MONITORING WALNUT TWIG BEETLE ACTIVITY IN THE SOUTHERN SAN JOAQUIN VALLEY

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ABSTRACT

Walnut twig beetle, *Pityophthorus juglandis*, is the vector of thousand cankers disease, an emerging disease on walnut caused by the fungus *Geosmithia morbida*. Thousand cankers disease was originally reported in declining black walnut in Colorado, but the disease was confirmed in California in 2008 and has since been reported in several counties. Since 2009, several incidents of thousand cankers disease in commercial walnut orchards in the southern San Joaquin Valley (SSJV) have been documented. In an effort to better understand the seasonality of activity of the walnut twig beetle, in 2010 the population of the beetles was monitored weekly by trapping weekly in two Tulare County orchards. The 2010 survey relied exclusively on random trap catches of walnut twig beetle on yellow sticky traps. The availability of a new, patent-pending, male-produced aggregation pheromone (Compound X) identified by US Forest Service researcher Dr. Steve Seybold, may enhance the probability of detecting walnut twig beetles. In 2011 Compound X was utilized in conjunction with sticky traps, to assess walnut twig beetle activity in three orchards in the SSJV. The influence of trap position on frequency of beetle detection was assessed by comparing trap catches in traps placed on the perimeter of orchards to those placed within the orchard. The influence of trap height on frequency of beetle detection was also assessed by placing traps at two vertical distances from the ground.

OBJECTIVES

1. Assess the seasonal activity of walnut twig beetle in walnut orchard systems.
2. Investigate the influence of trap position, including height and location in the orchard, on trap catch of walnut twig beetle.

PROCEDURES

In 2011, walnut twig beetle activity was monitored in three walnut orchards including two commercial orchards in Tulare Co. (Farmersville, CA and Porterville, CA) and the walnut breeding block at Kearney Agricultural Center (Parlier, CA).

**Site 1:** The Porterville, CA orchard was originally 'Serr' grafted onto black walnut rootstock; however, because all replants were on 'Paradox' rootstock, 7% of the trees are currently on 'Paradox'. In February 2011, a random survey of the orchard conducted by Hishinuma and Fichtner documented at least 7 trees with walnut twig beetle galleries (Hishinuma and Fichtner). The neighboring orchard, 'Tulare' on 'Paradox' rootstock, also contained at least 7 trees colonized by walnut twig beetle in November 2010; however, all trees were removed and burned by mid-January 2011.

**Site 2:** The Farmersville, CA orchard was originally planted as 'Chico' on black walnut rootstock. The orchard now contains 9 black walnut trees (2.0% of total) that grew from stump sprouts. All 9 black walnut trees exhibited galleries of walnut twig beetle. One tree (0.2% of total) was a replant on 'Paradox' rootstock.
Site 3: The site in Parlier, CA is a walnut breeding block at Kearney Agricultural Center. The block contains a diversity of walnut breeding lines, with each line grafted on both black walnut and 'Paradox' rootstocks. To date we have not observed thousand cankers disease or walnut twig beetle colonization on the trees in this block.

Trapping Strategy: Two poles containing traps were placed in each orchard, one pole on the orchard perimeter and one in the center of the orchard. Each pole contained two traps, one placed at approximately 4 ft above ground and one at approximately 8 ft above ground. Compound X was placed in a permeable plastic bottle between two flaps of plexiglass coated with stickem at each height. The twelve traps (3 locations x 2 heights x 2 locations) were changed weekly from April through September 2011.

Beetle Quantification. In the laboratory, walnut twig beetles were removed from the traps with the aid of a dissecting microscope and/or hand lens. All walnut twig beetle specimens selected from traps were placed in glass vials and frozen for season-long storage. At the end of the season, all samples were transported to the laboratory of Dr. Seybold (USDA Forest Service) for species-level verification and for determination of sex ratio of beetles trapped. The number of each sex caught during each trapping period was normalized to a 7-d period.

RESULTS

Site 1. At the Porterville site, a total of 59 walnut twig beetles were caught (21 males and 38 females) and the beetle was trapped at the highest rate between 22 April and 3 June. The highest mean weekly trap catch was recorded in late May and early June (approx. 2 females/trap). There was a noticeable absence in trap catch in June, July, and most of August, likely because of the repellency of the type of stickem that we used during these months. One specimen of the ambrosia beetle, Xyleborinus saxeseni, was also trapped between 26 Aug. and 2 Sept.

Site 2: At the Farmersville site, a total of 232 walnut twig beetles were caught (90 males and 142 females) and the beetle was trapped at the highest rate between 22 April and 3 June. The highest mean weekly trap catch was recorded in late May and early June (12.5 females and 9.8 males/trap). There was a noticeable absence in trap catch in June, July, and most of August, likely because of the repellency of the type of stickem that we used. When we resumed using the original type of stickem in late August, measurable trap catches of walnut twig beetle were recorded again. Two specimens of the ambrosia beetle, Xyleborinus saxeseni, were also trapped between 3 and 10 June and between 1 and 8 July, respectively.

Site 3. A total of 327 walnut twig beetle were caught (97 males and 230 females) and the beetle was trapped at the highest rate between 6 May and 17 June. The highest mean weekly trap catch was recorded in mid-June (7.8 females and 5.5 males/trap). There was a decline in trap catch in the remainder of June and early July, but the catch increased again in late July, parts of August, and mid-September. It seems that the problems that occurred with tanglefoot stickem in the Tulare Co. were not as pronounced at this Fresno Co. site. Three specimens of the ambrosia beetle, Xyleborinus saxeseni, were also trapped. These catches occurred between 25 July and 5 August (2 specimens) and 5 Aug. and12 Aug. (1 specimen).
DISCUSSION

Since our first finding of thousand cankers disease in Tulare Co. 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 Cos., 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 *Agrobacterium tumefaciens*, or larval predation of roots by Ten Lined 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. The number of documented incidences of thousand cankers disease in Tulare County continues to grow; however, many growers remove symptomatic trees from the orchard and retain only one for formal diagnosis. Consequently, as grower awareness of the disease increases, the number of documented new incidents of disease is expected to decrease.

The overall goal of our walnut twig beetle monitoring program is to enhance understanding of the life cycle of the thousand cankers disease vector. There was a noticeable absence in trap catch in June, July, and most of August, likely because of the repellency of the type of stickem that we used during these months. When we resumed using the original type of stickem in late August, measurable trap catches of walnut were recorded again. Because walnut twig beetles were observed on the surface of walnut trees in February of 2011, we are continuing to monitor the activity of the beetle through the winter of 2011-2012. In October 2011, we initiated our winter trapping program, which utilizes funnel traps rather than sticky traps.