

Urban and rural residents value trees and shrubs for their beauty and longevity and the shade and privacy they provide.

However, when attacked by pests, they may become unsightly and unsafe and require expensive treatment or removal.

The following articles describe problems of pest and blight infestation on trees and suggest possible management techniques.

Damage Threshold for Oak Pit Scale, *A. Quercicola*, on Valley Oaks

Pam Elam, Richard Coviello, Fields Cobb and Eva Hecht-Poinar

The oak pit scale is a serious pest of several species of both native and European deciduous oaks in California. Heavy populations can cause severe twig and branch dieback and may stunt the growth of young trees. Oaks are an important ornamental plant in the San Joaquin Valley, adding greatly to the aesthetic and economic value of property. Our project, conducted at Coombs Ranch in Fresno County, examined the effects of scale populations on valley white oak (*Quercus lobata*) seedlings to determine if there is a relationship between pit scale and oak decline.

One aim of this study was to determine pit scale crawler emergence by monitoring populations in Central Valley oak trees. A second goal was to evaluate the effects of known pit scale populations on valley white oak seedlings and analyze the relationship between pit scale numbers and baseline data on treatment/damage thresholds. The third goal, discussed in the accompanying report, was the evaluation, in cooperation with Fields Cobb and Eva Hecht-Poinar, of pit scale and *Diplodia* interactions in both seedlings and native stands of trees.

Previous studies by Koehler et al. established optimum temperature and humidity ranges for pit scale crawler development on individual oaks. That phenological work however, was done in the coastal ranges and not in the Central Valley, and it dealt with the pit scale species



Oaks dot the San Joaquin Valley landscape, but oak pit scale causes branch and twig dieback and threatens the trees' vitality.



Asterolecanium minus. In our valley oaks we found the pests to be *A. quercicola* (olive drab pit scale), a species for which there is little phenological literature.

Population Monitoring

Pit scale populations on three mature trees were monitored by using two-sided sticky tape on twigs in the lower canopies on four sides of the trees. Tapes were collected weekly and crawlers were counted. Rates of crawler emergence were determined and phenology charts developed. Crawler emergence peaked in early April with a second minor peak in early June. Populations then dropped to near zero and remained low for the duration of the summer. This may be due to extended high temperatures during the season or a characteristic of the species.

Establishment of Pit Scale on Oak Seedlings

Previous research shows that pit scale crawlers will move from infested twigs to nearby oak seedlings, and so this method of inoculation was used in the experiment. Valley oak seedlings were grown in one-gallon pots. We collected infested twigs from the field trees weekly beginning in late April and attached them to the seedlings.

Since the twigs often desiccated before crawlers established themselves on adjacent seedlings, we later placed the twigs in floral tubs filled with water where they remained viable for a longer period. However, crawler populations never reached adequate levels for further investigation.

During the second year of the experiment, we provided better conditions to promote movement of the crawlers onto the seedlings. One hundred seedling pots were moved to a greenhouse where humidity was maintained at a minimum of 60 percent during the crawler emergence period. The pots were then placed in a protected field location. In this part of the experiment we were able to establish two lightly infested seedlings (0-50 pits), eight moderately infested seedlings (50-200 pits) and four heavily infested seedlings (more than 200 pits) for a total of fourteen infested trees.

During the third year of the experiment, we wanted to see if the pit scale populations would move within the plot to infest adjacent seedlings. There was no increase in the number of infested trees nor a significant increase in the levels of infestation on trees already infested during this period.

Conclusion and Discussion

Pit scale is a serious problem for homeowners and landscapers who must frequently deal with pest control operations on very large valley oak trees. This study, in determining the early April and early June crawler emergence peaks, has supplied information on best timing of spray applications for controlling the crawler stage of *A. quercicola* in the San Joaquin Valley. Because of the inability to establish significant levels of infestation, however, we were not able to meet one goal of this project, which was to provide treatment thresholds for pit scale. There are many possible reasons for this. The insect may require high humidity during the crawler stage or a certain moisture status in the plant at all times to promote infestation. The scale may also need a greater leaf canopy or perhaps better air movement through the plants to move the crawlers around. These, as well as the correlation of pit scales to oak pathogens, are all areas for further study.

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