Virginia Wine Board Grant
Year Four (FY25-26)

07/05/2026
Project Lead: Emily Hodson
Organization: Winemaker's Research Exchange- Grape Breeding Program (ViRV)
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***Title*:** Groundwork for Development and Management of a Virginia Focused Wine Grapevine Breeding Initiative
***Proposal Number*:** 301-23-153
***Project Type*:** X Research ☐ Education ☐ Marketing
Is this a multi-year grant? X Yes ☐ No
If yes, which year does this report address?
This report addresses FY25-26, and is year four of five.

FY25-26 Funding Amount: $249,678.64
Remaining FY25-26 Balance: $0.00

Objectives and Results:

Project Goal: To develop *Vitis vinifera*-style wine grape cultivars adapted to the Mid-Atlantic that combine premium wine quality with durable downy mildew resistance for commercial release within 10–15 years.

Objectives: Define breeding goals precisely, including the highest priority traits and target wine quality. Identify advanced germplasm with downy mildew resistance, preferably introgressed into a high percentage vinifera background, and establish an evaluation/breeding block. Use marker assisted breeding for early selection of seedlings with multiple resistance loci and participatory breeding for evaluation of fruit for wine quality.

These portions of the research project objectives have been reached:

- Guided development of industry-driven breeding goals to be precisely defined and achievable over near term given existing germplasm and DNA markers.
- Defined the breeding goals precisely, including the highest priority traits, including examples of existing varieties with the desired quality characteristics.
- Identified advanced germplasm with downy mildew resistance, introgressed into a high percentage vinifera background, and established an evaluation/breeding block and nursery block.
- Acquired a partnership with ARS to provide land, infrastructure, greenhouses, growth chambers and resources necessary for the genotyping, phenotyping and evaluation of breeding lines for the project.
- Made crosses to generate seeds representing modified BC2 (Backcross Two-second generation backcross to vinifera) and BC3, targeting commercial fruit quality in BC3 or BC4.
- Improved efficiencies with the acquisition of a phytopathobot robot.
- Implemented streamlined field evaluation by installing QR codes to each individual cross in the experimental vineyard.

These objectives are ongoing:

- Made crosses to generate seed representing modified BC4 (Backcross Four-fourth generation backcross to vinifera) and BC4, targeting commercial fruit quality in BC3 or BC4. Current BC3 should produce fruit for evaluation in FY26-27.
- Use a combination of DNA markers and phenotypic selection to eliminate undesirable seedlings that lack either the desired resistance alleles or necessary viticultural characteristics.
- Share improved germplasm among Agricultural Resource Services breeding and research programs.
- Seed selection for fourth generation of crossings (BC4)
- Phase 4 planting of fourth generation of crosses (BC4)

These objectives have not yet been completed due to the long term nature of this project:

- Select two to four varieties to be patented and licensed
- File invention disclosures for two to four varieties selected by the Winemaker's Research Exchange.
- Establish multi-location replicated plantings of elite breeding lines and evaluate viticultural characteristics and fruit quality, including microvinification for wine quality evaluation.

Key Takeaways and Accomplishments:

- This project is progressing as planned despite significant internal USDA challenges.
- Expecting first crop in FY26-27 and are currently planning single vine fruit sampling protocols.
- Initial development and pursuit of Federal funding for a MidAtlantic Grapevine Improvement center at the Appalachian Fruit Research Station (AFRS-ARS) to sustain the initiative.

Overall Benefit for Virginia Wine Industry:

No other grape breeding program in the U.S. is developing vinifera-style wine grapes with resistance to downy mildew, nor other humid-climate diseases of economic importance to the Mid-Atlantic. ARS-Parlier, ARS-Geneva, and VitisGen partners have developed resistant germplasm with initial backcross generations into *V. vinifera* tracked by DNA markers, and have elucidated the genetic basis of host resistance via Quantitative Trait Locus (QTL) mapping and genome editing. AFRS-ARS and the Virginia Wine Board share a long-term interest in studying the genetics of downy mildew resistance in germplasm. Thus, this project is designed to make rapid and targeted progress for the Virginia wine industry.

The goal of this program is to develop two to four new grape varieties appropriate for Virginia and the Mid-Atlantic. A successful variety would be one with high vinifera parentage (> 90%) that correlates to high wine quality and consumer acceptance. Its genetic makeup would also offer resistance to the primary challenges of our regions, specifically the fungal pathogen Downy Mildew. These regional "brand name" grape varieties will gain popularity as competitive pricing and high wine quality will allow the industry to grow and evolve steadily, while minimizing environmental impacts.

Results: Downy Resistance Progress

Between 2023 and 2026, the breeding program produced 31,686 novel seeds, resulting in 13,909 disease-resistant seedlings advanced for evaluation, with 2026 resistant seedling totals pending. Seed production increased substantially in 2025 and 2026, reflecting continued expansion of the breeding program and increased crossing capacity. These seedlings are also further tested genetically (genotyped) and in the field for symptoms (phenotyped) for downy as well as powdery and black rot resistance.

Year	Novel Seeds	Resistant Seedlings
2023	6,837	5,428
2024	4,526	3,250
2025	10,042	5,231
2026	10,281	tbd
Total	**31,686**	**13,909**

***Publications and Activities Associated with Project*:**
Project results were disseminated through scientific presentations, industry outreach, and collaborative meetings with research and stakeholder groups throughout the reporting period. Research updates were presented at the USDA-ARS Field Day, the Virginia Vineyards Association, the USDA Appalachian Fruit Research Station (AFRS) Focus Group Meeting, the Eastern Winery Exposition, and the Virginia Wineries Association Technical Meeting, providing opportunities to communicate breeding progress to researchers, growers, and industry professionals.

Project personnel also participated in the USDA workshop held in conjunction with the Agricultural Outlook Forum and attended the UC Davis symposium, *The Vines of the 22nd Century*, which focused on emerging advances in grape genetics and future breeding strategies for the U.S. grape industry. In recognition of the program's expertise, Ben Jordan is currently an industry advisor to the Vitis Gen3 project and Emily Hodson was invited to serve as an industry advisor to the Vitis GEM (Genetics, Environment, Management) initiative, further strengthening collaboration between public research and industry stakeholders.

A manuscript evaluating Blackbird germplasm for resistance to powdery mildew and downy mildew was submitted for publication and is currently under peer review. Planned presentations by Dr. Sapkota were limited during the reporting period due to the federal government shutdown.

Collectively, the project generated four Virginia Wine Board presentations, nine additional research and industry outreach activities, participation in two national scientific meetings, and one published industry article. In-person presentations reached an estimated 750 growers, winemakers, researchers, and industry stakeholders, with substantially broader engagement achieved through published and online communications.

Presentations to the Virginia Wine Board
August 5th, 2025 VWB Update 8.5.25
December 4th, 2025 VWB Update 12.4.25
April 1st, 2026 VWB Update 04.01.26
May 13th, 2026 VWB Update 05.13.26

Final FY25-26 Budget and Justification:

Item Type	Original Awarded Amount	Amended Awarded Amount (12/12/23)	Final Amount Spent
Personnel	[$0.00]		[$0.00]
Fringe	[$0.00]		[$0.00]
Travel	[$0.00]		[$0.00]
Supplies & Materials	[$0.00]		[$0.00]
Contractual	$209,407.46	$249,678.64	$249,678.64
Other	[$0.00]		[$0.00]
Total	$209,407.46	$249,678.64	$249,678.64*

The original budget is in line with the final five year CRADA budget as the payments were made quarterly to the USDA to fulfill the terms of the CRADA. Due to the fact that the final invoice for this fiscal year (25-26) listed as payment #16 is dated June 3 of 2026 and has a 90 day payment term, the last payment for FY 25-26 of $62,419.66 is out of cycle with the fiscal year. In August of 2026 this payment will be submitted, making the final amount spent *$249,678.64

Detailed Progress Updates:

Second Quarter 2025 (April to June)

- Manuscript submitted on Blackbird imaging for powdery and downy mildew
- Attended and presented our program at the Maryland Grape Growers meeting. High level of concern about grape disease management when some fungicides are not available anymore
- Finished paperwork and obtained a vehicle for field and outside travel
- Seed germination of last year's crosses for planting in third quarter
- Image annotations from the data collected in the vineyard using Phytopathobot (PPB) robot with a new focus on Black rot
- Starting a second manuscript

Third Quarter 2025 (July to September)

- Crossing: very important year to move resistant alleles in the research vineyard forward to next generation
- Pollen Collection Location: AFRS, Walsh Family Vineyard, Finger Lakes Teaching Vineyard-Anthony Road in Geneva, NY (Flowering timing)
- Parents: Petit Manseng, Petit Verdot, Cabernet Franc, Tannat, Chardonnay
- Duration: May 16th, 2025 to June 17th, 2025 (~month)
- Crosses: ~90 crosses' total (our largest number in program history)
- Shifting personnel during cross season was challenging, but the back up plan was successful
- Remaining alleles/resistance sources that we could not accommodate this year will be included next year
- Black rot and weeds are becoming major issues

Fourth Quarter 2025 (October to December)

- Government Shutdown

First Quarter 2026 (Jan-April)

- Met with Dr. Nora Lapitan (USDA Deputy Administrator, National Program Staff Crop Production & Protection) and Tim Reinhart (Specialty Crop National Program Leader).
- First Quarter Board meeting (March 10)
- Attended USDA workshop in conjunction with the Ag Outlook Forum which showcases USDA resources, services and technology across all agencies
- Highlighted the idea of the ARS being a hub of pest and disease management in tandem with grape breeding work which was appealing to USDA leadership. Encouraged to use SLF language moving forward
- Presented ViRV at the USDA-AFRS focus group meeting
- Planning crosses for Spring of 2026
- Germinating over ten thousand seeds from crosses completed last year. There are 40 new family crosses in these seedlings. Starting to evaluate downy, and powdery resistance in these seedlings for evaluation for planting in the vineyard or nursery in 2026

Second Quarter 2026 (April to June)

- Met withTim Reinhart (USDA Specialty Crop National Program Leader).
- Second Quarter Board meeting (May 12)
- Highlighted the idea of the ARS being a hub of pest and disease management in tandem with grape breeding work which was appealing to USDA leadership. Encouraged to include SLF language moving forward

- Presented ViRV at the USDA-AFRS focus group meeting
- Frost on April 21st will impact crossing season timing and possibly reduce crop