Grant Report Template

1.0 INSTRUCTIONS

Use this grant report template to communicate progress on your project objectives to the Virginia Wine Board and its administrative agents.

This simplified form focuses attention on the intended and achieved results of the project, including how project results are separately shared with their intended beneficiaries. This report is not the place for a detailed technical discussion of research methodology or results.

- During the proposal stage, applicants complete the first (WHITE) sections to summarize the project's objectives, deliverables, and intended impact plus planned communication to stakeholders.
- At the midpoint of the project (December 1, due December 15), Research and Education grantees complete the center (GRAY) sections to note progress as well as expenditures to date.
- Finally, upon project conclusion (May 31, due June 30), all grantees complete the final (BLUE) sections to describe the project's results and communication, as well as the final expenditures.

2.0 GRANTEE INFORMATION

Project Title	**Maintain fungicide resistance testing capabilities for grape diseases-2025-2026**				
Organization	Virginia Tech				
VWB Proposal #	26-9	Proposal # *(if needed)*	P5UR26EQ	Award # *(if needed)*	

Project Lead		Mailing Address		
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3.0 PROJECT OBJECTIVE, PROGRESS, AND IMPACT

3.1 PROPOSAL (February)

Identify the specific deliverable or result that the project will produce.

Updated and improved information about which fungicides may be losing effectiveness against specific grape diseases, especially:

- Phosphites (downy mildew)
- FRAC Group 7 (boscalid, Endura, Pristine, etc.) (powdery mildew)
- Others, as concerns may arise

Summarize the project objective the result serves, including expected impact.

Alerting growers to types of fungicide resistance that may be developing in Virginia so crop failures can be avoided

Summarize the project's workplan.

- Continue conducting bioassays and tests on samples from recent years
- Collect samples and encourage grower submission.
- Disseminate results through Extension channels (including the Pest Management Guide) and by responding to individual inquiries

List the indicators that will show the project has a) made progress on its workplan, b) achieved its objective, and c) reached its audience.

- Solid conclusion reached on whether clear difference in phosphite sensitivity exist among downy mildew isolates, and sensitivity range quantified
- Solid conclusion reached on whether significant levels of resistance to boscalid (and other group -7 fungicides) exist among powdery mildew isolates
- Communicating the conclusions to at least 100 members of the Virginia industry via Extension outreach
- We will perform at least 50 bioassays on at least 20 grape disease samples from at least 10 different vineyards

3.2 Mid-Year Report (December)—Research and Education Grants only

Provide project indicator status information. Describe project/workplan progress. Include any obstacles the project has encountered and the plan to overcome them.

Downy mildew: Since June 1, three vineyard operations have submitted downy mildew samples, from which we established 9 separate isolates (from different blocks, varieties, and/or geographic locations)**.** One operation reported a spray program that produced a serious concern about Ridomil, which had been used twice, with serious downy mildew developing within a few weeks after those applications. However, all 3 isolates from this operation tested sensitive to Ridomil.

The most common question from the field was about sensitivity to the phosphite fungicides, a group that includes Prophyt, Phostrol, etc. The 2025 isolates produced results similar to those for many isolates collected since 2021: clearly less phosphite sensitivity than pre-2020 isolates, but considerable variability.

Phosphites inhibit the downy mildew pathogen directly, and at the same time stimulate the plant's defense capability, especially in non-stressed plants. Our bioassay can measure the direct effect on the pathogen, but may capture less, and perhaps little or none, of the activated plant defense effect. My "working hypothesis" is that much of the downy mildew population in Virginia has lost sensitivity to the direct effect (with considerable variability), but that the plant defense effect may be unaffected and still of some benefit. Tests of this hypothesis are planned for the coming (greenhouse) growing season once grape leaf production accelerates again.

As in previous years, an outdoor potted-plant spray trial measured the effect of Prophyt spray frequencies (every 7 days, 10-11 days, or 14 days) on downy mildew control and on early-season versus late-season phosphite sensitivity of the downy mildew. Downy mildew

symptoms were clearly recognizable by the presence of sporulation in the control and mancozeb treatments, but much harder to discern in the Prophyt treatments where leaf lesions sported only sparse or no sporulation. Downy mildew samples collected before sprays started, and at the end of the spray season from the weekly Prophyt treatments were stored frozen for later bioassay.

Powdery mildew: No new samples were submitted in 2025. However, tests of 8 previously-collected vineyard samples for boscalid (Endura or Pristine) and Vivando resistance confirmed some of the isolates as resistant to one or the other, and samples from one location as resistant to both. Unfortunately, we also discovered some Vivando resistance in our greenhouse's grape powdery mildew, which will make future research more difficult. The need to have untreated leaves available to maintain and test powdery mildew cultures prevents the simultaneous use of an effective anti-powdery mildew fungicide on all grapes. As an aside, 2025 was also the first year that spotted lanternfly was seen in our campus greenhouse.

Very few new **Botrytis** isolates were obtained this year, but tests continued with 13 isolates collected in previous season from 7 vineyards. The most notable results was a new location with Aprovia resistance.

Problem: Recently, I was told that my current lab on campus will have to move AGAIN (after a previous move in the summer of 2024. This will entail a lot of (unproductive) work this winter.

3.3 Final Report (June)

Compare the project to the objective, workplan, and project indicators. Provide (as a link or attachment) the project deliverable or result. Describe the realized or expected impact of the project.

Downy mildew: solid conclusions on phosphite resistance remain elusive. Clear differences exist among isolates, but results are often inconsistent, where an isolate will be strongly inhibited in one test but not in another. There is considerable variation among grape leaves, even when they appear similar in age and from similar-looking plants. We take that into account when designing tests, and use parts of one leaf for both the treated and untreaded "treatment, but variability remains. It is possible that plant vigor plays a role (difficult to quantify)

Example BV3: 0.3% Prophyt applied, downy mildew growth as percent of that on water-treated control leaf tissue: 81-- 0 – 5 – 47 – 65 – 2 - 100 – 33 – 83 – 7 – 19 (11 tests, average 33%; 100% would mean the treatment didn't work at all).
Sensitive control after 0.3% Prophyt application: usually 0% growth, occasionally a tiny bit of mildew development (~5%)

One small exploratory test was conducted of my "working hypothesis", that downy mildew isolates may have lost sensitivity to a *direct* effect of phosphite on the pathogen, but that an

intact plant may still effectuate *induced resistance*, which should be unaffected and still of some benefit.

On young **detached** leaves treated with 0.3% Prophyt, downy mildew developed …
for the sensitive isolate: 1 of 1 control leaves and 0 of 6 treated leaves
for the "resistant" isolate: 2 of 2 control leaves and 0 of 6 phosphite-treated leaves

On young leaves treated with 0.3% Prophyt while **attached** to plants and inoculated with
the sensitive isolate: 2 of 8 control leaves and 0 of 8 treated leaves
the "resistant" isolate 0 of 4 control leaves but 1 of 10 phosphite-treated leaves

Inoculations for attached and detached leaves are difficult to standardize, and many more tests will be needed before a difference can be confirmed. This will require a large number of rooted cuttings.

Some additional tests of the isolates submitted by growers in 2026 were completed. One vineyard had clear Revus resistance, one was variable in that regard, and samples from the third were sensitive to Revus. All were sensitive to Ridomil, and variable with respect to phosphite reaction, clearly less sensitive than our old-timey standard from many years ago, but still partially inhibited

Powdery mildew: Of the 7 isolates that initially were shown to have clearly reduced sensitivity to boscalid (Endura, and part of Pristine), five lost this property in later tests whereas two have maintained it. Five of the 7 had undergone a molecular test for resistance mutation in the previous year, and three had tested positive while two tested "mixed" Somewhat surprisingly, it was the two "mixed" isolated that retained their reduced sensitivity throughout the period. Similarly, of the six isolates that initially repeatedly showed reduced sensitivity to metrafenone (Vivando), four of them lost this property in later testing while two retained it. The highest label rates of both boscalid and metrafenone still provided considerable, but incomplete, inhibition in many of the tests.

Botrytis: a few additional tests have been conducted. The location with benzovindiflupyr (Aprovia) resistance also had fluopyram (Luna) resistance, and, possibly, resistance to fluxapyroxad (part of Merivon), but the latter needs confirmation by additional tests.

Overall numbers for the fiscal year:
Downy mildew: 15 separate tests, of 21 isolates (of which 9 obtained in 2025, the remainder in previous years)
Powdery mildew: 12 separate tests of 11 isolates from 7 vineyards, all collected in previous years (plus the Virginia Tech greenhouse as mentioned in December)
Botrytis: 13 tests, of 5 samples, from 4 different vineyards

Much of the winter was spent on a lab move and maintenance of cultures. In the spring, the undergraduate student lab workers of the past 3 years graduated, and a new person was hired and is being trained. Grape leaf production since mid-Spring has been poor due to a serious thrips outbreak in our greenhouse sections. The first few insecticide sprays didn't appear to work, so I have started using different ones. Young leaves are needed for both

powdery and downy mildew experiments, and hopefully, leaf production will improve in the next few weeks.

4.0 COMMUNICATION WITH STAKEHOLDERS

4.1 PROPOSAL (February)

Identify the specific audience/s for this project

Virginia grape growers, vineyard managers, and consultants.

Summarize how you will share project information or results with this audience. For example, will you submit for publication in a peer reviewed journal? Present at a technical conference? Conduct a training? Post on a site?

If individual growers, vineyard managers, or consultants provide samples, they will be notified by email of any specific results obtained. The knowledge obtained will be communicated to the general viticulture community through Extension programs and the Virginia Pest Management Guide.

4.2 Mid-Year Report (December)—Research and Education Grants Only

Describe communication with stakeholders to date. Note dates and locations of events or publications, as available/relevant, and cite or estimate the number reached.

I attended all summer Viticulture Extension webinars, and provided a brief presentation on current findings at one, to make sure that something was said about the opportunity to provide grape disease samples for fungicide resistance testing.

Email exchanges with all growers who submitted samples were used to communicate preliminary results.

I also drafted a general summary of the current results and submitted it to Dr. Mizuho Nita, who posted a modified version at https://ext.grapepathology.org/grape-disease-risks-7-2-7-9-2025-downy-mildew-8-day-forecast-and-comments-on-fungicide-resistance

4.3 Final Report (June)

Describe how the technical or material content of the project was or is planned to be shared with stakeholders or beneficiaries, and cite or estimate the number reached. List title, date, type (article, brochure, presentation, or other), purpose, and estimated audience reached. Provide a copy or link if (when) available for inclusion on the virginiawine.org site.

Results have been shared with Dr. Mizuho Nita for incorporation in the Virginia Extension Pest Management Guide as well as his extension programming.

5.0 BUDGET

Budget Summary			Mid-Year Research/Education only		Final	
Expense Category	**5.1 Request**	**5.2 Awarded**	**5.3 Spent**	**5.4 Remaining**	**5.5 Spent**	**5.6** Remaining
Personnel	7,650	7,650	5,379.70	2,270.30	8,474.16	0
Fringe Benefits	250	250	4.61	245.39	15.42	0
Contractual	1,200	1,200	350.39	849.61	988.91	0
Travel	400	400	0	400.00	0	0
Supplies	400	400	403.20	3.20	421.51	0
Equipment (Rental)	0	0	0	0	0	0
Other						
Total	**9,900**	**9,900**	6,137.90	3,762.10	**9,900.00**	