Cover Crops and Tillage Effects on Grapevine Physiology and Metabolism in a Mature Vineyard in San Joaquin Valley

Maria Zumkeller, Kaan Kurtural, University of California Davis. Runze Yu CSU Fresno, Nazareth Torres Universidad Pública de Navarra

The San Joaquin Valley is one of the leading irrigated viticulture regions in the world. However, decreases in precipitation amounts and increases in temperature threaten soil water content. Although cover crops are promising resources to face this water scarcity, given that they mitigate soil erosion and water loss, there is a lack of information on how they work under different tillage systems. The aim of this study was to find the best management of vineyard soils using different cover crop and tillage systems to preserve plant available water in soil prior to the initiation of irrigation. A randomized study was conducted in Fresno with three cover crops, a permanent grass, barley, and native vegetation, under till vs. no-till systems in a Ruby Cabernet (Vitis vinifera spp.) vineyard. Our results indicated that grass under no-till preserved plant available water, which resulted in 30% less negative mid-day stem water potential in grapevine. Consequently, net carbon assimilation of grapevines grown with grass as cover crop under no-till management was enhanced compared to those with barley and natural vegetation. On the other hand, no-till associated with barley diminished carbon assimilation during berry ripening that led to lower content of sucrose in shoots. At harvest, no changes on berry mass, must pH, acidity or total soluble solids were recorded. Similarly, neither yield per vine nor berry flavonoids responded to different cover crops or tilling systems. Therefore, the use of cover crops under no-till systems may be implemented in irrigated vineyards of San Joaquin Valley with no effect on grape productivity but improving grapevine water use. These findings provide new insights into the dynamics of soil-grapevine-atmosphere continuum under current warmer conditions.