Topics in Subtropics Newsletter

University of California Cooperative Extension

Fresno, Kern, Madera, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Tulare, & Ventura Counties

News from the Subtropical Tree Crop Farm Advisors in California

Volume 21, Winter 2020

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ANNOUCMENTS:
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Rattlesnakes in California Orchards: Growers Beware

Sonia Rios and Roger A. Baldwin

First, remember that the desire to avoid any kind of an interaction is mutual. Rattlesnakes are an important part of the ecosystem, feeding on rodents, birds, and other small animals. Snake season in Southern California runs from April through October, but the warmer the weather, the more the reptiles are likely to be out and about. Rattlesnakes are California's only native venomous snake, with some adults reaching up to 6 feet long. According to the California Poison Control Center notes, rattlesnakes account for more than 800 bites each year, with one to two deaths. About 25 percent of the bites are "dry," meaning no venom was injected, but the bites still require medical treatment. There are nine species live in various areas of the state and their size can vary.

According to the *University of California Integrated Pest Management Guidelines (2014),*the most widespread rattlesnake in California is the western rattlesnake (*Crotalus oreganus*), found from the northern part of the state as far south as Santa Barbara County and from sea level to 7,000 feet. Two closely related species (*C. helleri* and *C. lutosus*) are found in coastal Southern California and in the northern Sierra Nevada, respectively. The sidewinder (*C. cerastes*) is the smallest rattlesnake and is so named because of its peculiar method of sideways locomotion. The sidewinder is sometimes called the horned rattler because of the hornlike scales above its eyes. It is most commonly found in sandy desert areas from below sea level to 6,000 feet. The Mohave rattlesnake (*C. scutulatus*) ranges across the desert and foothills of southeastern California from sea level to higher elevations. The southwestern speckled rattlesnake (*C. mitchellii*) ranges from Baja California northward across much of the Colorado, Mojave, and

Sonoran Deserts, overlapping with the red diamond rattlesnake (*C. ruber*) in western parts of its range and the sidewinder farther east. The Panamint rattlesnake (*C. stephensi*) is closely related but has a more northerly distribution in the inland desert regions of Southern California. The red diamond rattlesnake is found in Baja California and in southwestern California south of Los Angeles. The western diamond-backed rattlesnake (*C. atrox*) is seldom seen in California but occurs in the extreme southeastern part of the state in desert regions.

Of the nine species of rattlesnakes in this region, the Western Diamondback rattlesnake is probably the most dangerous because of its size and aggressive nature. State experts say the Diamondback can be found primarily in Imperial, Riverside and San Bernardino counties. Most trees crops that are found in this county that are at risk for hosting these snakes are avocados, citrus and dates.

This vertebrate pest can cause a threat to workers conducting routine agriculture cultural practices such as irrigating, fertilizing, and harvesting. In the deserts of Riverside and Imperial county where the laborious date palms are grown, rattle snakes can cause a threat to harvesters if orchard vegetation is left uncontrolled. The snakes are also attracted to water, so irrigators can run the risk of coming into contact with the snakes.

Biology and Behavior

Rattlesnakes are thick-bodied snakes with keeled (ridged) scales in a variety of colors and patterns. The National Wildlife Federation reported that rattlesnakes typically live for 10 to 25 years.

Most species are patterned with dark diamonds, rhombuses or hexagons on a lighter background. Rattlesnakes are ovoviviparous, which means that eggs incubate inside the mother's body. Babies are born live, encased in a thin membrane that they puncture after being born.

They are among the group of snakes called pit vipers because of the small pits on each side of the head between the eye and nostril. These pits are temperature-sensitive structures that assist the snake in finding prey, even in complete darkness. The tongue is also used to detect

the scent of prey. Rattlesnakes have a specialized venom delivery system. Venom is produced in glands behind the eyes and then flows through ducts to the hollow fangs. Normally the fangs fold back against the roof of the mouth and when a snake strikes, the fangs pivot forward to inject venom.(Kardong and Bels, 1998).

The California Department of Fish and Wildlife recommends being alert and also having a sense of where a rattlesnake could be at a particular time of day. After a cold night, the snakes will try to raise their body temperatures by laying out in the sun around mid-morning. To prevent overheating during the day, they may be more active at dusk, dawn and nighttime hours.Though they are not nocturnal, in the hot summer months they may be more active at night.

Management

The nine species of rattlesnakes found in California are not considered endangered or threatened. California Department of Fish and Wildlife Code classifies rattlesnakes as native reptiles. California residents can take most rattlesnake species on private lands in any legal manner without a license or permit, although a bag limit of two still applies. Additionally, the red diamond rattlesnake (*C. ruber*) is prohibited from being taken or killed by state wildlife regulation.

Habitat Modification

Most rattlesnakes seek cover in crevices of rocks, under surface objects, beneath dense vegetation and in rodent burrows, so eliminating potential shelter is critical. Adults eat live prey, primarily rodents; the young consume mostly lizards and young rodent. Controlling the vermin population in your orchard is an important factor as the rodent borrows can become a snake's new homes. Weed management in orchards are critical during the warmer months. The vegetation can be a habitat for snakes. In addition, pruning or removing old trees from the orchard, proper disposal of the wood is important. Stacking or saving the wood in piles create a habitat for the rattlesnakes.

Exclusion

Structures for farming operations can vary in size and age. Chemical sheds, equipment garages, machinery shops are infamous to hosting snakes. In summer, rattlesnakes may be attracted to cool and/or damp places, such as beneath buildings. Sealing all cracks and other openings greater than 1/4inch can prevent them from entering. Gaps beneath doors are often large enough to permit snakes to enter, especially young ones.

Benefits

According to the *University of California Integrated Pest Management Guidelines (2014),* Rattlesnakes add to the diversity of our wildlife and are important members of our ecosystem. They can reduce the number of disease carrying rodents and other pest species. In general, they should be left alone, whenever possible, especially in wildland areas. Nonvenomous snakes, such as gardener snakes should also be left alone wherever found.

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What's All The Fuss Over Spotted Lantern Fly?

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Adult spotted lantern flies clustered on tree trunk. Credit: USDA, Lance Cheung

SLF egg mass laid on a wooden pallet. Credit: USDA, Lance Cheung

Spotted lantern fly (SLF), *Lycorma delicatula* (Hemiptera: Fulgoridae), native to China, was first detected in Pennsylvania in 2014 and specimens were collected from large colonies infesting Chinese tree of heaven, *Ailanthus altissma*. SLF is spreading rapidly on the east coast of the USA. Established populations are now found in New York and Delaware (both in 2017), New Jersey, Maryland, and Virginia (all 2018). Rapid spread is most likely occurring because of indiscriminant egg laying on non-plant material. For example, females readily lay egg masses on the sides of stationary rail cars parked in close proximity to *A. altissma*. Subsequent movement of contaminated rail cars could be facilitating spread of this pest over distances far greater than SLF is capable of flying. This type of spread on non-biotic materials increases greatly the risk of

SLF being inadvertently introduced into new areas. For example, SLF eggs laid on trailers, motor homes, trucks, or pallets that originate in SLF-infested areas and are accidentally moved cross country could result in this pest being introduced into California.

SLF has emerged as a serious grape pest in the NE USA. It has been implicated in the near complete mortality of possibly two vineyards in Pennsylvania, despite regular pesticide use to knock down populations. The reason for vine mortality is uncertain, but it is has been suggested that heavy feeding over two consecutive years may have removed sufficient levels of carbohydrates that "winterize" vines which facilitates survival during prolonged periods of cold. Loss of these "anti-freeze" chemicals because of SLF feeding made them vulnerable to cold damage. Additionally, it has been reported that SLF is a pest of walnuts in South Korea, another country where this pest is invasive. Consequently, SLF is considered a significant invasion threat to California because this insect will likely become a serious new pest of two California specialty crops, grapes and nuts. Dead SLF adults have been found numerous times in aircraft landing in Southern California (e.g., San Bernardino Airport). However, the most likely mode of introduction leading to successful establishment will probably be via hitchhiking eggs masses that go undetected.

Anastatus orientalis, an egg parasitoid that attacks SLF eggs. Credit:Nehme Malek, University of Trento

In response to this obvious invasion threat we have begun a proactive biocontrol program. To do this we are evaluating in quarantine the safety of a SLF egg parasitoid, *Anastatus orientalis*, which native to China, in advance of the anticipate invasion of SLF into California. We are doing this work in collaboration with the USDA and the CDFA has provided funding for this proactive work. An important aspect of this project is assessing the

risk *A. orientalis* presents to lantern flies native to the southwestern USA. These insects are very poorly studied and the mountainous "sky islands" of southern Arizona are regions of high native lantern fly biodiversity. We are currently working in the Chiricahua Mountains identifying native lantern fly species, the native plants they feed and breed on, and aspects of their population phenology (e.g., egg laying periods). The purpose of this field work is to obtain eggs of native lanternfly species so they can be used in experiments in quarantine to determine whether A. orientalis will attack them or not, and if they are attacked, whether Chinese parasitoids can successfully develop in these novel hosts and emerge as functional adult parasitoids. For a great video on this work in Arizona click on this link: https://magazine.ucr.edu/fly As you can probably guess, this is a very challenging project and we have a long way to go, so please stay tuned!

Avocado Growers Had a Cold Winter in February

Sonia Rios and Ben Faber

It was not the Freeze of 2014 when 6 inches of snow fell in Riverside (photo above), but there was a snap cold spell in early February 2020, and growers are living with the damage. Here's a review of Frost/Freeze information.

Frost vs. Freeze

The avocado tree, while quite adaptable to a range of climatic conditions, is considered to be sensitive to frost. Growers in regions where frost is likely will need to consider this when designing the layout and irrigation of their orchard. It's important to differentiate between a frost and a freeze. There is a lot of science behind frost, but in basic terms, frost is the formation of ice crystals on plants which more importantly can lead to the freezing of internal sap. Frost is the result of climatic conditions that lead to sub-zero temperatures. A frost is caused when objects cool during the night and radiate their heat loss, chilling the surrounding air. Cold air tends to settle near the ground while warm air rises. In Southern California, the "ceiling" is often low, which means that warm air is closer to the ground. This phenomenon is called a temperature inversion and it tends to protect orchards from the cold. That said, when forecasts indicate windy conditions this disrupts the inversion and thus the colder air is pressed to ground level. Knowing whether a temperature inversion is present or not is a key factor in determining whether to use wind machines as a preventative measure.

A freeze occurs when a mass of cold air moves in and the temperature of the air decreases at both ground level and in the higher air levels. Protecting groves in these conditions is difficult and usually involves adding heat to the grove with orchard heaters. When grove temperatures

are cold (generally below 60-degrees Fahrenheit) and the day is sunny, avocado leaves can stress and bleach or yellow because they cannot metabolize the light being received in such cold temperatures. The leaves produce hydrogen peroxide, which damages the leaves.

For California avocado growers, January is the month that groves tend to be susceptible to frost and freeze damage. As the threat of colder weather arrives, it's important for growers to understand the mechanics of frosts and freezes, and what they can do to protect their groves from unseasonably cold conditions. Be aware of temperatures falling below 30-degrees Fahrenheit, regardless of weather forecasts. Rather than rely on forecasts, establish a frost-management plan, and follow it.

Protecting Groves

To ***prevent frost damage*** in a mature grove, the two most-relied-upon methods are orchard heaters and wind machines.

As a guide to inexperienced growers, Table I gives a basis for establishing frost protection practices. The critical temperatures listed are for mature healthy trees. Other tree conditions might move these figures one or two degrees higher. Also, the duration of the damaging temperatures would affect the degree of injury.

Variety Frost Resistance		
Race	**Typical varieties**	**Critical temperature below which fruit and/or trees are subject to damage**
Mexican	Duke, Topa topa, Mexicola, Zutano, Bacon	25 Degrees F
Hybrids	Fuerte, Puebla	28 Degrees F
Guatemalan (Tender)	Ryan, Hass, MacArthur, Nabal, Endranol, Rincon	29 Degrees F
Guatemalan (Very Tender)	Anaheim, Dickinson, Carlsbad, Challenge, Hellen	30 Degrees F

Orchard heaters tend to distribute heat to all parts of the grove when well distributed but can be expensive to run and can present a fire hazard.

Wind machines are economical and less labor intensive and, when used with orchard heaters, can increase the effectiveness of the heaters. Wind machines should only be used in frost conditions — not during freeze conditions in which temperatures fall 4 or more degrees below damage points. In addition, wind machines should not be used in conditions (usually windy) in which no temperature inversion is present. If wind machines are used in these conditions, they can cause more damage because they simply stir up the cold air at tree level.

In situations in which there is no temperature inversion, the best practice is to run microsprinklers during the day and then turn off the water prior to sunset. As water freezes it gives off heat, so by providing water to freeze, you are generating heat. However, water cannot flow when it is frozen, so any under-tree irrigation systems must be started before the temperature gets to a point when the water freezes in the pipes or emitters. If temperatures drop below 32˚ during the night, the water should be started again and run until sunrise. Since it can be expensive to run water in San Diego County, growers can opt to choose those portions of their grove that tend to be the coldest in order to save money. When the temperature is below freezing, Dr. Faber recommends against running water in a block during the night and then turning it off to water another block as this will lower the temperature in both blocks and lead to damage. It should be noted that these methods are less effective for protecting young trees. To protect young trees, insulative wrap or frames with a burlap cover may be needed. Side and top cover is required to protect from frost, trunk guards can help prevent total tree death by protecting the main trunk.

Location, location, location! Choose a good growing location to minimize the chances of cold air. Cold air is heavier than warm air, so planting on a slope allows cold air to flow down and out of your groves. It is important to have space available for downhill air drainage of cold air. Trees that are planted more towards this area are more prone to damage, especially when the trees are young (up to 3 years of age) or if they have cold-sensitive cultivars. Orchard design is another important factor, aligning your rows to run up and down slopes rather than across slopes to allow effective air drainage. Cultivation practices can also help with battling frost. Maximizing tree health can also be beneficial for a grove susceptible to frost, a healthy, leafy tree will generate some internal heat and reduce the depth of frost burn into the tree. Unhealthy trees should be treated for root rot at the beginning of spring. If not properly

treated, these trees will flower excessively in spring; but fail to grow new shoots. If the leaves yellow during winter, consider reviewing your nutrient program. Weed control is an important pest management routine that should be taken seriously. A strip of bare, moist earth under and around the trees will absorb and release heat more than a weedy or dry site.

Occasionally avocado trees are in a growth flush (a period of rapid new growth) when freezing temperatures occur. This is not usual, but unseasonably warm weather may stimulate a tree into abnormal growth in the winter. To avoid stimulation, pruning should be delayed until early spring. When tender growth occurs in the winter, growers may have to provide additional protection or sustain damage.

Caring for Frost Damaged Tree

Immediately after a frost event the main thing to do is carefully monitor your soil moisture. As the tree may have been significantly damaged, the amount of water it will be using will be reduced. The last thing you need is to damage the root system as well through waterlogged conditions. Trees stressed by wet soils may have premature leaf drop, bear small and pale green leaves, and show signs of avocado shoot die back. Too much water during this time can cause root rot. If trees lose leaves to frost/freeze, it's important to protect exposed branches from sunburn with whitewash. Initially all you can do is to let the trees start to recover naturally. Once they have started to re-shoot in spring, then you can begin the task of removing dead wood and shaping/balancing the tree.

Post Freeze Grove Management and Harvest

According the California Avocado Commission (CAC), after a freeze, California avocado growers should look for the following freeze indicators:

- Firm, brittle, curled leaves
- Water-soaked or discolored wood or twigs
- Older branches and trunks splitting and losing bark (this happened a lot during the snow event in 2015)
- Discolored avocados, with hues ranging from barely visible bronze to black
- Brown buds and flowers
- Fruit stems can be killed or ring barked, causing heavy-fruit drop

Soon after leaves fall, whitewash defoliated trees with white-latex or lime-based paint that is water diluted (not too diluted, as paint should appear white on tree). This will protect damaged wood from sunburn, which can cause further damage. Do not apply dressings — or additional paint-on sealants — to cracked bark, as it might strengthen bacterial or fungal infections. Pruning can be postponed until spring or summer, when new growth develops. Survey damaged trees before applying fertilizer, to identify what minerals are lacking, as nitrogen applications are likely to trend downward. It is suggested that avocado growers withhold nitrogen fertilization until midsummer (or longer). However, zinc sprays often are applied to expanding young foliage.

Stem-damaged fruit will drop within seven to ten days of a freeze, it should be picked first, assuming it is mature and not otherwise harmed by the cold. While stem damage may be apparent, fruit might be unscathed. When stems are completely girdled by a brown band, fruit will drop. Drops typically occur within seven to 10 days, following a freeze. Also, do not pick any discolored avocados (barely visible bronze to black).

Work Cited

1. California Avocado Society. The Weekly Newsline: Market news, opinions & Statistics for Avocado growers. [http://www.californiaavocadosociety.org/] Accessed 7 January 2015.
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Dealing With COVID-19 in Agriculture and Home

The University of California has put together a series of publications on addressing COVID-19 in the home and the workplace. They can be found at: COVID-19 Guidelines

The individual articles are below:

Preventing Spread of COVID-19 in Households

Safety Guidelines in Agriculture During COVID-19

Food Safety Guidelines for COVID-19

Filing for Supplemental Pay During ShutDown

Take Care and Stay well.

And from CDFA:

Coronavirus Resources for Food and Agriculture page

BEST PRACTICES GUIDELINES

Food producers and manufacturers have been required by longstanding federal and state laws and regulations to prevent anyone who is sick or has a communicable disease from handling, processing or preparing food for human consumption. Thus, industries handling food and agricultural commodities are well practiced at this important and general principle of food safety and hygiene. It is important to follow recommendations as set forth by the CDC as well as those outlined below:

- Maintain diligence in good hygiene, monitor for employee illness, and adhere to social distancing guidelines as possible.
- Adhere to your Sanitation Standard Operating Procedures (SSOP), ensuring that those supervising staff and operations are vigilant in their oversight.
- Ensure adequate frequency of cleaning and sanitizing per CDC Environmental Cleaning and Disinfection guidance.
- Adhere to cleaning and sanitizing frequency of restroom and other high contact areas.
- Consider ways for employees to easily identify themselves (business card, company ID badge) outside of business operations for ease in transportation to and from work while adhering to local ordinances.

According to both the U.S. Centers for Disease Control (CDC) and the United States Department of Agriculture (USDA) there is currently no evidence to support transmission of COVID-19 associated with food or food packaging. The CDC is also reporting that, in general, because of poor survivability of the coronavirus on surfaces, there is likely a very low risk of spread from food products or packaging that are shipped over a period of days or weeks at ambient, refrigerated, or frozen temperatures.

Labor is a vital component to the food supply, from farm to fork. California has among the highest standards for food safety, which includes worker health and hygiene standards supported by labor laws that are very specific about paid sick leave for those individuals that may be affected by COVID-19 and unable to work.

New Recommendations for Laurel Wilt Disease

Laurel Wilt Disease of Avocado and the relatives of avocado in the Laurel Family has devastated the the forests along the east coast from North Carolina down to Florida and along the Caribbean into Texas. It has caused significant losses to wildlands and to the Florida avocado industry.

The extent of the native tree loss is shocking and there is very little that can be done to correct the problem, other than to curb the spread of contaminated wood that is spread by humans, There has been some success in the avocado orchards. While there is no "silver bullet", there is some progress, e.g. pruning to increase light levels to suppress Ambrosia Beetle activity. In addition, research has continued for:

- Vaccinations to protect avocado trees from the LW pathogen
- Developing a faster LW diagnostic tool
- Screening scions and rootstocks for tolerance/resistance

- AB control tactics and suppression
- Molecular understanding of the pathogen
- Economics and the LW epidemic

Read the latest results in these two recent publications:

Recommendations for the Detection and Mitigation of Laurel Wilt Disease in Avocado and Related Tree Species in the Home Landscape

Recommendations for Control and Mitigation of Laurel Wilt and Ambrosia Beetle Vectors in Commercial Avocado Groves in Florida1

Photo: Dead avocado trees from Laurel Wilt in Florida

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Avocado Growers Seminar

FREE Avocado Grower Seminars California Avocado Society, Inc., California Avocado Commission, and University of California Cooperative welcome everyone to FREE Avocado Grower Seminars throughout the year, starting in February 2020. Please see tentative schedule below. All Southern California seminars will be held at the Farm Bureau in Escondido: 420 S Broadway, Escondido, CA 92025. **PLEASE BE AWARE, DUE TO T HE COVID-19 ALL OF THESE SEMINARS ARE PENDING UNTIL FURTHER NOTICE.**

THOUGH THE COVID-19 PANDEMIC HAS INTERFERED WITH THE ABILITY TO HOLD ITS APRIL SEMINAR IN THE FIELD, WE ARE COMMITTED TO PROVIDING AVOCADO GROWERS WITH MANY OF THE HELPFUL TOOLS AND INFORMATION THAT WOULD HAVE BEEN PRESENTED AMONG THE TREES. WE HAVE A LINE-UP OF EXPERTS WHO WILL HELP GROWERS IN A VARIETY OF TOPICS THROUGH SUPPORT MATERIALS THAT WILL BE POSTED TO THE CALIFORNIA AVOCADO SOCIETY WEBSITE IN MID-APRIL.

A PREVIEW OF TOPICS AND PRESENTERS:

PLANTING DENSITY: TIM SPANN OF CAC
PRUNING: GARY BENDER, SONIA RIOS OF UCCE AND GABE FELIPE OF MISSION PRODUCE
ROOT ROT MANAGEMENT: BEN FABER OF UCCE
PEST MONITORING: ENRICO FERRO, TOM ROBERTS, JANE DELAHOYDE, JIM DAVIS
NEW SCIONS/ROOTSTOCKS: MARY LU ARPAIA, PATRICIA MANOSALVA OF UC RIVERSIDE
HEALTHY SOILS PROGRAM: ALLI FISH, ESTHER MOSASE OF UCCE; LANCE ANDERSEN OF MISSION RCD; JAMIE WHITEFORD OF VENTURA RCD; CLAIRE BALINT OF CAL POLY; MARY MATAVA OF EL CORAZON COMPOST

JUNE SEMINAR TOPIC

VARIETIES LIKE GEM, MALUMA, AND FUTURE VARIETIES & ROOTSTOCK UPDATE

Speakers:
Dr. Mary Lu Arpaia: CE Subtropical Horticulture Specialist.
Eric Focht: Staff Research Associate at the Department of Botany and Plant Sciences, UCR
Dr. Patricia Manosalva: Assistant Professor of Plant Pathology and Director of the UCR Avocado Breeding Program at UC Riverside.

This will probably be a zoom meeting. Tune in for how and where to listen – probably on your home computer or smart phone.

UC Cooperative Extension Office Auditorium, 669 County Square Dr., Ventura, CA 93003
Thursday, June 11, 2020, 1:00 p.m. to 3:00 p.m.

AUGUST SEMINAR TOPIC

LIFE WITHOUT GLYPHOSATE, WEED ID, AND A REVIEW OF MICROBIAL AMENDMENTS

Speakers:
Sonia Rios: Area Subtropical Horticulture advisor for both Riverside and San Diego Counties.
Travis Bean: Assistant Weed Science Specialist in Cooperative Extension
Ben Faber: Soils/Water/Subtropical Crops Advisor
Tim Spann: CAC Research Program Director

Dates/Times/Locations:
Tuesday, August 4, 2020, 1:00 p.m. to 3:00 p.m.
UC Cooperative Extension Office Auditorium, 2156 Sierra Way, San Luis Obispo, CA 93401
Wednesday, August 5, 2020, 9:00 a.m. to 11:00 p.m.
UC Cooperative Extension Office Auditorium, 669 County Square Dr., Ventura, CA 93003
Thursday, August 6, 2020, 1:00 p.m. to 3:00 p.m.
San Diego Farm Bureau, 420 S. Broadway, Escondido, CA 92025

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Topics in Subtropics

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