

**IN THIS ISSUE:**

Polyphagous shot hole borer (PSHB) update for avocado growers

Weed Management in Citrus

UC Davis Olive Center: Sensory Evaluation of Olive Oil Certificate Courses

Water Terminology

Olive Quick Decline in Italy is associated with unique strain of *Xylella fastidiosa*

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**Editor's Note:**

We appreciate suggestion of topics that you would like to see covered in future editions of the Topics in Subtropics Newsletter. Please forward your suggestions to a member of our editorial board. We also encourage you to visit our online Topics in Subtropics blog: <http://ucanr.edu/blogs/Topics/>. –Elizabeth Fichtner, Spring 2015 Editor

## **Polyphagous shot hole borer Update - February 25, 2015**

*Tom Bellamore, Ken Melban, and Tim Spann, California Avocado Commission*

The California Avocado Commission continues to deploy traps and lures for polyphagous shot hole borer (PSHB) monitoring in the major avocado growing regions. The infestation is currently limited to Northern San Diego County, where thirteen groves have confirmed PSHB. Those groves have a total acreage of about 1,000 acres, but not all of the acreage is infested. To date over 100 traps have been set-up in avocado groves in San Diego and Riverside Counties to monitor current infestation beetle levels and to serve as an early warning system should the beetle spread. In addition, traps with lures have been deployed in other avocado production areas to serve as sentinels. Ventura County and Santa Barbara County both have traps; soon traps will also be placed in San Luis Obispo County.

These traps are strategically placed in locations that have a higher susceptibility for the introduction of the PSHB, such as campgrounds, nurseries and green-waste facilities. There are also a few traps within avocado groves. Considering the high number of PSHB hosts, it is believed that movement of firewood and other plant materials from infested areas into non-infested areas presents the greatest risk. Most of the major handlers have set-up traps at their facilities as an additional safeguard.

Traps within the infested groves have shown some significant increases in beetle captures when the temperatures warmed. During January as UCR researchers monitored fifteen traps the average total number of beetles was around 100. In early February, though, when temperatures warmed, those same fifteen traps had over 1,000 combined beetles in one day. This data is preliminary, but it suggests how rapidly the beetle activity may increase as summer temperatures begin to occur. Accordingly, it is imperative that growers who are located within a few miles of infested groves remain vigilant in their monitoring for PSHB, especially with spring and summer fast approaching.

Updated distribution maps showing current infestations and trap locations may be viewed at the following links:

[Southern California Distribution Map, Updated February 2015](#)

[San Diego County Distribution Map, Updated February 2015](#)

Additional information regarding how to identify signs of PSHB may be found here:

<http://www.eskalenlab.ucr.edu/>.

The Commission, prior to the start of harvest, worked with handlers to develop protocols for harvest and transportation practices to mitigate possible risk of PSHB spread, and these protocols may be viewed here: <http://www.californiaavocadogrowers.com/sites/default/files/documents/PSHB-Harvest-Protocols-Fact-Sheet.pdf>

Finally, a grower meeting has been scheduled for March 24th, 2015, from 9-11 am in Escondido. UC Riverside researchers and Commission staff will provide an update on field trials evaluating possible curative and/or prophylactic pesticides and fungicides. The meeting will be held at the California Center for the Arts, 340 North Escondido Boulevard, Escondido, CA 92025.

## **Weed Management in Citrus**

*Sonia Rios, Area Subtropical Horticulture Advisor, Riverside & San Diego Counties, Travis Bean, UC Riverside Extension Weed Science Specialist, Kurt Hembree, Weed Management Advisor, Fresno County*

Weed management is an important component of citrus production and any successful program implements integrated pest management (IPM) strategies. Citrus IPM programs typically utilize a combination of control practices, like cultural, mechanical, and chemical, to minimize competitive effects of weeds on crop productivity. Weed management can be an expensive part of the total citrus production program, but resources invested here can provide significant economic returns.

### **Tree age and variety considerations**

The smaller canopies of younger trees allow more light to reach the orchard floor, promoting greater weed growth, which can lower yield by 23-33% compared to mature groves (Singh and Sharma 2008). Sensitivity of citrus trees to the various registered herbicides varies, depending partly on tree age. While mature trees tend to tolerate higher doses of herbicides, younger trees require greater attention to herbicide selection and potential damage from overspray or spray drift. Collars placed around the trunk of young trees are commonly used to reduce sunburn damage, but can also help protect young wood from damage caused by direct herbicide contact. Also, some herbicide products may only be labeled for non-bearing trees, meaning they can only be applied if a crop will not be harvested within 12 months following treatment. Consideration should also be given to product selection based upon citrus variety. For example, some products specify use only on oranges, thus prohibiting use on tangerines. Always refer to the pesticide label for these and other guidelines.

### **Influences of weeds**

Weeds can impact cultural operations, tree growth, and yields by altering the spray pattern of low-volume irrigation systems, intercepting soil-applied chemicals (fertilizer and agricultural chemicals), reducing grove temperatures during freeze events, and interfering with pruning and harvest operations. The presence of weeds in a citrus grove can also affect insect populations. Weeds growing around tree trunks may also create a favorable environment for pathogens that infect the trunk and roots (Futch and Singh, 2010). Weed species compete with citrus trees in many ways and with varying intensities; management of more competitive weeds such as hairy fleabane, horseweed, johnsongrass, dallisgrass, and vetch should be prioritized. While some weeds (e.g., puncturevine, spiny cocklebur, stinging nettle, bull thistle, and bristly oxtongue) may have low competitive effects on citrus trees, they can hinder labor operations and may also rank high for active management.

### **Cover crop benefits and complications**

Vegetated orchard floors can accentuate frost hazard, often experiencing 3-5°F cooler ambient temperatures than do bare orchard floors, depending on vegetation height and atmospheric conditions (Steinmaus 2014). Alternatively, ground cover in the row middles can reduce soil erosion, reduce sand blasting during windy conditions and help retain nutrients. Ground covers can also be beneficial if they

are less competitive than other weeds potentially present in the grove, and for erosion-prone situations such as on steep slopes or poorly structured soil. Cover crops may require additional management steps such as rotation to a different species or species mixture every few years to avoid pathogen buildup. Currently, there are no cover crops that will fit all situations and provide all possible benefits (Steinmaus 2014). Water requirements for vegetation regrowth after mowing can impact water availability within the grove, with grasses typically using more water than broadleaves post-mowing.

### **Weed ID is key**

Proper weed identification is a critical step in developing an effective management program. Weed species will vary with location, climate, season, soil type, previous site history, and current and past management programs. Weeds can be identified or grouped as: 1) broadleaf (including vines); 2) grass; or 3) sedge (WSSA 2015). Pay particular attention to key features like the shape and color of the leaves, stems, seed, seed head, plant size, root system, and especially flowers (if present). Weeds can be classified by their life cycle: annual, biennial, or perennial. Annual plants grow from seed, mature, and produce seed for the next generation all within a single year, presenting challenges for effective management (WSSA 2015). Annuals can be further divided into summer (sprout in spring, grow, mature, and produce seed and die before winter) or winter (sprout in the fall, grow, mature, produce seed and die before summer). Biennials have a two-year life cycle, growing from seed and developing a heavy root system the first year followed by seed production in the second year and then plant death. Perennials live more than two years with seed production occurring as early as the first year. For perennial species, vegetative structures such as rhizomes, tubers, and stolons pose management challenges, and are difficult to eradicate. If at all possible, manage perennial weeds before they begin producing these vegetative structures. A photo gallery of weeds, weed seedlings, and various weed anatomical features is available online through UC IPM at [http://www.ipm.ucdavis.edu/PMG/weeds\\_intro.html](http://www.ipm.ucdavis.edu/PMG/weeds_intro.html) . Additionally, an online identification tool is available through the UC Weed Research and Information Center at <http://weedid.wisc.edu/ca/weedid.php> .

### **Scouting**

Scouting for weeds should be conducted in all areas in and near the grove , including tree rows, row middles, water furrows, ditch banks, fence rows, and adjacent perimeter locations. These sites may receive different cultural practices which can facilitate the persistence and spread of different weed species. Look for small isolated weed patches and manage them before they spread to other areas of the grove. Since weeds emerge all year long, schedule weed surveys throughout the year, especially after rains or soil disturbances. Scouting should occur even if weeds are not easily visible or appear to be dead. Re-growth from perennial plants is common; they may appear to be dead, but may be just temporally stunted. If weeds are properly identified in the seedling or vegetative stage, then proper control can be achieved through: 1) optimal treatment timing; 2) possible reduced herbicide application rate; and 3) reduced environmental impact from treatments. The weed species present will vary with season and location, because weeds are typically not distributed uniformly. For further information about characteristics used to identify, see the Weeds section of the UC IPM Citrus Pest Management

Guidelines, <http://www.ipm.ucdavis.edu/PMG>. When scouting for weeds, records should be developed and recorded as to species abundance, location, and identity.

### **Weed management: cultural**

Preventive programs are often overlooked, but are an important component of cultural practices and are cost-effective. Practices, such as sanitation, spot spraying, and/or hand removal of weed escapes before they produce new seed are examples of prevention. While preventive programs may not stop the spread of all weed species, these practices may slow the spread of undesirable species, thereby reducing long-term weed control costs.

### **Weed management: mechanical**

Cultivation or tillage has been used in the past for many years in citrus production. Tillage is an effective method of controlling annual weeds effectively by severing weed stems and roots but it can be counterproductive for perennial grasses or sedges that can propagate vegetatively. Soil erosion concerns are cited as a reason why tillage use is decreasing as more groves are planted on raised berms. Also, citrus trees have a shallow fibrous root system and tillage increases risk of root and trunk damage. With the use of low-volume irrigation systems and closer in-row planting distances, tillage in both directions is no longer possible. Mechanical mowing is generally more expensive than tillage and can throw seed under the tree canopy, increasing weed pressure next to the tree trunk.

### **Weed management: chemical**

Herbicides used in a citrus grove are generally divided into two groups: 1) soil-applied (preemergence) herbicides that should be applied to fairly clean soil surfaces prior to weed emergence, and 2) foliar-applied (postemergence) herbicides that are applied after weeds have emerged (Futch and M. Singh 2014). Preemergence herbicides are generally applied two to three times per year, so the maximum amount of herbicide is in the upper soil profile (0 to 2 inches) slightly before peak weed emergence. Herbicides applied too early, before weeds emerge, will not provide adequate weed control due to herbicide leaching or degradation on the soil surface or within the soil profile. Preemergence herbicides must be incorporated (mainly by rainfall or irrigation) and are usually broadcast on the entire orchard floor since growers do not know where weeds will emerge and to reduce risk of frost damage. Growers using drip irrigation or micro-sprinkler irrigation have a difficult time adequately incorporating preemergence herbicides, so usually try to treat prior to predicted rainfall (Rector et al. 1998). Soil type can influence herbicide selection and rate used. Many preemergence herbicides including Goal, Prowl, Surflan, Treflan, and Visor can be used on sandy soils without injuring citrus trees (McCloskey and Wright 1998). Tree age is also an important consideration when selecting which herbicide(s) to use.

Postemergence herbicides are used to control weeds that escape control by preemergence herbicides or mechanical cultivation. Postemergence herbicides can be systemic or contact in activity. Systemic herbicides are moved within the target plant, killing the foliage and root system of the treated plant. Contact herbicides are active only on those parts of the weeds the herbicide comes into contact with. Hence, adequate spray coverage of the weeds is more critical than with systemic materials. These herbicides are effective on small annual weeds and usually only suppress growth of perennials. It should

be noted that the majority of organic herbicides are contact herbicides. Glyphosate is a widely used systemic postemergence herbicides used in citrus due to its efficacy on many weed species and relatively low cost (Sharma and Singh 2007), though continuous use over time will likely lead to the development of resistant populations in some weed species. To help reduce likelihood of herbicide resistance development, rotate and/or mix herbicides with different modes-of-action. For more information regarding herbicide usage in groves and for a list of herbicides registered for the use in California tree and vine crops, including citrus, can be found at the following websites:

[http://ucanr.edu/sites/Citrus/KAC/Weed\\_Management/](http://ucanr.edu/sites/Citrus/KAC/Weed_Management/)  
[http://wric.ucdavis.edu/PDFs/T&V\\_herbicide\\_registration\\_chart.pdf](http://wric.ucdavis.edu/PDFs/T&V_herbicide_registration_chart.pdf).

Herbicides may move through the soil to groundwater if used improperly. Factors influencing the rate of herbicide movement in the soil include, but are not limited to, irrigation practices, rainfall, herbicide solubility, soil type, and organic matter. Additional consideration should be given to products containing bromacil that are prohibited on deep, sandy, and ridge-type soils, and some product labels restrict the annual application of diuron within Highlands County. Please consult USDA-NRCS office or Web Soil Survey, <http://websoilsurvey.sc.egov.usda.gov> for information on soil type restrictions.

Always read the label of the product being used, and note that all registered pesticides are not necessarily listed on the UC IPM Online website (<http://www.ipm.ucdavis.edu>) or in this newsletter. Always check with the certifier to determine which products are organically acceptable.

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## UC Davis Olive Center: Sensory Evaluation of Olive Oil Certificate Courses

The UC Davis Olive Center at the Robert Mondavi Institute in Davis, CA will be offering two courses designed for the professional olive oil buyer, importer, category manager, producer, or anyone interested in gaining expertise in evaluating olive oil. Sensory, culinary, chemistry and policy experts will guide attendees through a unique tasting and educational odyssey. Those who attend both courses will have had the Master experience—having tasted over 100 olive oils from around the world!

**Sensory Evaluation of Olive Oil I: June 15-16, 2015**

**Sensory Evaluation of Olive Oil II: June 17-19, 2015**

**Where:** Silverado Vineyards Sensory Theater, Robert Mondavi Institute for Wine and Food Science, 392 Old Davis Rd., Davis, CA 95616-8571.

### Course Descriptions

**Sensory Evaluation of Olive Oil I:** Designed for the beginning or experienced taster. Attendees receive a booklet with presentations, and a flash drive with presentations and supplemental materials. Attendees will have the opportunity to evaluate more than 40 oils, review positive attributes and common defects, learn the science of tasting from a sensory scientist, understand strengths and weaknesses of standards, and taste the influence of harvest and processing variables on sensory quality. The course will also offer state-of-the art uses for olive oil in the kitchen.

**Sensory Evaluation of Olive Oil II:** (Prerequisite- attendance of Sensory Evaluation of Olive Oil I or similar). Attendees receive the *Olive Oil Defects Wheel*, a booklet with presentations, and a flash drive with presentations and supplemental materials. Participants will evaluate more than 60 oils and receive the training of an olive oil sensory panel member, with the opportunity to obtain instant feedback on one's comparison with other tasters (bring your laptop or tablet). Attendees will receive advanced discussion of sensory principles and experience world tours of olive oil from Spain, Italy, Greece, and the New World. An exercise in olive oil blending and a cooking demonstration with advanced olive oil food pairings will be included. Those attending both courses will receive a Master Certificate.

### Registration

For more information and registration, visit the UC Davis Olive Center website:

<http://olivecenter.ucdavis.edu/>

Early registration ends on April 17, 2015.

## Water Terminology

*Ben Faber, Farm Advisor, UCCE Ventura and Santa Barbara Counties*

I was just speaking to a group of Certified Crop Advisors and there was some confusion about the units used by different labs to report their results, so I put together this sheet to help understand the relationship between the different terms. They are usually interchangeable, but one needs to know how they convert between each other. So here is a cheat sheet.

Common ions in water: calcium ( $\text{Ca}^{2+}$ ), magnesium ( $\text{Mg}^{2+}$ ), sodium ( $\text{Na}^{1+}$ )  
sulfate ( $\text{SO}_4^{2-}$ ), chloride ( $\text{Cl}^-$ ), carbonate ( $\text{CO}_3^{2-}$ ),  
bicarbonate ( $\text{HCO}_3^-$ ), boron ( $\text{H}_3\text{BO}_3$ )

Measured as parts per million (ppm) or milligrams per liter (mg/l), which are interchangeable, or milliequivalents per liter (meq/l). A milliequivalent is the ppm of that ion divided by its atomic weight per charge.

Example:

$\text{Ca}^{2+}$  with atomic weight of 40 and a solution concentration of possibly 200 ppm.  $\text{Ca}^{2+}$  has two charges per atom, so it has a weight of 20 per charge. 200 ppm divided by 20 = 10 meq of calcium for a liter of water.

**Total Dissolved Solids (TDS):** measure of total salts in solution in ppm or mg/L

**Electrical Conductivity (EC):** similar to TDS but analyzed differently.

Units: deciSiemens/meter (dS/m) = millimhos/centimeter (mmhos/cm) =  
1000 micromhos/cm (umhos/cm).

Conversion TDS  $\leftrightarrow$  EC: 640 ppm = 1 dS/m = 1 mmhos/cm = 1000 umhos/cm

**Hardness:** measure of calcium and magnesium in water expressed as ppm  $\text{CaCO}_3$

**pH:** measure of how acid or base the solution

**Alkalinity:** measure of the amount of carbonate and bicarbonate controlling the pH, expressed as ppm  $\text{CaCO}_3$ .

**Sodium Adsorption Ratio (SAR):** describes the relative sodium hazard of water

$$\text{SAR} = (\text{Na}) / ((\text{Ca} + \text{Mg}) / 2)^{1/2}$$
, all units in meq/l



**General Irrigation Quality Guidelines  
(U.C. Leaflet 2995, 1979)**

<u>Measurement</u>	<u>No problem</u>	<u>Increasing</u>	<u>Unsuitable</u>
<i>Effect on plant growth</i>			
EC (dS/m)	<0.75	0.75-3	>3
Na <sup>+</sup> (SAR)	<3	3-9	>9
Cl <sup>-</sup> (ppm)	140	140-350	>350
H <sub>3</sub> BO <sub>3</sub> (ppm)	<0.5	0.5-2	>2
<i>Effect on soil permeability</i>			
EC (dS/m)	>0.5	<0.5	-
SAR	<6	6-9	>9

1.5 feet of water with EC of 1.6 adds 10,000 # of salt per acre and that same water with 20 mg/l of nutrient will supply 80# of that nutrient/acre. Sea water has ~ 50 dS/m, 20,000 ppm Cl, 10,000 ppm Irrigation water WATCH OUT- 1,000 ppm TDS, 100 ppm Na/Cl, 1 ppm B.

## **Olive Quick Decline in Italy is associated with unique strain of *Xylella fastidiosa***

*Elizabeth Fichtner, UCCE Tulare County, Dani Lightle, UCCE Glenn, Tehama, and Butte Counties, Rodrigo Krugner, USDA ARS, San Joaquin Valley Agricultural Sciences Center, Parlier, CA.*

Olive quick decline syndrome (OQDS) is a destructive new disease currently affecting approximately 20,000 acres of olive in southern Italy—an area approximately the size of table olive production in California. Symptoms of OQDS include extensive branch and twig dieback, yellow and brown lesions on leaf tips and margins, vascular discoloration, and subsequent tree mortality (Figure 1). Similar symptoms have been observed in olives in California, but disease incidence appears to be low when compared to Italy. The causal agent(s) of the disease is still unknown. A number of organisms, including fungi and a bacterium, have been isolated from sick trees in Italy and California. The bacterium *Xylella fastidiosa* has been found to infect olive trees in both locations. To date, only strains belonging to *X. fastidiosa* subspecies *multiplex* have been isolated from olives in California. These California strains have limited association with the disease and experimental infections did not cause disease in olive varieties commonly cultivated in California. In Italy, recent publications indicate that strains of the bacterium isolated from the outbreak area are closely related to *X. fastidiosa* subspecies *pauca*, a subspecies group not known to occur in the United States. The OQDS outbreak in Italy marks the first report of the bacterium in the European Union. Research is underway in Italy to evaluate the role of the bacterium in OQDS.

### **What are the *pauca*, *fastidiosa*, and *multiplex* subspecies?**

Strains of the *pauca* subspecies are known to cause citrus variegated chlorosis, a serious disease of citrus reported in Brazil and Argentina. In California, *X. fastidiosa* subspecies *fastidiosa* causes Pierce's Disease on grapevine as well as scorch on almond, whereas *X. fastidiosa* subspecies *multiplex* infects almond but not grapevine. Strains of *fastidiosa* and *multiplex* subspecies do not affect citrus in the United States. Knowledge of the subspecies present in different cropping systems is important because the relative risk to other crops in the landscape depends on the host range of the *X. fastidiosa* subspecies present.

### **What are the implications of OQDS for California olives?**

Olives can be a host for *X. fastidiosa* strains belonging to three subspecies groups: *pauca* in Italy and *multiplex* and *fastidiosa* in California. In addition, species of fungi associated with OQDS are not currently known to occur in California. Therefore, olive growers and landscape managers should report new incidences of extensive dieback or scorch on olives to farm advisors to facilitate early detection of potential pathogen introductions. International movement of plants and plant materials assures a constant flux of organisms across borders, necessitating constant awareness of global trends in pathogen and vector establishment.

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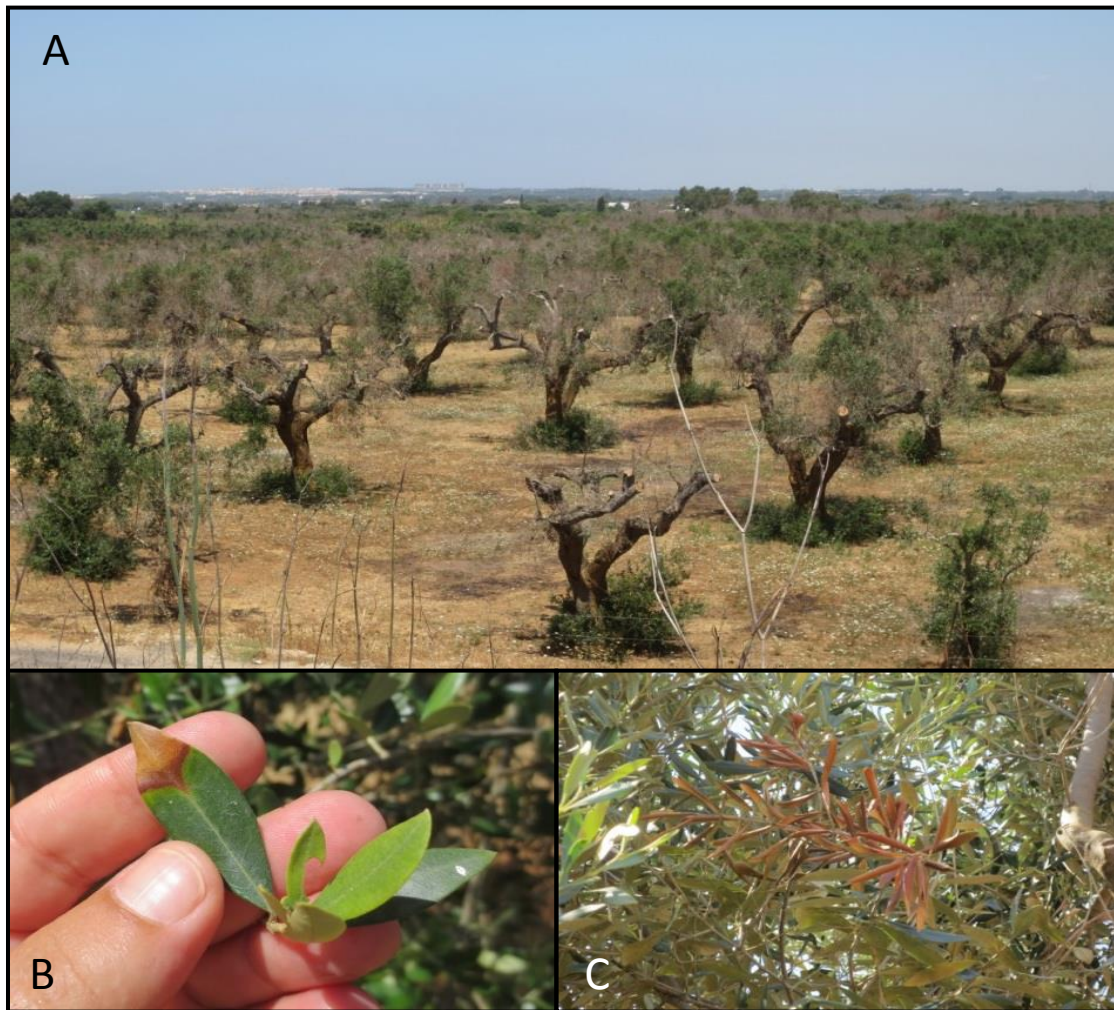


Figure 1. Symptoms of olive quick decline syndrome in Italy include canopy dieback (A), leaf scorch (B), and branch dieback (C). Photos: R. Krugner, USDA-ARS.

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# *Topics in Subtropics*



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