Effects of Spacing, Training, and Pruning on Vine Performance and Fruit Quality of St. Croix

Gouveia Vineyard
Wallingford, CT

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Background and Rationale: Most inland Connecticut growers continue to depend on French-American hybrids or other cold-hardy cultivars for the bulk of their production. These hybrids can be very productive and are relatively resistant to freeze damage. Many have growth habits quite different from those of *Vitis vinifera*, however, and may have the potential for greater production and higher fruit quality when grown on high training systems and divided canopies. Some Connecticut growers with newer plantings are employing wider vine spacing and divided canopies, but no efforts at within-vineyard comparisons have been made.

Treatments: Four training systems were followed:

- Geneva Double Curtain (GDC)
  - Horizontally divided canopy, top-wire trained.
  - Combed
- Hudson River Umbrella (HRU)
  - Top-wire trained
  - Combed
- Smart-Dyson (SD)
  - Vertically divided canopy, mid-wire trained.
  - Catch wires above and below
- Vertical Shoot Positioning (VSP)
  - Mid-wire trained
  - Catch wires above
  - Hedged

Each of these training methods was either cane or spur pruned. Plant spacing was 6 feet for the cane pruned plants and either 6 or 8 feet for the spur pruned plants. Thus there were a total of 12 treatments replicated 4 times within the experimental plot with at least 4 plants per replicate.

Spur pruned Hudson River Umbrella.

Methods: Vines were planted in 2008. Training and pruning was performed from early-March to mid-April each year. It took 3-4 years to establish the high wire cordons for the GDC and HRU spur pruned vines. By 2012 all training systems were incorporated into the plot. In that year two late frosts in the first week of May occurred after bud break and there was little or no fruit produced. In 2013, precipitation anomalies had a major effect on the vineyard. There was only 2.4 in. of rainfall from April 1 to 26 May, and then 8.4 in. in the next 10 days. This resulted in an early outbreak of downy mildew (first observed 8 June 2013) and excessive vegetative growth, as well as problems with fungicide application and weed control due to the soggy soil conditions. This disease had a major impact on training methods that produce fruit closer to the ground (SD and VSP) and is partially responsible for the lower fruit yields in these treatments. At harvest, cluster number and total yield (kg) data were collected for each vine and 100 berry samples were pooled from each replicate and frozen for later chemical analysis. Damage to clusters due to shattering and disease was estimated and recorded at harvest.

Smart-Dyson cane pruned at 6 foot spacing

Results: The productivity of the GDC trained vines was roughly twice as much as the HRU trained vines; which, in turn, was about twice as much as the other training methods (Table 1). Damage to clusters was more severe for VSP and SD treatments trained to the middle wire. In addition to fruit damage, foliar Downy Mildew damage was much more evident for these treatments. Chemical analyses indicated that berries from these treatments were smaller, had less sugar and were more acidic than their top wire trained counterparts (Table 2).

Table 1. Yield components for St. Croix Trial at Wallingford CT in 2013.

Training	Pruning	Spacing	Clusters[a] /vine	Yield[a] kg/vine	Yield[a] kg/foot	Damage[bc] %	Corrected[ab] Yield kg/foot
GDC	Cane	6	143.3 b	5.44 a	0.91 a	14.2 a	1.09 a
	Spur	6	152.9ab	4.29 ab	0.71 ab	19.5 ab	1.01 ab
		8	194.2a	5.29 a	0.66 bc	24.1 b	0.94 ab
HRU	Cane	6	76.9 cde	2.72 bcd	0.45 cd	0.0 a	0.45 abc
	Spur	6	96.5 cd	2.06 cde	0.34 de	9.4 a	0.48 abc
		8	117.5 bc	3.42 bc	0.43 de	0.0 a	0.43 abc
SD	Cane	6	76.9 cde	2.34 cd	0.39 de	26.3 b	0.62 ab
	Spur	6	55.9 e	1.01 e	0.17 ef	24.7 b	0.25 c
		8	67.5 de	1.23 e	0.15 ef	40.6 bc	0.31 bc
VSP	Cane	6	47.1 e	1.32 de	0.22 ef	49.2 bc	0.44 bc
	Spur	6	39.4 e	0.88 e	0.15 ef	54.4 c	0.39 bc
		8	48.7 e	1.03 e	0.13 f	62.7 c	0.36 bc

[a] *Values followed by the same letter are not significantly different.*

[b] *Percent skeletonization of fruit clusters. Corrected yield = 100*yield/ (100-Damage).*

[c] *Analysis was performed after an arcsine transformation of fractional data (Damage/100%).*

Table 2. Chemical analyses for St. Croix Trial at Wallingford CT in 2013.

Training	Pruning	Spacing	Berry[a] Weight g	°Brix[a]	TA[a] g/l	pH[a]
GDC	Cane	6	1.46 a	17.8ab	6.27 bc	3.94 ab
	Spur	6	1.42 ab	17.9ab	6.98 ab	3.96 a
		8				
HRU	Cane	6	1.52 a	18.2a	5.63 c	3.96 a
	Spur	6	1.43 a	17.3 b	6.26 bc	3.85 b
		8				
SD	Cane	6	1.32 b	18.3a	6.67 ab	3.89 ab
	Spur	6	1.28 b	16.9 bc	7.16 a	3.89 ab
		8				
VSP	Cane	6	0.98 c	15.6 d	6.74 ab	3.83 bc
	Spur	6	1.09 c	16.3 c	6.72 ab	3.81 bc
		8				

[a] *Values followed by the same letter are not significantly different.*

What the results mean:

- The Geneva Double Curtain had the greatest productivity due to the doubling of the length of the fruiting canes/cordons.
- Top-wire trained vines out-produced middle-wire trained vines, which were more prone to fruit rots and cluster shattering.