

Evaluation of a berry cuticle supplement to reduce cluster rots in vineyards

A progress report to the New York Wine & Grape Foundation

Co-Principal Investigators

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Objective: Evaluate the effectiveness of a proprietary oil/wax formulation, HydroShield, in reducing *Botrytis* bunch rot and sour rot and in improving berry skin firmness.

Materials and methods

On Long Island and in the Finger Lakes, plots were established to assess differences between untreated and HydroShield treated berries. A series of treatments were established to examine any differences in timing of applications and the number of applications of the material. A total of six treatments, plus an unsprayed control, were established as follows:

Treatment	Timing of treatments
1	Pea-sized berries
2	14 days after Treatment 1
3	Pre-veraison
4	Treatment 1 + Treatment 2
5	Treatment 2 + Treatment 3
6	Treatment 1 + Treatment 2 + Treatment 3
7	Unsprayed control

Disease incidence and severity was evaluated when berries reached harvest maturity, by examining a set number of clusters per replication and visually estimating the percentage of the cluster affected by *Botrytis* and/or sour rot. The incidence of each disease was calculated from these data based on percentage of clusters showing severity values greater than zero.

Berry firmness was assessed as an indicator of the berries' ability to resist cracking and egg-laying by fruit flies, and was measured using a digital penetrometer (Agricultural Solutions model FHP-801 Fruit Firmness Tester). This model was recommended for soft fruit including grapes. In 2019, this unit functioned poorly due to a large tip which tended to smash berries rather than penetrate the skin. In 2020, this tip was modified using an 18-gauge 1¼" wire brad with its tip flattened, which was attached to the instrument. This punctured skin as opposed to smashing the berry. However, results may not accurately represent kg/cm². Ratings should therefore be considered as comparisons. The challenge for

2021 is finding a more accurate but affordable pressure testing unit. The Long Island Grape Research Advisory Committee has agreed to fund this.

Long Island: Plots were established in the LIHREC Sauvignon Blanc (18 panels, replicated plots) and Pinot Noir (3 panels, treatments not replicated). Vines were trained to a VSP system and were leaf pulled by hand to maintain airflow through the cluster zone. Sprays were directed at the cluster zone with a CO2 backpack sprayer using ~ 90 GPA water, 40 psi, 3 passes/side. HydroShield was applied @ 0.5% v/v solution using the treatments below.

Finger Lakes

Plots were established at the FLGP’s Teaching & Demonstration Vineyard on Seneca Lake. The trial was conducted on Riesling, a cultivar known for its susceptibility to cluster rots. Vines were trained using a VSP system, and had leaves pulled from the fruit zone to mimic commercial practices. We established four replicates of each treatment listed above, and collected data from two interior vines within each panel. The material was applied with a battery-powered backpack sprayer to the fruit zone, at a concentration of 0.5% by volume.

Results - Long Island

The Sauvignon Blanc had very minor amounts of sour rot, thus only penetrometer readings were done. On the eastern side of the trellis, 5 berries were selected from the exposed side of the cluster. Five clusters/vine and 2 vines/treatment were evaluated for a total of 300 berries/treatment. While the results were not statistically significant, once again in 2020, differences between treated and untreated berries were detected from a sensory standpoint. Treated berries were much firmer. Therefore, the results below may reflect the unsuitability of this particular penetrometer for this experiment.

Table 1. Penetrometer ratings, LIHREC Sauvignon Blanc, Sept. 28, 2020

Treatment	Treatment timing	Pressure ¹ (kgf/cm ²)
1	Pea size	1.70
2	14 days later	1.95
3	Pre-veraison	1.94
4	Pea size + 14 days	1.70
5	14 days + pre-veraison	1.88
7	untreated	2.06

1 – Values are not significantly different at p=0.05.

In Pinot Noir, the treatments were not replicated. Rot ratings reflect sour rot only, there was no *Botrytis*. On the eastern side of the trellis, 5 berries were selected from the exposed side of the cluster. Five clusters/vine and 2 vines/treatment were evaluated with the penetrometer for a total of 50 berries/treatment. The single spray regimen appeared to have lower ratings compared to two and three sprays. . In addition, the berries in T3 were noticeably more difficult to remove from the cluster rachis. Sour rot was evaluated on 36 clusters/treatment. The results suggest decreasing sour rot with an increasing number of sprays. It could also reflect a higher efficacy with later spray timings. Unfortunately, an untreated replicate was not included in these demonstration plots.

Table 2. Penetrometer and sour rot ratings, LIHREC Pinot Noir, Sept. 21, 2020

Treatment	Timing	Pressure (kgf/cm ²)	Sour rot	
			Incidence (%)	Severity (%)
1	Pea size	1.87	73.68	10.0
2	Pea size + 14 days	2.11	66.67	8.14
3	Pea size + 14 days + pre-veraison	2.12	58.33	4.87

Results – Finger Lakes

We did not see any significant differences in *Botrytis* or sour rot incidence (percentage of clusters with any level of infection) or sour rot severity (the amount of infection per cluster), but we did see some difference in botrytis severity between some of the treatments (Table 3). As shown by the data, there was very little to no disease pressure to favor the development of botrytis or sour rot symptoms this past season, so these results need to be understood in that context.

Table 3. Incidence and severity of botrytis and sour rot symptoms in Riesling, FLX Teaching & Demonstration Vineyard, October 6, 2020.

Treatment	Botrytis Incidence (%)	Botrytis Severity* (%)	Sour Rot Incidence (%)	Sour Rot Severity (%)
1	10.6	1.2 ab	2.5	0.1
2	7.5	1.0 ab	3.1	0.2
3	6.9	1.4 ab	2.5	0.1
4 (Trmt 1+2)	3.8	0.2 b	2.5	0.2
5 (Trmt 2+3)	1.3	0.1 b	0.6	0.0
6 (Trmt 1+2+3)	5.6	1.0 ab	1.3	0.2
7	13.8	2.2 a	3.1	0.1

Results followed by the same letter are not statistically different from each other.

Penetrometer data was collected on 4 randomly selected berries from each of 10 clusters from each replicate. Using the same modified penetrometer unit as that used in Long Island, we did find differences between the treatments (Table 2). Some of the results fall in line with our expectations of a thicker, stronger cuticle layer with when more than one application of HydroShield is made. In the Finger Lakes, the two treatments with the highest pressure required to break the skin were the treatments where the material was applied at the two later timings and at all three. However, the unsprayed control was not statistically different from these two treatments either, so these results do not show anything conclusive about improved skin strength. In addition, while the control treatment's skin firmness was relatively higher than other treatments, it also had the highest amount of *Botrytis* incidence and severity. Again, the results from this year's trials need to be considered in the context of a lack of disease pressure, and therefore the presence or absence of disease was primarily due to this rather than any of the treatments we applied.

As we found in 2019, there was a distinct difference (not measured) between the treated and untreated fruit in skin texture when the fruit was chewed in the mouth, regardless of which treatment we tasted, although fruit that was sprayed later in the season seemed to have a chewier texture compared to that sprayed earlier.

Table 4. Penetrometer readings; October 6, 2020

Treatment	Pressure (kgf/cm ²)
1	1.83 c
2	1.93 bc
3	2.15 a
4	1.80 c
5	2.07 ab
6	2.16 a
7	2.01 ab

Conclusion

In 2019, we measured a reduction in *Botrytis* infection incidence and severity in Pinot noir fruit on Long Island. We could not measure differences in skin firmness in any of the cultivars using penetrometers, however we did note that berry skins from clusters treated with HydroShield were significantly tougher when chewed in the mouth. The trial this year was influenced to some extent by the low disease pressure for rot development, especially for sour rot, which is likely a factor in the results that we saw this year.

Results from other trials in Oregon have indicated that HydroShield can reduce fruit fly activity in small fruits, including *Drosophila suzukii*, and therefore improve harvestable yields. While we did not see consistent results with the product this past season, we believe that further investigation over more seasons is needed to determine the potential for this product to be a viable tool for management of cluster rots in Eastern vineyards.

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Appendix

Impact statement: HydroShield, a proprietary oil/wax formulation that purportedly toughens grape berry cuticles, was evaluated for its impact on late season cluster rot and on berry skin firmness. HydroShield reduced Botrytis in two of three plots. From a sensory standpoint, it was apparent that HydroShield toughened the berry skin as it was much harder to bite into the berries.

Publications/Presentations

Suffolk County Agricultural News article, May, 2020 (circ. 330)

Finger Lakes Spring Grape IPM Meeting, May 2020 (attendance: 100)

Summaries were posted to the CCE-Suffolk County Grape Program website (>2400 hits in 2019) – <http://ccesuffolk.org/agriculture/grape-program> - and the Finger Lakes Grape Program website – <http://flgp.cce.cornell.edu>.

Presentations

All presentations were prepared considering results from both regions.

- July 31, 2019 – Plant Science Day, Long Island. 12 growers toured plots.
- Sept. 4, 2019 – LIHREC Vineyard tour, Long Island – 15 growers toured plots.
- Dec. 11, 2019 – Walter-Peterson gave a zoom presentation at CRAVE, Cornell Recent Advances in Viticulture and Enology, 33 attendees.
- December 13, 2019 – Long Island: Walter-Peterson traveled to Long Island for a joint presentation with Wise on the project. It was very well-received by the 24 growers in attendance.
- February 28, 2020 – B.E.V. NY conference – Walter-Peterson presented. Wise was scheduled to travel to Rochester to give a joint presentation but flight was canceled. 175 attendees
- Canceled: April, 2020 Grape Pest Management (LI); LIHREC Plant Science Day, Aug.2020 (presentation and tour/discussion of LIHREC vineyard, respectively)