Observations on the Performance of Grape Cultivars in Nova Scotia[1]

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Abstract. **Field trials with grape cultivars, conducted at three locations in the Annapolis-Cornwallis Valley in Nova Scotia, show that the successful growth of wine cultivars is not feasible. While there were differences between locations, apparently lack of sufficient heat units to fully mature the fruit is responsible for the area's unsuitability.**

Grapes have wide climatic adaptability (6) and are grown successfully on a variety of soils (2). At Kentville the long term mean for degree days above a base of 50F is similar to means reported for certain locations in British Columbia where early maturing cultivars are successfully grown (6).

The present study was conducted to obtain factual information, applicable to the Annapolis-Cornwallis Valley area, on the nutritional status of various grape cultivars, their yields, and the quality of juice from their fruits.

In the spring of 1963, 8 to 10 2-year old vines of each of the cultivars Concord, Elvira, Fredonia, Seibel 9549, Van Buren, Delaware, Seibel 5249, Niagara, Buffalo, Seibel 10878 and New York Muscat were planted at each of 3 locations. Two of the locations, Acaciaville and Bear River, are some 70 miles west of Kentville and near the western end of the Annapolis-Cornwallis Valley. Melanson, the third location, is in the Kentville area in the eastern part of the Valley. All sites had a slight slope. The exposure was southern at Acaciaville and Melanson and western at Bear River.

At all locations the vines of each cultivar were randomized in three groups. Planting distances were 10 ft by 10 ft. The vines were trained to the four cane Kniffen system. Pruning was according to the balance system outlined by Bradt (2). When necessary, fungicide sprays were applied to control mildew.

Plant nutrients were supplied by ammonium nitrate, poultry manure and an 8-16-8-8 fertilizer at Melanson and by 6-12-12-4, 8-16-8, and 8-16-8-8 fertilizers at Bear River and Acaciaville (Table 1).

Table 1. Soil treatments applied for grapevines.

Location	Years	N	P	K	Mg	Poultry manure
		oz/vine/year				lb/vine/yr
Melanson	1964-68	6.7				37
	1969	0.64	0.56	0.53	0.39	
Bear River and Acaciaville	1964-65	1.44	1.26	2.39	0.58	
	1966	1.92	1.68	1.59		
	1967-68	0.96	0.84	1.59	0.39	
	1969	0.64	0.56	0.53	0.39	

In 1966 a composite soil sample, representative of the 0-6 inch depth, was taken from non-fertilized areas between the rows at each site. Determinations (1) made included pH, organic matter, exchangeable cations, cation exchange capacity (CEC), and available P as extracted with 0.03 N NH_4F plus 0.1N HCl.

From 1966 to 1969 inclusive plant tissue samples were obtained yearly from three of the more promising cultivars at each location. The samples, taken in July at approximately the end of the bloom period, consisted of petioles from mature leaves adjacent to clusters. Each sample was representative of all vines of one cultivar at one location. The samples were dried at 70C, ground in a Wiley mill and analyzed for total N, P, K., Ca and Mg. Nitrogen was determined by a micro-Kjeldahl procedure. Samples for P, K, Ca and Mg were dry ashed at 550C and taken up in HCl. Phosphorus was determined colorimetrically and K, Ca, and Mg by flame photometry.

At Melanson yields from four cultivars were recorded from 1967 to 1969 inclusive. Harvest dates, which depended primarily on the possibility of freezing temperatures, ranged from October 1 to 15. At the other two locations no cultivar matured fruit and yields were not recorded. However, at Acaciaville and Bear River fruit samples were taken on approximately the same dates that fruit was harvested at Melanson. Thus determinations for pH, soluble solids and titratable acidity were made on juice from samples of the most mature fruit from four cultivars at all locations. Soluble solids were determined in degree Brix, pH electrometrically and titratable acidity with 0.1 N NaOH using phenophthalein as the indicator. Results were expressed as g of tartaric acid per 100 ml of juice.

Principally because of their inability to mature fruit, six cultivars (Concord, Elvira, Niagara, New York Muscat, Seibel 5279 and Seibel 10878) were removed at all locations during 1967 and 1968.

Although the soils at all locations were well drained sandy loams there were marked differences in organic matter, available P and exchangeable K (Table 2). There were also significant differences in petiole nutrient levels with the most outstanding being the high percentage of Mg in Seibel 9549 in comparison with Fredonia and Van Buren; the low percentage of P at Melanson as compared to the percentages at Bear River and Acaciaville; and the high percentage of K at Bear River in comparison with the

Table 2. Analyses of soil samples.

Location	Organic matter (%)	pH	Exchangeable cations Ca	Mg	K	CEC	P*
			(meq/100g)			(meq/100g)	(ppm)
Melanson	3.3	5.1	4.02	1.33	0.33	12.3	38
Bear River	7.3	6.0	6.76	1.07	0.79	19.0	495
Acaciaville	6.8	5.5	3.70	1.50	0.28	18.5	298

*Acid-soluble plus absorbed.

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other two locations (Table 3). Although it has been suggested (4, 7) that soil tests are generally unreliable for determining fertilizer needs of grapes, it is interesting to note that the lowest soil test value for P and the lowest P percentage in petioles occurred at Melanson while the highest values for soil and petiole K were at Bear River.

It is well known that nutrient percentages in plant tissue vary with the physiological age of the plant, the plant part sampled and environmental conditions. There may also be differences between cultivars. However a comparison of the results of bloomtime petiole analyses (Table 3) with data reported by Bryant et al (3) suggests that the nutritional status of the vines in the present investigation was reasonably satisfactory.

At Melanson yields from four cultivars during 1967 to 1969 inclusive varied considerably with both cultivars and years (Table 4). Winter injury of buds and fruiting wood may have been a factor. Visual observations indicated little or no injury to Seibel 9549, slight to moderate to Fredonia and Van Buren, and slight to severe to Delaware. On a location basis injury was less at Melanson than at either Acaciaville or Bear River.

Analytical data for juice samples showed certain definite trends (Table 5). For example on the basis of mean values and irrespective of cultivar, soluble solids were highest at Melanson and lowest at Acaciaville and, with the exception of Seibel 9549, juice from fruit grown at Melanson had the lowest values for titratable acidity. Furthermore, pH values for juice from fruit grown at Acaciaville were lower than comparable values for the other two locations.

Crowther and Bradt (5) have reported average values at time of harvest for soluble solids, titratable acidity, and juice pH to be 18.2, 0.58 and 3.48 for Delaware, 17.5, 1.62 and 3.23 for Seibel 9549, and 15.8, 0.92 and 3.46 for Fredonia. In the present investigation average values for titratable acidity for these three cultivars were much higher and average pH values lower (Table 5). With the exception of Delaware grown at Melanson and Bear River all average values for soluble solids were also lower than those reported by Crowther and Bradt (5). Thus a comparison of reported values (5) and those obtained in the present investigation (Table 5) indicates that even fruit from Melanson may not have been entirely mature.

A comparison of temperatures at Kentville, which are applicable to Melanson, with those at Clementsvale, which are applicable to Bear River and Acaciaville, provides an explanation of why fruit from the two latter locations was generally less mature than fruit from Melanson. From 1965 to 1969 inclusive the monthly mean minimum at Kentville was consistently higher than at Clementsvale from April through November (Table 6). Differences of 4 and 5F were common during July, August and September. Comparison of monthly mean maximum temperatures show that with six exceptions temperatures at Kentville were higher than at Clementsvale. Five of the six exceptions occurred in April and November and in no case did the difference exceed 1F. Furthermore, temperatures at Kentville during July, August and September tended to be approximately 2F higher than at Clementsvale. Winter minimums were also consistently higher at Kentville than at Clementsvale.

The 50-year average for degree days, 50F base, at Kentville is 1698 (8). Values for 1965 to 1969 inclusive were 1451, 1724, 1942, 1747, and 1805 respectively. In four of the five years 82

Table 3. Effects of cultivars, locations and years on percentages of N, P, K, Ca and Mg in grape petioles.

Cultivar location, or year		% N	P	K	Ca	Mg
Fredonia	(12)[a]	1;18±.04[b]	.19±.01	3.24±.18	1.10±.06	.17±.01
Seibel 9549	(12)	1.41±.08	.23±.02	3.05±.28	1.35±.08	.40±.02
Van Buren	(12)	1.52±.06	.26±.02	3.71±.29	0.88±.06	.16±.01
Melanson	(12)	1.20±.06	.16±.01	2.80±.13	1.08±.07	.25±.03
Bear River	(12)	1.40±.08	.25±.02	4.30±.20	1.26±.10	.21±.03
Acaciaville	(12)	1.51±.06	.27±.02	2.91±.13	1.00±.07	.27±.04
1966	(9)	1.37±.09	.23±.03	3.27±.22	1.27±.09	.25±.04
1967	(9)	1.18±.06	.19±.02	2.95±.29	1.04±.09	.22±.04
1968	(9)	1.50±.07	.26±.02	3.88±.33	0.92±.07	.24±.04
1969	(9)	1.44±.10	.22±.02	3.22±.29	1.20±.11	.27±.05

[a]No. of values in each mean
[b]Mean and standard error

Table 4. Grape yields at Melanson.

Cultivar	1967	1968	1969	1967-69
		Mean yields lb/vine		
Delaware	22.0 (6)[a]	16.5 (8)	10.3 (7)	16.0 (21)
Seibel 9549	15.8 (8)	21.6 (8)	22.0 (8)	19.7 (24)
Van Buren	17.6 (9)	22.4 (9)	21.1 (9)	20.4 (27)
Fredonia	19.4 (9)	15.4 (10)	12.1 (10)	15.5 (29)

[a] (No. of vines)

Table 5. Grape juice analyses (Brix, titratable acidity, and pH).

Analyses	Melanson Range	Melanson Mean	Bear River Range	Bear River Mean	Acaciaville Range	Acaciaville Mean
			Delaware, 1965-69			
°Brix	18.0-19.5	18.5	15.5-21.0	18.4	11.9-18.9	15.4[a]
T. A.	0.99-1.63	1.28	1.28-1.68	1.46	1.81-1.92	1.86[a]
pH	2.92-3.26	3.08	3.02-3.28	3.20	2.90-2.92	2.91[a]
			Seibel 9549. 1965-69			
°Brix	15.0-17.6	16.0	10.2-16.4	13.3	11.1-14.9	12.7
T. A.	1.40-2.62	1.92	1.55-2.07	1.88	1.58-2.36	1.98
pH	2.80-3.08	2.92	2.72-3.18	2.94	2.62-3.00	2.84
			Van Buren, 1965-68			
°Brix	13.4-16.2	14.5	10.4-15.3	12.7	10.0-13.1	11.7
T. A.	0.81-1.37	1.21	1.28-2.16	1.49	1.33-1.66	1.49
pH	3.10-3.31	3.16	3.00-3.34	3.14	2.82-2.88	2.95
			Fredonia, 1965-67			
°Brix	10.0-15.6	12.8	11.2-14.4	12.4	9.2-12.0	10.8
T. A.	1.28-1.61	1.43	1.50-2.21	1.77	1.61-1.69	1.66
pH	2.84-3.14	2.95	2.88-3.22	3.02	2.76-3.10	2.92

[a] Two years, 1965 and 1966.

Table 6. Mean minimum and maximum temperatures at Kentville[1] and Clementsvale[2] in °F.

Month	1965		1966		1967		1968		1969	
	Kent.	Clem.	Kent.	Clem.	Kent.	Clem..	Kent.	Clem.	Kent.	Clem.
					Minimum					
April	29.2	27.3	29.2	26.9	26.2	24.2	32.8	30.4	32.0	29.9
May	39.0	37.1	39.1	36.8	37.2	35.1	38.1	34.5	40.7	38.0
June	45.8	46.1	51.2	47.8	50.0	48.3	48.7	45.1	50.8	47.9
July	54.9	49.9	54.5	49.0	60.6	57.2	57.5	52.4	54.5	49.7
Aug.	55.5	50.5	54.7	50.3	58.8	56.0	52.8	47.5	56.9	52.7
Sept.	45.3	39.2	45.0	38.5	48.7	44.6	50.5	45.9	50.2	46.9
Oct.	39.0	34.7	40.1	36.0	42.0	37.1	45.4	40.3	38.8	34.8
Nov.	28.6	26.3	36.7	32.9	32.9	30.5	30.2	27.7	35.2	32.3
					Maximum					
April	45.0	45.3	47.2	46.7	42.8	43.2	52.6	52.9	49.0	48.8
May	58.8	58.2	60.3	59.1	54.3	53.7	59.1	58.2	59.4	59.0
June	71.9	71.4	71.2	69.9	74.1	72.3	67.6	66.4	73.8	71.8
July	77.1	74.6	77.6	75.3	79.5	76.6	79.8	77.7	75.0	73.4
Aug.	75.5	73.9	76.6	73.8	77.6	75.4	73.5	71.2	76.7	74.4
Sept.	67.8	66.4	66.5	65.0	69.1	66.2	70.6	67.6	66.9	67.3
Oct.	55.4	54.6	57.5	57.0	56.9	55.9	60.4	59.7	54.5	53.8
Nov.	43.0	42.5	48.4	49.3	44.7	43.9	42.1	43.7	48.4	48.1
					Winter Minimum					
	-11	-16	-9	-15	-11	-23	-9	-10	+1	-1

[1]Applicable to Melanson.
[2]Applicable to Acaciaville and Bear River.

to 87% of the degree days occurred by September 1. Since the foregoing values are applicable to Melanson apparently lack of fruit maturation at this location was due to insufficient heat units during September.

Although vine growth of the six cultivars removed during 1967 and 1968 appeared satisfactory, Seibel 5279 was the most susceptible to winter injury. In terms of fruit maturity this cultivar was followed in order by Niagara, Seibel 10878, New York Muscat, Concord and Elvira. The ranking was the same at all locations although for any one cultivar the degree of fruit maturity was greater at Melanson than at either Bear River or Acaciaville.

On the basis of information obtained in the present investigation, the successful growth of wine cultivars in the Annapolis-Cornwallis Valley area of Nova Scotia is not feasible because of insufficient heat units, particularly during the period of fruit maturation.

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Comparative Effects of Gibberellin and Parthenocarpy on the Shape and Maturation of Peaches[1]

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Abstract. **A 500 ppm gibberellin A_3 (GA) spray applied shortly after full bloom to unemasculated peach flowers caused some fruit to develop parthenocarpically. Nonparthenocarpic fruit sprayed with GA were similar to parthenocarpic fruit in their elongated shape and advanced maturity, and dissimilar to unsprayed control fruit. The applied GA, rather than a lack of ovule development, is therefore primarily responsible for alterations in shape and maturity of parthenocarpic peaches.**

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Applications of gibberellin A_3 (GA) to emasculated peach flowers at full bloom were reported to produce parthenocarpic fruit which were elongated in shape and matured early (2, 3, 4). These fruit characteristics could have resulted from the absence of developing ovules or from the applied GA.

Crane (4) found that delaying the GA application until petal fall, when more could be absorbed, resulted in more normal development of parthenocarpic fruit, suggesting that a deficiency of gibberellin in the fruit without embryos was responsible for the modifications in fruit shape and maturity. Also, destruction of the embryo during latter stages of development has been found to accelerate the maturation of peaches (5). In contrast to this evidence favoring parthenocarpy *per se* as the casual factor, recent reports show that applied gibberellins cause an elongated shape of seeded (6, 7) as well as seedless (1) apples.

Based on our observation that GA applications to unemasculated flowers result in parthenocarpic peaches as well