Research in Plain English

Control of Sour Rot via Chemical and Canopy Management Techniques

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Summary by Raquel Kallas


Sour rot on a cluster. Photo by M. Hall

Background. Sour rot is a disease that results from the interaction of yeast, acetic acid bacteria, and fruit flies within an injured grape berry. Fruit flies are a key player in this disease, as symptoms do not develop without them. Yeast and acetic acid bacteria have been found both in and on the grape berries and in the guts and on the bodies of fruit flies. Sour rot commonly occurs in grape growing regions where it rains in the late season and where tight-clustered varieties are commonly grown, like New York, Ontario, Tasmania. Tight clusters are predisposed to separation of the berry from the pedicel, which can cause the skins to split and create ideal conditions for yeast and bacteria to flourish.

One can see and distinctly smell the symptoms of sour rot. The berries become soft, with oozing pulp and light brown skin. The aromas of acetic acid (vinegar) and sometimes ethyl acetate (similar smell to nail polish remover) will be apparent, and fruit flies are usually present.

Experiments. The trials in Geneva, NY lasted 4 years, from 2013 – 2016. In 2014, a hailstorm damaged the fruit at veraison, and the data was excluded. The cultivar selected was Vignoles, an interspecific hybrid known for compact clusters and a tendency to get *Botrytis* and sour rot infections. Two separate experiments were conducted, one addressed chemical control, and the other on sour rot severity in two different training systems.

1. *Chemical Control Experiment*: This trial took place in a cane-pruned vertical shoot-positioned (VSP) vineyard. Other disease pressures (black rot, Phomopsis, powdery mildew, *Botrytis*, and grape berry moth) were managed conventionally. Various insecticide and anti-microbial treatments were applied beginning at three different times and frequencies: 1) weekly treatments starting when berries reached an average of 15 °Brix; 2) one treatment at 15 °Brix only; and 3) weekly treatments starting after symptom development. Treatments included insecticide only, antimicrobial only, and insecticide + antimicrobial (sprayed together). The control vines were untreated. The materials used, rates, and timings of spray applications varied across the years, while volume and pressure using a hooded-boom sprayer was consistent at 935 L/ha and 2096 kPa.

- Insecticides: spinetoram (Delegate WG) in 2013, and zeta-cypermethin (Mustang Maxx) in 2015 and 2016
- Antimicrobials: potassium metabisulfite (KMS) (please note that KMS is not registered for use as an antimicrobial in vineyards in the U.S.), copper hydroxide (Kocide 3000), banda de Lupinus albus doce “BLAD” polypeptide (Fracture), and peroxyacetic acid (OxiDate 2.0)

2. *Canopy Management Control Experiment*: Two training systems were compared: High wire cordon (HWC) versus vertical shoot positioning (VSP), with no canopy manipulations (e.g., no hedging or leaf pulling). Canopy densities were measured using enhanced point quadrat analysis (EPQA) and ultrasound sensor methods. As in the first experiment, disease was managed with conventional chemical practices, but this experiment was not managed to protect specifically against sour rot.

Results of the Chemical Control Experiment. Across all 3 years, significant control (64%) of sour rot was achieved when insecticide + antimicrobials were applied weekly after fruit reached 15 °Brix, before symptoms appeared.

- In 2013, the insecticide + antimicrobial treatment reduced disease severity by 31 – 55% compared to control vines.
- In 2015, disease severity on control vines was double that observed in 2013. The “insecticide + antimicrobial” treatment proved to be more effective under high disease pressure, reducing disease severity by 79 – 87%.
- In 2016, disease severity was comparable to 2015. The “insecticide only” treatment reduced disease severity by about 50%, while the “insecticide +

antimicrobial" treatment reduced disease severity by about 66%, compared to the control.


Sour rot on a cluster. Photo by M. Hall

Overall, the study found that insecticides alone were better at controlling sour rot than antimicrobials alone, which were not reliable when applied by themselves. Additionally, starting chemical applications before the onset of symptoms improved the treatments' efficacy. Insecticides + antimicrobials applied before symptoms appeared provided the best protection. It should be noted that the experimental plot was located within a larger block of grapes that were not protected against sour rot pathogens.

Therefore, the authors commented that in a commercial setting, where the whole block would be treated against sour rot, there would presumably be little to no adjacent disease reservoir. *This means that a spray program initiated after symptoms appear might have more success in controlling sour rot than it did in this experiment.* In fact, the authors observed a vineyard in Branchport, NY, where the progression of sour rot was halted (albeit at 30% severity) by a single spray of an insecticide + antimicrobial (zeta-cypermethrin and KMS*, in this case) applied one week before harvest.

Fruit fly species were also quantified, to better understand species abundance and their role in vectoring sour rot. The common fruit fly/vinegar fly, *D. melanogaster*, made up the vast majority of the fly population sampled (13 – 25 *D. melanogaster* flies in a 25 berry sample), while the invasive spotted wing drosophila (SWD), *D. suzukii*, was much less abundant (less than 1 *D. suzukii* per 25 berry sample). At least under the conditions of this experiment, SWD was less abundant than common fruit flies, and therefore, not the main cause of the disease symptoms.

Results of the Canopy Management Control Experiment. Sour rot severity was significantly higher in the HWC training system compared to VSP in all years of the experiment. The HWC canopy was denser than the VSP canopy between the vineyard floor and the fruiting zone. The authors inferred that the HWC system, which creates a thick umbrella of vegetation over the fruiting zone and down to the vineyard floor, may promote a canopy microclimate that is more conducive to microbial or fruit fly development than the VSP system, but more investigation is needed to test this observation.

Conclusion and practical considerations. The best control of sour rot was achieved in these trials by applying an insecticide + antimicrobial at 15° Brix, then every week thereafter until harvest. In years with high late-season disease pressure, results from this treatment can be even more pronounced. Training system affected the severity of sour rot, with HWC-trained vines showing significantly higher disease severity than VSP-trained vines. The effect of delaying treatment after 15 °Brix and observation of sour rot symptoms has yet to be investigated. It is conceivable that a commercial vineyard applying sour rot control treatments to the whole vineyard may be able to hold off treatment until after first symptoms appear, and then maintain reasonably good control of the disease using an insecticide + antimicrobial treatment.

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