Comparative results of three training systems in Winchester

VVA Meeting: 13-15 Feb 2003

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Training system considerations

- Why research training systems in Virginia?
  - increase production efficiency under our growing conditions
  - evaluate yield and quality relationships
- Why are there so many training options….?
  - Varietal/species growth habit, vigor differences, personal bias/convictions, etc.

DETAILS OF TRAINING COMPARISON

- Vines established in 1998 at Winchester
- Three varieties:
  - Viognier (la Jota clone)
  - Cabernet franc (clone #1)
  - Traminette (own-rooted or grafted)
- Three training systems:
  - Vertical shoot-positioned
  - Smart-Dyson
  - Geneva Double Curtain

Bi-lateral cordon, vertical shoot-positioned

- A “standard” system in Virginia and East
- Cordons at 36 to 44 inches above the ground)
- Simple concept, relatively cheap installation
- Can be modified into vertically divided canopy training if vigor warrants

Geneva Double Curtain

- Cordons at top of trellis, separated by 4’
- Cordons spur-pruned to lower 180°; alternating spur length
- Use only in high vigor situations (I.e., > 0.3 pounds of cane prunings/foot of canopy realized or expected
- Shoot positioning required, typically 2X/year; first shortly after flowering, second w/in 4 weeks
- high yields; high phenols also possible - avoid over-exposure
- Suitable for American, hybrids, and some *vinifera* cvs.

Smart Dyson

- Opposing canopies originate from a common, mid-trellis cordon
- Downward positioning of lower canopy requires a two-step process to avoid shoot breakage.
- Yield increases of about 70% over non-divided VSP
- Suitable to most high-vigor situations
- Timing weed control

DETAILS OF TRAINING COMPARISON

- Row spacing = 10’ and vine spacing = 8’
  - Why this row spacing?

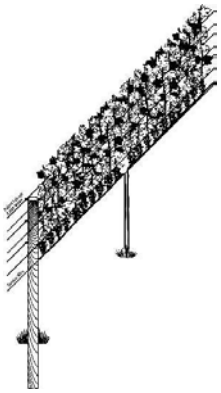
- Three sponsors
  - VA Winegrowers Advisory Board
  - NC Grape Council
  - Viticulture Consortium: East

DETAILS OF TRAINING COMPARISON

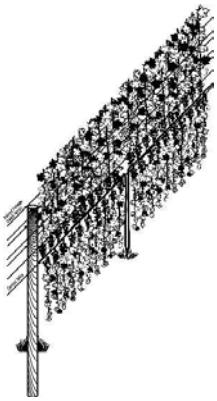
- Data collection
  - components of crop yield
  - fruit chemistry and color
  - canopy light environment
  - wine chemistry and sensory analysis
  - bud and cane cold hardiness
  - cane pruning weights

- This is a preliminary report

Systems evaluated at Winchester

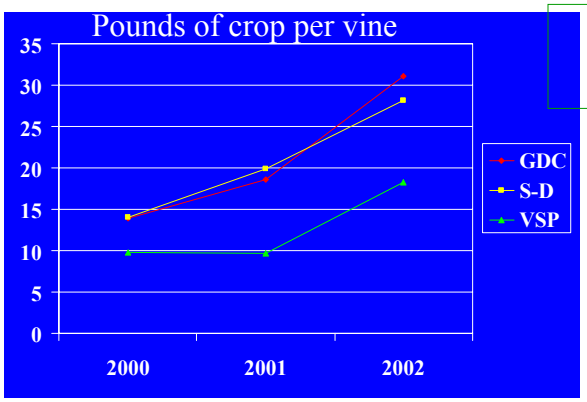


Vertically shoot-positioned (VSP)

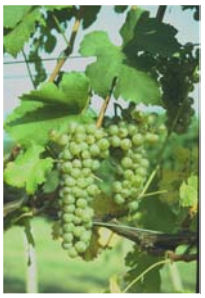


Smart-Dyson (SD)

Geneva Double Curtain (GDC)

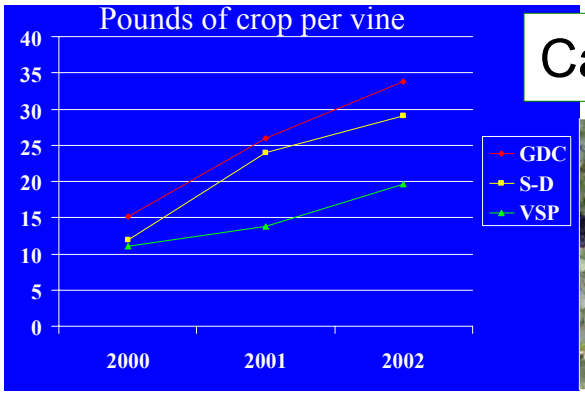


Viognier



	2000	2001	2002
GDC	3.8	5.1	8.5
SD	3.8	5.4	7.7
VSP	2.7	2.6	5.0

Tons of fruit per acre (equivalent)



Cabernet franc

	2000	2001	2002
GDC	4.1	7.1	9.2
SD	3.3	6.5	7.9
VSP	3.0	3.8	5.3

Tons of fruit per acre (equivalent)

Yields are increased by canopy division (GDC or Smart-Dyson). No surprises there…..

What components of yield are increased?

- Clusters/vine Yes, because the number of shoots per vine is increased
- Cluster weight? Not really
- Berry weight? Not really
- Clusters/shoot? Yes, increased with GDC and SD

Flower clusters/shoot before thinning

2002 season

	Traminette/ C3309	Cab franc	Viognier
GDC	1.6	1.7	1.3
SD	1.2	1.4	1.1
VSP	1.2	1.2	1.1

Training system and variety main effects were significant

Canopy sunlight measures: 8/2001

Percent of available sunlight in fruitzone

	GDC	SD-Up	SD-down	VSP
Cab franc	62.6	15.6	35.7	12.2
Tram/3309	30.2	12.5	18.8	7.4
Tram/own	59.4	12.8	16.0	10.8
Viognier	29.3	18.4	29.2	12.6

Primary fruit composition: Viognier

	2001		2002	
	Brix	pH	Brix	pH
GDC	23.7	3.33	24.1	3.38
SD-Down	-----	-----	23.9	3.35
SD-Up	24.2	3.31	24.3	3.31
VSP	24.1	3.33	23.9	3.39

Fruit was picked at comparable Brix for all training systems.
In 2002 all systems harvested on 12 September.

Primary fruit composition: Cabernet franc

	2001		2002	
	Brix	pH	Brix	pH
GDC	22.7	3.28	23.2	3.54
SD-Down	-----	-----	22.6	3.49
SD-Up	22.6	3.26	22.8	3.47
VSP	22.8	3.33	22.9	3.44

Fruit was picked at comparable Brix for all training systems.

"Primary fruit chemistry appears not to be adversely affected by the 50 to 70% greater yields achieved by Smart-Dyson and Geneva Double Curtain training.

But what about wine quality?"

Secondary fruit composition: Cabernet franc

	2001		
	Total Antho	Polymeric pigments	Total phenols
GDC	1.80	1.57	250
SD	2.00	1.45	85
VSP	1.75	1.42	95
Signif.	ns	***	ns

Secondary fruit composition: Cabernet franc

	2002			
	Total Antho	Poly. pigments	Total phenols	Wine PFGG
GDC	3.30	1.20	39	98
SD-Dn	3.10	1.05	35	85
SD-Up	3.45	1.15	35	87
VSP	3.20	1.01	35	83
Signif.	**	***	**	**

Wine sensory analysis
Cabernet franc, 2001
Evaluated November 2002

No differences were detected in triangle sensory tests of aroma or flavor between any of the training systems.

Wine sensory analysis
Viognier, 2001
March - April 2002

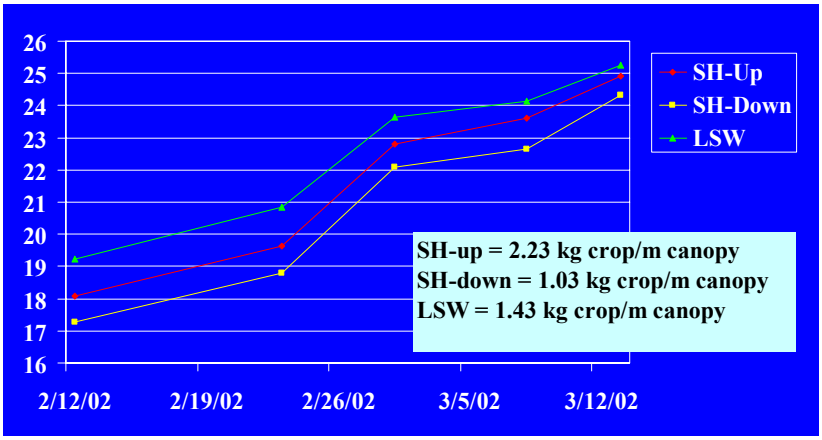
No consistent differences were detected in triangle sensory tests of aroma or flavor between GDC and VSP.

Significant differences in both aroma and flavor detected between SD and GDC.

- GDC had > varietal aroma intensity (related to higher fruit PFGG??) and > palate weight than did the SD

"I'm concerned that fruit won't mature uniformly between the upper and lower canopies of the vertically-divided Smart-Dyson training system"

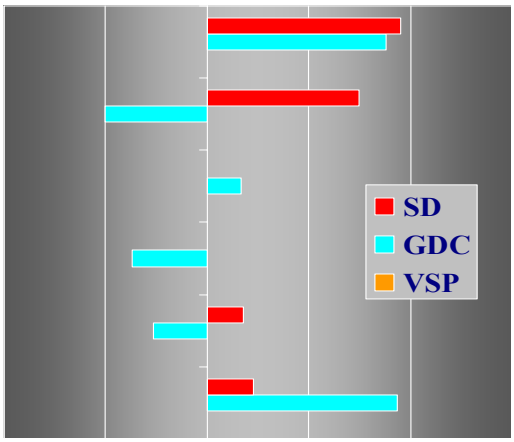
Comparison of fruit ripening (°Brix) of Scott Henry upper and lower canopies, and low single wire. Shiraz, Barossa SA, 2000

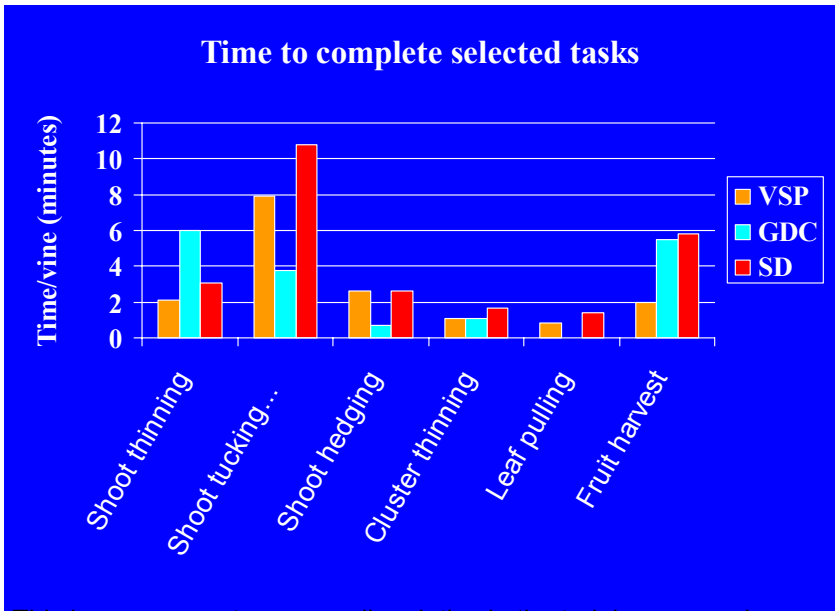


Relative performance of Smart-Dyson upper and lower canopies during the 2002 season.

	Clusters /vine	Crop/ Vine	Cluster wt (g)	Brix	pH	TA (g/L)
Cabernet franc						
Upper canopy	43.1	18.4	195	22.8	3.47	6.41
Lower canopy	24.9	10.7	194	22.6	3.49	6.18
Significance	***	***	ns	ns	ns	ns
Viognier						
Upper canopy	37.2	16.7	203	24.3	3.31	6.13
Lower canopy	27.2	11.5	195	23.9	3.35	6.52
Significance	ns	**	*	ns	ns	ns

Relative labor demands
Practices are depicted as a percentage of VSP time





This is an aggregate across all varieties in the training comparison

Conclusions

- Yields
  - vertically-divided systems increased yields by 50 to 70% without compromising primary fruit chemistry and with no measurable, negative effect on wine quality
  - Fruit thinning was necessary with all systems in 2002, particularly with the GDC -- still ended up with somewhat higher crops than we had anticipated

Conclusions

- Smart-Dyson
  - No asynchrony in fruit maturation between upper and lower canopies with the differential in cropping that we've provided between the two canopies
  - System is particularly appealing as an efficient use of vineyard space.
  - System is flexible to accommodate changes in vine vigor over time.
  - Cordon established at about 42" above ground to allow enough space for lower canopy.
  - Weed management has not been an issue.

Conclusions

- Geneva Double Curtain
  - Highest yields and greatest fruitfulness
  - Cabernet somewhat difficult to train to downward canopy
  - Devigorates shoots and vines
  - Fruit subject to slightly more rot (1% vs. 0.4%)
    - sunburn, birds and insects, dew formation??
  - Greater color and phenols in must and wine
  - Provide some sun protection with laterals
  - Weed management has not been an issue
  - Inexpensive management