Can root pruning and ground covers restrict vegetative growth and improve fruit composition of Cabernet Sauvignon grapevines?

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Excess vegetative vigor of grapevines is often associated with reduced fruit quality and increased incidence of disease (foliar and fruit). Many vineyards throughout the humid, eastern United States are considered to be excessively vegetative. It is hypothesized that ground covers growing under the vine trellis and root-pruning can reduce vegetative growth of grapevines, facilitating the control of diseases and positively affect berry quality. Both vegetative and reproductive variables of grapevines have been shown to be affected by root pruning (Dry et.al., 1998) or the competitive presence of ground covers grown in the row middles (Wolpert et.al. 1993). Field evaluation of these treatments had not been investigated in the mid-Atlantic. This project was initiated in 2005 with the following objectives:

1. Evaluate the relationship between vegetative/reproductive vine balance of Cabernet Sauvignon grapevines as affected by root pruning and/or under-trellis ground covers. .
2. Evaluate the relationship between root pruning and under-trellis ground covers to berry and wine quality

Shoot growth rate, cane pruning weights, and berry composition were evaluated in eight-year-old *Vitis vinifera* L. cv. Cabernet Sauvignon (clone 8/SO4 rootstock) grapevines in response to root-pruning and under-trellis ground covers. Five ground cover treatments: tall fescue (*Festuca arundinacea*) cvs: Kentucky 31 and Elite II, perennial ryegrass (*Lolium perenne*) cv. WB 300, hard fescue, (*Fescue ovina*) cv. Aurora Gold, orchard grass (*Dactylis glomerata*) were established (fall of 2005) in the row middles and under trellis of the treated plots to compare their relative ability to affect grapevine growth and berry composition. Root pruning was applied parallel to both sides of the vine row, 40-45 cm from trunk, 60 cm deep 2 weeks after budburst in 2005, 2006 and 2007. Root pruning was accomplished with a trenching machine (2005) and with a vibratory plow shank (2006, 2007) each year, approximately two weeks following budburst.

2005 pruning weights (0.77 kg/vine RP, 0.92 kg/vine NRP) and average cane weights (37g/cane RP, 42g/cane NRP) were significantly less in RP plots compared to non-root pruned (NRP) plots, regardless of ground cover treatments. Both root-pruning (RP) and cover crops reduced shoot length (per the last measurement date, June 29, 2006) (Figure 1). Average cane weights and pruning weights compared to the herbicide control were reduced in 2006 (Table 1).

To evaluate the relationship between soil moisture, vine growth and vine water potential readings, a FDR (frequency domain reflectivity) probe (Model PR-2 Dynamax, Houston TX) was used to determine volumetric water content of the soil at 2 locations in each subplot of 2 treatments (herbicide control and fescue KY-31) across all 6 replications for a total of 48 access tubes. The soil moisture was measured three times at each depth, (100, 200, 300, 400, 600 and 1,000 mm), at each location (access tube)and these 3 readings per depth were averaged and recorded per sample date. Pre-dawn vine water potential ($\Psi_{PD,,}$measured 3 times), mid-day leaf water potential (Ψ_{leaf}) and xylem water potential (Ψ_{stem}) were evaluated on two occasions during the 2006 season. Treatment differences were minor and no readings were considered to be indicative of stress. Primary fruit chemistry in 2006 was unaffected (Table 1) by treatment.

This research is being continued with results to-date suggesting that both root-pruning and under-trellis cover crops are potential tools for restricting vegetative growth of vigorous grapevines while effects on berry weight and fruit chemistry are less definitive.

References

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2. Wolpert, J.A., P.A. Phillips, R.K. Striegler, M.V. Mc Henry, and J. H. Foott. 1993. 'Berber' orchardgrass tested as cover crop in commercial vineyard. California Agriculture 47 (5): 23-25.

Table one. Effects of different under-trellis ground covers and root pruning on several vine and berry variables (2006); RP = root pruned, NRP = non root pruned.

Variable	Herbicide Control		Fescue 31		Perennial ryegrass		Orchardgrass		Elite II Fescue	
	RP	NRP	RP	NRP	RP	NRP	RP	NRP	RP	NRP
shoot length (cm)	122	122	101	106	98	104	94	107	102	107
pruning wt (kg/vine)	1.75	1.92	1.02	1.33	1.01	1.50	.94	1.38	1.03	1.57
average cane wt. (g)	78	86	47	60	48	69	45	62	46	71
fruit wt (kg/vine)	8.72	7.91	7.10	7.51	7.60	7.98	7.25	7.82	7.62	7.94
FW/PW ratio	4.98	4.11	6.96	5.65	7.52	5.32	7.71	5.67	7.40	5.06
berry chemistry										
soluble solids	19.6	19.3	19.5	19.4	19.2	19.2	19.5	19.2	19.5	19.2
titratable acidity	0.54	0.54	0.54	0.57	0.60	0.60	0.54	0.57	0.51	0.60
pH	3.37	3.43	3.29	3.47	3.38	3.39	3.36	3.47	3.33	3.38

Figure one. Figure 1. Mean shoot length measured on 6 dates in 3 ground cover treatments (RP root pruned, NRP non root pruned).