Replacing Herbicides with Under-Vine Cover Crops in Vineyards

The rapidly growing *Vitis vinifera* grape industry in the Finger Lakes of upstate New York is concentrated on the hillsides directly adjacent to the lakes, raising concern of pollution from runoff and leaching of nutrients and agrochemicals. The fertile loam soils, in combination with ample precipitation in the region, also make excessive vigor and vegetative growth a common challenge of grape growing in the region. The standard vineyard floor management practice in the region is to allow permanent vegetation to grow between rows, and maintain an herbicide strip approximately one meter wide under the trellis. Cover crops grown under the trellis have the potential to reduce vine growth, prevent erosion, improve soils, and limit pollution of local watersheds. Four under-trellis management systems were established in a Cabernet Franc vineyard in Lansing, NY in 2010: glyphosate herbicide (GLY), cultivation (CULT), native vegetation (NV), and white clover (*Trifolium repens*) annually-seeded at 10 lbs/acre (WC). Drainage lysimeters were installed beneath the under-trellis treatments to monitor nutrient and pesticide concentrations in leachate water samples. In 2012, nitrogen leachate concentrations from the WC treatment were 349% and 281% greater than that of NV and CULT, respectively; nitrogen leachate concentrations from the GLY treatment were 150% and 112% greater than NV and CULT, respectively. In 2013, GLY nitrogen leachate concentrations were 573% and 464% greater than that of NV and CULT. The bare soil treatments of GLY and CULT had similar dissolved organic carbon concentrations to one another, and were greater than dissolved organic carbon concentrations in the cover crop treatments of NV and WC in both years. In 2012, imidacloprid insecticide was found in measurable concentrations in 28% of GLY leachate samples, and imidacloprid metabolites in 33% of samples; in contrast, only 6% of CULT and WC, and 0% of NV samples contained imidacloprid at measurable concentrations or its metabolites. These results suggest that groundcover management may influence leaching of nutrients and pesticides from the vineyard. Groundcover also impacted vegetative growth and yield of grapevines. In 2012, the pruning weights of vines in the GLY treatment were 84%, 97%, and 69% larger than

those of CULT, NV and WC, respectively. In 2013, they were 53%, 133% and 63% larger. Yield was also greater in vines from the GLY treatment. In 2012, GLY treatment vines yielded 84%, 97%, and 69% more fruit than CULT, NV, and WC treatment vines, respectively. In 2013, only NV treatment vines yielded significantly less fruit than GLY, producing 28% less fruit than GLY. There was similar fruit composition between treatments in both years. Due to the severe cold temperatures during the winter of 2013/14, there was substantial primary bud mortality that differed among treatments. GLY treatment vines had 28% primary bud survival, significantly less than the 48% and 52% survival rate of CULT and NV treatment vines. Due to the impact on vine size, fruit composition, and bud survival, groundcover selection appears to have important implications in vine growth, and managing for vineyard production.