Managing Vine Mealybug in Winery Waste

Winery waste can be a source of vine mealybugs, but pomace management practices can greatly reduce the future contamination of vineyards.

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VINE MEALYBUGS (*Planococcus ficus*) were found in southern San Joaquin Valley vineyards in 1998, the Central Coast in 2000, and in the Sacramento Valley, Sierra Foothills and the North Coast in 2002. By the end of 2004, infestations were known to occur in 16 counties, and an additional three counties were suspected of having infested vineyards.

This pest can cause economic damage in vineyards by the sheer number of insects, the excessive honeydew they excrete and by the dramatic, black sooty mold that grows over clusters (FIGURE 1). It can also vector leaf roll viruses. Untreated populations can result in crop loss and vine death; and until biological controls are improved, insecticide applications are the most effective treatment.

Preventing the movement of vine mealybug (VMB) within and among vineyards is required to reduce the need for chemical controls directed at this pest. One potential but undocumented avenue for spread is through contaminated winery waste, specifically pomace: the unfermented skins, seeds and cluster stems that are produced from pressing grapes. During the 2004 harvest, we studied the fate of vine mealybug in winery whole-cluster press loads and also focused on insect survival in pomace piles.

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FIGURE 1: Vine mealybug-infested cluster with sooty mold. The cordon is dark from the seepage of moist honeydew through the bark.

SURVIVING PRESSING

Six and 12 tons of Grenache and Chardonnay grapes were used in two separate whole-cluster press trials conducted with two cooperating wineries in Sonoma County. The press regimens for each press load are shown in TABLE 1.

Grenache Trial The Grenache grapes were moderately infested with VMB, and we determined that 44 percent of the clusters in the load contained insects. Prior to pressing, the average number of insects present on infested clusters was found by counting all insect stages on 50 bunches. Insect counts ranged from 1 to 2,000, with an average of 107 per infested bunch.

Fifty individual infested clusters were each sewn inside a mesh bag, and all 50 bags were added to the press load. In this manner, mortality of VMB caused by pressing could be tracked on specific clusters. The mesh bags were retrieved after the load was pressed, then each pressed cluster was placed on a sticky card to count insect survival for a period of several weeks (FIGURE 2). In addition, several pounds of pomace were shoveled directly from the press, from which 1,400 pressed clusters were randomly selected and placed on sticky cards to count insect survival.

TABLE 1:
PRESS REGIMENS USED TO EVALUATE SURVIVAL OF VINE MEALYBUG IN WHOLE-CLUSTER PRESS LOADS

Grenache / 6 tons
(Winery standard practice: load taken to 1.8 bars in two hours)
• 25 minutes at 0.2 bars (6 cycles)
• Two hours at 0.4 bars
• One hour from 0.4 - 1.5 bars
• Press opened and load checked
• 20 minutes from 0 - 1.8 bars (1 cycle)
Chardonnay / 12 tons
(Winery standard practice: load taken to 2.0 bars in two hours)
• One hour at 0.2 bars (6 cycles)
• Second hour unknown (compressor off)
• One hour from 0 - 2.0 bars (6 cycles)
• Press opened and load checked
• Half-hour from 0 - 1.6 bars (3 cycles)

Ten days after pressing, a total of 32 VMB crawlers (first-stage nymphs) were found to have survived on the 1,400 pressed clusters (two insects per 100 stems). Two crawlers hatched from 50 infested clusters, thus 0.04 insects survived per cluster. If this number is adjusted to account for the actual incidence of VMB in the load (44 percent), the survival in the bags was similar to that of the survival in the loose pomace.

Chardonnay Trial The Chardonnay grapes did not contain VMB. Single severely infested clusters (each containing an average of over 4,800 crawlers) were sewn inside mesh bags, which were then added to the press load. In addition, to evaluate the effect of the mesh bags on insect mortality, we modified the contents of additional bags to contain either individual stems (no berries) or stems with detached berries.

Regardless of the mesh bag contents, we obtained survival in all bags. Significantly less survival occurred in bags that contained a whole cluster. In those bags, an average of 4 percent of the insects survived, thus nearly 200 viable crawlers per cluster were present at the end of the press run.

Both the Grenache and the Chardonnay trials showed that VMB could survive the press process. While the majority of the insects flowed out of the press with the must, some number always remained on the cluster parts. Regardless of whether under the artificial conditions of the mesh bags (which prevented insects from following the must stream) or on loose clusters shoveled from the press, live VMB crawlers remained in the discarded pomace.

Pomace infested with VMB could be a source of contamination for wineries or growers who traditionally spread pomace directly in the vineyard or stockpile unmanaged piles of pomace at the edge of a vineyard block.

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FIGURE 2: Individually pressed clusters were placed on sticky cards to count vine mealybug crawlers that became trapped in the stickum.

SURVIVAL IN UNMANAGED POMACE PILES

After pressing, it is common for wineries to create piles of pomace in a designated area. Traditionally, in the weeks that follow or in the spring after winter rainfall, the material is spread in vineyard rows or composted on-site. To evaluate how long the insects could live in piles of pomace from whole-cluster press loads, we placed infested rachises (with an average of 1,211 insects per rachis or leaf stem) inside mesh bags and then inserted the bags at two depths inside each of eight pomace piles (FIGURE 3).

Pile dimensions were approximately 12 to 16 feet in diameter and four feet high. Data loggers recorded temperatures in 15-minute intervals in all piles at both depths. Four replications of two treatments—covered with clear plastic and uncovered—were evaluated, and bagged rachises were removed over a four-week period to determine insect survival over time.

Significant VMB mortality resulted when pomace piles were covered with clear plastic for one week as compared to uncovered piles, regardless of whether the piles were "stemmy" (consisting of mostly stems) or if they were composed of primarily skins and seeds (TABLE 2). In the covered piles, percent vine mealybug reduction after one week was nearly 100 percent, regardless of the depth of the mesh bag in the pile or the proportion of stems present.

Diurnal temperature fluctuations occurred inside uncovered piles, especially the stemmy pile. Temperature in a covered stemmy pile fluctuated almost daily between 70° and 130°F. Temperatures in covered piles of mostly skins with few stems rose in the first several days to 100°F and then slowly increased to between 120° to 130°F, with little fluctuation in the remaining four weeks.

WASTE MANAGEMENT TO PREVENT CONTAMINATION

Winery waste should be placed in piles located away from vine rows then securely covered in plastic. Waste piles of predominantly stems ought to be avoided, if possible, because the temperatures generated inside such piles, if uncovered, are relatively low and thus allow greater survival of VMB.

Mixing stems generated from a destemmer with more dense material, such as pomace from whole-cluster press loads or press loads from mechanically harvested vineyards, will help to increase the temperature and decrease VMB survival. Although we did not evaluate the survival of vine mealybug in composted pomace, standard practices for successful compost production include maintaining temperatures of 130° to 140°F throughout the material volume, thus VMB survival would be extremely low.

The logistics of covering winery waste with clear plastic as soon as possible after the waste is generated can be challenging for many wineries. A lack of space to store and manage waste away from grapevines is the most critical problem. Cleaning equipment may also be challenging: tractors, bins and front loaders used to transport and handle pomace should be washed with a high-pressure sprayer to prevent contamination when moved to other locations.

Reducing the means of spread of VMB is in the best interest of both growers and wineries. This will no doubt result in changing practices for everyone trying to ensure their vines remain uninfested with VMB. **wbm**

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TABLE 2 **Percent reduction of Vine mealybug per stem in covered and uncovered pomace piles after one to four weeks.**

	Pile composition	Mesh bag position inside pile	percent reduction from control average of 1,211 VMB/stem: Week 1	Week 2	Week 3	Week 4
Uncovered piles	Mostly stems	Top	67.6	76.1	52.4	89.4
		Bottom	60.7	68.1	72.9	87.5
	Mostly skins/seeds (few stems)	Top	99.9	99.9	>99.9	>99.9
		Bottom	99.9	>99.9	99.9	100
Covered piles	Mostly stems	Top	>99.9	>99.9	100	100
		Bottom	100	99.9	>99.9	100
	Mostly skins/seeds (few stems)	Top	100	>99.9	>99.9	100
		Bottom	>99.9	99.9	99.9	>99.9

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FIGURE 3: Pomace piles made from whole-cluster press loads were covered with clear plastic or remained uncovered to evaluate vine mealybug survival.