

Alleyway Cover Crops Have Little Influence on 'Pinot noir' Performance

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ABSTRACT

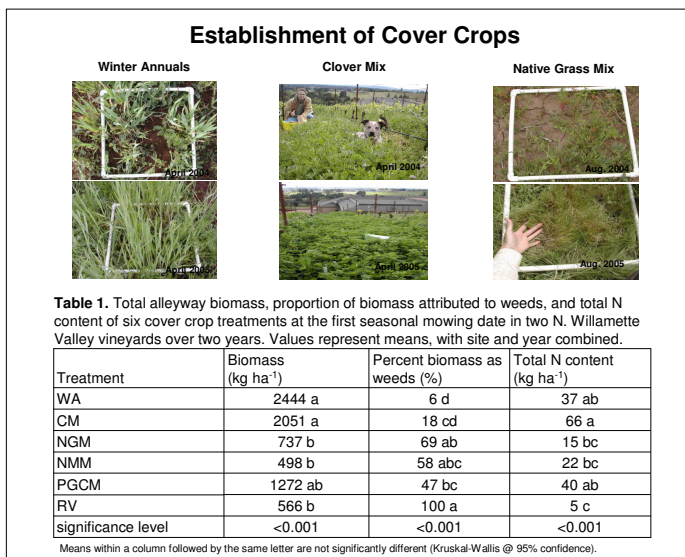
Competition between 'Pinot noir' grapevines and alleyway cover crops was evaluated in two commercial vineyards in western Oregon. Seven cover crop treatments including a clean-cultivated control were applied in the fall of 2003 and their impact on vines was monitored in 2004 and 2005. Competition with grapevines was assessed by measuring soil moisture, vine growth, vine water status, vine nutrient status, yield, and must quality over two years with typical weather patterns for the region. Despite large treatment differences in cover crop biomass and N contributions to the soil from mowed residues, cover crops had little measurable influence on vine growth or fruit quality. Small differences in alleyway soil water content, leaf nitrogen, and juice YANC were found between different treatments; however, no cover-cropped treatment differed from the clean-cultivated control. Alleyway cover crops managed by spring and summer mowing do not appear to compete significantly with established 'Pinot noir' grapevines in western Oregon vineyards. Therefore, advantages of using cover crops (e.g. protection against soil erosion and addition to soil organic matter) can be realized without impacting vine productivity or juice quality. The long term impact of certain cover crops, including the clover mix we used, could result in the supply of too much N to vines and this aspect should be further examined.

Materials & Methods:

Seven cover crop treatments were applied at two vineyards in the northern Willamette Valley (AS and JH) in the fall of 2003 and monitored for establishment and impact on vines in 2004 and 2005. Pinot noir grapevines (Pommard clone on 3309 rootstock) were grown at both sites (AS planted in 1994, JH planted in 2001). AS was planted at a density of 5123 vines ha⁻¹, and JH was planted at 2690 vines ha⁻¹. Treatments were: winter annuals (WA, oats, rye and vetch), clover mix (CM, subclovers, clovers and medic), native grass mix (NGM, Willamette Valley upland prairie species), native meadow mix (NMM, forbs plus grasses), perennial grass and clover mix (PGCM, sheep fescue, dwarf perennial rye, hard fescue, subclovers, clovers and medic), resident vegetation (RV), and a clean-cultivated control (CC). Each treatment was replicated four times at each site in a randomized complete block design. Treatments were applied to four adjacent alleys effecting 8 or 10 vines in three vine rows with one clean-cultivated border row dividing blocks.

Cover crop establishment was measured by destructive sampling of biomass above 10 cm (mowing height) each time the vineyard was mowed according to the growers' practices. Weeds were sorted from cover crops, and both residues were dried and weighed. Weeds and cover crops from each plot were recombined to determine the total N content. Over the course of the growing season, soil moisture content was measured in the vine row and alleys with time domain reflectometry, and midday vine leaf water potential was measured with a pressure bomb. Shoot lengths were measured twice during the spring and early summer of each year, but one site was hedged in 2005 prior to the second measurement. Leaves and petioles were collected at bloom and veraison for nutrient analysis (N, P, K, S, Ca, Mg, Mn, Cu, B, Zn and Fe). N was determined by combustion analysis in all samples, but other nutrients were analyzed by ICP-OES at one site in 2005 only. Root samples were taken at bloom and post harvest to a 45cm depth in the vine row and alley in three treatments (WA, PGCM and CC) and analyzed for fine root length and arbuscular mycorrhizal fungi (AMF) colonization. Fruit yield was assessed at harvest, and grape juice was analyzed for soluble solids, titratable acidity, pH and yeast assimilable nitrogen content (YANC). Shoot prunings were collected and measured in the winter during vine dormancy.

Data were analyzed by ANOVA and/or nonparametric tests, as appropriate. ANOVA was conducted using site, year (or sample date), and cover crop treatment as factors allowing for all interactions. Site was designated as a random factor to allow for the widest possible application of our results to Willamette Valley vineyards. Variables that violated assumptions of variance were analyzed using the Kruskal-Wallis (K-W) nonparametric test.

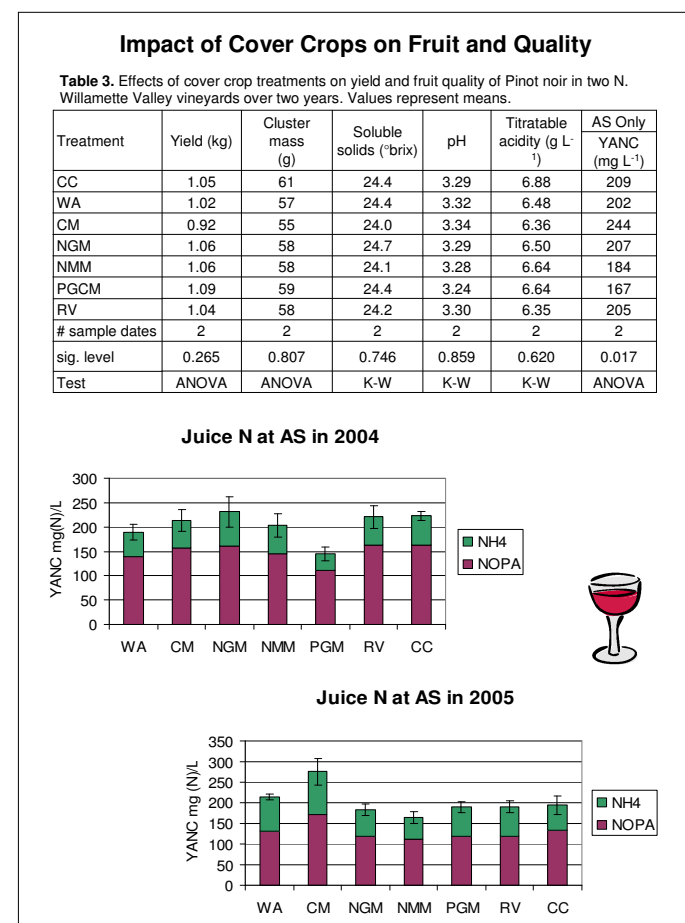
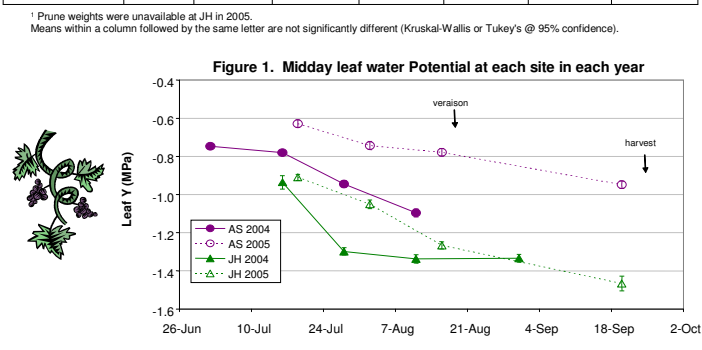


Impact of Cover Crops on Vines

Table 2. Effects of cover crop treatments on vine and soil parameters in two N. Willamette Valley vineyards over two years. Values represent means.

Treatment	Soil Moisture (% V)		Leaf water potential (MPa)	Leaf N (% dry mass)		Shoot Length (cm)	AS Only ¹ Prune weights (g)
	Vine row	Alley		Bloom	Veraison		
CC	20.6	19.1 ab	-0.97	3.22	2.21 ab	97	913 a
WA	20.1	21.4 a	-1.03	3.09	2.06 b	87	770 a
CM	20.8	20.9 a	-1.04	3.31	2.26 a	90	961 a
NGM	21.1	20.4 ab	-0.96	3.14	2.07 b	96	752 a
NMM	20.7	20.2 ab	-1.03	3.20	2.12 ab	93	856 a
PGCM	19.4	18.7 b	-1.03	3.24	2.10 ab	89	750 a
RV	nd	nd	-1.03	3.21	2.12 ab	93	845 a
# sample dates	10	10	7	2	2	3	2
sig. level	0.094	0.002	0.584	0.709	0.028	0.176	0.021
Test	K-W	K-W	K-W	ANOVA	ANOVA	ANOVA	ANOVA

¹ Prune weights were unavailable at JH in 2005. Means within a column followed by the same letter are not significantly different (Kruskal-Wallis or Tukey's @ 95% confidence).



Conclusions

- Winter Annuals and Clover Mix produced high biomass and had fewest weeds
- Native Grasses established well in the second year
- Native Meadow Mix provided floral resources in both years but did not compete well with weeds
- Vine growth, yield, & water status were not affected by cover crop treatments
- Clover Mix began to increase vine and juice N in year two, possibly at the expense of yield
- Alleyway cover crops managed by mowing do not compete with vines under typical weather years in Western Oregon