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Relative Performance of Ten 'Bath' Grape Clones

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Abstract

Ten clones of 'Bath' (*Vitis labruscana* Bailey) were tested in British Columbia in a non-replicated observational trial between 1976 and 1983 and in a replicated trial between 1984 and 1988. There were no consistent differences in vigor or yield of the ten clones. Clone 7 fruit generally maintained highest °Brix and pH as well as lowest titratable acidity (TA) throughout the course of both trials. Clones 4 and 9 also produced fruit with low TA and high pH. Since these clonal differences in fruit composition were not vigor- nor yield-related, it is concluded that they are true phenotypic differences, and that clones 4, 7, and 9, are early-maturing Bath clones.

Introduction

A small juice and table grape industry exists in British Columbia, based mostly upon *Vitis labruscana* hybrids. Of these, the 'Bath' cultivar constitutes the largest acreage. Although 'Bath' is reliably winter hardy and relatively high-yielding in British Columbia, prolonged cool periods during the autumn often delay sugar accumulation and acid degradation. Ethephon sprays were used by Denby (unpubl.) to successfully advance fruit maturation of Bath, but selection of a high-°Brix, low-acid clone provides a better alternative to chemical means.

Clones of 'Chardonnay' (4), 'Pinot noir' (4, 5, 7), 'Riesling' (2, 3, 10), and other *V. vinifera* cultivars have been selected, and stable phenotypic diversity between the clones in terms of growth habit, yield, and fruit composition have been reported. Becker (3) indicated that 70 different clones were registered in Germany for 'Müller-Thurgau,' along with 48 for 'Riesling,' 46 for 'Blauer Spätburgunder' ('Pinot noir'), 45 for 'Ruländer' ('Pinot gris'), 35 for 'Silvaner,' and 26 for 'Weissburgunder' ('Pinot blanc'). Among the 250 'Pinot noir' clones in Burgundy, Bernard cited differences in leaf shape, texture, and thickness; growth habit; bud fertility; cluster size; berry weight; sugar content; and, berry color. Differences in soil and climatic adaptation were also noted. These phenotypic differences have had an impact upon choice of viticultural practices and ultimately upon wine quality.

There are no published reports which chronicle phenotypic diversity or clonal selection within *V. labruscana* cultivars. The purpose of this investigation was to explore possible genetic differences within a population of 'Bath' vines, and to evaluate potential clones for vigor, yield, and fruit composition.

Materials and Methods

Clonal selection. Ten virus-free 'Bath' vines at the Agriculture Canada Research Station, Summerland, B.C., were flagged during September 1972 on the basis of apparent phenotypic differences in vine vigor, berry size, and yield. These differences did not appear to be due to applied treatments nor to variations in soil type that may have existed throughout the vineyard. Cuttings from the 10 vines were taken on 28 November 1972 and grown in a nursery during 1973 under provisional clone numbers 1 through 10.

In 1974, a non-randomized observational trial was established in a single row within an existing vineyard. Soil

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was a clay loam. Row x vine spacing was 3.7 x 1.8 m in north:south oriented rows. One vine of each potential clone was planted. Vines were trained on a "Y" trellis in which 1.3 m-high cordon wires were separated horizontally by 0.3 m. Balanced pruning based on a 30 + 10 formula was begun in 1976 when the vines were fully trained. Postbloom upward vertical shoot positioning each season maintained a divided canopy that was hedged 0.9 m above the cordon wire. Subcanopies were separated horizontally at the top by 1.6 m. Permanent sod was maintained between the rows, with a 1 m-wide strip within the rows kept weed-free with herbicides. Irrigation was provided by overhead sprinklers. Pest control practices were carried out according to published recommendations. (6).

The ten clones were repropagated in December 1980 and planted in May 1982 into a randomized complete block experiment containing five blocks and single-vine treatment (clone) replicates. The experiment comprised one north:south-oriented row. Spacing, soil type, and cultural practices were identical to the initial observational trial.

Growth and yield parameters. The 1987- and 1988-grown cane pruning weights were measured after dormant pruning in 1988 and 1989, respectively. Yields for each single-vine plot were measured in the observational trial between 1977 and 1983, excluding the 1980 and 1981 seasons. Yield per vine was recorded in the replicated trial in 1984, 1985, and 1987. Cluster weight, berry weight, and berries per cluster were determined in 1987 from four basal cluster samples per vine. These samples were stored at —40°C to await chemical analysis. Data were not collected in 1986 due to a manpower shortage.

Fruit composition. Eight random cluster samples per single-vine plot were taken from the observational trial during the 1976 to 1983 seasons, 1980 excluded, and from the replicated trial in the 1984 and 1985 seasons. °Brix and pH were measured on settled juice samples using an Abbé refractometer (AO Scientific Ltd.) and Fisher 825MP digital pH meter, respectively. Titratable acidity (TA) was measured according to the AOAC method (8). The extraction procedure of Mattick (9) was used in 1987 on 50-g berry subsamples of each cluster sample, with TA measured upon the resulting extracts by the Amerine and Ough method (1) with the aid of a Brinkmann 572 Titroprocessor.

Data analysis was performed using the SAS statistical package (SAS Institute, Cary, NC).

Results and Discussion

Observational trial. *Yield:* Table 1 lists yield and fruit composition data from the observational trial collected between 1976 and 1983 inclusive. It must be stressed that any conclusions made from these data are tentative at best, since there was no randomization and replication in this initial trial. Clone 4 tended to maintain highest yields throughout the trial; it was among the three highest-yielding clones in 4 of 5 years, and the highest-yielding clone in 2 of 5 years (1977 and 1982). Clone 10 was among the three lowest-yielding clones in 4 of 5 years and the lowest-yielding clone in 3 of 5 years (1977, 1978, and 1983).

Fruit composition: Clones 1 and 6 tended to have highest °Brix; both were among the top three clones in 4 of 7 years, and clone 1 had highest °Brix in 2 of 7 (1976 and 1981). Clone 7 had the highest °Brix in 2 of 7 years (1982 and 1983) while being among the top three clones in 3 of 7 years. Clones 2 and 3 were among the lowest °Brix clones in 4 of 7 and 3 of 7 years, respectively. Clone 2 had lowest °Brix in 1976, while clone 2 was lowest in 2 of 7 years (1977 and 1978).

Trends towards lowest TA were evident for clones 4, 7, and 9. Clone 9 displayed lowest TA in 3 of 6 years

Table 1. Yield, fruit composition, and harvest date of ten Bath clones, 1976-83.

	1976		12 Oct 1977		19 Oct 1978		9 Oct 1979		7 Oct 1981		14 Sept 1982		3 Oct 1983	
Clone	Yield[1]	°Brix	Yield	°Brix	Yield	°Brix	Yield	°Brix	Yield	°Brix	Yield	°Brix	Yield	°Brix
1	—	18.5	11.0	21.2	—	18.2	0.5	21.2	—	16.9	12.2	15.6	8.5	18.4
2	—	14.9	7.7	17.8	8.8	17.5	0.9	23.0	—	16.0	13.4	15.6	9.4	17.7
3	—	16.3	10.8	17.0	8.8	15.4	6.8	21.0	—	16.0	5.9	15.8	12.8	17.6
4	—	17.0	11.0	18.6	8.6	16.8	1.8	24.0	—	15.0	15.0	16.6	16.1	16.9
5	—	16.4	9.1	17.6	8.4	18.3	9.8	20.8	—	16.0	8.0	16.4	16.4	17.9
6	—	17.9	5.6	21.4	—	18.1	—	20.6	—	16.7	5.0	16.8	12.1	17.5
7	—	17.0	8.0	20.8	8.5	20.7	5.9	19.3	—	16.0	9.5	17.4	12.0	19.4
8	—	17.1	8.5	22.1	9.1	19.4	9.5	22.4	—	15.5	7.7	15.5	14.0	16.6
9	—	17.5	7.1	20.7	6.0	22.3	8.2	17.6	—	14.4	6.9	16.0	11.4	18.4
10	—	17.9	4.4	20.7	2.3	19.9	5.0	19.0	—	16.8	6.1	13.2	5.9	16.8

	1976		12 Oct 1977		19 Oct 1978		9 Oct 1979		7 Oct 1981		14 Sept 1982		3 Oct 1983	
Clone	TA[2]	pH	TA	pH	TA	pH	TA	pH	TA	pH	TA	pH	TA	pH
1	12.4	2.93	—	—	7.0	—	7.8	3.19	6.7	3.23	9.0	3.18	8.9	3.30
2	14.8	2.83	—	—	7.3	3.35	6.4	3.31	6.8	3.20	6.4	3.27	7.1	3.34
3	14.6	2.90	—	—	8.5	3.26	6.5	3.29	6.5	3.21	10.1	3.16	9.2	3.26
4	10.8	3.02	—	—	9.1	3.50	4.8	3.50	4.8	3.40	6.4	3.31	6.0	3.33
5	15.2	2.80	—	—	7.0	3.36	7.7	3.22	5.3	3.31	7.3	3.27	7.9	3.34
6	12.9	3.00	—	—	7.0	—	6.0	3.40	3.5	3.46	6.8	3.30	6.6	3.38
7	13.2	2.92	—	—	4.4	3.59	3.9	3.50	4.4	3.36	4.7	3.41	7.4	3.41
8	12.9	2.91	—	—	5.0	3.52	4.5	3.53	5.0	3.20	11.3	3.37	6.9	3.38
9	12.0	2.90	—	—	5.4	3.57	2.8	3.61	5.1	3.24	4.3	3.39	5.6	3.43
10	14.7	2.87	—	—	7.9	3.33	5.0	3.38	6.0	3.32	8.8	3.13	11.4	3.16

[1]Expressed in kg per vine.
[1]Expressed as g per liter of juice.

(1979, 1982, and 1983) and was among the three lowest-TA clones in 5 of 6 years. Clones 4 and 7 were both among the three lowest-TA clones in 4 of 6 years and contained lowest TA in 1976 and 1978, respectively. Highest TA was consistently found in clone 3, which ranked among the three highest-TA clones in 5 of 6 years. Clone 1 was also relatively high in TA, having been among the three highest-TA clones in 4 of 6 years while having highest TA in 1979.

Highest pH-clones included clone 7, which was among the three highest-pH clones in 5 of 6 years and had highest pH in 2 of 6 years (1978 and 1982). Other noteworthy clones were clones 8 and 9, both of which were among the top three clones in terms of pH in 4 of 6 years; clone 9 also had highest pH in 2 of 6 years (1979 and 1983). Clone 3 had consistently-lowest pH, having been among the three lowest-pH clones in 5 of 6 years, while having lowest pH in 1978. Clones 1 and 10 were among the three lowest-pH clones in 4 of 6 years, and had lowest pH in 1979 and in 2 of 6 years (1982 and 1983), respectively.

A desirable grape cultivar or clone for table use or juice manufacture needs to have relatively high °Brix and low TA for proper organoleptic balance. With these criteria in mind, clone 7 consistently showed a tendency towards high °Brix, low TA, and relatively high pH. Clone 9 also displayed a consistent trend towards low TA and high pH, with moderate °Brix.

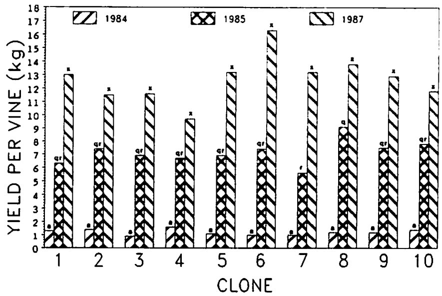

Figure 1. Weight of cane prunings of 10 Bath clones, 1987 and 1988. Means within years designated by different letters are significantly different at the 5% level, Duncan's Multiple Range Test.

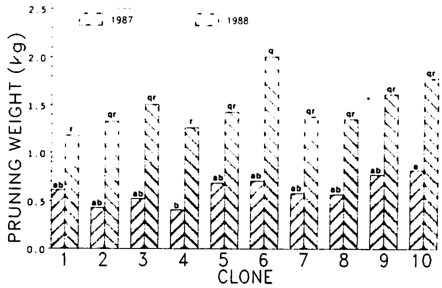

Figure 2. Yield per vine of 10 Bath clones, 1984, 1985, and 1987. Means within years designated by different letters are significantly different at the 5% level, Duncan's Multiple Range Test.

With yield taken into account, the high-yielding, low-TA clone 4 was also noteworthy.

Replicated Trial. *Growth and yield:* Small differences in vine vigor and yield existed between the 10 clones during the 1984 to 1988 period. Weight of 1987-grown cane prunings tended to be highest in clone 10 and were significantly greater than those of clone 4 (Fig. 1).

No differences in yield existed between the clones in 1984 and 1987 (Fig. 2). In 1985, clone 8 tended to be highest-yielding and displayed significantly greater yield than clone 7. In 1987, highest cluster weights were found in clones 6, 9, and 10, with clone 4 having lowest cluster weight (Fig. 3). Greatest number of berries per cluster was also found in clone 9 and the least in clone 4. Heaviest berries were found in clones 5, 6, and 10; clone 8 had lowest berry weight. In general, differences between clones in the various yield components were relatively small, although clones 6, 9, and 10 tended to display superior characteristics.

Fruit composition. Clone 7 consistently displayed a tendency towards highest °Brix during the 3 years of the replicated trial (Fig. 4), although no significant differences between clones were present in 1985. Clone 3 also had high °Brix in 1984, but not thereafter.

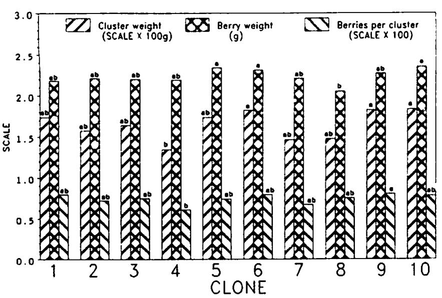

Figure 3. Yield components of 10 Bath clones, 1987. Means for the individual components designated by different letters are significantly different at the 5% level, Duncan's Multiple Range Test.

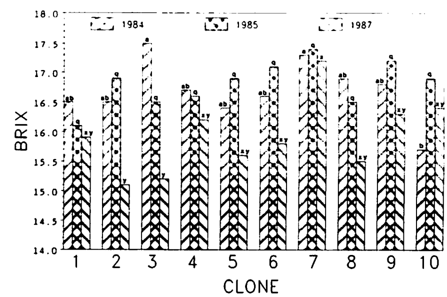

Figure 4. °Brix of 10 Bath clones, 1984, 1985, and 1987. Means within years designated by different letters are significantly different at the 5% level, Duncan's Multiple Range Test.

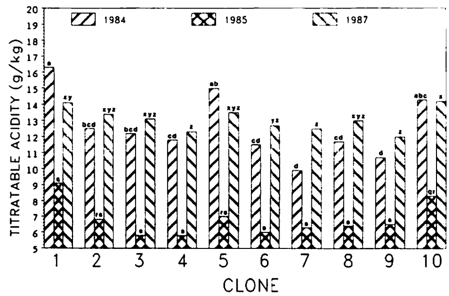

Figure 5. Titratable acidity of 10 Bath clones, 1984, 1985, and 1987. Means within years designated by different letters are significantly different at the 5% level, Duncan's Multiple Range Test.

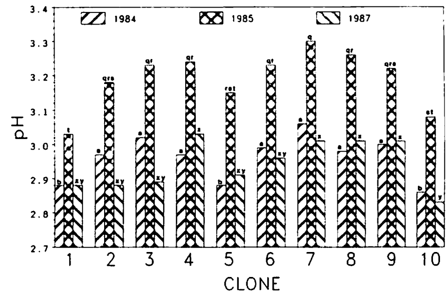

Figure 6. pH of 10 Bath clones, 1984, 1985, and 1987. Means within years designated by different letters are significantly different at the 5% level, Duncan's Multiple Range Test.

Clone 10 had lowest °Brix in 1984, while clones 2 and 3 were lowest in 1985 and 1987.

Lowest TA was consistently found in clones 4, 6, 7, and 9 (Fig. 5). Highest TA was found in clones 1 and 10. Clones 4, 7, 8 and 9 displayed a consistent tendency towards highest pH during the 3 years of the replicated trial (Fig. 6). Clone 10 appeared to maintain lowest pH.

Consistencies between the observational and replicated trials. No consistent patterns could be elucidated between the two trials in terms of yield, thus it can be concluded that the clones likely did not differ in this respect. Several consistent patterns were nevertheless present for fruit composition. Clone 7 showed superiority in terms of high °Brix and pH and low TA throughout both trials. Clones 4 and 9 also produced fruit with relatively low TA and high pH in the observational and replicated trials. Thus, it appears that clones 4, 7, and 9 are early-maturing clones of 'Bath' that may be of greater value to the table grape and juice industries than those clones presently being grown. Since these differences in fruit composition between clones do not appear to be vigor- or yield-related, it can be concluded that they are true phenotypic differences. The stability of these differences will not be known without further testing.

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