Pennsylvania Wine Market & Research Promotion Program

Progress Report

A financial status report and a project performance report will be required on a semi-annual basis. October and April reports are due. A final report may serve as the last semi-annual report due 30 days after completion of the contract. Grantees shall monitor performance to ensure that time schedules are being met and projected goals by time periods are being accomplished. Please submit reports to: RA-AGCommodities@pa.gov.

SECTION 1 – SUMMARY INFORMATION

Date of Report: June 7, 2021

Contract/PO#: 63019430 Fiscal Year: 2020-2021 Round of Grant: (i.e. Round 1, Round 2, etc) 4

Title of Paper: Defining regional typicity of Grüner Veltliner wines (Year 2)

Organization: The Pennsylvania State University

Project Coordinator: Michela Centinari, Associate Professor of Viticulture

Organization Address: 110 Technology Center

City/State/Zip: University Park, A, 16802-7000

Business Phone: 814-867-0514 Cell Phone: N/A

Email: mzc22@psu.edu

Progress Report: ☐ October ☐ April

☒ Final

Area of Focus: ☒ Research

☐ Marketing

SECTION 2 –OBJECTIVES | TIMELINES | OUTCOMES | BUDGET

(A comparison of actual accomplishments to the objectives for that period?)

The overarching goal of this multi-year study is to characterize the environmental, viticultural, and sensory factors that drive typicity of Grüner Veltliner across the Commonwealth, and to develop marketing strategies that best appeal to current and potential Grüner V. wine consumers. Our specific **objectives** are **1:** Conduct a multi-site study to identify the relationships among viticultural variables, grapevine physiology, environmental conditions, and volatile and non-volatile flavor compounds in Grüner V. wines; **2:** Characterize wines made from PA-grown Grüner V. through basic wine chemistry, sensory and compositional analyses, including volatile and non-volatile flavor profiling; and **3:** Provide marketers, retailers, and intermediaries with profiles of consumers who are likely to purchase and consume Grüner V. wines.

Timeline: October 17, 2020, to April 7, 2021.

Objectives 1 and 2. During the reporting period all data collected during the first two years of this project, which include this funding cycle, were analyzed and published in a peer-reviewed journal. The article "*Influence of Region on Sensory and Chemical Profiles of Pennsylvania Grüner Veltliner Wines*" is available online (https://doi.org/10.3390/foods10040825). In addition, Seasonal weather data collected in 2020 at nine Grüner V. grower cooperators across the Commonwealth were downloaded and compiled to calculate parameters such as seasonal growing degree days, cumulative solar radiation, and seasonal rainfall. Last, fruit samples were processed and analyzed for fruit carbon isotopic composition, which is an indicator of vine water status. This data will help us understand if the vine water status varied across the nine experimental sites. Fruit and wine chemistry data of the 2020 vintage were included in the April 2021 progress report (contract/PO # 44209075) and won't be discussed here.

Objective 3. A second internet survey was conducted in March 2021 to investigate further consumer interest in purchasing Pennsylvania Grüner Veltliner wine. Approximately half of the 702 survey participants either drank or were familiar with the wine, and the other half were unfamiliar with the varietal.

Outcomes:

Objcectives1 and 2: Results summarized in the above-listed manuscript indicated that differences in aroma, taste, mouthfeel, and in-mouth flavor existed between the wines when compared to each other as well as between wines from different growing regions. Sensory differences were also found for wines within the same growing region, specifically those located at the same commercial vineyard, suggesting mesoclimatic and soil factors might contribute to differences in wine sensory and chemical properties. All the significantly different wine attributes, with the exception of floral and canned vegetable aromas, also showed significant differences by region for the 2019 vintage (this funding cycle; Table 1). Weather conditions like heat accumulation (GDD) and rainfall for the entire growing season and the ripening period showed consistent associations with sensory and instrumental measures, namely thiol aroma and thiol flavor. Associations were either positive or negative based on the compound analyzed (please see publication for detailed information).

As the first study to examine Pennsylvania Grüner Veltliner wines sensorially, results revealed sensory characteristics that can be useful for wineries and their tasting room staff in marketing these lesser-known white wines to wine consumers as the variety grows in popularity in the state. While these results are encouraging there are other important factors, both cultural and environmental, that

may be contributing to regional differences that were not included in this initial analysis (2018-2019 vintages), but they are currently analyzed.

Here, we included a table showing variation in weather conditions across the nine experimental sites in 2020 (**Table 2**). Some regional weather groupings were observed: vineyards located in Southeast PA were overall warmer than those located in Northeast or Northwest PA, but at the same time they had higher rainfall. Overall, the north Central PA experimental site was the warmest site with relatively low rain. Data analysis for the whole study period, 2018- 2020 vintages (contract/PO # 44209075), is ongoing . Our 3-year extensive weather, vine nutrition and production dataset will allow us to evaluate which and how weather and cultural parameters drive specific flavor and aroma in Grüner Veltilner wines made from grape growing across the Commonwealth. This information will be disseminated through a second peer-reviewed manuscript, extension presentations and article for Pennsylvanian grape growers and winemakers, including targeted production guidelines for producing high-quality Grüner Veltliner wines.

Objective 3. While data analysis is still ongoing, a series of ordinal logistic regressions were run to determine the effect that variables (e.g., generation, wine consumption frequency, responses to Likert scales, including the ability to select a good white wine and wine purchase regret) have on interest in tasting Pennsylvania Grüner V. wine. There are positive correlations between interest in tasting the wine and participants' level of a) ability to select a good quality white wine; b) regret the experience when purchasing a bottle of wine; c) variety of wines they consume (i.e., how adventurous they are); and d) subjective knowledge. Additional analysis will include cluster analysis to segment participants based on demographic characteristics, attitudes, and behaviors, which will allow the researchers to describe "likely buyers" who reside in the Commonwealth and surrounding states. Two separate manuscripts are in draft form, one based on data collected in 2019 and the other based on the presented data. Manuscripts will be submitted to a peer-reviewed journal, and data will be the basis of extension articles for Pennsylvania stakeholders, including actionable plans for growers to implement.

Budget: Financial reporting is provided by the Department of Research Accounting at PSU in accordance with the terms of the grant agreement.

SECTION 3 – SCOPE OF WORK

(Reasons why established objectives were not met, if applicable?)

NA

SECTION 4 – DELAYS/RISKS

(Reasons for any problems, delays, or adverse conditions which will affect attainment of overall program objectives, prevent meeting time schedules or objectives, or preclude the attainment of particular objectives during established time periods. This disclosure shall be accomplished by a statement of the action taken or planned to resolve the situation?)

There were no major problems with data collection or analysis and no effect on the overall progress of the program objectives. However, laboratory work took longer than anticipated because of COVID-19 safety regulations and travel to meetings and conferences was eliminated, resulting in unspent funds. Furthermore, the PhD student working on the project (Andrew Harner) was supported by departmental funds in fall 2020, which resulted in unspent salary funds for the student.

SECTION 5 – SPECIAL NOTES

(What objectives and timetables are established for the next reporting period? Etc.)

NA; this is a final report.

Table 1. Significant differences between regions for 2019 wines analyzed during this funding cycle. Attributes that end in F indicate in-mouth flavor, A indicate aroma, T indicate taste, and MF indicate mouthfeel attributes.

Region[a]	Yellow Color	Haziness	Green Apple_F	Citrus_F	Thiol_F
NC	2.44a[b]	2.90ab	3.39a	2.30a	1.15a
NW	4.28c	3.13b	4.01b	3.51b	1.30a
SE	3.50b	2.10a	3.73ab	2.86a	1.76b
Region	**Thiol_A**	**Sour_T**	**Sweet_T**	**Salty_T**	**Astringent_MF**
NC	1.36a	3.69a	3.67c	1.29a	3.83a
NW	1.73a	5.09c	2.36a	1.70b	4.76b
SE	2.37b	4.32b	2.98b	1.50ab	4.39ab

[a] North Central region (NC), Northwest (NW), Southeast region (SE)
[b]Values that share the same letter within column are not significantly different according to Tukey's post-hoc comparison ($p < 0.05$).

Table 2. Weather data measured for the nine Grüner Veltliner vineyards during growing season (April 1 to commercial harvest) and berry ripening period (veraison-to-harvest) in 2020.

Year	Site[a]	GDD	GDD_v[b]	Rainfall (mm)	$Rainfall_v$[c] (mm)
2020	SE1	1644	386	538.4	166.1
	SE2	1722	465	718.3	168.4
	SE3	1654	463	887.8	186.2
	SE4	1544	429	941.2	178.4
	SE5	1651	389	NA	NA
	NC1	1762	435	404.4	63.2
	NE1	1399	336	346.1	34.7
	NW1	1453	385	499.2	41.8
	NW2	1429	371	415.3	34.5

[a] North Central region (NC), Northeast (NE), Northwest (NW), and Southeast (SE) regions
[b] GDD_v = Veraison-to-harvest GDD.
[c]$Rainfall_v$ = Veraison-to-harvest rainfall.