NYWGF RESEARCH - FINAL REPORT

Funding for fiscal year: April 1st, 2024 – March 31st 2025

SECTION 1:

Project title: Evaluation of Cabernet Franc Clone and Rootstock Viticulture and Wine Attributes suitable for the Hudson Valley AVA.

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New Research ☐ **Continued Research** ☒

Amount Funded **$** 30,000

SECTION 2:

Project Summary Impact Statement:

This project seeks to continue the research started in 2019 to investigate the different viticulture attributes of different Cabernet Franc clone-rootstock combinations. Furthermore, this work intends to evaluate wine characteristics from the Cabernet Franc clone-rootstock combinations. The expected outcome of this work is to determine which clone-rootstock combinations for Cabernet Franc excel in the Hudson Valley AVA, both in the vineyard and the winery. The results from this research will allow growers to make an informed decision about which clones and rootstocks to use when developing a new vineyard.

Objectives:
The objectives of this proposed research would be to continue the evaluation of all clone–rootstock combinations to characterize the phenological development, vigor potential, and crop load of different clone-rootstock combinations. Additionally, this project aims to provide insight into the potential wine quality of different clones by measuring berry composition and size. Lastly, this project will evaluate the cold hardiness of different clones during dormancy.

The prospective information gained from this study will contribute to the larger body of literature by defining the growth characteristics of clones where information is limited. This will also give growers crucial information to help them make informed decisions while planting a new vineyard.

Materials & Methods:

A 0.66-acre Cabernet Franc clonal and rootstock trial was planted in 2018. The trial was developed with a spacing of 1.83 m x 2.74 m (6 ft x 9 ft) and was trained using a vertical shoot positioned (VSP) training system. The trial included four Cabernet Franc clones (clone FPS 01, FPS 11, FPS 13.1, and 623) on three rootstocks (3309C, 101-14 Mgt, and Riparia Gloire). Clones were selected for suitability to the cool climate found in the Hudson Valley region, and rootstocks were selected based on what is commonly used by the New York wine industry.

Viticulture assessment:
This trial reached full production in 2021, when initial data would have been collected. Due to changes in staff, data was collected in 2021 and the latter half of 2023. This trial will be evaluated to account for vintage variation and data collected through the 2026 growing season; however, this proposal is only for the 2024 fiscal year. The data to be collected from this trial included:

- Phenological Growth Stages (Budbreak, 50% bloom, berry set, pea-size berries, version, and harvest) Stages will be recorded in accordance with the modified E-L system (Coombe 1995).
- Disease incidence and severity (black rot and botrytis) will be estimated at harvest if present.
- Yield parameters, including cluster count, average cluster weight, and total yield.
- Berry size (100-berry sample) and berry composition (TSS, pH, TA)
- Cold Hardiness, this will be evaluated using an environmental chamber.
- Dormant season pruning weight will be recorded in the following year's spring.

Wine assessment:

Fruit harvested from this trial will be made into wine for further analysis using a standardized winemaking process for red wine. Fruit will be made into unfinished wines at the Cornell Teaching Winery in Geneva, NY, following standard winemaking processes. A standard juice analysis will measure total soluble solids, pH, titratable acidity, and nitrogen content. Post-fermentation, phenolic compounds, and malic acid will also be analyzed. Finished wines will be subject to a blind wine tasting by Cabernet franc Coalition members.

Results/Outcomes/Next Steps:

RESULTS
During the 2024 growing season, defined as April 1st to October 31st, the vineyard accumulated 3277 growing degree days (base 50 ˚F) and received 21.01 inches of precipitation. Phenological data were collected at critical development stages, including bud break, bloom, and véraison. There were no significant differences observed between the clones, rootstocks, or their combinations.

Bud break, calculated using the modified E.L. system, occurred on May 3rd. Bloom, defined as 50% cap fall, was observed on June 7th. Similarly, véraison, indicated by 50% color, was reached on August 21st. The research project was harvested on September 30th due to concerns about declining fruit quality resulting from bird feeding damage.

At harvest, yield and cluster counts were collected per panel. There were no differences between clones, rootstocks, or clone-rootstock combinations for yield. The average yield (kg/m) for clones 01, 11, 13.1, and 623 was 0.83, 0.73, 0.61, and 0.61, respectively. Vines grafted to RIP had an average yield of 0.71 kg/m with vines grafted to 3309C and 101-14 Mgt having on average 0.70 and 0.69 kg/m, respectively. Clones 13.1 and 623 had fewer clusters, with an average of 91 and 84 clusters/panel, respectively; compared to clone 11 with an average of 130 clusters per panel. There were no differences between rootstocks or between clone-rootstock combinations. Average cluster weights were calculated from the yield and cluster counts and reported in grams. Clone 11 had smaller clusters than clone 01, with clusters weighing on average 40.12 grams and 56.9 grams, respectively.

A sub-sample of five clusters from each panel was collected at harvest for berry analysis. Berry metrics, including berry weight, TSS, pH, and TA were collected using these samples. The average berry weights varied among different rootstocks, with vines grafted to RIPG producing the highest average berry weight of 1.31 grams per berry. In comparison, vines grafted to 3309C and 101-14 Mgt had average berry weights of 1.19 and 1.23 grams, respectively. Additionally, there were differences in berry weights among clones; clone 11 had a lower average berry weight of 1.14 grams, while clones 01 and 13 had average weights of 1.29 and 1.32 grams, respectively. The combination of clone and rootstock did not influence berry weight. In terms of TSS levels, the only difference observed was between clone 11 and clone 01, with clone 11 measuring 21.7 TSS, while clone 01 measured 20.9 TSS. There were no differences in TSS levels among the rootstocks, which ranged from 21.3 to 21.4 TSS. There were no differences in pH between clones, rootstocks, or any combination of the two. The research vineyard had an average harvest pH of 3.40. The only observed difference in titratable acidity (TA) was between clones 01, 13.1, and 11. Clone 11 had lower TA, with an average of 0.69 g/L compared to clones 01 and 13.1, which on average had 0.76 and 0.77 g/L, respectively.

A portion of the leftover fruit not used for sub-samples was sent to Cornell Teaching Wine in Geneva for analysis. The fruit was organized by clone for the winemaking process, using the yeast strain GRE for all clones. Measurements were taken after crushing, before malic acid fermentation, and after malic acid fermentation. The results of the wine analysis are shown in Table 1.

The vegetative vigor of the clones and rootstocks was evaluated through pruning wood and cane weights. Pruning wood weights were collected using a digital hanging scale. Clones did not affect pruning weight; however, rootstocks did. Vines grafted to 101-14 Mgt had lower pruning weights than vines grafted to 3309C, with an average of 0.23 kg/m compared to 0.28 kg/m, respectively. Across all clones, the average pruning weight was 0.26 kg/m. Cane weights were calculated by taking the pruning weights collected and dividing them by the shoot counts recorded during the dormant season. Notably, clone 11 exhibited lighter cane weights, averaging 33.6 grams, compared to clone 13.1, which had an average cane weight of 42.0 grams. No differences were observed among the rootstocks, with the average cane weight across all rootstocks being 38.7 grams.

During the dormant season, monthly readings of cold hardiness were collected for all clones grafted onto the 101-14 Mgt rootstock from November through February. Due to logistical limitations, it was decided to assess the cold hardiness of the clones on only this rootstock. There were no noticeable differences between the clones within each sampling date; however, there were variations between sampling dates. Cold hardiness monitoring began in November 2024 with the average critical temperature for injury starting at -15.40 ˚C across all clones. The lowest critical temperature for injury observed was -23.40 ˚C in late December.

OUTCOMES

The 2024 vintage was ideal for grape production in the Hudson Valley AVA. While great for industry, this potentially limited the variations between clones and/or rootstocks that would otherwise be observed during growing seasons with more plant stressors. We did observe that clone 11 had the most differences compared to the other clones. Some of these variations observed in cluster counts, cluster weights, berry weights, and cane weights could be partially due to clone 11 being overcropped compared to the other clones. No crop thinning was conducted during this project to measure the reproductive capacity of the clones. The limited variation in yield between different clones and rootstocks may be misleading. This is likely due to bird feeding damage, despite the project being netted promptly, as well as severe black rot infections caused by high inoculum levels from previous years. Bird feeding was severe enough that no measurable yield could be found in 8% of panels. The incident of black rot was widespread throughout the vineyard, a result of previous years of neglect. The decision was made not to measure the severity of the black rot infections due to time restraints and the value of the information gathered versus the time it would have required.

Due to the presence of damaged fruit and the potential loss in fruit quality, the decision was made to harvest the trial earlier than originally planned. This early harvest directly affected the total soluble solids (TSS), pH, and titratable acidity (TA), potentially leading to a lack of variation between the clones and rootstocks in the berry chemistry analysis. Additionally, the presence of damaged fruit would impact the wine analysis, particularly the pH levels prior to malic acid fermentation.

We did see variations between vines grafted onto 101-14 Mgt vs 3309C in both berry weights and pruning weights. This suggests that vines grafted onto 101-14 Mgt will allocate more resources to reproductive development compared to vines grafted to 3309C, devoting more resources towards vegetative growth. More data is needed to confirm this potential relationship.

Next Steps

Should this project be selected for funding, the objectives of this project for the 2025-2026 season will remain the same: to assess the viticulture characteristics of the clones, rootstocks, and clone-rootstock interactions. In addition to evaluating the wine characteristics of each clone.

Technology Transfer Plan:

Results from this project will be distributed to the grape growing industry through monthly newsletters sent out to the Eastern New York Commercial Horticultural Program's (ENYCHP) grape list serv. Results from each previous season will be presented to the Cabernet franc Coalition during the blind tasting. Additionally, awareness of this project and its findings will be promoted through the ENYCHP quarterly reports, the ENY viticulture social media accounts, and periodically during the weekly updates in the Véraison to Harvest newsletter and accompanying podcast.

Attachments: Figure 1 Cold Hardiness, Table 1 Wine analysis

SECTION 3:

Project summary and objectives:

This project aims to continue research started in 2019 on the viticulture attributes of various Cabernet Franc clone-rootstock combinations and evaluate their impact on wine characteristics. The goal is to identify the best-performing combinations in the Hudson Valley AVA, aiding growers in making informed decisions for new vineyards.

Key objectives include assessing phenological development, vigor potential, and crop load of the combinations, as well as measuring berry composition and size to gauge potential wine quality. Additionally, the project will evaluate the cold hardiness of different clones during dormancy.

The findings will enhance existing literature on clone characteristics and provide growers with essential insights for vineyard planting decisions.

Importance of research to the NY wine industry:

Cabernet franc accounts for 638 acres of vineyards in New York State, according to the 2024 NYWGF Vineyard Survey, and is the most planted red *Vitis vinifera* in New York. However, there is limited information available on the performance of different Cabernet franc clones, and even less information is available on the cold hardiness of different Cabernet franc clones, a characteristic that is critical to the longevity of a vineyard, depending on the site. This research will provide results that could be directly applicable to New York vineyards.

Project Results/next steps:

During the 2024 growing season, defined as April 1st to October 31st, the vineyard accumulated 3277 growing degree days (base 50 ˚F) and received 21.01 inches of precipitation. Phenological data were collected at critical development stages, including bud break, bloom, and véraison. There were no significant differences observed between the clones, rootstocks, or their combinations.

Due to bird feeding pressure, the project was harvested on September 30th. At harvest, there were no differences between clones, rootstocks, or clone-rootstock combinations for yield.

The average yield (lb/vine) for clones 01, 11, 13.1, and 623 was 3.44, 2.93, 2.5, and 2.55, respectively. Vines grafted to RIP had an average yield of 2.92 lbs/vine, with vines grafted to 3309C and 101-14 Mgt having an average of 2.88 and 2.85 lbs/vine, respectively. Average cluster weights were calculated and reported in grams. Clone 11 had smaller clusters than clone 01, with clusters weighing on average 40.12 grams and 56.9 grams, respectively. There were no differences between the rootstocks, with the overall average cluster weight for the rootstock being 49.0 grams.

A sub-sample of five clusters from each panel was collected at harvest for berry analysis, measuring metrics such as berry weight, total soluble solids (TSS), pH, and titratable acidity (TA). Vines grafted to the RIPG rootstock produced the heaviest average berries at 1.31 grams, while those on 3309C and 101-14 Mgt had weights of 1.19 and 1.23 grams, respectively. Among clones, clone 11 had the lowest average weight at 1.14 grams, while clones 01 and 13 averaged 1.29 and 1.32 grams.

TSS differences were noted between clone 11 (21.7 TSS) and clone 01 (20.9 TSS), but rootstocks showed no significant variation, ranging from 21.3 to 21.4 TSS. The average harvest pH across the vineyard was 3.40, with no differences among clones or rootstocks. The only notable difference in TA was found between clone 11 (0.69 g/L) and clones 01 (0.76 g/L) and 13.1 (0.77 g/L).

After the harvest fruit was organized by clone, and a portion was sent to the Cornell Teaching Winery to undergo the winemaking process and analysis. Yeast Strain GRE was used for all clones, and measurements were taken after crushing, before malic acid fermentation, and after malic acid fermentation. The results of the wine analysis are shown in Table 1.

We observed that clone 11 exhibited the most significant differences compared to the other clones. Some variations in cluster counts, cluster weights, berry weights, and cane weights may be attributed to clone 11 being overcropped relative to the other clones. No crop thinning was performed during this project to assess the reproductive capacity of the clones. The limited variation in yield among different clones and rootstocks could be misleading, likely due to bird feeding damage. Despite the project being netted promptly, severe issues arose from high inoculum levels of black rot from previous years. In fact, bird feeding was so severe that no measurable yield could be found in 8% of the panels in the vineyard.

The objectives of this project for the 2025-2026 season will remain unchanged: to assess the viticulture characteristics of clones, rootstocks, and clone-rootstock interactions, as well as to evaluate the wine characteristics of each clone.

Supporting attachments: Table 1 Wine analysis

Variety	JUICE ANALYSIS			WINE ANALYSIS: Before Malic Fermentation				WINE ANALYSIS: After Malic Fermentation				Bottling	
	Brix	pH	TA (g/L)	pH	TA (g/L)	Malic (g/L)	Lactic (g/L)	pH	TA (g/L)	Malic (g/L)	Lactic (g/L)	pH	TA (g/L)
Cab Franc Clone 01	20.1	3.16	8.0	3.74	6.7	3.0	1.5	3.94	4.6	nd	3.8	3.67	6.6
Cab Franc Clone 623	20.8	3.27	7.8	3.91	6.8	3.1	1.7	4.07	4.7	nd	4.3	3.90	6.6
Cab Franc Clone 11	21.7	3.24	7.2	3.83	6.6	2.8	1.3	4.01	4.7	nd	3.7	3.80	6.5
Cab Franc Clone 13.1	21.1	3.21	8.7	3.80	7.1	3.2	1.5	3.99	4.9	nd	4.2	3.81	6.7

Table 1: Jucie and Wine analysis of Cabernet franc clones by Cornell Teaching Winery

	11/12/2024	12/12/2024	12/24/2024	2/26/2025
01	-14.96	-20.60	-23.63	-20.98
11	-15.87	-21.09	-22.61	-21.59
13.1	-15.42	-21.77	-23.98	-21.55
623	-15.33	-20.52	-23.38	-20.07

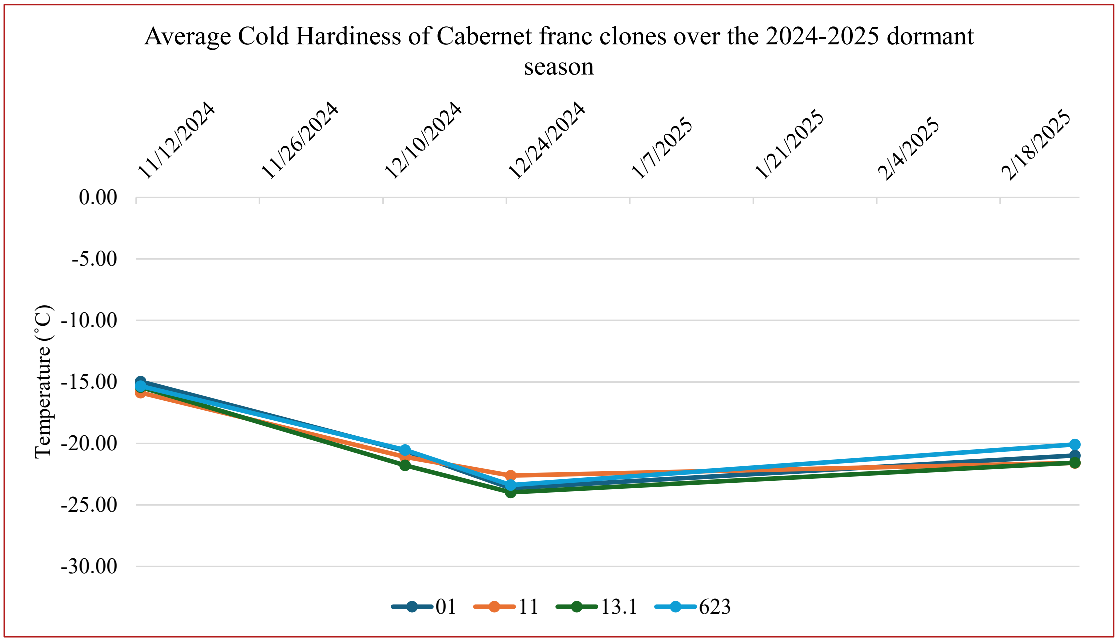

Table 1: Average threshold temperature of Cabernet franc clones at which bud mortaility or bud damage would occur.