

### What should PCAs know about Thousand Cankers Disease?

Elizabeth Fichtner, Tulare County, and Janine Hasey, Sutter/Yuba Counties, University of California Cooperative Extension

Thousand cankers disease was first associated with widespread mortality of black walnut (*Juglans nigra*) in Colorado; however, its recent emergence in commercial English walnut (*Juglans regia*) orchards in California highlights its potential importance to production agriculture. Since the first report of the disease on declining northern California black walnut (*Juglans hindsii*) in Yolo County, California in 2008, thousand cankers disease has been confirmed in commercial English walnut orchards throughout the state. The known distribution of the disease in California continues to expand as awareness within the grower and PCA communities leads to identification of new incidents of disease each year.

**Thousand Cankers Disease: the Pathogen and Vector.** Thousand cankers disease is caused by a newly-described fungal pathogen, *Geosmithia morbida*. The pathogen is not able to penetrate and infect trees without the aid of the walnut twig beetle, *Pityophthorus juglandis*, an insect that serves as a vector by carrying spores through the outer bark and into the phloem of the tree. Because numerous beetles aggregate and attack a single tree, the pathogen is introduced at many points of beetle entry. Consequently, numerous cankers form (hence the name “thousand cankers”) as the fungus colonizes and kills phloem tissue. As the beetle colonizes and reproduces within the tree, it produces a network of diagnostic transverse galleries (Fig. 1) which also support fungal colonization and sporulation (Fig. 2). The walnut twig beetle completes its life cycle within the branches and stem of the tree, with visible holes created by both the entry and exit of adult beetles (Fig. 3). Seasonal monitoring of walnut twig beetle activity suggests that beetles emerge as early as March in the southern San Joaquin Valley and April in the Sacramento Valley, with activity continuing into November. The highest populations occur in the summer. Walnut twig beetle attacks all species of walnut (*Juglans*) and so far, thousand cankers disease is only known to occur in walnut.

**Disease Symptoms.** Initial symptoms of infection may include thinning and yellowing of the crown, followed by dieback of larger branches and eventual collapse. Though dark staining, often referred to as “bleeding”, is often observed on the bark (Fig. 4), infections may occur in the absence of staining (Fig. 5). These asymptomatic infections were first observed during the 2010 growing season, and therefore may be more common during cooler



**Figure 1.** Galleries produced by walnut twig beetle. Photo: J. Hasey

seasons. Typically, bleeding is most evident during the late summer months of July and August. On black walnut, stains resemble “water-soaking”, whereas on English walnut the staining resembles “grease spots,” and may be mistaken for shallow bark canker, a bacterial disease on walnut. On Paradox rootstock, the bleeding may resemble Phytophthora crown rot. The key to differentiating thousand cankers disease from other common walnut diseases is observation of beetle entry or exit holes in association with symptomatic tissues. Because transmission of *G. morbida* requires the walnut twig beetle as a vector, cankers caused by thousand cankers disease will always be associated with walnut twig beetle activity.

**Thousand Cankers Disease in Northern California.** Since the initial finding of thousand cankers disease in Yolo County in 2008, infections have been found on black and English walnut trees as well as Paradox seedling rootstock in several other northern California counties. Counties with confirmed thousand cankers disease in commercial English walnut orchards include Solano, Sutter, Yuba, and Colusa. In Lake County, it has been documented in black walnut only. The English varieties where the pathogen has been found include ‘Howard’, ‘Chandler’ and ‘Franquette’. Thus far in the north, thousand cankers disease has only been confirmed on trees that are stressed or in decline. Bark staining and bleeding cankers surrounding beetle





**Figure 2.** Colonization of walnut twig beetle galleries by *Geosmithia morbida*. Photo: J. Hasey



**Figure 3.** Walnut twig beetle entrance and exit holes. Photo: E. Fichtner

holes have been observed on infected black walnut, English walnut, and Paradox rootstock. In 2010 however, infected English walnut trees were found that exhibited no bleeding around the beetle holes.

Working with Steve Seybold, an Entomologist with the US Forest Service, we are into the second year of a long-term spray management trial in a black walnut seed orchard in Sutter County comparing insecticides and a plant stimulant for use in preventing infection. Using yellow Pherocon AM traps, we are monitoring the population and seasonal activity of the walnut twig beetle from April through late October. In addition to walnut twig beetle, an ambrosia beetle, *Xyleborinus saxeseni*, may also be trapped, especially early in the season. These two beetles can only be distinguished by using a microscope. This season we are also monitoring the beetle's activity with experimental pheromone traps developed by the USDA Forest Service and UC Davis as a tool for detection and research. Since the pheromone is specific for walnut twig beetle, baited traps should have reduced catches of ambrosia beetles and other related species.

• **Thousand Cankers Disease in the Southern San Joaquin Valley.** Since our first finding of thousand cankers disease in Tulare County in October 2009, both the documented incidences of disease and the known geographic distribution of the disease have increased gradually over time. The disease has been detected in commercial English walnut orchards in both Tulare and Fresno Counties, as well as on a roadside black walnut in Kings Co. In the southern valley, the pathogen has been isolated from 'Tulare', 'Chico', and 'Chandler' varieties, as well as from both black and Paradox rootstocks. Initially thousand cankers disease was observed only on stressed trees exhibiting prior infection by *Phytophthora* or crown gall, or larval preda-



**Figure 4.** Bleeding on 'Chico' and Paradox rootstock. Photo: E. Fichtner





**Figure 5.** Infected 'Howard' on infected Paradox rootstock. Cankers of thousand cankers disease do not always exhibit external bleeding on the English walnut scion. Photo: J. Hasey

tion of roots by tenlined June beetle. In 2010, however, thousand cankers disease was observed on trees with no evidence of prior stress or decline.

In the southern San Joaquin Valley, we have observed walnut twig beetle activity in orchards with no history of thousand cankers disease. In the absence of symptomatic trees, the walnut twig beetle has been detected on sticky traps as well as in insect galleries on productive trees and on discarded wood in burn piles. Because bleeding cankers are not always associated with infection, the frequency of disease incidence is likely underestimated. Walnut twig beetle galleries have been associated with every documented case of thousand cankers disease. In an effort to better understand the life cycle of the thousand cankers disease vector, the seasonal activity of walnut twig beetle was monitored in two Tulare, CA orchards in 2010. The walnut twig beetle monitoring program has been expanded in 2011, with traps established in two Tulare County orchards and one Fresno County orchard.

**Other Counties with Documented Thousand Cankers Disease in English Walnut.** The *Geosmithia* pathogen was also confirmed in English walnut trees from Stanislaus and San Benito Counties in 2010. All documented incidents of thousand cankers disease in these counties were on trees that already exhibited infections by other pathogens.

**What to do when you suspect thousand cankers disease?** The geographic distribution of the disease and vector in northern California and the San Joaquin Valley is largely unknown; consequently, we continue to encourage growers and PCAs to report potential new incidents of disease in English walnut to their local UC Cooperative Extension Farm Advisor. Black walnut samples can be submitted to the Agricultural Commissioner. Submitting digital photos to first rule out other problems may save time and resources.

Once the disease has been confirmed, tree removal or removing infected branches to green wood are the only management tools. Infected wood should not be transported or sold as firewood but rather burned in accordance with local air quality restrictions or chipped. Chipping, however, does not kill the beetles but interferes with beetle reproduction. Raw logs or lumber for woodworking should be moved only with extreme caution and examined by an expert prior to shipment. During the last decade thousand cankers disease has also been identified in both eastern and native black walnuts in New Mexico, Utah, Arizona, Idaho, Washington, and Oregon. In July 2010, the first report east of the Rockies occurred in eastern black walnut in Tennessee. Several mid-western and eastern states have initiated quarantines to protect both native stands of black walnut as well as commercially-managed stands of the species. Quarantine policies should be followed to prevent introduction of the disease to otherwise unaffected regions. 🌱

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