

LEGUMES AND OUR LIMITED EXPERIENCE IN EASTERN VITICULTURE

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INTRODUCTION

The use of cover crops in vineyard row centers has several advantages over cultivation including erosion control, increased equipment mobility and preservation of vineyard soil structure.

Although vineyard cover crops have been used for many years, there has been little work done on the potential benefits of leguminous species as covers under eastern viticultural conditions. Indigenous plant covers often contain species which serve as alternate hosts for virus diseases of grapevines. Legumes are generally less laterally aggressive than grass crops and offer the potential benefit of fixing atmospheric nitrogen. The release and availability of additional nitrogen late in the growing season is theoretically beneficial in its ability to facilitate fruit and cane maturation, however, conventional wisdom dictates that available nitrogen late in the growing season may decrease grapevine winter hardiness. In unirrigated vineyards, the main disadvantage of any green cover during the growing season is competition for water during

critical growth periods which may influence crop size and canopy function.

Two legumes, Crown vetch (*Coronilla varia L.*) and clover (*Trifolium spp.*) were included in a floor management experiment established in a mature 'Concord' vineyard at the Vineyard Laboratory in Fredonia, New York. Alsike clover (*Trifolium hybridum L.*), originally planted in clover plots succumbed to rust disease in the summer of 1993, but plots were immediately replanted to rust resistant white or ladino clover (*Trifolium repens L.*). White clover plots were fully established early in the 1994 growing season. Plots were approximately 18 ft. wide and 72 ft. long, with each treatment replicated in four blocks. Standards for comparison include mulch (5 tons of oat straw per acre per year), 1.5 qt. glyphosate (Roundup®) application at bloom and 4-5 shallow cultivations from bud break through early August. Covers were initially established in 1991, but because of drought conditions, several treatments were not well established until 1992.

Table 1. Annual Pruning Weights (lbs.) of 'Concord' Grapevines Under Five Row Center Management Systems

Treatment	1992	1993	1994
Mulch	3.4 a	3.2 abc	3.9 a
Roundup®	3.4 a	2.5 bc	3.1 abc
Clover	3.1 ab	1.9 cd	3.1 abcd
Vetch	3.4 a	1.9 cd	3.0 bcd
Cultivation	3.4 a	2.8 abc	3.6 abc

Vines were balance pruned (20+20) and response was monitored through measurements of growth, yield and fruit quality. All vines received fifty pounds of actual nitrogen broadcast before budbreak and an additional thirty pounds broadcast after bloom.

VINE GROWTH

Initial pruning weights were taken after the 1992 growing season and while growth rates varied under different row center management strategies, there were no significant differences in the 1993 growing season. In 1994, however,

plots which were measured at 16.0° and 15.8° Brix respectively. This difference in fruit quality can at least partially be explained by treatment cropping level differences. Fruit quality from the Roundup® and cultivated plots were not significantly different than either of the other three treatments in 1993 (Figure 1).

There were significant differences in the 1994 yields among treatments. Mulch plots had significantly higher yields than either leguminous cover crop treatment. Roundup® and cultivated plots were not different than other row center management systems. Because

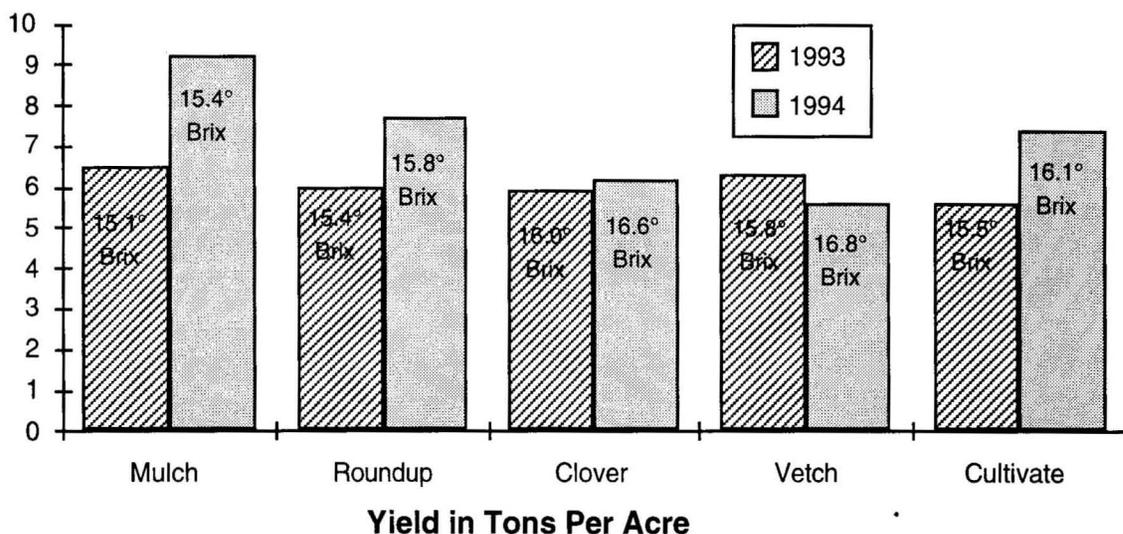


Figure 1. Results of yields in tons per acre and percent soluble solids for different cover management systems in Concord grapes in 1993 and 1994 at the Vineyard Research Laboratory in Fredonia, New York.

vines grown in mulch plots had significantly higher pruning weight than did those in vetch plots.

YIELD AND FRUIT QUALITY

In 1993, yields ranged between 5.6 tons per acre in the cultivated plots and 6.5 tons per acre in the mulch plots, but there were no significant differences between treatments. There were, however, significant differences in fruit quality among treatments. In 1993, fruit soluble solids in the mulch plots averaged 15.1° Brix and were significantly lower than the clover and vetch

retained node number after dormant pruning was dependent upon pruning weight, yield difference in 1994 are in part the result of mean 1993 pruning weight differences between treatments (Figure 1).

WATER USE

Polyethylene pots, buried to ground level and filled with soil from the plot profiles were located in field plots and contained the same representative plant cover as did the plots. Pots were weighed throughout the season to measure water loss under each treatment regime. The

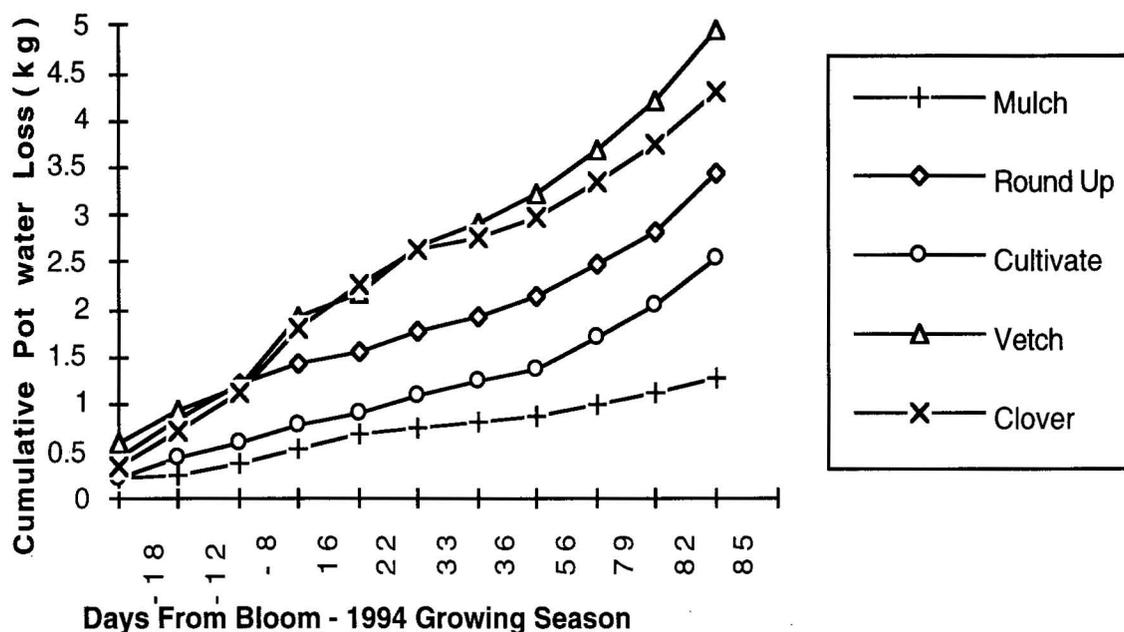


Figure 2. Difference in water use among cover management systems as measured throughout the 1994 growing season for Concord grapes at the Vineyard Research Laboratory in Fredonia, New York.

Figure 2 shows the difference in water use among cover management systems as measured throughout the 1994 growing season. As expected, mulch plots appear to be the most efficient in conserving soil moisture followed by cultivation and Roundup® treatments. The water use from clover and vetch plots diverged from the other treatments shortly after bloom and became most evident as the season progressed into the dry 1994 harvest period. Our limited experience with other cover crop systems suggests that if any green cover is present during the growing season, water deficit will occur and vines will pay a price in vigor and ultimately, in yield over time. Vetch and clover plots lost three times as much water over the course of the season as did mulch plots.

NUTRIENT LEVELS

Petioles were collected from plots in the fall of 1992, bloom and fall of 1993 and during bloom of 1994. Fall 1992 petiole analysis shows significantly higher potassium values in Roundup® and crown vetch plots than those from clover or cultivated plots. No other

significant differences were found at this sampling time (Figure 3). By bloom of 1993, the release of potassium in mulch plots resulted in higher petiole potassium status than those in Roundup® plots (Figure 4). All other treatments were intermediate in potassium level. Mulch plots had higher nitrogen status than those from clover or vetch plots but were not significantly different than vines in cultivated or Roundup® plots. The difference in nitrogen status continued in a similar trend through the fall. Vetch and clover plots had significantly lower nitrogen levels than mulch plots, but again cultivated and Roundup® plots were intermediate (Figure 5). There were no meaningful differences in nutrient levels in bloom 1994 petiole sampling (Figure 6).

CONCLUSIONS

Results from this experiment indicate that the competition for water from green covers during the summer months resulted in lower yield than those where existing vegetation was managed through physical or chemical means. Other row center experiments have shown that in wet

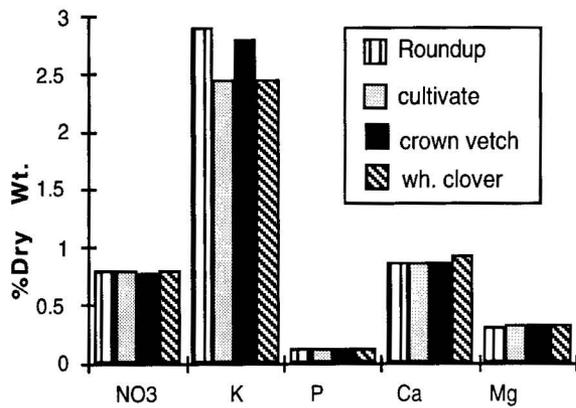


Figure 3. 1992 Fall Petiole Values for Concord Grapes under different management treatments at the Vineyard Research Laboratory in Fredonia, New York

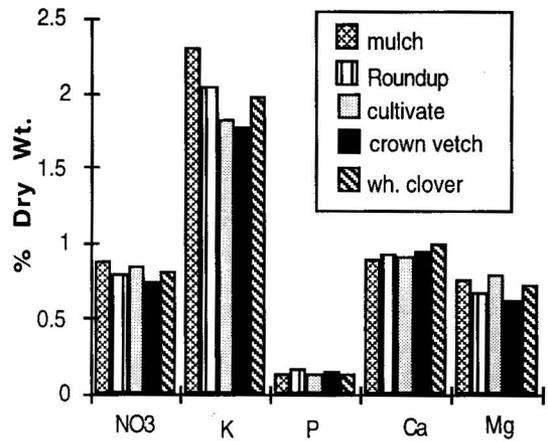


Figure 4. 1993 Bloom Petiole Values for Concord Grapes under different management treatments at the Vineyard Research Laboratory in Fredonia, New York

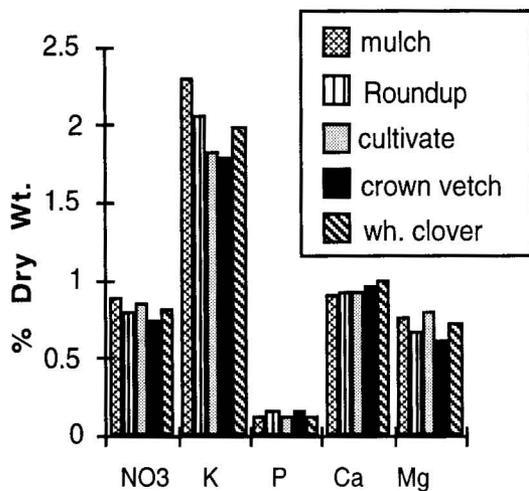


Figure 5. 1993 Fall Petiole Values for Concord Grapes under different management treatments at the Vineyard Research Laboratory in Fredonia, New York

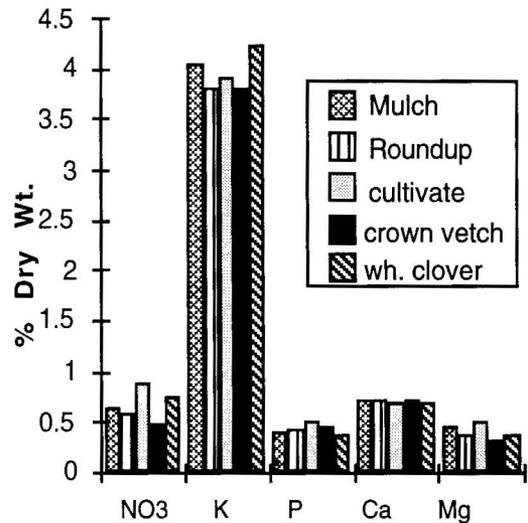


Figure 6. 1994 Bloom Petiole Values for Concord Grapes under different management treatments at the Vineyard Research Laboratory in Fredonia, New York

years, green row center covers had little effect on growth, yield or quality, but in dry years, there was a reduction in at least one of these parameters. In cultivars or locations where excessive vine vigor is a problem, or if supplemental water is added during critical growth periods, the use of these cover crops may result in an efficient management of row center vegetation.

Vines grown with leguminous row center covers did not have significantly higher nitrogen levels at any sampling date in the experiment. In other studies, legumes fixed higher levels of atmospheric nitrogen when soil nitrogen levels were low. Under conditions where there are restrictions on a grower's ability or inclination to apply nitrogenous fertilizers, the use of legumes may provide beneficials of available nitrogen.