

Vineyard Floor Management: Effects on Soil Carbon and Nitrogen Dynamics

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Cover crops can enhance soil properties in agricultural systems. Many studies have investigated effects of cover crops and cultivation on soil carbon and nitrogen dynamics, yet few have addressed effects of these practices in vineyards. Agricultural practices in the vineyard floor tend to be less frequent and intense than those in annual cropping systems. Thus, soil carbon and nitrogen dynamics in soils supporting cover crops may be distinct in vineyard systems. The study was conducted from Fall 2005 to Fall 2006 in Monterey Co. in a Chardonnay vineyard planted in 1997. The soil type was a Coarse-loamy, mixed, superactive, thermic Cumulic Haploxeroll. The three vineyard floor treatments included two cover crops [i.e., Trios 102 (*Triticale x Trio-secale*); Merced Rye (*Secale cereale*)] and a clean, cultivated treatment. The cover crops had been planted annually for five years prior to this study. Soil respiration, dissolved organic carbon, soil nitrate pools, nitrification potential, nitrogen mineralization potential, and denitrification pools were measured in the three vineyard floor treatments. Merced Rye tended to support 1.5-2 times more aboveground biomass than Trios 102, but their aboveground biomass was similar just prior to mowing in April. Root biomass at peak aboveground biomass was approximately 2.5 times greater in Trios 102 than Merced Rye from 0-10 cm. Also, weed biomass was greater in the Trios 102 treatment than in Merced Rye, likely due to Trios 102's relatively lower aboveground biomass that occurred during the growing season. Soil respiration and dissolved organic carbon were greatest in Trios 102, followed by Merced Rye, and the clean, cultivated treatment, respectively. This may be linked to the greater root biomass in Trios 102 than Merced Rye. In general, the two cover crops had greater rates of potential nitrification, potential nitrogen mineralization, and potential denitrification than the clean, cultivated soil. The cover crop treatments had similar rates among these factors. Thus, the presence of cover crops enhanced the biological function of the vineyard soils, but cover crop type did not affect nitrogen dynamics. Cover crop type did influence soil C dynamics as well as the associated weed biomass. Future analyses will determine short-term transformations of soil carbon and nitrogen pools in these vineyard floor treatments in response to both season and management. A next step is to understand potential links between these soil nutrient dynamics and grapevine health.