Control of Grape Mealybug using Carbon Dioxide and Sulfur Dioxide

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Grape mealybug is one of four pests of concern for export of California table grapes to Australia. While three of the four pests are controlled by treatment with 45% carbon dioxide for 13 days at 2°C (36°F), grape mealybug (*Pseudococcus maritimus*) has been difficult to control with any controlled atmosphere treatments at low temperatures. These results are in contrast to results with other species of mealybugs, which have been reported to be controlled by moderate controlled atmosphere conditions.

Table grapes are routinely treated with sulfur dioxide for control of postharvest decay. Sulfur dioxide has been shown to have some insect control activity. Carbon dioxide has been shown to enhance the activity of other fumigants, such as methyl bromide. In fact, a combination treatment with 6% carbon dioxide and 1% sulfur dioxide was developed by Harry Shorey at UCRiverside for control of black widow spiders on table grapes.

In our work with grape mealybug, we determined mortality of mealybug crawlers after a 30 minute exposure at 20°C (68°F) to various concentrations of sulfur dioxide. Mortality was 18, 73 and 100% following exposure to 0.25, 0.50, and 0.75% sulfur dioxide. (The legal limit for application of sulfur dioxide is 1%.) When the sulfur dioxide treatment was followed by 12 days of cold storage at 2°C (36°F), mortality increased to 82 and 100% following sulfur dioxide exposures of 0.25 and 0.50%. When the 30 minute sulfur dioxide exposure (0.25 to 0.50%) was followed by a controlled atmosphere treatment of 12 days at 45% carbon dioxide at 2°C (36°F), mortality increased to 93 to 96%. Mortality following 12 days of exposure to 45% carbon dioxide only was 36%.

Addition of carbon dioxide just prior to the sulfur dioxide treatment increased mortality significantly and allowed a lower concentration of sulfur dioxide to be used. There was no difference in mortality between 10 and 20% carbon dioxide; however, higher concentrations of carbon dioxide (up to 80%) reduced grape mealybug mortality. Lower levels of carbon dioxide will be tested to determine the lower limit necessary for maximum enhancement of mortality.

Early work with various lifestages of grape mealybug indicated that the eggs were the most resistant lifestage, followed by crawlers; and that adults were easiest to kill. Additional work on eggs and adults is underway to determine their response to these treatments.