

Horticulture Research Reports – 2016

TITLE:

Fertility program impacts on fruit chemistry on Concord grape production in Central Michigan. Experiment 16 – P104

Experiment Information:

Planted: 5/29/2010

Harvested: 9/28/16 thru 10/3/16

Yield Goal: 8 tons/acre

Target Fertilizer: Match Yield Goal

Variety: Concord Grapes

Population: 545 vines/acre

Row Width: 10'

Plot Size: 4 Vines (8' between vines)

Replications: 3

Rootstock: Concord

Soil Test Values:

pH: 7.3

CEC: 8.6

%OM: 1.3

Bray P1: 211

Bicarb P: ---

K: 124 ppm

S: 2 ppm

%K: 3.7

%Mg: 21.6

%Ca: 74.4

Zn: 13 ppm

Mn: 5 ppm

B: 0.8 ppm

Objective:

Compare different fertility programs impact on the fruit chemistry of Concord grape vines in Central Michigan.

Materials & Methods:

In the spring of 2010, this research vineyard was established with two rows of concord grapes. The rows were spaced ten feet apart and the in-row spacing for the vines was eight feet. Each plot contained four vines (4 vines x 8 ft.). These vines were established and trained to a High Wire Cordon System. The 2013 season was the first cropping year for this block of grapes. During spring, the vines were all pruned to a proper cropload level based on the 30+10 pruning formula. This pruning formula states that for the first pound of one year old growth material that 30 buds will be left on the vine and that for each additional pound of material that an additional 10 buds are left after prune is finished. For example a vine that produced 2 pounds of pruned material will have 40 buds left on the vine. A vine with 4 pounds will have 60 buds left after pruning. Pesticide applications to provide disease and insect control were applied uniformly across all plots as necessary during the growing season. Spring fertilizer applications were directed at the base of the vines at the time of bud-break. Foliar fertilizer applications were applied to selected plots at full bloom, bunch closure and Veraison utilizing a backpack sprayer. At maturity, all clusters were harvested and weighed for all four vines within each plot. To conduct fruit chemistry measurements, 100 random berries were then selected from each plot to be combined and used for later analysis.

Treatments:

The treatments used in the vineyard were developed to match the nutrient demand of the vineyard based off of the tonnage demand for the vineyard and as the available nutrients in the soil. Below is a table used to calculate the demand of nutrients for the plots in this experiment, this data provided in this table is compiled from various industry, academic, and private institutions.

Grapes Nutrition Requirements*											
	Nitrogen (N)	Phosphorus (P)	Potassium (K)	Calcium (Ca)	Magnesium (Mg)	Manganese (Mn)	Copper (Cu)	Sulfur (S)	Zinc (Zn)	Boron (B)	Iron (Fe)
Removal (lbs./ Tons of Fruit Produced)	2.92	0.56	4.94	1.00	3.2 oz.	-	0.02 oz.	0.08 oz	0.01 oz.	0.02 oz.	0.17 oz.

**Data from IPNI, Washington State University, Michigan State University, Internal Data*

After calculating the amount of nutrients need to produce the crop several experimental treatments were developed for this experiment. Dry fertilizer products were applied to the soil surface under the vines in the spring by hand to allow for equal amount of material spread. Conventional liquid fertilizer was mixed and applied using a rate controlled sprayer that allowed the material to be banded under the vines next to the drip irrigation system. The Agroliquid products were applied in the similar way using the same sprayer. All foliar treatments were applied at three times during the growing season (Fruit set, Bunch closure, and Veraison). This application was made using a backpack air blast sprayer to allow for controlled coverage of specific plots.

TREATMENT NUMBER	PRODUCT NAME	RATE PER ACRE	HOW MATERIAL APPLIED AND TIME
1	28% UAN	12.0 gallons	Banded under the vines in the spring
	10-34-0	12.9 gallons	Banded under the vines in the spring
	Sulfate of Potash (SOP)	100 pounds	Spread under the vines in the spring
	Micro-nutrient Mix	0.1 pound	Spread under the vines in the spring
2	High NRG-N	11 gallons	All products banded under the vines in the spring
	Pro-Germinator	4.2 gallons	
	Sure-K	4.2 gallons	
	Micro-500	1 gallon	
	Microlink Manganese	0.125 gallon	
3	High NRG-N	11 gallons	All products banded under the vines in the spring
	Pro-Germinator	4.2 gallons	
	Sure-K	4.2 gallons	
	Micro-500	1 gallon	
	Microlink Manganese	0.125 gallon	Applied 3 times as a foliar*
	Z-16 (EXPERIMENTIAL)	0.5 gallon	
4	28% UAN	12.0 gallons	Banded under the vines in the spring
	10-34-0	12.9 gallons	Banded under the vines in the spring
	C-15 (EXPERIMENTIAL)	0.5 gallon	Banded under the vines in the spring
	Sulfate of Potash (SOP)	100 pounds	Spread under the vines in the spring
	Micro-nutrient Mix	0.1 pound	Spread under the vines in the spring
5	High NRG-N	11 gallons	All products banded under the vines in the spring
	Pro-Germinator	4.2 gallons	
	Sure-K	4.2 gallons	
	Micro-500	1 gallon	
	Microlink Manganese	0.125 gallon	
	C-15 (EXPERIMENTIAL)	0.5 gallon	
6	High NRG-N	11 gallons	All products banded under the vines in the spring
	Pro-Germinator	4.2 gallons	
	Sure-K	4.2 gallons	
	Micro-500	1 gallon	
	Microlink Manganese	0.125 gallon	Applied 3 times as a foliar*
	GR-14	0.25 gallon	

*See Text for timing descriptions.

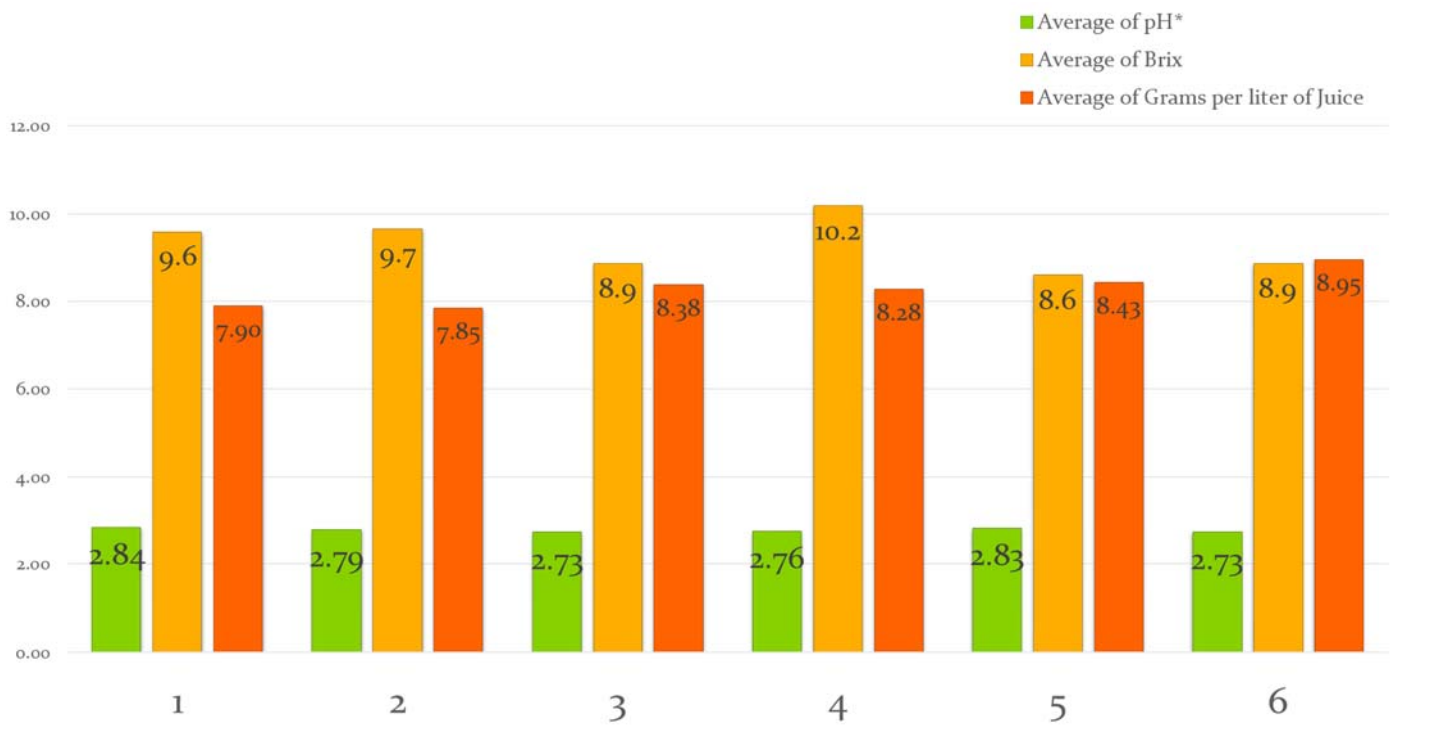
Chemical Analysis Procedures:

At the time of harvest a 100 berry sample was collected from each vine and placed into sealed plastic bags. These samples were kept frozen until chemical analysis could be performed after the completion of harvest. In order to complete chemical analysis the samples were thawed and allowed to return to room temperature before proceeding. The samples were crushed by hand to insure all of the berries inside produced a homogenous juice sample. Approximately 50 milliliters of juice was poured out of each sample bag and was used to conclude sugar content, pH, and amount of Tartaric acid contained in each juice sample. In order to gather the information for each one of these parameters, a standard grape juice testing protocol was followed. The table below shows the average results from each treatment from 2016.

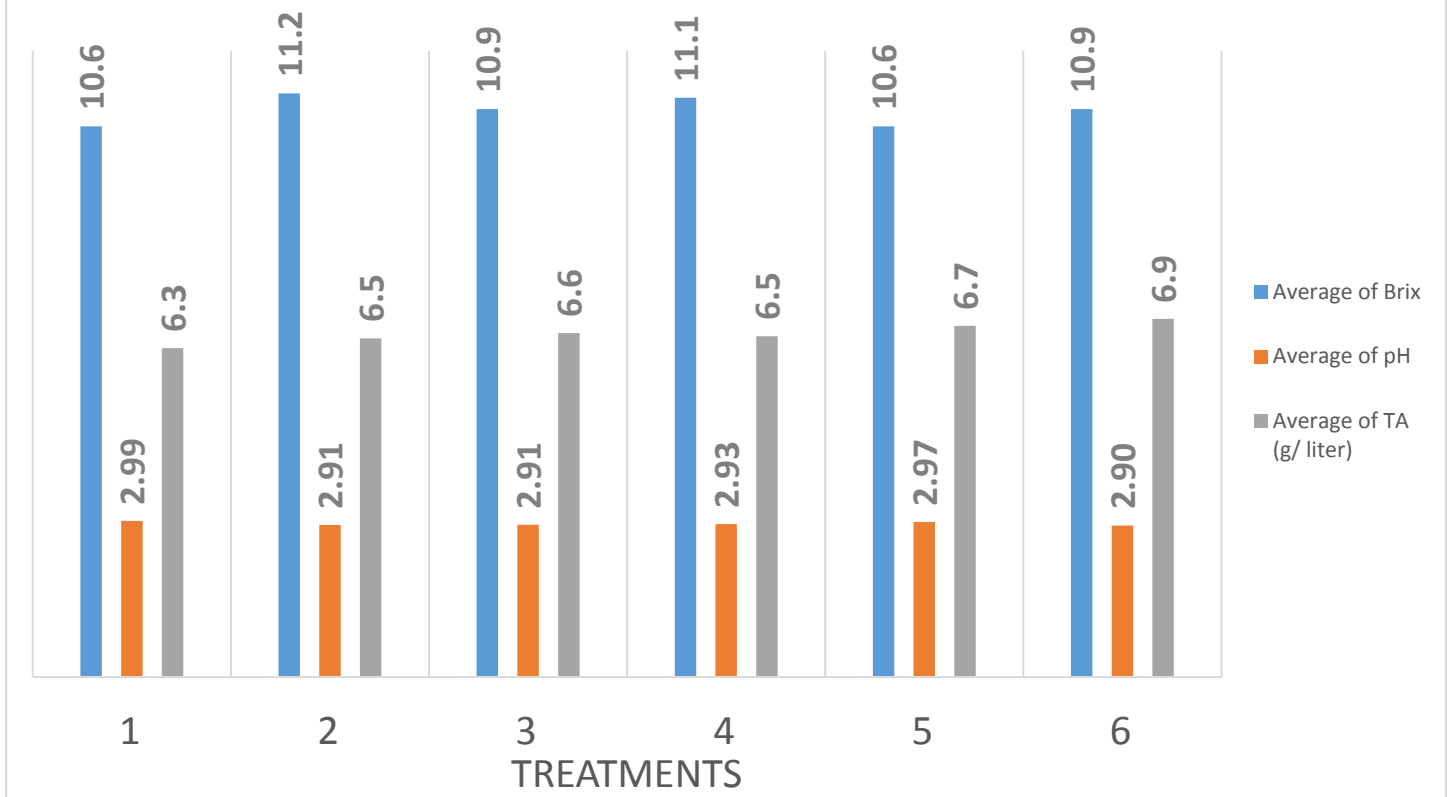
Treatment	Year	Brix	pH	TA (g/ liter)
1	2016	9.6	2.84	7.90
2	2016	9.7	2.79	7.85
3	2016	8.9	2.73	8.38
4	2016	10.2	2.76	8.28
5	2016	8.6	2.83	8.43
6	2016	8.9	2.73	8.95

Results:

Figure1: Average Fruit chemistry by treatment for 2016 growing season (NCRS, 2016)



FRUIT CHEMISTRY OF CONCORD GRAPES FROM 2015 AND 2016 ACROSS TREATMENTS (NCRS, 2016)



Conclusions:

- After two years of observing the impact of the different fertility on fruit chemistry, the use of an Agroliquid fertility program (Treatment2) produces high average total soluble sugars (Brix) as compared to using a conventional fertility program (Treatment 1).
- Between all of the different fertilizer regimes, no statistical difference was observed in the pH of the juice or the amount of titratable acidity (TA) over the past two seasons.
- In all treatments that used a foliar application of fertilizer had improved the amount of total soluble sugars found in the fruit at the time of harvest.
- The results from this study and yield study give substantial evidence that by using Agroliquid products the amount of fruit produced by the vines can be increased without having a negative impact on the fruit chemical analysis.
- In 2016, several of the products used in the vineyard were switched to investigate new products that are potentially beneficial to grapes. Due to the fact that grape bud formation is created during the growing season prior to the year the fruit is produced it is not possible to conclude that the results seen in 2016 are a results of the products applied in 2016. The results in 2017 will be able to conclude if the products applied in 2016 caused the observed effects.

Additional Information:

	2013 Yield	2014 Yield	2015 Yield	2016 Yield	3-Yr Average	4-Yr Average
Conventional	4.15	10.86	6.25	9.70	7.09	7.74
Agroliquid	5.15	11.70	6.30	10.19	7.72	8.34
Agroliquid + (fertiRain) + Z16	5.05	10.70	7.17	10.05	7.64	8.24
Conventional + (Fase2) + C-15	5.27	10.92	6.11	11.73	7.43	8.51
Agroliquid + (Fase2) + C-15	5.00	10.90	7.65	13.50	7.85	9.26
Agroliquid + (PTS) + GR-14	5.19	11.20	8.14	9.91	8.18	8.61

Yield of Research plots calculated to tons per acre for various years. Included are the three year average (2013-2015) and 4 year average (2013-2016).

Charts can be found at [2016 data\Field data 2016.xlsx](#)

Data and charts can be found at [2016 data\Grapes.xlsx](#)