Progress Report

Cabernet Franc Clone and Rootstock Selection Suitable for Hudson Valley AVA and Viticultural Techniques for Superior Fruit Quality

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The progress report summarizes accomplishments on the project objective:

- to define the most appropriate Cabernet Franc clones and rootstocks for Hudson River appellation based on results obtained through the clone & rootstock trial.

ACCOMPLISHED STEPS ON THE OBJECTIVE:

Year 2017:

The plot selected for the Cab Franc vineyard was previously used for vine grape variety trial and the removal of that vineyard was carried out during the Fall of 2017.

Purchased equipment: Ultra-Turrax T25 with a saw-tooth dispersing element ($3,196.00), which would be used for the grape sample preparation.

Year 2018:

To complete the site preparation 2 t/acre of garden lime were spread and line subsoiling done to a depth of 0.9 m with finished tillage performed shortly before planting in May 2018.

The planting and posting holes were drilled with 10” auger every 3 or 6 feet apart along the rows. Each panel in a row is 24 feet long with 4 plants within the panel. The vineyard consists of 13 rows with South-North orientation and their length ranges between 168 and 264 feet.

Cabernet Franc clone 1, FPS11, FPS13.1 and 623 grafted on 3309C, 101-14, and Riparia Gloire arrived on May 2nd and were stored in a walk-in cooler at 5°C prior the planting. Roots and grafting union were inspected upon arrival and each plant was labeled and bundled up. Twenty-four hours before planting, roots were soaked in cold water. The planting was carried out from May 11th to May 14th with help of 3 technicians. Previously drilled planting holes were filled with water and handful of garden lime was add to each hole. After that, roots were evenly spread out in a hole and buried

so the grafting union was under the soil surface. Vines were planted in blocks, so the trial was organized as a Complete Randomized Block Design. A day after planting, 150 Ibs of 15-0-30 was spread in the vineyard, which resulted in 24 Ibs of N/acre. Additional watering was included depending on soil moisture status.

Bud break occurred approximately 1 to 2 weeks after planting and at the begging of June all vines were shielded with Blue-X growth tubes with bamboo sticks as a support. The vineyard posts were installed during August using a post pounder mounted on a skid-stir. Newly established vineyard was periodically mowed, while herbicides were applied in the rows 3 times during the season. Fungicide sprays against downy and powdery mildew, Phomopsis and black rot were applied with a backpack sprayer in a 2-weeks schedule. Insecticides against mites and Japanese beetles were applied once in the second half of the season.

The anchor rods 40" x 5/8" with a 6" Helix were drilled at 3 feet distance from the end posts and fruiting wire was installed 3 feet above the ground in the beginning of September. Right after that growth tubes were removed allowing the shoots to harden properly. Two shoots per vine were trained along the fruiting wire to form a double cordon. The remaining two sets of removable catching wires were installed during the winter.

Purchased equipment: ThermoScientific UV-VIS Spectrophotometer Genesys 150 with a sipper unit ($3,016.00), which would be used for the color essays.

Year 2019:

Due to a sequence of events with extremely low winter temperature in the Hudson Valley, the newly plated vineyard started a season with 80% bud damage and a few dead vines. For that reason, we had to re-train survived vines from the base. Vineyard was fertilized in spring with 150 Ibs of 15-0-10 NPK formulation. Following a spray schedule recommended by the 2019 Ney York and Pennsylvania Pest Management Guidelines for Grapes, we sprayed on 10 to 14 days interval against downy and powdery mildew, Phomopsis, black rot, Alternaria, anthracnose, and applied herbicides 2 times during the season. Insecticides for Leafhoppers, Phylloxera, Banded Grape Bug, Grape Berry Moth, Leafhoppers, Japanese Beetles, Cutworms were applied based on scouting. Vines were not harvested since we had to remove all clusters shortly after the fruit set to encourage the new shoot growth.

Purchased equipment: STIHL KM 131 R KombiMotor ($379.95) and STIHL FH-KM (145°) adjustable scythe attachment for the removal of suckers from the HVL vineyard.

Year 2020:

The season started off with the winter pruning, which was completed in the last week of March. After the pruning, we recorded pruning weight and health status of the vines. Since 2018, plants have had an excellent survival rate of 99%. Colone 214 and rootstock 101-14 had the highest pruning weight per plant and clone CF1 and rootstock Riparia had lowest pruning weight.

On May 4, 89%, 82%, 78% and 79% buds of clones CF1, 214, 312, 623 were in budbreak, respectively. Unfortunately, we had frost on May 9 and 14, that killed 91% of the primary shoots. Secondary buds were in the swollen bud stage in the mid May. By 27th of May, over 75% of shoots were in 3-5” stage and on June 23 all clones were in the full bloom.

We started our spray program early in the season, spraying lime-sulfur on March 18 with a backpack sprayer. Then we had to wait for the purchased Rears 50 gallons Pak Blast sprayer to arrive in late May in order to start off the maintenance spray program. From May 29, we kept our spray schedule on 7-10 days interval. The season was drier than usual, so we did not observe high disease pressure. Veraison, occurred in the last week of August, when we put the side nets on the vines. However, just a few days later we observed first bird damaged clusters and the bird pressure was very intense so that by the harvest (Sep 12), we had lost over 50% of the crop.

The highest yielded clone was Clone 1 with 3.4kg of grape per vine. Clone 623 had the fewer clusters per vine. We did not see the rootstock effect on yield. Bunch rot incidence was not significantly different among clones and it was at 6 to 15%. However, bunch rot severity was slightly higher in clone 312 (Table1)

Table 1. Clone and rootstock effect on yield and bunch rot in 2020

Factor		Pruning Weight (g)	Yield per Vine (kg)	Number of Clusters per Vine	Cluster Weight (g)	Number of Berries per Cluster	Bunch Rot Incidence (%)	Bunch Rot Severity (%)
Clone	**CF1**	0.20 b	3.4 a	19.8 a	132.7 a	97.8 b	12.0 a	2.5 ab
	214	0.27 a	2.8 b	20.4 a	132.6 a	104.5 a	9.3 a	2.1 b
	312	0.24 ab	2.8 b	18.1 a	125.5 a	87.8 c	15.8 a	4.1 a
	623	0.23 ab	2.5 b	13.8 b	122.8 a	91.4 bc	6.2 a	1.5 b
	p-statistics	0.0121	0.0004	<.0001	0.4795	<.0001	0.3864	0.0217
Rootstock	**101-14**	0.28 a	2.8 a	18.2 a	119.1 a	90.9 b	13.7 a	2.3 a
	3309	0.24 b	2.8 a	18.4 a	127.7 a	94.6 b	10.2 a	2.5 a
	Riparia	0.16 c	3.0 a	18.8 a	143.5 a	103.7 a	9.1 a	3.3 a
	p-statistics	<.0001	0.4281	0.6211	0.001	<.0001	0.5919	0.4978
Interaction	*p*-statistics	<.0001	0.0001	0.0028	0.0038	0.0011	0.6275	0.2817

Means followed by the same letter are not significantly different at α=0.05 according to Student's t-test.

Samples for basic fruit chemistry were analyzed in the HVRL using HANNA Instruments HI 84532 Titratable Acidity Minititrator and pH meter to measure titratable acidity expressed in g/100mL as tartaric acid and juice pH. Prior the analysis, berry samples in the bags were left at the lab bench to reach room temperature, crashed with hands, and approximately 50 mL of grape juice was collected in centrifuge tubes. Ten mL of juice was used for titration against HI84532-50 low range titrant (sodium hydroxide) until the pH end point at 8.1. The remaining juice was used for soluble solids measured with Atago Pocket Refractometer PAL-1 and pH reading.

Anthocyanins (color) and total phenolics of the grape juice were also analyzed in the HVRL using the protocol described by Iland et al. (2003). The absorbances of the extracted color components were read on UV-Vis spectrophotometer (Genesys 150 with a sipper unit, ThermoScientific) at 520 nm and 280 nm and expressed as mg of anthocyanins per g of berry weight and a.u. of total phenolics per g of berry weight.

Among tested clones, clone 312 had the biggest berries and clone 214 had the smallest berries. Soluble solids and pH were similar between clones. Titratable acidity was higher in clone 1 and 312. Grape juice color was affected by clone and rootstock. The highest content of anthocyanins and phenolics was found in clone 623 and rootstock 101-14 (Table 2).

Table 1. Clone and rootstock effect on berry size and fruit chemistry and color in 2020

Factor		Berry Weight (g)	Soluble Solids (°Brix)	TA (g/100 mL as tartaric acid)	pH	Anthocyanins per gram berry weight (mg)	Total phenolics per gram berry weight (au)
Clone	**CF1**	1.36 b	21.3 a	0.40 a	2.86 a	0.67 c	1.11 c
	214	1.27 c	22.3 a	0.37 b	2.99 a	0.87 a	1.23 b
	312	1.44 a	22.1 a	0.41 a	2.90 a	0.73 b	1.35 a
	623	1.33 bc	22.0 b	0.37 b	2.99 a	0.82 a	1.38 a
	p-statistics	<.0001	<.0001	0.0019	0.0014	<.0001	<.0001
Rootstock	**101-14**	1.32 a	22.0 a	0.38 a	2.92 a	0.81 a	1.34 a
	3309	1.36 a	21.8 a	0.39 a	2.96 a	0.75 ab	1.22 b
	Riparia	1.38 a	22.0 a	0.40 a	2.91 a	0.73 b	1.21 b
	p-statistics	0.0693	0.8011	0.2368	0.2955	0.0359	0.0007
Interaction	*p*-statistics	<.0001	0.0044	0.0007	0.013	<.0001	<.0001

Means followed by the same letter are not significantly different at α=0.05 according to Student's t-test.

After the harvest, we made an agreement with "Whitecliff vineyards and winery", by which they would take our grapes and ferment each clone separately, so we could taste the wine on the Cabernet Franc Coalition Meeting and discuss its quality.

Purchased equipment: Rears 50 gallons Pak Blast with double hinge top deflector and grape scoops ($3,900.00) for application of the maintenance sprays in the HVL vineyard.

LIST OF SIGNIFICANT OUTREACH ACTIVITIES:

The Annual Hudson Valley Cab Franc Coalition Meeting, Benmarl Winery, Marlboro, NY (March 14, 2018). Document and talk delivered to the public: The Research Findings on Viticultural Techniques for MPs Control and Updates on the Cab Franc Vineyard.

The Annual HVRL Industry Meeting, HVRL, Highland, NY (September 7, 2018). Power Point presentation: Introducing New Cab Franc Clone and Rootstock Trial at HVRL.

2019 Hudson Valley Cabernet Franc Barrel + New Release Tasting, Nostrano Vineyards, Milton, NY (May 30, 2019).

Growers and Industry Reporting Session, HVRL, Highland, NY (September 5, 2019). Power Point presentation: Progress Report on New Cab Franc Clone and Rootstock Trial.

2019 CRAVE Conference, Cornell, Plant Science Bldg., Ithaca, NY (December 11, 2019). Power Point presentation: Cabernet Franc Clone and Rootstock Selection Suitable for Hudson River Region AVA and Viticultural Techniques for Superior Fruit Quality.

2019 Apple Forum, HVRL Highland, NY (December 17, 2019). Power Point presentation: Progress Report on New Cab Franc Clone and Rootstock Trial.

2020 Report for Hudson Valley Cabernet Franc Coalition Meeting

The results and information about the project and the progress on Cab Franc Trail can be accessed via HVRL Horticulture – Cornell Blog Service: https://blogs.cornell.edu/hvrlhorticulture/

IMPACT STATEMENT:

The project: 'Cabernet Franc Clone and Rootstock Selection Suitable for Hudson Valley AVA and Viticultural Techniques for Superior Fruit Quality' is intended to support the Hudson Valley Cabernet Franc Coalition in its task to encourage more vineyard plantings of Cabernet Franc in the region. With the complete assessments of clones and rootstocks through this project the Coalition will give complete information and recommendation on the best performing Cab Franc clones for Hudson River Appellation to the potential growers and thus implement its mission.