

Thousand Cankers Disease on Walnut: Tulare County Update

By Elizabeth J. Fichtner, Farm Advisor

An emerging disease known as “Thousand Cankers Disease” has caused extensive dieback and mortality of eastern black walnut (*Juglans nigra*) in several Western States. In 2008, symptoms of the disease were first observed in urban and suburban black walnut plantings in California; however, the disease has since been found in commercial English walnut orchards, including several orchards in Tulare County. The risk of the disease to commercial walnut orchards is yet unknown; however, the symptoms of the disease on English walnut are dramatic. As suggested by the name, an infected tree will develop an extensive number of bleeding cankers (Figure 1). An introduction of the pathogen and vector to the native range of eastern black walnut in the United States could threaten the species in native forests and in commercial black walnut orchards.

The Pathogen and Vector: Thousand cankers disease is caused by a fungal pathogen (*Geosmithia* sp.) that is vectored by a native bark beetle called walnut twig beetle (*Pityophthorus juglandis*). Though referred to as a “twig beetle”, the beetle actually prefers branches larger than the diameter of a thumb, including main trunks and scaffolds. It is an aggressive feeder and produces an aggregation pheromone that attracts a mass migration of walnut twig beetles to the tree. The beetles introduce the pathogen to the tree during gallery formation (Figure 2). Cankers are formed at infection sites; as disease progresses, these cankers may coalesce. A small beetle hole (approximately 1 mm diameter) can be seen in the center of each canker. Note that the beetle hole is the main diagnostic characteristic that differentiates thousand cankers disease from shallow bark canker, a bacterial disease.



Figure 1. Symptoms of Thousand Cankers Disease in Tulare County.



Figure 2. Walnut twig beetle emergence holes (A). Cankers are associated with beetle galleries (B).

Status of Thousand Cankers in California and Tulare County: The disease has been found in commercial walnut orchards in Sutter, Solano, Yolo, Tulare, and San Benito Counties. To date, the disease has been found in three orchards in Tulare County and every incidence of the disease in Tulare County was found while I was visiting an orchard on a farm call. Consequently, the disease may be more widespread and unreported as yet. In Tulare County, the disease has been found on both black walnut rootstock and on Paradox rootstock, as well as on English walnut. Generally, the disease has been observed on declining English walnut trees; however, a recent finding suggests that initial infection of black walnut rootstock may initiate tree decline and mortality. We are currently trapping walnut twig beetles at several sites in Tulare County to determine the seasonality of beetle activity.

Help Determine the Risk of Thousand Cankers Disease to English Walnut: As with any emerging disease, little is known of the life cycle of the pathogen and vector as well as the risk of the disease to commercial walnut production. The first step in recognizing the disease is to closely observe bleeding cankers to determine whether a walnut twig beetle hole is present. Don't bypass trees with shallow bark canker symptoms without taking a closer look! If you think you have found an incidence of Thousand Cankers Disease in your orchard, please contact me (559-684-3300 or ejfichtner@ucdavis.edu).

Don't bypass trees with shallow bark canker symptoms without taking a closer look!

For more information, visit the following websites:

Department of Entomology at UC Davis: <http://entomology.ucdavis.edu/news/walnuttwigbeetle.html>

UC IPM Online: <http://www.ipm.ucdavis.edu/EXOTIC/thousandcankers.html>

Colorado State University: http://www.ext.colostate.edu/pubs/insect/0812_alert.pdf

Delivering a Clean Almond Crop

Franz Niederholzer, UC Farm Advisor, Sutter/Yuba Counties and Joe Connell, UC Farm Advisor, Butte County

Producing a clean almond crop provides short and long-term benefits. Low reject levels -- usually due to low levels of worm and/or ant damage -- mean better grower returns. Damaged nuts have no value in the market, and some processors pay premiums for nuts below a certain percent damage. Low navel orange worm (NOW) damage also reduces the chance of aflatoxin contamination of nuts. Concerns about a high rate of aflatoxin detection in pistachio nuts from Iran caused the European Union to briefly ban imports of Iranian pistachios. Europe consumes roughly 30% of California almonds, so attention to NOW control will help reduce the risk of aflatoxin and will help maintain the excellent reputation of California almonds in the world market. What does all this mean to growers and PCAs in 2010? The following is a quick review of practices to consider to help deliver a clean crop.

Track NOW populations in your orchard. Use weekly egg trap counts to track moth flight development and determine when Nonpareil harvest should begin to avoid damage from the 3rd NOW generation. The graph in Figure 1 is an example of early harvest timed to minimize NOW damage.

Harvest soft shell varieties ASAP. Nonpareil should be ready for harvest when 95-100% of the nuts at eye level are split (see photo). Test shake a few trees to make sure the orchard is ready to go. If at least 95% of the nuts come off, the orchard is ready to harvest. Be careful with harvest timing. Premature harvest can reduce nut meat quality due to embedded shells. Early harvest is key to a clean crop. Hull split sprays only control 40-60% of NOW larvae, so early harvest is vital to obtain the lowest reject levels -- especially in a light crop year.

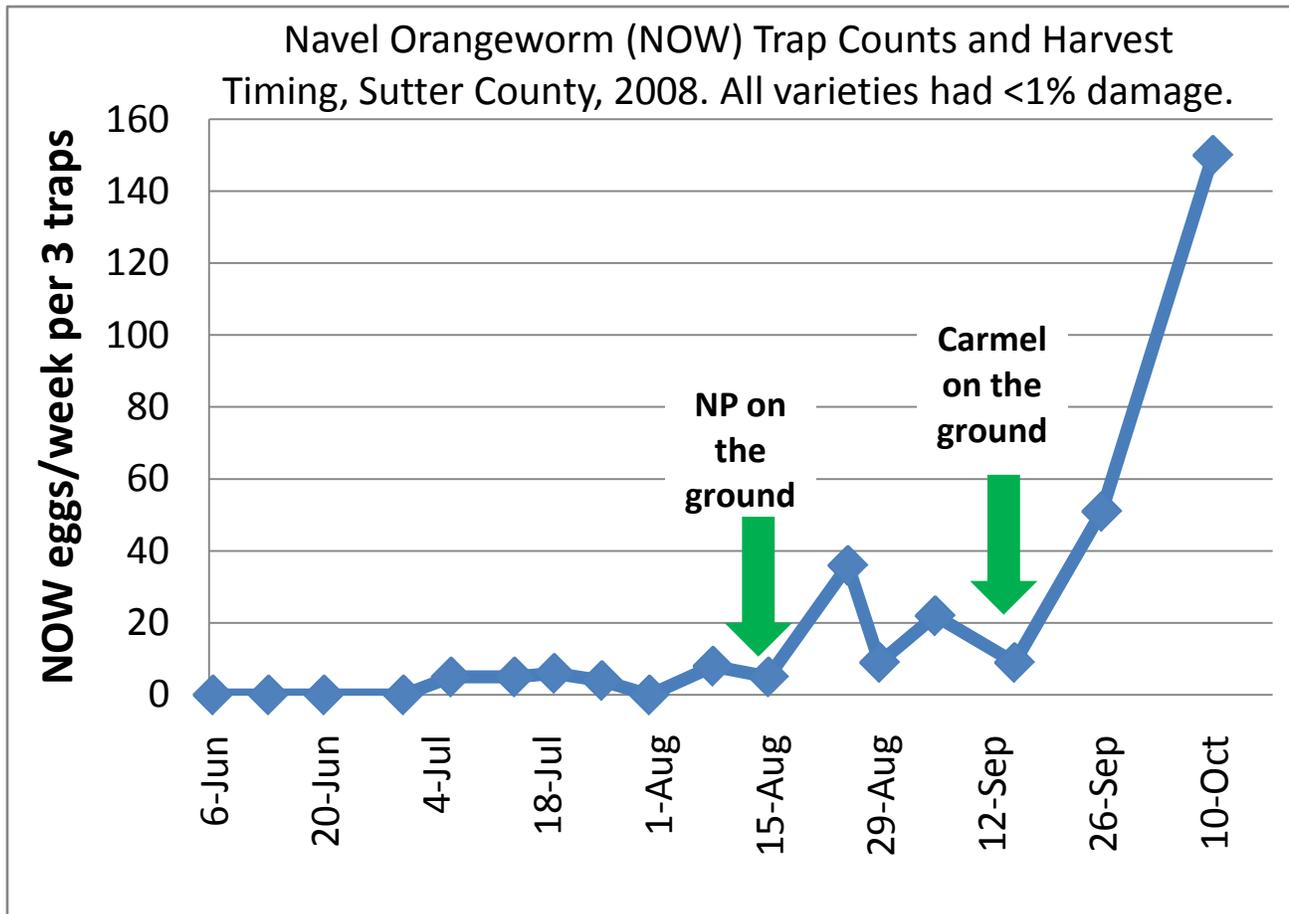


A nut ready for early harvest.

If needed, apply a hull split spray for NOW control once hull split has begun on sound nuts and eggs are being laid on split nuts or egg traps. If sound nuts are splitting, but eggs aren't being laid, wait to spray until you see eggs. If egg laying starts before hull split, wait until hull split starts before spraying. Hull split begins in tree tops on the southwest side. Check nuts in that part of the canopy on 5-6 trees per block to monitor for the beginning of hull split. Excellent spray coverage is essential for effective NOW control with a hull split spray. Peach twig borer (PTB) can be partially controlled with a hull split spray as well.

With an early harvest, nuts will dry more rapidly on the ground than in the trees. However, don't trade NOW damage for ant damage. Make sure ants are controlled when protein-eating ants are present. Ant bait should go down at least 4 weeks before predicted harvest. Prompt pick up of dry nuts will help reduce ant damage. Nuts are ready for pickup when hulls on 8 out of 10 harvested nuts snap instead of bend when bent back between thumb and index finger.

Combining an early harvest with a well-timed hullsplit spray, if needed, should result in a cleaner crop with better returns to the grower.



New Early Harvesting Walnut Cultivar ‘Ivanhoe’ Released

*Gale McGranahan, Pomologist and Chuck Leslie, Specialist
UC Davis Walnut Improvement Program, Dept. of Plant Sciences*

A new early harvesting cultivar, “Ivanhoe”, has been developed by the UC Davis Walnut Breeding Program and was released earlier this year. Ivanhoe has a harvest date similar to Payne or Serr, harvesting about a month earlier than Chandler. It is precocious, 100% laterally fruitful, and protogynous (the female flowers open before the males). Ivanhoe leafs out with Payne or Serr, but due to its reversed female and male bloom order, Ivanhoe female bloom is a week earlier. Payne, Ashley or Serr would be suitable pollenizers.

Ivanhoe produces light-colored kernels and exhibits high yields. The nuts are oval with a smooth thin shell. Kernels average 7.7 g and comprise 57% of the nut weight. The tree is only moderately vigorous and is not resistant to walnut blight. The oldest field trials are now in their 10th year.

Ivanhoe, formerly known as UC 95-11-14, was named after the town of Ivanhoe in Tulare County--the site of the first field trial. It is an offspring of a cross made in 1995 between UC67-13 “Chico”.

Walnut nurseries have been notified of the release, licensed, and provided graftwood. Ivanhoe can be purchased from any licensed commercial nursery.



Walnut Husk Fly Management in the Southern San Joaquin Valley

Robert H. Beede, UCCE Farm Advisor, Kings County

Walnut Husk Fly (WHF) has become a greater problem for walnut growers in the southern San Joaquin Valley. Once uncommon, more growers now discover WHF too late in the season to prevent it from substantially reducing walnut value. Since treatment typically begins in late July to early August, now is a good time to be reminded of the biology, monitoring, and spray timing for this pest. Although any variety can be infested with WHF, it is most commonly found in Serr, Chandler, Tulare, Hartley, and Franquette. Orchards next to abandoned groves, canals or rivers with riparian vegetation, or their favorite host, black walnut, are more likely to experience economic damage. The hulls of infested nuts turn dark brown to black and are very mushy. Removal of the damaged hull often reveals the maggot stage of the fly larva, as well as severe staining of the shell. Such staining is external offgrade, and the walnut kernel is also often darkened and moldy from WHF infestation. Maggots from infested nuts drop to the orchard floor, where they survive in the soil as pupae for as long as two years. Flies begin emergence the following season in mid-July, and peak in mid to late August. There is one generation per year.

WHF damage begins as a tiny, black spot on the hull surface. It resembles “fly spec” typically seen on walnut surfaces in groves adjacent to dairies. This black spot results from the female fly inserting (ovipositing) her miniature, rice-shaped eggs, into the hull tissue. The trained eye can identify these within two hours following oviposition. They are commonly referred to as “stings”. Stings often result in a dark “tear-mark” emanating from the sting, and should be used to identify WHF activity during field scouting. The presence of stings at this time of the season indicates the degree of infestation that has already taken place, and can be used to determine if immediate action is necessary. Orchards with a history of WHF should be monitored twice weekly for the first observation of stings, with treatment commencing as soon as possible thereafter.

The above “management” method for WHF is re-active, and therefore not preferred over the more scientific, pro-active one outlined at the University of California Integrated Pest Management website (<http://www.ipm.ucdavis.edu/PMG/r881301211.html>). The success of waiting for initial damage to occur is dependent upon how diligent one is in weekly monitoring, how large the infestation is, and how quickly you can accomplish treatment. I only suggest it for experienced growers with their own spray rig. I describe it first in this newsletter, knowing that many growers are unaware of this problem, and therefore hope that they venture out into their orchard to investigate before it is too late to avoid loss of substantial income!

The preferred method of monitoring involves purchase of WHF traps from your agricultural supplier. These traps consist of a yellow card covered with a clear, tacky material (called “tanglefoot”) used to capture the fly. A vial of ammonium carbonate comes with the trap, and one attaches it to the wire that suspends the trap in the tree. It is important NOT to use Apple Maggot traps, which closely resemble those of WHF, but they are much less effective in attracting husk flies due to

an acetate-based material mixed into the tanglefoot. This imparts a slight brown color to the apple maggot tanglefoot, so the two traps can be readily distinguished in the field.

WHF traps should be placed in the **upper third** of the walnut canopy by early July. Do NOT hang them low and in the sun. This location is worthless for effective monitoring. Instead, place them on the north side of the tree in a shady, preferably damp location. Placement in locations of previous damage is highly recommended. This is often near ungrafted black walnuts, a favored WHF host. A minimum of three traps should be placed per orchard. See the UC IPM website for trap guidelines in large orchards. Monitor traps twice weekly. Flies other than WHF will stumble into the trap. WHF can be distinguished by a yellow spot in the middle of their back, dark triangular bands at their wing tips, and they are about half the size of the common house fly. Photos are available at the website provided above.

Once WHF are trapped, it is necessary to determine the females from males, and when the females begin egg production. Female WHF are slightly larger than the males, and their hind body portion (abdomen) is more pointed. They also have a small, needle-like object (ovipositor) protruding from their abdomen which inserts the eggs into the walnut hull tissue. The front leg of the female is also blonde in color, in contrast to the dark forelegs of the males. I realize this now sounds much too complicated and scientific for most of you, **BUT THE BEST SPRAY TIMING DEPENDS UPON WHEN THE FEMALES BEGIN PRODUCING EGGS!** Egg production is determined by placing them on a dark piece of paper and gently pressing their abdomen with a blunt object. Tiny, rice-shaped eggs will emerge from pregnant females. **Once found, growers have about 7 days to treat before the flies successfully oviposit eggs in the walnut hulls.** Use of this pro-active, but more labor intensive monitoring method prevents growers from spraying too early or late, and avoids costly, ineffective treatments. Interested growers and crop consultants can watch a 22 minute video in the Kings County office describing all aspects of WHF management, or purchase it through our ANR Catalogue (<http://anrcatalog.ucdavis.edu/>).

Properly timed treatments of longer residual materials such as Lorsban or Malathion 8EC are typically effective for about three weeks. Orchards with heavy damage in past years may need two treatments. A second spray would be needed if a sharp rise in pregnant females occurs three weeks after the first treatment. **Flies will continue to be caught in the traps after spraying**, especially if they were hung low in the canopy. This represents the high attractiveness of the ammonium carbonate “supercharger”, and flies which have not fed on treated surfaces. Treatments are discontinued three weeks prior to harvest. Spinosad-based materials such as Entrust and GF-120 are registered for organic use. These products require weekly application for economic control. The effectiveness of all treatments is significantly increased through the addition of protein bait (Nu-Lure by Miller, and Monterey Bait), which serves as both an attractant and feeding stimulant. Follow label instructions and the recommendation of your pest advisor for all pesticide applications. Spray timing can vary between neighboring orchards due to factors affecting WHF populations, and the fact that fly and egg development are NOT driven by temperature. WHF is different in this respect from codling moth and navel orangeworm. **Optimal treatment timing therefore requires monitoring individual orchards.** Aerial treatments are reportedly effective, providing they are properly timed, and use extended residual materials in combination with the protein bait.

Growers with past WHF problems, as well as those with quality problems matching the description of this newsletter should immediately scout their orchard for evidence of stings, and preferably arrange for trap monitoring if not already in place.

Verticillium Wilt in Almonds

Carolyn DeBuse- Farm advisor Solano and Yolo Counties

Verticillium wilt can be seen in many young almond orchards this year. The cool wet spring has increased disease incidence. The symptoms show up in orchards in the late spring when the weather changes from cool to hot. The most visual symptom is dry yellow/brown leaves still hanging from one or two scaffolds of a young tree. At first look this disease gives the appearance of killing the trees but few trees are actually killed. The collapsed scaffolds often leaf out later in the year with the only loss being the tender tips of scaffolds that are too desiccated to regrow. It has been shown that affected trees can have reduced yields in subsequent years mainly due to smaller tree size.

Disease Development: Verticillium wilt (also known as blackheart) is caused by the fungus *Verticillium dahliae*. This soilborne fungus can be found in bare soil as microsclerotia or in plant debris that remains in the field. Microsclerotia are hard coated compacted fragments of fungus that can withstand harsh environmental conditions staying quiescent in the soil for years until roots of a host plant are in the vicinity. When a host plant is near, the fungus infects the roots and grows in the xylem (water conducting tissue) of the plant. The xylem becomes plugged with the fungus making it nonfunctional for water transport causing the plant to wilt. Cool wet springs are favorable for the growth of the fungus promoting the development of the disease. The fungus's growth is slowed or terminated by the hot dry summer conditions allowing the affected scaffolds to recover. In following years, re-infection can occur from new root infections or surviving fungus within the tree's roots and wood.

Many plants are hosts for Verticillium including all of the *Prunus* tree species, many row crops commonly grown in California (tomatoes, melons, potatoes, safflower, strawberry, eggplant, cotton) and many weed species (nightshade, groundsel, lambsquarter, dandelion, pigweed). Verticillium microsclerotia numbers can increase up to 60 per gram of soil where host plants have been grown. Yet, the disease can be a problem in new orchards planted where only 2-3 microsclerotia per gram of soil are found. The majority of the microsclerotia are found in the top layer of soil.

Diagnosing the Disease: Almonds are most susceptible to the disease from 1-5 years of age with most of the disease showing in the 2nd to 4th years. The following symptoms will help diagnose the disease.

- Flagging or wilting of one or two whole scaffolds often starting at the top of the scaffold and progressing downward. The rest of the tree may remain healthy. (photo 1)
- Leaves turn yellow/brown and adhere to the affected branches. Some leaf drop occurs lower on the scaffold.
- Scaffold shoot tips desiccate creating a 'shepherd's hook' appearance.
- Cutting into the wood or making a cut across the wood will show a darkening and streaking of the xylem tissue. (photo 2 & 3)
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What to Do After Verticillium Strikes: When you find verticillium affected trees the current recommendation is to be patient and not prune prematurely. The summer heat will slow the growth of the fungus and allow the tree to push new growth from the surviving tissue. I have already seen early infections this year begin to re-leaf. Do not prune out dead wood until you can tell how much of the tree will have made a full recovery. Often you'll find that only the tips of affected scaffolds have died. In 1st and 2nd leaf orchards, in extreme cases some trees may die and will need to be replaced.

How to Avoid or Minimize the Disease: Avoid planting new orchards following cultivation of susceptible host crops or weed infestations.

- Don't intercrop with Verticillium susceptible hosts in new orchards.
- Take soil samples from the top 12 inches to determine amount of microsclerotia present before planting.
- If Verticillium is a risk, in the year(s) prior to planting reduce the microsclerotia survival by flooding during the heat of summer, solarization using clear plastic tarps, fumigation with chloropicrin or a combination that contains chloropicrin, or grow a non-host cover crop like sudan grass.

Use Marianna 2624 rootstock if you are planting compatible almond varieties. Nonpareil is not compatible. M2624 comes with other negative issues such as suckering and possibly Union Mild Etch problems so all risks need to be considered in choosing this rootstock.

- If the orchard is already planted, black plastic mulch the first year can reduce infection or the use of a non-host cover crop (grasses) has been reported to help.



Photo 1. Verticillium wilt in a young almond tree (C.DeBuse)



Photo 2&3. Xylem darkening in verticillium affected almond tree. (C.DeBuse)

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Reminder: ReTain[®] Efficacy Questionnaire Due August 20, 2010.

If you received the ReTain[®] Efficacy Questionnaire from Bob Beede, Kings County Farm Advisor, please complete and submit the survey by August 20, 2010. The data collected from the survey will be summarized in a future newsletter.

“SAVE THE DATE”

**Tri-County Walnut Day
Thursday, February 3, 2011**

Elizabeth Fichtner
Farm Advisor

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