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FACTORS INFLUENCING YIELD AND QUALITY OF 'NIAGARA' GRAPES

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'Niagara' is the major cultivar used for white grape juice in the United States and is a major wine cultivar in the Eastern United States and Canada. However, little research has been reported on the yield and quality of the 'Niagara' grape. Pruning severity, nodes per bearing unit, training systems, and shoot positioning affect the yield and quality of 'Concord' grapes, a cultivar similar to 'Niagara'. Therefore, this study was established to examine the effects of these variables on the yield and quality of 'Niagara' grapes.

The study was conducted in a 4-year-old vineyard of 'Niagara' on their own roots at the Arkansas Agricultural Experiment Station, Fayetteville. The vines were trained to bilateral cordons (BC) or Geneva Double Curtain (GDC). Treatments (in a factorial arrangement) consisted of: 1) 3 pruning severities: 30+10, 50+10, and 70+10 (30, 50 or 70 nodes retained for the first 454 g of dormant cane prunings and 10 additional nodes retained for each additional 454 g of cane prunings removed); 2) 3 levels of nodes/bearing unit: 3, 6, or 9 nodes; 3) 2 training systems: BC or GDC; and 4) 2 canopy positioning treatments: not positioned (shoots allowed to grow at random) or shoot positioned (shoots manually positioned vertically toward the vineyard floor).

All treatments were imposed upon the same plots each year. Each plot consisted of 2 vines and all treatments were replicated 4 times. Before bloom 560 kg/ha of 10:20:10 fertilizer was applied to all vines, and ammonium nitrate (224 Kg/ha) was applied after bloom. The vines were not irrigated.

Yields were determined at harvest each year, and fruit samples, consisting of 3 whole basal clusters from each plot, were frozen at -18°C in polyethylene bags for subsequent quality analysis (ca. 3 months later). For quality analysis, samples were thawed overnight at 2oC and mixed for 15 sec in a blender. The percentage soluble solids, (as determined by a refractometer), the pH (determined at an accuracy of 0.01), and the titratable acidity were determined.

The 4-year means for yield showed no significant differences among pruning severities (See Table). However, the pruning severity X year interaction showed that during the final year of the study, the 70 + 10 pruning severity reduced yield (data not shown). Pruning to 50 + 10 or 70 + 10 levels reduced percent soluble solids. The 70 + 10 pruning severity slightly increased fruit acidity and slightly reduced pH as compared to the 30 + 10 treatment, but these differences are probably not of commercial importance.

The 3-node spurs produced lower yields than the 6-and 9-node canes for the 4 years of the study. The 3-node spurs produced fruit with a higher percentage of soluble solids, slightly higher pH, and slightly lower acidity than the 6-and 9-node canes.

Higher yields resulted from GDC training than from BC training, but BC training produced fruit with higher soluble solids and slightly lower acidity than did GDC.

Shoot positioning tended to increase yields each year of the study, but yields were increased significantly only during the second year and for the 4-year mean. Shoot positioning had no effect on the fruit soluble solids, but decreased pH and increased acidity.

In conclusion, light pruning (70 + 10) had begun to decrease yields by the last year of the study, but the reduction was not apparent in the 4-year means. Light pruning also decreased percent soluble solids and pH and increased acidity slightly, all of which indicate less mature fruit at harvest. The 3-node spurs produced lower yields and more mature fruit than did the 6-and 9-node canes. The GDC training system produced higher yields but less mature fruit than did the BC system. Positioning the shoots also increased yields. When both yield and quality (particularly the percent soluble solids) were considered, the best treatment for 'Niagara' grapes in Arkansas was a 30+10 pruning severity on 6-node canes trained to the GDC system and shoot positioned. This treatment produced an average of 20.7 MT/ha with an average dormant pruning weight of 1.4 kg/vine and had the following raw product quality at harvest: 14.6% soluble solids; a pH of 3.60; and 0.68% tartaric acidity.

See Table on next Page.

Effects of pruning severity, nodes/bearing unit, training system and shoot positioning on the yield and quality of 'Niagara' grapes (4yr means).

Main effects	(MT/ha)	Soluble solids (%)	pH	Acidity (% tartaric)
Pruning severity				
30+10	18.7 a[1]	14.4a	3.61a	0.68b
50+10	19.3a	13.9b	3.61a	0.69ab
70+10	19.6a	13.7b	3.57b	0.70a
Nodes/bearing unit				
3	18.5b	14.6a	3.63a	0.67b
6	19.9a	13.9b	3.58b	0.69a
9	19.2a	13.6b	3.58b	0.71a
Training system				
BC	17.6b	14.3a	3.61a	0.68b
GDC	20.8a	13.7b	3.59a	0.70a
Shoot positioning				
Not positioned	18.6b	14.0a	3.63a	0.68b
Positioned	19.8a	14.1a	3.56b	0.70a

[1]Means in the same column followed by the same letter are not significantly different at the 5% level of the Duncan's multiple range test.