

Virginia Wine Board 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 final expenditures.

2.0 GRANTEE INFORMATION

Project Title		Harvest Maturity and Postharvest Storage of Southern Apples for Cider Production			
Organization		Virginia Tech, Department of Food Science & Technology			
VWB Proposal #	26-39	Proposal #	PVUCGGZ5	Award # (if needed)	PVUCGGZ5
Project Lead		Mailing Address		Research	◇
Name	Amanda Stewart	1230 SW Washington St. 401F		Education	◇
Title	Associate Professor, Dept. of Food Science & Technology	Dept. of Food Science & Technology Blacksburg, VA 24060		Marketing	◇
Email	Amanda.stewart@vt.edu			Recurring?	◇
Phone	540-231-0868			Continuing?	◇
				Year	_ of _

3.0 PROJECT OBJECTIVE, PROGRESS, AND IMPACT

3.1 PROPOSAL (February)

Identify the specific deliverable or result that the project will produce. (1-2 sentences or bullets; Narrative section I.b.)

This project will tell us the extent to which harvest maturity (i.e. fruit maturity at 3 harvest intervals around the range of typical commercial maturity as defined by growers selling to the cider industry and cidemakers), and postharvest storage (control – no storage, short- and long- duration at cold and cool temperatures, conditions relevant to storage for cider fruit in Virginia) affect juice and cider chemistry, and the sensory characteristics of cider for a set of 4-6 apple cultivars relevant to Virginia's cider industry.

Summarize the project objective the result serves, including expected impact. (1-3 sentences or bullets; Narrative section I.a and II.a.)

The problem is that the cider industry (in Virginia and internationally) lacks research-based information on the extent to which harvest maturity and postharvest storage affect juice and cider quality. Virginia cidemakers agree that these factors likely have a significant impact on cider quality and the logistics and economics of cider production, and that the effects of harvest maturity and postharvest storage differ dramatically

among varieties used in cider production. **The objective of this project is to evaluate the effects of harvest maturity and postharvest storage of apples used in cidermaking in Virginia on the chemical and sensory properties of juice and cider.**

Summarize the project's workplan. (1-5 sentences or bullets; Narrative section III.b.)

- Define 4-6 varieties for investigation, identify grower/collaborators, define work plan and schedule for implementation of harvest maturity and postharvest storage treatments
- Implement harvest maturity and postharvest storage treatments
- Determination of juice chemistry
- Press fruit and make experimental ciders resulting from the treatments
- Determination of cider chemistry and cider sensory evaluation
- Data analysis, prepare manuscript for peer-reviewed journal
- Present findings to stakeholder audience in Virginia (e.g. Virginia Cider Association)

List the indicators that will show the project has a) made progress on its workplan, b) achieved its objective, and c) reached its audience. (1-5 sentences or bullets; Narrative section III.c.)

Key indicators for progress on the workplan would be implementation of the steps outlined in the objectives listed above, and in Figures 1 and 2 in the proposal. The apple harvest will occur between September to November 2025, depending on the varieties and the growing season conditions, and the storage, pressing, and fermentation to produce experimental ciders will follow. We will have succeeded in our overall objectives when we have completed the work outlined in Figures 1 and 2, and have communicated our findings to key stakeholders in Virginia in appropriate stakeholder-organized venues (e.g. VCA, WRE Cider events, CINA, CiderCon). We estimate that this dissemination will reach a total of 50 stakeholders in the VA apple and/or cider industry through 3 in-person communication opportunities at the venues listed above. We anticipate that communications will be conducted primarily through technical presentations to stakeholder audiences, but may also include small group or one-to-one discussions between the research team and stakeholders where more appropriate.

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.

We are making good progress toward completion of our work plan. We worked with three orchards in Virginia to source the fruit for this project: Silver Creek and Seaman's Orchard (Ruth Saunders), Glaize Apples (David Glaize), and Fruit Hill (Diane Kearns). We are sincerely grateful for the support and collaboration of these growers during such a difficult year for apples in Virginia. The crop load was much lower than usual for apples this year in Virginia due to spring frost damage resulting in significant crop loss. Despite this challenging situation, these grower-collaborators worked with us to identify varieties that would still be available AND be relevant to our research questions regarding postharvest storage and harvest maturity of apples for cider production. The modified plan we proceeded with, using fruit that was available this year, is described here:

Postharvest storage study: This part of the project required more fruit, due to the need to store an adequate sample size for different durations and under different conditions for each cultivar in the study. Our partner for this part of the project, David Glaize, suggested that we use 2 cultivars that were available in sufficient quantity this year, and are also used for cider production (Golden Delicious and Granny Smith) under both tree-run and packing house call conditions. Due to low apple prices in recent years, some growers have actually pulled fruit from the packing house to be pressed for cider or other processing applications, and questions arise as to how this affects cider quality. The packing house call fruit has been subjected to waxing and packing in plastic bags inside bushel boxes, whereas the tree-run fruit was stored directly from the tree into large storage bins, then transferred bulk to bushel boxes for our experiment. Typically cider fruit is tree-run. We are storing each of the 4 conditions (2

cultivars x packing house call and 2 cultivars x tree-run) at both 18°C and 4°C for 1 month and for 4 months after receiving them here at Virginia Tech Dept. of Food Science. We received each shortly after harvest. So far, we have pressed the 1 month storage conditions and are currently fermenting them. We are seeing some interesting differences in juice chemistry, color, and aroma. We will continue to conduct juice and cider chemistry analyses, and will conduct sensory evaluation of the bottled ciders in the spring, likely in March.

Harvest Maturity Study: The same challenges due to low crop yield for many varieties this year were evident as we worked to source fruit for this study. We were able to identify 4 cultivars relevant for cidermaking for this study from Silver Creek & Seamans' Orchard and from Fruit Hill, as follows: Pink Lady, Enterprise, York, and GoldRush. These were all harvested at an early and normal date, and then we also received a third, late harvest condition for Pink Lady and GoldRush. Unfortunately, we were only able to collect two harvest dates for Enterprise and York (early- and mid/normal-harvest). These samples were all pressed shortly after harvest and fermented. Early harvest conditions have been bottled, and then the mid- to late-harvest are still in progress. We are measuring juice and cider chemistry parameters for these, and will conduct sensory evaluation of these also in the spring, likely in March as well.

On the whole, we are on track to complete the project on time, and we believe that the modifications to the work plan due to the low crop yield in 2025 were appropriate and that we will still be able to address stakeholder needs in this area of research, although via a slightly different approach than originally planned.

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.

We were able to complete this project as planned. Experimental ciders were made from all planned treatments, with the changes described in the mid-year report. Data collection for the sensory evaluation of all experimental ciders (harvest maturity experiment and postharvest storage experiment) via descriptive analysis by a trained panel is complete, and data visualization and analysis are in progress, to be completed by mid-August 2026. The same graduate student who led this project is continuing in our lab group and will complete the data analysis and prepare a manuscript for publication during Summer/Fall 2026. Chemistry outcomes have been monitored as planned and chemistry data collection for juice and ciders is complete with the exception of the individual sugar measurement by UPLC-MS, which will be completed by August 2026.

The main things we have learned from this project are:

- For all varieties evaluated, sugar increased and acid decreased with increasingly fruit maturity, as expected, although the magnitude of the change was less than expected, potentially offering growers a wider harvest window for cider production.
- Changes in polyphenol content and primary amino nitrogen (PAN, essentially this is the same as YAN for apples which have little to no NH₃⁺) were more variable across the varieties evaluated. For these parameters, it is not safe to assume that they will consistently increase or decrease with fruit maturation. This inconsistency in the increase/decrease of YAN during ripening has been observed for YAN in wine grapes as well, and remains a topic of current research in both cider and wine production.
- Virginia cider apple growers are committed to supporting this research, and made a tremendous effort to provide samples for evaluation even in a difficult crop year.

4.0 COMMUNICATION WITH STAKEHOLDERS

4.1 PROPOSAL (February)

Identify the specific audience/s for this project. (1-2 sentences or bullets; Narrative section II.b.)

Our stakeholders are (1) Virginia cider producers, with and without orchards, (2) Virginia apple growers supplying the cider industry, (3) the national and international cider industry.

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?. (1-3 sentences or bullets; Narrative section II.b.)

We will communicate our findings (preliminary and final) to these stakeholders through presentations in appropriate cider industry venues, in Virginia, and to national/international audiences also attended by Virginia industry members (e.g. VCA, CINA, CiderCon), an open-access peer-reviewed publication, and other written formats as appropriate and useful to stakeholders (e.g. webpage or blog post of short report, Extension publication, CINA course materials, handouts/pdf's for Virginia Cider Association meetings, and other materials or formats as appropriate/useful). Our goal is to be sure that our findings are published in peer-reviewed journal articles and to also make sure that the stakeholders in the cider industry have access to this information in a format that is free to download/view, and easy to understand and apply.

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.

In July 2025, Dr. Stewart and two grad students from our group, Valeria Araujo and Olivia Vowell, attended the Virginia Cidermakers Association meeting at Albemarle Ciderworks in North Garden, VA. We presented work from the 2024 project that the VA Wine Board funded in our lab group (Southern Apples for Cider Production: Variety Evaluation), along with ciders from the project for sensory evaluation. We received very positive feedback on the project and the experimental ciders, and are working to continue this project.

At the same meeting we, talked with Diane Kearns of Fruit Hill to plan for the 2025 harvest maturity project. This was not easy to plan due to low crop yield and uncertainty about even the small quantities needed for this project (3 – 12 bushels per variety/condition), but we were at least able to establish a working plan and open the line of communication.

We were in touch with David Glaize in July, August, and then weekly from September through mid-November, working to organize enough fruit for the Postharvest Storage experiment.

Dr. Stewart also serves on the CiderCon 2026 organizing committee, and is working with Dr. Greg Peck at Cornell and Brigid O'Keane of the Cider Institute to plan a 75-min session on nitrogen and cider fermentation for CiderCon 2026 (Feb 2-4, Providence, RI). Dr. Stewart will present to an audience of ~100 (est.) cider industry stakeholders at this venue. Dr. Stewart will also be presenting on cider production at the North Carolina Winegrowers meeting in Feb. 2026 in Winston Salem, NC.

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.

Following the outreach plan, and the activities described in the mid-year report, we continued to share updates from this project and others in our lab group at relevant cider industry meetings. Specifically, we presented our work at Cider Con in Providence, RI, (Feb. 2-4, 2026). Two graduate students from our lab group (Olivia Vowell and Valeria Araujo) presented cider research projects funded by the VA Wine Board over the past 3 years, including a progress update on this project. The students were given the opportunity to present research posters, and to present short oral presentations to an audience of cider producers, researchers, and industry stakeholders. This presentation was well-attended, with around 100 people joining this session to learn about cider research.

The success of this session has in part ensured that CiderCon will continue to provide a venue for cider research presentations at their conference. Research funded by the VA Wine Board has been central to the technical program of CiderCon for over 10 years now, and we are committed to continue to represent the VA Cider Industry and research community at this increasingly international meeting. We then presented our work at the Virginia Cider Association meeting to an audience of ~30 VA cider industry stakeholders at Blue Bee Cider in Richmond, VA on Apr. 13, 2026. Finally, Valeria Araujo is also going to present this work as a poster at the upcoming Institute of Food Technologists IFT FIRST meeting in Chicago, IL (July 13-15, 2026).

5.0 BUDGET

Budget Summary			Mid-Year Research/Education only		Final	
Expense Category	5.1 Request	5.2 Awarded (Amended 8/12/2025)	5.3 Spent	5.4 Remaining	5.5 Spent	5.6 Remaining
Personnel	36,978	28,489.48	12,498.57	15,990.01	28,296.08	193.40
Fringe Benefits	11,072	2,459.52	934.92	1,524.60	2,404.08	55.44
Contractual	1,950	1,950	560.95	1,389.05	600.07	1,349.93
Travel	2,000	2,000	377.39	1,622.61	2,104.74	-104.74
Supplies	7,800	7,800	5,920.53	1,879.47	9,292.52	-1,492.52
Equipment (Rental)	n/a	n/a			n/a	n/a
Other	n/a	17,098	8,174.00	8,924	17,098.00	0
Total	\$59,800	\$59,797	\$28,466.36	\$31,329.74	\$59,795.49	\$1.51