to avoid resistance, as has happened with many older products. For additional information regarding these new options for control of Phytophthora root rot of citrus, see. (https://apsjournals.apsnet.org/doi/10.1094/PDIS-07-18-1152-RE).

More details on *Phytophthora* and its control can be found at the UC IPM website; https://www2.ipm.ucanr.edu/agriculture/citrus/?src=redirect2refresh.

Good Air or Bad Air? A Consideration for Airblast Spray Application in Trees and Vines

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Airblast sprayers are the most used equipment for pesticide application in perennial specialty crops in the San Joaquin Valley and across California. The application involves applying spray from both sides of the sprayer onto tree or vine canopies, as an operator drives the sprayer between tree/vine rows. Airblast sprayers use a fan to produce air intended to carry the spray to the target. The air also helps the spray droplets to penetrate the target canopies to deposit deep inside the canopy.

Good or Bad Air?

A critical consideration for any application is the amount of air needed to carry the spray to the target. How much air is too little? How much is adequate? How much is too much? There is a tendency to assume that more air always means better effectiveness, but one size does not fit all. So, the air can either work for or against effectiveness. Use too little air and the spray will not penetrate sufficiently. Use too much, and the spray will be excessively pushed through the canopy. Using the right amount of air will require making intentional adjustments during sprayer calibration and properly documenting the settings for future reference.

Finding It Out

As part of a California Department of Pesticide Regulation Grant (DPR grant number 19-PML-G002), an airblast spray deposition field study was conducted in 2020 in a mandarin (*Citrus reticulata*) orchard located in Exeter, California, to assess spray deposition using different fan air volume rates. The trees were 12 ft tall with 18-ft row spacing and 8-ft tree spacing within rows. Spray treatments using pyranine fluorescent tracer dye solution were applied to 16 tree blocks and sprayed leaf samples were collected at three canopy heights and four canopy depths as indicated in Figure 1. The leaf samples were analyzed in the lab by fluorometry to obtain dye deposition data.

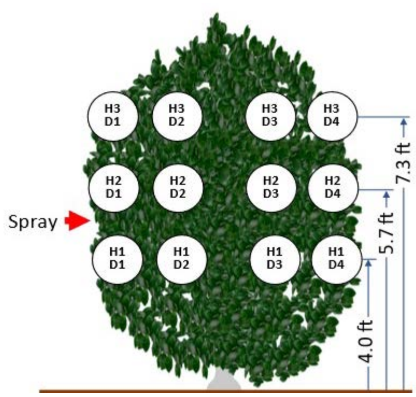

Figure 1. Sprayed leaf sampling locations (H – height; D – depth) in target tree canopy used in study.

What Was Observed

A summary of the results is shown in Figure 2 comparing between a D-39 sprayer with a single fan and a D-2/40 sprayer with two fans, both Air-O-Fan sprayers. By design, the D-2/40 sprayer delivered nearly twice the air volume rate produced by the D-39 sprayer. The figure provides mean dye deposition profiles: over canopy sampling depth (Figure 2a); across sampling height (Figure 2b); and with respect to increasing application rate (Figure 2c). It indicates that deposition generally decreased across the canopy and slightly so with increasing sampling height. Deposition on the nearside of the sprayer was nearly 7 times that on the far side. Furthermore, deposition increased with increasing application rate.

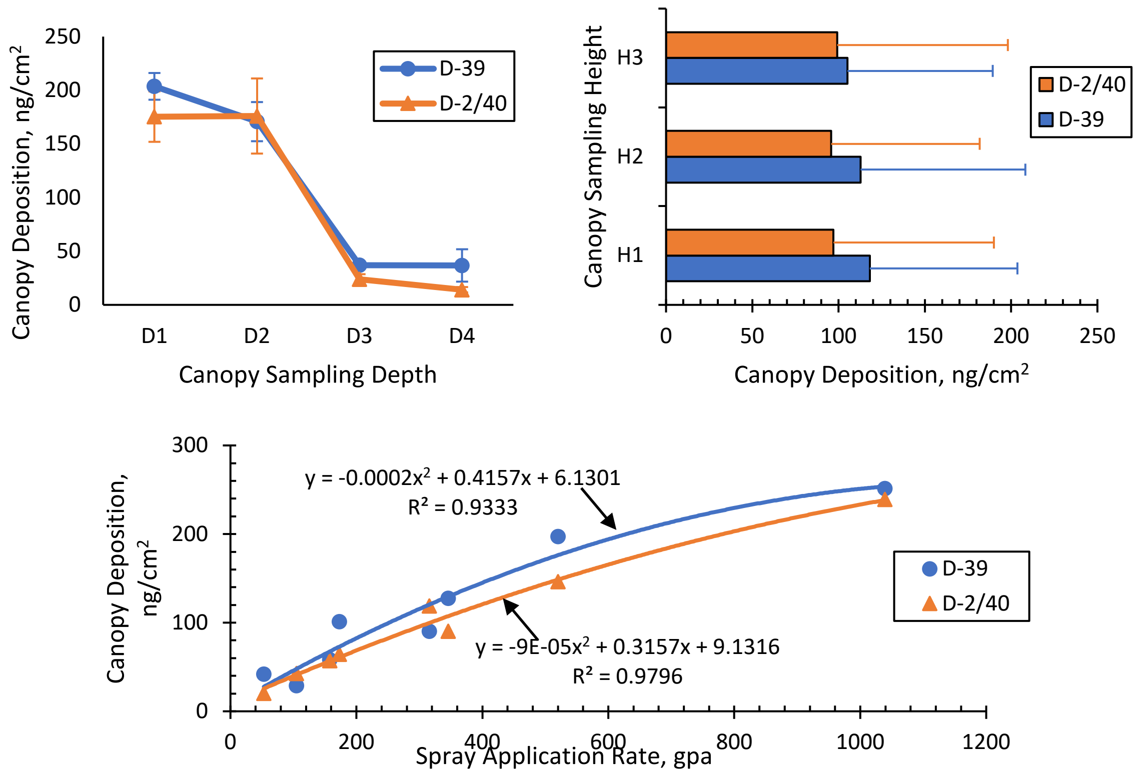

Figure 3. Mean canopy deposition for all spray treatments with respect to: a) sampling depth; b) sampling height; and c) application rate.

Overall, deposition was generally not statistically different between the two sprayers, however, the D-39 sprayer consistently achieved numerically greater deposition than the D-2/40 sprayer. The differences in deposition at different canopy depths and heights can be attributed to variation in spray penetration within the canopy in addition to decreasing spray liquid volume owing to dispersion. The lower deposition from the higher-air-volume sprayer can be attributed to a loss of spray due to overpenetration. In other words, it appears that the extra push on the spray by the D-2/40 sprayer fan air caused some of the spray that would have otherwise deposited within the canopy to exit from the far side of the canopy. This underscores the importance of matching the sprayer air to the target canopy characteristics such that the air does the important work of delivering the spray within the canopy while minimizing the chances of unecessarily pushing out spray droplets. Matching the sprayer air to the canopy size and foliage density optimizes the application and leads to better outcomes. Minimizing overpenetration also reduces the chances for spray drift due to escaped spray droplets that remain airborne and are susceptible to drift by the wind. An extension publication with more details of the study and its results is soon to be published. More on pages 4, 5 and 22 at https://calfruitandveg.com/2023/09/01/read-september-october-issue/

Temperature inversion data helps guide frost responses.

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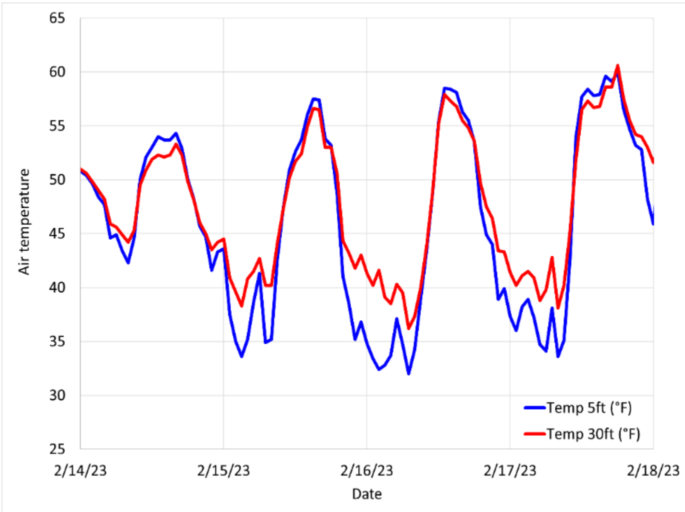
Coastal California crops include many which are sensitive to frost, including grapes, strawberries, avocado and citrus. Our primary active protection measures are water and wind; water for sprinkler frost protection is very effective in many situations, but the scarcity and high cost of water is making it increasingly difficult to justify, and the high rates of water application can degrade crop quality in some situations. Wind machines are therefore gaining increasing attention as an attractive alternative where conditions permit their use.
Wind machines generate a warming benefit primarily by mixing the warmer air aloft with the colder air near the crop. This situation of having warmer air aloft and colder air near the ground surface is termed a temperature inversion. Temperature inversions tend to form under nighttime conditions of clear skies and little to no wind; these are the typical conditions which drive a radiation frost. The cloudier and/or windier the nighttime conditions, the weaker the inversions. Under advective frost conditions, the air temperature aloft may actually be colder than near the ground; clearly under such conditions the operation of wind machines can be detrimental to the crop, hence the importance to have some understanding of the patterns of temperature inversions in our growing regions.

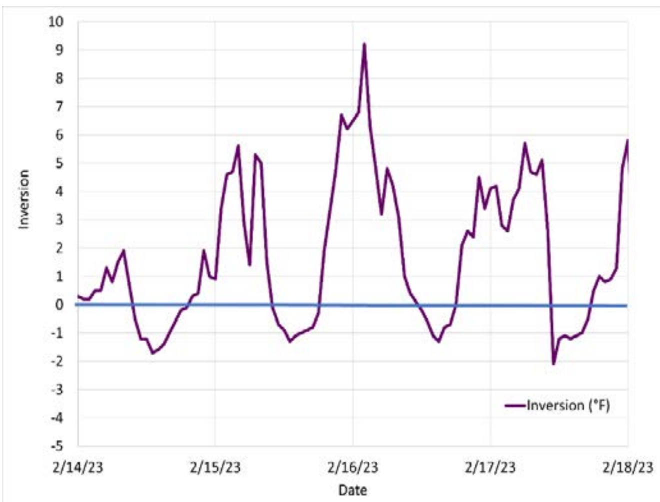
Measurements of the temperature inversion can be used in two fundamental ways. Firstly, as part of a site assessment, to help determine whether or not wind machines may be suitable for use at the site. Secondly, to help guide decisions of whether or not to utilize wind machines during a particular frost event. For the former, measurements can be made with inexpensive data loggers which store the values for later evaluation well after the frost period. For the latter, a more expensive weather station which can provide real-time data to users will be required.

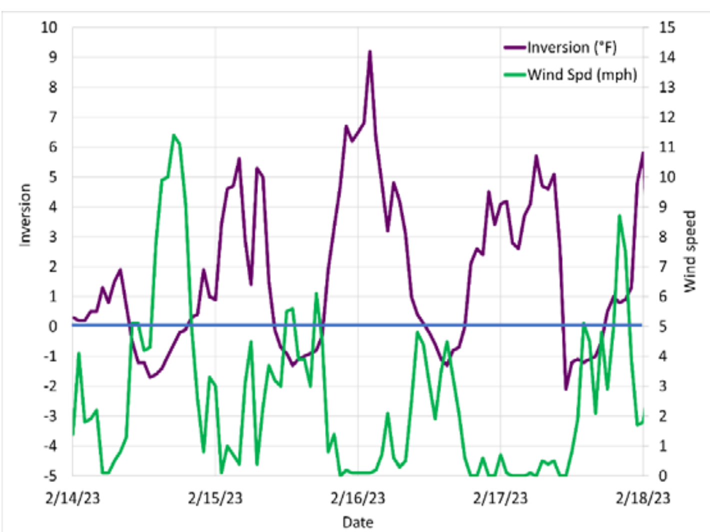
The measurement of the temperature inversion only requires one unusual item, a tall mast of some sort to support the upper air temperature sensor at the desired height aloft. Two main options exist for achieving this. The traditional option is to use a triangulated steel meteorological tower, installed on a concrete pad with guy wires; this is expensive and essentially permanent with a large footprint, but has the advantages of being quite robust and being able to support a variety of sensors at the upper height if needed. The other option is a slender flexible mast, similar to a very long fishing pole. This is very inexpensive and simple to install but has a limitation in that it can only support a very small air temperature sensor. They may also be more prone to occasionally breaking under extreme wind conditions since they have no guy wires.

I have used these flexible masts in a wide range of circumstances over the past dozen years and they have proven their value to collect temperature inversion data at very low cost. In combination with inexpensive data loggers, they serve as excellent tools for site assessment, and when attached to conventional weather stations they add valuable functionality. Currently in San Luis Obispo County I operate a network of twenty such weather stations, each providing real-time inversion data. One of these stations is in Morro Bay, primarily serving the avocado growers in that area. The charts below have examples of the data from this station over several cold nights in mid-February earlier this year, simply to introduce the fundamental characteristics of these types of measurements to growers who have never made use of such data before.

In Figure 1, the air temperature values at 5 ft and 30 ft heights are shown over a four-day period. One basic pattern becomes clear; during the daytime, the 5 ft temperatures are slightly warmer than the 30 ft temperatures, but at night this pattern is reversed (inverted – hence the term inversion). On the three coldest nights, the inversions were relatively strong, meaning that the air aloft was notably warmer than closer to the ground. Under such conditions, the operation of a wind machine will result in substantial warming of a crop.







In Figure 2, similar information is presented as a single variable of "Inversion." This value is calculated by subtracting the temperature at 5 ft from the temperature at 30 ft. A positive value indicates that an inversion is present, a negative value indicates that there is no inversion.

In Figure 3, the wind speed has now been added to the previous chart. Here we see another pattern pretty clearly: when the wind speed is very low at night, the inversion is stronger (larger positive value). This also tells us that the skies were likely clear as well, because if there was little wind but heavy cloud cover the inversion values would have remained small or nonexistent. Within single nights the relationship between wind and the inversion becomes clear, for example on the night of February 15 there is a short period when the inversion diminishes notably, which corresponds to a strong uptick in the wind at the same time.

These basic examples help demonstrate how this simple measurement can greatly increase our understanding of frost conditions, and the likely outcomes of using a wind machine during these periods. Additional information is available at the links below. UCCE weather station network: https://ucce-slo.westernweathergroup.com/ , https://cesanluisobispo.ucanr.edu/Viticulture/UCCE_weather_station_network/
Grape Notes Blog: http://ucanr.edu/blogs/GrapeNotesBlog/
Website: http://cesanluisobispo.ucanr.edu/

Bodil Cass- New Subtropical Fruit IPM Specialist

Dr. Bodil Cass (also goes by 'Bo') joins the University of California Agriculture and Natural Resources and the Department of Entomology at the University of California, Riverside, as an Assistant Professor of Extension (Cooperative Extension Specialist) in Integrated Pest Management (IPM) of Subtropical Fruit Crops. This appointment has statewide research and extension responsibilities to improve the sustainability of citrus, avocado, and other specialty fruit crop production in California through better management of arthropod pests and vectors of plant pathogens.

The research approach used by Dr. Cass employs a mix of data science or 'ecoinformatics' and traditional field ecology and laboratory experiments. Research begins directly with growers and pest control advisors (PCAs) to analyze field scouting and grove management records pooled from many farms across a region. This helps to gain an area-wide, broad scale overview of pest trends and issues across the range of growing conditions for a particular crop. The observational data is used in conjunction with researcher-generated data from controlled experiments to test specific hypotheses about pest effects and management. Current projects include research into Asian citrus psyllid, citrus thrips, citrus mealybugs, cottony cushion scale, and fork-tailed bush katydids, along with various other scales, mites, caterpillars, predators and parasitoids.

New research at the Subtropical Fruit IPM Lab builds on work conducted by Dr. Cass as a Postdoctoral Scholar at UC Davis and the UC Lindcove Research and Extension Center, which addressed the need for IPM guidelines specific for mandarin varieties of citrus. This ongoing research in several species of mandarins led to updates of the UC IPM pest management guidelines for key pests of citrus, including citrus thrips, fork-tailed bush katydids and earwigs, and publication of a photographic guide to citrus fruit damage in mandarins (UC ANR Publication 8708).

Dr. Cass holds a Ph.D. in Entomology and Insect Science from the University of Arizona, and a Bachelor of Science with Honors in Genetics from The University of Queensland, Australia. Prior to this role, Dr. Cass worked for the County of San Diego Department of Agriculture/Weights & Measures as an Agricultural Scientist (County Entomologist), managing the local Apiary Program, and the Plant Pest Diagnostic Laboratory, which aims to prevent the import and export of pests potentially harmful to agriculture and the environment.

Dr. Cass has studied a range of insects from large, chewing herbivores like katydids and earwigs, to microscopic thrips and whiteflies and their bacterial symbionts, with research presented at national and international conferences, published in >20 peer-reviewed reports, and shared through industry magazines, newsletters, roundtables, and field days. Dr. Cass is regularly involved in diversity and inclusion efforts for gender issues in science education and is especially interested in continuing this work with groups historically underrepresented and marginalized in agriculture.

Dr. Cass is currently setting up laboratory operations and meeting with industry and university partners to evaluate the research and extension needs. Please reach out to connect about these topics by phone (951) 827-9274 or email bodil.cass@ucr.edu.

More information about the Subtropical Fruit IPM Lab is available at https://subtropicalfruitcrops.ucr.edu/.

Photo: Dr. Bodil Cass is appointed as a Subtropical Fruit IPM Specialist based at UC Riverside.
Photo credit: Timo Rahula.

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Topics in Subtropics

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