Effects of Vineyard Cover Crop Management on Soil Moisture, Vine Growth and Nutrition in Establishing Young Vines

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PROJECT OBJECTIVES:
1. Determine impact of cover crop management on vine growth and development.
2. Determine effect of cover crop management on vine nutrition.
3. Evaluate efficacy of weed control using cover crop biomass.
4. Evaluate effect of cover crop management on soil moisture and rooting of young vines.

MAJOR ACCOMPLISHMENTS (2007–2010):
Cover crop management methods lead to increases in vine growth:
This trial is currently in its second year. Vines in the heaviest mulched treatments had longer shoot length when compared across season one (2009) to the non-cover cropped treatments. Shoot length was not different by treatment in 2010. Total vine leaf area at véraison was higher in mulched treatments than non-mulched treatments in 2009 due to larger leaf area per shoot. Dormant pruning weights from treatment vines did not differ in 2009; however, this could be attributed, in part, to the amount of canopy manipulation to train vines during the growing season. Also, trunk diameter will be measured post-harvest this fall to help determine size increase over time. These parameters will continue to be monitored throughout the remainder of 2010 to 2012.

Leaf and wood biomass was obtained in Fall for vines inter-planted in each treatment in Spring. These inter-planted vines were destructively harvested for above soil biomass quantification. Total vine biomass was highest in the mulched treatments compared to non-mulched treatment with the heaviest mulch treatment (three X rate) having more growth the one X mulch rate. Inter-planted vines in the three X mulch treatment accumulated up to three and a half times the biomass than vines in non-mulched treatments.

Vine growth differences cannot be attributed to water stress as stem water potential was not different by treatment when analyzed across the 2009 and 2010 growing seasons. None of the treatment vines reach water potential levels beyond -1.2 MPa.

Cover crop impacts on vine nutrition:
Results of the full macro- and micronutrient analysis of the vine tissues from 2009 and 2010 are still pending. We have collected tissue sampels at bloom and veraison for 2009 and 2010. The current data we have to date indicates no difference in percent C, percent N, and C:N ratio at véraison (2009). Soil nitrate and ammonia

concentration did not differ between heavily mulched and the unplanted treatment in soil samples collected at véraison in 2009.

Leaf chlorophyll was estimated at three time-points during both seasons with a SPAD meter. Mulched treatments had higher SPAD units than unplanted (UN) and mow-remove (MR) treatments. This higher chlorophyll content may indicate an increase in nutritional composition of the vine that may be reflected in tissue nutrient analysis.

Using cover crop biomass mulch decreases weed biomass and emergence:
During 2009 and 2010, weed counts and percent coverage of weeds were quantified both in-row and in the alleyways of all cover crop treatments. In-row weed suppression was highest in mulched treatments with nearly 100 percent suppression of broadleaf and grass species.

Using cover crop biomass in mulch layers in-row alters root distribution:
The heaviest mulched treatment was found to have greater fine root biomass when compared to the mowed and non-mulched treatment. Further, fine root density was greater in the heaviest mulched treatment at soil depths of zero-20 centimeters. This is likely due to soil moisture conservation and compaction differences between treatments. Using cover crop biomass as in-vine-row mulch has resulted in soil moisture conservation in the top 30 cm of soil. Soil moisture was conserved in the heaviest mulch treatment by approximately 35 percent as compared to non-mulched treatments in 2009, and a similar trend was observed in the 2010 season. In-row soil compaction was lowest in mulched treatments at four measured depths from zero-30 cm. Soil compaction in the top 30 cm of soil was again the lowest in mulched treatments in spring 2010. Further years of the study will help validate these findings and other objectives outlined herein.

TECHNOLOGY TRANSFER/OUTREACH:
Preliminary data from this trial have been showcased and discussed at regional industry workshops in Oregon during 2010.

EXTERNAL SUPPORT:
Preliminary project funding was provided for year one of this trial by the Agriculture Research Foundation.

COLLABORATOR:
Dean Underwood, Olsen Family Vineyards, Monmouth, OR.

RECENT PUBLICATIONS:
None to date; one manuscript is in progress.