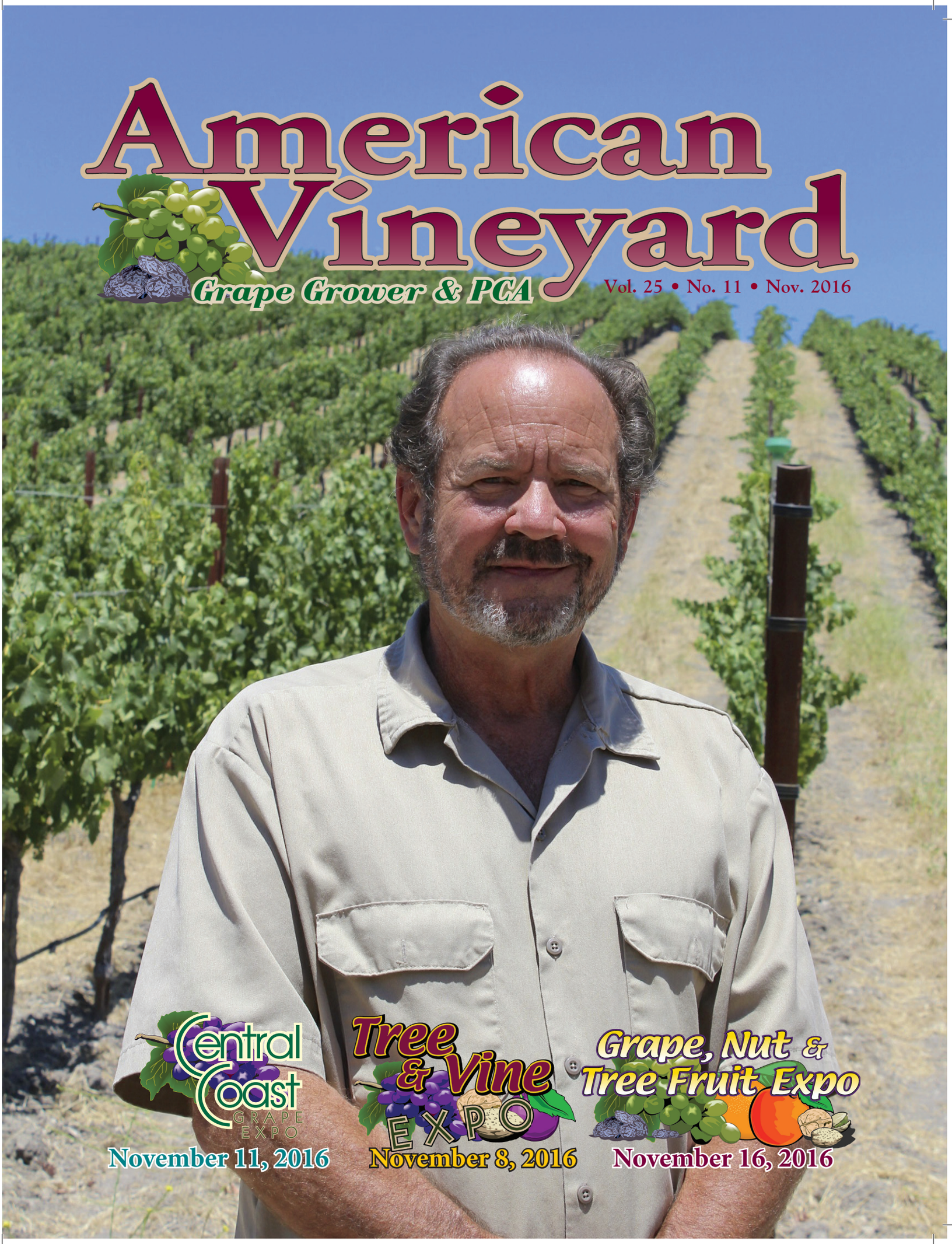
American Vineyard

Grape Grower & PCA

Vol. 25 • No. 11 • Nov. 2016



Central Coast Grape Expo
November 11, 2016

Tree & Vine Expo
November 8, 2016

Grape, Nut & Tree Fruit Expo
November 16, 2016

Control of Virginia Creeper Leafhopper

UCCE Area-wide IPM Program In North Coast Vineyards

By Houston Wilson, Lucia G. Varela, Glenn McGourty, Kent M. Daane, UCCE

Virginia creeper leafhopper (its scientific name is the family Ciccadellidae and species Erythroneura ziczac) is an invasive pest to California that was first reported in the Sierra Foothills and Sacramento Valley areas in the mid-1980s. Vineyard populations are primarily kept in check through a combination of biological control by the egg parasitoid Anagrus daanei (Mymaridae) and the use of common cultural and chemical controls for leafhoppers.

Around 2011, wine grape growers in Mendocino and Lake County began to experience severe outbreaks of the Virginia creeper leafhopper (VCLH); outbreaks were particularly difficult to control in organic vineyards. These outbreaks are due to a lack of biological control and poor understanding of best management practices for VCLH, which can easily be confused with a related and more common pest, the Western grape leafhopper (E. elegantula).

Since 2013, UCCE has been working in collaboration with regional growers and PCAs to conduct research and outreach to address this problem. Initial surveys and preliminary experiments in 2013-2015 has led to the development of an area-wide IPM program to collect and release parasitoids to improve biological control along with outreach and education efforts to raise grower awareness of best management practices. This includes information on pest identification, monitoring, spray timing and product selection, which has been of particular importance due to the large number of certified organic and/or biodynamic growers in this region. More information on this area-wide IPM program can be found at the project website: http://ucanr.edu/sites/vclh/

Distribution, Seasonal Biology & Key Parasitoids

VCLH is found throughout the eastern and mid-west United States as well as Southern Canada. It has been documented as a pest of grape, Boston ivy, and Virginia creeper vines. In California, this pest was first reported in Butte County in 1984 and has subsequently been documented in Siskiyou, Shasta, Sutter and Trinity Counties. More recently there have been reports of *VCLH* in Solano, Sacramento, Yolo, Amador, and of course, Mendocino and Lake County.

Come and hear Houston Wilson address growers at the Central Coast Grape Expo on November 11

VCLH is closely related to another common vineyard pest, the Western grape leafhopper (WGLH), which is regularly tolerated at low populations in many vineyards. Both VCLH and WGLH overwinter as adults in leaf litter and/or on shrubs and trees in and around the vineyard. As temperatures and photoperiod increase in the spring, the overwintering adults temporarily feed on a range of plants found around the vineyard such as blackberry, roses, willows and buckeye. As grapes begin to produce shoots and leaves, both of these leafhoppers move onto the vines and begin to feed and lay eggs in grape leaves. VCLH in particular have a preference for varietals with fewer leaf hairs (i.e. Grenache, Chardonnay). Feeding by both leafhopper species causes leaf stippling and reduced photosynthesis, which can impact crop yield and quality. High populations of leafhopper adults in the fall can also be a nuisance, flying into the eyes, nose, and mouth of workers manually harvesting grapes. A key difference between these two leafhoppers is that the VCLH begin to oviposit about one week earlier in the season, which leads to a slightly earlier appearance of nymphs. Additionally, VCLH reproduces later into the season than WGLH, which may allow VCLH to complete one or more additional generations per year depending on temperature. In a region like the North Coast, WGLH typically has 2-3 generations per year, whereas

VCLH can have 3-4 generations per year. Taken together, these traits can lead to earlier outbreaks of *VCLH* that persist later into the season. As grapes lose their leaves at the end of the season, both VCLH and WGLH adults enter reproductive diapause and move back to overwintering shelters where they reside until the following spring.

The primary egg parasitoid of *VCLH* is *Anagrus daanei, which also attacks* WGLH. Most important for parasitism of *VCLH* and WGLH is that these leafhopper species overwinter as adults near vineyards, whereas *A. daanei* overwinters in the eggs of other leafhopper species found on non-crop vegetation in the natural habitats that surround vineyards. In the North Coast, the primary overwintering habitat for *A. daanei* is blackberry but they have also been found on roses. Since A. daanei must leave the vineyard in order to seek out its overwintering host, the proximity of a vineyard to suitable *A. daanei* overwintering habitat can significantly influence the timing and abundance of parasitoids colonizing the vineyard in the spring, which could in turn have implications for biological control of *VCLH*.

Current Situation in the North Coast

VCLH were likely introduced into Mendocino and Lake County sometime around 2010. Early outbreaks were due to a combination of the lack of biological control and an incomplete understanding of the pest's biology and best management practices. Organic and biodynamic growers were especially impacted due to their reliance on contact insecticides that target leafhopper nymphs. The problem was primarily due to a total lack of biological control, given that the local A. daanei populations did not parasitize VCLH eggs. Starting in 2013, UCCE and UC Berkeley personnel began to address these outbreaks through a series of surveys, experiments and grower outreach/education efforts. This led to the development and implementation of an area-wide IPM program in 2016 that focuses on improving grower awareness of best management practices and introducing A. daanei from other regions of California where they are known to regularly attack VCLH. Ultimately, the goal of this area-wide IPM program is to reduce or eliminate the need for pesticide sprays to control VCLH.

Pest ID & Spray Timing are Critical

VCLH and WGLH are similar in size and appearance and the first instar (stage) nymphs are almost impossible to distinguish (see identification guide photos on page 10). When VCLH first arrived in the North Coast, it was not recognized as a different species. Many of the insecticides to control vineyard leafhoppers are contact products that are most effective against nymphs. Systemic products do exist and are quite effective, but these are unavailable to certified organic and/or biodynamic growers. Mendocino and Lake County growers were very accustomed to management of WGLH, relying on biological control and waiting until the second nymph generation to apply insecticide sprays targeting nymphs when needed. The lack of VCLH egg parasitism requires

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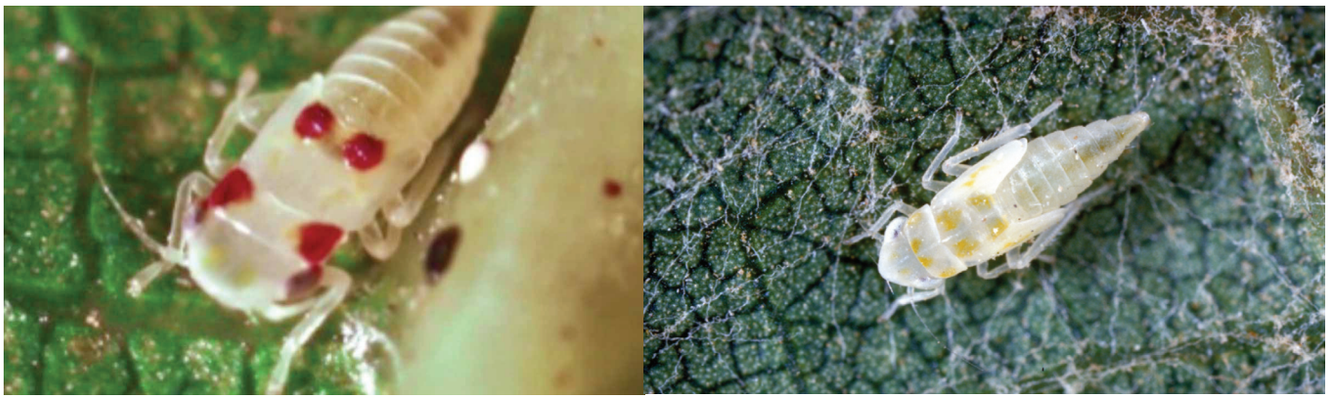

Virginia creeper (left) and Western grape leafhoppers are approximately the same shape, size (0.03 - 0.10 inch / 0.8 - 2.5 mm) and color (white/yellow) with the key exception that VCLH nymphs develop 4 distinct brown/red spots on their thorax as the nymphs mature.

Virginia Creeper

(continued from page 9)

first nymph generation. Furthermore, early season sprays are also more effective because VCLH populations are still synchronized at this time of year. As generations begin to overlap later in the season, VCLH eggs, nymphs and adults are simultaneously present and this can reduce the efficacy of insecticides that target a specific life-stage. As such, UCCE grower outreach and education has emphasized leafhopper identification, monitoring, spray timing and product selection. These efforts not only include grower meetings and "Tailgate Talks" in the field, but also the publication of a weekly email "Leafhopper Newsletter" that provides a regional summary of leafhopper population development. Leafhopper identification videos have been developed and published online as well.

Parasitoid Introduction in the North Coast

Initial surveys indicated that parasitism of VCLH was practically non-existent in this region, which was a surprise given that the key parasitoid A. daanei is commonly found throughout both counties and regularly attacks WGLH eggs in vineyards. For example, on a grape vine with a mixed population of VCLH and WGLH, the local A. daanei population in Mendocino/Lake would readily attack a majority of the WGLH eggs while leaving the VCLH untouched. Even when these local A. daanei were isolated in the laboratory and restricted to grape leaves with only VCLH eggs, they refused to attack them. This was unexpected given that A. daanei regularly attack VCLH in other parts of California, such as the Sacramento Valley. In response, A. daanei from the Sacramento Valley are now being regularly released into Mendocino and Lake County vineyards in an effort to re-establish a population of A. daanei in this region that prefers to attack both VCLH and WGLH. The first releases were made in July 2015, with over 2,000 A. daanei released into a vineyard near Hopland, which resulted in an increase of parasitism from 0% to 87-91% by the end of the season. To date this year, more than 12,000 A. daanei have been released at eight vineyard sites across Mendocino and Lake County. These parasitoid releases are scheduled to continue through October and will be repeated over the 2017-growing season as well.

Conclusion

The combined efforts of this area-wide IPM program has eliminated the severe outbreaks seen in previous years and aims to reduce or eliminate pesticide use for control of VCLH in Mendocino and Lake County vineyards. In the short-term this means improving pest identification, monitoring, spray timing and product selection, while in the long-term introductions of A. daanei will help re-establish biological control of VCLH. More information on this program can be found at the project website: http://ucanr.edu/sites/vclh/

Funding for this project has been provided in full or in part through a grant awarded by the Department of Pesticide Regulation (DPR). The contents of this document do not necessarily reflect the views and policies of DPR, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.