Marquette Training Trial

Coyote Moon Vineyards
Clayton, NY

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Background and Rationale: Choice of training system influences yield, quality, and labor inputs for growing grapes. A goal of this training trial is to provide data that will allow growers to choose training systems for Marquette grapes that minimize costs, maximize economic returns to growers and result in high quality, mature grapes for winemaking.

Treatments: We chose two high training systems and one mid-wire training system for comparison. Three training systems and follow up canopy management practices were applied, representing intensive, intermediate, and minimal post-shoot thinning treatments.

- **Vertical Shoot Positioning (VSP)**:
  - Midwire cordon with catch wires
  - Shoot position, shoot tip (hedging), leaf removal
  - *Intensive canopy management*
- **Top Wire Cordon (TWC)**:
  - High cordon
  - Shoot combing
  - *Moderate canopy management*
- **Umbrella Kniffin (**UK):
  - 3-4 long canes arched and tied to middle wire
  - No additional canopy management
  - *Minimal canopy management*

Methods. Training treatments were established in February 2012 during pruning. In both years, vines were pruned to 40-50 count buds per vine. In 2013, shoot number was adjusted to approximately five shoots per linear foot of canopy (35 shoots/vine) at 3-5" shoot growth, but thinning was not required in 2012 due to spring frost damage. Bud and shoot count data were also collected at this time in both years. Vine management was done as needed throughout the growing season. In both years, preharvest fruit chemistry samples were collected starting shortly after veraison, then every 7-14 days until harvest. At harvest, cluster number and total yield (kg) data were collected for each vine.

Results:
Yields. As vines were converted from mid-wire training to the three training systems in 2012, year 1 data (Table 1) reflects transition to the new training systems. Post-budburst frost events caused freeze injury to many of the primary buds, resulting in low yields (3-5 lb/vine) and cluster number (23-36 clusters per vine). There were

no significant differences in pruning weight, and the Ravaz index indicated that the vines were undercropped, as is expected due to the frost damage.

Table 1. Yield components in Marquette training trial at Clayton, NY in 2012.

2012 Treatment	Yield t/acre	Yield lb/vine	Clusters/ vine	Cluster wt. (g)	Berries/ cluster	Avg.berry wt. (g)	Pruning wt. (kg)	Ravaz index
TWC	1.1 ab	3.4 ab	23.6 b	63.5 a	48.8 a	1.3	0.89	2.4 ab
VSP	1.0 b	3.2 b	26.7 ab	49.2 b	37.8 b	1.3	0.89	1.8 b
UK	1.6 a	5.2 a	36.0 a	64.8 a	54.0 a	1.2	0.81	3.3 a

Treatment means followed by the same letter within a column are not significantly different at the α=0.05 level. Columns where no letters are present indicate a lack of significant differences among treatments.

2013. With a full number of shoots and no spring freeze injury, yields were higher in 2013 (Table 2). The TWC and UK systems both yielded significantly more (essentially double) than the VSP system. TWC and UK had significantly higher numbers than the VSP for nearly all the yield components. Compared with TWC, VSP had significantly fewer clusters per vine (17% fewer) and berries per cluster (34% fewer), and lower berry weight (7% lower). UK yields was 2.3 lb/vine higher than TWC, but the extra yield was associated with more shoots that were inadvertently left at thinning. When yield was adjusted for differing shot numbers, TWC yield was equivalent to UK yield on a per-shoot basis. VSP also had significantly fewer clusters per shoot than TWC or UK.

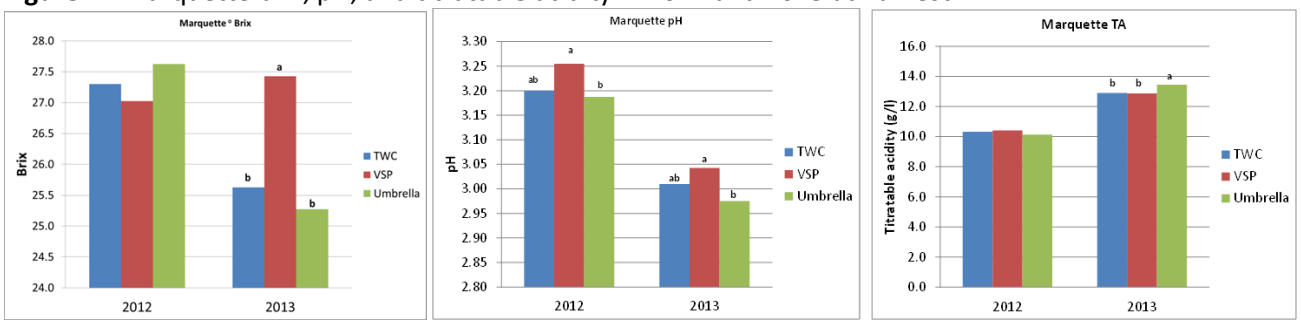
Table 2. Yield components in Marquette training trial at Clayton, NY in 2013.

2013 Treatment	Yield t/acre	Yield lb/vine	Clusters/ vine	Cluster wt. (g)	Berries/ cluster	Avg.berry wt. (g)	Adj. # shoots/vine	Yield (g)/ adj. shoots
TWC	4.3 b	13.8 b	83.5 b	76.6 a	63.2 a	1.21 ab	36.9 b	178.1 a
VSP	2.3 c	7.4 c	69.4 c	49.2 b	43.4 b	1.13 b	36.3 b	94.2 b
UK	5.0 a	16.1 a	101.3 a	72.5 a	59.2 a	1.23 a	41 a	178.8 a

Treatment means followed by the same letter within a column are not significantly different at the α=0.05 level. Columns where no letters are present indicate a lack of significant differences among treatments.

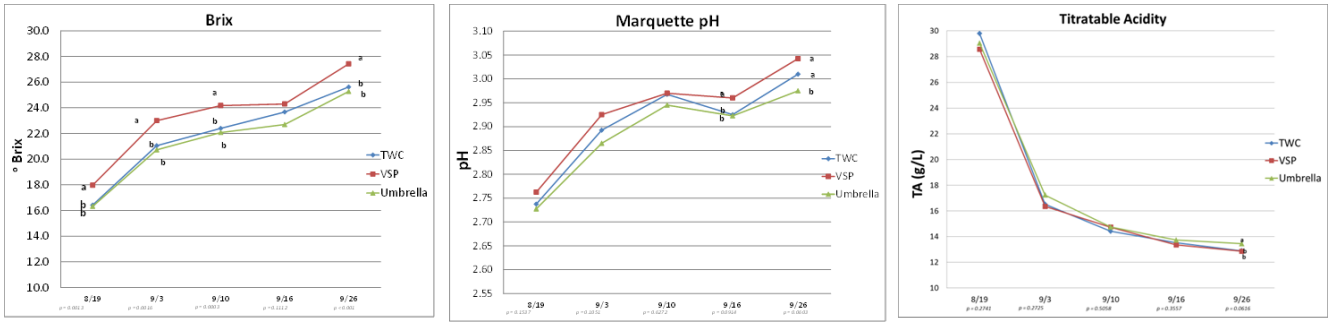
Fruit Composition. In 2012, fruit chemistry **(Figure 1)** reflected ample heat unit accumulations during the early season (across treatments, soluble solids around 27.2 °brix; titratable acidity about 10 g/L). In 2013 **(Figures 1 and 2)**, titratable acidity was higher than in 2012 across all training systems at harvest, and UK had slightly higher levels than VSP and TWC. Brix levels showed greater differences among training systems (VSP=27.3; TWC = 25.6; UK=25.2 °brix), and the difference was apparent from the time the first samples were collected. The 2 °brix higher soluble solids on VSP was likely associated with the lower crop carried by the VSP vines. Juice pH on VSP was significantly higher than UK in both years, and no differences were apparent in 2013 until just before harvest.

Figure 1. Marquette brix, pH, and titratable acidity in 2012 and 2013 at harvest.



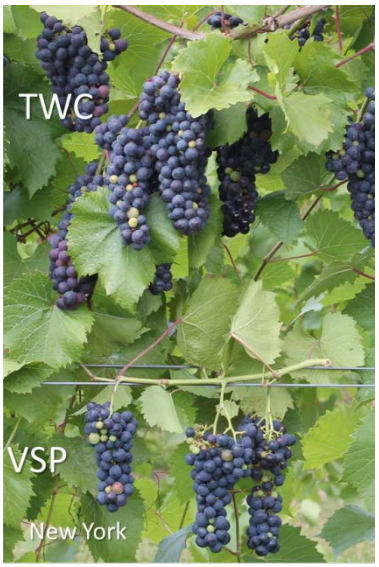
Treatment means followed by the same letter are not significantly different at the α=0.05 level.

Figure 2. Brix, pH, and Titratable acidity trends in 2013. Samples were collected from shortly after veraison until harvest.



For each sample date, treatment means followed by the same letter are not significantly different at the α=0.05 level.

What the results mean:



- The warm 2012 season produced high brix and low titratable acidity. The more moderate 2013 season provided a more reasonable expectation of maturity levels under northern NY growing conditions, with slightly lower brix and higher acidity at harvest.
- In 2013, Marquette trained high in either the spur-pruned TWC system or the cane-pruned UK system produced twice as much fruit as the VSP vines.
    - All yield components were affected. VSP vines had fewer clusters per vine, smaller clusters with fewer berries than the TWC or UK vines, and smaller berries than UK vines.
    - On a per-acre basis (table below), these yield components resulted in 47% less yield on VSP than on TWC vines, with berry number contributing the most (about half) to the yield difference.

Yield component	Difference	Lost crop (lb/vine)	Lost crop (t/acre)
Berry weight	7%	0.8	0.3
Berries/cluster	31%	4.4	1.4
Clusters/vine	17%	2.4	0.7
Yield/vine	**47%**	**6.6**	**2.1**

- The low crop on VSP in 2013 resulted in higher soluble solids (2 °Brix higher), and only moderately affected titratable acidity. pH was slightly higher on VSP than on the other treatments. The impact of this on wine quality may be minor, as TWC and UK fruit reached 25 °Brix.
- Over two growing seasons, TWC and UK have provided a yield advantage and fewer hand-labor passes through the vineyard than VSP. Some estimates show about a 30% difference in labor inputs.
- UK, without shoot positioning, has the lowest labor costs during the growing season, although as a cane-pruned system, it does require tying after dormant pruning, which is not the case with cordon-spur trained systems (TWC and VSP). Growers using cane pruning may save on post-budburst shoot thinning

(canes will not produce ‘noncount’ shoots; cordons will), but if there is no downward shoot positioning (as in our study), the cluster zone may be more shaded than on the TWC + shoot combing treatment.